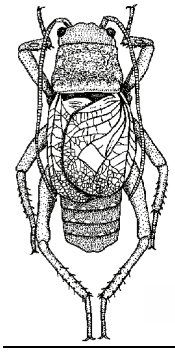

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EMPIS TRIPOTINI SP. N. FROM SOUTH KOREA: ONE OF THE LARGEST EMPIDOID FLIES EVER DISCOVERED (DIPTERA: EMPIDIDAE)

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Summary. *Empis* (*Planempis*) *tripotini* **sp. n.** (Diptera: Empididae, Empidinae) is described from South Korea. This new species is remarkable for its exceptional body size which makes it one of the largest empidoid species ever described with a wing length up to 12.5 mm. This species is more robust than the two other species of similar size, *E.* (*P.*) *pan* Frey, 1953 and *E.* (*P.*) *zhuae* Liu, Saigusa et Yang, 2012. New species most probably has the same behaviour as most Empidinae where males and females feed on nectar, and only males hunt prey that is given to females at the time of mating. An updated key to the males with dichoptic eyes of the subgenus *Planempis* Frey, 1953 is also provided.

Key words: Empidinae, taxonomy, new species, behaviour, East Asia.

К. Дажерон, И. В. Шамшев. *Empis tripotini* sp. n. из Южной Кореи: один из крупнейших когда-либо найденных видов семейства Empididae (Diptera) // Дальневосточный энтомолог. 2019. N 378. С. 1-10.

Резюме. Из Южной Кореи описан *Empis* (*Planempis*) *tripotini* **sp. n.** (Diptera: Empididae, Empidinae). Новый вид выделяется необычайно большими размерами тела, что делает его одним из крупнейших когда-либо описанных видов эмпидид (длина крыла до 12.5 мм). Этот вид крупнее, чем два других близких по размеру тела вида, *E.* (*P.*) *pan* Frey, 1953 и *E.* (*P.*) *zhuae* Liu, Saigusa et Yang, 2012. Поведение нового вида похоже на поведение большинства Empidinae, у которых самцы и самки питаются нектаром и только самцы охотятся на жертву, предлагая её самкам во время спаривания. Приведена определительная таблица самцов подрода *Planempis* Frey, 1953 с дихоптическими глазами.

INTRODUCTION

The Empidoidea is a large group of flies of more than 11000 known species with a wide variety of feeding and mating behaviours. There is also a large range in morphology and size, from the tiny dolichopodid genus *Enlinia* Aldrich (wing length 0.8 mm) to the very large *Empis* (*Planempis*) *pan* Frey, 1953 (wing length nearly 12 mm) of the family Empididae (Sinclair & Cumming, 2006).

The subgenus *Planempis* Frey, 1953 was extensively studied these last years (Daugeron & Chvála, 2002; Shamshev, 2002; Liu *et al*., 2012; Saigusa, 2012; Shamshev, 2016). Shamshev & Daugeron (2018) published an updated list of all known species. However many new species remain to describe especially from Asian areas that have been little explored to date. The Korean peninsula is one of those areas where the biodiversity of Empidoidea remains largely unknown.

In this paper we describe a new species of the subgenus *Planempis* from South Korea. This species is remarkable for its large size similar to *E.* (*P.*) *pan* and *E.* (*P.*) *zhuae* (Liu *et al*., 2012). Moreover, the presence of pollen grains on the body of several collected specimens as well as the capture of specimens with their prey are good indicators of its feeding and mating behaviour. Also, an updated key to *Empis* (*Planempis*) species with dichoptic eyes in males is compiled.

