

THE GENUS *TEUCHOPHORUS* (DIPTERA: DOLICHOPODIDAE) IN SINGAPORE

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ABSTRACT. – Thirteen species of *Teuchophorus* (Dolichopodidae: Sympycninae) are reported from Singapore. Nine species are new to science and are described and illustrated. Only one species from the *T. conspicuus* – *notabilis* group was found: *T. ornatulus* Meuffels & Grootaert. Three species belong to the *T. graciosus* group (former genus *Mastigomyia* Becker) that is supposed to be arboricolous: *T. temasek*, new species, *T. neesoonensis*, new species, and *T. antennatus*, new species. Four species belong to the *T. pauper* group: *T. singaporensis*, new species, *T. meieri*, new species, *T. spinulosus*, new species, and *T. acuminatus*, new species. *T. pauper* from Thailand is re-examined and illustrated. Three species belong to the *T. pectinatus* group and all live here in mangrove: *T. simplicissimus* Meuffels & Grootaert, *T. limosus*, new species, *T. bulohensis*, new species. Two species are considered incertae sedis and not assigned to a species group: *T. krabiensis* Meuffels & Grootaert, a species from coastal sandy beaches and *T. stenostigma* Meuffels & Grootaert, a species from stream beds in forest. A key is given for all Singaporean species. In addition, some records of species from Malaysia are given and a mangrove species from Pulau Tioman (Malaysia) related to Singaporean mangrove species is described as well.

KEY WORDS. – Diptera, Dolichopodidae, *Teuchophorus*, new species, Singapore, mangrove, swamp forest.

INTRODUCTION

In 2003, Meuffels & Grootaert published 40 new species of *Teuchophorus* from the Oriental and Australasian region. Despite this huge input of new species, still more new species were found after intensive sampling in a quite small area like Singapore. Evenhuis & Grootaert (2002) reported two unidentified species of *Teuchophorus* from Singapore, but in the present paper I raise that number to thirteen species. Nine species are new to science while the other four were described by Meuffels & Grootaert (2003). *Teuchophorus ornatulus*, originally described from Thailand, is the only Southeast-Asian species that was found here in Singapore that belongs to the *T. conspicuus-notabilis* group. This species group can be considered as a Gondwana connection since it has many representatives in the Afrotropical region described under the genus name *Olegonegrobovia* Grichanov, 1995. Remarkable is the presence of three new species of the rare *T. graciosus* group (former genus *Mastigomyia* Becker, 1924), characterised by a very long third antennal segment. They were found in the same habitat i.e. swamp forest and are apparently arboricolous. The *T. pectinatus* group (Meuffels & Grootaert, loc. cit.), which is very diverse in New Guinea,

has only three representatives in Singapore. They are all found in mangrove habitats, including *T. tiomanensis* that is described here from Pulau Tioman. Four representatives of the *T. pauper* group were found. This group is characterised by the absence of the acrostichals and all were found in acidic swampy habitats.

The typical microhabitat of *Teuchophorus*, being muddy and sandy patches along small streams in forests, are very hard to find in Singapore. Nevertheless, the nature reserves in the Central Catchment Area hold nine species. Moreover, four species are recorded in marine habitats: *T. krabiensis* is found exclusively on sandy beaches while *T. simplicissimus* and two newly described, related species are very abundant in mangrove habitats.

MATERIAL AND METHODS

Material was collected by sweep netting (5-13 October 2000, 4-13 December 2002, 19 November-11 December 2003 and March-July 2005) and with Malaise traps (November-December 2003 and a 6-month period in 2005: March-August

2005). The Malaise traps were operated at following sites in Singapore: Bukit Timah (secondary rain forest at place of sampling), Sime forest (rain forest), Central Catchment Area (swamp forest), Sungei Buloh (mangrove) and Pulau Ubin (mangrove).

The material is stored in alcohol in the collections of the Raffles Museum for Biodiversity Research, Singapore (ZRC: Zoological Reference Collection) and the Royal Belgian Institute of Natural Sciences, Brussels (RBINS). For each record a register number is given (register number in Database linked to collection data such as locality, date, collector, habitat). In addition, an inventory number (e.g. Si200) indicates where the specimens can be found in the wet collection.

The terminology used in the descriptions is that of Meuffels & Grootaert (2003) in order to conserve continuity in the descriptions. The following abbreviations are used: a: anterior; acr: acrostichal bristles; ad: anterodorsal; av: anteroventral; dc: dorsocentral bristles; pd: posterodorsal; pv: posteroventral; tp: posterior cross vein.

Morphology of the male genital apparatus

The epandrium (hypopygium or genital capsule) is composed of a spherical to pear-shaped capsule bearing a number of appendages. Dorsal (original position, before the rotation and flexion) are a pair of cerci. Their structure is simple in *Teuchophorus*. Sometimes the apical hairs are much longer than the rest (Fig. 44 in *T. tiomanensis*) or there is a long apical bristle (Figs. 7, 8 in *T. temasek*). Two pairs of surstyli are present: a dorsal and a ventral pair. The dorsal pair generally bears a strong dorsal bristle with a few minute hairs on its tip. The ventral surstylus is generally larger than the dorsal and often bears a pair of long bristles at its ventral base. These bristles should not be confused with epandrial bristles. There is no pair of lateral epandrial lobes in *Teuchophorus* like in other groups such as *Diaphorus*, *Nepalomyia*, *Dolichopus* and others. However, one or more epandrial setae are sometimes present (Fig. 8 in *T. temasek*).

The aedeagal complex is composed of three structures forming a tube: the hypandrium, the aedeagus and a pair of appendages on the epandrium. The hypandrium is generally a single plate fused at its base with the epandrium, but the hypandrium can bear two arms. On the dorsal wall of the epandrium there are generally one or two lobes that we call here the dorsal epandrial lobes. The aedeagus is generally a simple tube lying in the middle of a tube formed by the dorsal epandrial lobes and the hypandrium.

Illustrations: The lateral view of the genitalia is always the left side of the fly, because sometimes the hypandrium is asymmetrical (e.g. in *T. pauper*, *T. singaporensis* and the *T. conspicuus* group) so that right and left side are different.

TAXONOMY

Teuchophorus Loew, 1857

The genus *Teuchophorus* belongs to the subfamily Sympycninae and is very closely related to the *Sympycnus* – *Chaetogonopteron* complex. *Teuchophorus* represents small flies of about 1.5–4 mm (diagnosis see Meuffels & Grootaert, 2003). The third antennal segment is generally triangular with a dorsal arista. However, in the *T. graciosus* group (former genus *Mastigomyia* Becker) the third antennal segment can range from 3.5 times to 5.5 times as long as wide. In these species the arista can be longer than the third antennal segment, shorter or even completely absent. Females of the *T. graciosus* group have short, triangular antennae.

Chaetotaxy on the mesoscutum is stable and is as follows: The acrostichals are generally uniseriate in *Teuchophorus* and rarely absent. In the *T. pauper* group the acr are always absent. Some species of the *T. graciosus* group also lack acrostichals. Four to five dorsocentrals; one humeral with a hair beside, two notopleurals, one posthumeral, one presutural, one sutural, one intraalar, two supraalar; scutellum with two strong marginals.

The first tarsomere of the hind leg is always shortened. Vein m1+2 is turned up immediately after the connection with the cross vein tp and not presenting a wing “boss” at some distance of the cross vein like in the *Sympycnus* – *Chaetogonopteron*-complex. Males have often a stigma, being a darkened swelling on the costa. It is present in most Palaearctic species, but in Singapore only *T. stenostigma* has a slight thickening and darkening of the costa. The other species do not display that character.

Key to male *Teuchophorus* of Singapore

1. Third antennal segment more than 2.5 times as long as wide 2
 - Third antennal segment at most 1.5 times as long as wide, or shorter 4
2. Arista longer than third antennal segment; third antennal segment nearly 3.5 times as long as wide (Fig. 6) *T. temasek*, new species (pg. 62)
 - Arista shorter than third segment or even spine-like; third antennal segment more than 3.5 times as long as wide (Figs. 9, 12) 3
3. Arista shorter than base of third antennal segment. Third antennal segment 5.5 times as long as wide (Fig. 12). Acr uniseriate
 - Arista well developed but shorter than length of third antennal segment (Fig. 9). Third antennal segment 4.5 times as long as wide. No acr *T. neesoensis*, new species (pg. 64)
4. Acr present 5
 - No acr present 11
5. Mid femur ventrally with a pair of very long bristles (Fig. 2). Mid tibia ventrally near middle with a long flattened bristle ..
 - Mid femur ventrally without long bristles; mid tibia without flattened bristles *T. ornatulus* Meuffels & Grootaert (pg. 61)
- Mid femur ventrally without long bristles; mid tibia without flattened bristles 6

6. Third antennal segment about 1.5 times as long as wide; hind tibia with some strong dark bristles in the preapical comb (Fig. 49) (sandy beach) *T. krabiensis* Meuffels & Grootaert (pg. 78)
- Third antennal segment at most 1.2 times as long as wide, or shorter; hind tibia without stronger bristles in the preapical comb 7
7. Wing costa slightly thickened between R1 and R2+3, but not a real stigma (Fig. 51) *T. stenostigma* Meuffels & Grootaert (pg. 79)
- Costa with at most a darkening of the area between R1 and R2+3 8
8. Hind tibia posteriorly near base with about 5 erect hairs (mangrove) *T. simplicissimus* Meuffels & Grootaert (pg. 73)
- Hind tibia posteriorly without such hairs 9
9. Tip of cercus darkened and with long bristles *T. tiomanensis*, new species (pg. 75)
- Tip of cercus not darkened and without long bristles 10
10. Fore leg with a basal ventral spinule on first tarsomere. Surstyli short, truncate; cerci longer than surstyli (Fig. 47) *T. bulohensis*, new species (pg. 77)
- No spinule on fore metatarsus. Aedeagal complex contrastingly black and large (Fig. 39) *T. limosus*, new species (pg. 74)
11. Mid femur ventrally with about 4-5 short spine-like bristles (Fig. 26) *T. spinulosus*, new species (pg. 71)
- Mid femur ventrally without or only minute bristles 12
12. Third antennal segment about 1.5 times as long as wide, with a fine elongated tip (Fig. 28) *T. acuminatus*, new species (pg. 72)
- Third antennal segment shorter than wide 13
13. Hypandrium symmetrical (Fig. 23). Prosternum yellow, with a central brown spot *T. meieri*, new species (pg. 69)
- Hypandrium asymmetrical (Fig. 18). Prosternum entirely brown with a central black stripe 14
14. Right arm of hypandrium much longer than left arm and wrinkled laterally (Fig. 20); ventral surstylus ventrally indented, bearing two strong bristles (Thailand) *T. pauper* Meuffels & Grootaert (pg. 68)
- Right arm of hypandrium almost as long as left arm; tip of right arm smooth (Fig. 19); ventral surstylus ventrally not indented *T. singaporensis*, new species (pg. 66)

Species records and descriptions

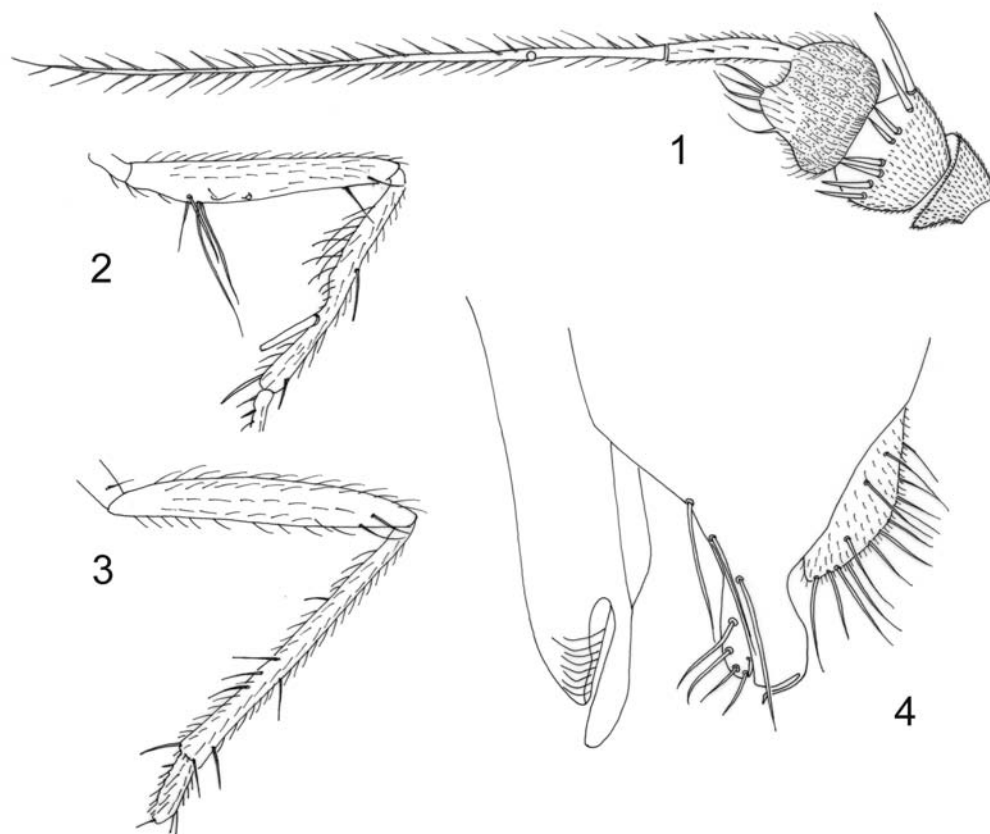
Group I. *T. conspicuus-notabilis* group

The *T. conspicuus-notabilis* group has several representatives in the Afrotropical region. They were described by Grichanov (1995) in the genus *Olegonegrobovia*. Future genetic work might reveal if recognition of *Olegonegrobovia* indeed renders *Teuchophorus* paraphyletic. This species group has also diversified in Southeast Asia with *T. ornatulus*, *T. ornatuloides* and *T. vexillifer* (Meuffels & Grootaert, 2003), but I have seen four more undescribed species (one from Northeast Thailand, one from Cambodia and two from South-China). This species group can be seen as a Gondwana-link between Southeast Asia and Africa. It is also the only “*Teuchophorus*” present in the Afrotropics.

Teuchophorus ornatulus Meuffels & Grootaert, 2003 (Figs. 1-4)

Meuffels & Grootaert, 2003: 150, Figs. 2-6.

Material examined. – SINGAPORE: 6 males, 3 females, Sime



Figs. 1-4. *Teuchophorus ornatulus* Meuffels & Grootaert, male: 1, antenna; 2, mid leg; 3, hind leg; 4, hypopygium lateral view.

forest, 24 Mar.2005 (25026, coll. P. Grootaert, Si561); 9 males, 19 females, Sime forest, 15 Apr.2005 (25061, coll. P. Grootaert, Si715); 30 males, 37 females, Sime forest, 2 Jul.2005 (25191, coll. P. Grootaert, Si865); 1 male, Sime forest, 7 Sept.2005 (25334, coll. P. Grootaert, Si1112).

MALAYSIA: 9 males, 2 females, Johor, Gunung Belumut, 22 Oct.2005, sandy riverbanks in oil palm plantation (25396, coll. P. Grootaert, Si1096); 7 males, 1 female, Gunung Belumut, 22 Oct.2005, sandy and rocky riverbanks in primary rain forest (25397, coll. P. Grootaert, Si1101).

Diagnosis. – A medium-sized metallic green species with a short antenna (shorter than wide) and wing without stigma and without “flag” (group of black bristles on hind margin of wing). Mid femur ventrally with two very long bristles near base (Fig. 2). Mid tibia with a long, flattened ventral bristle beyond middle. Hind femur with only short ventral bristles.

Distribution. – Singapore, Malaysia, South-Thailand (Trang prov.).

Group V. *T. gratiosus* group

The *T. gratiosus* species group was erected by Meuffels and Grootaert (2003) to group a number of species that were formerly considered to belong to the genus *Mastigomyia* Becker, 1922. *Mastigomyia* was synonymised with *Teuchophorus* on the basis of the identical wing venation and the inconsistent length of the third antennal segment and the arista in males. Males have a very long third antennal segment, but the length of the arista is variable. In some species the arista is absent, or short, spine-like or the arista can be longer than the third segment. Females have a short third antennal segment with long arista and cannot be separated from other *Teuchophorus* species. This was one more reason to lump *Mastigomyia* with *Teuchophorus*. Future genetic work might prove if this synonymy was a useful action or not.

Two species are known to occur in Southeast Asia: *T. gratiosus* (Becker, 1924) (described from Taiwan and recorded from Laos and Ryukyu Island, Japan) and *T. trangensis* (Bickel, 1999) (Thailand). Here I describe three additional species from Singapore, but more species are expected since I have seen an undescribed species from Northeast Thailand (Na Haeo, Loei province). Further species in the *T. gratiosus* group are *T. miricornis* Meuffels & Grootaert, 2003, from Papua New Guinea, *T. amami* (Bickel, 1999) from Ryukyu Island (Japan) and *T. anomalicerus* (Hollis, 1964) from Nepal.

In contrast to most other *Teuchophorus* species which are found on humid soils, the *T. gratiosus*-species are found by sweep netting in the vegetation or in Malaise traps and they are not active at ground-level. Hence it is likely that the adults live in the vegetation and the canopy.

