The flower bug genus *Orius* Wolff, 1811 (Hemiptera: Heteroptera: Anthocoridae: Oriini) of Thailand

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**ABSTRACT**

The flower bug genus *Orius* Wolff, 1811 (Hemiptera: Heteroptera: Anthocoridae: Oriini) in Thailand is reviewed. Eleven valid species are recognised; seven of them are described as new to science: *Orius* (*O.* *) sakaerat*, *O.* (*O.* *) taksini*, *O.* (*O.* *) tomokunii*, *O.* (*O.* *) filiferus*, *O.* (*O.* *) machaerus*, *O.* (*O.* *) inthanonius* and *O.* (*Trichorius*) *crassus*. *Orius* (*Heterorius*) *dravidiensis* Muraleedharan, 1977, which has been known from India, is recorded from Thailand for the first time, and is correctly placed in the subgenus *Dimorphella* Reuter, 1884. The subgenus *Paraorius* Yasunaga and Miyamoto, 1993 is proposed as a synonym of *Dimorphella*. Diagnoses, digital habitus images, scanning electron micrographs and illustrations of diagnostic features including both male and female genitalia are provided. Keys to the Thai species are offered to facilitate identification. Biology of Thai species is also discussed.

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**Introduction**

*Orius* Wolff, 1811 is the largest flower bug genus in the family Anthocoridae, comprising approximately 80 species throughout the world (cf. Herring 1966; Péricart 1996; Hernández and Stonedahl 1999; Postle et al. 2001; Carpintero 2002; Aukema et al. 2013). Taxonomic study of *Orius* substantially had its beginnings with the comprehensive works of Reuter (1884) and Poppius (1909). Subsequently, many publications dealing with regional faunas were added to those early efforts: Wagner (1952, 1967) and Péricart (1972) for Europe; Carayon (1961) and Hernández and Stonedahl (1999) for South and East Africa; Kerzhner (1988) for Russia; Ghauri (1972), Muraleedharan and Ananthakrishnan (1974) and Muraleedharan (1977) for the Indian subcontinent; Bu and Zheng (2001) for China; Yasunaga (1993, 1997a, 1997b, 1997c, 2000) for Japan and Taiwan; Jung et al. (2011) for the Korean Peninsula; Herring (1967) for Micronesia; Woodward and Postle (1986) and Postle et al. (2001) for Australia; and Kelton (1963, 1978) and Herring (1966) for the New World. These regional faunas were reviewed in part because *Orius* includes...
effective candidates of bio-control agents against serious (sometimes chemical-resistant) agricultural pests. Many species of *Orius* have been studied for use as a biological pesticide in agro-ecosystems (e.g. Glenister 1998; Sigsgaard and Ersboll 1999; Lattin 2000; Silveira et al. 2004; Kim et al. 2008; Wang et al. 2014).

In Thailand, this economically important taxon also has attracted the attention of researchers working in agro-ecosystems (e.g. Kernasa et al. 2008). However, taxonomic studies of *Orius* in this species-rich country have been fragmentary thus far, and its fauna is currently represented only by three species, *O. maxidentex* Ghauri, 1972, *O. minutus* (Linnaeus, 1758) and *O. tantillus* (Motschulsky, 1863) (Yasunaga and Miyamoto 1993; Kernasa et al. 2008). For effective use of *Orius* species in integrated pest management (IPM) programs, thorough taxonomic study of this genus is required.

This is the first comprehensive attempt to classify the genus *Orius* from Thailand. We carefully examined numerous specimens collected by the authors and our colleagues in Thailand, and recognised a total of 11 valid species. In the present paper, these 11 species are documented, and include seven species described as new, and one species reported for the first time from Thailand. In addition, three known species are redescribed and new synonymy is proposed. Two keys are provided to aid in exact identifications of the Thai species. Biology of Thai species is also discussed.

**Materials and methods**

The bugs were mostly collected from forbs, shrubs and trees by sweeping. Specimens were preserved in 70% ethyl alcohol when freshly collected, and then dried and mounted for study. Examination and illustration of the genitalia and other detailed external structures were made from specimens macerated in hot 10% potassium hydroxide (KOH) solution until the organs became transparent. The structures were dissected with micro-pins in glycerin on a well glass slide under a binocular microscope (Nikon Stereoscopic Zoom Microscope SMZ1500). Illustrations were made with the aid of an eyepiece grid. Habitus images of living individuals (Figure 1) were made with a Canon EOS Kiss X2, combined with a Canon MP-E65 mm F2.8 1-5x Macro Photo objective and Canon Macro Twin Lite MT-24EX flash lights. Photographs (Figures 2–5) were taken using a HiROX digital microscope KH-7700. For examining the detailed surface structures, Scanning Electron Microscope (SEM) images were taken using a HITACHI Scanning Electron Microscope (SEM) SU1510 housed in the Osaka Prefecture University (without gold coating; Figure 6A, C, E, F), a HITACHI Miniscope TM3030 (without gold coating; Figures 6B, D, 7C) and a JEOL JSM-5300 housed in the Tokushima Prefectural Museum (with gold coating; Figures 7A, B, 8). All measurements are given in millimetres. Terminology for genital structures mainly follows Yasunaga (1997a).

Depositories of the specimens are abbreviated as follows:

BMNH – The Natural History Museum, London, United Kingdom;
DOA – Insect Collection, Entomology & Zoology Group, Plant Protection Research and Development Office, Bangkok, Thailand;
NSMT – National Museum of Nature and Sciences, Tsukuba, Ibaraki, Japan;
TKPM – Kazutaka Yamada collection in the Tokushima Prefectural Museum, Tokushima, Japan;
TYCN – Tomohide Yasunaga collection, Nagasaki, Japan.
Checklist of Southeast Asian species of the genus *Orius* Wolff, 1811

*O. (Orius) sakaerat* Yamada and Yasunaga, sp. nov. – distribution: Thailand.

*O. (O.) taksini* Yamada and Yasunaga, sp. nov. – Thailand.

*O. (O.) tomokunii* Yamada and Yasunaga, sp. nov. – Thailand.

*O. (O.) filiferus* Yamada and Yasunaga, sp. nov. – Thailand.

*O. (O.) machaerus* Yamada and Yasunaga, sp. nov. – Thailand.

*O. (O.) inthanonius* Yamada and Yasunaga, sp. nov. – Thailand.

*O. (Trichorius) crassus* Yamada and Yasunaga, sp. nov. – Thailand.

*O. (Dimorphella) maxidentex* Ghauri, 1972 – Sudan, Iran, Pakistan, India, Thailand.

**Figure 1.** Habitus photographs of living individuals. (A, B) *O. sakaerat*, female; (C) *O. filiferus*, female; (D) *O. tantillus*, male; (E) *O. dravidiensis*, female; (F) same, male.
Figure 2. Habitus. (A, B) O. sakaerat, holotype, male, dorsal and lateral views; (C, D) same, paratype, female, dorsal and lateral views; (E, F) O. taksini, holotype, male, dorsal and lateral views; (G, H) same, paratype, female, dorsal and lateral views; (I, J) O. tomokunii, holotype, male, dorsal and lateral views; (K, L) same, paratype, female, dorsal and lateral views. Scale bars: 0.5 mm.

O. (D.) tantillus (Motschulsky, 1863) – Nigeria, Tanzania, Kenya, Iran, India, Sri Lanka, Thailand, Cambodia, Malaysia, China, Taiwan, Japan, Australia, Micronesia.

O. (D.) dravidiensis Muraleedharan, 1977 – India, Thailand, Cambodia.
O. (Heterorius) minutus (Linnaeus, 1758) – Thailand, Palearctic Region, North Africa.
O. (?) sublaevis (Poppius, 1909) – India, Indonesia, China.

Figure 3. Habitus. (A, B) O. filiferus, holotype, male, dorsal and lateral views; (C, D) same, paratype, female, dorsal and lateral views; (E, F) O. machaerus, holotype, male, dorsal and lateral views; (G, H) same, paratype, female, dorsal and lateral views; (I, J) O. inthanonius, holotype, male, dorsal and lateral views; (K, L) O. crassus, holotype, male, dorsal and lateral views. Scale bars: 0.5 mm.
Figure 4. Habitus. (A, B) *O. maxidentex*, male, dorsal and lateral views; (C, D) same, female, dorsal and lateral views; (E, F) *O. tantillus*, male, dorsal and lateral views; (G, H) same, female, dorsal and lateral views; (I, J) *O. dravidiensis*, male, dorsal and lateral views; (K, L) same, female, dorsal and lateral views. Scale bars: 0.5 mm.

**Taxonomy**

**Genus *Orius* Wolff, 1811**

*Orius* Wolff, 1811: iv. Type species by monotypy: *Salda nigra* Wolff, 1811; Zimmerman 1948: 170 (key, note); Wagner 1952: 23 (redescription); Gross 1954: 136 (diagnosis); Herring
Figure 5. Head and pronotum, dorsal view. (A, B) O. sakaerat; (C, D) O. taksini; (E, F) O. tomokunii; (G, H) O. filiferus; (I, J) O. machaerus; (K) O. inthanonius; (L) O. crassus; (M, N) O. maxidentex; (O, P) O. tantillus; (Q, R) O. dravidiensis.

1967: 399 (key); Péricart 1967: 148 (diagnosis, discussion); Ghauri 1972: 410 (discussion); Péricart 1972: 160 (redescription); Elov 1976: 372 (diagnosis, key); Herring 1976: 147 (key, figure); Muraleedharan 1977: 233 (diagnosis); Kelton 1978: 46 (diagnosis, key); Muraleedharan and Ananthakrishnan 1978: 8 (key); Ford 1979: 116 (list); Henry 1988: 18 (note); Kerzhner 1988: 770 (key); Lattin and Stanton 1992: 449 (diagnosis, note); Yasunaga 1993: 12 (diagnosis); Cassis and Gross 1995: 33 (catalogue); Péricart 1996: 122
Figure 6. SEM images of ostiolar peritreme and evaporatorium, left lateroventral view. (A) O. sakaerat, holotype, male; (B) O. taksini, holotype, male; (C) O. tomokunii, paratype, female; (D) O. filiferus, paratype, female; (E) O. machaerus, holotype, male; (F) O. inthanonus, holotype, male. Abbreviations: eva = evaporatorium; mf = median furrow; op = ostiolar peritreme; sca = supracoxal area.

(catalogue); Yasunaga 1997a: 358 (diagnosis, discussion); Hernández and Stonedahl 1999: 548 (diagnosis); Bu and Zheng 2001: 185 (redescription); Yasunaga 2001: 287 (note); Carpintero 2002: 37 (catalogue); Ghahari et al. 2009: 50 (list); Jung et al. 2011: 65 (diagnosis); Aukema et al. 2013: 90 (catalogue); Jung et al. 2013: 424 (catalogue).
The genus *Orius* is distinguished from other genera of the tribe Oriini by the combination of following characters: body oval to oblong oval; sexually dimorphic antennae, usually thickened in male; membrane with one to three veins (usually with single visible vein near costal margin of membrane); ostiolar peritreme evenly curved anteriorly, reaching anterior margin of metapleura; male protibia with a row of teeth on ventral side, lacking fossula spongiosa at apex; claws with pulvilli; dorsal laterotergites not fused with mediotergites on abdominal segments II and III; paramere spiral in shape with flagellum and sometimes with denticule on cone; female with developed ovipositor; copulatory tube usually located on intersegmental membrane between VII and VIII. Detailed diagnostic characters and redescription were provided by Wagner (1952), Péricart (1972) and Hernández and Stonedahl (1999).

**Figure 7.** SEM images of ostiolar peritreme and evaporatorium, left lateroventral view. (A) *O. maxidentex*, male; (B) *O. tantillus*, male; (C) *O. dravidiensis*, female. Abbreviations: eva = evaporatorium; mf = median furrow; op = ostiolar peritreme; sca = supracoxal area.
Remarks
This genus is regarded as an independent group within the Anthocoridae according to recent molecular phylogenetic analyses (e.g. Jung et al. 2010). Morphologically this genus also unequivocally differs from other genera of the Anthocoridae by a combination of the above diagnostic characters; however, any synapomorphy is yet to be clearly suggested for Orius.

Wagner (1952) proposed the subgeneric classification within the genus Orius and divided it into four subgenera, Dimorphella Reuter, 1884; Microtrachelia Blöte, 1929; Orius s. str.; Heterorius Wagner, 1952. Yasunaga and Miyamoto (1993) added a new subgenus, Paraoiri, to accommodate O. tantillus (Motschulsky 1863). Subsequently, Yasunaga (1997a) described two subgenera, Trichorius and Xylorius, each of which accommodates a single Japanese species. Wagner’s subgeneric classification system, generally restricted to the European and East African species, has been used in several taxonomic works (e.g. Péricart 1967, 1972, 1996; Ghauri 1972; Muraleedharan 1977; Yasunaga 1997a, 1997b, 2001; Hernández and Stonedahl 1999). However, several authors who have treated species from other regions ignored the subgenera (e.g. Herring 1966; Woodward and Postle 1986; Bu and Zheng 2001; Postle et al. 2001). To demonstrate more evident subgeneric classification, further comprehensive revision on a global basis would be required. In this paper, we tentatively use Dimorphella Reuter, Heterorius Wagner, and Trichorius Yasunaga, in addition to the nominotypical subgenus, for the classification of Thai species.
Key to species of *Orius* from Thailand

*External characters (without genital structures)*

1. Pronotum with long, stout setae near anterolateral and posterolateral corners (*Figures 9, 10A*) ........................................................................................................................................................ 2
   – Pronotum without long, stout setae near anterolateral and posterolateral corners (*Figure 10B–D*) ........................................................................................................................................................ 8

2. Head, pronotum and scutellum blackish brown, in clear contrast to mostly yellowish brown hemelytra ............................................................................................................................................................................. 3
   – Body generally dark (blackish brown, greyish brown, dark orange brown)............................................................................................................................................................................. 4

3. Body length 1.65–1.90 mm (*Figure 2E–H*); head with shortened neck (*Figure 9B*); male antennal segment II 0.66 times as long as head width across eyes (*Figure 9B*); labium pale yellow (*Figure 2F, H*) ............... *O. taksini* sp. nov.
   – Body length 2.35–2.95 mm (*Figure 2I–L*); head with distinct neck (*Figure 9C*); male antennal segment II 0.8 times as long as head width across eyes (*Figure 9C*); labium blackish brown (*Figure 2J, L*) .... *O. tomokunii* sp. nov.