MATERIAL AND METHODS

The material studied in this work was collected by Pierre Tripotin in the Odaesan mountain range (Gangwondo Province); it is deposited in the insect collection of the National Institute of Biological Resources, Incheon (NIBR), the national collection of Diptera of the Muséum national d'Histoire naturelle, Paris (MNHN), the Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia (ZIN) and the private collection of Pierre Tripotin (PCPT). An inventory number starting with the initials ED (meaning *Entomology* and *Diptera*, respectively) was attached to each specimen deposited in MNHN and data captured in the related collection database (https://science.mnhn.fr/institution/mnhn/collection/ed/item/

Morphological terminology follows McAlpine (1981), except for the antennal structure, which follows Stuckenberg (1999). Interpretation of male genital sclerites is based on Daugeron (1997a). Male genitalia were dissected and macerated in hot 10% KOH, positioned in glycerine and drawn using a camera lucida.

TAXONOMY

Family Empididae Latreille, 1804

Subfamily Empidinae Latreille, 1804

Genus *Empis* Linnaeus, 1758

***Empis* (*Planempis*) *tripotini* Daugeron et Shamshev, sp. n.**
http://zoobank.org/urn:lsid:zoobank.org:act:F3A86361-C666-48D9-BF17-77EB0F9BF13F
Figs 1–10

MATERIAL. Holotype: ♂, **South Korea**: Gangwondo, Pyeongchang, Yongpyeong-Myeon, Nodong-li, Nodong Valley, 37.6957°N 128.4727°E, 900 m, 1.VI 2007, leg. P. Tripotin (NIBR). Paratypes: **South Korea**: Gangwondo, Gyebangsan Unturyeong (pass), 37.7075°N 128.4448°E, 1100–1400 m, on ridge along forest path, 01.VI 2006, 4 ♂ (ED10583, ED10584, ED10585, ED10586), leg. P. Tripotin; Gangwondo, Odaesan near Dongdaesa, 37.7419°N 128.60305E, 800 m, in old Korean fir forest by 4 malaise traps, 21.VI–2.VIII 2006, 2 ♂ (ED10588, ED10589), leg. P. Tripotin; Gangwondo Odaesan, Pyeongchang-gun, Yeonggam-sa, 37.7276°N 128.5997°E, 800 m, 6.VI 2003, 1 ♂ (ED10591), leg. P. Tripotin; Gangwondo, Odaesan, Pyeongchang-gun, Yeonggam-sa, 37.7276°N 128.5997°E, 800 m, in Korean fir forest, 9.VI 2003, 2 ♂, leg. P. Tripotin (NIBR, ZIN); Gangwondo, Gyebangsan Unturyeong (pass), 37.7075°N 128.4448°E, 1100–1400 m, on ridge along forest path, 01.VI 2006, 1 ♂, leg. P. Tripotin (PCPT).

DIAGNOSIS. One of the largest empidoid flies (wing length 11.5–12.5 mm) ever discovered, robust with a small head compared to the size of the thorax, with yellow femora, clear wing, dusted greyish to brownish-yellowish abdomen, various parts of the body (occiput, prothorax, postpronotal lobes, notopleuron and lateral area of abdominal tergites) covered with strong, long subpennate golden yellow to brownish setae; distinct ventral and dorsal black pennation on hind femur apically.

DESCRIPTION. Male (Figs 1, 2). Head. Occiput dusted grey, covered with lateral golden yellow and a few black setae. Ocellar triangle dusted grey, with pair of strong, long setae directed forward, numerous short black setae especially in back. Frons wide, dusted grey, with distinct short whitish to golden yellow setulae. Face bare, dusted greyish in its upper part to shiny brownish-black in lower part. Scape blackish, pedicel, base of postpedicel brownish-yellow, both with black setulae, postpedicel, stylus black, stylus as long as scape and pedicel together. Labrum almost twice head height, brownish to blackish; labium dark brown to blackish, labella with a few fine setae, palpus orange-brown, darker basally, with fine setae. Eyes dichoptic, all ommatidia of equal size.

