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Taxonomic review of *Rheocricotopus* Brundin, 1956 (Diptera: Chironomidae: Orthoclaadiinae) from East Asia, with descriptions of twelve new species

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Abstract. East Asian species of *Rheocricotopus* are reviewed and 12 species are illustrated and described as new to science in the subgenus *Psilocricotopus* Sæther: *R. (P.) albulus* sp. nov., *R. (P.) bannaensis* sp. nov., *R. (P.) beibengensis* sp. nov., *R. (P.) binotatus* sp. nov., *R. (P.) chinogodavarius* sp. nov., *R. (P.) fasciolatus* sp. nov., *R. (P.) hanmiensis* sp. nov., *R. (P.) masarui* sp. nov., *R. (P.) monovittatus* sp. nov., *R. (P.) nippobifasciatus* sp. nov., *R. (P.) protuberans* sp. nov., and *R. (P.) yunnanensis* sp. nov. Additionally, the female adult, pupa and larva of *R. (P.) togakuroasi* (Sasa & Okazawa, 1992), the female adult and pupa of *R. (P.) orientalis* Wang, 1995, the larva of *R. (s. str.) tamahumeralis* Sasa, 1981, and the female adult, pupa and larva of *R. (s. str.) togapeniculus* Sasa & Okazawa, 1992 are described for the first time. In total, 28 new synonyms are given: *Rheocricotopus nudisquamus* Makarchenko & Makarchenko, 2009, *R. brochus* Liu, Lin & Wang, 2014 and *R. longiligulatus* Yamamoto & Yamamoto, 2017 are listed as junior synonyms of *R. amamipubescius* (Sasa, 1990), *R. bifasciatus* Wang & Zheng, 1991 and *R. oiraprimus* Sasa, 1991, respectively; *R. chalybeatus bicoloratus* Caspers & Reiss, 1989, *R. emeiensis* Wang & Zheng, 1989, *R. nigrus* Wang & Zheng, 1989, *R. okifoveatus* Sasa, 1990, *R. tedorisecundus* Sasa, 1994, *R. isigadeeus* Sasa & Suzuki, 2000, *R. yakulemeus* Sasa & Suzuki, 2000, *R. inaquereus* Sasa, Kitami & Suzuki, 2001, *R. inaxeyeus* Sasa, Kitami & Suzuki, 2001, *R. taiwanensis* Wang, Yan & Maa, 2004, *R. heterochros* Liu, Song & Wang, 2014, and *R. nemoacrostichalis* Chaudhuri & Sinharay, 1983 are treated as junior synonyms of *R. chalybeatus* (Edwards, 1929); *R. akagisecundus* Kikuchi & Sasa, 1994 and *R. gotocedeus* Sasa & Suzuki, 2001 are treated as junior synonyms of *R. togakuroasi* (Sasa & Okazawa, 1992); *R. baishanensis* Wang & Zheng, 1991 and *R. himalayensis* Chaudhuri & Sinharay, 1983 are treated as junior synonyms of *R. effusus* (Walker, 1856); *R. reduncusoides* Namayandeh & Beresford, 2018 and *R. shofukusecundus* Sasa, 1998 are treated as junior synonyms of *R. reduncus* Sæther & Schnell, 1988 and *Paracladius akansexatus* Sasa & Kaminura, 1987, respectively; *R. kamimonji* Sasa & Hirabayashi, 1993 and *R. kurocedeus* Sasa, 1996 are treated as junior synonyms of *R. togapeniculus* Sasa & Okazawa, 1992; *Parorthoclaadius negoroi* Yamamoto, 2011 and *Orthoclaadius piloculatus* Kobayashi, 2012 are treated as junior synonyms of *Parorthoclaadius intermedius* (Tokunaga, 1939) comb. nov.; *R. tobatervicesimus* Kikuchi & Sasa, 1990, *Paratrithoclaadius unabrevis* Sasa, 1996 and *R. rotundus* Liu, Lin & Wang, 2014 are treated as junior synonyms of *Paracricotopus irregularis*

Niitsuma, 1990. In addition, two new combinations, *Parorthocladius intermedius* (Tokunaga, 1939) comb. nov. and *Paracricotopus brachypus* (Wang & Zheng, 1991) comb. nov. are proposed here. To accommodate these species, generic and subgeneric diagnoses are emended. A key to the known male adults from East Asia is provided.

Keywords. *Rheocricotopus*, new species, new synonyms, key, East Asia.

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Introduction

The species of *Rheocricotopus* Brundin, 1956 (Chironomidae: Orthoclaadiinae) are common rheophilic dwellers in streams and rivers, and frequently are found in aquatic biomonitoring samples. Generally, male *Rheocricotopus* can be separated from other Orthoclaadiinae by the hairy eyes, well-developed pulvilli, pointed anal point with posterolaterally directed setae, gonocoxite with distinct lobes, and abdomen with irregular body setae; pupa can be separated from others by the well-developed thoracic horn, tergite III–VII(VIII) usually with a row of posterior band with strong spines, tergite IV–VI without a median transverse band, segment VI without taeniate seta and anal fringe usually present except *R. (P.) tirolus* Lehmann, 1969, *R. (P.) albulus* sp. nov. and *R. (P.) orientalis* Wang, 1995; larva can be distinguished from others by the well-developed ventromental plate with a round base and well-developed beards beneath. So far, about 80 species have been described from the Holarctic, Afrotropical, Oriental and Neotropical regions (Ashe & O'Connor 2012; Yamamoto & Yamamoto 2014; Hazra *et al.* 2016; Moubayed-Breil & Ashe 2019; Lin *et al.* 2020; Namayandeh *et al.* 2024). Currently, these species are allocated to one of two subgenera and several species groups. The initial framework of this classification established by Sæther and his colleagues (Sæther 1986; Sæther & Schnell 1988; Cranston *et al.* 1989) has been adopted and supplemented by many subsequent authors.

In East Asia, 54 species of *Rheocricotopus* have been recorded mainly from Japan, China and the Russian Far East. These represent more than 60% of the species of *Rheocricotopus* known from the world. Twenty-four of these species were described as new to science by Sasa and his coworkers (Ashe & O'Connor 2012). However, it is well known that many of their species are junior synonyms of other taxa (Kobayashi & Endo 2008; Tang & Niitsuma 2017; Yamamoto & Yamamoto 2018; Yamamoto *et al.* 2019). Unfortunately, many of their specimens were badly damaged during the mounting procedures. Therefore, Fu *et al.* (2016: 272) failed to correct errors in their redescriptions of Japanese *Rheocricotopus* although the holotypes were re-examined. To avoid further confusion, we reviewed the species of *Rheocricotopus* described from East Asia except three Indonesian species described by Johannsen (1932), see Remark below. Based mainly on re-examinations of type and voucher specimens, many species are treated here as junior synonyms of other species included in this paper.

During fieldwork for taxonomic studies on Chironomidae in China and Japan, we collected 12 interesting species of *Rheocricotopus* assessed as new members of the subgenus *Psilocricotopus* Sæther, 1986. We describe and illustrate here the following species: *R. (P.) bannaensis* sp. nov. from China and *R. (P.) nippobifasciatus* sp. nov. from Japan, each based on the male and female adults; *R. (P.) albulus* sp. nov. and *R. (P.) masarui* sp. nov. from China, each based on the male adult and the pupa; *R. (P.) beibengensis* sp. nov., *R. (P.) binotatus* sp. nov., *R. (P.) chinogodavarius* sp. nov., *R. (P.) fasciolatus* sp. nov., *R. (P.) hanmiensis* sp. nov., *R. (P.) monovittatus* sp. nov., *R. (P.) protuberans* sp. nov., and *R. (P.) yunnanensis* sp. nov. from China, each based on the male adult. Additionally, the following descriptions are given for the first time in this paper: the female adult, the pupa and the larva of *R. (P.) togakuroasi* (Sasa &

Okazawa, 1992); the female adult and the pupa of *R. (P.) orientalis* Wang, 1995; the larva of *R. (s. str.) tamahumeralis* Sasa, 1981; and the female adult, the pupa and the larva of *R. (s. str.) togapeniculus* Sasa & Okazawa, 1992.

Recently, the second author collected a pharate male of *R. (P.) orientalis* from Guangdong in China that leads us to emend the generic and subgeneric diagnoses and to discuss the validity of the *orientalis* group. However, due to insufficient information on the immature stages, we refrain from a deeper discussion about the other species groups pending further holomorphological information.

Remark

Three species described in *Spaniotoma (Trichocladus)* by Johannsen (1932) have been examined by P.S. Cranston (pers. comm. 1999–2025) and clearly belong to *Rheocricotopus (Psilocricotopus)*. All were collected by Thienemann, and extant material is slide mounted and now housed in the NHM (London, UK). For *R. mediocris* (Johannsen, 1932), the extant material comprises a male hypopygium, compressed and distorted, labelled as from the holotype, the only known male specimen. For *R. rigidus* (Johannsen, 1932), available material is the male hypopygium on one slide and fore-leg on another. Although type status is not indicated on the slide, the collection location of ‘Middle Java’ matches that given in the text. According to Johannsen’s text, both species were reared, but it seems the immature stages became dissociated from the adult and were likely retained by Thienemann. However, the valuable immature stages have not been found in the ZSM (Munich, Germany), where some material from the expedition is extant (M. Spies pers. comm. 2021). Although the descriptions by Johannsen are good and quite detailed, they allow little possibility of discrimination from the range of species reported in this paper: reluctantly, these two species should be considered as nomina dubia. In contrast, the 3rd species, *R. lobalis* (Johannsen, 1932) comprises more than one adult specimen, dissected under 4 coverslips on separate slides. A modern description of the holotype adult male can be made, and on this basis, *R. lobalis* can be recognized as present regionally in Malaysian Borneo and Thailand, as well as the Java type locality (Cranston & Tang unpublished).

Material and methods

Measurements and counts are given as ranges, followed by the means when three or more specimens are measured or counted. The number of observations (n) is expressed at the beginning of the description of the species except when otherwise stated.

The terminology and abbreviations for general morphology follow Sæther (1980, 1986).

Abbreviations used for the material

F = adult female
L = larva
Le = larval exuviae
M = adult male
P = pupa
Pe = pupal exuviae

Institutional abbreviations

BU = University of Burdwan, Burdwan, India
CNC = Canadian National Collection, Ottawa, Canada
FEBRAS = Far East Branch of the Russian Academy of Sciences, Vladivostok, Russia
JNU = Jinan University, Guangzhou, China
KU = Kyushu University, Fukuoka, Japan

NHM	= Natural History Museum, London, UK
NK/NKU/BDN	= Nankai University, Tianjin, China
NSMT	= National Museum of Nature and Science, Tsukuba, Japan
PCHN	= private collection of Hiromi Niitsuma, Shizuoka, Japan
SHOU	= Shanghai Ocean University, China
ZMB	= Museum of Zoology, University of Bergen, Norway
ZSM	= Zoologische Staatssammlung München, Munich, Germany

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Family Chironomidae Macquart, 1838
Subfamily Orthocladiinae Kieffer, 1911

Genus *Rheocricotopus* Brundin, 1956

Type species

Chironomus effusus Walker, 1856, by original designation.

Rheocricotopus Thienemann & Harnisch, 1932: 135. Nomen nudum.

Rheocricotopus Brundin, 1956: 118.

Rheocricotopus – Ashe & O'Connor 2012: 558. — Yamamoto & Yamamoto 2014: 296.

Emended diagnosis

Male

Humeral pit on thorax small to large, occasionally absent (*R. (P.) valgus* Chaudhuri & Sinharay, 1983). Wing vein R usually with setae, occasionally bare (*R. (P.) valgus*). Superior volsella plate- or finger-like (the *R. (s. str.) reduncus* group); inferior volsella triangular, or digitate (the *R. (P.) orientalis* group). Gonostylus with apical, subapical, or median crista dorsalis (*R. (P.) chinogodavarius* sp. nov., *R. (P.) protuberans* sp. nov. and species of the *R. (P.) orientalis* group); occasionally crista dorsalis reduced or seemingly absent.

Female

Spermathecal ducts curved, occasionally with loop (*R. (P.) nippobifasciatus* sp. nov. and *R. (P.) orientalis* Wang, 1995).

