



## Research article

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# Eight new species of marine dolichopodid flies of *Thinophilus* Wahlberg, 1844 (Diptera: Dolichopodidae) from peninsular Thailand

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**Abstract.** Eight new species of marine dolichopodid flies from southern Thailand belonging to the genus *Thinophilus* Wahlberg, 1844 are described and illustrated: *Thinophilus boonrotpongi* sp. nov., *T. langkawensis* sp. nov., *T. minutus* sp. nov., *T. parmatoides* sp. nov., *T. parvulus* sp. nov., *T. spinatus* sp. nov., *T. spinatooides* sp. nov. and *T. variabilis* sp. nov. A key is provided to the species of the Thai-Malay Peninsula.

**Keywords.** Marine Dolichopodidae, *Thinophilus*, peninsular Thailand.

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## Introduction

The present paper is part of a recent inventory of the marine dolichopodid flies from southern Thailand. In a previous survey (Grootaert & Meuffels 2001) 15 species belonging to seven genera of Dolichopodidae were found. Samoh *et al.* (2015) added the genus *Ngirhaphium* Evenhuis & Grootaert, 2002 with three species, resulting in 18 known species from southern Thailand to date. Only three species of *Thinophilus* have been recorded from peninsular Thailand until now: *T. nitens* Grootaert & Meuffels, 2001, *T. parmatus* Grootaert & Meuffels, 2001 and *T. setiventris* Grootaert & Meuffels, 2001.

The genus *Thinophilus* Wahlberg, 1844 belongs to the subfamily Hydrophorinae Lioy, 1864 and is one of the most diverse groups of dolichopodid flies inhabiting coastal environments (Grootaert *et al.* 2015). They are adapted to and survive excellently in marine habitats such as front, mid and back mangroves, tide pools, mudflats, sandy beaches and rocky shores.

At the moment 31 species of *Thinophilus* are known from Southeast Asia. None of these species, however, correspond to the species reported in the present paper.

In the extreme northern part of the South China Sea, four species occur on the coast of continental China: *T. clavatus* Zhu *et al.*, 2006 (Hainan), *T. dongae* Grootaert *et al.*, 2015 (Shenzhen), *T. lamellaris* Zhu *et al.*, 2006 (Shenzhen) and *T. zhuae* Grootaert *et al.*, 2015 (Shenzhen). These robust species have not yet been reported from other parts of Southeast Asia and a key to these species can be found in Grootaert *et al.* 2015.

Various species were described in the past from Taiwan. Becker (1922) was the first to describe five species from Taiwan: *T. formosinus* Becker, 1922, *T. insertus* Becker, 1922, *T. integer* Becker, 1922, *T. seticoxis* Becker, 1922 and *T. tessellatus* Becker, 1922. In addition, Becker (1922) also reported *T. indigenus* Becker, 1902 from Taiwan, a species he had described earlier from Egypt. However, having examined the holotype from Egypt and compared it with the specimens from Taiwan, we doubt their conspecificity (Grootaert, unpubl.). Later, Parent (1935) reported *T. indigenus* Becker, 1902 from Port Dickson (peninsular Malaysia), but since he did not give any characteristics regarding the identification and because we have not found any specimens during our inventory that fit the description given by Becker's (1902), we consider this record as doubtful. Finally Parent (1941) added *T. hilaris* Parent, 1941, so that now seven species of *Thinophilus* are known from Taiwan. In fact none of these have been reported from the rest of the South China Sea and so they are provisionally considered as endemic to Taiwan.

*Thinophilus aequalichaetus* Parent, 1941 is the only species of *Thinophilus* reported from the Philippines (Luzon). Labelled 'Atimonan S.O. Luzon', it is probably a marine species since this locality is situated near the sea. We studied the holotype and paratype males, with missing heads, and found that there are a few characters typical of this species: the legs are yellow, including the fore coxa, but mid and hind coxae are black. Tarsomere 5 of the fore leg is brownish. The fore coxa is anteriorly set, with yellowish bristles and a few brown bristles at the tip. Fore, mid and hind femora lack ventral bristles. We consider *T. aequalichaetus* as a species *inquirenda* for the moment (Grootaert, unpubl.).

In 1935, Parent described eight species from Northeast Borneo (now Sabah, Malaysia): *T. amoenus* Parent, 1935, *T. chetatarsis* Parent, 1935, *T. ciliatus* Parent, 1935, *T. duplex* Parent, 1935, *T. egenus* Parent, 1935, *T. pallidipes* Parent, 1935, *T. valentulus* Parent, 1935 and *T. varicoxa* Parent, 1935. All these species seem to be endemic to Sabah for the moment and none of them correspond to the species of southern Thailand.

Up to now, only four species of *Thinophilus* have been reported from Indonesia: *T. androegenus* Hollis, 1964 and *T. phollae* Hollis, 1964, both described from Fort de Kock (now Bukittingi on Sumatra), *T. cuneatus* De Meijere, 1916 and *T. pectinipes* De Meijere, 1916, having both Wonosobo, Java as type locality (De Meijere 1916). All four are fresh water species and the descriptions do not fit those of our marine species from southern Thailand.

At the moment, only three marine species have been published from Singapore: *T. asiobates* Evenhuis & Grootaert, 2002, *T. longicilia* Evenhuis & Grootaert, 2002 and *T. murphyi* Evenhuis & Grootaert, 2002. Since they occur at the tip of the Malay Peninsula, the three species are included in the key given below.

Concerning the fauna of peninsular Malaysia, Parent (1935) described *T. peninsularis* based on one male and five females from Port Dickson on the coast of peninsular Malaysia, not far from Kuala Lumpur. In the description, Parent also included specimens from Langkawi Island, but did not indicate how many and whether they were males or females. Being sympatric, this species is of special concern in our study since it occurs very close to our study area. According to Parent's description (1935) it is a very small species of about 2 mm without particular characters, and it seems to be related to one of our new species.

In the present paper we describe an additional eight new species of *Thinophilus* found in mangroves along the seacoast from both sides of peninsular Thailand (Andaman Sea and Gulf of Thailand). The new species from the Andaman Sea side also represent the first records of *Thinophilus* for the Andaman Sea, which proves to be more diverse than the Gulf of Thailand, as will be demonstrated herein. A key is given for all of the presently known species from the Thai-Malay Peninsula.

## Material and methods

### Study sites and sampling techniques

This study was mainly conducted in eight provinces of peninsular Thailand namely, Chum Phon, Surat Thani, Nakhon Sri Thammarat, Songkhla, Pattani, Satun, Krabi and Phang Nga (Fig. 41). Sweep netting and Malaise trapping were used to collect fresh specimens of marine dolichopodids in various types of mangroves, tide pools and mudflats. Ethyl acetate was used to relax all specimens collected by sweep netting.

### Collection preservation and deposition

All specimens were preserved in 70% ethyl alcohol and stored in a refrigerator to prevent DNA degradation. All type material is deposited in the collections of the Princess Maha Chakri Sirindhorn Natural History Museum of the Prince of Songkla University (NHM-PSU), Hat Yai, Songkhla, Thailand, unless otherwise indicated. In addition, a few voucher specimens are also kept in the collections of the Royal Belgian Institute of Natural Sciences (RBINS), Brussels, Belgium.

### Revision of the oriental types of *Thinophilus*

The third author (P.G.) revised the material described by Becker (Museum für Naturkunde, Berlin; Deutsches Entomologisches Institut, Müncheberg) and de Meijere (Naturalis, Leiden) as well as the types deposited by Parent in the Muséum national d'Histoire naturelle (Paris) (Grootaert, in preparation).

### Terminology and abbreviations

Fly terminology is used as in Grootaert & Puniamoorthy (2014). The following abbreviations are used in text and figures:

acr	=	acrostical bristles
ad	=	anterodorsal bristles
av	=	anteroventral bristles
c	=	cercus
dc	=	dorsocentral bristles
ds	=	dorsal surstylus
hy	=	hypandrium
pd	=	posterodorsal bristles
pv	=	posteroventral bristles
T 1–5	=	tarsomeres 1–5
Tp	=	posterior cross vein (dm-Cu)
vs	=	ventral surstylus

Measurements are presented as mean values. Scales on drawings are 0.1 mm.

### Photography

A focus stacking technique (see Brecko *et al.* 2014) was used to photograph all specimens. The high resolution pictures were stacked using Zerene Stacker software. Scales on photos are 1 mm.

### Results

Class Insecta Linnaeus, 1758  
Order Diptera Linnaeus, 1758  
Superfamily Empidoidea Latreille, 1804  
Family Dolichopodidae Latreille, 1809  
Subfamily Hydrophorinae Lioy, 1864

*Thinophilus* Wahlberg, 1844

*Thinophilus* Wahlberg, 1844: 37. Type species: *Rhaphium flavipalpe* Zetterstedt, 1843 (monotypy).

*Parathinophilus* Parent, 1932: 161. Type species: *Parathinophilus expolitus* Parent, 1932 (monotypy).

*Thinophilus boonrotpongi* sp. nov.

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Figs 1–5

### Diagnosis

A medium-sized species with black fore coxa bearing long white bristles. Apical half of fore tibia pale, almost white with black tip. Tip of all apical tarsomeres black.



**Figs 1–2.** *Thinophilus boonrotpongi* sp. nov. 1. ♂, habitus. 2. ♀, habitus.



### Etymology

This species is dedicated to Dr Singtoe Boonrotpong, promoter of the PhD thesis of the first author, in recognition of his help and support during the current project.

### Type material

#### Holotype

THAILAND: ♂, Sai Thai, Muang, Krabi Province, 8°03'23.5"N, 98°53'38.2"E, sweep netting, 27 Feb. 2015, A. Samoh leg. (NHM-PSU).

#### Paratypes

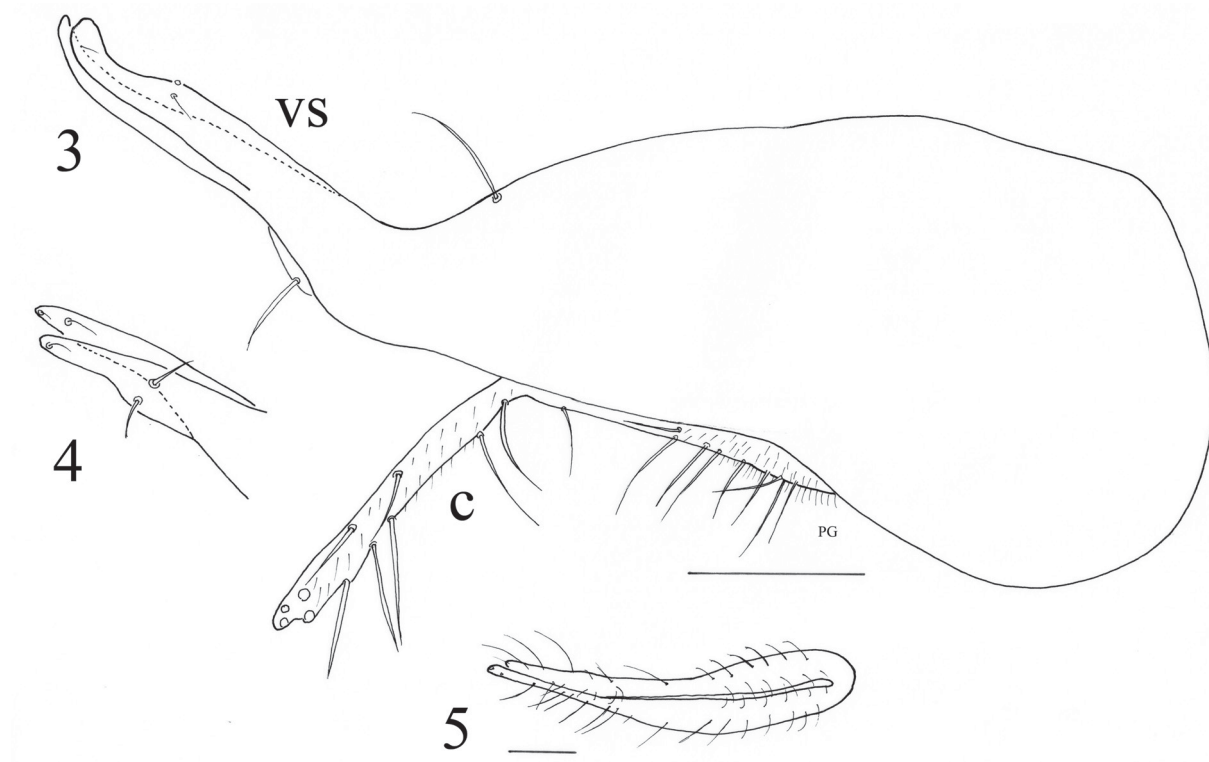
THAILAND: 7 ♂♂, 10 ♀♀, same collection data as for holotype; 1 ♂, 7 ♀♀, Khlong Phon, Khlong Thom, Krabi Province, 7°48'11.2"N, 99°10'11.9"E, sweep netting, 13 Jun. 2015, A. Samoh leg.; 1 ♂, 1 ♀, Ban Bakan Tohtid, Langu, Satun Province, 6°47'29.8"N, 99°48'53.5"E, sweep netting, 3 Jun. 2015, A. Samoh leg.; 1 ♂ (with yellow femora), Ban Bakan Tohtid, Langu, Satun Province, 6°47'29.8"N, 99°48'53.5"E, sweep netting, 4 Jun. 2015, A. Samoh leg. (RBINS); 3 ♂♂, 2 ♀♀, Bo Sane, Thappud, Phang Nga Province, 8°27'29.7"N, 98°36'17.8"E, sweep netting, 13 Feb. 2015, A. Samoh leg.