Thorax dusted greyish; postpronotal lobes shiny brownish at tip; antepronotum covered with golden yellow setae; scutum with a narrow blackish stripe on acrostichals, evanescent in the prescutellar depression, a broader stripe on dorsocentrals; anterior and posterior spiracles whitish to yellow. Postpronotal lobe with numerous long, thick, pennate-like, and simple golden yellow setae. Proepisternum and prosternum with fan of numerous golden yellow setae; cervical sclerite and ventral part

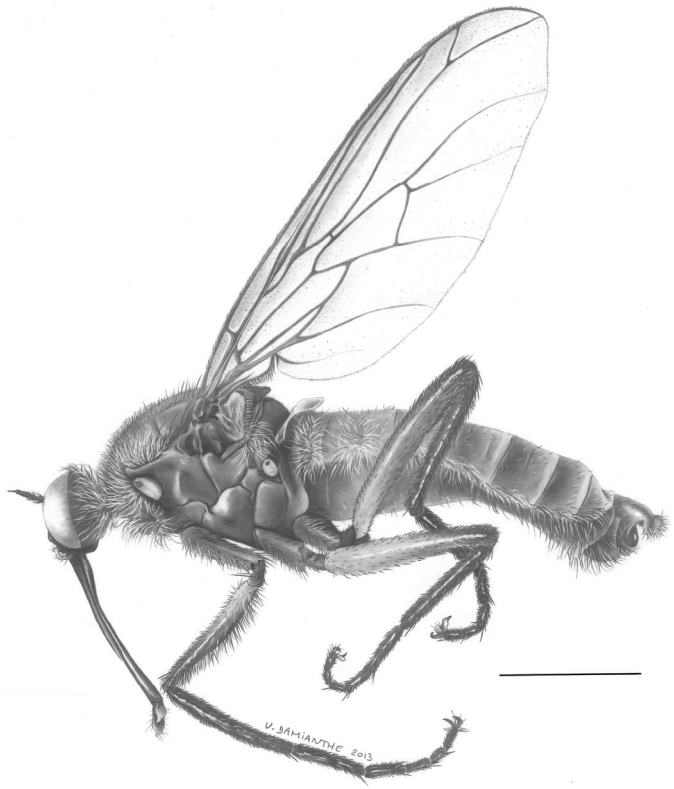


Fig. 1. *Empis* (*Planempis*) *tripotini* sp. n., male habitus, lateral view. Scale bar: 3 mm.

of prosternum bare. Acrostichals fine, short, 4-serial anteriorly, 2-serial posteriorly, absent in front of and on prescutellar depression. Dorsocentrals multiserial, golden yellow and black, fine, rather short anteriorly, becoming irregularly biserial, black, longer posteriorly especially in prescutellar depression. Presutural area of scutum covered with golden yellow fine setae mixed with a few black setae posteriorly. Two strong, long black postsutural supra-alars. Notopleuron completely covered with long, thick, pennate-like golden yellow setae and bearing about ten black posterior setae. Postalar callus with a few golden yellow rather fine setae. Latero-tergite with fan of numerous strong, long golden yellow setae mixed with a few strong, long black setae. Scutellum with 6–8 pairs of rather fine, long black setae.

Legs. Coxae, trochanters dusted grey; femora yellow to black apically; tibiae and tarsi black. Fore femur with many fine, long posterodorsal golden-yellow to black setae, many shorter black anterodorsals apically. Fore tibia short-haired. Mid femur ventrally covered with many distinct short black setae, a few short dorsal subpennate setae apically. Mid tibia densely covered ventrally with minute bristly-hairs. Hind femur with distinct rather short dorsal pennate setae at apical half, strong,

longer anteroventrals mixed with a few pennate setae at apical half. Hind tibia densely covered with bristly-hairs ventrally and dorsally (longer dorsally). All tarsi short-haired.

Wing long (length 11.5–12.5 mm), clear. Sc abbreviated, brownish, remaining veins complete, brownish basally to blackish apically. Anal lobe well developed. Halter yellow.