Teuchophorus temasek, new species (Figs. 5-8)

Material examined. – Holotype male: SINGAPORE: Nee Soon, Central Catchment Area (Upper Peirce Reservoir), acidic swamp forest, Malaise trap, 3 Dec.2003 (23104, coll. P. Grootaert, Si39).

Paratypes: SINGAPORE: 1 male, Nee Soon, 16 Mar.2005, Malaise trap 1 in swamp forest (25015, coll. P. Grootaert, Si459); 1 female, Nee Soon, 16 Mar.2005, Mal. 2 (25016, coll. P. Grootaert, Si481); 8 males, 2 females, Nee Soon, 16 Mar.2005, Mal. 3, (25017, coll. P. Grootaert, Si496); 1 male, Nee Soon, 12 Aug.2005 (25291, coll. P. Grootaert, Si949); 1 male, 1 female, Nee Soon, 19 Aug.2005 (25298, coll. P. Grootaert, Si951); 5 males, 5 females, Nee Soon, 16 Sept.2005 (25350, coll. P. Grootaert, Si1110, Si1111).

Diagnosis. – A species of the *T. gratiosus* group with third antennal segment nearly 3.5 times as long as wide and with arista longer than third segment. Acr absent.

Description. – Male. *Body length*: 1.5 mm; *wing length*: 1.65 mm.

Head. Frons broad, with shining metallic green ground colour; face concolorous with frons, narrow, near middle as wide as an eye facet. Eye facets enlarged in front and below, small above. Palpi small, brown, with a black apical bristle. Rostrum brown. Occiput shining metallic green. Chaetotaxy as usual; a pair of long brown ocellars and verticals, 2 small postocellars. Postocular cilia uniseriate, short, brown. *Antenna* (Fig. 6) with basal segments yellow, third segment brown, very long, at least three times (3.2) as long as wide. Arista about 1.5 times as long as third segment.

Thorax. Mesoscutum and scutellum shining metallic green, but yellowish-brown on sides (humeral, notopleural depression, postalar calli). Pleurae brown in apical half, lower half of mesopleura and sternopleura yellow. Long bristles on mesoscutum brown. Chaetotaxy as usual, but no acr, 5 dc. Scutellum with 2 marginals, flanked each by a minute hair. *Legs*, including coxae, yellow.

Fore leg. Coxa with very short, sparse brown hairs, and a row of brown bristles towards apex. Femur with short, ventral bristles in basal third, half as long as femur is wide. A weak posterior preapical present. Tibia about as long as femur, without bristles or serration. First tarsomere without basal spinule. Length of femur, tibia and tarsal segments (in mm): 0.49 : 0.49 : 0.3 : 0.14 : 0.14 : 0.07 : 0.07.

Mid leg. Coxa with long brown exterior bristle. Femur with a brown preapical av and a preapical pv. Tibia with a weak brownish yellow pd on basal third; 2 ad and apical crown with 2 somewhat longer bristles. Tarsomeres 4 and 5 unusually short. Length of femur, tibia and tarsal segments (in mm): 0.63 : 0.6 : 0.31 : 0.14 : 0.8 : 0.3 : 0.3.

Hind leg. Coxa with a brown exterior bristle (shorter than that on mid coxa). Femur slightly thickened, without any bristle, except a preapical a and av. Tibia longer than femur, with 3 short brownish yellow pd. Length of femur, tibia and tarsal segments (in mm): 0.7 : 0.84 : 0.14 : 0.17 : 0.1 : 0.07 : 0.06.

Wing faintly brownish tinged, with brown veins. Costa not thickened. r4+5 and m1+2 apically slightly diverging. Apical portion of Cu twice as long as tp. Halter yellow. Squama with almost black border and black cilia.

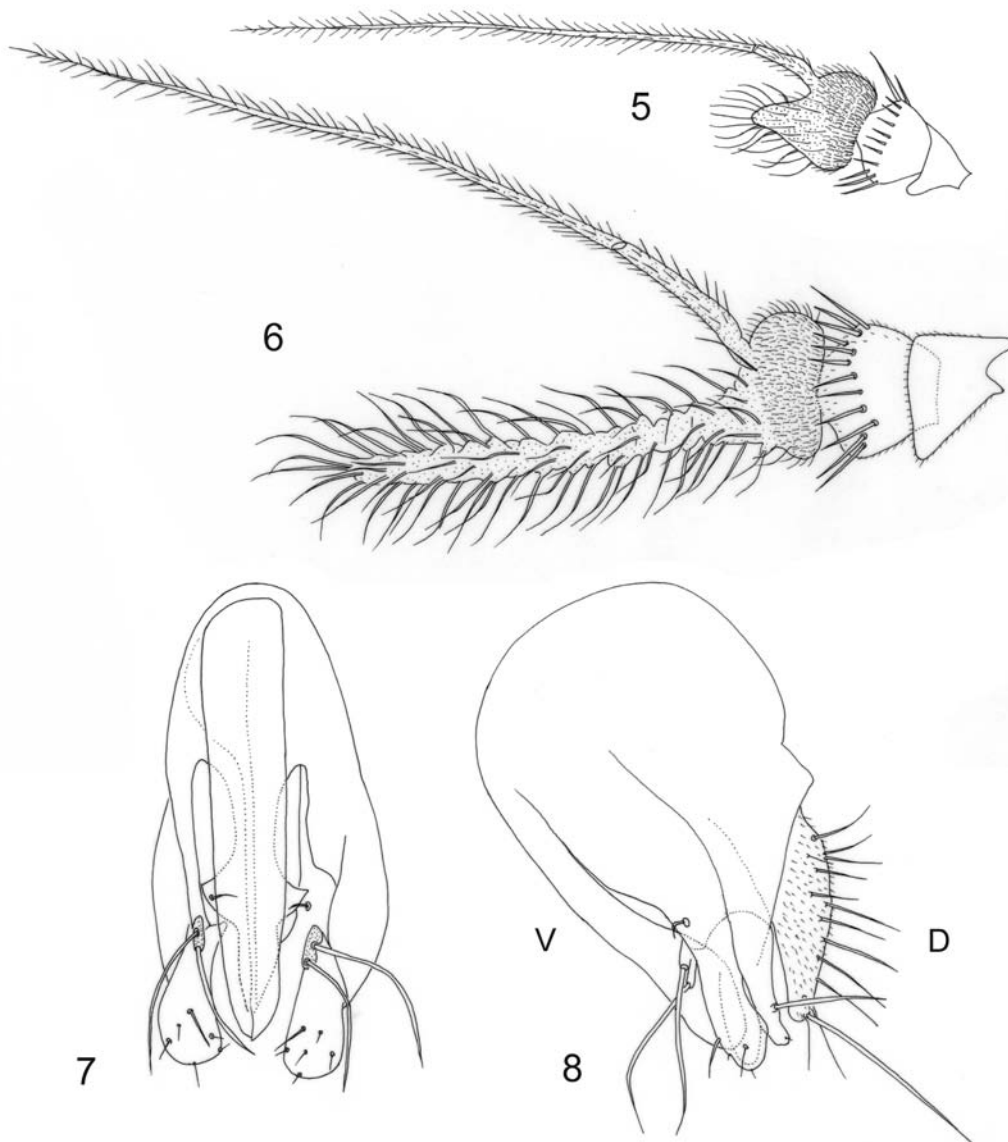
Abdomen brown; venter yellowish. Hairs and bristles brownish. First tergite with 5 pairs of long marginal bristles (outer most short). Hypopygium (Figs. 7-8) brown; cerci brown. Cercus with a long apical bristle (about as long as cercus is long). A pair of strong pedunculate epandrial bristles and a short basal epandrial (Fig. 7). Hypandrium a simple plate.

Female. Body length: 2.1 mm; wing length: 1.92 mm. Identical to male in most respects but third antennal segment short (Fig. 5); a little longer than wide. Face a little broader than in male, a little wider than second antennal segment.

Etymology. – The species name *temasek* refers to the name of ancient Singapore, which means “city at the sea”. Used as a noun in apposition.

Discussion. – *Teuchophorus temasek*, new species, is closely related to *T. graciosus* but the latter has uniseriate acrostichal bristles and the arista very short. In *T. temasek*, the arista is longer than the third antennal segment and there are no acrostichal bristles. A synapomorphy are the long marginal bristles on the first tergite.

Teuchophorus temasek, new species, and *T. neesoonensis*, new species, are sister species. The main differences in the two species are the length of the third antennal segment and the arista. In *T. temasek* the third antennal segment is nearly 3.5 times as long as wide with the arista longer than the third segment (about 1.5 times as long) and the basal antennal segments are yellowish. In *T. neesoonensis* the third antennal segment is 4.5 times as long as wide and the arista is shorter than the third segment (3/4 length of third segment). The basal antennal segments are brown. The structure of the hypopygium of both species is almost identical. Both have two strong lateral epandrial bristles on a tubercle and a small median epandrial seta. A strong dorsal bristle is present on the dorsal surstylus. The cercus bears a very long apical



Figs. 5-8. *Teuchophorus temasek*, new species: 5, female antenna; 6, male antenna; 7, hypopygium ventral view; 8, hypopygium lateral view. D: dorsal; V: ventral.

bristle. Finally, *T. temasek* and *neesoonensis* differ from *T. antennatus* new species in having no acrostichal bristles and the presence of a well-developed arista. *T. antennatus* has a very short spine-like arista and distinct, uniseriate acrostichals. It also lacks the very long apical bristles on the cercus and has only a single lateral epandrial bristle.

Distribution and habitat. – Singapore. Swamp forest.

***Teuchophorus neesoonensis*, new species**
(Figs. 9-11)

Material examined. – Holotype male: SINGAPORE: Nee Soon, Central Catchment NR, acidic swamp forest, Malaise trap, 24 Mar.2005 (25029, coll. P. Grootaert, Si600).

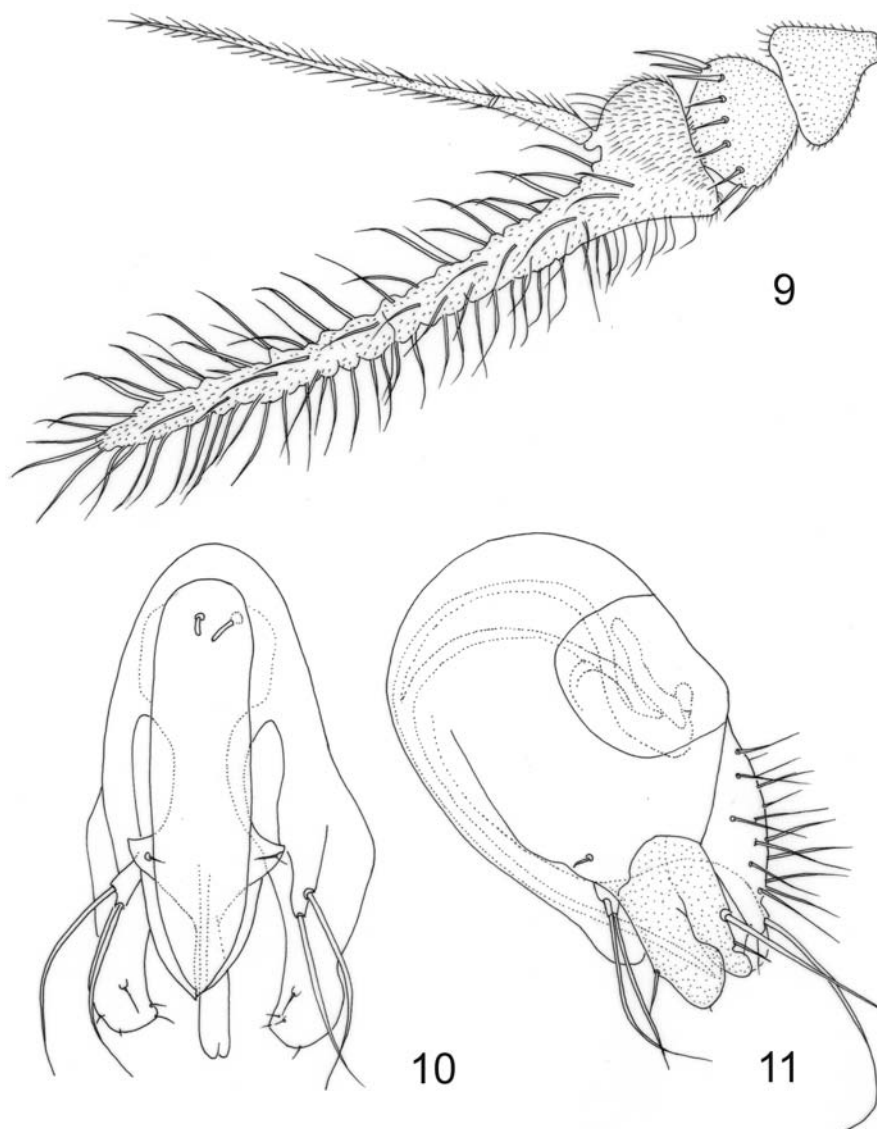
Paratypes: SINGAPORE: 2 males, Nee Soon, 26 Aug.2005, Mal 3, (25318, coll. P. Grootaert, Si1108); 1 male, Nee Soon, 7 Sept.2005, Mal. 2, (25332, coll. P. Grootaert, Si1051); 1 male, Nee Soon, 16 Sept.2005, Mal. 2, (25350, coll. P. Grootaert, Si1109).

Diagnosis. – A species of the *T. gratiosus* group with third antennal segment nearly 4.5 times as long as wide and with arista shorter than third antennal segment (about 3/4 of length of third antennal segment). Basal antennal segments brown. Acr absent.

Description. – Male. *Body length*: 1.6 mm; *wing length*: 1.5 mm.

Head. Frons broad, with shining metallic green ground-colour; face concolourous with frons, narrow, near middle as wide as an eye facet. Eye facets enlarged in front and below, small above. Palpi small, brown, with a black apical bristle. Rostrum brown. Occiput shining metallic green. Chaetotaxy as usual; a pair of long brown ocellars and verticals, 2 small postocellars. Postocular cilia uniseriate, short, brown. *Antenna* (Fig. 9) with basal segments dark brown, third segment pale brown, very long, about 4.5 times as long as wide. Arista about 3/4 length of third segment.

Thorax. Mesoscutum and scutellum shining metallic green, but yellowish-brown on sides (humeri, notopleural



Figs. 9-11. *Teuchophorus neesoonensis*, new species, male: 9, antenna; 10, hypopygium ventral view; 11, hypopygium lateral view.

depression, postalar calli). Pleurae brown on upper half, but yellow on lower half. Long bristles on mesoscutum black. Chaetotaxy as usual, but no acr, 6 dc. Scutellum with 2 marginals.

Legs, including coxae, yellow.

Fore leg. Coxa with very short, sparse brown hairs, and a row of brown bristles towards apex. Femur without ventral bristles. A weak posterior preapical present. Tibia about as long as femur, without bristles or serration. First tarsomere without basal spinule. Length of femur, tibia and tarsal segments (in mm): 0.49 : 0.49 : 0.24 : 0.14 : 0.08 : 0.05 : 0.05.

Mid leg. Coxa with long brown exterior bristle. Femur with a brown preapical av and a preapical pv. Tibia with a weak brownish pd on basal third; 2 ad and apical crown with 2 somewhat longer bristles. Tarsomeres 4 and 5 unusually short. Length of femur, tibia and tarsal segments (in mm): 0.56 : 0.56 : 0.25 : 0.12 : 0.08 : 0.07 : 0.07.

Hind leg. Coxa with a brown exterior bristle (shorter than that on mid coxa). Femur slightly thickened, without any bristle, except a preapical a and av. Tibia longer than femur, with 3 short brownish pd. Length of femur, tibia and tarsal segments (in mm): 0.77 : 0.77 : 0.17 : 0.19 : 0.08 : 0.05 : 0.05.

Wing faintly brownish tinged, with brown veins. Costa not thickened. r4+5 and m1+2 apically slightly diverging. Apical portion of Cu 1.5 times as long as tp. Halter yellow. Squama with almost black border and black cilia.

Abdomen brown; venter yellowish (except for brown 5th

sternite). Hairs and bristles brownish. First tergite with 3 pairs of long black bristles. First tergite with 6 long black marginal bristles. Hypopygium (Figs. 10-11) brown; cerci brown. Cercus with a long apical bristle (longer than cercus is long). Dorsal surstylus with a very long dorsal bristle. A pair of strong pedunculate epandrial bristles and a short basal epandrial bristle (Fig. 10). Hypandrium a simple plate.

Female unknown.