Pupa

Frontal apotome usually without warts, except *R. (P.) orientalis* with low warts. Anteriorly directed spinules mostly present posterior to spine rows on tergites II–IV or II–V or on conjunctives II/III–IV/V or II/III–V/VI; occasionally these spinules absent (*R. (P.) albulus* sp. nov. and *R. (P.) orientalis*). Segment VIII usually with 4–5 LS-setae, occasionally with 3 bristle-like L-setae and 1 LS-setae (*R. (P.) tirolus* Lehman, 1969), or with 3 bristle-like L-setae only (*R. (P.) albulus* sp. nov. and *R. (P.) orientalis*).

Larva

Chaetulae basales 2, simple or apically bifid. Seta interna with 5–7 branches.

Remarks

Generic diagnoses have been given by Brundin (1956: 118), Lehmann (1969: 348), Sæther (1969: 85; 1977: 97; 1986: 61) and Cranston *et al.* (1989: 234) for the adult; Lehmann (1969: 349), Coffman *et al.* (1986: 203) and Sæther (1986: 62) for the pupa; and Cranston (1982: 130), Cranston *et al.* (1983: 195), Sæther (1986: 63), Epler (2001: 7.134) and Andersen *et al.* (2013: 254) for the larva. Normally, the hairy eye, well-developed pulvilli, conventional anal point with lateral seta, obvious gonocoxite lobes and abdominal setation are still useful for separating *Rheocricotopus* from other Orthoclaadiinae; in addition, the acrostichals, anteprenotals and wing vein setae are critical for the delimitation of the species, while the humeral pit, crista dorsalis and squamals vary both intraspecifically and interspecifically. In the pupa, the well-developed thoracic horn, posterior strong spine band and fringed anal lobe together with three strong macrosetae still work well for separating most of the *Rheocricotopus* from other orthoclaids, but the lateral taeniate setation on T VII–VIII is found to vary greatly, also the anal fringe can be completely absent. In the larva, the well-developed ventromental plates with a round base and beard beneath are still useful in determining the *Rheocricotopus* larva, but the SI condition and length of body setae vary greatly.

Although *R. (P.) orientalis* has rather unusual features for the genus, the number of species in the *R. (P.) orientalis* group came to be known as higher in the genus. Therefore, we emend the generic diagnosis to accommodate this expanded species group, as well as the other Chinese and Japanese species treated here.

Key to the adult males of East Asian *Rheocricotopus* Brundin, 1956

1. Abdomen with or without yellow bands or markings. Superior volsella usually thin, triangular or roundly protruded medially(subgenus *Psilocricotopus* Sæther, 1986) 2
 - Abdomen unicoloured. Superior volsella thick, horn- or finger-shaped, roundly or triangularly protruded(subgenus *Rheocricotopus* Brundin, 1956) 31
2. Abdomen bicoloured, with distinct colour pattern (Figs 16A, 22A, 24A). Foretibia with or without pale band 3
 - Abdomen entirely brown, without distinct colour pattern. Fore tibia uniformly brown, without pale band 20
3. Wing not cuneiform, anal lobe obtuse (Fig. 11D) 4
 - Wing cuneiform, anal lobe much reduced (Fig. 13C) 5
4. Tergites VIII–IX entirely yellow. Humeral pit absent. Costal extension much produced (Fig. 11D) *R. (P.) valgus* Chaudhuri & Sinharay, 1983
 - Tergites VIII–IX brown. Humeral pit large, circular. Costal extension slight (Fig. 21C) *R. (P.) monovittatus* sp. nov.
5. Foretibia bicoloured (Fig. 2C–D) 6
 - Foretibia uniformly brown 8
6. Gonostylus with crista dorsalis at middle (Fig. 17J) *R. (P.) chinogodavarius* sp. nov.
 - Gonostylus with crista dorsalis at subapex (Fig. 6E–F) 7
7. Tergite II yellow (Fig. 2A–B). Hypopygial anal point slender, apically pointed; superior volsella relatively thick, triangular (Fig. 2H) *R. (P.) bifasciatus* Wang & Zheng, 1991
 - Tergite II brown. Hypopygial anal point robust, apically blunt; superior volsella thin, roundly protruded medially (Fig. 14G) *R. (P.) albulus* sp. nov.

8. Inferior volsella triangular (Fig. 18E)	9
– Inferior volsella digitate (Fig. 12A, E)	15
9. Crista dorsalis indistinct or absent (Wang & Zheng 1991: 100 fig. 1c)	
..... <i>R. (P.) tibialis</i> Wang & Zheng, 1991	
– Crista dorsalis distinct even if small (Fig. 19E)	10
10. Tergites VI–VIII partly brown (Fig. 18A)	<i>R. (P.) fasciolatus</i> sp. nov.
– Tergites VI–VIII entirely brown	11
11. Tergite II entirely brown (Fig. 16A–B)	<i>R. (P.) binotatus</i> sp. nov.
– Tergite II entirely or partly yellow	12
12. Anteprenotal setae divided into medial and lateral groups (Fig. 6E). Superior volsella thick, roundly protruded inwards	<i>R. (P.) oiraprimus</i> Sasa, 1991
– Anteprenotal setae lateral only (Fig. 8A). Superior volsella thin, triangular (Fig. 19D)	13
13. Tergite IV entirely brown (Fig. 19A)	<i>R. (P.) hanmiensis</i> sp. nov.
– Tergite IV entirely yellow (Figs 22A, 24A)	14
14. Tergite V entirely brown. Veins R ₁ and R ₄₊₅ bare (Fig. 24C)	<i>R. (P.) yunnanensis</i> sp. nov.
– Tergite V brown with transverse yellow band on anterior 1/4–1/2. Veins R ₁ and R ₄₊₅ setiferous (Fig. 22A)	<i>R. (P.) nippobifasciatus</i> sp. nov.
15. Inferior volsella short, apically lump-like (Fig. 12A)	<i>R. (P.) kongi</i> Lin & Wang, 2020
– Inferior volsella long, slender (Figs 12E, 13D)	16
16. Tergite IX posterolaterally with setiferous lobes (Fig. 12E)	<i>R. (P.) orientalis</i> Wang, 1995
– Tergite IX posterolaterally without lobes (Fig. 13D)	17
17. Hypopygial anal point constricted at middle (Yan & Wang 2004: 561 fig. 3)	
..... <i>R. (P.) constrictus</i> Yan & Wang, 2004	
– Hypopygial anal point without middle constriction	18
18. Tergite IX posterolaterally with setal tufts (Wang & Sæther 2001: 239 fig. 2d)	
..... <i>R. (P.) villiculus</i> Wang & Sæther, 2001	
– Tergite IX without any setal tuft	19
19. Tergite VII entirely brown (Wang & Sæther 2001: 239 fig. 1c). R ₁ and R ₄₊₅ setiferous (Wang & Sæther, 2001: 239 fig. 1b)	<i>R. (P.) calviculus</i> Wang & Sæther, 2001
– Tergite VII entirely yellow (Fig. 13A). R ₁ and R ₄₊₅ bare (Fig. 13C)	<i>R. (P.) bannaensis</i> sp. nov.
20. Acrostichal setae indistinct or absent (Fig. 3B)	21
– Acrostichal setae distinct (Fig. 22B)	23
21. Gonostylus gently curved upwards at apex (Sæther 1969: 89 fig. 44 as <i>R. kenorensis</i> Sæther, 1969)	<i>R. (P.) robacki</i> (Beck & Beck, 1964)]
– Gonostylus sharply curved upwards at apex (Fig. 3G–H)	22
22. AR 0.9–1.5	<i>R. (P.) chalybeatus</i> (Edwards, 1929)
– AR ca 0.5	<i>R. (P.) imperfectus</i> Makarchenko & Makarchenko, 2005

23. Anteprenotal setae divided in medial and lateral groups (Figs 6C, 23A)	24
– Anteprenotal setae usually lateral only (Fig. 8A)	25
24. Costal extension well developed, ca 100 µm long	
..... <i>R. (P.) insularis</i> Makarchenko & Makarchenko, 2005	
– Costal extension scarcely developed, 25–45 µm long (Fig. 23B)	<i>R. (P.) protuberans</i> sp. nov.
25. Wing cuneiform, anal lobe much reduced (Figs 1B, 15A)	26
– Wing anal lobe more or less developed, obtuse, right-angled or greater	27
26. Costal extension 110–125 µm long, R ₄₊₅ setiferous. Crista dorsalis low, broad (Fig. 1D–E)	
..... <i>R. (P.) amamipubescius</i> (Sasa, 1990)	
– Costal extension 60 µm long, R ₄₊₅ bare. Crista dorsalis high, slender (Fig. 15C)	
..... <i>R. (P.) beibengensis</i> sp. nov.	
27. Wing anal lobe obtuse (Figs 7A, 8B)	28
– Wing anal lobe right-angled, or somewhat projected basally (Fig. 10B)	29
28. Costal extension 45–65 µm long. Crista dorsalis low, broad (Fig. 8F)	
..... <i>R. (P.) togakuroasi</i> (Sasa & Okazawa, 1992)	
– Costal extension 30–40 µm long. Crista dorsalis triangular (Fig. 7D)	
..... <i>R. (P.) serratus</i> Liu, Lin & Wang, 2014	
29. Humeral pit triangular (Fig. 5A). Superior volsella relatively thick (Fig. 5C)	
..... <i>R. (P.) hidakadeeus</i> Sasa & Suzuki, 2001	
– Humeral pit ovoid or quadrate (Fig. 10D). Superior volsella thin (Fig. 10H)	30
30. Tergites II–IV uniformly brown. costal extension 95 µm long (Fig. 10B)	
..... <i>R. (P.) tokarakeleus</i> Sasa & Suzuki, 1995	
– Tergites II–IV each with median dark I- or inverted T-shaped marking (Fig. 20A–C). Costal extension 65–80 µm long (Fig. 20E)	<i>R. (P.) masarui</i> sp. nov.
31. Humeral pit large, distinct, consisting of large hole and small hole (Fig. 27A, G)	32
– Humeral pit small, indistinct or absent (Figs 23A, 28A)	34
32. Anteprenotal setae occasionally divided into medial and lateral groups. Superior volsella long, finger- like (Fig. 27D)	<i>R. (s. str.) tatequintus</i> Sasa, 1996
– Anteprenotal setae lateral only. Superior volsella short, horn-like	33
33. Wing anal lobe right-angled. Large hole of humeral pit long, oval (Lehmann 1969: 372 fig. 13a) ...	
..... <i>R. (s. str.) effusus</i> (Walker, 1856)	
– Wing anal lobe obtuse. Large hole of humeral pit triangular or quadrate (Fig. 25A–D)	
..... <i>R. (s. str.) tamahumeralis</i> Sasa, 1981	
34. Humeral pit indistinct, absent, or small when recognizable. Superior volsella finger-like (Fig. 27D)	
.....	35
– Humeral pit small, consisting of fused several small holes (Fig. 28A). Superior volsella triangularly or roundly protruded (Fig. 28C, D)	36

35. Costal extension 35–60 µm long. Gonostylus curved, slightly narrowed in apical 1/3 (Sæther & Schnell 1988: 67 fig. 1d) *R. (s. str.) reduncus* Sæther & Schnell, 1988
– Costal extension 75–80 µm long. Gonostylus curved, expanded in apical 1/3 (Makarchenko & Makarchenko 2005: 133 fig. 22) *R. (s. str.) tshernovskii* Makarchenko & Makarchenko, 2005
36. AR 0.60–0.85. Foreleg ratio 0.60–0.75. Superior volsella triangular at apex (Sæther 1971: 1250 fig. 8d) *R. (s. str.) pauciseta* Sæther, 1969
– AR 0.90–1.20. Foreleg ratio 0.75–0.80. Superior volsella rounded at apex (Fig. 28D) *R. (s. str.) togapeniculus* Sasa & Okazawa, 1992

Subgenus *Psilocricotopus* Sæther, 1986

Psilocricotopus Sæther, 1986: 72.

Psilocricotopus – Ashe & O’Connor 2012: 559. — Yamamoto & Yamamoto 2014: 296.

Type species

Cricotopus atripes Kieffer, 1913 by original designation.