### Description

#### Male (Fig. 1)

LENGTH. Body 3.5 mm; wing 2.8 mm.

HEAD. Frons and face with shiny dark metallic green ground colour. Face as wide as length of postpedicel. Clypeus about one-third of epistoma, protruding. A pair of long divergent black ocellars. Two very



**Figs 3–5.** *Thinophilus boonrotpongi* sp. nov., ♂, terminalia. **3.** Genital capsule, lateral view. **4.** Apex of surstylus, dorsal view. **5.** Cerci, dorsal view.

short postocellars. A pair of convergent proclinate verticals, a little shorter than ocellars. Postcranium dark metallic green. Two converging postverticals, stronger and longer than, and not in row with upper postoculars. Postoculars uniseriate, black above, white and becoming multi-seriate below. Antenna brownish at tip and above, yellowish below. Arista dorsal, twice as long as antenna, brown, bare. Basal article short. Palpus yellowish to brown, with black bristly hairs. Proboscis dark brown.

**THORAX.** Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 4 equally long dc in one row, preceded by a short bristle and a longer prescutellar outside the row. Scutellum with 2 marginals, without lateral hairs. Two short white upper propleural bristles and 2 longer lower propleural bristles.

**LEGS.** Brownish, but tibiae and tarsi pale. Fore coxa completely black; mid and hind coxae entirely black. All femora generally black. All tibiae with basal half brownish, becoming whitish towards tip. Fore tibia with black spot on tip ventrally. All tarsomeres whitish, but tip of terminal tarsomere black. Coxa anteriorly with long white bristles in apical half. Trochanter with long white bristles. Fore femur thickened in basal two-thirds. Ventrally at base with 2 rows of white bristles, longer than femur is wide, apical two-thirds with few short black bristles; with 3 strong equally long posterior preapical bristles. Fore tibia shorter than femur, ventral bristles short; posteroventral bristles of tibia on basal third longer than following bristles. Tarsomere 1 densely set with spine-like bristles. Mid coxa: exterior bristles white and longer than coxa; anterior bristles long and white. Mid femur thinner than fore femur; with row of black ventral bristles, longer at base. Mid tibia with a long anterodorsal at apical quarter; 2 dorsal and 2 pd; crown of apicals, ventral bristles longest. Hind coxa with short white exterior bristles. Hind femur a little thicker than mid femur; a long dorsal and anterodorsal bristle at apical third; row of black ventral bristles about as long as femur is wide. Hind tibia with 2 anterodorsal and 2 shorter dorsal bristles and a crown of long apicals. Hind tarsomere 1 long but shorter than tarsomere 2.

**WINGS.** Uniformly brownish tinged, without spots. Tp straight, apical part of  $M_{3+4}$  1.5 times as long as Tp. Anal vein not reaching wing margin.

**ABDOMEN.** Shining dark metallic green. Hairs and hind-marginal bristles on tergites short, black. Sternites with short white bristles.

**TERMINALIA** (Figs 3–5). Phallus long, strap-shaped. Cerci pale brownish, with pale hairs; epandrium black. Cerci not fused (Fig. 5).

### **Female** (Fig. 2)

**LENGTH.** Body 3.6 mm long; wing 3 mm long. Larger than male.

**BODY.** Similar to male except following characters: clypeus  $\frac{1}{4}$  length of face, bulging; fore coxa with short white bristles only, fore femur with minute bristles, mid and hind femora also with minute ventral bristles; sternites with short white bristling.

### **Distribution**

Southern Thailand, only known from Andaman Sea coast.

### **Remarks**

*Thinophilus boonrotpongi* sp. nov. is quite unique in having a black fore coxa bearing long white bristles, combined with the apical half of the fore tibia almost white with a black apex. All apical tarsomeres are also darkened. Only *T. nitens* Grootaert & Meuffels, 2001 has white bristles on the fore coxa, with a single black bristle among them, but the fore coxa itself is yellow. Among the material examined

was one male specimen with all femora and tibiae yellow that we attribute to *T. boonrotpongi* sp. nov. The tarsi are yellowish and not whitish (cf. Fig. 1). Other characters, such as the fore femur with long white soft bristles at the base, the general bristling of the legs and the male genitalia, also suggest that it represents *T. boonrotpongi* sp. nov. A future molecular analysis should ascertain if there is a genetic difference.

***Thinophilus langkawensis* sp. nov.**

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Figs 6–11

**Diagnosis**

A large species. Antenna completely yellow. Tibiae and tarsomeres completely yellowish white. Hypopygium elongate, more than half length of abdomen. Cerci in male reaching almost to thorax. Surstyli are movable and out-folding with a veil-like membrane.

**Etymology**

The specific epithet refers to the island of Langkawi (Malaysia), where the species was found for the first time.

**Type material**

**Holotype**

THAILAND: ♂, Ko Tarutao, Molae Bay, Satun Province, 6°40'21.0" N, 99°38'20.9" E, sweep netting, 9 Jan. 2015, A. Samoh leg. (NHM-PSU).

**Paratypes**

THAILAND: 5 ♂♂, 7 ♀♀, same collection data as for holotype (1 ♂ and 1 ♀ in RBINS).

MALAYSIA: 6 ♂♂ (destroyed for DNA extraction, Lim *et al.* 2009), 8 ♀♀, Langkawi, Mutiara Bureau Bay, from crab burrows on sandy beach, 1 Sep. 2005, I. Van de Velde & P. Grootaert leg. (RBINS).

**Description**

**Male (Fig. 6)**

LENGTH. Body 6.4 mm; wing 5 mm.

HEAD. Frons and face with shiny dark metallic green ground colour. Face twice as wide as length of postpedicel. Clypeus a third of length of face. Ocellar tubercle pronounced but sunken between the eyes, not surpassing eye borders (Fig. 6). A pair of long divergent black ocellars. No postocellars. A pair of convergent proclinate verticals, a little shorter than ocellars. Vertex excavated; postcranium metallic green. Two converging postverticals, stronger and longer than, and not in row with, upper postoculars. Postoculars uniseriate, black above, white and becoming multi-seriate below. Antenna yellow; pedicel and postpedicel hardly darkened dorsally. Arista dorsal, 2.5 times as long as antenna, not pubescent. Basal article short, yellowish brown; arista white, base a little browned. Palpus yellow, with short white bristly hairs. Proboscis brown.

THORAX. Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 5 equally long dc, prescutellar a little longer and dc row preceded by a short bristle. Scutellum with 2 marginals and a short lateral bristle. Four short white propleurals above and 7 longer white propleural bristles below.

6



**Fig. 6.** *Thinophilus langkawensis* sp. nov., ♂, habitus.



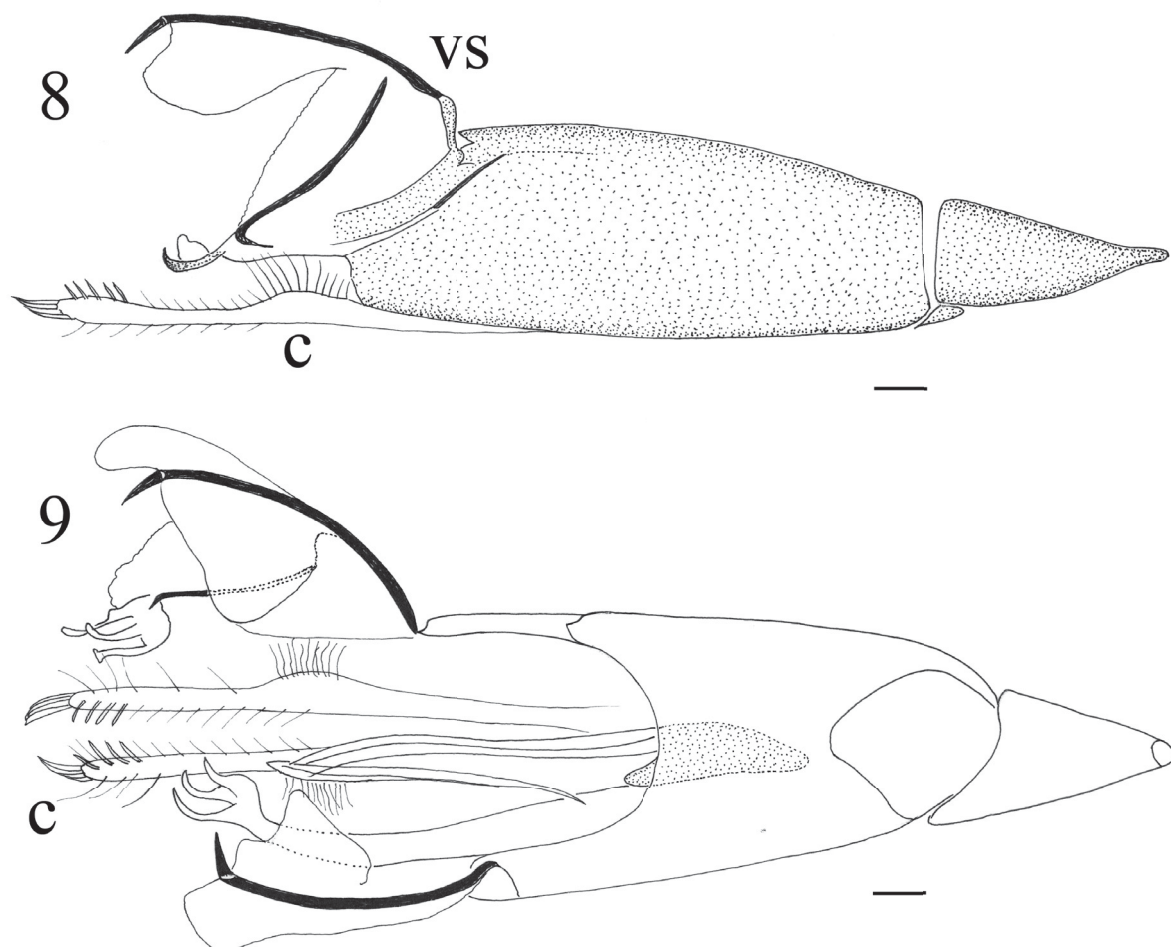
**Fig. 7.** *Thinophilus langkawensis* sp. nov., ♀, habitus.