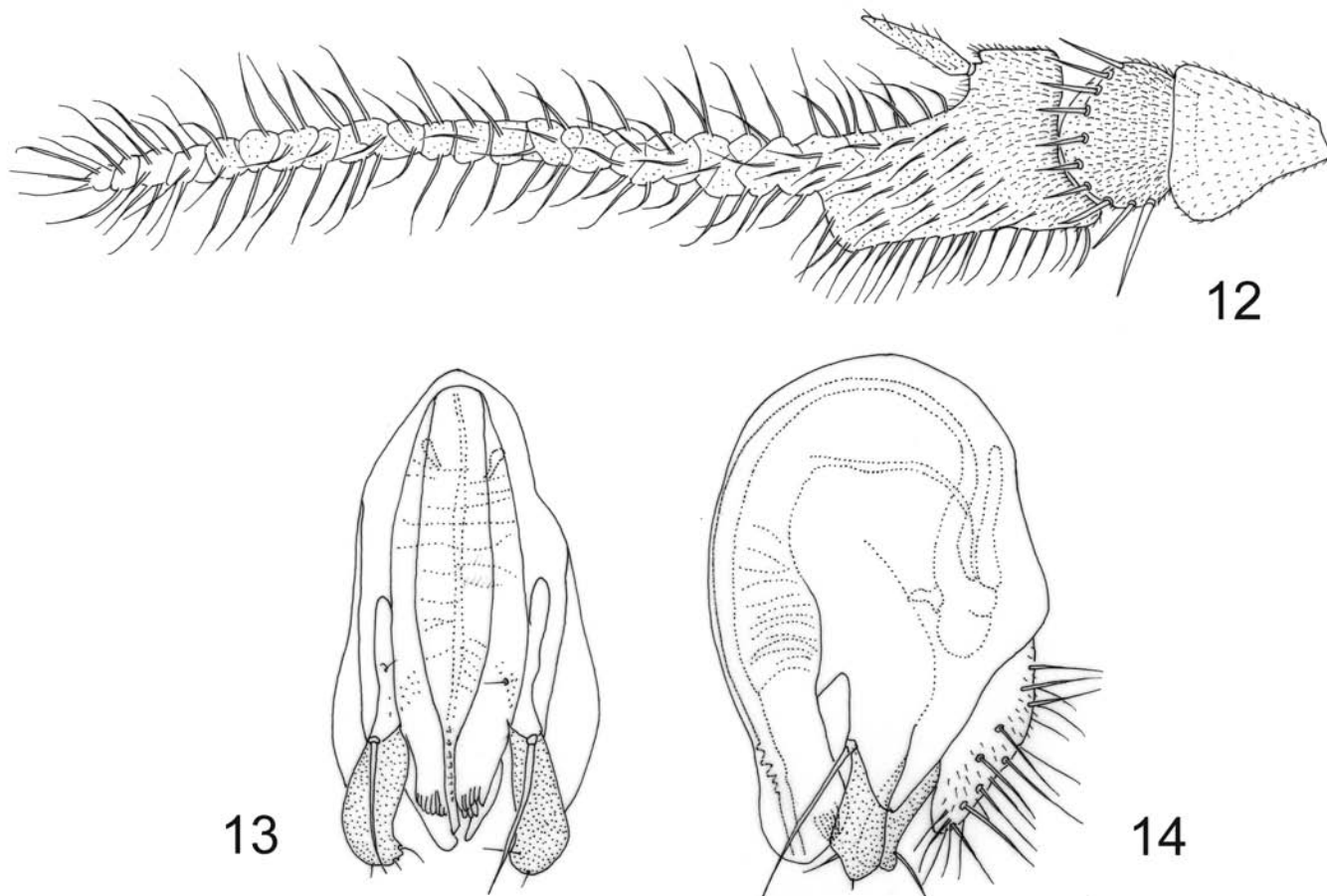
Etymology. – The name *neesoonensis* refers to the type locality that is probably one of Singapore's most diverse forests.

Discussion. – *Teuchophorus neesoonensis*, new species, is very closely related to *T. temasek*, new species. For the differences between the two species and the other species of the *T. graciosus* group, I refer to the discussion under *T. temasek*, new species. The most obvious character is the length of the arista and the third antennal segment.

Distribution and habitat. – Singapore. Swamp forest.

***Teuchophorus antennatus*, new species**
(Figs. 12-14)

Material examined. – Holotype male: SINGAPORE: Sime forest, 2 Jul.2005, Mal. 1 (25189, coll. P. Grootaert, Si864).



Figs. 12-14. *Teuchophorus antennatus*, new species, male: 12, antenna; 13, hypopygium ventral view; 14, hypopygium lateral view.

Paratypes: SINGAPORE: 1 male, Sime forest, 7 Sept.2005, Mal. 1 (25334, coll. P. Grootaert, Si1106); 1 male, Nee Soon, 16 Sept.2005, Mal. 2 (25350, coll. P. Grootaert, Si1107).

Diagnosis. – A species of the *T. graciosus* group. Third antennal segment 5.5 times as long as wide; base subrectangular. Arista spine-like, very short, about half as long as the subrectangular swelling of third antennal segment is wide (by). Bristles on head and thorax brown. Acr brown, uniseriate and diverging. Four pairs of marginals on tergite 1.

Description. – Male. *Body length*: 1.75 mm; *wing length*: 1.75 mm.

Head. Frons broad, with shining metallic green ground-colour; face concolorous with frons, narrow, near middle as wide as an eye facet. Eye facets enlarged in front and below, small above. Palpi small, brown, with a black apical bristle. Rostrum brown. Occiput shining metallic green. Chaetotaxy as usual; a pair of long brown ocellars and verticals, 2 small postocellars. Postocular cilia uniseriate, short, brown. *Antenna* (Fig. 12) with basal segment yellow, second segment pale brown, third segment brown, very long, about 5.5 times as long as wide, basally with a subrectangular swelling. Arista very short, about half as long as base of third antennal segment.

Thorax. Mesoscutum and scutellum shining metallic green, but brown on sides (humeri, notopleural depression, postalar calli). Pleurae brown on upper half, but yellow on lower half (sternopleuron, hypopleuron). Long bristles on mesoscutum dark brown. Chaetotaxy as usual. Acr distinct, uniseriate and diverging, 6 dc. Scutellum with 2 marginals.

Legs, including all coxae, yellow.

Fore leg. Coxa with very short, brown hairs, and a row of brown bristles at apex. Femur with minute ventral bristles, and a single longer preapical. A weak posterior preapical present. Tibia about as long as femur, without bristles or serration. First tarsomere without basal spinule. Length femur, tibia and tarsomeres (in mm): 0.58 : 0.49 : 0.28 : 0.14 : 0.084 : 0.056 : 0.056.

Mid leg. Coxa with long brown exterior bristle. Femur with a short, brown preapical av and a strong preapical pv. Tibia with a weak brownish pd on basal third; 3 weak pv and an apical crown of bristles. Length femur, tibia and tarsomeres (in mm): 0.63 : 0.63 : 0.28 : 0.112 : 0.07 : 0.07 : 0.056.

Hind leg. Coxa with a brown exterior bristle (shorter than the one on mid coxa). Femur slightly thickened, without any bristle, except a preapical a and av. Tibia longer than femur, with 4 short brownish pd. Tarsus somewhat curved. Length femur, tibia and tarsomeres (in mm): 0.77 : 0.91 : 0.07 : 0.224 : 0.112 : 0.084 : 0.07.

Wing faintly brownish tinged, with brown veins. Costa not thickened. r4+5 and m1+2 apically slightly diverging. Apical portion of Cu twice as long as tp. Halter yellow. Squama with black border and black cilia.

Abdomen with brown tergites; first sternite yellow, following segments pale brown. Hairs and bristles brownish. Basal tergite with 4 pairs of long black marginal bristles (outmost pair shortest). Hypopygium (Figs. 13-14) brown; cerci brown. Dorsal side of aedeagus near tip sagged. Cercus without long

apical bristle. A single long, non-pedunculate lateral epandrial and a short basal epandrial bristle present. Dorsal surstylus with a short dorsal bristle.

Female unknown.

Discussion. – The new species is closely related to *T. trangensis* Bickel, 1999. Both have a very long third antennal segment with a very short arista and the base of the third antennal segment has a peculiar subrectangular broadening. In *T. trangensis* the arista is somewhat longer than the width of the third antennal segment, whereas in the new species the arista is shorter: about half as long as the width of the third segment. In *T. trangensis* both basal antennal segments are yellow, while only the scape is yellow in the new species. The male genitalia of *T. trangensis* are not illustrated, but Bickel states (l.c.) that the genitalia of *T. trangensis* are similar to those of *T. graciosus*. The latter has a very long aedeagus, and two long, lateral epandrial setae on a tubercle. The new species has a short aedeagus with a sagged tip and only one lateral epandrial seta. Although *T. trangensis* and the new species are morphologically very similar, we consider the morphological characters as sound enough to distinguish them as separate species. For a further comparison with *T. temasek* and *T. neesoonensis*, I refer to the key and the descriptions above.

Distribution and habitat. – Singapore. Swamp forest.

Group VII. *T. pauper* group

Species without acrostichal bristles and without a basal spinule on tarsomere 1 of the fore leg. Males have no wing stigma. The legs are poorly bristled. The antennae are predominantly yellow and the third antennal segment is short. This group originally included two species: *T. pauper* Meuffels & Grootaert, 2003 (Thailand, Indonesia, Sulawesi) and *T. cteniuchus* Meuffels & Grootaert, 2003 (Irian Jaya). Here I add *T. singaporensis*, new species, and *T. meieri*, new species, that resemble very much to *T. pauper* in the somatic characters. *T. spinulosus*, new species, and *T. acuminatus*, new species, are added here provisionally on the basis of the absence of acr and the absence of a basal spinule on tarsomere 1 of the fore leg, but the colour and shape of antenna do not really fit in the group.

Teuchophorus singaporensis, new species (Figs. 15-19)

Material examined. – Holotype male: SINGAPORE: Sime forest, 24 Mar.2005 (25026, coll. P. Grootaert, Si562, ZRC).

Paratypes: SINGAPORE: 1 male, 4 females, Nee Soon, 9 Mar.2005, swamp forest (25006, coll. P. Grootaert, Si376); 3 females, Nee Soon, 9 Mar.2005 (25005, coll. P. Grootaert, Si393); 5 males, 5 females, Sime forest, 24 Mar.2005 (25026, coll. P. Grootaert, Si562 - male dissected); 2 females, Bukit Timah, 16 Mar.2005 (25021, coll. P. Grootaert, Si515); 1 female, Pulau Ubin, Check Jawa, 26 Mar.2005 (25034, coll. P. Grootaert, Si536); 1 male, 4 females, Sime

forest, 15 Apr.2005 (25061, coll. P. Grootaert, Si716); 1 female, Kranji (beach forest), 27 Jul.2005 (25254, coll. P. Grootaert, Si927).

MALAYSIA: 2 males, 1 female, Pulau Tioman, Salang, 13 Jul.2005, forest (25209, coll. P. Grootaert, Tio2); 4 males, Pulau Tioman, Salang, 13 Jul.2005 (25211, coll. P. Grootaert, Tio6); 7 males, Juara, 20 Jul.2005 (25246, coll. P. Grootaert, Tio128; extracted for DNA); 8 males, 6 females, Johor, Gunung Belumut, 22 Oct.2005, riverbanks in palm oil plantation (25396, coll. P. Grootaert, Si1098).

THAILAND: 38 males, 29 females, Phang-Nga province, Thap Put, 23 Oct.1997, (97107, coll. P. Grootaert) population of only *T. singaporensis*; 9 males, females (?), Phang-Nga province, Thap Put, 23 Oct.1997, (97107, coll. P. Grootaert) mixed population of *T. singaporensis* and *T. pauper*, so females unidentified; 24 males, 5 females, Songkhla province, Ban Huai Mo, 30 Oct.1997, swamp forest (97150, coll. P. Grootaert, RBINS), pure population of *T. singaporensis*, no *T. pauper* found.

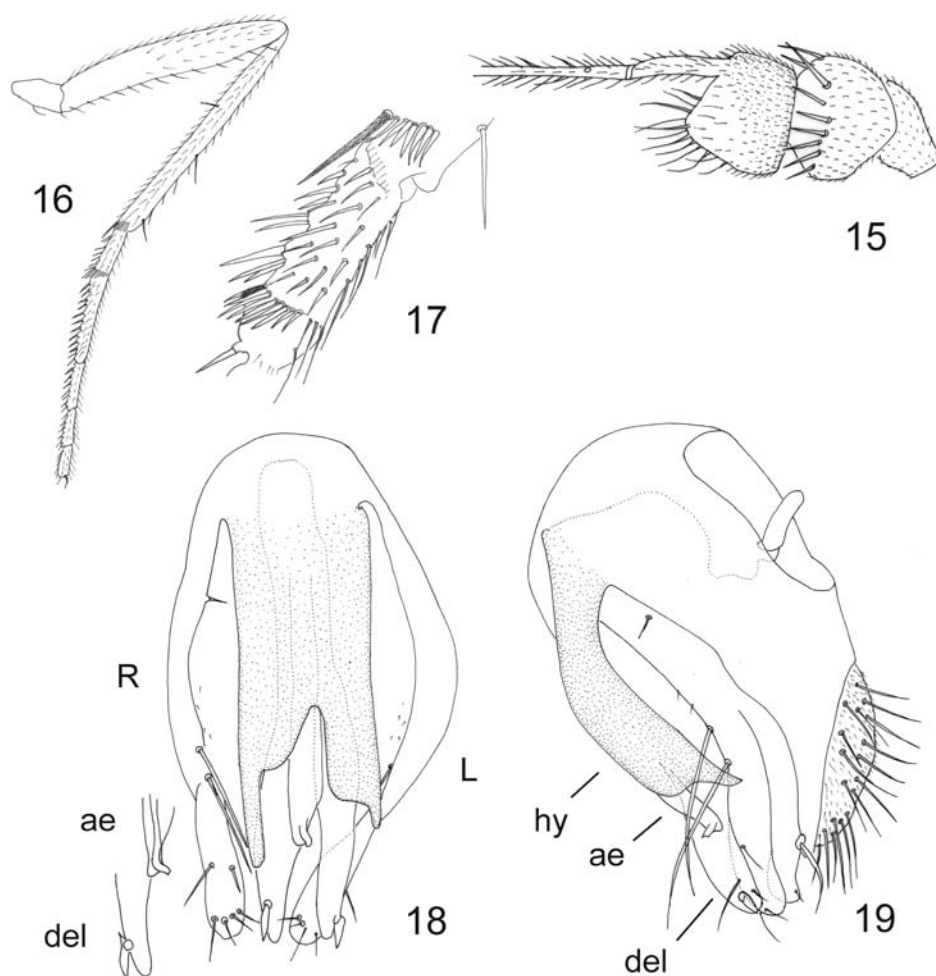
Diagnosis. – Medium-sized species with yellowish antennae. No acr; 5 dc. Bristles on head, thorax and legs yellow to yellowish brown. Costa not thickened. Prosterna entirely brown with a central black stripe. Mesopleura almost entirely brown. Hypandrium bifurcate, but asymmetric with a short

left arm and a longer right arm. In resting position aedeagus shorter than hypandrium.

Description. – Male. *Body length:* 1.38-1.50 mm; *wing length:* 1.25-1.30 mm.

Head. Frons and face with greenish black ground-colour, feebly shining. Frons broad. Face wide, at its narrowest point about as wide second antennal segment. Palpi yellowish brown, each with a short brownish yellow, sometimes dark apical bristle. Rostrum yellowish brown. Occiput greenish black, feebly shining. Chaetotaxy as usual, all bristles brownish; 2 very short postocellars. *Antenna* (Fig. 15) short, yellow; second segment darkened on dorsal surface and narrowly along apical margin; third segment darkened on about apical third. Third segment shorter than wide, with a short, blunt apex. Arista slightly more than three times as long as antenna; basal arisal segment slightly shorter than third antennal segment.

Thorax. Mesoscutum brown, with a greenish shine, becoming paler towards sides; humeri, lower part of notopleura, and a narrow border from wing root unto scutellum brownish yellow. Scutellum brownish with paler border. Mesopleura



Figs. 15-19. *Teuchophorus singaporensis*, new species, male: 15, antenna; 16, hind leg; 17, tarsomere 1 of hind leg; 18, hypopygium ventral view, with detail of tip of aedeagus and ventral epandrial lobe; 19, hypopygium lateral view. ae: aedeagus; del: dorsal epandrial lobe; hy: hypandrium; L: left; R: right.

almost completely brownish; sternopleura yellow; Prosterna brown with a black central stripe. Chaetotaxy as usual, but there are no acr; all bristles brownish or brownish yellow. 5 dc. Scutellum with 2 marginals. No propleural bristle.

Legs, including all coxae, yellow. The preapical posterior comb on the basal tarsomere of the hind legs is contrastingly darkened (the other combs are pale).

Fore leg. Coxa with short pale sparse hairs and a row of short brownish bristles towards apex. Femur with a very short hair-like preapical pv. Tibia about as long as femur, without bristles or serration. First tarsomere without ventral spinule. Length of tibia and tarsal segments (in mm): 0.4 : 0.2 : 0.09 : 0.07 : 0.06 : 0.07.

Mid leg. Coxa anteriorly and exteriorly with very short hairlets. Femur with 2 minute preapical av and 1 minute preapical pv. Tibia a little longer than femur, with 2 small brown ad; 1 small pd near base; 2 small bristles in apical crown. Length of tibia and tarsal segments (in mm): 0.65 : 0.22 : 0.13 : 0.1 : 0.08 : 0.08.