Emended diagnosis

Male

Gonocoxite with superior volsella triangular or rounded, thin to relatively thick, never with digitate or horn-like projections; inferior volsella triangular, often double-layered apically, or digitate (the *orientalis* group). Crista dorsalis usually triangular and small at subapex of gonostylus; occasionally low and broad (*R. (P.) togakuroasi* (Sasa & Okazawa, 1992)), or indistinct (*R. (P.) amamipubescius* (Sasa, 1990) and *R. (P.) tibialis* Wang & Zheng, 1991), or large (*R. (P.) binotatus* sp. nov., *R. (P.) chinogodavarius* sp. nov., *R. (P.) fasciolatus* sp. nov., *R. (P.) protuberans* sp. nov. and the *orientalis* group).

Female

Spermathecal ducts usually curved, occasionally looped.

Pupa

Frontal apotome usually smooth, occasionally with low warts (*R. (P.) orientalis* Wang, 1995). Abdominal tergites III–VI usually without median patch of spines or spinules, occasionally with distinct median cluster of several spines (*R. (P.) togakuroasi*).

Remarks

Subgeneric diagnoses were given by Sæther (1986: 72) and Cranston *et al.* (1989: 234, in key) for the adult; Coffman *et al.* (1986: 204, in key) and Sæther (1986: 72) for the pupa; and Sæther (1986: 72) and Andersen *et al.* (2013: 254, in key) for the larva. Here, emendations for adult male and pupal diagnoses are given mainly based on newly collected specimens from China and Japan.

The superior volsella, the inferior volsella and the crista dorsalis, as well as the abdominal colouration are more or less diverse in the male morphology. In addition, the presence of the pupa having median spine patches on the pupal tergites IV–VI may obscure the boundary between the subgenera *Psilocricotopus* Sæther, 1986 and *Rheocricotopus* s. str. Brundin, 1956.

Based on the adult morphology, Wang & Sæther (2001: 240) wrote: “However, the striking coloration, peculiar genitalia, complete absence of humeral pit and the crista dorsalis which do not conform to

any of the subgenera lead us to suggest that the *orientalis* group form the sister group of the subgenus *Psilocricotopus* or of the full genus and may deserve subgeneric or even generic rank.” However, our examinations of the males of this species group revealed that these adults actually do have humeral pits. *Rheocricotopus* (*P.*) *protuberans* sp. nov. and *R. (P.) chinogodavarius* sp. nov. possess large median crista dorsalis. The bicoloured abdomen and the third palpomere bearing many sensilla clavata, regarded by Wang & Sæther (2001: 240) as features peculiar to the *orientalis* group actually occur not only in the *orientalis* group, but also in the other species groups. Further, the pupa of *R. (P.) orientalis* resembles that of *R. (P.) albulus* sp. nov. in lacking frontal setae and any row of spinules posterior to spine rows on tergites III–V or on conjunctives III/IV–V/VI, and in having three pairs of L-setae on segments II–VIII and unfringed anal lobes. Certainly, the digitate inferior volsella is unique within *Rheocricotopus*, and separates the *orientalis* group from the other species groups in *Psilocricotopus*. On the other hand, pupal morphology appears to pull back the *orientalis* group into the subgenus *Psilocricotopus*.

The subgenus *Psilocricotopus* currently includes four species groups: the *atripes* group, the *chalybeatus* group, the *godavarius* group, and the *orientalis* group.

***Rheocricotopus (P.) amamipubescius* (Sasa, 1990)**

Fig. 1, Table 1

Eukiefferiella amamipubescia Sasa, 1990: 127.

Rheocricotopus (Psilocricotopus) nudisquamus Makarchenko & Makarchenko, 2009: 122. **Syn. nov.**

Rheocricotopus (Rheocricotopus) amamipubescius – Sæther *et al.* 2000: 161. — Ashe & O’Connor 2012: 568. — Yamamoto & Yamamoto 2014: 297.

Rheocricotopus (Psilocricotopus) nudisquamus – Ashe & O’Connor 2012: 566.

Rheocricotopus (Psilocricotopus) amamipubescius – Yamamoto *et al.* 2015: 108.

Type material

Holotype of *Eukiefferiella amamipubescius*

JAPAN – **Kagoshima** • ♂; Amami-oshima Island, Yakugachi River; 18 Mar. 1989; M. Sasa leg.; NSMT, NSMT-I-Dip 4690.

The type specimen of *R. (P.) nudisquamus* was not examined.

Other material examined

CHINA – **Fujian** • 1 ♂; Nanping, Wuyishan, Mt Wuyi NNR, Tongmu; 27°45′ N, 117°40′ E; 850 m a.s.l.; 9 Aug. 2014; H.Q. Tang leg.; JNU, JNU 190130003. – **Guangdong** • 1 ♂; Shaoguan, Ruyuan, Nanling NNR, “Mangshan” [Mt Mang]; 24°55′ N, 113°01′ E; 1054 m a.s.l.; 25 Jul. 2020; Z. Li leg.; JNU, JNU 21081601.

JAPAN – **Shizuoka** • 1 ♂; Shimizu, Ihara River; 35°4′ N, 138°27′ E; 202 m a.s.l.; 25 Sep. 1990; H. Niitsuma leg.; PCHN.

Description

Male (n = 4)

Total length 2.1 (2) mm.

COLOURATION. Body mostly brown. Thorax with Sct, Pn, Pe and 3 scutal vittae dark brown; pleural membrane yellow. Abdomen light brown, occasionally anterior few tergites somewhat paler. Legs brown; P₁ somewhat darker than P₂₋₃.

HEAD. Temporals 3–4, 4. AR 0.31–0.46, 0.41 (3). Clypeus with 6–11, 9 setae. Lengths (μm) of Pm_{1-5} : 34–37, 36 (3); 49–59, 56 (3); 111–143, 130 (3); 111–135, 123 (3); 221–285, 259 (3), respectively. Pm_4/Pm_3 0.9–1.0, 1.0 (3); Pm_5/Pm_4 2.0–2.2, 2.1 (3). Pm_3 with 9–13, 11 (3) SCL on 2–3, 2 (3) subapical oval depressions; Pm_4 without SCL.

THORAX. Lateral Aps 5–6 (2). Ac 11–15 (2), and longest 8–11 (2) μm long; Dc 8 (2), including 2 (2) H; Pa 3 (2). Scts 4–5 (2), uniserial. Humeral pit (Fig. 1A) moderately large, oval.

WING (Fig. 1B). Length 1.5–2.1, 1.8 mm. C extended much beyond end of R_{4+5} ; its extension 111–123, 119 μm long. VR 1.1. R with 4–10, 8 setae; R_1 with 0–5, 3 setae, and R_{4+5} with 5–10, 8 setae. AnL much reduced, wing widest at around end of Cu_1 . Squama with 0–1, 1 seta.

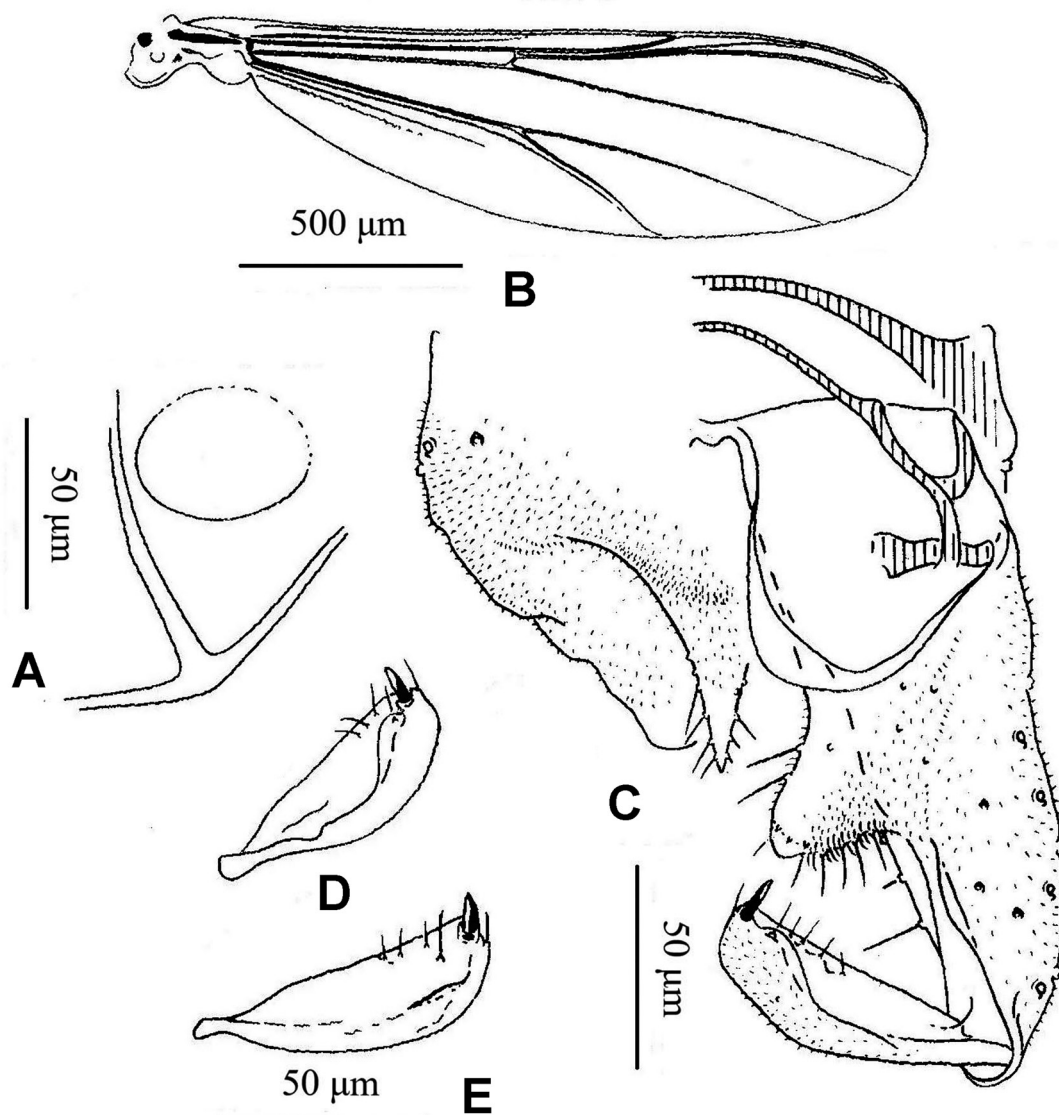


Fig. 1. *Rheocricotopus (P.) amamipubescius* (Sasa, 1990). A–C. ♂ (PCHN). D. Holotype, ♂ (NSMT-I-Dip 4690). E. ♂ (JNU 21081601). A. Humeral pit. B. Wing. C. Hypopygium, dorsal view. D–E. Gonostylus, showing variation.

Table 1. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *amamipubescius* (Sasa, 1990), ♂♂ (n = 4).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	725–960	715–970	637–823	353–412	255–304	176–216	98–108	0.86–0.89	2.4–2.6	1.4–1.8
	862	862	725 (3)	382 (3)	281(3)	199 (3)	105 (3)	0.88 (3)	2.5 (3)	1.6 (3)
P2	608–857	617–813	412–588	157–216	118–167	69–88	59–78	0.61–0.67	4.1	1.7–2.1
	756	733	490	194	142	78	69	0.64	4.1	2.0
P3	686–931	774–1078	500–686	216–304	176–235	98–137	78–88	0.62–0.65	3.3–3.5	2.1–2.4
	818	936	593	265	213	120	86	0.63	3.4	2.3 (3)

LEGS. P_1 with single ti spur, 30–44, 36 μm long. P_2 with 2 ti spurs, 12–17, 16 and 12–16, 14 μm long, respectively; P_3 with 2 ti spurs, 44–51, 46 and 15–21, 18 μm long, respectively. P_2 and P_3 without Sch; P_3 with ti comb of 12–14, 13 bristles. Lengths and proportions of legs as in Table 1.

ABDOMEN. Hypopygium (Fig. 1C) with AnP pointed apically, bearing 6–18, 10 lateral setae. Gc 155–172, 165 μm long, 2.9–3.6, 3.2 \times as long as broad at middle, with SVo somewhat thick, protruded roundly; and IVo triangular, double-layered, dorsally rounded at apex. Gs (Fig. 1D–E) 66–76, 71 μm long, roundly convex in outer margin; CD nearly triangular, relatively broad, occasionally very low or indistinct. HR 2.22–2.39, 2.32.

Female, pupa and larvae

Unknown.

Distribution

The present species has been known from Palaearctic and Oriental Japan, Oriental China and the Russian Far East.

