

A new species of *Meoneura* Nitzsch from Japan (Diptera: Carnidae)

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Abstract. A new species of the genus *Meoneura* (Diptera: Carnidae), i.e. *Meoneura issunboshii* sp. n., is described from Japan.

Key words. Diptera, Carnidae, *Meoneura*, sp. n., Japan.

INTRODUCTION

The family Carnidae is a member of the superfamily Carnoidea (Diptera: Schizophora: Acalyptratae). The flies are only up to 2 mm long and mainly black. Due to the similarity to several other, more common acalyptrates, Carnidae are recognised only by experts and are easily overlooked in samples. The larvae of Carnidae are saprophagous and develop in various kinds of dead organic material as dung, birds' nests or fungi. To date only five extant and one fossil genera are recognised. Carnidae comprise 116 valid species distributed as follows: 10 Afrotropical species, 26 Nearctic species, 6 Neotropical species, 14 Oriental species, and 77 Palearctic species (Brake 2011, Stuke unpublished). The highest number of species is known from Europe (52 species; Brake 2011, Stuke unpublished), probably as a result of the long history of dipterological research, and it is very likely that the lack of Carnidae described from the Eastern Palearctic Region, and the low number of species recorded from this region, is a result of a comparably poor collecting activity.

Only three Carnidae species are reported from Japan so far. Iwasa et al. (2000) recorded *Carnus hemapterus* Nitzsch, 1818 from Fukagawa (Hokkaido), and Iwasa et al. (2014) found *Carnus orientalis* Maa, 1968 from Kunigami, (Okinawa). Tago (2011) reported *Meoneura triangularis* Collin, 1930 from Tokio, representing the first record of this genus from the region. With 98 valid species, *Meoneura* Rondani, 1856 is the genus of Carnidae with the largest number of species worldwide. Due to an excellent drawing of the male genitalia provided by Tago (2011), it became evident that this was a new species and is herewith described in this study.

MATERIALS AND METHODS

All material reported here was previously published by Tago (2011), later sent to and examined by JHS. The abdomen of three male and two female specimens were dissected, macerated for about three hours in NaOH_(aq) solution and stored in a microvial in glycerine together with the specimen on the insect pin. The morphological terminology follows Cumming & Wood (2009) and Buck & Marshall (2007). The terms that are used to describe the postabdomen are additionally illustrated in Figures 1–3. A separate sclerite, ventrally beneath the protandrium (syntergosternite 6–8 *sensu* Wheeler 2010: 1102, Fig. 5), is recognised as tergite 7 (Buck & Marshall 2007: 14, Fig. 16). The most anteroventral seta on the face is interpreted as the vibrissa, those above the vibrissa as supravibrissal setae, and those posterior to the vibrissal seta on the gena as genal setae. The labels of the holotype are listed and numbered in the order found, commencing with the uppermost. The original content of the label information is cited between double quotation marks (“ ”) and line breaks are indicated by a slash mark (/).

Digital images were taken using a Zeiss Axioskop 40, Zeiss A-Plan 10x / 0.25 Ph 1 Var1 with a Nikon D7000 mounted on a Zeiss 45 60 05 2.5 x. The pictures were used as template and the drawings were made with Affinity Designer 1.6.0 on Wacom DTZ -1200W.

DESCRIPTION OF THE NEW SPECIES

Meoneura issunboshii sp. n.

Figs 1–4

Meoneura triangularis Collin, 1930. Tago (2011).

Diagnosis. Males of *Meoneura issunboshii* sp. n. are easily identified by the unique shape of the falcated surstylus with 4–5 dorsal setae (Fig. 2), the characteristic large lamella (larger than surstylus) covered with long setae (Figs. 1–2), and the short epandrium (shorter than surstylus, Fig. 1). Females of *Meoneura issunboshii* sp. n. cannot be identified at species level with morphological characters.