Hind leg. Coxa with a very thin and short black exterior bristle. Femur (Fig. 16) with 1-2 preapical av and 1 preapical pv, all very short and weak. Tibia (Fig. 16) hardly longer than femur; 2 (sometimes 3) weak yellowish brown or black dorsal bristles on apical half, and in between them a row of slightly lengthened hairs. First tarsal segment slightly thickened; on its anterior apical rim a fringe of very short brownish hairlets. Length of tibia and tarsal segments (in mm): 0.6 : 0.1 : 0.2 : 0.1 : 0.07 : 0.075.

Wing hyaline, slightly brownish tinged, with yellowish brown veins. Costa not thickened and not darkened. r4+5 and m1+2 apically very feebly, but distinctly diverging. Tp short, straight, oblique, much shorter than apical part of m3+4 (about 2 : 5). Halter yellow. Squama small, yellowish with darkened border, with brownish cilia.

Abdomen dorsally dark brown or brown, feebly shining, with yellowish incisions. Venter and sides yellowish. Hairs and hindmarginal bristles on terga short, dark. Hypopygium (Figs. 18 and 19) large, dark brown, partly blackish, especially the asymmetrical hypandrium contrastingly black and bulging; right arm of hypandrium almost as long as left arm; tip pointing downward and smooth. Aedeagus rather thick. Two long dorsal epandrial lobes present that surpass the tip of the hypandrial arms, each bearing a small papilla.

Female. *Body length* 1.3-1.7 mm; *wing length* 1.2-1.5 mm. Agrees in every aspect with the male. Face a little wider. Legs as in male. Oviscapt with 6 short black acanthae on each hemitergite.

Discussion. – There are three very closely related species in the *T. pauper* group that should be compared: *T. pauper* Meuffels & Grootaert, 2003, *T. singaporensis*, new species, and *T. meieri*, new species. All three species lack acrostichals, are of the same size, have yellowish brown antenna, no peculiar bristling on legs and wing without stigma. Although all three species are small in size, and even if there is variation in colouration of the thorax and the bristles, they can easily be recognized in lateral view, by looking at the shape of the hypandrium and the surstyli.

T. singaporensis, new species, and *T. pauper* are very closely related. Both have 5 equally long dorsocentrals that are yellowish-brown, prosterna entirely brown with a central black stripe and mesopleura almost entirely brown. The most obvious difference is in the genitalia. Both, *T. singaporensis* and *T. pauper* have an asymmetrical hypandrium while *T. meieri* has a symmetrical hypandrium. It is not possible to differentiate *T. pauper* from *T. singaporensis* on the somatic characters, but the structure of the male hypopygium is very different: shape of the surstyli, hypandrium, dorsal epandrial lobes and aedeagus.

T. meieri, new species, has 4 equally long, black dc, yellow prosterna with a small central black spot and only the upper third of the mesopleura brown, lower two thirds are yellow. *T. meieri* has, seen in apical view, a large hypandrium with long, symmetrical arms. Both arms end in a large, bifid tip. The ventral epandrial extensions are also symmetrical and the tip, in lateral view, is very wide. The surstyli are rather short in comparison to the long, digitiform surstyli in *T. pauper* and *T. singaporensis*.

Distribution and habitat. – Thailand, Malaysia, Singapore. Rain forest and swamp forest.

Teuchophorus pauper Meuffels & Grootaert, 2003 (Figs. 20-21)

Material examined. – THAILAND: 4 males, Phang-Nga, Sa Nangmanora (type locality), 23 Oct.1997 (97104, coll. P. Grootaert); 12 males, Phang-Nga province, Thap Put, 23 Oct.1997, (97107, coll. P. Grootaert) mixed population of *T. singaporensis* and *T. pauper* so 3 females unidentified; 1 male, Satun province, Ban Du Son, 29 Oct.1997, forest with mainly bamboo, (97141, coll. P. Grootaert, RBINS); 119 males, 31 females, Songkhla province, Ban Khlong Kua, 29 Oct.1997, secondary rain forest (97142, coll. P. Grootaert, RBINS), pure population of *T. pauper*, no *T. singaporensis* present; 2 males, 2 females, Satun province, 20 km north of La-Ngu, 1 Nov.1997, secondary rain forest (97155, coll. P. Grootaert, RBINS); 10 males, 1 female, Satun province, 21 km north of La-Ngu, 1 Nov.1997, secondary rain forest (97156, coll. P. Grootaert, RBINS).

Diagnosis. – Medium-sized species with yellowish antennae. No acr; 5 dc. Bristles on head, thorax and legs yellow to yellowish brown. Costa not thickened. Prosterna entirely brown with a central black stripe. Mesopleura almost entirely brown. Hypandrium bifurcate, but asymmetric with a very short left arm and a longer right arm. The tip of the right arm is rugose in right lateral view. The tip of the aedeagus is long effilate. The dorsal surstylus is dorsally near tip excavated and bears two long bristles at the base of the concavity.

Description. – Male. *Body length*: 1.5 mm, *wing length*: 1.25 mm.

Meuffels & Grootaert (2003) shows curiously bent appendages below the hypandrium. Specimens of the type locality (Sa Nangmanora near Phang-Na, Thailand) were re-examined. In the original description (Fig. 120) the structure of the right hypandrial arm was misinterpreted. It is much

shorter and has a rugose (wrinkled) tip. The dorsal epandrial lobe is very long and bears two short, pointed appendages (Fig. 20).

I have not found *T. pauper* in Singapore. Considering its distribution in South-Thailand and the mixed populations of *T. pauper* and *T. singaporensis*, it is likely to occur in Singapore as well.

Distribution and habitat. – South Thailand, Indonesia: Sulawesi Utara. Rain forest and swamp forest.

***Teuchophorus meieri*, new species**
(Figs. 22-24)

Material examined. – Holotype male: SINGAPORE: Nee Soon, 5 Apr. 2005, Malaise trap in swamp forest (25048, coll. P. Grootaert, Si665).

Diagnosis. – Medium-sized species with yellowish antennae. No acrostichals. 4 black dc. Bristles on head, thorax and legs black. Legs poorly bristled. Costa not thickened. Hypandrium symmetrical. Prosterna yellow, with a central brown spot. Upper third of mesopleura brown, lower two thirds yellow.

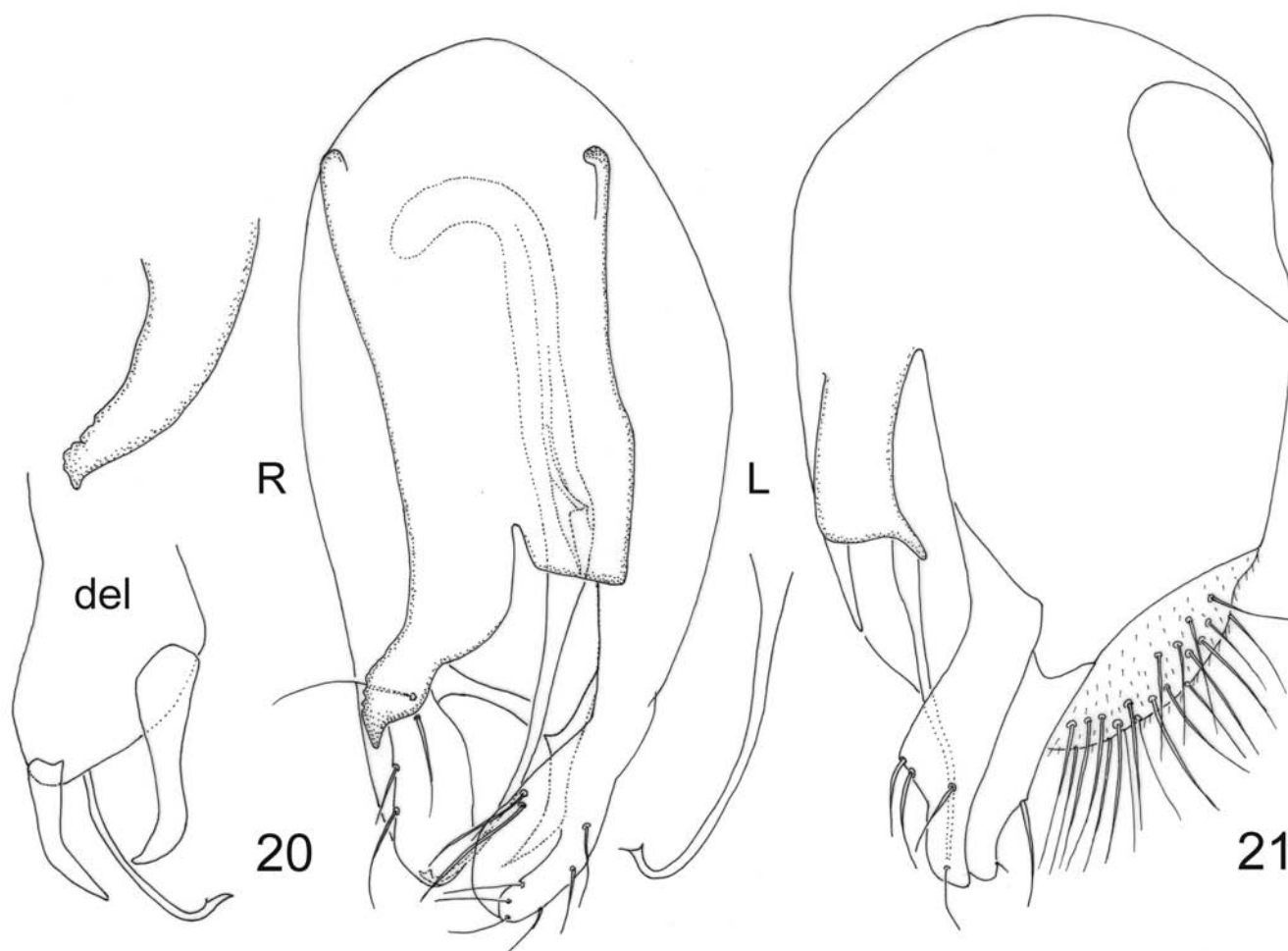
Description. – Male. *Body length*: 1.5 mm, *wing length*: 1.25 mm.

Head. Frons and face with greenish blue black ground-colour, feebly shining. Frons broad. Face wide, at its narrowest point almost as wide as second antennal segment is wide. Palpi brown, each with a short black apical bristle. Rostrum yellowish brown. Occiput greenish black, feebly shining. Chaetotaxy as usual, all bristles black; 2 very short postocellars. *Antenna* (Fig. 22) short, yellowish brown; third segment hardly as long as wide, with a short, blunt apex. Arista slightly more than three times as long as antenna; basal arisal segment shorter than third antennal segment.

Thorax. Mesoscutum dark brownish, shining, paler brownish towards sides: humeri, lower part of notopleura, and a narrow stripe from wing root unto scutellum brownish yellow. Scutellum brown. Pleurae yellowish. Upper third of mesopleura brown, lower two thirds yellow, Sternopleura and hypopleura yellow. Bristles on thorax black. No acr; 4 dc. Scutellum with a pair of black marginals. A minute pale propleural bristle.

Legs, including coxae, yellow (including posterior four coxae). Tip of hind femora brown.

Fore leg. Coxa with very short sparse hairs and a row of short brownish bristles at apex. Femur with a very short hair-like preapical pv. Tibia about as long as femur, without bristles



Figs. 20-21. *Teuchophorus pauper* Meuffels & Grootaert, male: 20, hypopygium ventral view, with detail of dorsal epandrial lobe (del), right hypandrial arm and tip aedeagus; 21, hypopygium lateral view. L: left; R: right.

or serration. No basal spinule on first tarsomere. Length of femur, tibia and tarsal segments (in mm): 0.36 : 0.35 : 0.15 : 0.08 : 0.07 : 0.06 : 0.07.

Mid leg. Coxa anteriorly and exteriorly with very short hairs, no exterior bristle. Femur with a minute preapical av. Tibia a little longer than femur, with 2 small brown ad (one basal, one median); 1 small pd near base; 2 small bristles in apical crown. Length of femur, tibia and tarsal segments (in mm): 0.49 : 0.53 : 0.19 : 0.11 : 0.08 : 0.05 : 0.05.

Hind leg. Coxa with a very thin and short dark exterior bristle. Femur with 1-2 preapical av and 1 preapical pv, all very short and weak. Tibia hardly longer than femur; 2 (sometimes 3) weak yellowish brown or black dorsal bristles on apical half, and in between them a row of slightly lengthened hairs. First tarsal segment slightly thickened; on its anterior apical rim a fringe of very short brownish hairs. Length of femur, tibia and tarsal segments (in mm): 0.49 : 0.49 : 0.08 : 0.14 : 0.08 : 0.07 : 0.07.

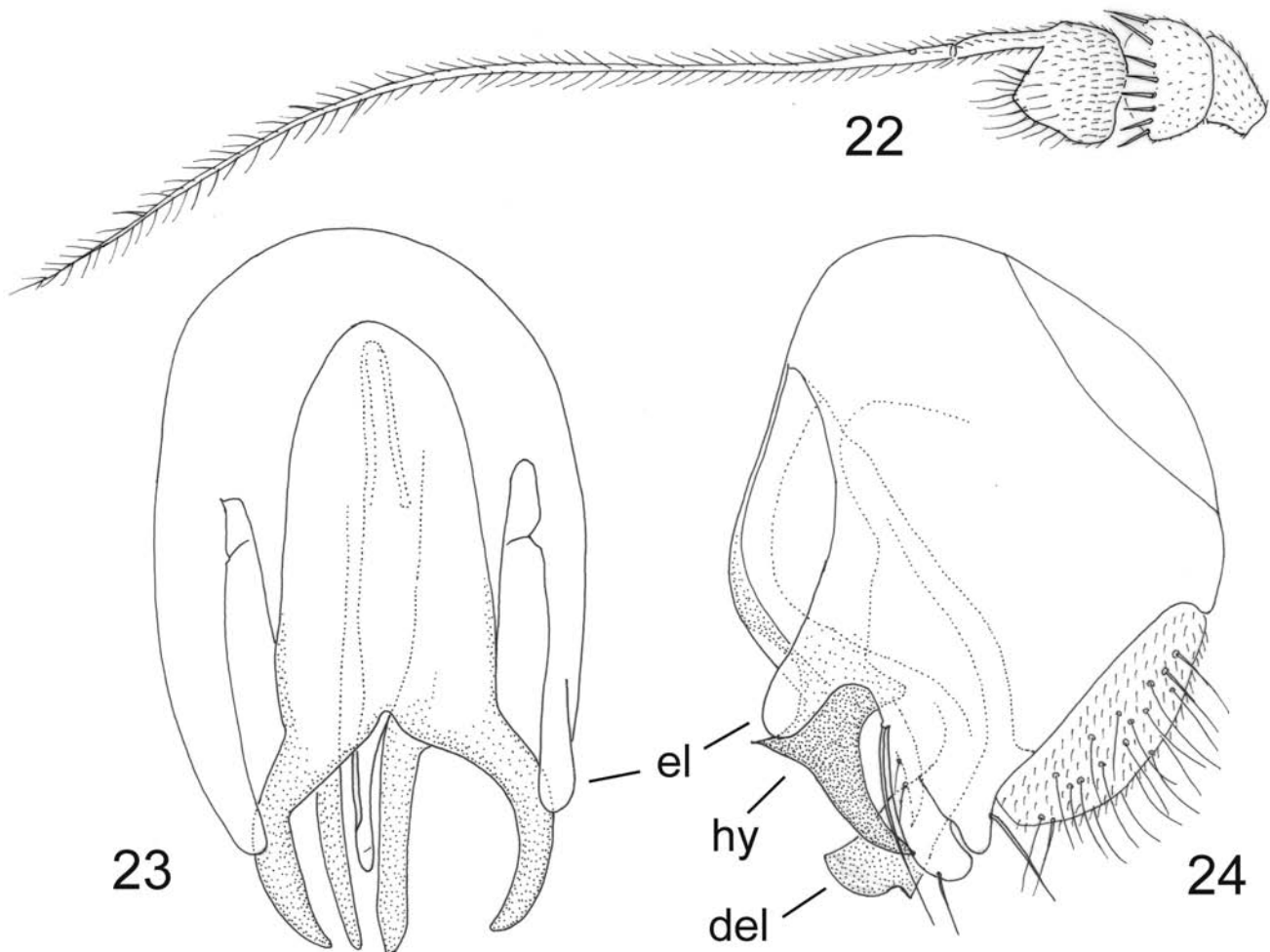
Wing hyaline, slightly brownish tinged, with brownish veins. Costa not thickened, no stigma but the costa between r1 and r2+3 darker brown (not black). r4+5 and m1+2 apically very feebly diverging. Tp short, straight, oblique, much shorter than apical part of m3+4 (about 2 : 5). Halter yellow. Squama small, with darkened border, with few short brownish cilia. *Abdomen* dorsally dark brown or brown, feebly shining,.

Venter and sides yellowish. Hairs and hindmarginal bristles on terga extremely short, dark. Hypopygium (Figs. 23-24) moderately large, dark brown, partly blackish, with partly black appendages. Hypandrium with two long arms (Fig. 23). The tip of the arms are enlarged and bifid in lateral view (Fig. 24). In addition, the epandrium bears a pale, lateral lobe on both sides, partly covering the tips of the hypandrium (Fig. 24). (This structure is unique in *Teuchophorus* and probably not homologous with the epandrial lobe in other groups). Tip of ventral epandrial lobes much enlarged; the lobes are symmetrical in ventral view.