4. Profemora uniformly pale yellow to yellowish brown (*Figure 3B, D, F, H, J*) . 5
   – Profemora darkened (*Figures 2B, D, 3L*). ................................................................................................................................. 7

5. Body generally blackish brown, but hemelytra distinctly paler than pronotum (*Figure 3I*); male profemora with six fuscous small teeth on ventral side........................................................................................................................................................................................................ 6
   – Body overall greyish brown to blackish brown or brown to dark orange brown, hemelytra mostly same colour as pronotum (*Figure 3A, C, E, G*); male profemora without small teeth on ventral side ........................................................................ 6

6. Overall greyish brown to blackish brown, female head pale yellow to yellowish brown (*Figure 3A, C*); posterior pronotal width 2.2 times as wide as anterior pronotal width (*Figure 9D*)....................................................................................................................... *O. filiferus* sp. nov.
   – Overall brown to dark orange brown, head somewhat paler anterior to eyes (*Figure 3E, G*); posterior pronotal width about 2.6 times as wide as anterior pronotal width (*Figure 9E*) ................................................................................................................................................. *O. machaerus* sp. nov.

7. Body oblong oval, somewhat parallel sided, generally blackish brown to pitch black (*Figure 2A, C*); antennal segment II 0.5–0.55 times as long as head width across eyes (*Figure 9A*) ........................................................................................................................................................................................................ 8
   – Body more oval, generally greyish brown (*Figure 3K*); antennal segment II 0.63 times as long as head width across eyes (*Figure 10A*)................. *O. crassus* sp. nov.

8. Pronotal callus usually arched, impunctate, shiny................................................................................. *O. minutus*
   – Pronotal callus flattened, centrally separated by setigerous punctures (*Figures 5M–R, 8A, D, G*)................................................................................................................................................................................................. 9

9. Head black with pale yellow at apex, labium mostly pale yellow (*Figures 4J, L, 5Q, R*); hemelytra yellowish brown, cuneus darkened, embolium sometimes
posteriorly darkened (Figure 4I, K); profemora without small teeth on ventral side. 

- Head black, sometimes tinged with orange brown at apex, labium mostly blackish brown (Figure 4B, D, F, H); hemelytra uniformly semitransparent pale yellow or with cuneus apically darkened (Figure 4A, C, E, G); profemora with small teeth on ventral side (Figure 8C, F). 

10. Hemelytra semitransparent pale yellow, with cuneus apically darkened (Figure 4A, C); anterior area to median furrow in ostiolar peritreme very narrow (Figure 7A). 

- Hemelytra uniformly semitransparent pale yellow (Figure 4E, G); anterior area to median furrow in ostiolar peritreme very wide (Figure 7B). O. tantillus

Male and female genitalia

1. Paramere with denticule. 
   - Paramere without denticule. 

2. Cone wide, strongly rounded, apically obtuse; denticule contiguous to base of flagellum. 
   - Cone very thin, not rounded, apically acute (Figure 14); denticule arising from inner side of cone (Figure 14). 

3. Flagellum straight, with rounded ventral projection near base (Figure 14G); copulatory tube bulbous basally (Figure 19C). 
   - Flagellum gently curved, without rounded ventral projection near base (Figure 14A, D); copulatory tube tubular basally (Figure 19A, B). 

4. Denticule slender, straight (Figure 14A); copulatory tube with apical membranous section short and rounded (Figure 19A). 
   - Denticule small, finger shaped (Figure 14D); copulatory tube with apical membranous section somewhat tubular (Figure 19B). 

5. Pygophore ovoid shaped (Figure 12); cone widened in lateral view, elevated dorsally with weak projection (Figures 15B, C, 16B, C, E, F, 17B, C). 
   - Pygophore globular shaped (Figure 13); cone narrowed apicad in lateral view, not elevated dorsally, without projection (Figure 18B, C, E, F, H, I). 

6. Flagellum bifurcate (Figure 12D). 
   - Flagellum not bifurcate (Figure 12A–C). 

7. Cone strongly rounded (Figure 15); flagellum filamentous, much longer than four times width of cone (Figure 15). 
   - Cone moderately curved (Figure 16A, D); flagellum robust and/or sword shaped, not longer than four times width of cone (Figure 16). 

8. Flagellum not expanded basally in lateral view (Figure 16C). O. machaerus sp. nov. 
   - Flagellum noticeably expanded from base to middle in lateral view (Figure 16F). O. inthanonus sp. nov. 

9. Cone obtuse at apex in dorsal view (Figure 18A); lamelliform process present (Figures 18A–C); copulatory tube adjacent to base of ovipositor (Figure 20A). O. maxidentex
Figure 9. Head and pronotum, male, dorsal view. (A) *O. sakaerat*, holotype; (B) *O. taksini*, holotype; (C) *O. tomokunii*, holotype; (D) *O. filiferus*, paratype; (E) *O. machaerus*, paratype; (F) *O. inthanonus*, holotype. Scale bars: 0.2 mm.
- Cone acute at apex in dorsal view (Figure 18D, G); lamelliform process absent (Figure 18D–I); copulatory tube remote from base of ovipositor (Figure 20B, C).

10. Flagellum tripartite (Figure 18D–F); copulatory tube fused on mesal part of intersegmental membrane between sterna VII and VIII (Figure 20B).. O. tantillus
- Flagellum simple (Figure 18G–I); copulatory tube fused on left part of intersegmental membrane between sterna VII and VIII (Figure 20C)......... O. dravidiensis

Subgenus Orius Wolff, 1811

**Diagnosis**
Recognised by a combination of the following characters: pronotum highly polished, impunctate, sparsely covered with setae, with long, stout setae near anterolateral and posterolateral corners and a pair of similar setae behind ocelli, with distinct collar and
convex callus; ostiolar peritreme usually with wide and smooth area anterior to median furrow. Detailed diagnostic characters were provided by Péricart (1967, 1972).

Remarks
Twenty-five species have hitherto been assigned to this subgenus, occurring in eastern Ethiopian and western and middle Palearctic Regions (cf. Péricart 1996; Hernández and Stonedahl 1999). Four species occur in India and one species occurs in Japan (Muraleedharan 1977; Yasunaga 2001). This subgenus is recorded from Thailand for the first time.

Orius (Orius) sakaerat Yamada and Yasunaga, sp. nov.
(Figures 1A,B, 2A–D, 5A,B, 6A, 9A, 11A, 14A–C, 19A)

Type materials
Holotype. ♂ (Figures 2A, B, 5A, 6A, 9A, 11A, 14A–C), THAILAND, Nakhon Ratchasima, Sakaerat Environmental Research Station, N14°29′24.4″–30′37.5″, E101°54′37.8″–55′49.7″, 372–601 m alt., 23–25 January 2009, T. Yasunaga leg’ (DOA). Paratypes. Two ♀ (one in Figures 2C, D, 5B, the other in Figure 19A), same locality as holotype, 14°30′26.7″N, 101°55′39.2″E, 407 m alt., light trap, 11–14 June 2009, K. Yamada (one ♀ in TKPM, one ♀ in DOA). Nakhon Nayok: two ♀, Sarika, 14°18′45.37″–14°21′16.9″N, 101°16′22.41″–101°18′03.83″E, 40–96 m alt., 19 March 2014, K. Yamada (TKPM); one ♂, four ♀ (one in Figure 1A, one in Figure 1B), same locality, 20 March 2014, T. Yasunaga and K. Yamada (one ♀ in BMNH, one ♀ in TYCN, others in TKPM).

Diagnosis
Recognised by the following characters: body generally blackish brown to pitch black (Figures 1A, B, 2A–D); femora blackish brown to black excepting pale yellow apex (Figure 2B, D); cone very thin, gradually acute apicad; denticule slender and straight; flagellum gently curved, slightly exceeding the tip of cone (Figures 14A–C); copulatory tube very small, consisting of short, rounded membranous apex and slightly curved, tubular basal section (Figure 19A).

Description
Colouration. Body generally blackish brown to pitch black (Figures 1A, B, 2A–D). Head and pronotum uniformly blackish brown, tylus with pale tinge; eyes reddish brown, area surrounding ocellus reddish brown (Figure 5A, B). Antennae yellowish brown, with segments I, III and IV faintly darkened (Figure 5A, B). Labium dark brown, with apical half of segment III and basal half of IV yellowish brown (Figure 2B, D). Scutellum and hemelytra overall blackish brown to pitch black, with cuneus more darkened; membrane uniformly greyish brown (Figure 2A, C). Coxae, trochanters and femora blackish brown to black, with apex of femora pale yellow; tibiae uniformly pale yellow, but male metatibiae somewhat darkened except for pale yellow base; tarsi pale yellow, with darkened apex. Venter of thorax and abdomen blackish brown to black (Figure 2B, D).
Structure. Body oblong oval, somewhat parallel sided (Figure 2A, C). Head smooth, shiny, about 0.6 times as long as width across eyes, sparsely covered with short decumbent setae, and with a longer erect seta on each side of clypeus, near anteromedial margin of each eye, and between eye and ocellus; ante-ocular portion 0.6–0.7 times as long as length of eye in dorsal view; vertex about 2.2 times as wide as eye in dorsal view; eye oblong, about 1.5 times as long as eye width in dorsal view; postocular portion constricted; neck shortened (Figure 9A). Antennal segment I stout, slightly exceeding apex of head, sparsely covered with short suberect setae; segment II 0.55 times as long as head width across eyes in male, 0.5 times in female, densely covered with suberect setae which are shorter than width of the segment; segments III and IV slightly narrower than maximum width of segment II, covered with long erect setae intermixed with short decumbent setae, longest seta about as long as width of respective segment; segment III equal length to segment IV (Figures 5A, B, 9A). Labium extending to about middle of mesosternum, sparsely covered with short suberect setae. Pronotum smooth, shiny, sparsely covered with long decumbent setae; anterior margin nearly straight, width about 1.2 times as wide as mesal length; lateral margin nearly straight, curved at anterior corner in female; lateral carinae weakly expanded anteriorly; posterior margin shallowly concave, width about 2.4 times as wide as anterior pronotal width; collar narrow, with transverse weak groove and suberect setae, demarcated by shallow impression from callus; callus strongly convex, impunctate, with scattered long setae, demarcated posteriorly by deep transverse impression (Figures 5A, B, 9A). Scutellum nearly equilateral, shorter than basal width, depressed through middle, uniformly covered with long decumbent setae. Hemelytra impunctate, overall densely covered with short decumbent setae; maximum width of endocorium about twice as wide as embolium; cuneal margin about 0.7 times as long as embolial margin in male, 0.55 times in female; membrane with single visible vein located near costal margin (Figure 2A, C). Anterior area to median furrow in ostiolar peritreme smooth, about as wide as maximum width of posterior area to median furrow; posterior area weakly squamous entirely; supracoxal area smooth, without rugosity (Figure 6A). Legs densely covered with decumbent setae; male protibiae with a row of fuscous small teeth on ventral side.

Male genitalia (Figures 11A, 14A–C). Pygophore globular shaped but somewhat dorsoventrally depressed, posteroventrally covered with six long, stout setae intermixed with short, erect setae along outer margin, of which the longest setae are shorter than half length of pygophore (Figure 11A); dorsal surface densely distributed with short, suberect setae; cone very thin, gradually acute apicad (Figure 14A); denticule slender and straight, arising from inner side of cone, shorter than half of maximum width of cone (Figure 14A, B); flagellum gently curved, thickened at base, slightly exceeding the tip of cone in dorsal view (Figure 14A–C).

Female genitalia (Figure 19A). Copulatory tube very small, fused on left part of intersegmental membrane between sterna VII and VIII in dorsal view, consisting of short, rounded membranous apex and slightly curved, tubular, basal section; basal section more or less divided into weakly sclerotised apical half and more membranous basal half.
Measurements (mm)
[♂ (n = 1, holotype)/♀ (n = 2)]. Body length 1.68/1.65–1.70; head length (excluding neck) 0.22/0.22–0.23; head width across eyes 0.34/0.34–0.35; vertex width 0.18/0.18; width between ocelli 0.14/0.15–0.16; lengths of antennal segments I–IV: I – 0.08/0.08, II – 0.19/0.17, III – 0.14/0.13–0.14, IV – 0.14/0.13–0.14; lengths of labial segments II–IV: II – 0.07/0.08, III – 0.21/0.22, IV – 0.16/0.19; anterior pronotal width 0.28/0.29–0.30; mesal pronotal length 0.24/0.24–0.26; basal pronotal width 0.66/0.66–0.72; length of embolial margin 0.50/0.51–0.54; length of cuneal margin 0.34/0.27–0.34; maximum width across hemelytra 0.73/0.72–0.78.

Etymology
Named after the type locality, Sakaerat Environmental Research Station in Wang Nam Khieo District, Nakhon Ratchasima Province, northeastern Thailand; a noun in apposition.

Distribution
Northeastern Thailand (Nakhon Ratchasima, Nakhon Nayok).

Remarks
Orius sakaerat is most similar in external appearance to the darkened variant of O. niger Wolff, 1811 from continental Palearctic Region and India, but is clearly distinguished from it by the blackish brown to black femora excepting pale yellow apex (in niger, entirely black meso- and metafemora), the gradually curved flagellum of paramere slightly exceeding the tip of cone (in niger, straight, much exceeding the tip of cone), and the slightly curved and tubular basal section of copulatory tube. In having the blackish colouration of body, this new species also resembles O. filiferus described below, but clearly differs from the latter by the colouration of head and legs, the shape of ostiolar peritreme, and the structure of paramere and copulatory tube.

Habitat
Collected on inflorescence of the fabaceous broadleaf trees (Acacia spp., Leucaena spp.) and the spurge tree Homonoia riparia Lour. (Euphorbiaceae). A few specimens were captured by light trap.