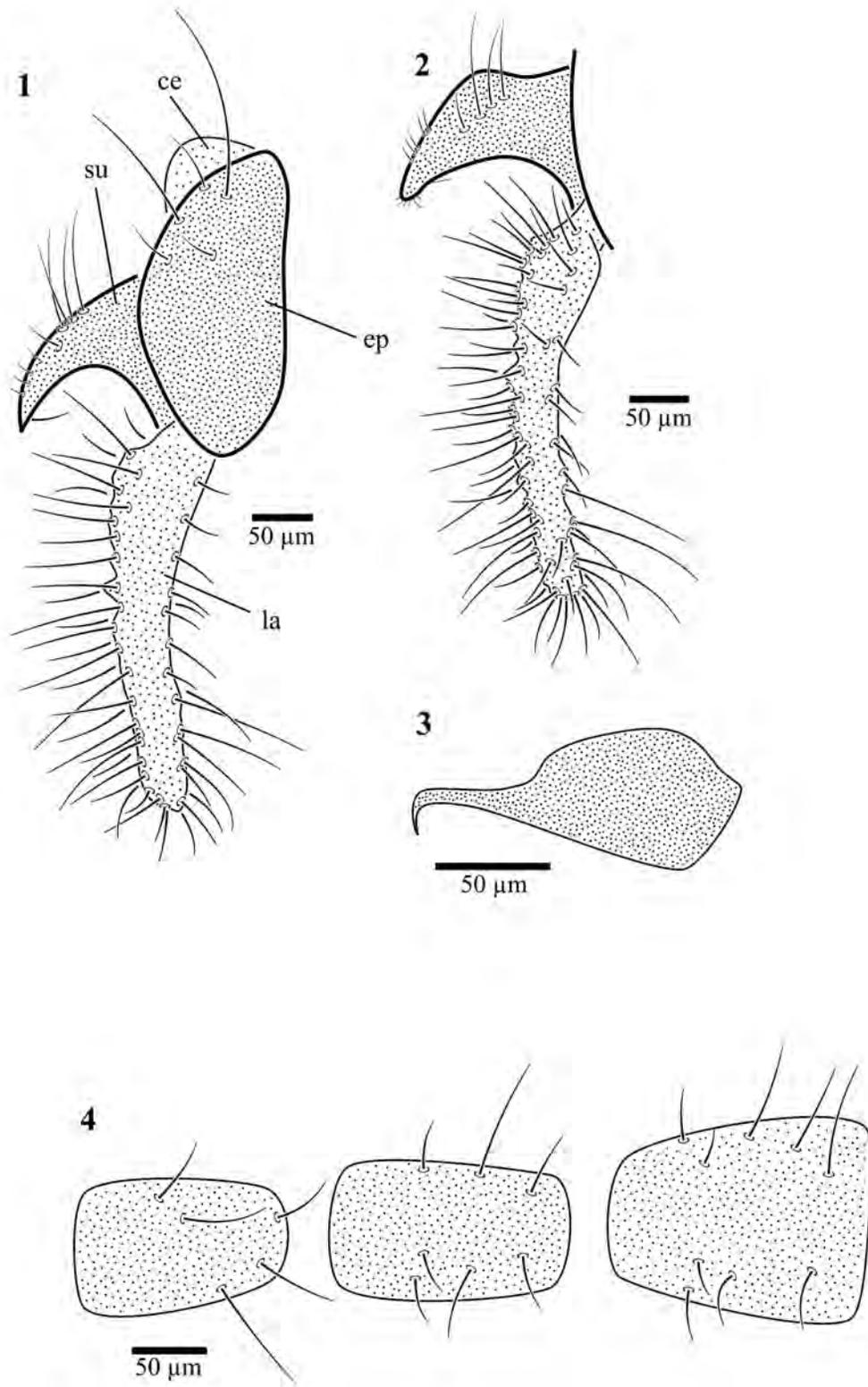
At first glance the postabdomen of *Meoneura issunboshii* sp. n. resembles several other *Meoneura* species with obvious long and setulose structures: *Meoneura amurensis* Ozerov, 1986 can easily be ruled out because the large and setulose structure projecting from the epandrium is identified as the surstylus by Ozerov (1986), and the prominent cercus with long setae of *Meoneura amurensis* (see Ozerov 1986: 85) does not occur in *Meoneura issunboshii* sp. n. *Meoneura krivosheinae* Ozerov, 1991 and the suspiciously similar *Meoneura forcipata* Sabrosky, 1959, also have both obvious large and setose structures projecting from the epandrium, too. But these structures are identified as surstyli, they are narrow basally and have dense setae restricted to their apical half (see Ozerov 1991: 8, Figs. 4–5, Sabrosky 1959: 21, fig. 8). There is no additional structure identified in the original descriptions of both species that resembles the surstylus of *Meoneura issunboshii* sp. n. *Meoneura stepposa* Ozerov, 1994 has a shorter, triangular surstylus with only one seta apically and a longer epandrium (at least twice as long as surstylus, see Ozerov 1994: 141). *Meoneura lamellata* Collin, 1930 has a shorter lamella that is only about as long as surstylus and a larger epandrium (see Collin 1930: plate III, fig. 7). *Meoneura perlamellata* Hennig, 1937 has a large setulose surstylus but no lamella and a longer epandrium (see Hennig 1937: 71, fig. 70).