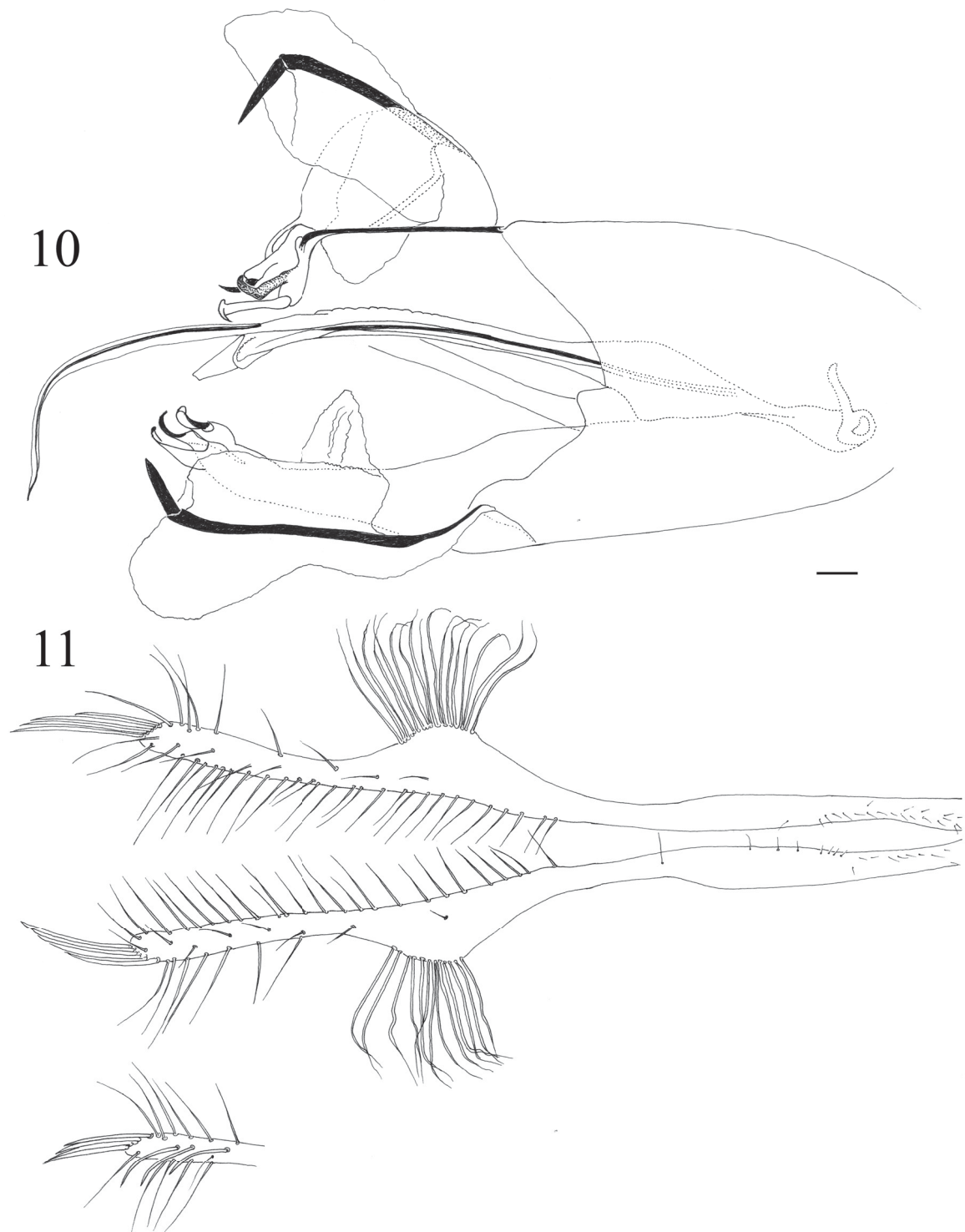
**LEGS.** Yellowish white including all tarsomeres. Fore coxa black on basal two-thirds, yellowish on apical third; mid and hind coxae brownish, apices pale. Fore coxa anteriorly with short white bristles. Trochanter bare. Fore femur narrower than mid femur. Ventrally almost bare, except for some minute white hairs; 2 short posterior preapical bristles. Fore tibia shorter than femur, with only minute ventral bristles. Mid coxa with a long, black exterior bristle near middle, with short, white anterior bristles at tip. Mid femur wider than fore femur; ventrally with an anterior row of 3 short brown bristles and a posterior row of 5 bristles. Mid tibia as long as femur, with 3 short ad, 2 longer ad and 2 pd. Hind coxa with black exterior bristle and minute white anterior bristles. Hind femur only a little wider than mid femur; ventrally on apical  $\frac{2}{3}$  with a row of long white bristles, twice as long as femur is wide; in addition a few minute ventral bristles on basal third; 2 long black ad bristles on apical third. Hind tibia with 3 ad, 2 very long pd; a row of short black pd on basal third as long as tibia is wide; 2 somewhat recurved ventral bristles at basal third.

**WINGS.** Clear, without spots. Tp straight, apical part of  $M_{3+4}$  1.5 times as long as Tp. Anal vein not reaching wing margin.

**ABDOMEN.** Shining dark metallic green. Hairs and hind-marginal bristles on tergites black. Sternites with short pale hairs.



**Figs 8–9.** *Thinophilus langkawensis* sp. nov., ♂, terminalia. 8. Genital capsule, lateral view. 9. Genital capsule, dorsal view.



**Figs 10–11.** *Thinophilus langkawensis* sp. nov., ♂, terminalia. **10.** Genital capsule and surstyli, ventral view. **11.** Detail of apex of cerci, dorsal view.

**TERMINALIA** (Figs 8–11). Elongate, more than half length of abdomen, with surstyli reaching tip of sternite 3 but cerci almost reaching to base of thorax. Cerci pale yellowish (Fig. 6), ventrally not fused. Apex cercus with remarkable pattern of bristling (Fig. 11). Surstylus movable, connected by a veil-like membrane to epandrium, suspended by black, rod-like structures. Phallus long, strap-shaped, but not coiled (Fig 10). Epandrium elongate, brown.

#### **Female** (Fig. 7)

**LENGTH.** Body 6.4 mm long; wing 5.6 mm long.

**BODY.** Stouter than male, otherwise similar except following characters: hind femur lacking long white ventral bristles; sternites with minute pale bristling.

#### **Distribution**

Southern Thailand and northern Malaysia (Andaman Sea coast).

#### **Remarks**

The male of this robust species with yellow legs has very long terminalia, which in rest position are partly hidden in a cavity formed by the sternites 4 to 6. When the terminalia are extended, the surstyli move and open a veil-like lined cavity (Figs 8, 10). This phenomenon was not previously observed in *Thinophilus*. This large species was found on the adjacent islands of KoTarutau in Thailand and Langkawi Island in Malaysia.

#### *Thinophilus minutus* sp. nov.

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Figs 12–15

#### **Diagnosis**

A small species with completely yellow antenna, yellow fore coxa, brown mid and hind coxa and legs further completely yellow. Fore tibia without a ventral row of spine-like bristles. Only mid and hind femur with distinct black ventral bristles.

#### **Etymology**

The specific epithet refers to the small size of the species.

#### **Type material**

##### **Holotype**

THAILAND: ♂, Ban Laem Son, Langu, Satun Province, 6°56'27.9" N, 99°42'12.4" E, sweep netting, 27 Feb. 2015, A. Samoh leg. (NHM-PSU).

##### **Paratypes**

THAILAND: 1 ♂, same collection data as for holotype; 1 ♂, Phanang Tak, Muang, Chumphon Province, 10°30'23.9" N, 99°13'55.6" E, sweep netting, 17 Feb. 2015, A. Samoh leg.; 1 ♂, Bang Yai, Bang Nai Si, Takuapa, Phang-Nga Province, 9 Feb. 2015, A. Samoh leg.

#### **Description**

##### **Male** (Fig. 12)

**LENGTH.** Body 2.4 mm; wing 2 mm.

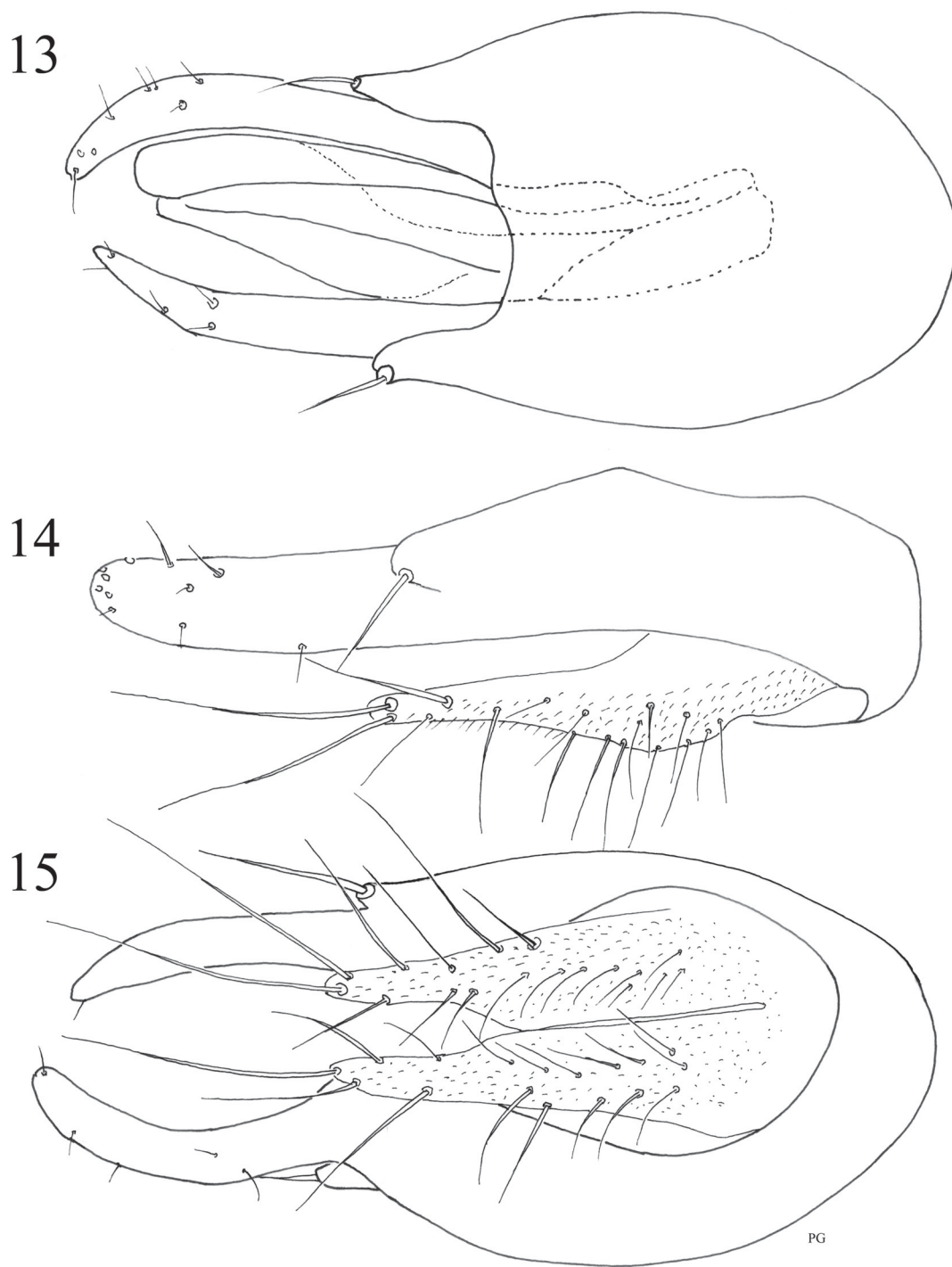
HEAD. Frons and face with shiny dark metallic green ground colour. A pair of long, divergent, black ocellars. Two very short postocellars. A pair of convergent, proclinate, long verticals, a little shorter than ocellars. Postcranium dark metallic green. Two converging postverticals, stronger and longer than, and not in row with upper postoculars. Postoculars uniseriate, black above, white and becoming multi-seriate below. Antenna pale brownish. Arista dorsal, 2.5 times as long as antenna, shortly pubescent. Basal article short. Palpus yellow, with short, black bristly hairs, only anteriorly. Proboscis dark brown.



**Fig. 12.** *Thinophilus minutus* sp. nov., ♂, habitus.

**THORAX.** Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 4 equally long dc in one row, preceded by a short bristle and prescutellar outside the row and hardly longer than preceding bristles. Scutellum with 2 marginals, without lateral hairs. Three short lower pale brownish propleural bristles.

**LEGS.** Yellow including all tarsomeres. Fore coxa yellowish white; mid and hind coxae entirely brownish. Fore coxa anteriorly with short brown bristles. Trochanter bare. Fore femur club-shaped, a



**Figs 13–15.** *Thinophilus minutus* sp. nov., ♂, terminalia. 13. Genital capsule, ventral view. 14. Genital capsule, lateral view. 15. Genital capsule, dorsal view.



little thickened in basal half, apical half thin. No ventral bristles; 3 distinct posterior bristles on apical third. Fore tibia shorter than femur, no ventral bristling. First tarsomere densely set with spine-like bristles. Mid coxa with a long black exterior near middle and a long anterior bristle at tip. Mid femur slightly thinner than fore femur; with row of short ventral bristles in basal half. Mid tibia with a short ad and pd in basal quarter and a short ad and pd near middle; a crown of short apical bristles. Hind coxa with a black exterior bristle. Hind femur wider and longer than mid femur; short ventral bristles, short, upright anterior bristles near middle. Hind tibia with 1 ad and 2 dorsal bristles, a crown of long apicals.