Orius (Orius) taksini Yamada and Yasunaga, sp. nov.
(Figures 2E–H, 5C,D, 6B, 9B, 11B, 14D–F, 19B)

Type materials
Holotype. ♂ (Figures 2E, F, 5C, 6B, 9B, 11B, 14D–F), THAILAND, Nakhon Ratchasima, Sakaerat Environmental Research Station, N14°29′24.4″–30′37.5″, E101°54′37.8″–55′49.7″, 372–601 m alt., 23–25 January 2009, T. Yasunaga leg’ (DOA). Paratypes. Thailand: Saraburi: one ♀ (Figure 19B), Kyusei Nature Farming Center, Champakpaew, Kaengkoi, 14°32′75.8″N, 101°04′71.5″E, 60 m alt., 20 January 2009, K. Yamada (TKPM); one ♀ (Figures 2G, H, 5D), same locality, T. Yasunaga (TKPM).
**Diagnosis**

Recognised by the following characters: hemelytra yellowish brown, cuneus widely darkened (Figure 2E, G); legs pale yellow, coxae and trochanters brown to blackish brown (Figure 2F, H); male antennal segment II much thickened, fusiform (Figures 5C, 9B); cone very thin, gradually acute apicad; denticule small, finger shaped; flagellum gently curved, exceeding the tip of cone (Figure 14D–F); copulatory tube very small, consisting of three distinct parts: apical membranous section, sclerotised cylindrical section, and basal duct (Figure 19B).

**Description**

**Colouration.** Head blackish brown, with pale yellow apex; eyes reddish brown, area surrounding ocellus reddish brown (Figures 2E, G, 5C, D). Antennae uniformly pale yellow, but male with apex of segment II and whole of segments III and IV with fuscous tinge (Figure 5C, D). Labium pale yellow; apex of segment IV somewhat fuscous (Figure 2F, H). Pronotum and scutellum uniformly blackish brown (Figure 5C, D). Hemelytra yellowish brown with cuneus widely darkened; membrane uniformly greyish brown (Figure 2E, G). Legs pale yellow; coxae and trochanters brown to blackish brown; tarsi pale yellow, with darkened apex (Figure 2F, H). Venter of thorax blackish brown. Abdomen brown to blackish brown (Figure 2F, H).

**Structure.** Body oblong oval (Figure 2E, G). Head smooth, shiny, about 0.7 times as long as width across eyes, sparsely covered with short decumbent setae, and with a longer erect seta on each side of clypeus, near anteromedial margin of each eye, and between eye and ocellus; ante-ocular portion 0.6–0.7 times as long as length of eye in dorsal view; vertex about 1.9 times as wide as eye in dorsal view in male, about 2.2 times in female; eye oblong, about 1.5 times as long as eye width in dorsal view; postocular portion constricted; neck shortened (Figure 9B). Antennal segment I stout, exceeding apex of head, sparsely covered with short suberect setae; segment II thickened, fusiform, 0.66 times as long as head width across eyes in male, 0.56 times in female, densely covered with suberect setae which are shorter than half width of the segment in male, a little shorter than width of the segment in female; segments III and IV narrower than maximum width of segment II, covered with long erect setae intermixed with short decumbent setae, longest seta about as long as width of respective segment; segment III equal length to segment IV (Figures 5C, D, 9B). Labium slightly exceeding the procoxae, sparsely covered with short suberect setae. Pronotum impunctate, shiny, sparsely covered with long decumbent setae; anterior margin slightly concave, width about 1.2 times as wide as mesal length; lateral margin nearly straight, curved at anterior corner in female; lateral carinae weakly expanded anteriorly; posterior margin shallowly concave, width 2.1–2.3 times as wide as anterior pronotal width; collar narrow, with transverse weak groove and suberect setae, demarcated by shallow impression from callus; callus strongly convex, impunctate, with scattered long setae, demarcated posteriorly by deep transverse impression (Figures 5C, D, 9B). Scutellum nearly equilateral, much shorter than basal width, depressed through middle, uniformly covered with long decumbent setae. Hemelytra impunctate, overall densely covered with short decumbent setae; maximum width of endocorium about twice as wide as embolium; cuneal margin about 0.5 times as long as embolial margin; membrane with single visible vein located
near costal margin. Ostiolar peritreme similar in general shape to *O. sakaerat*; anterior area to median furrow in ostiolar peritreme smooth, a little wider than maximum width of posterior area to median furrow; posterior area weakly squamous entirely; supracoxal area smooth, without rugosity (Figure 6B). Legs densely covered with decumbent setae, male trochanters with one small tooth in ventral side; male protibiae with a row of 17 small fuscous teeth on ventral side.

**Male genitalia (Figures 11B, 14D–F).** Pygophore globular shaped but somewhat dorsoventrally depressed, posteroventrally covered with six long, stout setae intermixed with short, erect setae along outer margin, of which the longest setae are shorter than half length of pygophore (Figure 11B); mediodorsal surface densely distributed with short, suberect setae; cone very thin, gradually acute apicad (Figure 14D); denticule

![Figure 11. Pygophore with paramere, dorsal view. (A) *O. sakaerat*, holotype; (B) *O. taksini*, holotype; (C) *O. tomokunii*, holotype. Abbreviations: eb = ejaculatory bulb; prm = paramere; pyg = pygophore. Scale bars: 0.1 mm.](image_url)
small, finger shaped, arising from inner side of cone (Figure 14D, E); flagellum gently curved, basally not adjacent to the paramere body, exceeding the tip of cone in dorsal view (Figure 14D–F).

**Female genitalia (Figure 19B).** Copulatory tube very small, fused on left part of intersegmental membrane between sterna VII and VIII in dorsal view, consisting of three distinct parts: apical membranous section, sclerotised cylindrical section, and basal duct; apical membranous section somewhat tubular; sclerotised cylindrical section thickened; basal duct very thin, merging into intersegmental membrane.

**Measurements (mm)**

\[\text{♂ (n = 1, holotype)/♀ (n = 2)]: Body length 1.65/1.85–1.90; head length (excluding neck) 0.24/0.24–0.25; head width across eyes 0.35/0.36–0.37; vertex width 0.16/0.18–0.19; width between ocelli 0.14/0.16; lengths of antennal segments I–IV: I = 0.08/0.09, II = 0.23/0.20–0.21, III = 0.18/0.16–0.17, IV = 0.18/0.17–0.18; lengths of labial segments II–IV: II = 0.09/0.09, III = 0.24/0.24–0.25, IV = 0.18/0.20; anterior pronotal width 0.31/0.31–0.32; mesal pronotal length 0.25/0.26–0.27; basal pronotal width 0.66/0.70–0.72; length of embolial margin 0.55/0.56–0.58; length of cuneal margin 0.29/0.29–0.35; maximum width across hemelytra 0.71/0.72–0.79.

**Etymology**

Named for the third author of this paper, Mr. Taksin Artchawakom, who greatly supported our field investigations; a noun in genitive case.

**Distribution**

Northeastern Thailand (Nakhon Ratchasima, Saraburi).

**Remarks**

In general appearance, *Orius taksini* resembles *O. conchaconus* Ghauri, 1972 from Pakistan and *O. ugandensis* Hernández & Stonedahl, 1999 from Uganda, but is distinguished from *conchaconus* by the presence of denticule (in *conchaconus*, lacking) and the gently curved flagellum (in *conchaconus*, strongly bifurcate), and from *ugandensis* by the very thin and gradually acute apex of cone (in *ugandensis*, wide and rounded) and the denticule arising from inner side of cone (in *ugandensis*, near outer margin of cone).

**Habitat**

Collected on flowers of *Mangifera indica* (Anacardiaceae) and on unidentified tropical broadleaved trees.

**Orius (Orius) tomokunii** Yamada and Yasunaga, sp. nov.

(Figures 2I–L, 5E,F, 6C, 9C, 11C, 14G–I, 19C)

**Type materials**

**Holotype.** ♂ (NSMT-I-He 74275; Figures 2I, J, 5E, 9C, 11C, 14G–I), (THAILAND), Maeo Khun Klang, 1300 m, Doi Inthanon, 18 October 1983, M. Tomokuni’ (NSMT). Left antenna is
missing. **Paratypes.** Thailand: Chiang Mai: 3♀, Pa Kia, Chiang Dao, 4–6 May 2000, S. Nagashima (TKPM); one ♂, five ♀ (NSMT-I-He 74276-74281; one in Figures 2K, L, 5F, 6C, one in Figure 19C), same data as holotype (NSMT).

**Diagnosis**
Recognised by the following characters: head with distinct neck (Figures 5E, F, 9C); hemelytra yellowish brown, cuneus widely darkened, not in clear contrast to yellowish brown endocorium (Figure 2I, K); legs yellowish brown, meso- and metafemora sometimes fuscous at middle (Figure 2J, L); antennal segment II 0.8 times as long as head width across eyes in male, 0.67 times in female (Figures 5E, F, 9C); cone very thin, gradually acute apicad; denticule slender and straight; flagellum straight, with rounded ventral projection near base (Figure 14G–I); copulatory tube with tubular, long, membranous apical section and bulbous, shortened, weakly sclerotised basal section (Figure 19C).

**Description**

**Colouration.** Head blackish brown, with pale yellow tylus; eyes reddish brown, area surrounding ocellus reddish brown (Figure 5E, F). Antennae yellowish brown, segments I, III and IV with fuscous tinge (Figure 5E, F). Labium blackish brown, apex of segment III and base of segment IV yellowish brown (Figure 2J, L). Pronotum and scutellum uniformly blackish brown to black (Figure 5E, F). Hemelytra yellowish brown with cuneus widely darkened, but cuneus without clear contrast in colouration to yellowish brown endocorium; membrane uniformly somber dark brown (Figure 2I, K). Legs yellowish brown; meso- and metafemora sometimes fuscous at middle; tarsi pale yellow, with darkened apex (Figure 2J, L). Venter of thorax blackish brown (Figure 2J, L). Abdomen brown to blackish brown (Figure 2J, L).

**Structure.** Body elongate oval (Figure 2I, K). Head smooth, shiny, 0.70–0.75 times as long as width across eyes, sparsely covered with short decumbent setae, and with a longer erect seta on each side of clypeus, near anteromedial margin of each eye, and between eye and ocellus; ante-ocular portion 0.66 times as long as length of eye in dorsal view in male, 0.8 times in female; vertex about 1.9 times as wide as eye in dorsal view; eye oblong, about 1.5 times as long as eye width in dorsal view; postocular portion constricted; neck distinct (Figure 9C). Antennal segment I stout, exceeding apex of head, sparsely covered with short suberect setae; segment II 0.8 times as long as head width across eyes in male, 0.67 times in female, densely covered with suberect setae which are about 0.5 times as long as width of the segment in male, about as long as width of the segment in female; segments III and IV narrower than maximum width of segment II, covered with long erect setae intermixed with short decumbent setae, longest seta about as long as width of respective segment in male, slightly longer than width of respective segment in female; segment III slightly shorter than segment IV (Figures 5E, F, 9C). Labium extending to the procoxae, sparsely covered with short suberect setae. Pronotum smooth, shiny, sparsely covered with short decumbent setae and tiny punctures; anterior margin nearly straight, width about as wide as mesal length in male, slightly narrower in female; lateral margin nearly straight; lateral carinae distinctly expanded, slightly bulging at callus; posterior margin shallowerly concave, width 2.1–2.3
times as wide as anterior pronotal width; collar distinct, somewhat transversely rugose, demarcated by shallow transverse impression from callus; callus strongly convex, with scattered short setae, demarcated posteriorly by deep transverse impression (Figures 5E, F, 9C). Scutellum nearly equilateral, much shorter than basal width, deeply depressed through middle, sparsely covered with long decumbent setae. Hemelytra overall densely covered with short decumbent setae and tiny punctures; maximum width of endocorium about 1.8 times as wide as embolium; cuneal margin about 0.45 times as long as embolial margin; membrane with two visible and one indistinct veins; one visible vein located near costal margin, another visible vein near posterior margin of the membrane; one indistinct vein located between two visible veins. Ostiolar peritrete very wide, evenly curved forward; anterior area to median furrow smooth, about twice as wide as maximum width of posterior area to median furrow; posterior area narrow, squamous ranging from middle to forward; evaporative area very narrow (Figure 6C). Legs densely covered with decumbent setae, male trochanters with one small tooth on ventral side; male protibiae with a row of 26 small fuscous teeth on ventral side.

**Male genitalia (Figures 11C, 14G–1).** Pygophore globular shaped but somewhat dorsoventrally depressed, posteroventrally covered with nine long, stout setae intermixed with short, erect setae along outer margin, of which the longest setae are shorter than half length of pygophore (Figure 11C); dorsal surface densely distributed with short, suberect setae; cone very thin, gradually acute apicad (Figures 14G); denticule slender and straight, apically blunt in lateral view, arising from inner side of cone, shorter than half of maximum width of cone (Figure 14G, H); flagellum straight, with rounded ventral projection near base, a little exceeding the tip of cone in dorsal view (Figure 14G–1).

**Female genitalia (Figure 19C).** Copulatory tube fused on left part of intersegmental membrane between sterna VII and VIII in dorsal view, adjacent to base of ovipositor, consisting of apical membranous section and weakly sclerotised basal section; apical membranous section somewhat tubular, long; weakly sclerotised basal section bulbous, shortened.

**Measurements (mm)**

\[ \sigma (n = 2)/\varphi (n = 5) \text{, value for holotype male in parentheses}. \]

- Body length: 2.35–2.38 (2.35)/2.55–2.95; head length (excluding neck): 0.31 (0.31)/0.31–0.33; head width across eyes: 0.41–0.42 (0.42)/0.42–0.48; vertex width: 0.21 (0.21)/0.21–0.24; width between ocelli: 0.16–0.17/0.16–0.20; lengths of antennal segments I–IV: I – 0.11 (0.11)/0.11–0.13, II – 0.34 (0.34)/0.29–0.31, III – 0.25 (0.25)/0.18–0.22, IV – 0.26 (0.26)/0.23–0.25; lengths of labial segments II–IV: II – 0.08 (0.08)/0.08–0.09, III – 0.33 (0.33)/0.36–0.39, IV – 0.23 (0.23)/0.23–0.25; anterior pronotal width: 0.34–0.35 (0.34)/0.35–0.39; mesal pronotal length: 0.34 (0.34)/0.36–0.44; basal pronotal width: 0.79–0.81 (0.79)/0.74–0.84; length of embolial margin: 0.77–0.78 (0.77)/0.79–0.91; length of cuneal margin: 0.41–0.42 (0.42)/0.42–0.49; maximum width across hemelytra: 0.89–0.90/0.94–1.11.
**Etymology**
Named in honor of Dr. Masaaki Tomokuni, who collected most of the type specimens; a noun in genitive case.