Female unknown.

Etymology. – The new species is dedicated to my host Dr. Rudolf Meier, Associate Professor at NUS and head of the Evolutionary Biology Laboratory.

Discussion. – *Teuchophorus meieri*, new species, is very similar to *T. singaporensis* and *T. pauper* in the absence of acrostichal bristles, the similar size, general colouration, as well as the poorly bristled legs. We refer to the discussion under *T. singaporensis* to distinguish *T. meieri* from *T. singaporensis* and *T. pauper*.



Figs. 22-24. *Teuchophorus meieri*, new species, male: 22, antenna; 23, hypopygium ventral view; 24, hypopygium lateral view. hy: hypandrium; del: dorsal epandrial lobe; el: epandrial lobe.

There are more species without acr especially in the *T. graciosus* group. Here in Singapore, there are *T. temasek*, new species, and *T. neesoonensis*, new species. The males of both have very long antennae. The females having short antenna, that are however at least as long as wide, are hard to distinguish from *T. pauper* and *T. meieri*. *T. spinulosus*, new species, and *T. acuminatus*, new species, also lack acrostichals, but have the third antennal segment about 1.5 times as long as wide.

Distribution and habitat. – Singapore. River banks in rain forest.

***Teuchophorus spinulosus* new species**
(Figs. 25-27)

Material examined. – Holotype male: SINGAPORE: Sime forest, 24 Mar.2005 (25026, coll. P. Grootaert, Si560).

Paratypes: SINGAPORE: 1 male, Sime forest, 24 Mar.2005 (25026, coll. P. Grootaert, Si560); 5 males, Sime forest, 1 Apr.2005 (25041, coll. P. Grootaert, Si637); 1 male, Sime forest, 15 Apr.2005, sweeping (25061, coll. P. Grootaert, Si717); 1 male, Sime forest, 8 Apr.2005 (25053, coll. P. Grootaert, Si736); 1 male, Sime forest, 1 Jul.2005 Mal. 1 (25189, coll. P. Grootaert, Si1061).

Diagnosis. – A small species without acrostichal bristles. Wing without stigma. Third antennal segment elongated, triangular, almost 1.5 times as long as high. Mid femur with 4 to 5 short ventral spine-like bristles.

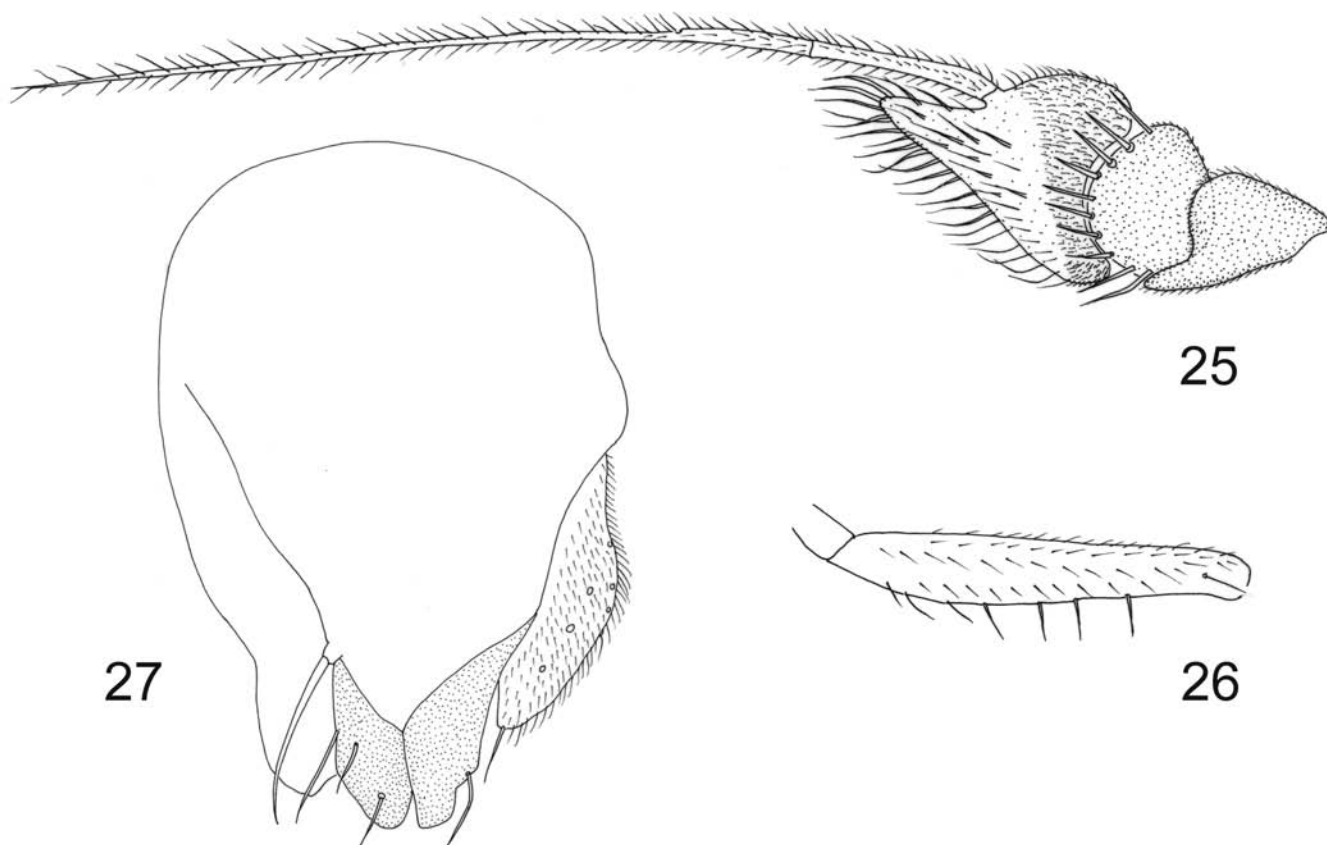
Description. – Male. *Body length*: 1.63 mm; *wing length*: 1.63 mm.

Head. Frons and face with shining dark metallic green ground-colour. Eyes almost touching on face. Palpus small, black, with a small, black apical bristle. Rostrum brown. Occiput blackish green. Chaetotaxy as usual; no postocellars. Postoculars uniseriate, short, black. *Antenna* (Fig. 25) brown; third segment pointed triangular, 1.5 times as long as wide. Arista slightly more than twice as long as antenna, shortly pubescent.

Thorax. Mesoscutum dark brown, paler at sides, but darker toward tip; scutellum blackish. Pleurae largely brown; insertion of wing yellowish. Chaetotaxy as usual, but no acr. **Legs** and coxae yellow, but apical 1/4 of hind femora, and tarsi brown, hind tarsi darkest. **Fore leg.** Coxa anteriorly with very short black hairs, that become longer towards apex of coxa. Femur without bristles. Tibia slightly shorter than femur, without bristles or serration. First tarsal segment without a basal, ventral spinule. Length of femur, tibia and tarsal segments (in mm): 0.56 : 0.42 : 0.19 : 0.07 : 0.06 : 0.06 : 0.08.

Mid leg. Coxa anteriorly with very short brown hairs. Femur (Fig. 26) ventrally with about 4-5 short spine-like bristles being 3/4 of width of femur; a weak preapical pv, and a yet thinner preapical av. Tibia with 2 ad, 1 pd. Length of femur, tibia and tarsal segments (in mm): 0.65 : 0.58 : 0.22 : 0.14 : 0.09 : 0.07 : 0.08.

Hind leg. Coxa with a thin, black exterior bristle. Femur with a small preapical av, and some of the hairs of the anteroventral row near tip very slightly lengthened. Tibia about as long as



Figs. 25-27 *Teuchophorus spinulosus*, new species, male: 25, antenna; 26, mid femur; 27, hypopygium lateral view.

femur; with 2-3 short dorsal bristles; 1 very short and weak ventral bristle. Length of femur, tibia and tarsal segments (in mm): 0.70 : 0.64 : 0.11 : 0.19 : 0.11 : 0.08 : 0.08.

Wing greyish brown tinged, with dark brown veins. No stigma and costa between r1 and r2+3 not darkened. r4+5 and m1+2 very parallel. Apical part of cu, 1.5 times as long as tp. Halter white. Squama brown, with a black border, and 5 long black cilia.

Abdomen dorsally dark brown, with a feeble greenish gloss. Sterna brown. Hairs and hindmarginal bristles on terga short, black. Hypopygium (Fig. 27) brown, with tips of surstyli black.

Female unknown.

Etymology. – The name *spinulosus* refers to the 4-5 short spine-like bristles on the mid femur.

Discussion. – The short spine-like bristles on the mid femur are characteristic. The shape of the third antennal segment is also quite unique.

Distribution and habitat. – Singapore. Riverbanks in rain forest.

***Teuchophorus acuminatus*, new species**
(Figs. 28-30)

Material examined. – Holotype male: SINGAPORE: Nee Soon (Lower Peirce Reservoir), 27 Apr.2005 (25091, coll. P. Grootaert, Si783).

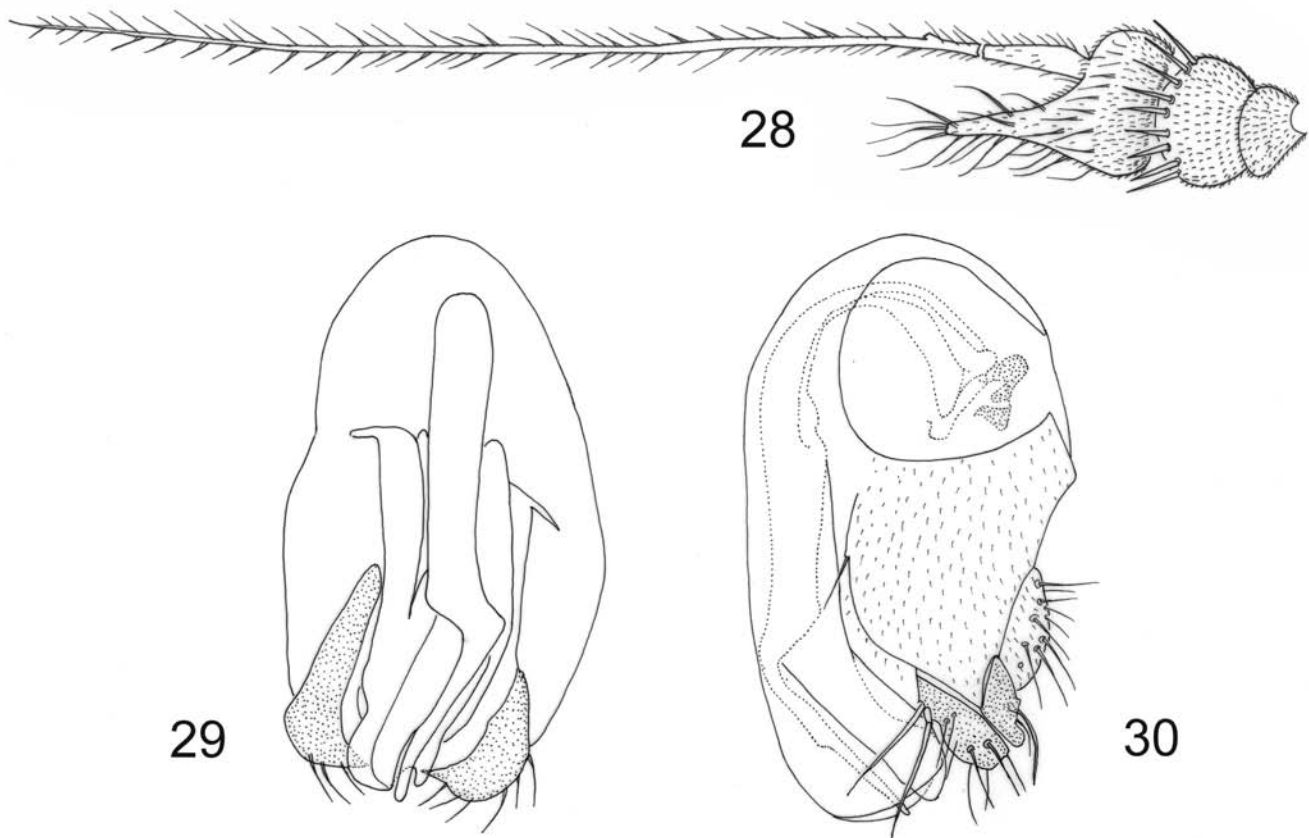
Paratypes: SINGAPORE: 1 male, Nee Soon (Lower Peirce Reservoir), 27 Apr.2005 (25094, coll. P. Grootaert, Si789); 1 male, Nee Soon, 19 Aug.2005 (25297, coll. P. Grootaert, Si952); 1 male, Nee Soon, 7 Sept.2005 (25323, coll. P. Grootaert, Si1052).

Diagnosis. – Third antennal segment nearly 1.5 times as long as wide: basal part wide, with a fine, elongated tip. No acr. No stigma. No ventral bristles on femora.

Description. – Male. *Body length*: 1.75 mm; *wing length*: 1.5 mm.

Head. Frons broad, with shining metallic green ground-colour; face concolorous with frons, narrow, near middle as wide as eye facet. Eye facets enlarged in front and below, small above. Palpi small, yellowish-brown, with a black apical bristle. Rostrum brown. Occiput shining metallic green. Chaetotaxy as usual; a pair of long brown ocellars and verticals, 2 small postocellars. Postocular cilia uniseriate, short, brown. *Antenna* (Fig. 28) with all segments yellowish-brown; third antennal segment not triangular, but rather onion-shaped with a slender point; almost 1.5 times as long as wide. *Thorax.* Mesoscutum and scutellum brownish in ground-colour, with a metallic green shine. Pleura with mesopleura yellowish-brown; sternopleura and hypopleura contrastingly pale yellow; pteropleura brown. Long bristles on mesoscutum dark brown. No acr, 5 dc. Scutellum with 2 marginals.

Legs yellow, without distinct bristles. Femora without ventral bristles. No indication of a basal spine, or a hair on a tubercle on fore metatarsus. Fore leg: No indication of a basal spinule or hair on tarsomere 1. Length femur, tibia and tarsomeres (in mm): 0.42 : 0.42 : 0.36 : 0.11 : 0.07 : 0.06 : 0.06.



Figs. 28-30. *Teuchophorus acuminatus*, new species, male: 28, antenna; 29, hypopygium ventral view; 30, hypopygium lateral view.

Mid leg: Length femur, tibia and tarsomeres (in mm): 0.53 : 0.59 : 0.39 : 0.27 : 0.084 : 0.07 : 0.07.

Hind leg: Length femur, tibia and tarsomeres (in mm): 0.63 : 0.64 : 0.11 : 0.252 : 0.14 : 0.098 : 0.07.

Abdomen. Tergites brown, sternites pale brown. First tergite with short marginals only (not long as in *T. temasek* and the other species of the *T. graciosus* group). Male genitalia large, elongated. Hypandrium and aedeagus asymmetrical (Fig. 29-30).

Female unknown.

Etymology. – The name *acuminatus* refers to the pointed tip of the third antennal segment (*acuminatus* Lat. for pointed).

Discussion. – The shape of the tip of the third antennal segment suggests that *T. acuminatus*, new species, might belong to the *T. graciosus* group. In contrast to the *T. graciosus* group, the genitalia are large and there are no long marginal bristles on the first tergite. Because of the absence of the acrostichals, the rather pale mesoscutum and the asymmetrical hypandrium, *T. acuminatus*, new species, is provisionally placed in the *T. pauper* group.

Distribution and habitat. – Singapore. Riverbanks in rain forest.