Description. Male Length about 2.4 mm. Wing length = 2.1 mm. Head height = 0.5 mm. **Head:** black with only anterior half of frons dark brown. Antenna black. Arista without pubescence. Eye without ommatrichia. Ratio of maximum eye length : maximum eye height is 1 : 1. Ratio of posteroventral margin of gena closest to eye margin : maximum eye height is 1 : 2 (= 0.5). Frons microtomentose, frontal triangle shiny. Frontal triangle distinct, reaching anteriorly less than 1/2 distance from anterior ocellus to frontal margin. Face slightly microtomentose. Carina narrow. Postcranium microtomentose. Prementum about as long as labellum and only slightly wider. Palpus brown, almost half as long as the haustellum. One pair of distinct ocellar setae. Supralunular setae convergent. Four

fronto-orbital setae, two anterior mesocline, two posterior laterocline. Two vertical setae. Postocellar setae parallel. One strong vibrissal seta; two supravibrissal setae, the ventral one distinctly smaller. Three strong genal setae, the anterior strongest and upcurved.

Thorax: Scutum completely slightly microtomentose, and covered with black setulae. Scutellum slightly microtomentose. Pleurae dusted to subshiny. Scutum with only one long and two inconspicuous smaller dorsocentral setae (two single setae broken in holotype). Two postpronotal setae; one praesutural seta; two notopleural setae; one supraalar seta; two postalar setae; one praescutellar seta; one apical and one lateral scutellar seta. One outstanding seta and some smaller setulae at posterior margin of anepisternum. One dorsal seta and one ventral seta on katapisternum. Wing completely covered with microtrichiae. Costa without obvious setae beyond radial vein R_1 . Wing hyaline to light brown, veins light brown to white yellow. R_{4+5} almost straight. Knob of halter whitish yellow, base of haltere brownish. Legs black to brown. Fore femur with three strong posteroventral setae. Hind femur apically with one strong anteroventral seta. Fore coxa with one outstanding strong seta, middle coxa with two strong setae, hind coxa with one outstanding seta. Hind metatarsus ventrally with scattered yellow golden hairs only. Ratio of length metatarsus 2 : length tibia 2 is 0.7.