**Distribution**
Northern Thailand (Chiang Mai).

**Remarks**
Orius tomokunii is similar to *O. luridoides* Ghauri, 1972 from Pakistan in colouration and shapes of head and pronotum, but is distinguishable from the latter by the cone being gradually acute apicad (*luridoides*, obtuse apically) and the straight flagellum with rounded ventral projection near base and slightly exceeding the tip of cone (*luridoides*, short and leaf like, its apex bifurcate, not exceeding the tip of cone).

**Habitat**
Unknown.

**Orius (Orius) filiferus** Yamada and Yasunaga, sp. nov.
(Figures 1C, 3A–D, 5G, 6D, 9D, 12A, 15, 19D)

**Type materials**

**Holotype.** ♂ (Figures 3A, B, 5G, 12A, 15), Nakhon Nayok, Sarika Water Fall, N14°18’17.6”–33.1”, E101°15’18.2”–27.8”, 62–76 m alt., 17 June 2009, K. Yamada (DOA). Right and left antennal segment III and IV are missing. **Paratypes.** Thailand: Nakhon Nayok: 1 ♀, Wang Takhrai, 23 March 2010, K. Yamada (TKPM); one ♂ (Figure 9D), six ♀ (one in Figure 1C, one in Figures 3C, D, 6D, 19D, one in Figure 5H), same data as holotype (two ♀ in BMNH, one ♀ in DOA, one ♀ in TYCN, others in TKPM).

**Diagnosis**
Recognised by the following characters: overall colouration greyish brown to blackish brown, head pale yellow to yellowish brown (Figure 3A–D); legs pale yellow to yellowish brown (Figure 3B, D); cone strongly rounded, elevated dorsally with weak projection; denticule lacking; flagellum very long, filamentous, much longer than four times maximum width of cone (Figure 15); copulatory tube very long, consisting of apical membranous section, weakly swollen middle section, and basal duct (Figure 19D).

**Description**

**Colouration.** Overall colouration greyish brown to blackish brown (Figure 3A–D). Head pale yellow to yellowish brown, but male with fuscous tinge posterior to ocelli; eyes reddish brown, area surrounding ocellus red to reddish brown. Antennae pale yellow to yellowish brown, with segment I dark brown (Figure 5G, H). Labium uniformly pale yellow (Figure 3B, D). Pronotum and scutellum greyish brown to blackish brown (Figure 5G, H). Hemelytra greyish brown to blackish brown, cuneus somewhat darker than remaining area of corium; membrane uniformly somber dark brown (Figure 3A, C).
Legs pale yellow to yellowish brown (Figure 3B, D). Venter of thorax and abdomen dark brown, tinged with darker orange brown (Figure 3B, D).

**Structure.** Body elongate oval (Figure 3A, C). Head smooth, shiny, about 0.65 times as long as width across eyes, and with a long erect fuscous seta on each side of clypeus, near anteromedial margin of each eye, and between eye and ocellus; ante-ocular portion 0.60–0.65 times as long as length of eye in dorsal view; vertex about 1.6 times as wide as eye in dorsal view; eye oblong, proximate to anterior margin of pronotum, about 1.3 times as long as eye width in dorsal view; neck indistinct (Figure 9D). Antennal segment I stout, reaching apex of head, sparsely covered with short suberect setae; segment II 0.55–0.60 times as long as head width across eyes, densely covered with suberect setae which are about as long as width of the segment; segments III and IV a little narrower than maximum width of segment II, covered with long erect setae intermixed with short decumbent setae, longest seta much longer than width of respective segment; segment III shorter than segment IV (Figures 5G, H, 9D). Labium extending to the procoxae, sparsely covered with short suberect setae. Pronotum smooth, shiny, sparsely covered with short decumbent setae, and long stout fuscous corner setae; anterior margin slightly concave, width 1.3 times as wide as mesal length; lateral margin nearly straight, angulate at anterior corner; lateral carinae distinctly expanded; posterior margin shallowly concave, width 2.2 times as wide as anterior pronotal width; collar narrow, with transverse weak groove and a row of short setae, demarcated by shallow transverse impression from callus; callus polished, strongly convex, with scattered short setae, demarcated posteriorly by deep transverse impression (Figures 5G, H, 9D). Scutellum nearly equilateral, shorter than basal width, deeply depressed through middle, sparsely covered with long decumbent setae. Hemelytra overall densely covered with short decumbent setae and tiny punctures; maximum width of endocorium about 1.9 times as wide as embolium; cuneal margin about 0.5 times as long as embolial margin; membrane with one visible vein located near costal margin. Ostiolar peritrete roundly curved forward; anterior area to median furrow in ostiolar peritrete smooth, much narrower than half width of posterior area to median furrow; posterior area squamous entirely; supracoxal area transversely rugose (Figure 6D). Legs densely covered with decumbent setae; male protibiae with a row of 15 small fuscous teeth on ventral side.

**Male genitalia (Figures 12A, 15).** Pygophore ovoid shaped, posteroventrally covered with 4–5 long, stout setae which are much shorter than half length of pygophore (Figure 12A); mediodorsal surface densely distributed with short, suberect setae; cone strongly rounded in dorsal view, somewhat pointed at apex, elevated dorsally with weak projection (Figure 15); denticule lacking; flagellum very long, filamentous, much longer than four times maximum width of cone, extending well beyond the left edge of pygophore (Figure 15).

**Female genitalia (Figure 19D).** Copulatory tube very long, arising from left part of intersegmental membrane between sterna VII and VIII in dorsal view, consisting of apical membranous section, weakly swollen middle section, and basal duct; apical
Figure 12. Pygophore with paramere, dorsal view. (A) *O. filiferus*, holotype; (B) *O. machaerus*, holotype; (C) *O. inthanon*, holotype; (D) *O. crassus*, holotype. Abbreviations: eb = ejaculatory bulb; prm = paramere; pyg = pygophore. Scale bars: 0.1 mm.
membranous section somewhat tubular, curved anteriorly, extending beyond the posterior marign of sterna VII; basal duct very long, stout, strongly curved.

**Measurements (mm)**

\[
\text{♂ (n = 2)}/\text{♀ (n = 5), value for holotype male in parentheses. Body length 1.60–1.65 (1.60)/1.50–1.70; head length (excluding neck) 0.21–0.22 (0.21)/0.21–0.23; head width across eyes 0.33–0.35 (0.35)/0.32–0.35; vertex width 0.15–0.16 (0.15)/0.16–0.17; width between ocelli 0.12–0.13 (0.12)/0.14–0.15; lengths of antennal segments I–IV: I – 0.08 (0.08)/0.08–0.09, II – 0.19–0.20 (0.20)/0.18–0.19, III – 0.15 (missing)/0.15–0.17, IV – 0.19 (missing)/0.19; lengths of labial segments II–IV: II – 0.06–0.07 (0.07)/0.08–0.09, II – 0.21–0.22 (0.21)/0.21–0.22, IV – 0.13–0.15 (0.13)/0.15–0.17; anterior pronotal width 0.27–0.29 (0.29)/0.26–0.29; mesal pronotal length 0.20–0.22 (0.22)/0.20–0.22; basal pronotal width 0.62–0.63 (0.62)/0.60–0.66; length of embolial margin 0.47–0.50 (0.50)/0.49–0.53; length of cuneal margin 0.25 (0.25)/0.25–0.28; maximum width across hemelytra 0.61–0.69/0.68–0.72.}
\]

**Etymology**

From Latin, *filiferus* (= thread shaped), referring to very filamentous flagellum of paramere; an adjective.

**Distribution**

Northeastern Thailand (Nakhon Nayok).

**Remarks**

Judging from the description and illustrations by Muraleedharan and Ananthakrishan (1974), *Orius filiferus* is similar in colouration to *O. shyamavarna* Muraleedharan and Ananthakrishnan, 1974 from India, but is distinguished from the latter by the strongly rounded cone (in *shyamavarna*, not rounded), the flagellum being much longer than four times maximum width of cone (in *shyamavarna*, about twice maximum width of cone), and the copulatory tube with anteriorly curved apical membranous section (in *shyamavarna*, apically with S-shaped curve). In having the paramere with very long filamentous flagellum, *O. filiferus* is closely related to *O. trivandrensis* Muraleedharan and Ananthakrishnan, 1974 from India, but can be distinguished from it by the greyish brown to blackish brown pronotum (in *trivandrensis*, yellowish brown), the greyish brown to blackish brown hemelytra with somewhat darker cuneus (in *trivandrensis*, embolium and cuneus brown, clavus and corium pale brown), the more rounded cone, and the copulatory tube with anteriorly curved apical membranous section (in *trivandrensis*, apically not curved anteriorly).

**Habitat**

Collected on flowers of *Macaranga* sp. (Euphorbiaceae). One female specimen was found under the bract of a shoot of *Macaranga* tree, together with a plant bug species, *Decomioides verecundus* Yasunaga, 2010 (Miridae: Phylinae: Phylini) (cf. Yasunaga 2010).
Orius (Orius) machaerus Yamada and Yasunaga, sp. nov.
(Figures 3E–H, 5I,J, 6E, 19E, 12B, 16 A–C, 19E)

Type materials
Holotype. ♂ (NSMT-I-He 74282; Figures 3E, F, 6E, 12B, 16A–C), (THAILAND), Maeo Khun Klang, 1300 m, Doi Inthanon, 18 October 1983, M. Tomokuni. Paratypes. Two ♂ (NSMT-I-He 74283, 74284; one in Figures 5I, 9E), one ♀ (NSMT-I-He-XXXX; Figures 3G, H, 5J), same data as holotype; one ♀ (NSMT-I-He 74285; Figure 19E), same locality as holotype, 17 October 1983, M. Sakai. All in NSMT.

Diagnosis
Recognised by the following characters: overall colouration brown to dark orange brown (Figure 3E–H); hemelytra faintly paler than pronotum and scutellum (Figure 3E, G); pygophore with a row of short, stout setae along the edge that fits the flagellum (Figure 12B); cone thin, acute apicad, elevated dorsally with weak projection (Figure 16A–C); denticule lacking; flagellum sword shaped, much longer than twice maximum width of cone (Figure 16A–C); copulatory tube very long and broad, consisting of apical membranous section, weakly sclerotised middle section, and basal duct (Figure 19E).

Description
Colouration.
Overall colouration brown to dark orange brown (Figure 3E–H). Head dark orange brown, somewhat paler anterior to eyes; eyes reddish brown, ocellus and its surroundings area red to reddish brown. Antennae pale yellow to yellowish brown, with segments I, III and IV having fuscous tinge (Figure 5I, J). Labium yellowish brown; segments I and II blackish brown; basal half of segment III and apex of IV dark pale brown (Figure 3F, H). Pronotum and scutellum uniformly dark orange brown (Figure 5I, J). Hemelytra uniformly orange brown to brown, faintly paler than pronotum and scutellum; membrane somber dark brown (Figure 3E, G). Legs pale yellow to yellowish brown, metafemora tinged with dark orange brown basally (Figure 3F, H). Venter of thorax and abdomen orange brown to dark orange brown (Figure 3F, H).

Structure.
Body elongate oval (Figure 3E, G). Head smooth, shiny, about 0.6 times as long as width across eyes, and with a long erect fuscous seta on each side of clypeus, near anteromedial margin of each eye, and between eye and ocellus; ante-ocular portion 0.6–0.7 times as long as length of eye in dorsal view; vertex about 1.8–2.0 times as wide as eye in dorsal view; eye oblong, proximate to anterior margin of pronotum, about 1.5 times as long as eye width in dorsal view; neck indistinct (Figure 9E). Antennal segment I stout, exceeding of head, sparsely covered with short suberect setae; segment II about 0.6 times as long as head width across eyes, densely covered with suberect setae which are about as long as width of the segment; segments III and IV a little narrower than maximum width of segment II, covered with long erect setae intermixed with short decumbent setae, longest seta a little longer than width of respective segment; segment III shorter than segment IV (Figures 5I, J, 9E). Labium extending to the procoxae, sparsely covered with short suberect setae. Pronotum smooth, shiny, sparsely covered with decumbent setae, and long stout fuscous corner
setae; anterior margin slightly concave, width about as wide as mesal length; lateral margin nearly straight, angulate at anterior corner; lateral carinae distinctly expanded; posterior margin shallowly concave, width about 2.6 times as wide as anterior pronotal width; collar wide, weakly rugulose, and with short setae, demarcated by shallow transverse impression from callus; callus longitudinally wide, polished, strongly convex, with scattered short setae, demarcated posteriorly by deep transverse impression (Figures 5I, J, 9E). Scutellum nearly equilateral, impunctate, shorter than basal width, deeply depressed through middle, sparsely covered with long decumbent setae. Hemelytra parallel sided, overall densely covered with short decumbent setae and tiny punctures, maximum width of endocorium 1.56–2.00 times as wide as embolium; cuneal margin about 0.5 times as long as embolial margin; membrane with three visible veins, one located near costal margin, one near posterior margin of the membrane, and one between these veins. Ostiolar peritreme similar in general shape to O. filiferus; anterior area to median furrow in ostiolar peritreme smooth, a little narrower than maximum width of posterior area to median furrow; posterior area squamous entirely; supracoxal area with transversely rugose (Figure 6E). Legs densely covered with decumbent setae; male protibiae with a row of about 15 small fuscous teeth on ventral side.

**Male genitalia (Figures 12B, 16A–C).** Pygophore ovoid shaped, posteroventrally covered with six long, stout setae which are much shorter than half length of pygophore (Figure 12B); mediadorsal surface densely distributed with short, suberect setae, and with a row of short, stout setae along the edge that fits the flagellum (Figure 12B); cone thin, acute apicad in dorsal view, elevated dorsally with weak projection (Figure 16A–C); denticule lacking; flagellum sword shaped, strongly curved basally, much longer than twice maximum width of cone, extending well beyond the left edge of pygophore (Figure 16A–C).