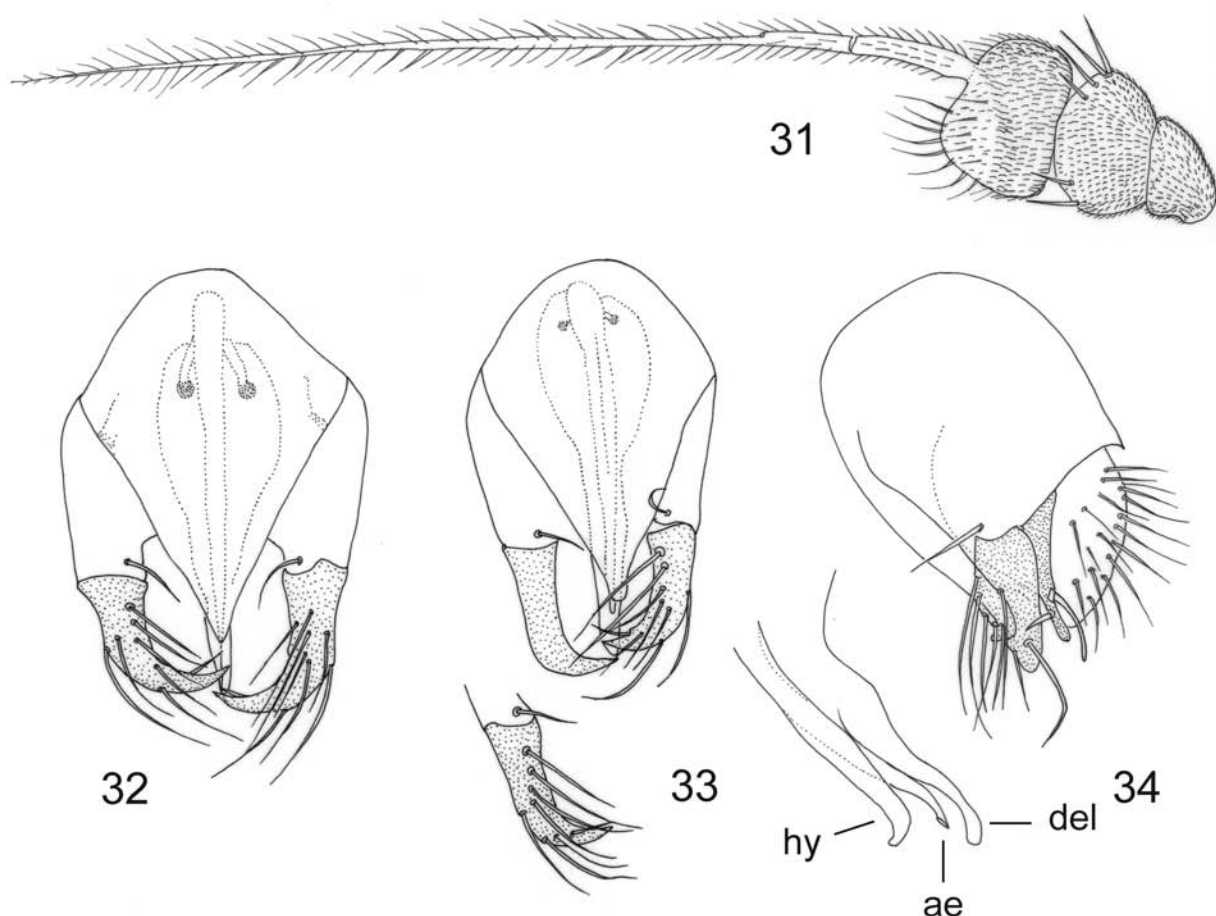
Group X. *T. pectinatus* group

This large species group is characterized as follows: spinules at ventral base of fore tarsomere 1 present; Legs usually poorly bristled; Eyes separated on face, except in *T. costalis* subgroup; Third antennal segment short, length less than or equal to width, seldom longer than wide; Surstyli separated, but sometimes closely connected, usually long, mostly of about equal length and often finger-shaped. Cerci often sickle-shaped. Hypandrium as a rule not surpassing tips of surstyli. This is a very large group containing 29 species that has been subdivided into 12 subgroups (Meuffels & Grootaert, 2003). This group is apparently characteristic for the Oriental and Australian Regions and radiated here.

Teuchophorus simplicissimus Meuffels & Grootaert, 2003 (Figs. 31-34)

Meuffels & Grootaert, 2003: 222, Figs. 192-197.

Material examined. – SINGAPORE: 15 males, Sungei Buloh, 6 Oct.2000 (20032, coll. P. Grootaert & N. Evenhuis); 19 males, 22 females, Sungei Buloh, 9 Dec.2002 (22057, coll. P. Grootaert); 7 males, Sungei Buloh, 28 May.2005 (25037, coll. P. Grootaert, Si555); 62 males, Sungei Buloh, 22 Jun.2005 (25121, coll. P.



Figs. 31-34. *Teuchophorus simplicissimus* Meuffels & Grootaert, male: 31, antenna (Sungei Buloh); 32, hypopygium ventral view (Pulau Tioman); 33, hypopygium ventral view with detail of dorsal surstylus (Sungei Buloh); 34, hypopygium lateral view with detail of aedeagus (Sungei Buloh). ae: aedeagus; del: dorsal epandrial lobe; hy: hypandrium.

Grootaert, Si795); 10 males, Sungei Buloh, 26 Aug.2005, sweep netting (25321, coll. P. Grootaert, Si1020); 1 male, Kranji, 27 Jul.2005 (25254, coll. P. Grootaert, Si926).

MALAYSIA: 70 males, 48 females, Pulau Tioman, Monkey Bay, 14 Jul.2005 (25217, coll. P. Grootaert, Tio30); 14 males, Juara, 20 Jul.2005 (25244, coll. P. Grootaert, Tio76); 67 males, Juara, 20 Jul.2005 (25245, coll. P. Grootaert, Tio86); 33 males, Juara, 20 Jul.2005 (25246, coll. P. Grootaert, Tio124).

Diagnosis. – Third antennal segment hardly as long as wide. Costa not swollen, but darkened between r1 and r2+3. First tarsomere of fore leg with a basal spinule. Mid femur without bristles. Mid tibia with a row of ventral spinules in apical third. Hind femur without ventrals. Hind tibia posteriorly in second basal quarter with about 5 erect hairs. Tip of hypandrium with a small hook.

Discussion. – The specimens in Sungei Buloh are a little smaller than the ones on Pulau Tioman. Study of the male genitalia (Figs. 33 vs. 32) suggests that they are conspecific. It is confirmed by genetic work (Wei Song, Grootaert & Meier, in litt.). For identification one should check the

presence of the 5 erect hairs in the second basal quarter posteriorly on the hind tibia.

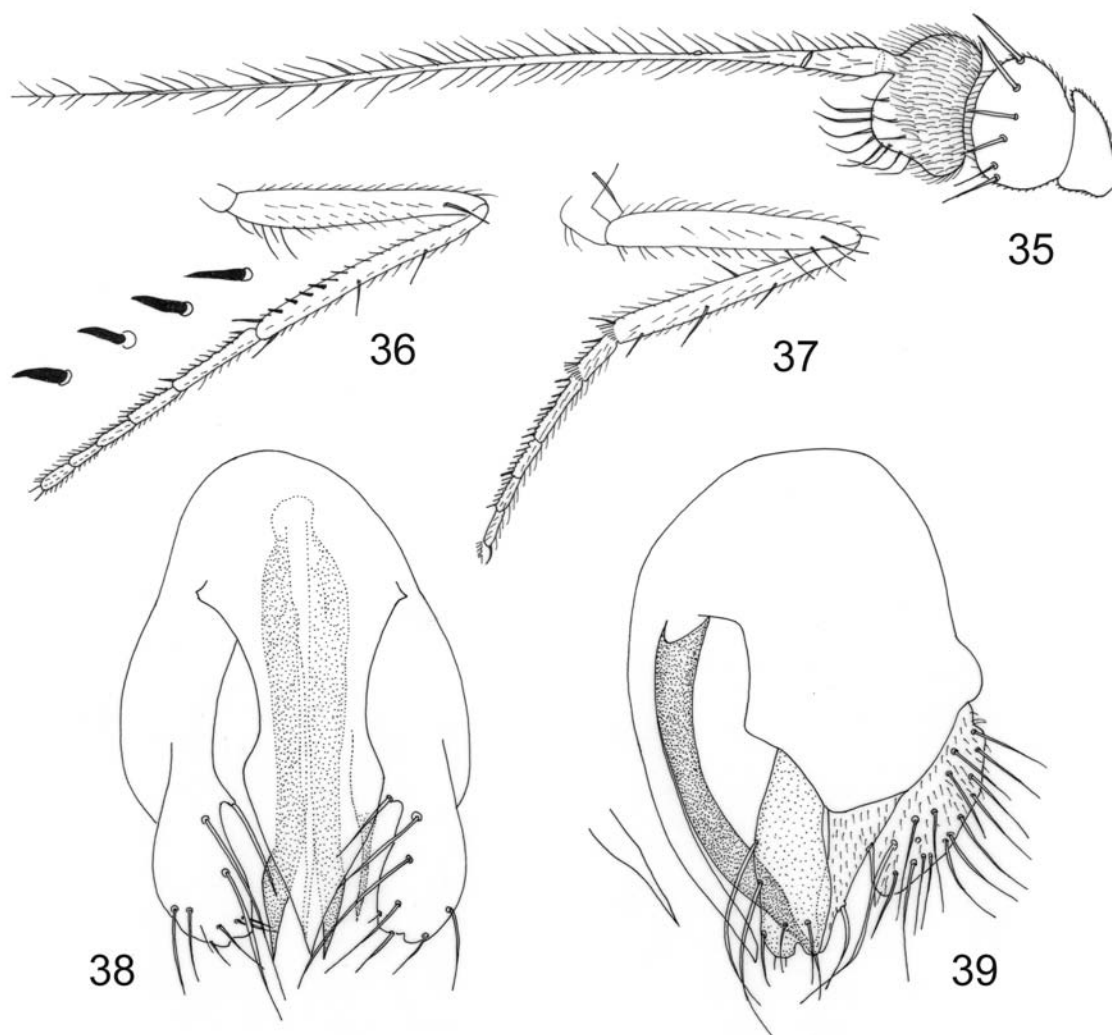
Distribution and habitat. – Thailand, Malaysia and Singapore. It is very common in the upper, less saline parts of mangroves in Singapore. The specimens in Thailand were collected on the sides of pools in a cave system in connection with a mangrove.

***Teuchophorus limosus*, new species**
(Figs. 35-39)

Teuchophorus limosus is referred to as species B in Evenhuis & Grootaert, 2002: 316.

Material examined. – Holotype male: SINGAPORE: Sungei Buloh, 27 Nov.2003, mangrove (23092, coll. P. Grootaert) in Raffles Museum.

Paratypes: SINGAPORE: 44 males, Sungei Buloh, 27 Nov.2003, mangrove (23092, coll. P. Grootaert); 2 males, 4 females, Sungei Buloh, 27 Nov.2003 (23091, coll. P. Grootaert); 2 males, Sungei



Figs. 35-39. *Teuchophorus limosus*, new species male. 35. antenna; 36. mid leg with detail of ventral spinules on apical third of tibia; 37. hind leg; 38. hypopygium ventral view; 39. hypopygium lateral view.

Buloh, 9 Dec.2003 (22057, coll. P. Grootaert); 7 males, Sungei Buloh, 28 Mar.2005 (25037, coll. P. Grootaert, Si554); 63 males, Sungei Buloh, 22 Jun.2005 (25121, coll. P. Grootaert, Si794); 2 males, Sungei Buloh, 11 May.2005 (25159, coll. P. Grootaert, Si810); 7 males, Sungei Buloh, 6 Jul.2005 (25199, coll. P. Grootaert, Si879); 27 males, Sungei Buloh, 26 August.2005, sweep netting (25321, coll. P. Grootaert, Si1019); 4 males, 7 females, Lim Chu Kang, 13 Oct.2000 (20051, coll. P. Grootaert & Neal Evenhuis); 3 males, Pulau Ubin, Chek Jawa, 19 Nov.2003 (23080, coll. P. Grootaert); 3 males, 1 female, Chek Jawa, 2 Dec.2003 (23097, coll. P. Grootaert); 1 male, 1 female, Chek Jawa, 11 Dec.2003 (23119, coll. P. Grootaert); 3 males, Pandan mangrove, 5 Dec.2003 (23109, coll. P. Grootaert); 17 males, 10 females, Mandai mangrove, 9 Oct.2000 (20038); 3 males, 3 females, Kranji, mangrove, 6 Oct.2000 (20033, coll. P. Grootaert & N. Evenhuis, species B in Evenhuis & Grootaert, 2002); 2 males, Kranji (beach forest), 27 Jul.2005 (25254, coll. P. Grootaert, Si925).

Diagnosis. – Antenna brownish black with third antennal segment a little wider than long. No stigma present, but costa between r1 and r2+3 darkened. Acr uniseriate. First tarsomere of fore leg without basal spinule (at most an indistinct hair). Mid femur with 2 short ventral bristles at base. Mid tibia ventrally with 4 spinules in apical third. Hind femur without bristles, except for 3 av bristles in apical third. Hind tibia with 2 dorsal bristles. Aedeagal complex strong, black, separated from surstyli.

Description. – Male. *Body length:* 1.4-1.6 mm; *wing length:* 1.25-1.4 mm.

Head. Frons subshining metallic green. Face somewhat denser greyish dusted than frons. Palpi small, brown, with a small black bristle. Rostrum brownish yellow. Occiput subshining dark metallic green. Chaetotaxy as usual; no postocellars. Postoculars short, uniseriate, black. *Antenna* (Fig. 35) short; first and second segments brownish black; third segment dark brown, with a lighter coloured apex. Third segment short, shorter than wide, with a blunt apex. Arista less than 3 times as long as antenna, shortly pubescent; basal segment slightly shorter than upper margin of third antennal segment.

Thorax. Mesoscutum and scutellum subshining dark metallic green. Pleurae dark brown, with a metallic green gloss on mesopleura and metapleura; the latter with a black anterior border. Acr uniseriate; 5 dc. A minute propleural bristle.

Legs, including coxae, yellow. Mid coxa exteriorly with a vague brown longitudinal streak.

Fore leg. Coxa anteriorly with short, sparse, brownish hairs; towards tip a row of 4-5 rather short brownish bristles. Femur with a very weak preapical pv. Tibia about as long as femur, with a short anterodorsal serration, most distinct in apical half. First tarsal segment without spinules at base, at most an indistinct hair. Length of femur, tibia and tarsal segments (in mm): 0.42 : 0.42 : 0.2 : 0.07 : 0.06 : 0.04 : 0.07

Mid leg. Coxa anteriorly with short brownish hairs, no exterior bristle. Femur (Fig. 36) with a rather long preapical av, and a slightly shorter preapical pv; ventrally at base 3 pale bristles about half as long as femur is deep; tibia about as long as femur; 2 ad, 1 pd; ventrally on apical two fifths a row of 4-5 short spinules (Fig. 36); apical bristles short. Length of femur, tibia and tarsal segments (in mm): 0.52 : 0.52 : 0.21 : 0.11 : 0.08 : 0.07 : 0.07.

Hind leg. Coxa with a weak black exterior bristle. Femur (Fig.

37) without ventral bristles, with two long av preceding the preapical a. Tibia about as long as femur; 3 dorsal bristles; first tarsal segment short; on posterior apical rim a short black fringe. Length of femur, tibia and tarsal segments (in mm): 0.52 : 0.56 : 0.11 : 0.14 : 0.1 : 0.07 : 0.07.

Wing hyaline. Costa not thickened between tips of r1 and r2+3, at most darker than the rest of the costa. r4+5 and m1+2 apically more or less parallel. Length ratio of basal and apical parts of m1+2 about 1:2.5. Halter yellow. Squama brown, broadly blackened at apex, with dark cilia.

Abdomen dorsally dark bronze-brown, subshining. Venter yellowish; sternites brownish at middle. Hairs and marginal bristles on terga short, black. Hypopygium (Figs. 38-39) dark brown. Hypandrium, aedeagus and dorsal epandrial lobes strongly curved and separated from surstyli. Aedeagal complex looks contrastingly black due to the black dorsal epandrial lobes, but hypandrium and aedeagus transparent.

Female. *Body length* 1.4-1.7 mm; *wing length* 1.3-1.45 mm. In most respects identical to male. Ventral spinules on apical half of mid tibia absent.

Etymology. – The name *limosus* (Latin for muddy) refers to the muddy substrate in the mangrove where the new species lives.

Discussion. – The new species looks superficially like *T. simplicissimus* that is sympatric. It is easily distinguished from the latter by the strong, black, curved aedeagal complex, the absence of the posterior erect hairs on the hind tibia and the absence of a basal spinule at the base of the first tarsomere of the fore leg.

To identify the species quickly, squeeze the abdomen so that the large black aedeagal complex is freed or, look for absence of the erect posterior hairs on the hind tibia to separate the species from *T. simplicissimus*.

Distribution and habitat. – Singapore. Very common in mangrove, but occurs only in the upper mangrove near pools with less saline water or along affluent freshwater streams.

Teuchophorus tiomanensis, new species (Figs. 40-44)

Material examined. – Holotype male: MALAYSIA: Pulau Tioman, Paya, 19 Jul.2005 (25237, coll. P. Grootaert, Tio44).

Paratypes: MALAYSIA: 198 males, 118 females, Pulau Tioman, Paya, 19 Jul.2005 (25237, coll. P. Grootaert, Tio44; 25 males selected for DNA sequencing); 10 males, Juara, 20 Jul.2005 (25244, coll. P. Grootaert, Tio77); 30 males, Juara, 20 Jul.2005 (25245, coll. P. Grootaert, Tio87), 16 males, Juara, 20 Jul.2005 (25246, coll. P. Grootaert, Tio126). Females of the Juara samples could not be separated from the females of *T. simplicissimus*.

Diagnosis. – Antenna brownish black with third antennal segment as long as wide. No stigma present and costa between r1 and r2+3 only faintly darkened. Acr uniseriate. Fore tibia with dorsal serration. First tarsomere of fore leg with a small

basal spinule. Mid tibia ventrally with a row of spinules in apical half. Hind femur with minute bristles, except for 3 av bristles in apical third. Hind tibia with 3 dorsal bristles; posteroventrally in apical half a row of hairs about as long as tibia is wide. Hypandrium black, pointed. Cercus with long apical bristles, surpassing tip of ventral surstylus. Dorsal surstylus not developed.

Description. – Male. *Body length:* 1.6–1.75 mm; *wing length:* 1.5–1.6 mm.