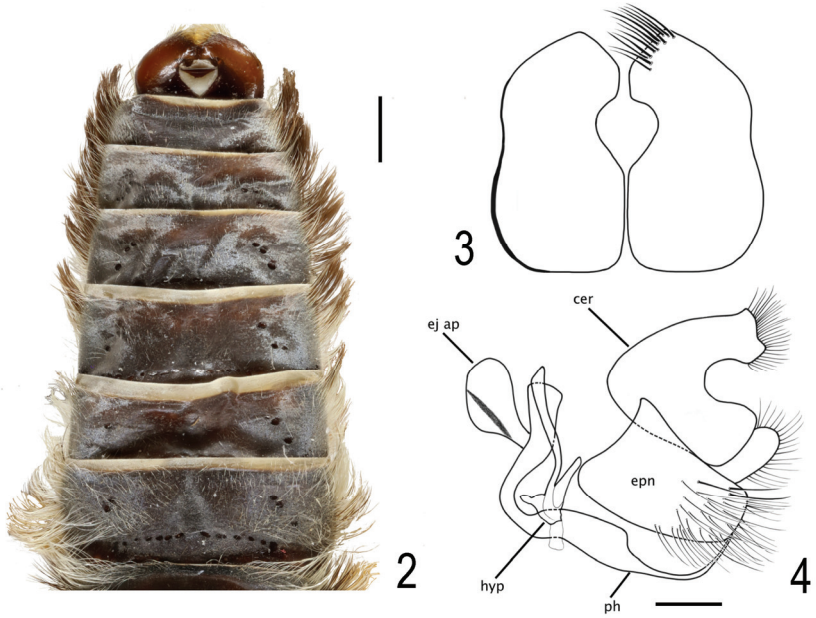
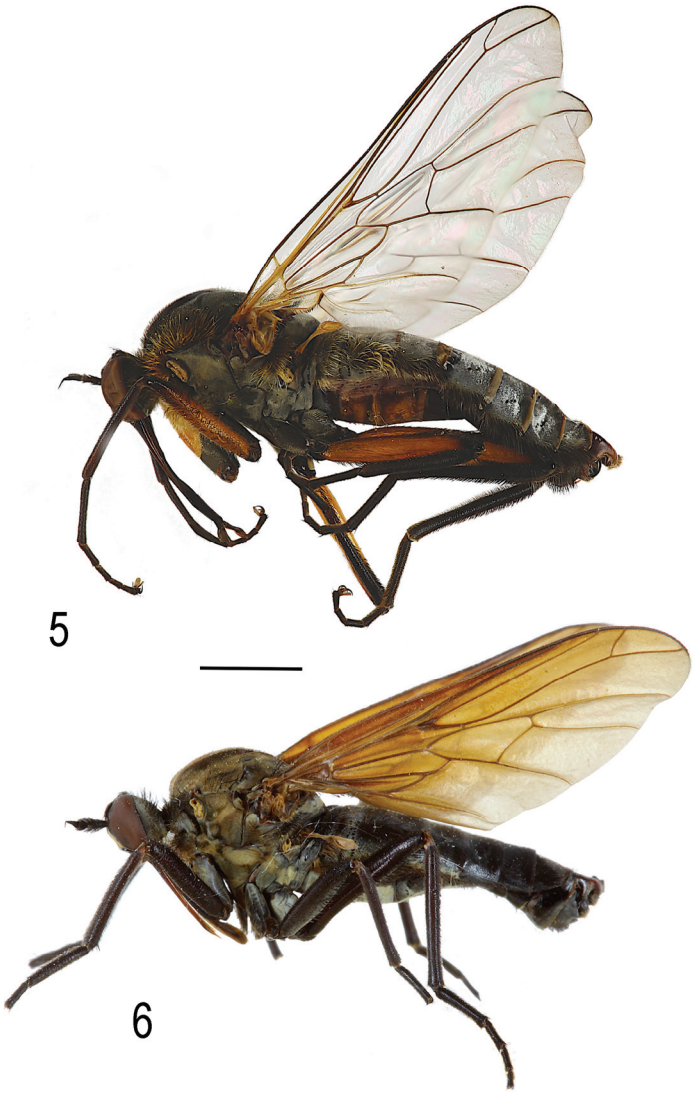