Abdomen: Tergites without obvious depressions or setulae tufts. Abdominal pleura with scattered setae on segments 3–5. Segments 1–5 narrow, ratio of width of tergite 3 : length of tergite 3 = 2.7. Tergites 2–5 each with a small lateral seta at the posterior margin. Tergite 5 with three longer setae at the posterior margin. Sternite 5 rectangular slightly longer than wide (Fig. 4). Sternite 5 with two strong laterally curved setae. Midventral tergite 7 distinctly developed. Protandrium distinct, longer than short epandrium and about 1/2 of length of tergite 5. Protandrium ventrally widely separated. Epandrium with two outstanding long setae and a few smaller setae (Fig. 1). Ratio of maximum length dorsally in the middle of epandrium (including cerci): maximum width of epandrium = 0.2. Cerci indistinct, slightly projecting, and with a few minute setulae only. Subepandrial sclerites fused with each other and fused with the narrow sclerotized hypoproct but the structures can be distinguished due to a different sclerotisation. No setula recognized on subepandrial plate. Hypoproct not projecting laterally, with few strong, short setae. No tooth on subepandrial plate. Surstylus as Figs. 1–2: falcated, dorsobasally slightly concave, with an indistinctly bulging base. Surstylus dorsally with four to five strong setae, some minute setulae in front of these and one long, medially directed setulae apically. Lamella large (Figs. 1–2) densely covered with long setae that are dorsally and apically longer than ventrally. Surstylus and lamella distinctly fused basally (Figs. 1–2). Postgonite (Fig. 3): distinctly sclerotized, with a broad base, elongated, pointed,



Figs 1–4. *Meoneura issunboshii* **spec. nov.** (drawn from holotype). **1.** Postabdomen, left, lateral view. **2.** Surstylus, left, lateral view. **3.** Postgonite, left, lateral view. **4.** Sternites, ventral view: sternite 3 (left), sternite 4 (middle), sternite 5 (right). Abbreviations: ce - cercus, ep - epandrium, la - lamella, su - surstylus.