Head. Frons subshining metallic green. Face wide, almost as wide as basal antennal segment. Palpi small, black, with a small black bristle. Rostrum brown. Occiput subshining dark metallic green. Chaetotaxy as usual. Postoculars short, uniseriate, black. *Antenna* (Fig. 40) short; first and second segments brownish black; third segment dark brown, with a lighter coloured apex. Third segment as long as wide, with a rounded tip. Arista 3.5 times as long as antenna, shortly pubescent; basal segment longer than upper margin of third antennal segment.

Thorax. Mesoscutum and scutellum subshining dark metallic green. Pleurae dark brown, with a metallic green gloss on

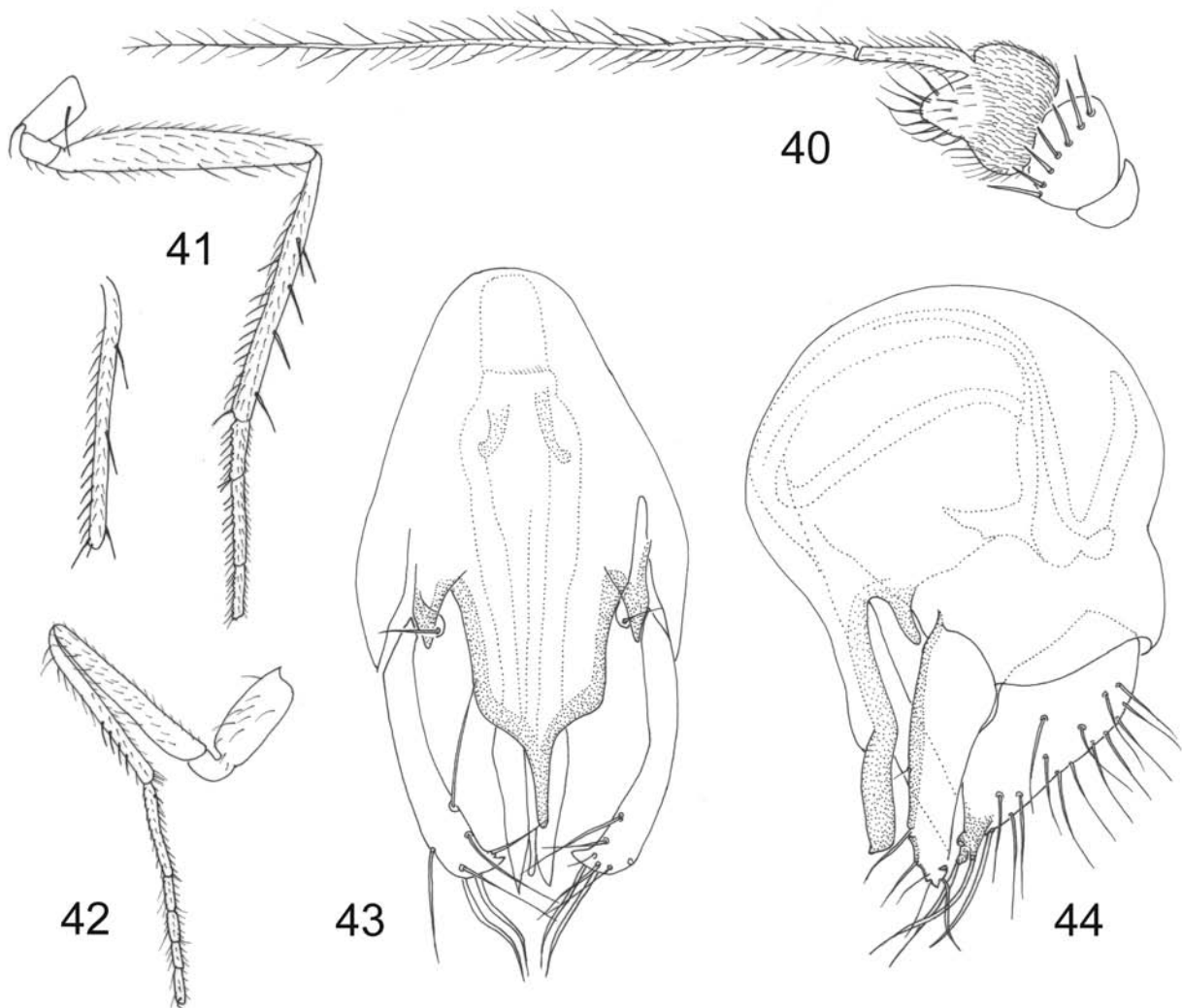
mesopleura and metapleura. Acr uniseriate, much shorter than dc; 5 dc.

Legs, including coxae, yellow. Mid coxa brownish, exteriorly with a vague brown longitudinal streak.

Fore leg. Coxa anteriorly with short, sparse, brownish hairs; towards tip a row of 4 brownish bristles. Femur with a very weak preapical pv. Tibia about as long as femur, with an anterodorsal serration (Fig. 42). First tarsal segment with a spinule at base. Length of femur, tibia and tarsal segments (in mm): 0.49 : 0.41 : 0.21 : 0.07 : 0.07 : 0.07 : 0.08.

Mid leg. Coxa anteriorly with short brownish hairs, no exterior bristle. Femur with a rather long preapical av, and a slightly shorter preapical pv; ventrally with only minute hairs. Tibia about as long as femur; 2 ad, 1 pd; ventrally on apical third a row of 4–5 short spine-like bristles; apical bristles short. Length of femur, tibia and tarsal segments (in mm): 0.59 : 0.59 : 0.25 : 0.17 : 0.09 : 0.08 : 0.07.

Hind leg. Coxa with a weak black exterior bristle. Femur (Fig. 41) without ventral bristles, with two long av preceding the preapical a. Tibia about as long as femur; 3 dorsal bristles; a weak posterior in basal 2/5; posteroventrally in apical half a row of hairs about as long as tibia is wide (Fig. 41). Length



Figs. 40–44. *Teuchophorus tiomanensis*, new species, male: 40, antenna; 41, hind leg anteriorly with detail of tibia in posterior view; 42, fore leg; 43, hypopygium ventral view; 44, hypopygium lateral view.

of femur, tibia and tarsal segments (in mm): 0.59 : 0.63 : 0.13 : 0.24 : 0.11 : 0.07 : 0.07.

Wing hyaline. Costa not thickened between tips of r1 and r2+3, hardly darker than the rest of the costa. r4+5 and m1+2 apically more or less parallel. Apical half of m1+2 about twice as long as tp. Halter white. Squama brown, darker at apex, with dark cilia.

Abdomen dorsally dark bronze-brown, subshining. Sternites brown. Hairs and marginal bristles on terga short, black. Hypopygium (Figs. 43-44) dark brown. Hypandrium broad at base, but tip narrow and elongate. A single short basal epandrial bristle present. Dorsal surstylus absent. Cercus yellowish, but with a brown tip bearing about 3-4 long bristles.

Female. *Body length:* 1.4-1.7 mm; *wing length:* 1.3-1.45 mm. In most respects identical to male. Fore tibia with a weak serration. First tarsal segment also with a basal spinule. Mid tibia without ventral spinules in apical half; a strong av bristle near middle (absent in male), a strong anterior at basal quarter and an anterior just below middle. Hind tibia without a pv row of hairs.

Etymology. – The name *tiomanensis* refers to the type locality Pulau Tioman, a Malaysian island in the South China Sea.

Discussion. – *T. tiomanensis* is related to *T. simplicissimus* but can easily be distinguished from the latter by its cerci that are as long as the single surstylus, and that bear a number of long bristles at tip.

Distribution and habitat. – Malaysia, Pulau Tioman. Mangrove.

***Teuchophorus bulohensis*, new species**

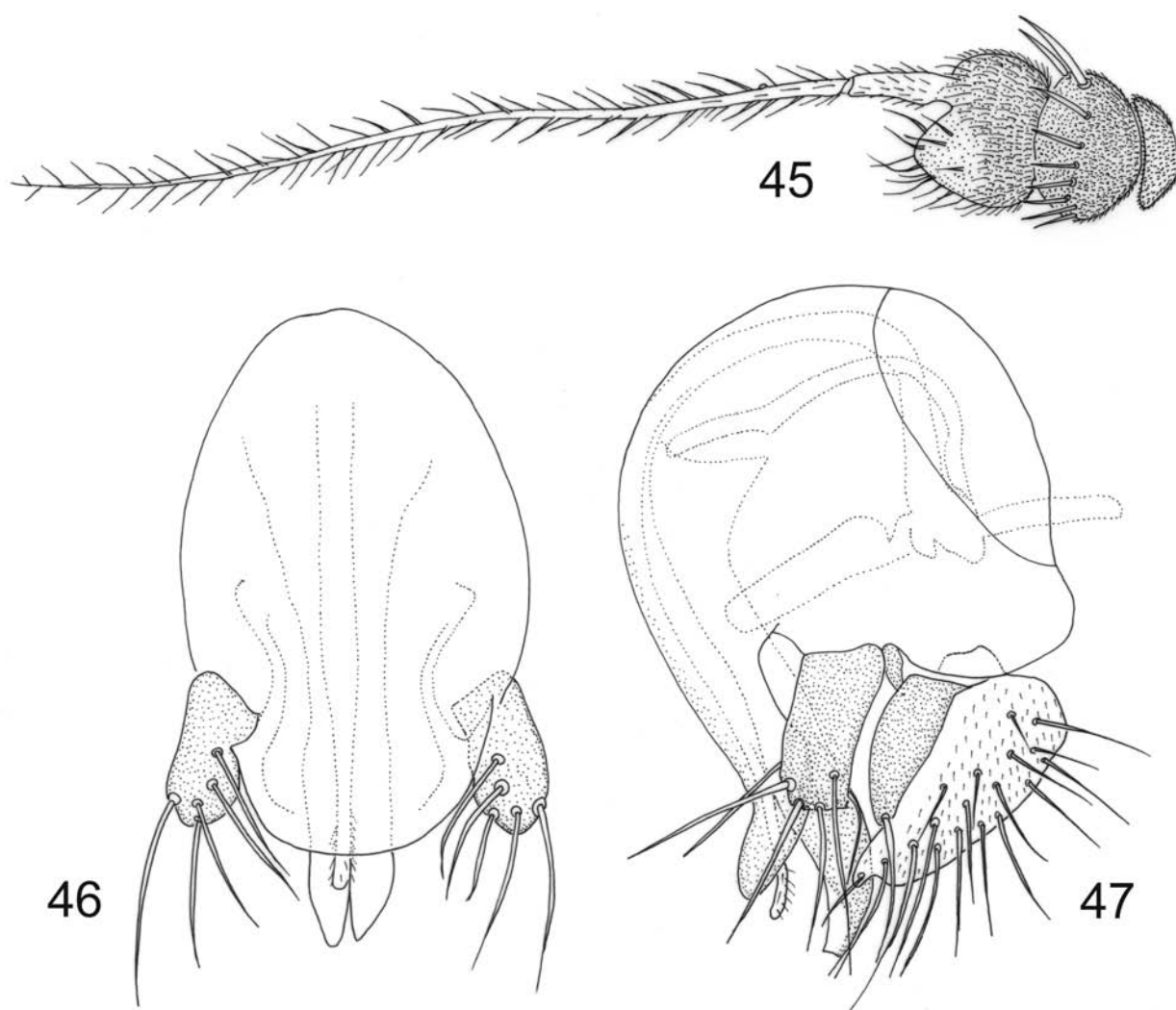
(Figs. 45-47)

Material examined. – Holotype male: SINGAPORE: Sungei Buloh, 28 Mar. 2005 (25037, coll. P. Grootaert, Si553).

Diagnosis. – Rather large species with short surstyli; cerci longer than surstyli. Hind tibia with some short posteroventral bristles near middle (not erect like in *T. simplicissimus*).

Description. – Male. *Body length:* 1.5 mm; *wing length:* 1.6 mm.

Head. Frons and face shining metallic green. Face broad, about as wide as basal antennal segments. Palpi small, brown, with a small black bristle. Rostrum brownish yellow. Occiput



Figs. 45-47. *Teuchophorus bulohensis*, new species, male: 45, antenna; 46, hypopygium ventral view; 47, hypopygium lateral view.

subshining dark metallic green. Chaetotaxy as usual; minute postocellars. Postoculars short, uniseriate, black. *Antenna* (Fig. 45) short; first and second segments brownish black; third segment dark brown, with a paler apex. Third segment short, shorter than wide, with a rounded apex. Arista about 3 times as long as antenna, shortly pubescent; basal segment slightly shorter than upper margin of third antennal segment. *Thorax*. Mesoscutum and scutellum subshining dark metallic green. Pleurae dark brown, with a metallic green gloss on mesopleura and metapleura; the latter with a black anterior border. Acr uniseriate; 5 dc. A minute propleural bristle.

Legs, including coxae, yellow. Mid coxa exteriorly with a vague brown longitudinal streak.

Fore leg. Coxa anteriorly with short, sparse, black hairs; towards tip a row of 4-5 short black bristles. Femur with a preapical pv, without ventral bristles. Tibia about as long as femur, with an anterodorsal serration, most in apical two thirds. First tarsal segment with a small spinule at base. Length of femur, tibia and tarsal segments (in mm): 0.46 : 0.39 : 0.22 : 0.07 : 0.06 : 0.07.

Mid leg. Coxa anteriorly with short black hairs, no exterior bristle. Femur with a rather long preapical av (preapical pv probably broken); ventrally at base with some short bristles about half as long as femur is deep; tibia about as long as femur, with a strong anterior at middle; 2 ad, 1 pd; ventrally on apical half a row of 4-5 black spinules; apical bristles short. Length of femur, tibia and tarsal segments (in mm): 0.59 : 0.59 : 0.29 : 0.17 : 0.98 : 0.98 : 0.07.

Hind leg. Coxa with a weak black exterior bristle. Femur without ventral bristles (preapical probably rubbed off). Tibia about as long as femur; 5 dorsal bristles and some short, but distinct posteroventral bristles near middle (not erect like in *simplicissimus*). Length of femur, tibia and tarsal segments (in mm): 0.57 : 0.59 : 0.14 : 0.21 : 0.14 : ? : ? .

Wing hyaline. Costa not thickened between tips of r1 and r2+3. r4+5 and m1+2 apically more or less parallel. Length ratio of basal and apical parts of m1+2 about 1:2.5. Halter yellow. Squama brown, broadly blackened at apex, with 6 black cilia.

Abdomen dorsally dark bronze-brown, subshining. Sternites brownish. Hairs and marginal bristles on terga short, black. Hypopygium (Figs. 46-47) dark brown, with short truncate ventral surstylus. Cercus a little longer than surstyli.

Female unknown.

Etymology. – The species is named after the type locality Sungei Buloh, a mangrove nature reserve on the North coast of Singapore.

Discussion. – The short, truncate ventral surstylus is quite unique in *Teuchophorus*. *Teuchophorus bulohensis* resembles *T. limosus* but is bigger. It differs from *T. simplicissimus* in having the eyes wider separated on face and lacking the erect bristles on the posterior side of the hind tibia.

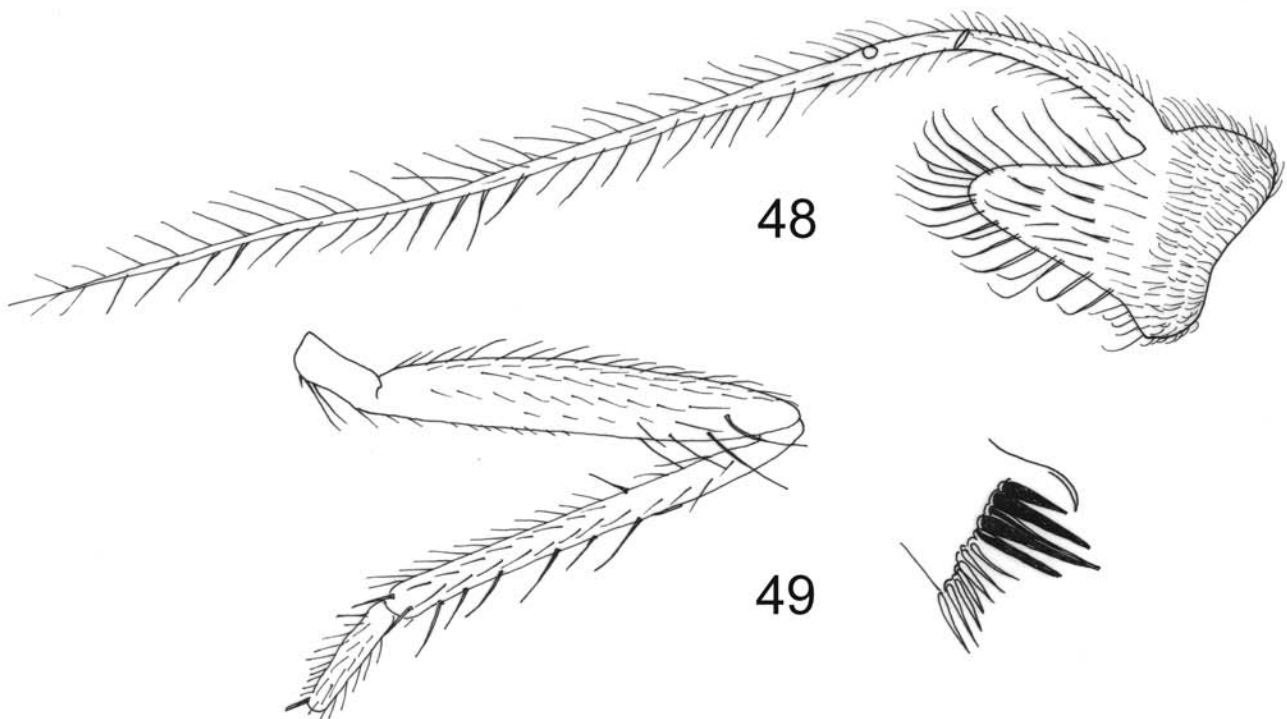
Distribution and habitat. – Singapore. Actually it is only known from the holotype male found in mangrove.