**Female genitalia (Figure 19E).** Copulatory tube very long and broad, arising from left part of intersegmental membrane between sterna VII and VIII in dorsal view, consisting of apical membranous section, weakly sclerotised middle section, and basal duct; apical membranous section somewhat cup-shape; weakly sclerotised section cylindrical, narrowed posteriad and connecting into basal duct; basal duct broad, longer than twice the length of the weakly sclerotised section.

**Measurements (mm)**

\[
\begin{align*}
\text{♂} (n = 3)/\text{♀} (n = 2), \text{value for holotype male in parentheses}, \text{Body length} & \ 1.70–1.90 \ (1.70)/1.75–2.00; \text{head length (excluding neck) } & \ 0.22–0.23 \ (0.23)/0.24–0.25; \text{head width across eyes } & \ 0.34–0.36 \ (0.35)/0.35–0.36; \text{vertex width } & \ 0.16–0.17 \ (0.16)/0.18–0.19; \text{width between ocelli } & \ 0.13–0.15 \ (0.13)/0.15–0.16; \text{lengths of antennal segments I–IV: } & \ I – 0.09–0.10 \ (0.09)/0.09, \ II – 0.21–0.22 \ (0.22)/0.22–0.23, \ III – 0.15–0.17 \ (0.17)/0.17–0.18, \ IV – 0.19 \ (0.19)/0.21; \text{lengths of labial segments II–IV: } & \ II – 0.07–0.09 \ (0.09)/0.09, \ III – 0.22–0.24 \ (0.22)/0.25–0.26, \ IV – 0.16 \ (not measured)/not measured; \text{anterior pronotal width } & \ 0.28–0.29 \ (0.29)/0.29; \text{mesal pronotal length } & \ 0.25–0.26 \ (0.25)/0.29; \text{basal pronotal width } & \ 0.73–0.74 \ (0.73)/0.75–0.76; \text{length of embolial margin } & \ 0.61–0.62 \ (0.62)/0.64–0.69; \text{length of cuneal margin } & \ 0.29–0.31 \ (0.29)/0.31–0.35; \text{maximum width across hemelytra } & \ 0.83 \ (not measured)/0.85–0.86.
\end{align*}
\]
**Etymology**
From Latin, *machaerus* (= sword, dirk), referring to sword-shaped flagellum of paramere; an adjective.

**Distribution**
Northern Thailand (Chiang Mai).

**Remarks**
In general colouration, *Orius machaerus* is most similar to *O. shyamavarna* (cf. Muraleedharan & Ananthakrishnan 1974). But the former is distinguishable from the latter by the sword-shaped flagellum (in *shyamavarna*, much more slender, apically thread like) and the very long and broad copulatory tube with somewhat cup-shaped apical membranous section (in *shyamavarna*, much more slender, apically with S-shaped curve). Also resembles *O. filiferus*, but readily differs from it by the brown to dark orange brown body (paler than that of *filiferus*) and the morphology of paramere and copulatory tube.

**Habitat**
Unknown.

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*Orius* (*Orius*) *inthanonus* Yamada and Yasunaga, sp. nov.
(Figures 3I, J, 5K, 6F, 9F, 12C, 16D–F)

**Type material**
Holotype. ♂ (NSMT-I-He 74287; Figures 3I, J, 5K, 6F, 9F, 12C, 16D–F), (THAILAND), Maeo Khun Klang, 1300 m, Doi Inthanon, 20 October 1983, M. Sakai (NSMT). Right antenna, left antennal segments III and IV, pronotal corner setae excepting left posterolateral one, and long, erect setae between each eye and ocellus are missing.

**Diagnosis**
Recognised by the following characters: body generally blackish brown (Figure 3I, J); hemelytra brown to greyish brown, embolium posteriorly darkened, cuneus darker (Figure 3I); legs yellowish brown, meso- and metafemora dark brown (Figure 3J); male profemora with six fuscous small teeth on ventral side; cone thin, acute apicad, elevated dorsally with a projection (Figure 16D–F); denticule lacking; flagellum robust, roundly curved, noticeably expanded from base to middle in lateral view (Figure 16D–F).

**Description**
Male (holotype). Colouration: body generally blackish brown (Figure 3I, J). Head brown to blackish brown, with paler apex (Figure 5K); eyes reddish brown, ocellus and its surrounding area red to reddish brown. Antennal segments I and II yellowish brown (Figure 5K). Labium uniformly pale yellow, but segments I and II with fuscous tinge (Figure 3J). Pronotum and scutellum uniformly blackish brown (Figure 5K). Hemelytra brown to greyish brown; embolium posteriorly darkened; cuneus darker than remainder area of corium; membrane uniformly somber dark brown (Figure 3I). Legs pale yellow to yellowish brown; meso- and metafemora dark brown (Figure 3J).
Venter of thorax and abdomen dark brown, tinged with darker orange brown (Figure 3J). Structure: body elongate oval (Figure 3I). Head smooth, shiny, about 0.66 times as long as width across eyes, and with a longer erect seta on each side of clypeus, and near anteromedial margin of each eye; ante-ocular portion 0.64 times as long as length of eye in dorsal view; vertex about 1.8 times as wide as eye in dorsal view; eye 1.4 times as long as eye width in dorsal view; postocular portion constricted; neck distinct (Figure 9F). Antennal segment I stout, much exceeding apex of head, sparsely covered with short suberect setae; segment II 0.63 times as long as head width across eyes, densely covered with suberect setae which are shorter than width of the segment (Figures 5K, 9F). Labium sparsely covered with short suberect setae. Pronotum shiny, smooth, sparsely covered with short decumbent setae and tiny punctures; anterior margin slightly concave, width about as wide as mesal length; lateral margin moderately curved; lateral carinae distinctly expanded; posterior margin concave, width 2.5 times as wide as anterior pronotal width; collar distinct, strigose, demarcated by shallow transverse impression from callus; callus strongly convex, with scattered short setae, demarcated posteriorly by deep sinuate transverse impression (Figures 5K, 9F). Scutellum nearly equilateral, shorter than basal width, deeply depressed through middle, sparsely covered with short decumbent setae and tiny punctures. Hemelytra overall sparsely covered with short decumbent setae and tiny punctures; maximum width of endocorium twice as wide as embolium; cuneal margin 0.5 times as long as embolial margin; membrane with one indistinct vein located near costal margin. Ostiolar peritreme similar in general shape to O. filiferus and O. machaerus; anterior area to median furrow in ostiolar peritreme smooth, about as wide as maximum width of posterior area to median furrow; posterior area squamous entirely; supracoxal area transversely rugose (Figure 6F). Legs densely covered with stramineous decumbent setae; male protrochanters bearing one fuscous small tooth on ventral side; male profemora with six fuscous small teeth on ventral side; male protibiae with a row of 16 fuscous small teeth on ventral side. Male genitalia (Figures 12C, 16D–F): pygophore ovoid shaped, posteroventrally covered with four long, stout setae which are shorter than length of pygophore (Figure 12C); mediodorsal surface densely distributed with short, suberect setae; cone thin, acute apicad in dorsal view, elevated dorsally with a projection (Figure 16D–F); denticule lacking; flagellum robust, roundly curved, longer than twice of maximum width of cone, basally thickened in dorsal view, noticeably expanded from base to middle in lateral view, extending well beyond the left edge of pygophore (Figure 16D–F).

**Female.** Unknown.

**Measurements (mm)**

\[\sigma^\circ (n = 1)\]. Body length 2.05; head length (excluding neck) 0.25; head width across eyes 0.38; vertex width 0.18; width between ocelli 0.15; lengths of antennal segments I–II: I – 0.09, II – 0.24, III – missing, IV – missing; lengths of labial segments II–IV: II – 0.09, III – 0.25, IV – 0.22; anterior pronotal width 0.30; mesal pronotal length 0.30; basal pronotal width 0.76; length of embolial margin 0.68; length of cuneal margin 0.35; maximum width across hemelytra 0.84.
**Etymology**
Named after the type locality, Doi Inthanon in Chom Thong District, Chiang Mai Province, northern Thailand; a noun in apposition.

**Distribution**
Northern Thailand (Chiang Mai).

**Remarks**
*Orius inthanonus* is distinctive among the species of the subgenus *Orius* in having brown to greyish brown hemelytra with posteriorly darkened embolium and darker cuneus and the male profemora with six fuscous small teeth on ventral side. The structure of male genitalia of *O. inthanonus* somewhat resembles that of *O. machaerus*; however, it differs from the latter by the roundly curved flagellum being noticeably expanded from base to middle in lateral view.

**Habitat**
Unknown.

**Subgenus Trichorius** Yasunaga, 1997

*Trichorius* Yasunaga, 1997a: 362 (subgenus of *Orius*). Type species by original designation: *Orius atratus* Yasunaga, 1997; Aukema et al. 2013: 93 (catalogue).

**Diagnosis**
Recognised by the combination of following characters: pronotum sparsely covered with long setae and small punctures, with long stout setae near anterolateral and posterolateral corners and a pair of similar setae behind ocelli, with wide callus; ostiolar peritreme roundly curved anteriorly, evaporatorium wide; genital segments of both sexes densely covered with long setae; paramere lacking denticule, with conspicuously long and bifurcate flagellum. A detailed description was provided by Yasunaga (1997a).

**Remarks**
The subgenus *Trichorius* Yasunaga, 1997 was proposed to accommodate a single species, *O. atratus* Yasunaga, 1997. Yasunaga (1997a) stated the following characters to define *Trichorius*: dorsum shiny; pronotum with four corner setae (on anterolateral and posterolateral corners) and wide, flat callus; ostiolar peritreme rounded; genital segments of both sexes covered densely covered with long setae; paramere lacking denticule; flagellum conspicuously long and bifurcate. In this study, an undescribed species, sharing the above diagnostic characters, was discovered from Thailand, and is described here as a second representative of *Trichorius*.

**Orius (Trichorius) crassus** Yamada and Yasunaga, sp. nov.
(Figures 3K,L, 5L, 10A, 12D, 17)

**Type material**
*Holotype*. ♂ (Figures 3K, L, 5L, 10A, 12D, 17), THAILAND, Nakhon Ratchasima, Sakaerat Environmental Research Station, N14°30′26.9″, E101°55′39.2″, 407 m alt., light trap, 17–20 March 2010, T. Yasunaga & K. Yamada (DOA).
Diagnosis
Recognised by the following characters: body generally greyish brown (Figure 3K, L); hemelytra greyish brown, paler than pronotum and scutellum, cuneus somewhat darker than remainder of corium (Figure 3K); antennal segment II thickened, fusiform (Figure 5L); legs pale yellow, each femur dark brown excluding pale yellow apex (Figure 3L); cone thin, pointed at apex in dorsal view, widened in lateral view, slightly elevated dorsally with weak projection (Figure 17); flagellum much longer than maximum width of cone, distinctly remote at base from the cone (Figure 17).

Description
Male (holotype). Colouration: body generally greyish brown (Figure 3K, L). Head greyish brown, with paler apex; venter of head pale brown; eyes reddish brown, area surrounding ocellus red to reddish brown (Figure 5L). Antennae yellowish brown; segment I dark brown; segments III and IV with dark brown tinge. Pronotum and scutellum greyish brown to blackish brown (Figure 5L). Hemelytra greyish brown, paler than pronotum and scutellum; cuneus somewhat darker than remainder of corium; membrane uniformly somber dark brown (Figure 3K). Legs pale yellow; each femur dark brown excluding pale yellow apex (Figure 3L). Venter of thorax and abdomen dull greyish brown to dark brown (Figure 3L). Structure: body oval (Figure 3K). Head smooth, sparsely covered with short setae, 0.63 times as long as width across eyes, and with a longer erect seta on each side ofclypeus, near anteromedial margin of each eye, and between eye and ocellus; ante-ocular portion 0.58 times as long as length of eye in dorsal view; vertex 1.9 times as wide as eye in dorsal view; eye proximate to anterior margin of pronotum, 1.3 times as long as eye width in dorsal view; neck indistinct (Figure 10A). Antennal segment I stout, exceeding apex of head, sparsely covered with short suberect setae; segment II thickened, fusiform, 0.63 times as long as head width across eyes, densely covered with short suberect setae which are as long as width of the segment; segments III and IV slightly narrower than maximum width of segment II, covered with long erect setae intermixed with short decumbent setae, longest seta longer than width of respective segment; segment III slightly shorter than segment IV (Figures 5L, 10A). Labium extending to the procoxae, sparsely covered with short suberect setae. Pronotum smooth, shiny, sparsely covered with long decumbent setae; anterior margin nearly straight, width as wide as mesal length; lateral margin nearly straight, slightly angulate at anterior corner; lateral carinae expanded anteriorly; posterior margin shallowly concave, width 2.4 times as wide as anterior pronotal width; collar distinct, strigose, with transverse weak groove, demarcated by deep impression with short setae and tiny punctures from callus; callus strongly convex, impunctate, with scattered long setae, demarcated posteriorly by deep transverse impression with short setae and tiny punctures (Figures 5L, 10A). Scutellum nearly equilateral, slightly shorter than basal width, deeply depressed and covered with long setae through middle. Hemelytra overall sparsely covered with long decumbent setae and tiny punctures; costal margin rounded; maximum width of endocorium 1.87 times as wide as embolium; embolial margin rounded; cuneal margin slightly curved, about 0.57 times as long as embolial margin; membrane with two visible veins, one located near costal margin and one near posterior margin of the membrane. Legs densely covered with decumbent setae; male protibiae with a row of about 17 small fuscous teeth on ventral side. Male
genitalia (Figures 12D, 17): pygophore ovoid shaped, posteroventrally covered with 10 long, stout setae, of which the longest setae are about as long as half length of pygophore (Figure 12D); mediodorsal surface densely distributed with short, suberect setae; cone thin and pointed at apex in dorsal view, widened in lateral view, slightly elevated dorsally with weak projection (Figure 17); flagellum with outer shorter branch and inner longer branch, shorter branch slightly bent at apex, longer branch nearly straight in dorsal view and much longer than maximum width of cone, basal portion of flagellum distinctly remote from the cone (Figure 17).