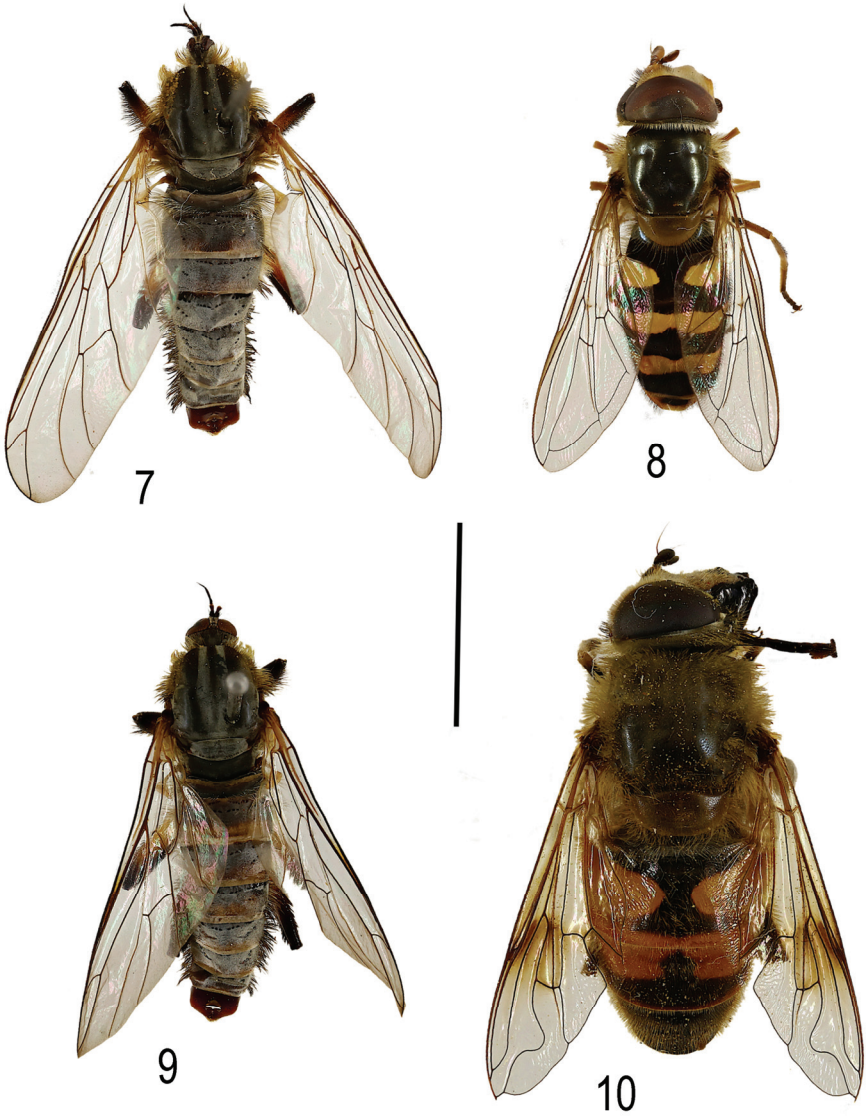
Fig 2–4. *Empis* (*Planempis*) *tripotini* sp. n., male. 2 – abdomen, dorsal view; 3 – cercus, dorsal view; 4 – hypopygium, lateral view. Abbreviations: cer – cercus; epn – epandrium; ej ap – ejaculatory apodeme; hyp – hypandrium; ph – phallus. Scale bars: 2 = 1 mm; 3, 4 = 0.4 mm.