WINGS. Yellowish brown, without spots. Tp straight, brownish seamed, apical part of  $M_{3+4}$  1.5 times as long as Tp. Anal vein not reaching wing margin.

ABDOMEN. Shining dark metallic green. Hairs and hind-marginal bristles on tergites black. Sternites with short brown hairs.

TERMINALIA (Figs 13–15). Phallus long, strap-shaped (Fig. 13). Cercus whitish, with long brown apical bristles (Figs 14–15), epandrium brown.

#### **Female**

Unknown

#### **Distribution**

Southern Thailand (Andaman Sea and Gulf of Thailand).

#### **Remarks**

*Thinophilus minutus* sp. nov. is quite unique among *Thinophilus* in southern Thailand by having only a few distinct bristles on the legs. Only mid and hind femora have distinctly longer ventral bristles. It is similar to *T. peninsularis* Parent, 1935, a sympatric species that also exhibits only a few distinctive characters on the legs. The latter species, however, has a dorsal bristle on the basal quarter of the fore tibia, lacking in *T. minutus* sp. nov. Further, it has the fore coxa darkened on the basal two-thirds and the apical tarsomere darkened as well. The fore coxa and even the apical tarsomere of all legs are yellow in *T. minutus* sp. nov. Finally, in *T. peninsularis* the first tarsomere of the fore leg is as long as the following tarsomeres together, while in *T. minutus* sp. nov. the first tarsomere is half as long as the following four tarsomeres together. Both species share a brownish tinged wing. In *T. minutus* sp. nov. the Tp and M are brownish seamed.

*Thinophilus minutus* sp. nov. should also be compared with *T. dongae* Grootaert *et al.*, 2015, known from southern China. The latter species also has yellow fore coxae, no ventral bristles on the fore femur, no ventral spinules or bristles on the fore tibia. It has, however, the apical tarsomere of all legs black and mid and hind femora without ventral bristles. In *T. minutus* sp. nov. all tarsomeres are yellow and the mid and hind femora have short but distinct bristles. Both species are likely related in a species-group characterized by the similar shape of the cerci and surstyli.

#### ***Thinophilus parmatoides* sp. nov.**

[urn:lsid:zoobank.org:act:74D863DC-E1F0-4BF9-80FC-8F5339E26D42](http://urn:lsid:zoobank.org:act:74D863DC-E1F0-4BF9-80FC-8F5339E26D42)

Figs 16, 18–20

#### **Diagnosis**

A medium-sized species with a shield-like protuberance on mid tarsomere 2. Mid femur with a cluster of about 10 short spine-like ventral bristles at base.

## Etymology

The specific epithet refers to the resemblance with *T. parmatus* Grootaert & Meuffels, 2001, also described from southern Thailand.

## Type material

### Holotype

THAILAND: ♂, Pak Phanang Tawantok, Pak Phanang, Nakhon Sri Thammarat Province, 8°24'09.4" N, 100°11'29.9" E, sweep netting, 30 Apr. 2015, A. Samoh leg. (NHM-PSU).

### Paratypes

THAILAND: 7 ♂♂, 10 ♀♀, same collection data as for holotype (2 ♂♂, 2 ♀♀ at RBINS).

## Description

### Male (Fig. 16)

LENGTH. Body 2.6 mm; wing 2.4 mm.

HEAD. Frons and face with shiny dark metallic green ground colour. Face above as wide as length of postpedicel, near middle half as wide as postpedicel. A pair of long divergent black ocellars. Two very short postocellars. A pair of minute verticals at level of ocellar tubercle. Vertex a little sunken. A pair of minute postverticals. Four black upper postoculars, followed by a row of yellowish uniseriate lower postoculars. Antenna yellowish; only postpedicel dusky above. Arista subdorsal, 3.5 times as long as antenna, brown, with short pubescence. Basal article very short. Palpus yellowish brown, with a few fine black bristles along sides, centrally only minute bristles.

THORAX. Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 4 short dc of equal length, prescutellar twice as long as preceding dc. Scutellum with 2 long crossing marginals, and a short lateral bristle. No upper propleurals and a few very short lower propleurals.

LEGS. Yellow, but fore coxa completely black, densely set with black bristles; mid and hind coxae brown. Fore and mid trochanters yellow, ventrally brown. Fore femur a little wider than mid femur, especially on basal half; ventrally near base with a few short bristles. Fore tibia longer than femur, with a ventral row of bristles, over entire length, all longer than tibia is wide; bristles near middle longest. Mid coxa with a long, black exterior bristle, half as long as coxa is high; anterior bristles very dense, black. Mid femur with spindle-shaped base; at base a cluster of about 10 black bristles (shorter than femur is wide). Mid tibia much longer than femur; without prominent bristles; ventrally in apical quarter with long hair-like bristles. Mid tarsomere 2 bearing a black shield-like dorsal extension; tarsomere 3 shorter than tarsomere 2, white (Fig. 16). Hind coxa with black exterior bristle. Hind femur a little spindle-shaped at base; ventrally in apical half with only 2 short black bristles. Hind tibia with a short ad near middle.

WINGS. Brownish tinged, without spots. Tp straight, longer than apical part of  $M_{3+4}$ . Anal vein not reaching wing margin.

ABDOMEN. Shining dark metallic green. Hairs and hind-marginal bristles on tergites black. Sternites 2 and 3 with minute hairs; sternite 4 with a few longer black apical bristles.

TERMINALIA (Figs 18–20). Phallus long, strap-shaped. Cerci pale brownish, with pale hairs, dorsally fused (Fig. 20); surstyli and epandrium a little darker than cerci.

**Female**

LENGTH. Body 2.9 mm long; wing 2.6 mm long.

BODY. Similar to male, except for following characters: mid femur without cluster of ventral bristles at base, mid tarsomere 2 without shield-like protuberance.

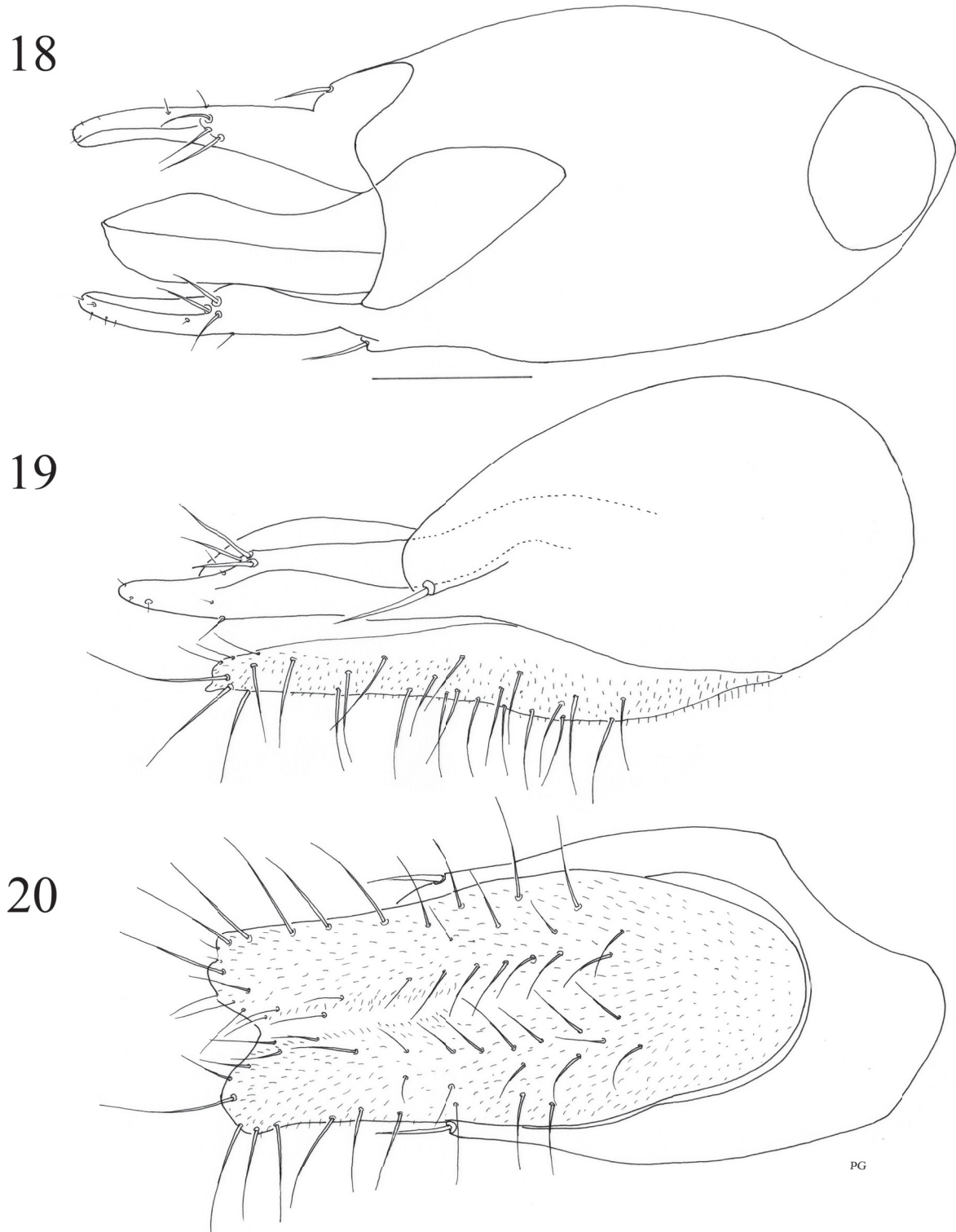


**Fig. 16.** *Thinophilus parmatoides* sp. nov., ♀, habitus.





**Fig. 17.** *Thinophilus parmatus* Grootaert & Meuffels, 2001, ♂, habitus.



**Figs 18–20.** *Thinophilus parmatoides* sp. nov., ♂, terminalia. **18.** Genital capsule, ventral view. **19.** Genital capsule, lateral view. **20.** Cerci, dorsal view.



### Distribution

Southern Thailand (Gulf of Thailand).

### Remarks

This species is similar to *T. parmatus* in having a black shield-like protuberance on tarsomere 2 of the mid leg. There are a few black bristles at the base of the fore femur, a thick tuft of black bristles at the base of the mid femur, long hair-like bristles on the tip of the mid tibia and only short ventral bristles on the hind femur. In *T. parmatus*, there is a single long bristle at the base of the fore femur, the mid femur has only 4 thin bristles at its base and the hind femur has longer bristles in the apical half. The shield on tarsomere 2 of the mid leg is rounded in *T. parmatoides* sp. nov., but elongated in *T. parmatus* (Fig. 17). The shape of the male genitalia is very similar in both species.

*Thinophilus parvulus* sp. nov.

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Figs 21–24

### Diagnosis

A small species with fore tibia bearing 1 short and 1 long black posterodorsal bristle near base.

### Etymology

The species name is derived from the Latin ‘*parvulus*’, referring to the very small size of the species.

### Type material

#### Holotype

THAILAND: ♂, Muang, Pattani Province, Prince of Songkhla University, Pattani campus, 6°53'04.9"N, 101°14'10.1"E, Malaise Trap, 11 Apr. 2015, A. Samoh leg. (NHM-PSU).

### Description

#### Male (Fig. 21)

LENGTH. Body 1.8 mm; wing 1.7 mm.

HEAD. Frons and face with shiny dark metallic green ground colour. Face at narrowest point wider than postpedicel. Clypeus about a quarter as long as face. A pair of long divergent black ocellars. No postocellars. A pair of convergent verticals, a little shorter than ocellars. Posteranium dark metallic green. Two converging postverticals, stronger and longer than, and not in row with upper postoculars. Postoculars uniseriate, black above and white below. Antenna brownish. Arista dorsal, 3 times as long as antenna, brown, bare. Basal article short. Palpus yellow, with pale bristly hairs. Proboscis dark brown.

THORAX. Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 4 dc, anterior 3 dc equally long, prescutellar twice as long. Scutellum with 2 marginals, without lateral hairs. Two very short lower white propleurals.