**Female.** Unknown.

**Measurements (mm)**

\[ \sigma (n = 1) \]. Body length 1.93; head length (excluding neck) 0.24; head width across eyes 0.38; vertex width 0.19; width between ocelli 0.13; lengths of antennal segments I–II: I – 0.09, II – 0.24, III – 0.17, IV – 0.19; lengths of labial segments II–IV: II – 0.06, III – 0.24, IV – 0.19; anterior pronotal width 0.33; mesal pronotal length 0.33; basal pronotal width 0.78; length of embolial margin 0.63; length of cuneal margin 0.36; maximum width across hemelytra 0.89.

**Etymology**

From Latin, *crassus* (= thick, stout), referring to thickened, fusiform male antennae; an adjective.

**Distribution**

Northeastern Thailand (Nakhon Ratchasima).

**Remarks**

*Orius crassus* evidently differs from *O. atratus* Yasunaga, 1997 from Japan and Taiwan in having a generally greyish brown body (in *atratus*, shiny blackish), the hemelytra being paler than pronotum and scutellum with somewhat darker cuneus (in *atratus*, shiny dark, chestnut brown to more blackish), the much thicker male antennae (in *atratus*, not strongly thickened in male), and the labium being extending to the procoxae (in *atratus*, reaching the mesocoxae). In the male genitalia, however, there are few differences between *crassus* and *atratus*. The former can be distinguished from the latter by the flagellum with nearly straight inner longer branch (in *atratus*, sinuate) and the basal portion of flagellum being distinctly remote at base from the cone (in *atratus*, rather proximate to base of cone).

**Habitat**

Unknown. A single specimen was collected with an ultraviolet light trap.

**Subgenus Dimorphella** Reuter, 1884

*Dimorphella* Reuter, 1884: 646 (subgenus of *Triphleps*). Type species by monotypy: *Anthocoris agilis* Flor, 1860; Wagner 1952: 25 (subgenus of *Orius*, redescription); Ghauri 1972: 414 (subgenus of *Orius*, list); Péricart 1972: 185 (subgenus of *Orius*, diagnosis, key);
Elov 1976: 374 (subgenus of Orius, key); Kerzhner 1988: 775 (subgenus of Orius, key); Ghahari et al. 2009: 50 (subgenus of Orius, list); Aukema et al. 2013: 90 (catalogue). Paraorius Yasunaga and Miyamoto, 1993: 230 (subgenus of Orius). Type species by monotypy: Anthocoris tantillus Motschulsky, 1863; Péricart 1996: 127 (catalogue); Yasunaga 1997c: 387 (diagnosis, discussion); Aukema et al. 2013: 92 (catalogue). Syn. nov.

Diagnosis
Recognised by the combination of following characters: head and pronotum finely and densely covered with setigerous punctures; head without a longer erect seta on each side of clypeus, near anteromedial margin of each eye, and between eye and ocellus; pronotum lacking long stout seta on each angle, with callus flattened and centrally separated by setigerous punctures; male profemora sometimes with 3–5 small teeth on ventral side; paramere usually with cone apically obtuse, lacking denticule. Detailed diagnostic characters were provided by Péricart (1967, 1972).

Remarks
Yasunaga and Miyamoto (1993) established the subgenus Paraorius to accommodate O. tantillus (Motschulsky, 1863) following the opinion of Ghauri (1972) and Woodward and Postle (1986). Hernández and Stonedahl (1999) did not agree with the placement of O. tantillus in an independent subgenus because this species shares many characters with species of Dimorphella. They treated it as a member of the subgenus Dimorphella. Subsequently, Yasunaga (2001) followed the treatment of Hernández and Stonedahl (1999) without taxonomic comment. However, Paraorius is yet to be published as a synonym of Dimorphella. We also agree with the placement of O. tantillus in Dimorphella and herein suggest Paraorius is a junior synonym of Dimorphella.

Dimorphella currently comprises nine species (cf. Péricart 1996; Yasunaga 1997c; Hernández and Stonedahl 1999; Aukema et al. 2013). In Southeast Asia, only two species are known, O. maxidentex and O. tantillus; both were also previously recorded from Thailand (Yasunaga and Miyamoto 1993; Kernasa et al. 2008).

Orius (Dimorphella) maxidentex Ghauri, 1972
(Figures 4A–D, 5M,N, 7A, 8A–C, 10B, 13A, 18A–C, 20A)

Orius (Dimorphella) maxidentex Ghauri, 1972: 414. Holotype. ♂, Hangu, West Pakistan (BMNH) [examined]; Muraleedharan 1977: 234 (diagnosis, key); Kernasa et al. 2008: 1 (biology); Erfan et al. 2010: 341 (record, note, figure).

Specimens examined
Thailand: Nakhon Ratchasima: one ♂, three ♀, Horticultural Experimental Station, Bandon, Murang, 18 March 2010, K. Yamada. Saraburi: two ♂ (one in Figure 18A–C), Kyusei Nature Farming Center, Champakpaew, Kaengkoi, 14°32'75.8"N, 101°04'71.5"E, 60 m alt., 20 January 2009, K. Yamada. Nakhon Nayok: four ♂ (one in Figures 7A, 8A–C, 13A) 12 ♀, Sarika, 14°17'20.8"–18°37.8"N, 101°17'20.5"–58.6"E, 25–37 m alt., 6 March 2009, T. Yasunaga; five ♂ (one in Figure 4A, B, one in Figures 5M, 10B) five ♀ (one in Figure 4C, D), same locality, 21–23 March 2010, K. Yamada. Suphan Buri: four ♀ (one in Figure 5N, one in Figure 20A), Sri Prachan, 14°41'18.3"N, 100°08'25.8"E, 10 m alt., 21 January 2009, K. Yamada and T. Yasunaga. Ayutthaya: one ♀, Rajamangala Univ. of Technology Suvarnabhumi,
Hantra Campus, 14°22’30.5”–39.9”N, 100°36’07.0”–23.7”E, 10–20 m alt., 24 October 2008, K. Yamada. Bangkok: one ♀, Ramkamhaeng, Prawet, 19 June 2009, K. Yamada. All in TKPM.

**Diagnosis**
Recognised by the following characters: hemelytra semitransparent pale yellow, cuneus apically darkened (Figure 4A, C); anterior area to median furrow in ostiolar peritreme very narrow (Figure 7A); male profemora with 3–4 small fuscous teeth on ventral side (Figure 8C); cone obtuse at apex (Figure 18A); flagellum gently curved (Figure 18A); lamelliform process widened, arising near the base of flagellum (Figure 18A–C); copulatory tube extremely stout, consisting of membranous apical section and strongly curved, tubular, basal section (Figure 20A).

**Redescription**

**Colouration.** Head blackish brown to black; eyes reddish brown, ocellus and its surrounding area red to reddish brown. Antennae pale yellow; segments III and IV with fuscous tinge (Figure 5M, N). Labium blackish brown; apex of segment III and base of segment IV yellowish brown (Figure 4B, D). Pronotum and scutellum blackish brown to black (Figure 5M, N). Hemelytra semitransparent pale yellow, with cuneus apically darkened; membrane semitransparent greyish brown (Figure 4A, C). Legs uniformly pale yellow; coxae generally blackish brown (Figure 4B, D). Venter of head and thorax blackish brown tinged with orange brown distally (Figure 4B, D).

**Structure.** Body small, oblong oval (Figure 4A, C). Head about 0.7 times as long as width across eyes, densely punctate with very short setae; ante-ocular portion 0.6 times as long as length of eye in dorsal view; vertex about twice width of eye in dorsal view; eye oblong, about 1.6 times as long as eye width in dorsal view, proximate to anterior margin of pronotum; neck indistinct (Figure 10B). Antennal segment I stout, slightly exceeding apex of head, sparsely covered with short suberect setae; segment II thickened, 0.5–0.6 times as long as head width across eyes, densely covered with suberect setae which are shorter than half width of the segment; segment III and IV narrower than maximum width of segment II, densely covered with suberect setae which are shorter than width of respective segment; segment III about 0.8 times as long as segment IV (Figures 5M, N, 10B). Labium reaching the procoxae, sparsely covered with short suberect setae. Anterior pronotal margin slightly concave, width a little longer than mesal length; lateral margin slightly sinuate; lateral carinae expanded at anterior two-thirds; posterior margin shallowly concave inwardly, width 2.2–2.3 times as wide as anterior pronotal width; callus weakly convex, scattered short setae and deep punctures, density of setae and punctures slightly less than that of O. tantillus (Figures 8A, B, 10B). Maximum width of endocorium about twice as wide as embolium; cuneal margin about 0.50–0.55 times as long as embolial margin; membrane with one distinct vein near costal margin and one obscure vein at middle. Ostiolar peritreme wide; anterior area to median furrow in ostiolar peritreme smooth, very narrow; posterior area to median furrow strongly squamous entirely, wider than twice maximum width of anterior area to median furrow; evaporative area very narrow, narrower than maximum width of ostiolar peritreme; supracoxal area smooth, without rugosity (Figure 7A). Male trochanters with one small fuscous tooth on ventral side (Figure 8C);
male profemora with 3–4 small fuscous teeth on ventral side; male protibiae with a row of 20–22 small fuscous teeth on ventral side (Figure 8C).

**Male genitalia (Figures 13A, 18A–C).** Pygophore globular shaped but somewhat dorsoventrally depressed, posterodorsally covered with 5–7 long, stout setae which are much shorter than half length of pygophore (Figure 13A); mediadorsal surface distributed with short, suberect setae, and with a row of short, stout setae along the edge that fits the flagellum (Figure 13A); cone thin, obtuse at apex in dorsal view (Figure 18A); flagellum gently curved, situated upper (outer) side from lamelliform process, slightly longer than maximum width of cone, extending near the left edge of pygophore (Figure 18A–C);
Figure 14. Paramere, three different views. (A–C) *O. sakaerat*, holotype; (D–F), *O. taksini*, holotype; (G–I), *O. tomokunii*, holotype. Abbreviations: cn = cone; flg = flagellum; dt = denticule. Scale bars: 0.05 mm.
lamelliform process arising near the base of flagellum, widened, extending distally along the curvature of cone, apically sinuate in dorsal view (Figure 18A).

**Female genitalia (Figure 20A).** Copulatory tube extremely stout, fused on mesal part of intersegmental membrane between sterna VII and VIII in dorsal view, adjacent to base of ovipositor, consisting of membranous apical section and strongly curved, tubular basal section.

**Measurements (mm)**

| Sex | (n = 5) |
|-----|--------|
| ♂   | 1.63–1.80/1.75–2.05 |
| ♀   | 1.75–2.05 |

Body length 1.63–1.80/1.75–2.05; head length (excluding neck) 0.24–0.26/0.25–0.28; head width across eyes 0.34–0.38/0.36–0.39; vertex width 0.16–
Figure 16. Paramere, three different views. (A–C) O. machaerus, holotype; (D–F) O. inthanonus, holotype. Abbreviations: cn = cone; flg = flagellum. Scale bars: 0.05 mm.

0.19/0.17–0.20; width between ocelli 0.14–0.17/0.17–0.19; lengths of antennal segments I–IV: I – 0.09/0.09, II – 0.20–0.21/0.18–0.21, III – 0.16–0.17/0.14–0.16, IV – 0.18–0.21/0.16–0.19; lengths of labial segments II–IV: II – 0.06–0.08/0.08–0.09, III – 0.23–0.24/0.24–0.26,
IV – 0.15–0.16/0.15–0.16; anterior pronotal width 0.29–0.31/0.29–0.33; mesal pronotal length 0.26–0.29/0.27–0.31; basal pronotal width 0.64–0.70/0.66–0.77; length of embolial margin 0.51–0.59/0.57–0.68; length of cuneal margin 0.28–0.33/0.29–0.34; maximum width across hemelytra 0.67–0.71/0.69–0.86.

**Distribution**
Northeastern and central Thailand (Nakhon Ratchasima, Saraburi, Nakhon Nayok, Suphan Buri, Ayutthaya, Bangkok); India (Ghauri 1972; Muraleedharan 1977), Pakistan (Ghauri 1972), Iran (Erfan et al. 2010), Sudan (Ghauri 1972). It was recorded from Thailand by Kernasa et al. (2008) under the reports on its biology.

**Remarks**
*Orius maxidentex* is most similar to *O. tantillus*, but can be distinguished from the latter by the semitransparent pale yellow hemelytra with apically darkened cuneus, the slightly lower density of setae and punctures on pronotal callus, and the very narrow anterior area to median furrow in ostiolar peritreme. In addition, the structures of male and female genitalia readily distinguish *O. maxidentex* from *O. tantillus* (Figures 13A, B, 18A–F, 20A, B).

**Habitat**
Mainly found on Gramineae and Cyperaceae species near or in cultivated areas, where it co-occurred with *O. tantillus*. Sometimes collected on flowers of *Mangifera indica* (Anacardiaceae), together with *O. dravidiensis*. 

![Figure 17. Paramere, three different views. (A–C), O. crassus, holotype. Abbreviations: cn = cone; flg = flagellum. Scale bars: 0.05 mm.](image-url)
Figure 18. Paramere, three different views. (A–C) *O. maxidentex*; (D–F) *O. tantillus*; (G–I) *O. dravidensis*. Abbreviations: cn = cone; flg = flagellum; Imp = lamelliform process. Scale bars: 0.05 mm.
Anthocoris tantillus Motschulsky, 1863: 89. Neotype (Ghauri 1972: 414): ♂, Ceylon [= Sri Lanka], Pundalu-oya (BMNH) [examined]; Distant 1904: 222 (Triphleps, list); Distant 1906: 8 (Triphleps, redescription, figure); Poppius 1909: 43 (Triphleps, redescription); Ghauri 1964: 687 (Orius, diagnosis); Ghauri 1972: 411 (Orius, redescription, neotype designation, figures); Muraleedharan and Ananthakrishnan 1974: 38 (Orius, diagnosis, key, figures); Manley 1976: 103 (Orius, record, biology); Muraleedharan 1977: 234 (Orius, diagnosis, key); Zheng 1982: 193 (Orius, record, figure); Zhang and Lin 1985: 195 (Orius, diagnosis, note, figure); Kerzhner and Jansson 1985: 38 (note on type

**Orius (Dimorphella) tantillus** (Motschulsky, 1863)
(Figures 1D, 4E–H, 5O,P, 7B, 8D–F, 10C, 13B, 18D–F, 20B)

Figure 19. Female genitalia, dorsal view. (A) *O. sakaerat*, paratype; (B) *O. taksini*, paratype; (C) *O. tomokunii*, paratype; (D) *O. filiferus*, paratype; (E) *O. machaerus*, paratype. Abbreviations: ism = inter-segmental membrane between abdominal sterna VII and VIII; st VI = sternum VI; st VII = sternum VII. Scale bars: 0.05 mm.
specimens); Woodward and Postle 1986: 247 (Orius, redescription, key, figures); Zheng and Bu 1990: 26 (Orius, list); Yasunaga 1993: 231 (Orius (Paraorius), figures); Cassis and Gross 1995: 34 (Orius, catalogue); Péricart 1996: 127 (Orius (Paraorius), catalogue); Yasunaga 1997c: 387 (Orius (Paraorius), record, diagnosis, key, figures); Hernández and Stonedahl 1999: 559 (Orius (Dimorphella), redescription, key, figures); Postle et al. 2001: 232 (Orius, key, figures); Bu and Zheng 2001: 207 (Orius, redescription, key, figures); Yasunaga 2001: 291 (Orius (Dimorphella), note, key, figures); Ghahari et al. 2009: 50 (Orius (Dimorphella), record, note); Aukema et al. 2013: 92 (Orius (Paraorius), note).