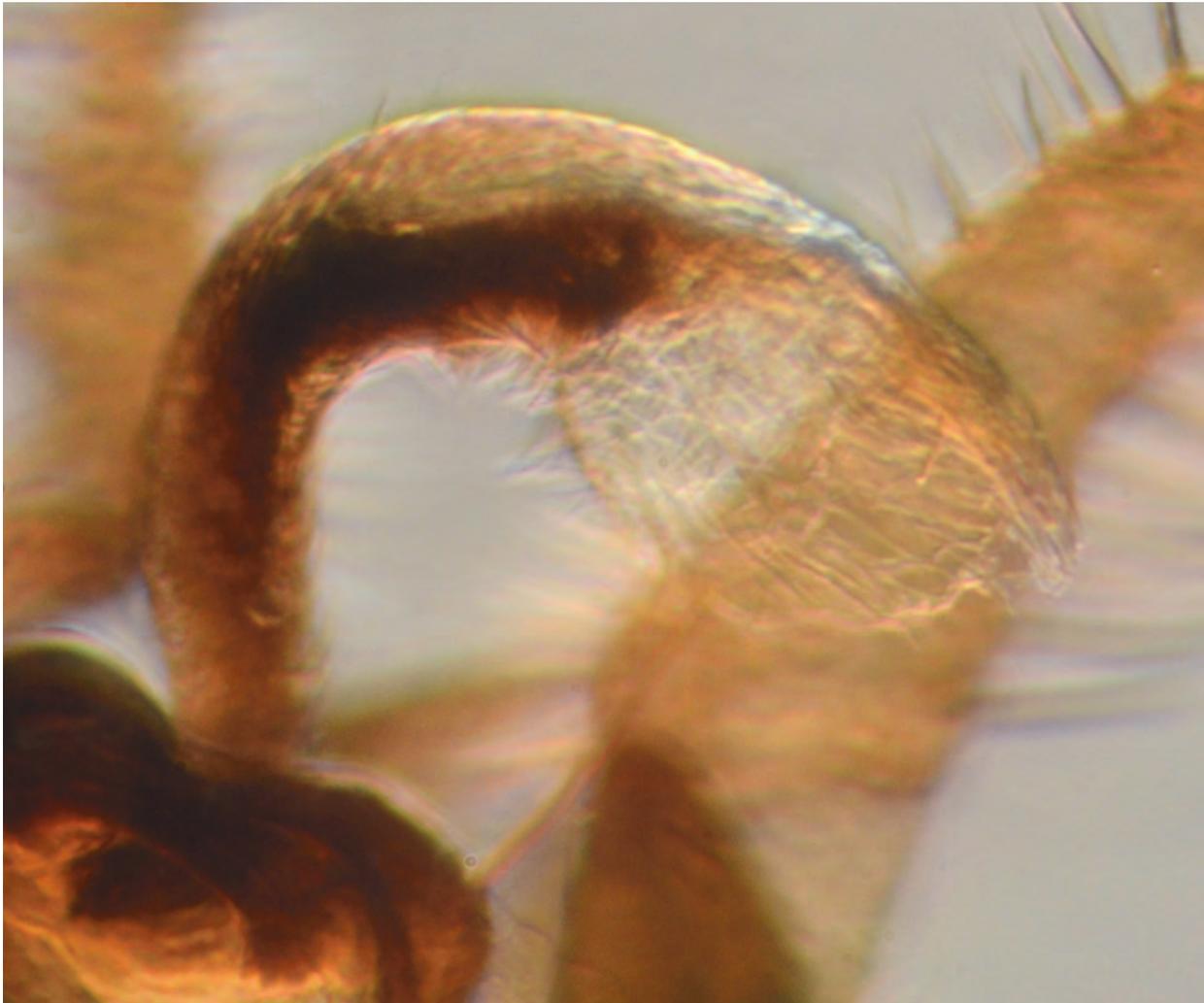


Fig. 5. *Meoneura issunboshii* **spec. nov.** (paratype, locus typicus, 11.xii.2011), distiphallus, lateral right view.

apically curved into hook-like prolongation. Distiphallus (Fig. 5) distinctly longer than epandrium, covered all over with setulae and apically with a small sclerotized area. Basiphallus sclerotized, long, narrow, distinctly widened at base.

Description of female abdomen. Tip of female abdomen identical to drawing of female abdomen of *Meoneura obscura* (Fallén, 1823) as figured by Sabrosky (1987: 911, fig. 5). Abdominal pleura with dense setae on segments 4–5. Sternite 5 elongated, with two distinct setae on apical half. Sternite 6 elongated, with four setae on apical half. Sternite 5 almost square. Sternite 5 with one seta. Apical half of segment 7 ventrally with four setae of which two are always close together. Segment 8 at apical margin ventrally with two pairs of setae. Hypoproct almost square with one seta. Fused cerci elongate, with several setae.

Etymology. The name *issunboshii* is derived from the name of the Inch-High Samurai Issun-bōshi (一寸法師) from a Japanese fairy tale. Issun-bōshi showed that a minute man can be very successful.

Distribution. To date *Meoneura issunboshii* sp. n. is only known from the locus typicus, Mizumoto Park in Tokio, Katsushika, Japan.

Examined material. Holotype ♂: (1) “Mizumoto, / Katsushika ward, / Tokyo, Japan / 10. I. 2010 / T. Tago leg.”; (2) “Holotypus / *Meoneura issunboshii* / spec. nov. ♂ / det. Stuke, 2017”. Male holotype is deposited in the Museum für Naturkunde der Humboldt-Universität, Germany, Berlin (ZMHB). Posterior part of abdomen dissected, macerated and stored in glycerine in a microvial pinned beneath the specimen. The remainder of the specimen is glued on a paper and in an excellent condition.

Paratypes: 9♂♂ 10♀♀ with same data as holotype but different collecting dates stored in the collection of the Osaka Museum of Natural History, Japan (OMNH) and in the private collection of Jens-Hermann Stuke, Germany, Leer (PJHS): 3♂♂ 1♀ 10.i.2010 (PJHS); 2♂♂ 2♀♀ 10.i.2010 (OMNH); 1♂ 2♀♀ 11.xii.2011 (PJHS); 3♂♂ 11.xii.2011 (OMNH); 2♀♀ 13.i.2013 (PJHS); 1♀ 13.i.2013 (OMNH); 1♀ 8.i.2011 (OMNH); 1♀ 26.ii.2012 (OMNH).