LEGS. Yellow, tarsomeres 4 and 5 brown. Fore coxa yellowish white, mid and hind coxa entirely brown, extreme tips yellowish. Fore coxa anteriorly with short white bristles. Trochanter bare. Fore femur a little thickened in basal half. Anteroventrally with a row of whitish to pale brownish, long, hair-like bristles, up to three times as long as femur is wide; a little coiled at tip and with a posteroventral row of white bristly hairs, also 3 times as long as femur wide. Fore tibia as long as femur, with 2 remarkable posteroventral bristles in basal half. Mid coxa without exterior bristle. Mid femur thickened in basal  $\frac{2}{3}$ , a little thicker than fore femur; with a row of 4 brownish ventral bristles in basal third, half as long as

femur is wide, anteriorly with row of 4 tiny preapicals; a stronger preapical pv. Mid tibia with a short ad and pd. Hind coxa without exterior bristle. Hind femur thickened in basal half, a little thicker than mid femur; double row of pale ventral bristles in apical half, as long as femur is wide, dorsally near base with a few erect bristles, anteriorly with 2 fine preapical bristles, posteriorly with 1 preapical bristle. Hind tibia with a row of ventral bristles, near middle as long as tibia is wide.

WINGS. Without spots. Tp straight, apical part of  $M_{3+4}$  2 times as long as Tp. Anal vein not reaching wing margin.

ABDOMEN. Shining dark metallic green. Hairs and hind-marginal bristles on tergites short and pale. Sternites with brownish, inconspicuous bristles.

TERMINALIA (Figs 22–24). Phallus long, strap-shaped. Cerci yellowish, not fused and with long apical bristles (Figs 23–24).

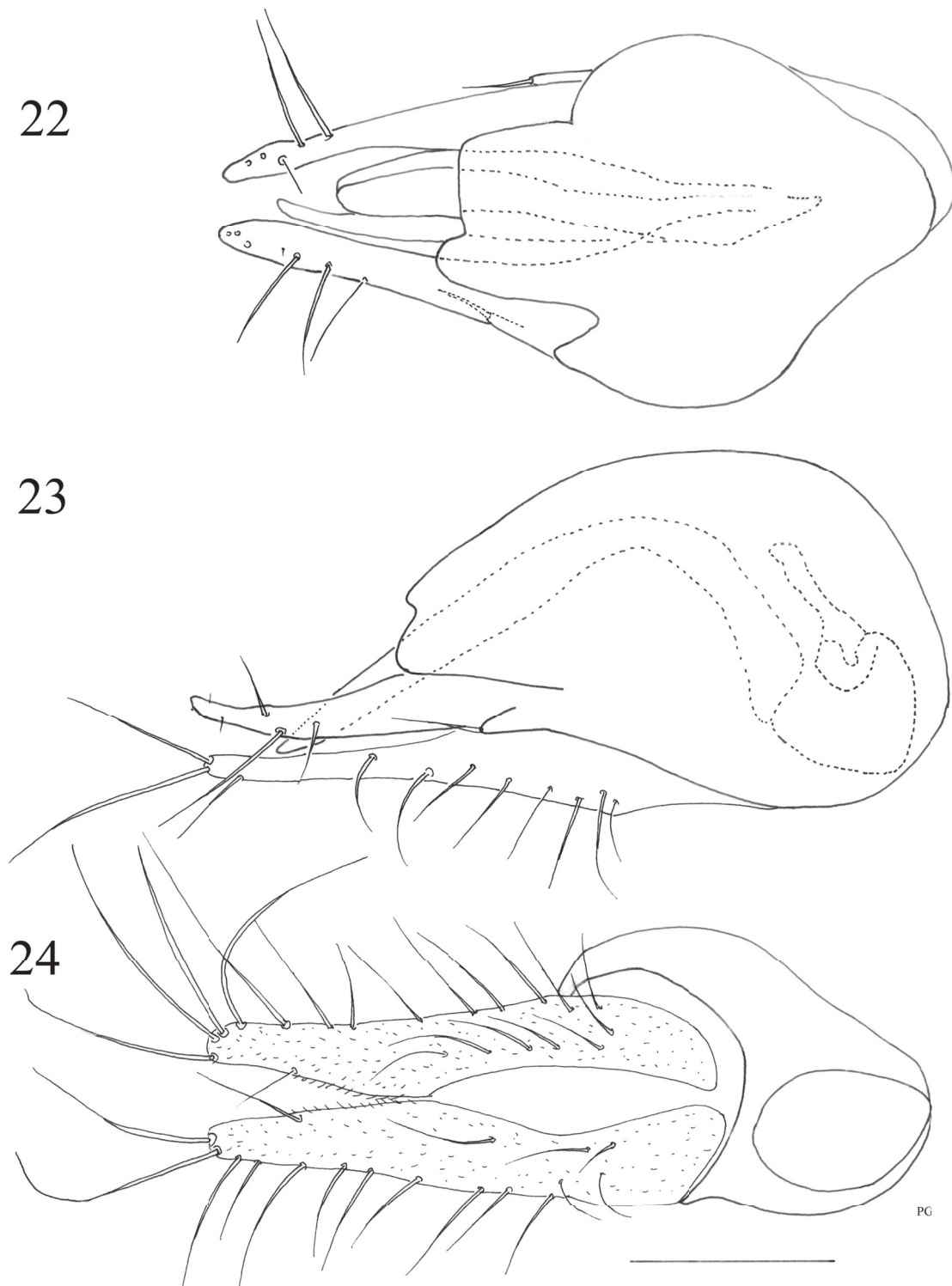
#### Female

Unknown.

21



**Fig. 21.** *Thinophilus parvulus* sp. nov., ♂, habitus.



**Figs 22–24.** *Thinophilus parvulus* sp. nov., ♂, terminalia. 22. Genital capsule, ventral view. 23. Genital capsule, lateral view. 24. Genital capsule, dorsal view.

### Distribution

Southern Thailand (Gulf of Thailand).

### Remarks

*Thinophilus parvulus* sp. nov. is a very small species characterized by the yellowish white fore coxa and the 2 long posteroventral bristles near the base of the fore tibia.

*Thinophilus spinatoides* sp. nov.

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Figs 25–29

### Diagnosis

A medium-sized species with very long yellow legs. Both male and female with a set of 4–5 long, stiff brown ventral bristles on fore femur. Fore femur spindle-shaped, basal quarter much dilated. Fore tarsomere 1 very long and slender, twice as long as fore tibia. Tarsomere 3 contrastingly yellowish white, tarsomeres 4 and 5 widened, black.

### Etymology

The specific epithet refers to the resemblance with *T. spinatus* sp. nov., also described from southern Thailand.

### Type material

#### Holotype

THAILAND: ♂, Bakan Tohtid, Langu, Satun Province, 6°47'29.8" N, 99°48'53.5" E, sweep netting, 3 Jun. 2015, A. Samoh leg. (NHM-PSU).

#### Paratypes

THAILAND: 2 ♂♂, 1 ♀, same collection data as for holotype.

### Description

#### Male (Fig. 25)

LENGTH. Body 4.5 mm; wing 3.8 mm.

HEAD. Frons and face with shiny dark metallic green ground colour. A pair of long divergent black ocellars. No postocellars. A pair of tiny proclinate verticals at level of front ocellars. Postcranium dark metallic green. Postverticals not differentiated from upper postoculars. Upper postoculars uniseriate, short, black; with a few yellow lower postoculars. Antenna yellowish. Arista dorsal, 2.5–3 times as long as antenna, brown, not pubescent. Basal article short, brown; rest of arista paler. Palpus yellow, with few black bristly hairs. Proboscis dark brown.

THORAX. Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 7 rather short dc, gradually growing longer toward scutellum, ending in a very long prescutellar. Scutellum with 2 long marginals with a tiny hair at outside. 2 short black propleural bristles.

LEGS. Yellow, with apical 2 tarsomeres of all legs black. Fore coxa with basal quarter darkened; mid and hind coxae black, tip yellow. Coxa anteriorly with a short bristle near base and a long bristle at basal third. Trochanter with short white bristles. Fore femur club-shaped, very thickened in basal quarter; apical  $\frac{3}{4}$  very thin. Ventrally with 4 long black bristles; longest bristle nearly twice as long as femur is



wide; others shorter. Fore tibia much longer than femur, without ventral bristling. Fore tarsomere 1 very long and slender, twice as long as fore tibia. Tarsomere 3 contrastingly yellowish white, tarsomeres 4 and 5 widened, black. Mid coxa with a short black exterior bristle above middle; anterior bristles short, black. Mid femur ventrally without bristles; no preapical av. Mid tibia longer than mid femur, with a crown of short apical bristles and 2 minute ad. Mid tarsomere 1 almost twice as long as following tarsomeres. Hind coxa without exterior bristle. Hind femur without ventral bristles; no preapical anterodorsal bristles. Hind tibia with 2 short ad and crown of apical bristles. Hind tarsomere 1 a little longer than tarsomere 2.

WINGS. Uniformly yellowish tinged, without spots. Tp straight, apical part of  $M_{3+4}$  1.5 times as long as Tp. Anal vein not reaching wing margin.



**Fig. 25.** *Thinophilus spinatoides* sp. nov., ♂, habitus.



ABDOMEN. Shining dark metallic green. Hairs and hind-marginal bristles on tergites short, black. Sternites without bristles, except sternite 4 with tuft of short black bristles.

TERMINALIA (Figs 27–29). Phallus long, strap-shaped. Cerci pale brownish, with pale hairs, dorsally fused (Fig. 29).

**Female** (Fig. 26)

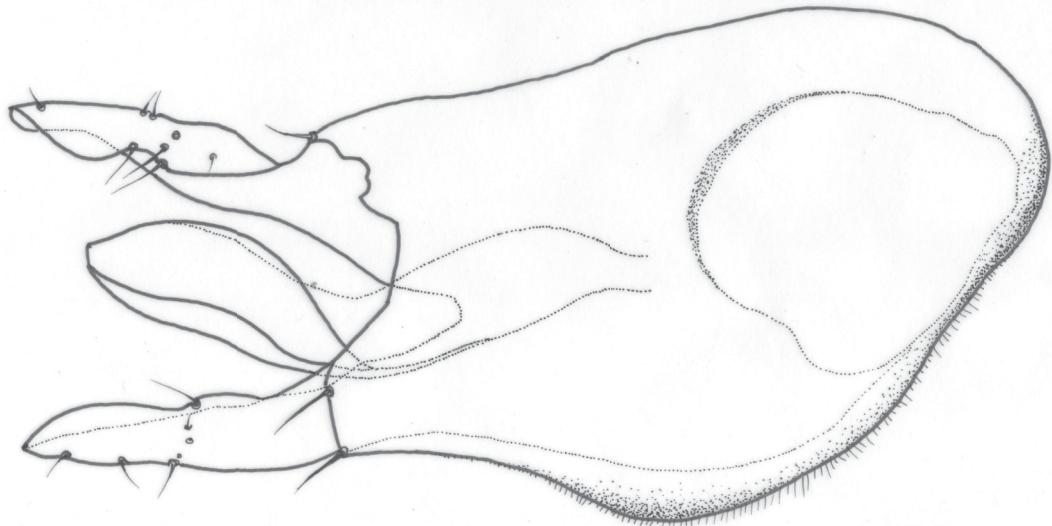
LENGTH. Body 4.5 mm long, wing 4.2 mm long.



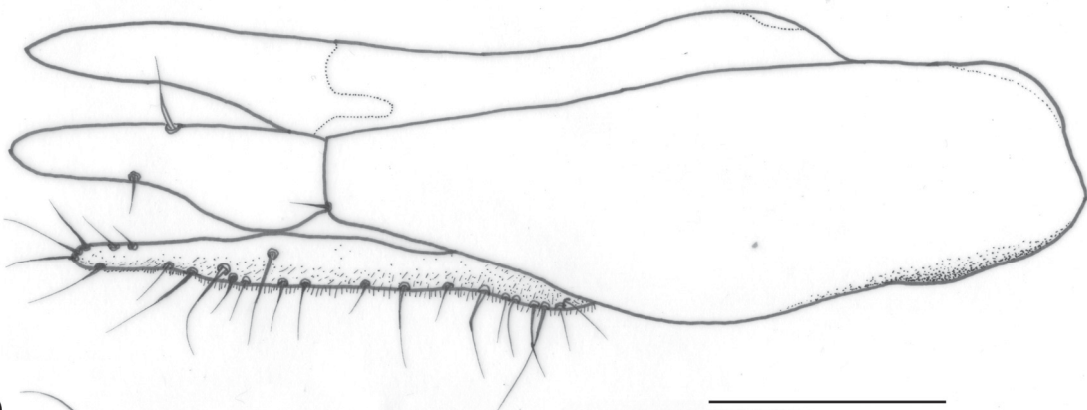
**Fig. 26.** *Thinophilus spinatoides* sp. nov., ♀, habitus.