Abdomen (Fig. 2). Coloration variable: tergites brownish-dusted grey anteriorly to brown-yellowish at the posterior margin, or widely brownish to yellowish, or entirely dusted grey to blackish with the posterior margin yellowish; sternites 1–2 yellowish, sternites 3–4 shiny dark brown-blackish, sternite 5 shiny brownish anteriorly to yellowish posteriorly, sternites 6–7 dusted brownish anteriorly to yellowish posteriorly, sternite 8 brown, or first sternite dusted grey, sternites 2–5 shiny brownish, sternites 6–8 brownish. First three or four tergites with long, lateral golden-yellow setae, tergite 3 or 4 with long golden yellow setae anteriorly becoming blackish posteriorly, remaining tergites laterally covered with strong to subpennate blackish setae mixed with simple golden yellow setae, tergite 8 reduced, ring-like, almost bare. Sternites with a few golden yellow setae, sternite 8 with more distinct marginal setae.



Figs 5–6. Male habitus, lateral view. 5 – *Empis* (*Planempis*) *tripotini* sp. n.; 6 – *E.* (*P.*) *pan* Frey. Scale bar: 3 mm.

Hypopygium (Figs 3, 4). Dorsal surface of cercus strongly sclerotized, flattened, polished, shiny brownish, with a tuft of golden yellow setae at tip. Lower part of cercus with a posterior rounded process bearing fine setae. Epandrium subrectangular with many brownish rather fine, long setae posteriorly, a few stronger setae dorsally. Hypandrium of complex structure laterally, membranous ventrally. Phallus more or less parallel to epandrium in its median part, thick at middle then abruptly thin apically.



Figs 7–10. Males of new species with their prey, dorsal view. 7, 9 – *E.* (*P.*) *tripotini* sp. n.; 8 – *Syrphus* sp.; 10 – *Eristalis tenax* (L.). Scale bar: 6 mm.

Female. Unknown.

DIFFERENTIAL DIAGNOSIS. Within the subgenus *Planempis*, *E.* (*P.*) *tripotini* sp. n. belongs to a group of large species (body size 8–12 mm) with prosternum ventrally bare and males with dichoptic eyes. In addition to the new species, this group includes *E.* (*P.*) *achelota* Collin from Primorskiy Territory of Russia, *E.* (*P.*)

xanthomelas Saigusa and *E.* (*P.*) *lucidiventris* Saigusa (both from Japan). A complete description of the last two species can be found in Saigusa (1992) whereas *E.* (*P.*) *achelota* was entirely re-described by Shamshev (2002). The two Japanese species can be easily distinguished from the two others by the absence of acrostichal setae on their scutum; *E.* (*P.*) *tripotini* sp. n. can be readily distinguished from *E.* (*P.*) *achelota* by its acrostichal setae organised in several rows (versus 1–2 rows), black tibiae (versus yellowish), and the absence of a lateral brownish macula in the presutural area of scutum (see Shamshev 2002: figures 1–2). The new species is more robust than the two other species of similar size known to date, *Empis* (*Planempis*) *pan* Frey (Fig. 6) and *E.* (*P.*) *zhuae* Liu, Saigusa & Yang. We provide below an updated key to *Empis* (*Planempis*) species with dichoptic eyes in males (Shamshev, 2002).

DISTRIBUTION. Republic of Korea (Gangwondo province).

NOTES. The Empidinae particularly prefer temperate and high altitude areas (Daugeron & Lefebvre 2014; Lefebvre *et al.*, 2018 ; Chatelain *et al.*, 2018), which is also the case of *E.* (*P.*) *tripotini* sp. n. occurring in the mountainous areas of the Gangwondo province of South Korea, where the specimens were found between 800 and 1400 m.

ETYMOLOGY. The new species is dedicated to its collector, Pierre Tripotin, who kindly gave us the material for study.