Remarks

A re-examination of the holotype of *Eukiefferiella amamipubescia* Sasa, 1990 revealed that the male is characterized by the somewhat large, oval humeral pit; the wing with a much-reduced anal lobe, and a long costal extension and no squamal seta; the legs with well-developed pulvilli; the roundly protruded superior volsella; and the triangular, broad, occasionally low, crista dorsalis. The species belongs to the genus *Rheocricotopus* Brundin, 1956, rather than to *Eukiefferiella* Thienemann, 1926. The low, broad crista dorsalis may suggest that it is a member of *Rheocricotopus* s. str. However, a male (JNU 190130003) newly collected from Fujian Province, China, has a triangular, high but broad crista dorsalis in the right gonostylus, but a low crista dorsalis in the left. The difference in the shape may occur from the mounting orientation. A cuneiform wing with squamal setae reduced in number is often found in the subgenus *Psilocricotopus* rather than in *Rheocricotopus* s. str. Although the immature stages are unknown, in fact, the species seems to be a member of subgenus *Psilocricotopus*.

This species was recorded subsequently under the name *Eukiefferiella amamipubescia* Sasa, 1990 from Toyama Prefecture, also in Palaearctic Japan by Sasa & Okazawa (1992: 94). Furthermore, Sasa & Suzuki (1993: 114) redescribed this species as a member of *Eukiefferiella* from Amami Island in Oriental Japan. Based on examinations of voucher specimens housed in NSMT; however, Yamamoto *et al.* (2015: 108) pointed out that the former species is *R. (P.) oiraprimus* Sasa, 1991 and the latter species should be treated as *R. (P.) tokarakeleus* Sasa & Suzuki, 1995. The male of *R. (P.) nudisquamus* Makarchenko &

Makarchenko, 2009 does not differ significantly in morphology from this species. Without having examined the holotype, we regard the species to be a junior synonym of *R. (P.) amamipubescius*.

The male is similar to that of *R. (P.) godavariensis* Lehmann, 1969 collected from Nepal in the low antennal ratio of 0.31–0.46, cuneiform wings with a very long costal extension and reduced number of squamal setae, and in the triangular inferior volsella with a rounded apex, but separable from it in the brown tergite IV, the somewhat large, oval humeral pit, and the relatively large, roundly protruded superior volsella. According to Lehmann (1969: 361–362, 370 fig. 9, 372 fig. 14b), the latter has a yellow tergite IV, small humeral pits consisting of fused several small holes, and relatively thin, triangular superior volsellae.

***Rheocricotopus (P.) bifasciatus* Wang & Zheng, 1991**

Fig. 2, Table 2

Rheocricotopus bifasciatus Wang & Zheng, 1991: 100.

Rheocricotopus (Psilocricotopus) brochus Liu, Lin & Wang, 2014a: 20. **Syn. nov.**

Rheocricotopus (Psilocricotopus) bifasciatus – Sæther *et al.* 2000: 160. — Liu *et al.* 2014a: 18. — Ashe & O'Connor 2012: 560.

Type material

Holotype of *Rheocricotopus bifasciatus*

CHINA – Sichuan • ♂; Mt Jinfo; 29.0° N, 107.1° E; 1800 m a.s.l.; 9 May 1986; X. Wang and L. Zheng leg.; NKU.

Paratype of *Rheocricotopus (P.) brochus*

CHINA – Zhejiang • ♂; Yueqing, Lingdi, Jiulong; 28°31' N, 120°96' E; 18 Apr. 2011; X.L. Lin leg.; NKU.

Photographs of the holotype of *R. bifasciatus* and a paratype of *R. (P.) brochus* provided by X. Lin (SHOU) were examined.

Other material examined

CHINA – Guangdong • 1 ♂; Xinyi, Mt Yunkai NNR; 22°16' N, 111°11' E; 1130 m a.s.l.; 20 Feb. 2020; S.X. Luo leg.; JNU • 4 ♂♂; same data as for preceding; 20 Apr. 2020. – Anhui • 1 ♂; Huangshan, Tangkou, Mt Huang, Fu stream; 30°05' N, 118°08' E; 570 m a.s.l.; 26 May 2012; H.Q. Tang leg.; JNU.

Description

Male (n = 6)

Total length 1.9–2.5, 2.2 mm.

COLOURATION. Head dark brown on vertex. Thorax mostly dark brown, with pale HP and pleural membrane; and indistinct scutal vittae. Abdomen (Fig. 2A–B) bicoloured; T I–II, IV entirely yellow; T III entirely brown, or yellow with posteromedial brown marking; remaining tergites dark brown. P₁ (Fig. 2C) largely brown to dark brown with basal tip of fe, apical $\frac{2}{3}$ – $\frac{4}{5}$ of ti, and all of ta_{1–3} whitish; occasionally ta_{2–5} brown. P_{2–3} (Fig. 2D) brown to dark brown, with basal tip of fe, apical $\frac{1}{3}$ – $\frac{2}{3}$ of ti and all of ta_{1–4} whitish; occasionally ta_{2–5} brown.

HEAD. Temporals 4–8, 6 (5). Antennae broken off. Clypeus trapezoid with 8–10, 9 setae. Lengths (μm) of Pm_{1-5} : 30–37, 34; 49–57, 52; 98–123, 114; 118–135, 127 (5); 209–258, 233 (3), respectively. Pm_4/Pm_3 1.0–1.2, 1.1 (5); Pm_5/Pm_4 1.7–2.0, 1.9 (3). Pm_3 with 5–7, 6 (3) SCL in 2 groups; Pm_4 without SCL.

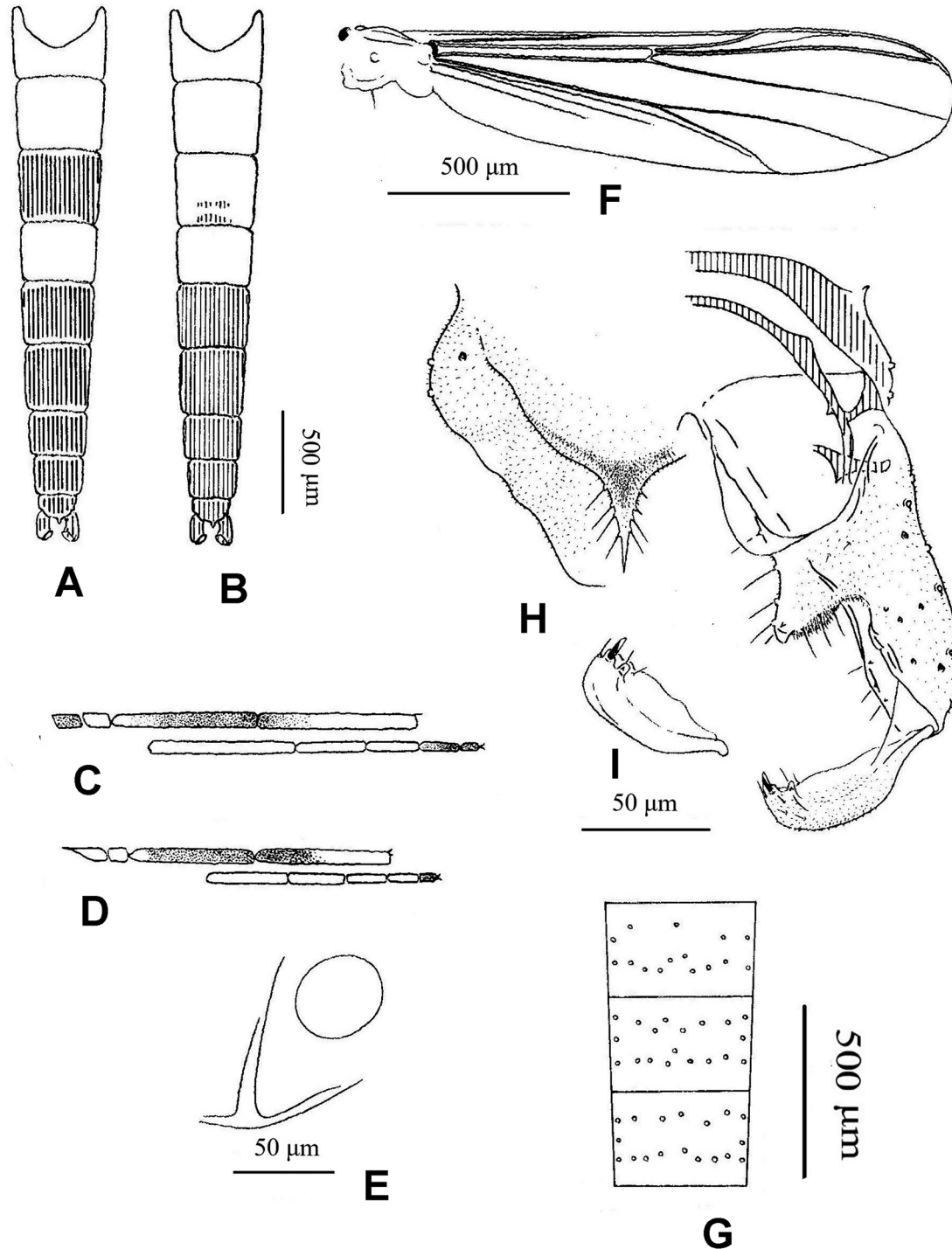


Fig. 2. *Rheocricotopus* (*P.*) *bifasciatus* Wang & Zheng, 1991. **A, F, H.** Holotype, ♂(NKU). **B–E, G, I.** ♂(JNU). **A–B.** Abdominal colour pattern, showing variation. **C.** Colour pattern of foreleg. **D.** Colour pattern of mid leg. **E.** Humeral pit. **F.** Wing. **G.** Setal arrangement on tergites II–IV. **H.** Hypopygium, dorsal view. **I.** Gonostylus.

Table 2. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) bifasciatus* Wang & Zheng, 1991, ♂♂ (n = 6).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	627–735 699	696–804 766	608–725 682 (5)	333–402 374 (5)	235–274 255 (5)	157–176 171 (5)	78–98 88 (5)	0.87–0.91 0.89 (5)	2.4–2.5 2.4 (5)	1.7–2.1 (2) –
P2	588–676 644	559–657 626	353–421 398 (5)	157–196 180 (5)	108–127 123 (5)	59–69 67 (5)	59–69 67 (5)	0.63–0.64 0.64 (5)	3.7–3.9 3.8 (5)	2.3–2.7 2.4 (3)
P3	588–706 671	696–823 782	431–510 482 (5)	206–255 231 (5)	157–186 178 (5)	78–98 92 (5)	69–78 74 (5)	0.61–0.63 0.62 (5)	3.3–3.4 3.4 (5)	2.9–3.3 3.1 (3)

THORAX. Lateral Aps 1–4, 3 (4). Ac 10–16, 13 (4); minute, longest 10–12, 10 (4) μm long; Dc 5–7, 6, including 1–2, 2 H, uniserial; Pa 3; Scts 4–7, 5. HP (Fig. 2E) oval, moderately large.

WING (Fig. 2F). Length 1.4–1.7, 1.6 mm. C extension moderately long, 62–76, 67 μm . VR 1.0–1.1, 1.1 (5). R with 4–8, 6 setae; R_1 and R_{4+5} bare. AnL much reduced. Sq with 1–3, 2 setae.

LEGS. P_1 with ti spur 39–42, 41 (5) μm long; P_2 with 2 ti spurs both 15–17, 16 and 15 (5) μm long; P_3 with 2 ti spurs 34–44, 40 (5) and 15–17, 17 (5) μm long. P_2 without Sch. P_3 with ti comb consisting of 10–12, 11 (5) bristles. Lengths and proportions of legs as in Table 2.

ABDOMEN (Fig. 2G). Tergal setae irregularly arranged. Hypopygium (Fig. 2H) with AnP sharply pointed at apex, bearing 6–8, 7 (5) lateral setae. Gc 153–165, 157 μm long, 3.1–3.5, 3.2 \times as long as broad at middle, with SVo (Fig. 2H) plate-like triangular, relatively thick, apically rounded; IVo triangular double-layered, dorsally with blunt apex. Gs (Fig. 1I) 62–69, 66 μm long, with minute, subapical CD. HR 2.3–2.5, 2.4.

Female, pupa and larva

Unknown.

Distribution

The species has been known from Oriental and Palaeartic China.