**BODY.** Similar to male except for following characters: fore femur basally not so strongly swollen as in male and with 5 strong black ventral bristles up to 3 times as long as femur is wide; tarsomere 1 of fore and mid legs more than twice as long as following tarsomeres together; sternites 3, 4, and 5 with pale bristles.

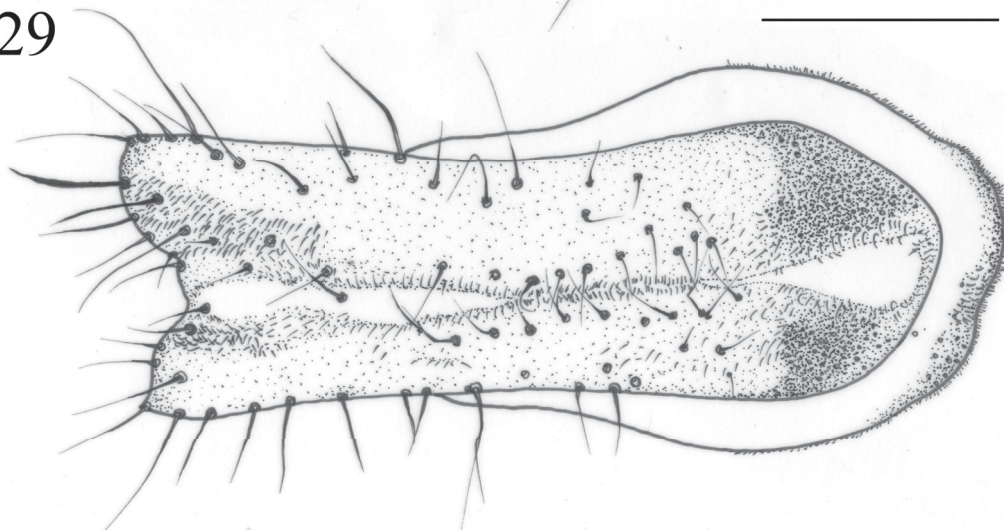
27



28



29



**Figs 27–29.** *Thinophilus spinatoides* sp. nov., ♂, terminalia. 27. Genital capsule, ventral view. 28. Genital capsule, lateral view. 29. Genital capsule, dorsal view.

## Distribution

Southern Thailand (Andaman Sea coast).

## Remarks

*Thinophilus spinatoides* sp. nov. is particular in that it has the fore femur with the basal quarter very spindle-shaped and dilated. It is less dilated in *T. spinatus* sp. nov. Fore tibia much longer than fore femur; shorter in *T. spinatus* sp. nov. Fore tibia slender and without ad in male, present in female; fore tibia stouter and with 2 long ad in *T. spinatus* sp. nov. Fore tarsomere 3 contrastingly yellowish white, tarsomeres 4 and 5 much widened, black. Fore tarsomere 3 has the same pale yellowish colour as tarsomeres 1 and 2. Tarsomeres 4 and 5 black, not widened in *T. spinatus* sp. nov. Only base of fore coxa brown; basal  $\frac{2}{3}$  of fore coxa brown in *T. spinatus* sp. nov. Lower postocular bristles yellow; black in *T. spinatus* sp. nov. Anal vein distinct in basal  $\frac{2}{3}$ ; anal vein not distinct at all in *T. spinatus* sp. nov.

*Thinophilus spinatus* sp. nov.

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Figs 30–35

## Diagnosis

A medium-sized, slender-legged species with yellow legs, but fore coxa black except for apical third. The femora are spindle-shaped and the fore femur in male as well as in female bear long, brown spine-like bristles.

## Etymology

The specific epithet refers to the ventral bristles on the fore femur that are present in both male and female.

## Type material

### Holotype

THAILAND: ♂, Phang Nga Province, Muang, Bang Phat, 8°21'48.8" N, 98°34'38.8" E, Malaise trap, 13 Feb. 2015, A. Samoh leg. (NHM-PSU).

### Paratypes

THAILAND: 1 ♂, 1 ♀, same collection data as for holotype.

## Additional material

SINGAPORE: 1 ♀, Sarimbun (SR3), mangrove, 21 May 2014, J (leg. J. Puniamoorthy; Lee Kong Chian Natural History Museum, Singapore).

## Description

### Male (Fig. 30)

LENGTH. Body 4.3 mm; wing 3.75 mm.

HEAD. Frons and face with shiny dark metallic green ground colour. Face half as wide as length of postpedicel. Clypeus about one third of epistoma, hardly protruding. A pair of long divergent black ocellars. No postocellars. A pair of tiny proclinate verticals at level of front ocellars. Postcranium dark metallic green. Postverticals not differentiated from upper postoculars. Upper and lower postoculars uniseriate, short, black, with a few white bristles behind mouth. Antenna pale brownish. Arista dorsal, 2.5–3 times as long as antenna, brown, not pubescent. Basal article short, brown; rest of arista paler. Palpus yellow, with few black bristly hairs. Proboscis dark brown.



**THORAX.** Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 7 rather short dc, gradually growing longer toward scutellum, ending in a very long prescutellar. Scutellum with 2 long marginals with a tiny hair at outside. Two short black propleural bristles.

**LEGS.** Yellow but sometimes pale brownish; apical tarsomere 2 of all legs brownish. Fore coxa black, but apical third yellowish brown; mid and hind coxae entirely black. Coxa anteriorly with a short bristle near base and a long bristle at apical third. Fore femur club shaped, thickened in basal half, apical half thin. Ventrally with 4 long black bristles; longest bristle twice as long as femur is wide. Fore tibia about as long as femur, without ventral bristling; tarsomere 1 much longer than following tarsomeres together. Mid coxa with a tiny black exterior bristle near middle; anterior bristles very short, black. Mid femur ventrally without bristles; no preapical av. Mid tibia as long as mid femur; with a crown of short apical bristles; 2 distinct ad. Mid tarsomere 1 twice as long as following tarsomeres together. Hind coxa with a very short black exterior bristle. Hind femur without ventral bristles; no preapical anterodorsal bristles. Hind tibia with 2 very short ad and a crown of apical bristles. Hind tarsomere 1 as long as tarsomere 2.

**WINGS.** Uniformly brownish tinged, without spots. Tp straight, apical part of  $M_{3+4}$  almost twice as long as Tp. Anal vein not reaching wing margin.



**Fig. 30.** *Thinophilus spinatus* sp. nov., ♂, habitus.



ABDOMEN. Shining dark metallic green. Hairs and hind-marginal bristles on tergites short, black. Sternites without bristles, except sternite 4 with a tuft of short black bristles in apical half.

TERMINALIA (Figs 32–35). Phallus long, strap-shaped (Fig. 34 phallus folded). Cerci pale brownish with pale hairs, dorsally fused (Fig. 33).

**Female (Fig. 31)**

LENGTH. Body 3.5 mm long, wing 3.1 mm long.

BODY. Similar to male except for following characters: clypeus  $\frac{1}{3}$  length of face, bulging; fore femur with 5 strong black ventral bristles up to 3 times as long as femur is wide.

**Distribution**

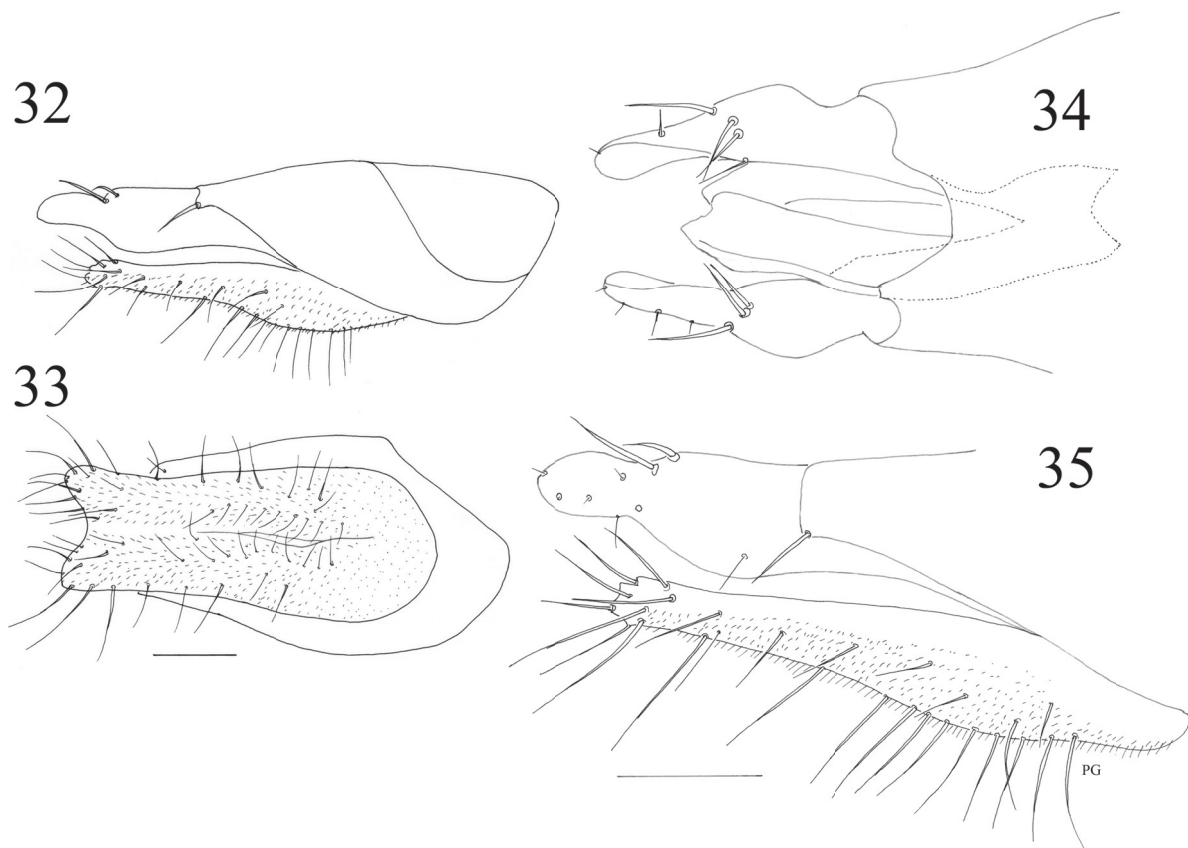
Southern Thailand (Andaman Sea) and Singapore.

**Remarks**

The femora are spindle-shaped and the fore femur in male as well as in female bears long, brown stiff bristles as in *T. spinatoides* sp. nov. The main difference is that the fore femur in males of *T. spinatoides* sp. nov. is much more inflated than in *T. spinatus* sp. nov. For further differences, see under Remarks in *T. spinatoides* sp. nov.



**Fig. 31.** *Thinophilus spinatus* sp. nov., ♀, habitus.



**Figs 32–35.** *Thinophilus spinatus* sp. nov., ♂, terminalia. **32.** Genital capsule, lateral view. **33.** Cerci, dorsal view. **34.** Detail of tip of surstyli, ventral view. **35.** Detail of surstylus and cercus, lateral view.

***Thinophilus variabilis* sp. nov.**

[urn:lsid:zoobank.org:act:269414E1-124D-4113-9781-234E3E5340F9](http://urn:lsid:zoobank.org:act:269414E1-124D-4113-9781-234E3E5340F9)

Figs 36–40

**Diagnosis**

Medium-sized species with yellowish brown to brown fore coxa bearing black bristles. Fore tibia with a row of long ventral spine-like bristles over entire length of tibia. Wing brownish.

**Etymology**

The specific epithet refers to the variable colour of the legs. In some specimens the legs are yellow, in others brown to black.

**Type material**

**Holotype**

THAILAND: ♂, Laem Pho, Hat Yai, Songkhla Province, 7°09'15.9" N, 100°28'03.6" E, sweep netting, 27 Jun. 2015, A. Samoh leg. (NHM-PSU).

**Paratypes**

THAILAND: 6 ♂♂, 10 ♀♀, Ban Nua Nam, Phumriang, Chaiya, Surat Thani, 9°23'34.0" N, 99°15'24.0" E, sweep netting, 18 Apr. 2015, A. Samoh leg.; 2 ♂♂, 4 ♀♀, Ban Nua Nam, Phumriang, Chaiya, Surat

SAMOH A. *et al.*, New species of *Thinophilus* from peninsular Thailand

Thani, 9°23'34.0" N, 99°15'24.0" E, sweep netting, 20 Apr. 2015, A. Samoh leg.; 5 ♂♂, 18 ♀♀, Ban Dato, Yaring, Pattani, 6°55'17.1" N, 101°19'50.7" E, sweep netting, 12 Apr. 2015, A. Samoh leg. (NHM-PSU); 2 ♂♂, 1 ♀, same collection data as for holotype (RBINS).