Remarks. *Meoneura issunboshii* sp. n. is found in the Mizumoto Park at about 5 m above sea level. Adults are recorded only in the winter months from November to January with temperatures of -3°C to -15°C. This might be the reason why the species has been overlooked previously. The flies aggregate on the bark of sun exposed parts of trees like *Zelkova serrata* (Thunb.) Makino and *Metasequoia glyptostroboides* Hu & W.C. Cheng. There they sunbathe, walk around, fly a short distance after disturbance, and mate. The forest floor was covered with woodchips. Although TT looked for, *Meoneura issunboshii* sp. n. was not recorded at neighbouring parks or forests in Tokyo.

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REFERENCES

- Brake I (2011) World Catalog of the Family Carnidae (Diptera, Schizophora). *Myia* 12: 113–169
- Buck M, Marshall SA (2007) *Enigmocarnus chloropiformis* gen. et sp. nov., and parallel evolution of protandrial symmetry in Carnidae (Diptera). *Annals of the Entomological Society of America* 100: 9–18
- Collin JE (1930) Some species of the genus *Meoneura* (Diptera). *Entomologist's Monthly Magazine* 66: 82–89
- Cumming JM, Wood DM (2009) Adult morphology and terminology. Pp 9–50 in: Brown BV, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado MA (eds) *Manual of Central American Diptera*. Volume 1. NRC Research Press, Ottawa
- Hennig W (1937) 60a. Milichiidae et Carnidae. Pp 1–91 in: Lindner E (eds) *Die Fliegen der palaearktischen Region VI.1*. Schweitzerbartsche Verlagsbuchhandlung, Stuttgart
- Iwasa M, Sakamoto H, Asahi K (2014) Discovery of a bird-parasitic fly, *Carnus orientalis* (Diptera: Carnidae), in Japan, with bionomic remarks and a key to *Carnus* species. *Journal of Medical Entomology* 51: 484–488
- Iwasa M, Sanada M, Ito T (2000) *Carnus hemapterus* Nitzsch (Diptera, Carnidae) found from the external auditory meatus of human, new to Japan. *Medical Entomology and Zoology* 51: 265–268
- Ozerov AL (1986) [Calliphoridae and Carnidae of the Zeja State Natural Reserve]. *Proceedings of the Zoological Institute, Leningrad* 146: 79–86 [In Russian]
- Ozerov AL (1991) [New species of Micropezidae, Piophilidae and Carnidae (Diptera) from the USSR]. *Vestnik Zoologii* 6: 7–12 [In Russian]
- Ozerov AL (1994) [A new species and new synonymy in the genus *Meoneura* (Diptera: Carnidae)]. *Zoologičeskij Žurnal* 73: 137–141 [In Russian]
- Sabrosky CW (1959) The Nearctic species of the filth fly genus *Meoneura* (Diptera, Milichiidae). *Annals of the Entomological Society of America* 52: 17–26
- Sabrosky CW (1987) Carnidae. Pp 909–912 in McAlpine JF, Peterson BV, Shewell GE, Teskey HJ, Vockeroth JR, Wood DM (eds) *Manual of Nearctic Diptera*. Volume 2. Monograph of the Research Branch Agriculture Canada 11, Ottawa
- Tago T (2011) [Record of the carnid fly *Meoneura triangularis* Collin from Tokyo]. *The Dipterist's Club of Japan "Hana Abu"* 32: 46–48 [In Japanese]
- Wheeler TA (2010): Carnidae (Carnid Flies). Pp 1101–1104 in: Brown BV, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado MA (eds): *Manual of Central American Diptera*. Volume 2. NRC Research Press, Ottawa