Triphleps australis China, 1926: 361 (syn. Woodward and Postle 1986: 247). Syntypes: §, Australia, Queensland (BMNH) [examined]; Gross 1954: 136 (Orius, diagnosis).

Orius niobe Herring, 1967: 399 (syn. Ghauri 1972: 411). Holotype: ♂, Guam Is., Yona (U. S. National Museum of Natural History, Smithsonian Institution) [examined].

Specimens examined
Thailand: Nakhon Ratchasima: three ♂ (one in Figure 1D) four §, Sakaerat Silvicultural Research Station, 14°27′59.12″N, 101°54′11.70″E, 404 m alt., 24 March 2014, K. Yamada.
Saraburi: one ♂ (Figures 5O, 10C) one ♀, Kyusei Nature Farming Center, Champakpaew, Kaengkoi, 14°32′75.8″N, 101°04′71.5″E, 60 m alt., 20 January 2009, K. Yamada; seven ♂ (one in Figure 4E, F) 15 ♀ (one in Figure 20B), same locality, 22 January 2009, K. Yamada. Nakhon Nayok: four ♀, Sarika, 14°17′20.8″–21′16.9″N, 101°16′22.41″–18′07.7″E, 25–96 m alt., 15–17 June 2009, T. Yasunaga; four ♀, same locality, 16–17 June 2009, K. Yamada; six ♂, 20 ♀ (one in Figures 4G, H, 5P), same locality, 21–23 March 2010, K. Yamada; two ♂, three ♀, same locality, 6 March 2009, T. Yasunaga; one ♀, same locality, 20 March 2014, T. Yasunaga and K. Yamada. Suphan Buri: three ♂, two ♀, Sri Prachan, 14°41′18.3″N, 100°08′25.8″E, 10 m alt., 21 October 2008, K. Yamada; two ♂ (one in Figures 7B, 8D–F, 13B, 18D–F), same locality, 25 October 2008, K. Yamada. Kanchanaburi: five ♂, four ♀, 7 February 2009, T. Yasunaga. All in TKPM.

Additional specimens examined
Cambodia: Siem Reap: two ♂, two ♀, 31. i. 2014, T. Yasunaga (TKPM).

Diagnosis
Recognised by the following characters: hemelytra semitransparent pale yellow (Figure 4E, G); anterior area to median furrow in ostiolar peritreme very wide (Figure 7B); male profemora with 2–4 small fuscous teeth on ventral side (Figure 8F); cone acute at apex (Figure 18D); flagellum with three branches (Figure 18D–F); copulatory tube consisting of membranous apical section and cylindrical basal section (Figure 20B).

Redescription
Colouration. Head black, tinged with orange brown at apex; eyes reddish brown, ocellus and its surrounding area red to reddish brown (Figure 5O, P). Antennae pale yellow; segments III and IV with fuscous tinge (Figure 5O, P). Labium blackish brown; apex of segment III and base of segment IV yellowish brown (Figure 4F, H). Pronotum and scutellum uniformly black (Figure 4E, G). Hemelytra semitransparent pale yellow; membrane semitransparent greyish brown (Figure 4E, G). Legs uniformly pale yellow; coxae generally blackish brown (Figure 4F, H). Venter of head and thorax blackish brown tinged with orange brown distally (Figure 4F, H).

Structure. Body small, oblong oval (Figure 4E, G). Head about 0.7–0.75 times as long as width across eyes, densely punctate with very short setae; ante-ocular portion about 0.7 times as long as length of eye in dorsal view; vertex about 2.2 times as wide as width of eye in dorsal view; eye oblong, about 1.6 times as long as eye width in dorsal view, proximate to anterior margin of pronotum; neck very shortened (Figure 10C). Antennal segment I stout, slightly exceeding apex of head, sparsely covered with short suberect setae; segment II thickened, fusiform, 0.8–0.85 times as long as head width across eyes, densely covered with suberect setae which are shorter than half width of the segment; segments III and IV narrower than maximum width of segment II, densely covered with suberect setae which are shorter than width of respective segment; segment III 0.8–0.9 times as long as segment IV (Figures 5O, P, 10C). Labium reaching the procoxae, sparsely covered with short suberect setae. Anterior pronotal margin slightly concave, width about as wide as mesal length; lateral margin nearly straight; lateral carinae expanded at
anterior two-thirds; posterior margin shallowly concave, width 2.2–2.4 times as wide as anterior pronotal width; callus weakly convex, scattered short setae and deep punctures, density of setae and punctures a little higher than that of O. maxidentex (Figures 8D, E, 10C). Maximum width of endocorium about twice as wide as embolium; cuneal margin about 0.57 times as long as embolial margin; membrane with two distinct veins near costal margin and at middle. Ostiolar peritreme wide; anterior area to median furrow in ostiolar peritreme smooth, very wide; posterior area to median furrow strongly squamous entirely, a little narrower than maximum width of anterior area to median furrow; evaporatorium narrow; supracoxal area smooth, without rugosity (Figure 7B). Male trochanters with one small fuscous tooth on ventral side; male profemora with 2–4 small fuscous teeth on ventral side; male protibiae with a row of 21–22 small fuscous teeth on ventral side (Figure 8F).

**Male genitalia (Figures 13B, 18D–F).** Pygophore globular shaped but somewhat dorsoventrally depressed, posteroventrally covered with seven long, stout setae which are much shorter than half length of pygophore (Figure 13B); mediodorsal surface distributed with short, suberect setae; cone thin, acute at apex in dorsal view (Figure 18D); flagellum with three branches: uppermost (outermost) branch slightly thickened apically in dorsal view and weakly sinuate in lateral view; middle branch longest, straight, exceeding the apex of cone; lowermost (innermost) branch slightly curved in lateral view (Figure 18D–F).

**Female genitalia (Figure 20B).** Copulatory tube fused on mesal part of intersegmental membrane between sterna VII and VIII, extremely remote from base of ovipositor, consisting of membranous apical section and cylindrical basal section: apical section slender, short, slightly curved; basal section weakly sclerotised, thickened.

**Measurements (mm)**

$\left[\sigma \ (n = 10)/\varphi \ (n = 10)\right]$. Body length 1.80–2.00/1.56–2.30; head length (excluding neck) 0.26–0.28/0.25–0.29; head width across eyes 0.35–0.36/0.35–0.40; vertex width 0.18–0.19/0.18–0.22; width between ocelli 0.15–0.16/0.16–0.18; lengths of antennal segments I–IV: I – 0.09–0.10/0.10–0.11, II – 0.22–0.24/0.19–0.23, III – 0.19–0.22/0.16–0.19, IV – 0.21–0.24/0.19–0.23; lengths of labial segments II–IV: II – 0.07–0.09/0.06–0.09, III – 0.24–0.26/0.25–0.28, IV – 0.14–0.18/0.14–0.17; anterior pronotal width 0.29–0.30/0.29–0.33; mesal pronotal length 0.29–0.29/0.29–0.33; basal pronotal width 0.65–0.68/0.67–0.78; length of embolial margin 0.56–0.60/0.58–0.69; length of cuneal margin 0.32–0.35/0.34–0.39; maximum width across hemelytra 0.70–0.73/0.73–0.81.

**Distribution**

Thailand (Chiang Mai, Nakhon Ratchasima, Saraburi, Nakhon Nayok, Suphan Buri, Kanchana Buri) (Yasunaga and Miyamoto 1993; present study); Cambodia (present study; new record); Malaysia (Manley 1976), India (Ghauri 1972), Sri Lanka (Distant 1906), Iran (Ghahari et al. 2009), China (Zheng 1982; Bu and Zheng 2001), Taiwan (Yasunaga 1997c), Japan (Yasunaga 1997c), Australia (China 1926; Woodward and Postle 1986), Micronesia (Herring 1967), Nigeria (Hernández and Stonedahl 1999), Tanzania (Hernández and Stonedahl 1999), Kenya (Hernández and Stonedahl 1999).
Remarks
In general habitus, *O. tantillus* is similar to *O. albidipennis* (Reuter, 1884) mainly known from the Atlantic zone of western Europe, middle East and sub-Saharan Africa, and *O. naivashae* (Poppius, 1920) from Kenya, but is distinguished from them by the wider ostiolar peritreme, the uniformly pale yellow femora (in *albidipennis*, profemora yellow, meso- and metafemora brown or dark brown; in *naivashae*, each femur dark brown), and the paramere with three-branched flagellum (in *albidipennis* and *naivashae*, with roundly curved flagellum and distinct lamelliform process).

Habitat
Abundantly collected on Gramineae and Cyperaceae plants near and in rice paddy fields, grasslands and other cultivated areas.

*Orius (Dimorphella) dravidiensis* Muraleedharan, 1977
(Figures 1E,F, 4I–L, 5Q,R, 7C, 8G–I, 10D, 13C, 18G–I, 20C)

*Orius (Heterorius) dravidiensis* Muraleedharan, 1977: 234. Holotype: ♂, Tamilnadu, India [not examined].

Specimens examined
Thailand: Nakhon Ratchasima: three ♂, two ♀, Sakaerat Environmental Research Station, 14°29′24.4″–30′51.9″N, 101°54′37.8″–56′19.7″E, 372–601 m alt., 23–25 January 2009, T. Yasunaga; 17 ♂ (one in Figure 18G–I) 37 ♀ (one in Figure 20C), same locality, February 2009, T. Yasunaga; one ♀, same locality, 12–15 June 2009, K. Yamada; two ♀, same locality, light trap, 17–20 March 2010, T. Yasunaga and K. Yamada; 29 ♂ (one in Figure 1F) 17 ♀, same locality, 24 March 2014, T. Yasunaga and K. Yamada; one ♂, eight ♀, same locality, light trap, 21–24 March 2014, K. Yamada; 10 ♂ (one in Figure 8G, H) eight ♀, Horticultural Experimental Station, Bandon, Murang, 18 March 2010, K. Yamada. Saraburi: 12 ♂ (one in Figure 10D, one in Figure 13C) 229 ♀ (one in Figure 1E, one in Figures 4K, L, 5R, one in Figure 7C), Kyusei Nature Farming Center, Champakpaew, Kaengkoi, 14°32′75.8″N, 101°04′71.5″E, 60 m alt., 20 January 2009, K. Yamada and T. Yasunaga; one ♂ (Figures 4I, J, 5Q) seven ♀, same locality, 22 January 2009, K. Yamada and T. Yasunaga. Nakhon Nayok: 29 ♂, 18 ♀, Sarika, 14°18′45.37″N, 101°18′03.83″E, 40 m alt., 19 March 2014, K. Yamada; one ♂, four ♀, Sarika, 14°18′37.8″N, 101°17′58.6″E, 37 m alt., 6 March 2009, T. Yasunaga; one ♂, 10 ♀, Sarika, 14°21′16.9″N, 101°16′22.41″E, 96 m alt., 20 March 2014, T. Yasunaga and K. Yamada. Suphan Buri: 14 ♂ (one in Figure 8I) 132 ♀, Sri Prachan, 14°41′18.3″N, 100°08′25.8″E, 10 m alt., 21 January 2009, K. Yamada and T. Yasunaga. Ayutthaya: two ♂, six ♀, Rajamangala Univ. of Technology Suvarnabhumi, Hantra Campus, 14°22′30.5″–14°22′39.9″N, 100°36′07.0″–100°36′23.7″E, 10–20 m alt., 24 October 2008, K. Yamada; one ♂, four ♀, same locality, 31 October 2008, K. Yamada; one ♂, same locality, 21 January 2009. All in TKPM.

Additional specimens examined
Cambodia: Siem Reap: one ♂, three ♀, 31 January 2014, T. Yasunaga. India: Karnataka: two ♂, Bangalore, Attur, January 2013, on Mango tree; one ♂, one ♀, Bangalore, Hebbel,
March 2012, on *Peltophorum ferrugineum* (DC.); one ♀, Kanakapura, December 2013. Maharashtra: one ♀, Ahmednagar, Rahuri, April 2013, on *Cassia fistula* L. All in TKPM.

**Diagnosis**
Recognised by the following characters: head black with pale yellow at apex (*Figure 5Q, R*); hemelytra yellowish brown, cuneus darkened, embolium sometimes posteriorly darkened (*Figures 1F, 4I, K*); male trochanters with one small fuscous tooth on ventral side; metafemora usually with fuscous annulation at apical third; cone wide, obtuse at apex in lateral view (*Figure 18H, I*); denticule lacking; flagellum slender, moderately curved (*Figure 18G*); copulatory tube slender, consisting of membranous apical section and weakly curved, tubular basal section (*Figure 20C*).