BEHAVIOUR. Many species of Empidinae are flower visitors feeding on nectar of various plants (Lefebvre *et al*., 2014, 2018), and predation is only conserved during the mating period (Daugeron, 1997b) where nuptial gifts, often preys, are transferred by males to females (e.g. see Tréhen, 1971). Specimens of *E. tripotini* sp. n. were directly dry prepared and most of them have retained pollen grains on their body, which is interpreted as an indication of a flower visiting behaviour. Due to its large size this species is probably a good pollinator. But males of some large Empidinae species are also known to hunt prey of equal or greater size. Three male specimens of *E. tripotini* sp. n. were collected with a prey item belonging to the family Syrphidae (Figs 7–10): two preys belong to a species of the genus *Syrphus* and one is a representative of the cosmopolitan *Eristalis tenax* (Linnaeus, 1758). All the preys are of similar (*Syrphus* sp.) or much larger size (*E. tenax*) than the males themselves, which shows that they are indeed fearsome predators. Syrphids and *E.* (*P.*) *tripotini* sp. n. being flower visitors, they probably frequent at least partially the same habitat, so that the males of the new species find both the energy resources (nectar) on which they depend but also the protein resources (prey) essential to the females for the maturation of their eggs and which will be offered to them by the males during the mating period.

Key to *Empis* (*Planempis*) species with dichoptic eyes in males

1. Prosternum setose 2
– Prosternum bare 6
2. Hind femur almost evenly slender, with short bristles ventrally 3

– Hind femur distinctly thickened on basal part, with numerous long bristles ventrally (except extreme base); femora blackish on basal half and yellowish on apical half, tibiae entirely yellowish …..... ***E. microtheca*** **Frey, 1955**

3. Acrostichal and dorsocentral setae multiserial. Legs entirely black, at most tibiae reddish closer to base 4

– Acrostichal and dorsocentral setae irregularly 2-serial. Legs yellowish or with black and yellow pattern 5

4. Palpus black. Proepisternum and laterotergite with black hair-like setae. Abdominal tergites with black hair-like setae laterally ..... ***E. pan*** **Frey, 1953**

– Palpus yellow. Proepisternum and laterotergite with yellow hair-like setae. Abdominal tergites with golden yellow hair-like setae laterally … ***E. latro*** **Frey, 1953**

5. All femora and tibiae brownish yellow. Antennal scape nearly as long as postpedicel ..... ***E. pulchra*** **Saigusa, 1964**

– Femora blackish, tibiae almost entirely yellowish, sometimes only tips somewhat darkened. Antennal scape nearly half as long as postpedicel ..... ***E. xanthotibia*** **Saigusa, 1964**

6. Smaller: body 4.0–4.5 mm. Cercus with rounded dorsal surface 7

– Larger: body 8.0–11.0 mm. Cercus with flattened dorsal surface 8

7. Body (including antennae and legs) largely blackish brown, abdominal tergites 7 and 8 yellowish on posterior half ..... ***E. luteipilosa*** **Saigusa, 1992**

– Body largely yellow; scutum with very narrow black vittae, abdomen entirely blackish brown ..... ***E. freyi*** **Yang, Zhang et Zhang, 2007**

8. Acrostichal setae present, arranged in 1–4 rows. Occiput laterally and postpronotal lobe with tufts of long golden yellow setae 9

– Acrostichal setae absent. Occiput and postpronotal lobe with short yellow hair-like setae 10

9. Acrostichal setae 1–2-serial. Tibiae yellowish ..... ***E. achelota*** **Collin, 1941**

– Acrostichal setae 4–serial anteriorly. Tibiae black ..... ***E. tripotini*** **sp. n.**

10. Abdominal segments 1–3 entirely yellow; all tergites faintly light grey pollinose ..... ***E. xanthomelas*** **Saigusa, 1992**

– Abdominal tergite 1 entirely black; tergites 2 and 3 largely yellow, with black, broad, dorsomedian longitudinal vitta; all tergites polished ..... ***E. lucidiventris*** **Saigusa, 1992**

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