Remarks

Only males of this species have been reported from Oriental and Palaeartic China. According to the original description (Wang & Zheng 1991: 100 fig. 2), the male possesses the following features: abdomen dark brown with yellow tergites I–II, and IV; humeral pit distinct, ovoid; antennal ratio ca 0.9; wing with a much-reduced anal lobe and a long costal extension; inferior volsella large, sub-rectangular; crista dorsalis small, preapical. Further, according to W. Liu (pers. comm. 2024), the males collected from Sichuan, Hunan, Ningxia and Gansu provinces in China have an antennal ratio of 0.93, 0.80, 0.80–0.87, and 0.86, respectively. The photographs of the holotype taken by X. Lin (pers. comm. 2022) show that the male has bicoloured legs (tibia dark brown apically with a broad white band), and superior volsella roundly protruded from the base of gonocoxite. The newly collected males from Oriental China are consistent with that of this species in the morphological features except the antenna, all of which were all lost in collecting. This collection includes an interesting and broad colour variation as in Fig. 2B.

In the original description of *R. (P.) brochus* Liu, Lin & Wang, 2014 collected from Oriental China, the authors (Liu *et al.* 2014a: 22) wrote that the male resembles that of *R. (P.) bifasciatus* Wang & Zheng,

1991. A significant difference between them is colouration on the tergite III, which is largely yellow and medially brown in the former, whereas entirely brown in the latter. However, the photograph of a paratype of *R. (P.) brochus* taken by X. Lin (pers. comm. 2022) has a brown posteromedial mark on the yellow tergite III, which also occurs in *R. (P.) bifasciatus* as an individual variation. *Rheocricotopus (P.) brochus* is a junior synonym of *R. (P.) bifasciatus*.

The male somewhat resembles that of *R. (P.) godavarius* from Nepal in the abdomen with white tergites I and IV, and the wing with a much-reduced anal lobe and a distinct costal extension, but differs from it in the entirely yellow tergite II, the higher antennal ratio (AR ca 0.9), and the large distinct humeral pit. According to the original description (Lehmann 1969: 361; 372 fig. 14b), in the latter the tergite II is brown, the antennal ratio is 0.3, and the humeral pit is small and indistinct.

***Rheocricotopus (P.) chalybeatus* (Edwards, 1929)**

Figs 3–4, Table 3

Spaniotoma (Trichocladus) chalybeata Edwards, 1929: 331.

Eukiefferiella urbana Goetghebuer, 1932: 101.

Trichocladus leruthi Goetghebuer, 1939: 2.

? *Rheocricotopus nemoacrostichalis* Chaudhuri & Sinharay, 1983: 401. **Syn. nov.**

Rheocricotopus chalybeatus bicoloratus Caspers & Reiss, 1989: 135. **Syn. nov.**

Rheocricotopus (Psilocricotopus) emeiensis Wang & Zheng, 1989: 311. **Syn. nov.**

Rheocricotopus (Psilocricotopus) nigrus Wang & Zheng, 1989: 311. **Syn. nov.**

Rheocricotopus okifoveatus Sasa, 1990: 129. **Syn. nov.**

Paratrachocladus yamasiroprimus Sasa, 1994: 30.

Rheocricotopus tedorisecundus Sasa, 1994: 51. **Syn. nov.**

Rheocricotopus shofukutertius Sasa, 1998: 31.

Eukiefferiella toneeefa Sasa & Tanaka, 2000: 3.

Rheocricotopus isigadeeus Sasa & Suzuki, 2000a: 7. **Syn. nov.**

Rheocricotopus yakulemeus Sasa & Suzuki, 2000b: 69. **Syn. nov.**

Rheocricotopus fukuabeus Sasa & Tanaka, 2001: 54.

Rheocricotopus inaquereus Sasa, Kitami & Suzuki, 2001: 19. **Syn. nov.**

Rheocricotopus inaxeyeus Sasa, Kitami & Suzuki, 2001: 19. **Syn. nov.**

Rheocricotopus taiwanensis Wang, Yan & Maa, 2004: 239. **Syn. nov.**

Rheocricotopus (Psilocricotopus) heterochros Liu, Song & Wang, 2014b: 102. **Syn. nov.**

Spaniotoma (Trichocladus) chalybeata – Tokunaga 1938: 319.

Rheocricotopus chalybeatus – Lehmann 1969: 354. — Sasa & Kawai 1987a: 36; 1987b: 43. — Sasa & Hasegawa 1988: 239. — Sasa *et al.* 1988: 47. — Sasa 1989: 67. — Sasa & Okazawa 1992: 103. — Sasa & Suzuki 1993: 114; 2000a: 6; 2001c: 21. — Ree 2013: 219.

Rheocricotopus (Psilocricotopus) chalybeatus – Sæther 1986: 82. — Sæther *et al.* 2000: 160. — Ashe & O’Connor 2012: 561. — Liu *et al.* 2014a: 22. — Yamamoto & Yamamoto 2014: 296.

Rheocricotopus (Psilocricotopus) emeiensis – Sæther *et al.* 2000: 161. — Ashe & O’Connor 2012: 563.

Rheocricotopus (Psilocricotopus) nigrus – Sæther *et al.* 2000: 161 — Ashe & O’Connor 2012: 566.

Rheocricotopus okifoveatus – Sæther *et al.* 2000: 161. — Ashe & O’Connor 2012: 566. — Yamamoto & Yamamoto 2014: 297; 2018: 518.

Rheocricotopus tedorisecundus – Sæther *et al.* 2000: 161. — Ashe & O’Connor 2012: 572. — Yamamoto & Yamamoto 2014: 298. — Fu *et al.* 2016: 272.

Eukiefferiella toneeefa – Yamamoto 2004: 92.

Paratrachocladus yamasiroprimus – Yamamoto 2004: 92.

Rheocricotopus shofukutertius – Yamamoto 2004: 92.

Rheocricotopus (Psilocricotopus) chalybeatus bicoloratus – Ashe & O’Connor 2012: 561.
Rheocricotopus isigadeeus – Ashe & O’Connor 2012: 565. — Yamamoto & Yamamoto 2014: 297.
— Fu *et al.* 2016: 263.

Rheocricotopus yakulemeus – Ashe & O’Connor 2012: 573. — Yamamoto & Yamamoto 2014: 298. —
Fu *et al.* 2016: 274.

? *Rheocricotopus nemoacrostichalis* – Ashe & O’Connor 2012: 566.

Rheocricotopus taiwanensis – Ashe & O’Connor 2012: 567.

Rheocricotopus inaquereus – Ashe & O’Connor 2012: 571. — Fu *et al.* 2016: 267.

Rheocricotopus inaxeyeus – Ashe & O’Connor 2012: 571. — Fu *et al.* 2016: 268.

Type material

Holotype of *Paratrichocladus yamasiroprimus* [misabeled as *Paratrichocladus yamasiroensis*]
JAPAN – Ishikawa • ♂; Yamashiro, Hot Spring Town; 11 Jul. 1991; M. Sasa leg.; NSMT, NSMT-I-Dip
4860.

Holotype of *Rheocricotopus tedorisecundus*
JAPAN – Ishikawa • ♂; Shiramine, Lake Tedor; 5 Aug. 1994; M. Sasa leg.; NSMT, NSMT-I-Dip 4959.

Holotype of *Rheocricotopus shofukutertius*
JAPAN – Toyama • ♂; Kurobe, Ikuji; 29 Aug. 1996; m. Sasa leg.; NSMT, NSMT-I-Dip 5099.

Holotype of *Rheocricotopus isigadeeus*
JAPAN – Okinawa • ♂; Ishigaki Island, Nagura River; 30 Jun. 1999; H. Suzuki leg.; NSMT, NSMT-I-
Dip 5287.

Holotype of *Rheocricotopus yakulemeus*
JAPAN – Kagoshima • ♂; Yaku Island, Nagata; 23 Mar. 1999; H. Suzuki leg.; NSMT, NSMT-I-Dip
5250.

Holotype of *Eukiefferiella toneeefa*
JAPAN – Gumma • ♂; Maebashi, Tone River; 1 Jul. 1999; N. Tanaka leg.; NSMT, NSMT-I-Dip 5327.

Holotype of *Rheocricotopus inaquereus*
JAPAN – Fukushima • ♂; Lake Inawashiro; 4 Sep. 1999; K. Kitami leg.; NSMT, NSMT-I-Dip 5353.

Holotype of *Rheocricotopus inaxeyeus*
JAPAN – Fukushima • ♂; Lake Inawashiro; 35 Aug. 2000; K. Kitami leg.; NSMT, NSMT-I-Dip 5376.

Syntypes of *Rheocricotopus okifoveatus*
JAPAN – Okinawa • 29 ♂♂, 11 ♀♀, 1 Pe; Genga River; 26–29 Nov. 1988 (emerged 13 Jan.–6 Feb.
1989); M. Sasa leg.; NSMT, NSMT-I-Dip 5836 to 5864.

Photographs of holotype specimens of *R. (P.) emeiensis* and *R. (P.) nigrus* provided by X. Lin (SHOU) were examined. No type specimens of *Spaniotoma (Trichocladus) chalybeata*, *R. (P.) chalybeatus bicoloratus*, *R. taiwanensis*, *R. (P.) heterochros* and *R. nemoacrostichalis* were examined.

Other material examined

JAPAN – Okinawa • 1 ♂, 1 ♀; Miyako Island; 2–15 Feb. 1982; M. Sasa leg.; NSMT, NSMT [No. 65:
34] • 1 ♀; Ishigaki Island; 1 Feb. 1982; M. Sasa leg.; NSMT, NSMT [No. 65: 91] • 1 ♂; Ishigaki Island,
Nagura River; 30 Jun. 1999; H. Suzuki leg.; NSMT, NSMT [No. 385: 16] • 1 ♂, 1 ♀; Okinawa Island,
Hija River; 14 Dec. 1981; M. Sasa leg.; NSMT, NSMT [No. 65: 79] – Fukushima • 1 ♂, 1 Pe; Iwaki,

Obisa River; 37°16' N, 140°57' E; 28 m a.s.l.; 1 Sep. 1989 (emerged 16 Sep 1989); H. Niitsuma leg.; PCHN • 1 ♂; Iwaki, Shiraiwa River; 37°08' N, 140°56' E; 39 m a.s.l.; 10 Aug. 1992; H. Niitsuma leg.; PCHN. – **Tochigi** • 1 Pe; Ichikai, Siota River, 36°36' N, 140°5' E; 133 m a.s.l.; 15 Apr. 1989; H. Niitsuma leg.; PCHN. – **Shizuoka** • 1 ♀ with Le, 1 L; Shimizu, Ihara River; 35°4' N, 138°27' E; 202 m a.s.l.; 20 Sep. 1989; H. Niitsuma leg.; PCHN • 1 ♂ (teneral); Harada River; 35°2' N, 138°22' E; 77 m a.s.l.; 3 Nov. 1995 (emerged 20 Nov. 1995); H. Niitsuma leg.; PCHN • 1 ♀; Kujiragaike Pond, unnamed stream; 35°2' N, 138°23' E; 70 m a.s.l.; 15 Oct. 1987; H. Niitsuma leg.; PCHN • 1 ♂ (teneral), 6 Pe, 4 L; Mariko