**Description**

**Male** (Fig. 36)

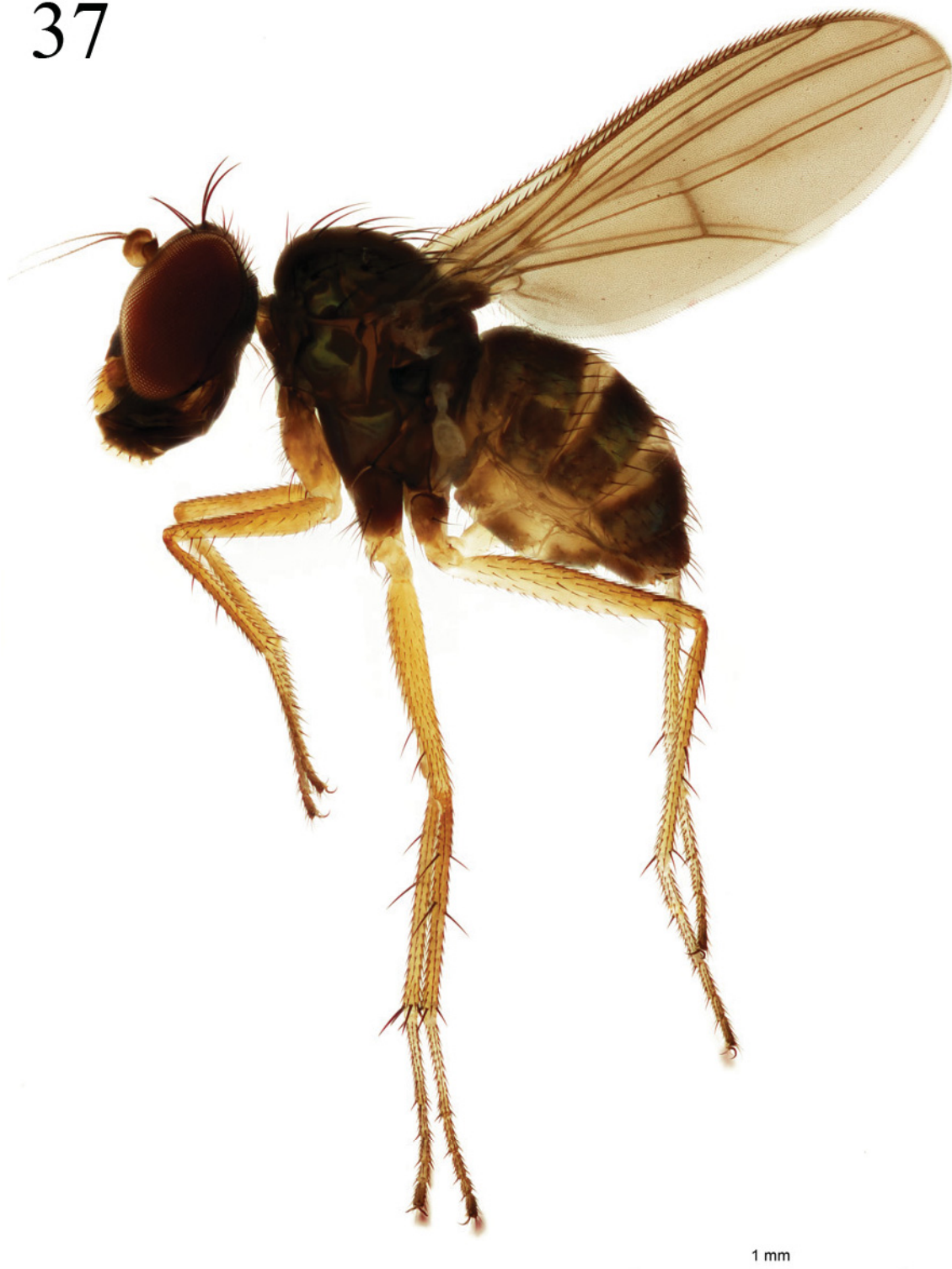
LENGTH. Body 2.7 mm; wing 2 mm.

36



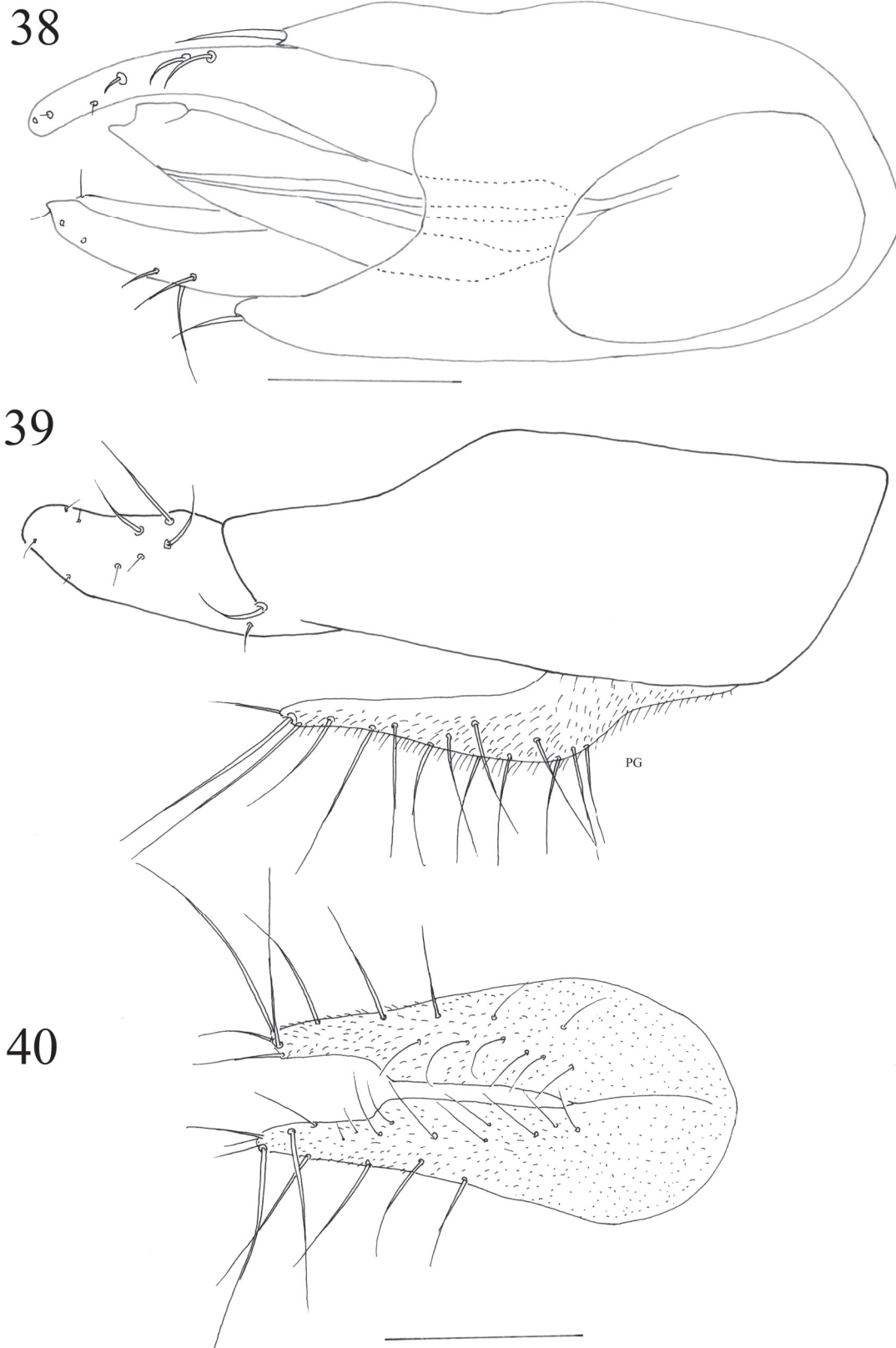
**Fig. 36.** *Thinophilus variabilis* sp. nov., ♂, habitus.

37



**Fig. 37.** *Thinophilus variabilis* sp. nov., ♀, habitus.





**Figs 38–40.** *Thinophilus variabilis* sp. nov., ♂, terminalia. 38. Genital capsule, ventral view. 39. Genital capsule, lateral view. 40. Cerci, dorsal view.

**HEAD.** Frons and face with shiny dark metallic green ground colour, but epistoma above with purplish reflections. Face above as wide as length of postpedicel, near middle narrower than postpedicel. Clypeus a third of length of epistoma. A pair of long divergent black ocellars. Two very short postocellars. A pair of convergent proclinate verticals, as long as ocellars. Vertex not excavated, dull. A pair of converging postverticals, only a little longer than postoculars, and not in row with upper postoculars. Postoculars uniseriate and black throughout; below neck with a transverse row of 4 black bristles longer than postoculars. Antenna yellowish; pedicel darker than postpedicel. Arista subdorsal, 3 times as long as antenna, brown, with short pubescence on basal half, longer diverging pubescence on apical half. Basal article short, brown; rest of arista paler. Palpus yellow, with short black bristly hairs. Proboscis brown.

**THORAX.** Thorax and scutellum shiny dark metallic green, with coppery and purple reflections. No dull black spots. Bristles on thorax black. Acr lacking; 4 almost equally long dc, prescutellar one longest and outside row. Scutellum with 2 marginals and a short lateral bristle. One short black propleural above and 2 longer black propleurals below.

**LEGS.** Yellow to brown, including all tarsomeres. Fore coxa completely yellow, sometimes with sides brownish or completely brown; mid and hind coxae brownish, apices pale. Fore coxa anteriorly with long curved black bristles. Trochanter with a long black bristle. Fore femur a little wider than mid femur, especially on basal half; ventrally near base a few black bristles that are shorter than femur is wide; a posteroventral row of bristles over entire length, near base as long as femur is wide, on apical half longer (Fig. 36). Fore tibia shorter than femur, a ventral row of bristles over entire length, bristles as long as tibia is wide only on apical half. Mid coxa with a long black exterior bristle near middle as long as coxa is long; anteriorly with long black bristles. Mid femur with an av bristle at apical quarter; 4 pv bristles on apical quarter. Mid tibia as long as femur; with 2 ad, 2 shorter pd and apical crown of bristles. Hind coxa with a short and a long exterior bristle. Hind femur only a little wider than mid femur; ventrally with a row of black bristles half as long as femur is wide; near middle with an ad and an preapical at apical fifth; 3 preapical pv as long as femur is wide and 3 shorter av.

**WINGS.** Brownish tinged, without spots. Tp straight, apical part of  $M_{3+4}$  2.5 times as long as Tp. Anal vein not reaching wing margin.

**ABDOMEN.** Shining dark metallic green. Hairs and hind-marginal bristles on tergites black. Sternites with black hairs.

**TERMINALIA** (Figs 38–40). Phallus long, strap-shaped. Cerci pale yellowish, surstyli brown, epandrium brown. Cerci pale yellowish, surstyli brown, epandrium brown. Cerci not fused, with very long subapical bristles.

#### **Female** (Fig. 37)

**LENGTH.** Body 2.4 mm long, wing 2.3 mm long.

**BODY.** Stoutier than male, otherwise similar except for following characters: fore femur with only a row of pd near tip; tibia with only short ventrals.

#### **Distribution**

Southern Thailand (Gulf of Thailand).

#### **Remarks**

*Thinophilus variabilis* sp. nov., a small species, differs from *T. minutus* sp. nov. in having distinct ventral bristles on all femora. Most characteristic in *T. variabilis* sp. nov. is the row of long ventral bristles on

the fore tibia, which is absent in *T. minutus* sp. nov. Coxae and femora can vary in colour from yellow to brown and even dark brown. Such a variation in colour is fairly unusual in *Thinophilus* and might be due to the preservation of the specimens in denaturated ethanol. The species seems to be widespread in peninsular Thailand.