**Redescription**

**Colouration.** Head black, with pale yellow at apex; eyes reddish brown, ocellus and its surrounding area red to reddish brown (*Figure 5Q, R*). Antennae pale yellow; segment III with fuscous tinge; segment IV sometimes tinged with reddish brown (*Figure 5Q, R*). Labium pale yellow; segment II and apex of segment IV fuscous (*Figure 4J, L*). Pronotum and scutellum uniformly black (*Figure 4I, K*). Hemelytra yellowish brown, cuneus darkened, embolium sometimes posteriorly darkened; membrane semitransparent greyish brown (*Figure 4I, K*). Legs uniformly pale yellow; coxae basally blackish brown; metafemora with fuscous annulation at apical third, sometimes lacking (*Figure 4J, L*). Venter of head and thorax blackish brown (*Figure 4J, L*). Abdomen blackish brown, sometimes light brown to brown (*Figure 4J, L*).

**Structure.** Body oblong oval (*Figure 4I, K*). Head 0.66–0.70 times as long as width across eyes, densely punctate with very short setae; ante-ocular portion about 0.66 times as long as length of eye in dorsal view; vertex about 1.9 times as wide as width of eye in dorsal view; eye oblong, about 1.5 times as long as eye width in dorsal view, proximate to anterior margin of pronotum; neck indistinct (*Figure 10D*). Antennal segment I stout, exceeding apex of head, sparsely covered with short suberect setae; segment II thickened, about half width of head across eyes, densely covered with suberect setae which are shorter than half width of the segment; segment III and IV narrower than maximum width of segment II, densely covered with suberect setae which are shorter than width of respective segment; segment III equal to segment IV (*Figures 5Q, R, 10D*). Labium reaching the procoxae, sparsely covered with short suberect setae. Anterior pronotal margin slightly concave, width about as wide as mesal length; lateral margin nearly straight; lateral carinae expanded at anterior two-thirds; posterior margin slightly concave, width about 2.4 times as wide as anterior pronotal width; callus weakly convex, scattered short setae and deep punctures (*Figures 8G, H, 10D*). Maximum width of endocorium about twice as wide as embolium; cuneal margin about 0.54 times as long as embolial margin; membrane with two visible veins, one located near costal margin and one near posterior margin of the membrane. Ostiolar peritreme wide; anterior area to median furrow in ostiolar peritreme smooth, very narrow; posterior area to median furrow strongly squamous entirely, wider than twice maximum width of anterior area to median furrow; evaporative area narrow, a little narrower than maximum width of ostiolar peritreme;
supracoxal area narrow, weakly rugose (Figure 7C). Male trochanters with one small fuscous tooth on ventral side; male protibiae with a row of 19–20 small fuscous teeth on ventral side.

**Male genitalia (Figures 13C, 18G–I).** Pygophore globular shaped but somewhat dorso-ventrally depressed, posteroventrally covered with three long, stout setae which are much shorter than half length of pygophore (Figure 13C); mediodorsal surface distributed with short, suberect setae; cone wide in dorsal view, obtuse at apex in lateral view (Figure 18G–I); denticule lacking; flagellum slender, moderately curved, exceeding the tip of cone in dorsal view (Figure 18G–I).

**Female genitalia (Figure 20C):** Copulatory tube slender, fused on left part of intersegmental membrane between sterna VII and VIII in dorsal view, remote from base of ovipositor, consisting of membranous apical section and weakly curved, tubular basal section.

**Measurements (mm)**

$\varphi \ (n = 10)/\varphi \ (n = 10)$. Body length 1.65–2.05/1.88–2.15; head length (excluding neck) 0.24–0.27/0.26–0.29; head width across eyes 0.37–0.40/0.37–0.41; vertex width 0.17–0.19/0.19–0.21; width between ocelli 0.15–0.18/0.17–0.19; lengths of antennal segments I–IV: I – 0.08–0.10/0.10–0.11, II – 0.19–0.23/0.18–0.23, III – 0.16–0.19/0.16–0.19, IV – 0.16–0.19/0.17–0.19; lengths of labial segments II–IV: II – 0.06–0.09/0.09–0.10, III – 0.23–0.26/0.25–0.28, IV – 0.13–0.16/0.17–0.19; anterior pronotal width 0.29–0.34/0.31–0.35; mesal pronotal length 0.27–0.33/0.31–0.35; basal pronotal width 0.66–0.78/0.73–0.88; length of embolial margin 0.53–0.61/0.61–0.69; length of cuneal margin 0.29–0.33/0.33–0.36; maximum width across hemelytra 0.72–0.81/0.79–0.91.

**Distribution**

Northeastern and central Thailand (Nakhon Ratchasima, Saraburi, Nakhon Nayok, Suphan Buri and Ayutthaya; new record); Cambodia (present study; new record); India (Muraleedharan, 1977).

**Remarks**

We were unable to examine the holotype of this species directly, but were able to examine specimens from areas near its type locality in southern India. These specimens mostly correspond to the original description and illustrations of genitalia provided by Muraleedharan (1977). Thus, it was easy to identify the Thai specimens as *O. dravidiensis*.

*Orius dravidiensis* is similar in general aspect to *O. latibasis* Ghauri, 1972 from India, but is separable from it by the yellowish brown hemelytra with darkened cuneus (in *latibasis*, uniformly yellowish brown) and the wider cone (in *latibasis*, much narrower).

Muraleedharan (1977) assigned this species to the subgenus *Heterorius* based on the pronotal structure. Our careful examination of the pronotum, however, revealed that the pronotum of *O. dravidiensis* has a flattened callus being centrally separated by setigerous punctures. In addition, the metathoracic scent efferent system of this species is most similar in shape and surface condition to those of *Dimorphella* rather than those of *Heterorius*. Therefore, we transfer *O. dravidiensis* to *Dimorphella* from *Heterorius*. 


Habitat
Very common species found on flowers of various trees. Readily collected on flowers of Mangifera indica (Anacardiaceae) and Leguminosae species (Acacia sp., Leucaena sp., etc.). Orius dravidiensis was more abundant in such inflorescences than the other Orius species.

Subgenus Heterorius Wagner, 1952
Heterorius Wagner, 1952: 27 (subgenus of Orius). Type species by original designation: Cimex minutus Linnaeus, 1758; Péricart 1967: 150 (diagnosis, key, figures); Péricart 1972: 174 (redescription, key); Elov 1976: 373 (key); Kerzhner 1988: 775 (key); Yasunaga 1993: 12 (redescription); Lariviére and Wearing 1994: 18 (diagnosis); Péricart 1996: 123 (catalogue); Yasunaga 1997b: 379 (diagnosis, discussion); Yasunaga 2001: 292 (note); Ghahari et al. 2009: 51 (list); Jung et al. 2011: 65 (diagnosis); Aukema et al. 2013: 90 (catalogue); Jung et al. 2013: 424 (catalogue).

Diagnosis
Recognised by the combination of the following characters: head without a longer erect seta on each side of clypeus, near anteromedial margin of each eye, and between eye and ocellus; pronotum densely covered with setae and punctures, lacking long stout seta on each angle, with callus usually arched, impunctate, shiny; paramere with rounded cone, and usually with denticule, sometimes lacking. Detailed diagnostic characters were provided by Péricart (1967, 1972).

Remarks
The subgenus Heterorius, currently containing 11 species, is widely distributed in the Palearctic Region and in the adjoining areas of the Oriental Region (Thailand) (cf. Péricart 1996; Yasunaga 1997b; Aukema et al. 2013). The species with the widest distribution, Orius vicinus (Ribaut, 1923), also occurs in New Zealand and North America (Lariviére and Wearing 1994; Lewis and Lattin 2010).

Orius (Heterorius) minutus (Linnaeus, 1758)
Cimex minutus Linnaeus, 1758: 446. Neotype (Péricart 1970: 742): ♂, France, near Montereau, Marolles, bord de la Seine (Muséum National d’Histoire Naturelle, Paris) [examined].
For further synonyms and references of this species, see Péricart (1996) and Bu and Zheng (2001).

Specimens examined
Thailand: Chiang Mai: one ♂, Khee Lek, Maetaeng, 8. i. 1988, Y. Hirose; one ♂, five ♀, Muangkaew, Mae Rim, 9 February 1988, Y. Hirose. All in TYCN.
**Additional specimens examined**
Japan: Honshu: Gifu: one ♀, Hashizume, Yoro, 19. vii. 2001, K. Yamada; Nara: one ♂, one ♀, Hatta, Gojo, 28. vii. 2000, K. Yamada; Osaka: one ♂, six ♀, Hachigamine, Sakai, 25. vi. 1997, Y. Nakatani; Wakayama: two ♂, four ♀, Minami-hizue, Shingu, 17. vi. 1997, Y. Nakatani. Kyushu: Nagasaki: four ♀, Iwamatsu, Omura, 25. ix. 2001, K. Yamada; Kagoshima: one ♀, Mt. Kaimondake, Ibusuki, 28. vii. 2001, K. Yamada. All in TKPM.

**Diagnosis**
Recognised by the following characters: head and pronotum black; hemelytra mostly yellowish brown, cuneus apically darkened; metafemora always darkened excepting pale apex; metatibiae usually pale yellow, sometimes darkened at middle; cone wide, strongly rounded, apically obtuse; flagellum much longer; denticule large, contiguous to base of flagellum; copulatory tube slender, tubular, consisting of apical and basal segments, apical segment about half length of basal segment. Detailed diagnostic characters and redescription were provided by Wagner (1952), Péricart (1972) and Yasunaga (1997b).

**Distribution**
Northern Thailand (Chiang Mai; Yasunaga and Miyamoto, 1993); Palearctic Region (Péricart 1996; Yasunaga 1997b; Lewis and Lattin 2010), North Africa (Péricart 1996).

**Remarks**
*Orius minutus* is closely related to East Asian species *O. sauteri* (Poppius, 1909) and *O. strigicollis* (Poppius, 1914). The structure of the male and female genitalia is the only key character clearly separating the species. *Orius minutus* can be distinguished from these species by the large denticule being contiguous to base of flagellum (in *sauteri*, small, near base of flagellum; in *strigicollis*, slender, small, remote from base of flagellum) and the basal segment of the copulatory tube without expanded apex (in *sauteri* and *strigicollis*, with expanded apex). Recently, Lewis and Lattin (2010) suggested that all previous records of *O. minutus* in North America are based on misidentifications of *O. vicinus*.

**Discussion**
Species of *Orius* live on a wide variety of living plants. Although most members are undoubtedly predatory and assumed not to be host-plant specific, plant preferences and use of specific plant structures appear to differ among species. *Orius* is abundantly found in forbs and grasses (Lattin 2000). In Thailand, *O. tantillus* and *O. maxidentex*, like *O. (Heterorius) nagaii* Yasunaga, 1993 in temperate eastern Asia, were collected predominantly from the rice plant community, composed primarily of Poaceae and Cyperaceae species near and in cultivated areas, rice paddy fields and grasslands. Although these two species usually co-occur in these environments, the population density of *O. tantillus* is apparently higher than the density of *O. maxidentex*. Among insects co-occurring with *Orius* in these habitats, several species of tiny thripid thrips were observed to be the most common. *Orius tantillus* has been reported to feed on *Thrips palmi* Karny (Thysanoptera: Thripidae), eggs of *Helicoverpa armigera* (Hübner)
(Lepidoptera: Noctuidae) and a wide range of insect pests on crops and flowers (China 1926; Yasunaga and Miyamoto 1993; Hernández and Stonedahl 1999; Postle et al. 2001). In laboratory tests, O. tantillus preys particularly on thrips, aphids, leafhoppers and lepidopteran eggs (e.g. Manley 1976; Nakashima and Hirose 1997; Nagai et al. 1998). Orius maxidentex also is an effective predator of thrips, preying extensively on Thrips palmi, Scirtothrips dorsalis Hood, Frankliniella schultzei (Trybom), Anaphothrips sudanensis Trybom and Caliothrips graminicola (Bagnall and Cameron) (Thysanoptera: Thripidae) (Kumar and Ananthakrishnan 1984). In addition, this species was reported to attack the silverleaf whitefly, Bemisia tabaci (Gennadius) (Hemiptera: Aleyrodidae) in Thailand (Kernasa et al. 2008). Orius minutus was collected from eggplant gardens in Northern Thailand, where it was found to prey on Thrips palmi (Yasunaga and Miyamoto 1993), but no specimens of this species were found in central and northeastern Thailand during our field investigations. As O. minutus prefers temperate and cold temperate climate zones, its populations in Thailand are suspected to have been introduced possibly from the Palearctic Region.

The Orius fauna is especially diverse in plants of the shrub layer (Lattin 2000). Inflorescences of various trees are often highly attractive to the species of Orius in Thailand. Orius sakaerat and O. dravidiensis were frequently collected from inflorescences of Acacia spp. and Leucaena spp. (Leguminosae). The former species was also collected from the spurge tree, Homonoia riparia (Euphorbiaceae).

Inflorescences of the mango tree, Mangifera indica (Anacardiaceae), were highly suitable habits for three Thai species, O. taksini, O. dravidiensis and O. maxidentex. During its blooming from January to March in Thailand, numerous individuals of Orius are found on the flowers of this species. Of these three species, O. dravidiensis accounted for more than 90% of the total collected specimens. Other flowers of broadleaf trees such as Macaranga sp. (Euphorbiaceae) harbor O. taksini, O. filiferus and O. dravidiensis. Of these species, O. dravidiensis was found to be the most common and widespread Orius in at least central and northeastern Thailand. Regarding the biology of the remaining species (O. tomokunii, O. machaerus, O. inthanonus and O. crassus), no information is available because most specimens were collected by light trap.

Some species of Orius prefer prey that lead to the fastest development, highest fecundity and longevity, or other biological performance measures (e.g. Venzon et al. 2002; Wang et al. 2014). Thrips are known to be preferred prey for many species of Orius (Castañé et al. 2002; Salehi et al. 2011). Orius tristicolor (White, 1879) and O. insidiosus (Say, 1832) occur on the flowers of a diverse number of plant species because their primary prey species, Frankliniella occidentalis (Pergande) (Thripidae), is highly generalised (Horton 2008; Miliczky and Horton 2011). Through our investigations and observations in Thailand, various tiny insects and other arthropods were usually collected together with Orius species. However, several thrips are assumed to be primary host insect for Orius species because they are always found in much larger numbers than other insects and arthropods. Although we were unable to identify the species of those thrips collected together with Orius, the differences in thrips fauna are considered to be one of the important factors that determine the preferred or associated plant species and vegetation as habitat for Orius species.
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