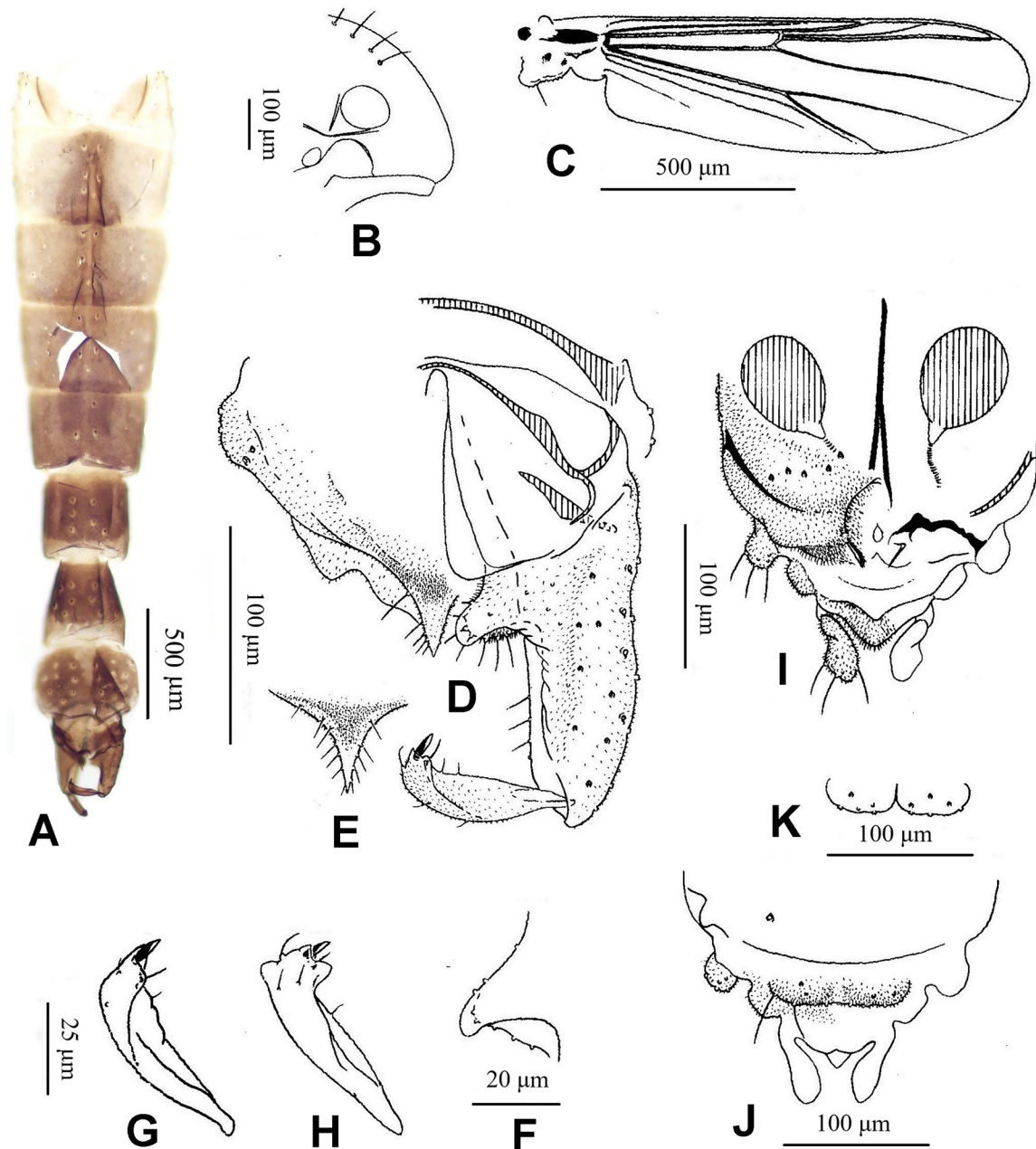


Fig. 3. *Rheocricotopus* (*P.*) *chalybeatus* (Edwards, 1929). **A.** ♂ (JNU 2402). **B–H.** ♂ (PCHN). **I–K.** ♀ (PCHN). **A.** Abdominal colour variation, dorsal view. **B.** Thorax with humeral pit, lateral view. **C.** Wing. **D.** Hypopygium, dorsal view. **E.** Anal point. **F.** Inferior volsella, showing variation. **G–H.** Gonostylus, showing variation. **I.** Genitalis, ventral view. **J.** Genitalis, dorsal view. **K.** Tergite IX, showing variation.

River; 34°56' N, 138°19' E, 39 m a.s.l.; 19 May 1985 (emerged 25–30 May 1985); H. Niitsuma leg.; PCHN • 2 ♂♂, 3 ♀♀; Ashikubo, stream; 35°2' N, 138°22' E; 77 m a.s.l.; 10 May 1986 (emerged 25–30 May 1985); H. Niitsuma leg.; PCHN • 1 ♂ with Pe; same data as for preceding; 15 Feb. 1996 (emerged 18 Feb. 1996); PCHN.

CHINA – **Guangdong** • 1 ♂, 1 ♂ (pharate); Guangzhou, Conghua, Lyutian, Mt Guifeng; 23°48' N, 114°01' E; 390 m a.s.l.; 31 Jul. 2011; H.Q. Tang leg.; JNU • 2 ♂♂ (pharate), 1 L; Guangzhou, Conghua, Lyutian, Xinlian and Fentian; 23°48' N, 113°58' E; 300 m a.s.l.; 27 Jun. 2014; H.Q. Tang leg.; JNU • 1 ♂, 1 ♂ (pharate), 1 Pe; Guangzhou, Huangpu, Xinlong, Jinkeng River; 23°15' N, 113°30' E; 130 m a.s.l.; 14–18 Dec. 2016; H.Q. Tang leg.; JNU • 2 ♂♂ (pharate); Maoming, Hehua and Chidong, Jianjiang River; 22°15' N, 110°42' E; 60 m a.s.l.; 3 Aug. 2013; H.Q. Tang leg.; JNU. – **Yunnan** • 1 ♂; Xishuangbanna, Mengla, Menglun, Luosuo River; 21°55' N, 101°16' E; 550 m a.s.l.; 29 Aug. 2014; H.Q. Tang leg.; JNU • 1 ♂; Dehong, Yingjiang, unnamed pond; 24°32' N, 97°42' E; 1000 m a.s.l.; 3 Jun. 2021; H.Q. Tang leg.; JNU • 1 ♂, 1 ♀ (pharate); Ximeng, Wengkake, Yingla Reservoir; 22°38' N, 99°35' E; 1170 m a.s.l.; 2 May 2022; Y.J. Liang leg.; JNU. – **Xinjiang** • 1 ♂; Altay, Burqin; 47°45' N, 86°46' E; 450 m a.s.l.; 10 Aug. 2022; J.D. Yin leg.; JNU 2402.

Description

Male (n = 22)

Total length 1.7–3.1, 2.4 mm.

COLOURATION (Fig. 3A). Body mostly dark brown with pale humeral pits on thorax. Usually abdomen entirely dark brown; occasionally few anterior tergites pale brown, or with pale lateral patches.

HEAD. Temporals 2–4, 4 (21). AR 0.91–1.23, 1.10 (21). Clypeus with 9–19, 13 setae. Lengths (μm) of Pm_{1-5} : 25–37, 31 (20); 30–62, 47 (20); 52–98, 79 (20); 74–128, 104 (20); 130–207, 168 (20), respectively. Pm_4/Pm_3 1.2–1.5, 1.3 (20); Pm_5/Pm_4 1.4–1.9, 1.6 (20). Pm_3 with 1–2, 1 (20) SCL; Pm_4 without SCL.

THORAX. Lateral Aps 2–7, 4 (21). Ac absent; Dc 9–21, 13, including 1–4, 2 H; Pa 3–4, 3 (21); Scts 4–13, 8 (21), uniserial. HP (Fig. 3B) very large, oval.

WING (Fig. 3C). Length 1.2–1.8, 1.5 (16) mm. C slightly extended beyond end of R_{4+5} ; extension 12–27, 18 (9) μm long. VR 1.0–1.2, 1.1 (18). R with 1–5, 3 (13) setae; R_1 and R_{4+5} bare. AnL developed, right-angled. Sq with fringe of 3–15, 8 (21) setae.

LEGS. P_1 with ti spur 34–52, 41 (21) μm long; P_2 with 2 ti spurs 12–20, 17 (21) and 10–20, 14 (21) μm long; P_3 with 2 ti spurs 32–49, 41 (21) and 11–20, 17 (21) μm long. P_2 with 2–5, 3 (21) Sch on ta_1 ; P_3 with 0–2, 0 (21) Sch on ta_1 . P_3 with ti comb of 9–13, 11 (20) bristles. Lengths and proportions of legs as in Table 3.

ABDOMEN. Hypopygium (Fig. 3D) with AnP (Fig. 3E) triangular, pointed apically, bearing 6–12, 9 (14) lateral setae. Gc 148–207, 181 (21) μm long with thin, triangular SVo; IVo (Fig. 3F) double-layered, dorsally with rounded, nearly bare apex. Gs (Fig. 3G–H) 57–84, 74 μm long, sharply curved upwards at apex, occasionally with weak outer projection; CD triangular, small, placed near apex of Gs, occasionally indistinct. HR 2.16–2.86, 2.45 (21).

Female (n = 9)

Total length 1.3–2.1, 1.7 mm.

COLOURATION. Similar to male. SCa pale brown

HEAD. Temporals 4–7, 5. Antenna with 5 flagellomeres; Fm_5 74–98, 89 (7) μm long, as long as or slightly longer than combined length of Fm_3 and Fm_4 ; AR 0.48–0.63, 0.57 (7). Clypeus with 13–20, 15 setae. Lengths (μm) of Pm_{1-5} : 30–42, 35 (7); 30–54, 44 (7); 49–76, 66 (7); 69–106, 92 (7); 130–202, 163 (7), respectively. Pm_4/Pm_3 1.3–1.5, 1.4 (7); Pm_5/Pm_4 1.5–1.9, 1.7 (7). Pm_3 with 1–2, 1 (8) SCI; Pm_4 without SCI.

THORAX. Lateral Aps 2–6, 4. Ac absent; Dc 10–23, 14 including 2–7, 4 H; Pa 3–5, 4. Sct 6–13, 9 in transverse row.

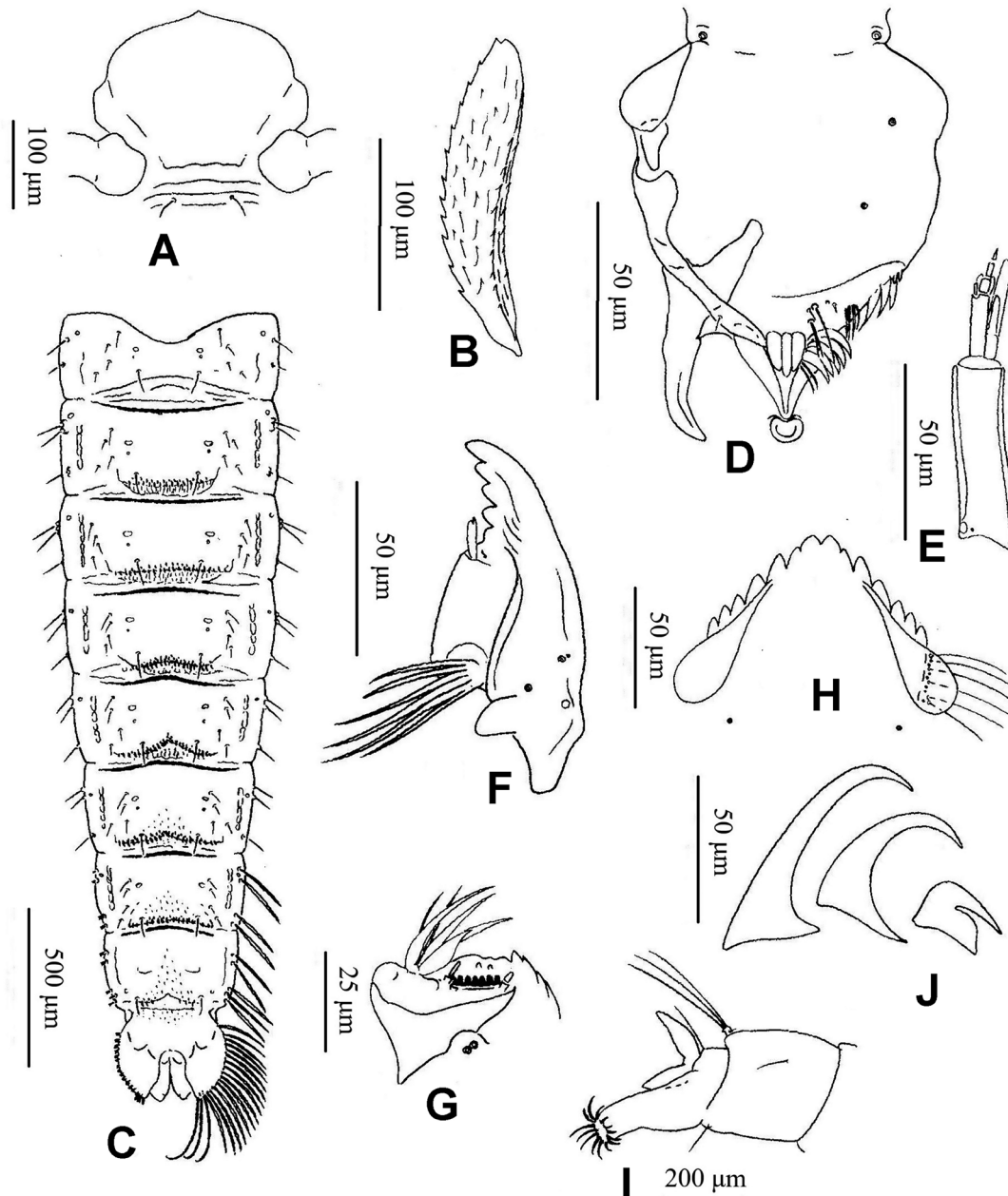


Fig. 4. *Rheocricotopus* (*P.*) *chalybeatus* (Edwards, 1929). **A–C.** Pupa (PCHN). **D–J.** Larva (PCHN). **A.** Frontal apotome. **B.** Thoracic horn. **C.** Abdomen, dorsal view. **D.** Labro-epipharyngeal region. **E.** Antenna. **F.** Mandible. **G.** Maxilla. **H.** Mentum. **I.** Posterior abdomen, lateral view. **J.** Posterior parapod claws.