Unclassified species

Teuchophorus krabiensis Meuffels & Grootaert, 2003 (Figs. 48-49)

Meuffels & Grootaert, 2003: 235, Figs. 229-234.

Teuchophorus species A - Evenhuis & Grootaert, 2002: 316.



Figs. 48-49. *Teuchophorus krabiensis* Meuffels & Grootaert, male: 48, antenna; 49, hind leg anterior view with detail of the black bristles in the apical comb in posterior view.

Material examined. – SINGAPORE: 2 males, Labrador Park, 7 Oct.2000 (20035, coll. P. Grootaert & N. Evenhuis; species A in Evenhuis & Grootaert, 2002); 2 males, Labrador Park, 31 Jul.2005 (sample no. 25275, coll. P. Grootaert, Si929); 2 males, Semakau Island, sandy beach near mangrove, 10 Mar.2005 (25009, coll. P. Grootaert, Si403).

MALAYSIA: 2 males, 5 females, Langkawi, Burau Bay, 4 Sept.2005, sandy beach (25327, coll. P. Grootaert; all extracted for DNA sequencing).

Diagnosis. – Third antennal segment about 1.5 times as long as wide (Fig. 48). No stigma: costa darkened, not thickened. First tarsomere of fore leg with a basal spinule. Mid femur at base with about 5-6 bristles, shorter than femur is wide. Mid tibia with black spinules ventrally in apical third. Hind femur without bristles, apart from some anteroventral preapicals. Hind tibia with at least 6 long dorsal bristles. Subapical comb on hind tibia with some dark, thickened bristles (Fig. 49).

Discussion. – This species comes close to *T. simplicissimus* and belongs to the group of species with a row of ventral spinules on the apical third of the mid tibiae. The black bristles in the posteroventral comb on hind tibia are unique in *Teuchophorus* and thus an easy character for identification.

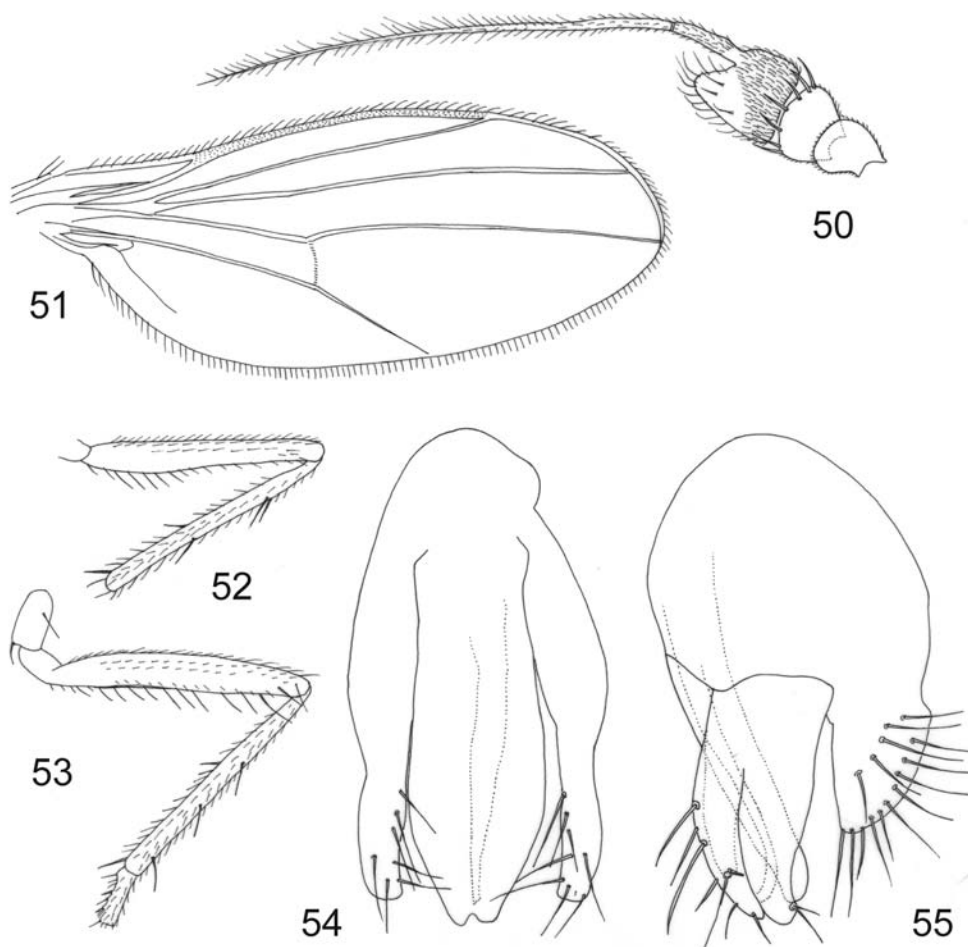
Distribution and habitat. – South Thailand, Singapore. Rare; on sandy beaches where it prefers wet, shady areas.

***Teuchophorus stenostigma* Meuffels & Grootaert, 2003**
(Figs. 50-55)

Material examined. – SINGAPORE: 3 males, 2 females, Nee Soon, Central Catchment area, acidic swamp forest, 4 Dec.2002 (22054, coll. P. Grootaert, Si320, Si 444); 1 female, Nee Soon, 9 Mar.2005, (25005, coll. P. Grootaert Si513); 1 male, 1 female, Bukit Timah, 16 Mar.2005 (25021, coll. P. Grootaert, Si514); 3 males, 1 female, Sime forest, 14 Mar.2005 (25013, coll. P. Grootaert, Si420); 5 males, 3 females, Sime forest, 1 Apr.2005 (25041, coll. P. Grootaert, Si638); 1 male, 2 females, Sime forest, 8 Apr.2005 (25044, coll. P. Grootaert, Si690); 1 male, Sime forest, 2 Jul.2005 (25191, coll. P. Grootaert, Si867).

MALAYSIA: 12 males, Pulau Tioman, Juara, 20 Jul.2005 (24246, coll. P. Grootaert, Tio127); 5 males, Johor, Gunung Belumut, 22 Oct.2005 (25397, coll. P. Grootaert, Si1099).

Diagnosis. – Third antennal segment as long as wide. Wing with a very narrow stigma i.e. costa a little thickened and slightly darkened. Acr uniseriate. Fore metatarsus with a distinct small ventral spinule at base (also in female). Mid femur with only minute ventral bristles. Mid tibia on apical third without a ventral row of spinules nor a serration. Hind femur with very short ventral bristles, some longer av preapicals. Halter dark. Aedeagus not large nor contrastingly black like in *T. limosus*.



Figs. 50-55. *Teuchophorus stenostigma*, male: 50, antenna; 51, wing; 52, mid leg anteriorly; 53, hind leg anteriorly; 54, hypopygium ventral view; 55, hypopygium lateral view.

Description. – Male. *Body length*: 1.37–1.55 mm; *wing length*: 1.32–1.5 mm.

Head. Frons and face with shining dark metallic green ground-colour. Face about 3/4 times as wide as width of third antennal segment. Palpus small, black, with a small, black apical bristle. Rostrum brown. Occiput blackish green. Chaetotaxy as usual; no postocellars. Postoculars uniseriate, short, black. *Antenna* (Fig. 50) brown; third segment rounded triangular, with downward shifted blunt apex, a little longer than wide. Arista about 3 times as long as antenna, shortly pubescent; basal arisal segment slightly more than half as long as third antennal segment.

Thorax. Mesoscutum dark brown, paler at sides, but darker toward tip; scutellum blackish. Pleurae largely yellowish brown. Chaetotaxy as usual; acr uniseriate, moderately long. *Legs* and coxae yellow, but apical 3/4 of hind femora, hind tibiae and tarsi brown.

Fore leg. Coxa anteriorly with very short black hairs, that become longer towards apex of coxa. Femur without bristles. Tibia slightly shorter than femur, without bristles or serration. First tarsal segment ventrally shortly spinulose, and with a small black spinule at ventral base. Length of femur, tibia and tarsal segments (in mm): 0.35 : 0.37 : 0.21 : 0.08 : 0.07 : 0.06 : 0.07.

Mid leg. Coxa anteriorly with very short brown hairs. Femur with about 4 ventral bristles at basal third being $\frac{1}{2}$ of width of femur (Fig. 52); a weak preapical pv, and a yet thinner preapical av. Tibia 2 ad, 1 pd, 1 av, all strong. Length of femur, tibia and tarsal segments (in mm): 0.56 : 0.52 : 0.21 : 0.12 : 0.07 : 0.07 : 0.07.

Hind leg. Coxa with a thin, black exterior bristle. Femur (Fig. 53) with a short preapical av, and some of the hairs of the anteroventral row near tip very slightly lengthened. Tibia about as long as femur; 3 dorsal bristles; 1 very short and weak ventral bristle. Length of tibia and tarsal segments (in mm): 0.56 : 0.56 : 0.14 : 0.17 : 0.11 : 0.08 : 0.07 : 0.07.

Wing (Fig. 51) brownish tinged, with dark brown veins. A narrow, lanceolate, brownish stigma, occupying less than half the width of subcostal cell. r_4+5 and m_1+2 very slightly diverging. Vein Cu black, at least darker than the other veins. Halter somewhat brownish (rather dark in some specimens). Squama brown, with a blackish border, and 4 long black cilia. **Abdomen** dorsally dark brown or brown, with a feeble greenish gloss. Sterna brown. Hairs and hindmarginal bristles on terga short, black. Hypopygium (Fig. 54–55) brown, with tips of surstyli black.

Female. *Body length*: 1.55 mm; *wing length*: 1.5 mm

In most respects identical to male. Face hardly broader than in male. Wing without stigma, but costa slightly thickened. Oviscap with a row of short black acanthae.

Discussion. – *Teuchophorus stenostigma* is the only Singaporean species with a slightly developed stigma, the other species have at most the costa a little darkened. *T. laosensis* Olejnicek, 2003, is a similar species, but it has brownish black antennae and yellow halteres. The hind tibia should bear ventral bristles, but Olejnicek's drawing shows a row of long dorsal bristles. *Teuchophorus stenostigma* from Singapore has brown antennae, darkened halteres, hind tibiae

without ventral bristles, at most some hairs ventrally and only 3 dorsal bristles. *Teuchophorus stenostigma* was originally described from South Thailand (Trang province) in a similar habitat as here in Singapore. The original description mentions yellow antenna, yellow halteres and largely yellow pleurae. The specimens from Singapore are all darker. The shape of the surstyli is the same, but the bristling on the ventral surstylus is longer in the Singaporean specimens. At the moment we consider them conspecific.

Distribution and habitat. – Thailand, Malaysia, Singapore. River banks in forest.

GENERAL DISCUSSION

The goal of the present paper is to give a taxonomic account of the genus *Teuchophorus* occurring in Singapore. Singapore is a small island republic at the southern tip of the Malay Peninsula and further surrounded by Indonesian islands. Singapore is densely populated, but still possesses some semi-natural forests. Thirteen *Teuchophorus* species are recorded here. Nine are new for science while the other four species have been described by Meuffels & Grootaert in 2003.

Local diversity

Table 1 gives a survey of the species distribution per sampled site. The data of the terrestrial rain forest and swamp forest are grouped on the left side of the table. As can be seen, Nee Soon (near Upper Peirce reservoir, a swamp forest, with acidic soil) is the most diverse site in Singapore with seven *Teuchophorus* species. Sime forest, a rain forest that together with Nee Soon is part of the large Central Catchment, is the second diverse site with six species. The species composition however is not the same. Nee Soon has three species of the *T. gratosus* group. *T. temasek* being very abundant in Nee Soon, but absent in Sime forest. On the other hand, *T. ornatulus* is very abundant in Sime forest, but not present in Nee Soon. *T. spinulosus* is also only recorded in Sime forest. Additional sampling in comparable sites will show if a correlation can be established between the presence of the species and the soil type (acidic, soil texture, mud/sand), soil humidity and exposure to sunlight. Only two species are recorded from the rain forest in Taban valley at Bukit Timah. Although Taban valley looks like a typical *Teuchophorus* site i.e. a small stream with large mud and sandy banks, the insect fauna there is poor on the whole. A reason is probably that the site was heavily disturbed by human activity until ten years ago and vegetation changed considerably during the last years from open to closed shrub vegetation underneath high trees. The weekly mosquito fogging in the nearby habitations could also have a negative impact.

The marine sites such as the mangroves at Sungei Buloh, Kranji, Mandai, Pasir Ris, Chek Jawa (Pulau Ubin), and Pandan and the sandy beach at Semakau Island and Labrador Park are grouped at the right side of table 1. *Teuchophorus krabiensis* is a species that is only found on sandy beaches and here in Singapore it was recorded from the sandy part of

Table 1. Occurrence of *Teuchophorus* in Singapore.

	terrestrial forest				marine habitats								
	Nee Soon	Sime forest	Bukit Timah	Seletar	Sungei buloh	Kranji	Mandai	Pasir Ris	Chek Jawa	Padan	Semakau Island	Labrador Park	Total specimens
species name													
<i>Teuchophorus acuminatus</i>	3	1											4
<i>Teuchophorus antennatus</i>	1	2											3
<i>Teuchophorus bulohensis</i>					1								1
<i>Teuchophorus krabiensis</i>											2	2	4
<i>Teuchophorus limosus</i>					156	2	27		8	3			196
<i>Teuchophorus meieri</i>	2												2
<i>Teuchophorus neesoonensis</i>	5												5
<i>Teuchophorus ornatulus</i>		105											105
<i>Teuchophorus simplicissimus</i>					132	1	1	1					135
<i>Teuchophorus singaporensis</i>	8	15	3	3		1			1				31
<i>Teuchophorus spinulosus</i>		10											10
<i>Teuchophorus stenostigma</i>	6	17	2	6									31
<i>Teuchophorus temasek</i>	32												32
Total specimens	57	150	5	9	289	4	28	1	9	3	2	2	559
Number species	7	6	2	2	3	3	2	1	2	1	1	1	13

the beach at Labrador Park and the new, reclaimed sandy beach at Semakau landfill Island.

Although a reasonable amount of material was collected (559 specimens), I do not claim that the taxonomic survey of Singapore is complete. In fact, only twelve sites were more or less intensively sampled. These sites are locally reputed as quite natural, and undisturbed. But I am sure that there remain a lot of small, isolated sites all over the island that host isolated populations of *Teuchophorus*. Only *T. bulohensis* is a singleton (i.e. a species represented by a single specimen). *T. meieri* is the only doubleton. Singletons and doubletons make up fifteen percent of the recorded fauna. This low figure is an indication that the sampling of the selected sites was quite representative. Nevertheless for the reason cited above and when looking on a regional basis, more species are expected to be present in Singapore.

When looking on a regional scale it is also clear that many more species of *Teuchophorus* are expected to occur in Southeast Asia. At the moment only seven species are recorded from Malaysia, four shared with Singapore. Singapore has thirteen species. Thailand has nineteen species now, only four shared with Singapore. Indonesia has twenty species, none shared with Singapore. These observations show nothing else than the huge under-sampling of the region.

Further research in *Teuchophorus*

The problem of cryptic species in *Teuchophorus* is shown here. Mixed and un-mixed populations of *T. pauper* and *T. singaporensis*, new species, were found. The somatic

characters of these species differ hardly, and no Male Secondary Sexual Characters are present. Nevertheless, the male genitalia of both species are quite distinct. Dissection, preparation of the male genitalia of these small species will be mandatory to identify *Teuchophorus* correctly whenever the slightest doubts arise on the somatic characters.

A detailed comparative anatomical study of the male genitalia of *Teuchophorus* is necessary not only to understand its function, but also the phylogeny and group relations in *Teuchophorus*. The aedeagal complex is composed of the hypandrium, the aedeagus and a pair of sclerites that I provisionally call here the “dorsal epandrial lobes”. In at least one species, *T. pauper*, they are broadly fused at their base and bear apical papillae. In many other species the two sclerites are separated for most of their length as can be seen in *T. limosus*, new species. Hypandrium and the dorsal epandrial lobes form a tube into which the aedeagus can be moved. The hypandrium is usually symmetrical, but in some species it is asymmetrical, raising questions about its function. A better understanding of the genital morphology will show if the 10 species groups tentatively established by Meuffels & Grootaert (2003) will stand. At the same time the relation with the *Sympycnus* – *Chaetogonopteron* complex will be better understood. Future molecular work will be an independent way to corroborate the data.

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