### Key to male *Thinophilus* from the Thai-Malay Peninsula

1. Wing with dark spot on middle of apical section of  $M_{1+2}$  (level of wing boss), on cross vein and sometimes on vein  $R_{4+5}$ , if the clouding on the veins is weak; male with a tuft of long bristles on sternite 3 and 4 ..... *setiventris* Grootaert & Meuffels, 2001  
 – Wing without spots and sternites with at most short hairs ..... 2
2. Fore femur with long ventral bristles, at least twice as long as femur is wide ..... 3  
 – Fore femur with bristles that are at most a little longer than femur is wide ..... 5
3. Fore femur in both male and female with 4–5 stiff brown bristles that are more than twice as long as femur is wide (Figs 25, 30). Legs yellow ..... 4  
 – Fore and mid legs with very long, soft ventral bristles on femur, tibia and expanding on tarsomere 1. Legs darkened (Singapore) ..... *longicilia* Evenhuis & Grootaert, 2002
4. Fore coxa completely yellow. Fore femur strongly spindle-shaped dilated in basal quarter (Fig. 25). Fore tibia longer than fore femur. Fore tarsomere 1 very long and slender, twice as long as fore tibia. Fore tarsomere 3 contrastingly yellowish white, tarsomeres 4 and 5 widened, black ... *spinatoides* sp. nov.  
 – Fore coxa black. Fore femur weakly dilated at base. Fore tibia a little shorter than fore femur (Fig. 30). Fore tarsomere 1 about as long as fore tibia. Fore tarsomere 3 not paler than preceding tarsomeres. Fore tarsomeres 4 and 5 not widened, black ..... *spinatus* sp. nov.
5. Fore coxa darkened on basal half or completely darkened (*variabilis* sp. nov. usually has yellow fore coxa, but they might be brownish infusate) ..... 6  
 – Fore coxa completely yellow (except for extreme base) ..... 11
6. Tarsomere 2 of mid leg with a shield-like dorsal black protuberance (Figs 16–17), tarsomere 3 white ..... 7  
 – Tarsomere 2 of mid leg without dorsal protuberance ..... 8
7. Mid femur at base with a cluster of distinct black ventral bristles (Fig. 16). Hind femur with ventral bristles in apical half shorter than femur is wide (Fig. 16) ..... *parmatoides* sp. nov.  
 – Mid femur at base without a cluster of black ventral bristles (Fig. 17). Hind femur with ventral bristles in apical half longer than femur is wide (Fig. 17) ..... *parmatus* Grootaert & Meuffels, 2001
8. All femora darkened, if femora yellow, fore femur with long white curly bristles at base. Tip of fore tibia and all tarsomeres 5 darkened at tip. Hypopygium short, less than one-third length of abdomen (Fig. 1) ..... *boonrotpongi* sp. nov.  
 – All femora yellow, without long curly white bristles at base ..... 9
9. Fore coxa entirely black. Large robust species with distinctly bristled legs ..... 10  
 – Fore coxa black on basal two-thirds. Small species (2 mm) with few bristles on legs .....  
 ..... *peninsularis* Parent, 1935
10. Fore coxa in male protruding, hump-backed. Hypopygium less than half length of abdomen ..... *murphyi* Evenhuis & Grootaert, 2002  
 – Legs entirely yellowish white except for all coxae darkened. Fore coxa not hump-backed swollen. Hypopygium elongate, more than half length of abdomen (Fig. 6) ... *langkawensis* sp. nov.

11. Very small species (less than 2 mm). Fore tibia with 2 strong brown posteroventral bristles near base (Fig. 21) ..... *parvulus* sp. nov.  
 – Larger species. Fore tibia without strong brown posteroventral bristles near base ..... 12
12. Fore tibia with a ventral row of bristles longer than tibia is deep over entire length (Fig. 36) ...  
 ..... *variabilis* sp. nov.  
 – Fore tibia with only short ventral bristles ..... 13
13. Fore coxa anteriorly near base with long, soft white bristles and a single black bristle; apical bristles black. Fore femur in basal half with a row of 4–5 ventral bristles about as long as femur is wide (all trochanters yellow). Fore tarsomere 1 ventrally set with a row of black spinules; mid leg with apical tarsomeres 2 black (freshwater species) ... *nitens* Grootaert & Meuffels, 2001  
 – Fore coxae without long soft bristles ..... 14
14. Fore femur with only a single yellowish brown ventral bristle at base. Fore tarsomeres 1–4 whitish ...  
 ..... *asiobates* Evenhuis & Grootaert, 2002  
 – Fore femur with only short ventral bristles, without the single basal bristle. All apical tarsomeres yellowish ..... *minutus* sp. nov.

## Discussion

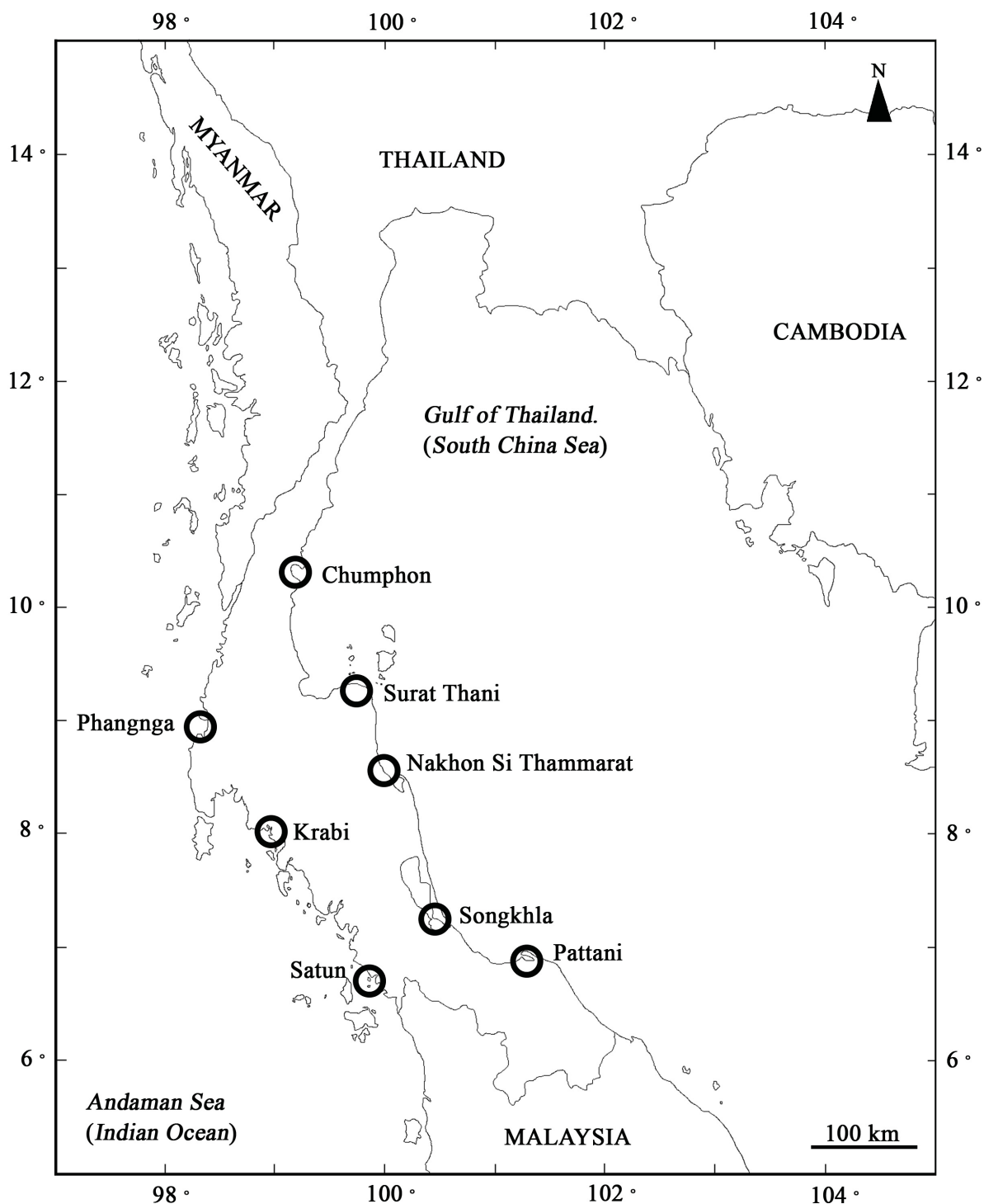
The present study is primarily based on a survey done by the first author to assess the species diversity in mangroves of peninsular Thailand. *Thinophilus* is a very diverse genus that is widely distributed in many littoral marine habitats, including mangroves, mudflats, sandy beaches and rocky shores. The present survey in peninsular Thailand confirms the statement of Evenhuis & Grootaert (2002), that *Thinophilus* is quite common in marine habitats of the Oriental and the Indo-Pacific regions.

Here, we did not compare the marine fauna with freshwater habitats such as streams and marshland. It should be noted that *T. setiventris* and *T. nitens*, described from a dry streambed near Wat Tapotaram in Ranong Province (Thailand) by Grootaert & Meuffels (2001), are primarily freshwater species and might be erroneously interpreted as marine as the title of that paper suggests. Observations in Singapore showed that *T. setiventris* is mainly present in drains and marshland. It rarely invades mangroves, together with *T. nitens*, after periods of heavy rains and flooding from nearby grasslands, where they forage on mosquito and chironomid larvae. Otherwise, these species were never found in mangrove (Grootaert, unpubl.). Most of the marine *Thinophilus* occur in front mangroves or along creeks draining back mangroves (Grootaert *et al.* 2016), where they forage along the water line for insect larvae in the mudflats. However, we also observed specimens foraging on rocky shores.

Although marine fauna is supposed to disperse easily along coasts, the marine *Thinophilus* seem to be rather endemic in the different parts of the South China Sea. The species of the mangroves along the coast of the Chinese mainland differ from those of Taiwan (Becker 1922), Northeast Borneo (Parent 1935) and those of the southern part of the South China Sea, as shown in the present study. Differences in faunal composition between the Gulf of Thailand and the Andaman Sea is more trivial, since the composition of the mangrove flora on either side of the Thai-Malay Peninsula has been proven to be different (Ge & Sun 2001; Huang *et al.* 2008; Minobe *et al.* 2009; Liao *et al.* 2009). We do not yet have information on the insect fauna in general. Three species of the nine true marine *Thinophilus* from peninsular Thailand, *T. parmatoides* sp. nov., *T. parvulus* sp. nov. and *T. variabilis* sp. nov., are actually known from the Gulf of Thailand, the southern part of the South China Sea, only; while *T. minutus* sp. nov. and *T. parmatus* occur on both sides. The remaining four newly described species are so far known only from the side of the Andaman Sea (*T. boonrotpongi* sp. nov., *T. langkawensis* sp. nov., *T. spinatus* sp. nov. and *T. spinatoides* sp. nov.). Moreover, the type of mangroves is different. Along the



Gulf of Thailand, the mangroves are less extended, with smaller and less dense trees and under higher anthropogenic pressure. The mangroves along the coast of the Andaman Sea are much more extended, with higher trees and more pristine overall. The land barrier between the Andaman Sea and the Gulf of Thailand is important, implying that the flies cannot cross them easily (Fig. 41). First contact between the two seas is only in the extreme South of the Peninsula at the level of Singapore. Genetic studies



**Fig. 41.** Map of peninsular Thailand indicating the provinces respectively on the side of the Andaman Sea and the Gulf of Thailand (southern part of the South China Sea).

may demonstrate how large the genetic differences are in species common to both sides and how old the separation is. On the other hand there is a yearly crossing of fishing boats over land from one side to the other that might explain that some species are found on both sides of the peninsula. Pupae or larvae sticking on the hull of the boats could be transported this way.

Although nearly 40 species of *Thinophilus* are known hitherto from the Oriental region, it is not yet practical to classify them into species-groups. In the present study, a tight relationship is seen between *T. parmatius* and *T. parmatoides* sp. nov. They share a modified mid tarsus with a shield-like black protuberance, being a male secondary sexual character often found in other dolichopodid genera. *Thinophilus spinatus* sp. nov. and *T. spinatoides* sp. nov. share the presence of a pair of very long ocellar bristles and minute vertical bristles on the head (the forward shifted vertical bristle in a fronto-orbital position), combined with long, slender legs with club-shaped fore femora swollen near the base. All four species also have dorsally fused cerci over the entire length. It is likely that these four species can be united into a species-group that, however, will need to be confirmed by molecular support. Although Lim *et al.* (2009) used six genes, the relationship of fourteen species was not resolved at all, with very low bootstraps between the nodes. Similar poor resolution between various species from Singapore and China was found by Grootaert *et al.* (2015). All this points to an early origin of *Thinophilus* that cannot be resolved by non-conservative molecular markers. Delineating further species-groups is highly speculative, since the polarities of key morphological characters are unclear and sound molecular data are not yet available.

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