WING. Length 1.2–1.7, 1.5 (8) mm. C extension slightly projected. VR 1.1–1.2, 1.1 (8). R with 3–11, 7 (7); R₁ with 2–8, 5 (7); R₄₊₅ with 2–10, 6 (7) setae. Sq with 4–15, 8 setae.

LEGS. P₁ with single ti spur 25–32, 28 (8) µm long; P₂ with 2 ti spurs 11–20, 16 (7) and 11–17, 15 (7) µm long; P₃ with 2 ti spurs 36–44, 41 (8) and 15–20, 18 (8) µm long. P₂ with 4–10, 6 (7) Sch on ta₁; P₃ with 0–6, 2 (7) Sch on ta₁. P₃ with ti comb of 10–14, 11 (8) bristles. Lengths and proportions of legs as in Table 3.

GENITALIA (Fig. 3I). S VIII with 8–15, 10 (5) setae in total. T IX (Fig. 3J–K) undivided or partly divided into 2 protrusions, with 8–15, 12 (8) setae in total. Gc IX with 4–11, 8 setae on each side. Cercus 42–86, 64 (8) µm long. No 81–125, 102 (7) µm long. SCa bare, 86–118, 104 (4) µm long, 1.5 (1) × as long as broad, with conical neck; duct without loop, their openings separate.

Pupa (n = 13)

Total length 2.3–3.4, 3.0 mm.

COLOURATION. Exuviae pale brown with dark abdominal Apo and posterior spines on T II–VIII.

CEPHALOTHORAX. FA (Fig. 4A) weakly pebbled, with FS 24–42, 32 (10) µm long. Thoracic horn (Fig. 4B) 125–263, 216 (11) µm long, and 5.1 (1) × as long as broad. Lengths (µm) of Pc_{1–3}: 65–130, 88; 81–160, 135 (12); 37–74, 55 respectively; these setae arranged in triangle. Lengths (µm) of Dc_{1–4}: 44–84, 64 (12); 20–54, 38 (12); 17–62, 38 (12); 32–66, 50 (12), respectively. Distances (µm) of Dc₁–Dc₂, Dc₂–Dc₃, Dc₃–Dc₄: 27–54, 39; 15–71, 54; 22–93, 45, respectively; these arranged in line. Distance ratio of Dc₁–Dc₂ to Dc₂–Dc₃ 0.52–1.00, 0.71.

ABDOMEN (Fig. 4C). T I–V without spinulation. T VI–VIII each with posterior triangular spinule patch along median line. T IX with anterior spinulation. Rows of spines present on posterior margins of T II–VIII, some of them on T II recurved; rows on T VIII weak or absent. Anteriorly directed spinules present, posterior to spine rows on T II–V. S III–VI with rows of small, sporadic spines on posterior margin. PSB absent. Segment I with 2 L-seta; II–VI each with 3 L-setae, VII with 4 LS-setae, VIII with 5 LS-setae. AL 185–295, 234 (11) µm long, 1.5–1.9, 1.7 (11) × as long as broad, with 13–25, 20 (12) lateral taeniae on posterior ³/₄; male genital sac 1.0–1.1, 1.1 (4) × as long as AL.

Larva (n = 6)

Total length 4.7–5.3, 5.1 (3) mm. Length of head capsule 339–397, 376 (4) µm.

COLOURATION. Head yellow with dark brown M, mandible and Po.

HEAD. CI 0.62–0.71, 0.65 (4). PM 185–207, 196 µm long. Dorsal surface (Fig. 4D) with frontoclypeolabrum and lateral labral sclerites. Labrum with bifid SI. At least one pair of ChB apically bifid. Lengths (µm) of 1st to 5th antennal segments: 54–57 (2), 18–20 (2), 5–7 (2), 4 (2), 5 (2) respectively. AR 1.7 (2). First segment (Fig. 4E) 3.2–3.5 (2) × as long as broad with RO and single SA, both located 0.15–0.18 (2) from base; with Bl 20 (2) µm long, reaching apex of 4th segment; Abl 11–15 (2) µm long. Second segment apically with LO 7 (2) µm long, and St 5 (1) µm long. Pm 57 (1) µm long. Mandible (Fig. 4F) 82–108 (2) µm long; Si with 5–6 branches apically serrated. Maxilla (Fig. 4G) with PG consisting of 6–7 (2) distinct teeth; anterior LCh 3.2–3.3 (2) × as long as broad. M (Fig. 4H) with 2 median teeth each bearing accessory tooth; combined width of 2 median teeth 21–28, 26 µm; 5 pairs of lateral teeth. Vmp 12–20, 16 µm wide at most, with 11–14, 12 (5) beard setae beneath.

BODY. With setae 123–160, 144 µm long. Pc (Fig. 4I) 23–33, 28 (5) µm long, 1.4–1.8, 1.5 (5) × as long as broad, with 1 spur and 3 anal setae. PP with 16 claws, small claws (Fig. 4J) squashed.

Table 3. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *chalybeatus* (Edwards, 1929), ♂♂ (n = 21) and ♀♀ (n = 8).

Male	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	441–637	510–735	314–480	206–333	167–265	108–167	78–108	0.60–0.67	2.1–2.5	1.0–2.0
	530	628	395	260	202	133	91	0.63	2.3	1.5 (18)
P2	402–608	392–598	196–333	98–186	69–127	39–69	49–79	0.50–0.56	3.3–4.0	1.8–3.0
	505	493	261	135	98	50	65	0.53	3.6	2.3 (16)
P3	402–617	490–735	274–451	147–245	118–196	58–98	59–98	0.55–0.61	2.8–3.2	2.3–3.9
	500	610	354	189	156	76	77	0.58	3.0	2.8 (17)
Female	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	402–598	480–696	265–421	157–274	127–225	88–137	78–98	0.55–0.61	2.3–2.7	–
	497	590	347	211	169	116	86	0.59	2.5	
P2	392–588	372–568	176–294	88–147	69–108	39–69	59–78	0.47–0.53	3.6–4.0	–
	483	467	230	113	84	50	64	0.49	3.8	
P3	372–559	451–666	255–392	137–206	108–167	59–88	69–88	0.54–0.59	2.9–3.2	–
	464	559	320	163	136	71	75	0.57	3.0	

Distribution

Rheocricotopus (*P.*) *chalybeatus* is widely distributed in the Palearctic and Oriental regions including East Asia.

Remarks

In East Asia, this species was reported first by Tokunaga (1938: 319) based on specimens from Kyoto and Osaka in Palearctic Japan, under the name *Spaniotoma* (*Trichocladius*) *chalybeata* Edwards, 1929. The species was transferred to *Rheocricotopus* subsequently and recorded by several authors: e.g., Sasa & Kawai (1987a: 36; 1987b: 43); Sasa & Hasegawa (1988: 239); Sasa *et al.* (1988: 47); Sasa (1989: 67); Sasa & Okazawa (1992: 103); Sasa & Suzuki (1993: 114; 2000a: 6; 2001c: 21); Ree (2013: 219); and Liu *et al.* (2014a: 22).

The male has the following features: antennal ratio ca 1.0; thorax with large humeral pits; scutum without acrostichal setae; wing with a right-angled anal lobe and a short costal extension; legs with well-developed pulvilli; superior volsella thin, triangular; inferior volsella double-layered with an apically rounded dorsal lobe; and gonostylus sharply bent upward at the apex, with a small preapical crista dorsalis. Further, the abdomen tergites II–V have 3 to 5 paired longitudinal rows of setae as illustrated in Sasa (1990: 156 fig. 17i) and Sasa & Suzuki (2000b: 115 fig. 24i).

Detailed re-examinations of the syntypes of *R. okifoveatus* Sasa, 1990, and the holotypes of *R. tedorisecundus* Sasa, 1994, *R. shofukutertius* Sasa, 1998, *R. isigadeeus* Sasa & Suzuki, 2000, *R. yakulemeus* Sasa & Suzuki, 2000, *R. inaquereus* Sasa, Kitami & Suzuki, 2001, *R. inaxeyus* Sasa, Kitami & Suzuki, 2001, *Paratrachocladus yamasiroprimus* Sasa, 1994 and *Eukiefferiella toneefea* Sasa & Tanaka, 2000 show those are junior synonyms of *R. (P.) chalybeatus* (Edwards, 1929). We found no significant difference among them.

Yamamoto & Yamamoto (2018: 518) wrote: “*Rheocricotopus okifoveatus* strongly resembles *R. chalybeatus* in many morphological characters. The former is separable from the latter by having a distinct crista dorsalis.” Almost all male specimens examined, including Chinese material, have a more or less distinct crista dorsalis. Occasionally, the crista dorsalis on the right and left differ in size and /

or prominence. We found no corresponding pupal type with a similar size of the crista dorsalis as in the associated males, showing this is individual variation of the crista dorsalis.

Likewise, we judged *R. (P.) taiwanensis* Wang, Yan & Maa, 2004 as a junior synonym of *R. (P.) chalybeatus*, although the holotype from Taipei wetland in Oriental China was not examined. Wang *et al.* (2004: 239) described *R. (P.) taiwanensis*, believing that the bare wing veins and the preapical, semicircular crista dorsalis were sufficient to separate it from the other members of this subgenus. After evaluating our extensive material from wide geographical populations, such features can be regarded as intraspecific variation.

In the original description of *R. tedorisecundus*, the author (Sasa 1994: 52) wrote: “inner lobe of gonocoxite is absent, gonostylus without preapical tooth, and ninth tergite with a pair of highly chitinized finger-like processes at the base of anal point.” A re-examination of the holotype revealed that the crista dorsalis is small, and the inferior volsella is crushed by the coverslip and the dorsal lobe is transformed into a finger-like process beneath the base of anal point. Such errors often occur in the descriptions of Sasa and his coworkers.

Also, when putting a label on the holotypes of *R. fukuabeus* Sasa & Tanaka, 2001, *R. inaxeus* and *Paratrichocladus yamasiroprimus*, Sasa and co-authors made several errors. According to Sasa & Tanaka (2001: 54), the holotype of *R. fukuabeus*, collected from the Tone River in Gumma Pref. on July 31, 2000, should be given the registration number 393: 62, but our re-examination of the specimen (NSMT-I-Dip 5339) revealed that this number actually is assigned to a specimen of *Polypedilum (Tripodura) masudai* (Tokunaga, 1938), with a label written, “*Tripodura*, Kahokugata Lagoon, Ishikawa Pref., 26.7.2000, Sumida, 393: 62”. Although *R. fukuabeus* had been synonymized with *R. (P.) chalybeatus* by Ashe & O’Connor (2012: 562) and Yamamoto & Yamamoto (2014: 296), the holotype may be lost. Further, after re-examination of the holotype of *R. inaxeus*, NSMT-I-Dip 5376 (No. 401 (2): 79), we found that the specimen possesses a label written “*Rheocricotopus inaquereus*, Lake Inawashiro, 5-VIII-2000, K. Kitami, L.T., 401 (2): 79, #43-10”. The features of the specimen are almost consistent with the original description of *R. inaxeus* rather than *R. inaquereus*, in the morphometric data, especially in the numbers of anteprenotal, dorsocentral, and squamal setae. The authors (Sasa *et al.* 2001: 19) possibly mistook the name *R. inaquereus* for the name *R. inaxeus* in labelling. The true holotype of *R. inaquereus* is the specimen NSMT-I-Dip 5353 (No. 397: 10). Although the specimen NSMT-I-Dip 4860 (No. 227: 98) was labeled “Holotype, *Paratrichocladus yamasiroensis*”, the features are well consistent with the original description of *Paratrichocladus yamasiroprimus*. The author (Sasa 1994: 30) evidently made a spelling mistake.

In the descriptions of *Paratrichocladus yamasiroprimus* and *Eukiefferiella toneeifea*, the authors (Sasa 1994: 30; Sasa & Tanaka 2000: 40, respectively) undervalued several features: well-developed humeral pit, large pulvilli in the legs and superior volsella in the gonocoxite, which is a combination peculiar to *Rheocricotopus*, rather than to *Paratrichocladus* and *Eukiefferiella*.

Judging from the original descriptions (Wang & Zheng 1989: 311), the features of *R. (P.) emeiensis* Wang & Zheng, 1989 and *R. (P.) nigrus* Wang & Zheng, 1989 are well consistent with those of *R. (P.) chalybeatus*. Additionally, photographs of the holotype males of *R. (P.) emeiensis* and *R. (P.) nigrus* taken by X. Lin (pers. comm. 2022) show that the superior volsella is plate-like, thin, triangular, and much resemble that of *R. (P.) chalybeatus*. Although we have not directly examined these holotypes, the Chinese species *R. (P.) emeiensis* and *R. (P.) nigrus* undoubtedly are junior synonyms of *R. (P.) chalybeatus*.

Rheocricotopus nemoacrostichalis Chaudhuri & Sinharay, 1983 was described from India. The male resembles that of *R. (P.) chalybeatus* in the antennal ratio of 0.81, the scutum without acrostichal setae,

the wing with a well-developed anal lobe and a slight costal extension, the gonocoxite with a double-layered, apically blunted inferior volsella, and the gonostylus with a sharply bent apex. According to the original description, however, the scutellum has setae in two rows, and the vein R_{2+3} ends closer to R_1 than to R_{4+5} , which are unusual features in *Rheocricotopus*. Further, the authors (Chaudhuri & Sinharay 1983: 403 fig. 2f) drew the superior volsella as somewhat projecting posteriorly, with an acute-angled apex. As we have not examined the holotype, we cannot confidently synonymize the species with *R. (P.) chalybeatus*. Here, *R. nemoacrostichalis* is treated as a questionable junior synonym of *R. (P.) chalybeatus*.

Rheocricotopus (s. str.) *heterochros* Liu, Song & Wang, 2014 was described based on males from Xinjiang Uygur Autonomous Region in Palaearctic China. According to the authors (Liu *et al.* 2014b: 102), the male is characterized by a bicoloured abdomen: tergite I entirely yellow; II–III yellow, posteromedially with a triangular brown patch; IV–V largely brown, laterally with yellow patches; remaining tergites entirely brown. Almost all features of the male agree with those of *R. (P.) chalybeatus bicoloratus* Caspers & Reiss, 1989 from Turkey. Although both holotypes of *R. (s. str.) heterochros* and *R. (P.) chalybeatus bicoloratus* are not examined here, we confirm that this colour pattern is mixed with the standard form in specimens collected from various geographical regions. The pattern varies between individuals in distinctness (see Fig. 3A) and is considered intraspecific variation.

***Rheocricotopus (P.) hidakadeeus* Sasa & Suzuki, 2001**

Fig. 5, Table 4

Rheocricotopus hidakadeeus Sasa & Suzuki, 2001b: 184.

Rheocricotopus (Psilocricotopus) hidakadeeus – Ashe & O'Connor 2012: 564. — Yamamoto & Yamamoto 2014: 297. — Fu *et al.* 2016: 262.

Type material

Holotype

JAPAN – Hokkaido • ♂; Nakasatsunai, Hidaka Mountain area; 26 Sep. 1998; H. Suzuki leg.; NSMT, NSMT-I-Dip 5367 [No. 401 (1): 51].

Description

Male (n = 1)

Total length 3.4 mm.

COLOURATION. Body mostly dark brown, with scutal vittae, Sct and Pn blackish brown. Legs dark brown.

HEAD. Temporals 10. AR 1.5. Clypeus with 14 setae. Lengths (μm) of Pm_{1-5} : 44, 74, 123, 172, 266, respectively. Pm_4/Pm_3 1.4, Pm_5/Pm_4 1.5. Pm_3 with 1 SCL.

THORAX. Lateral Aps 9. Ac 15, longest 25 μm long; Dc 16 including 4 H; Pa 5; Scts 12. HP (Fig. 5A) nearly triangular, very large.

WING (Fig. 5B). Length 2.3 mm. C well projected from end of R_{4+5} , extension 86 μm long. VR 1.1. R with at least 7 setae, R_1 with 1 seta, R_{4+5} scratched. AnL developed, nearly right-angled. Sq with 10 setae.

LEGS. P_1 with ti spur 52 μm long; P_2 with 2 ti spurs 20 and 17 μm long; P_3 with 2 ti spurs 54 and 22 μm long. P_2 with 4 Sch on ta_1 . P_3 with ti comb of 13 bristles. Lengths and proportions of legs as in Table 4.

ABDOMEN. Hypopygium (Fig. 5C) with AnP pointed apically, bearing 4 lateral setae. Gc 246 μm long, 3.1 \times as long as broad at middle, with SVo somewhat thick, triangular, bearing rounded apex; IVo double-layered, with apically rounded dorsal lobe. Gs 106 μm long, nearly straight in outer margin; CD triangular, distinct. HR 2.33.

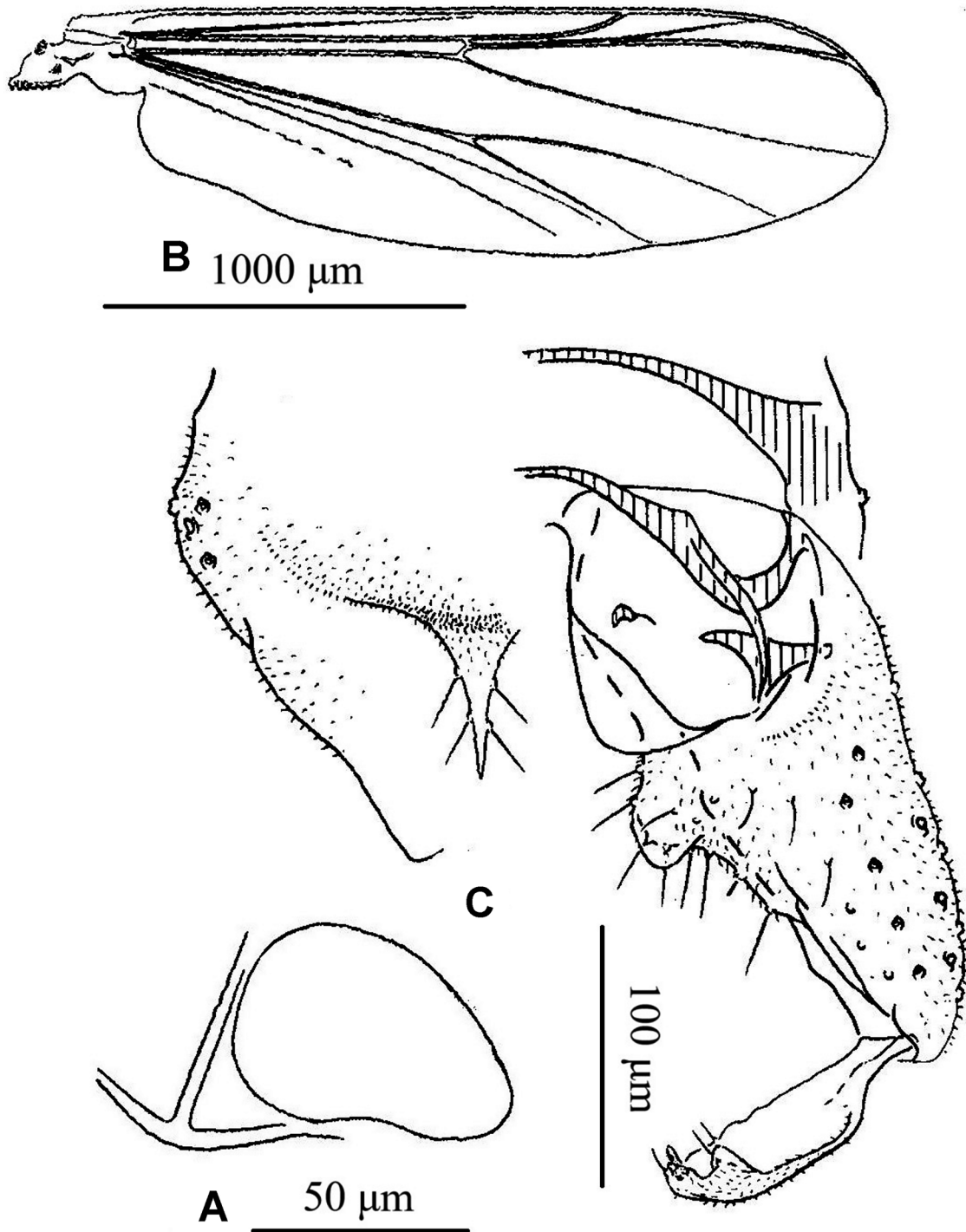


Fig. 5. *Rheocricotopus (P.) hidakadeeus* Sasa & Suzuki, 2001, holotype, ♂ (NSMT-I-Dip 5367). A. Humeral pit. B. Wing. C. Hypopygium, dorsal view.

Table 4. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *hidakadeeus* Sasa & Suzuki, 2001, ♂ (n = 1).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	784	862	755	382	294	196	108	0.88	2.45	1.8
P2	764	755	461	216	167	88	88	0.61	3.54	1.9
P3	804	951	588	284	235	118	108	0.62	3.14	2.5

Female, pupa and larva

Unknown.

Distribution

The species is known only from the type locality, Hokkaido in Palaeartic Japan.

Remarks

The male is very similar to that of *R. (P.) tokarakeleus* Sasa & Suzuki, 1995 in the wing with a right-angled anal lobe and a long costal extension; the triangular superior volsella; the double-layered inferior volsella bearing an apically rounded dorsal lobe; and the triangular, distinct crista dorsalis. However, re-examinations of the holotypes of both species suggest that the males may be separated by stronger acrostichal setae (25 μm long in the longest seta), the thicker superior volsella, and the gonostylus with a nearly straight outer margin. In *R. (P.) tokarakeleus*, the acrostichal seta is at most 15 mm long, the gonocoxite bears a relatively thin superior volsella, and the gonostylus is roundly convex in outer margin. Additionally, the holotype of *R. (P.) hidakadeeus* is much darker than that of *R. (P.) tokarakeleus*. The male was described from a badly damaged single specimen as in *R. (P.) tokarakeleus*. The former was collected from Palaeartic Japan, while the latter is from Oriental Japan. We treat these as two different species, until more material is available for both.

Rheocricotopus (P.) imperfectus Makarchenko & Makarchenko, 2005

Rheocricotopus (Psilocricotopus) imperfectus Makarchenko & Makarchenko, 2005: 126.

Rheocricotopus (Psilocricotopus) imperfectus – Ashe & O'Connor 2012: 564. — Liu *et al.* 2014a: 24.

Type material

Holotype

RUSSIA – **Sakhalin** • ♂; Dolinsky District, vicinity of Sokol, Belaya River; 15 Jul. 2001; E. Makarchenko leg.; FEBRAS.

The type specimen of *Rheocricotopus (P.) imperfectus* was not examined.

Distribution

Except for the type locality of the Russian Far East, the distribution in Palaeartic China is highly doubtful.

Remarks

Makarchenko & Makarchenko (2005: 126) described the species based on a male from Sakhalin Island in the Russian Far East. The male is similar to that of *R. (P.) chalybeatus* in lacking acrostichal setae and a gonostylus sharply turned up apically, but separable in the low antennal ratio (AR 0.47), the wing

with a reduced anal lobe and a moderately long costal extension (50 µm long), and the inferior volsella with a beak-like projection. In our opinion, the male of *R. (P.) chalybeatus* is characterized by the higher antennal ratio (AR ca 1.0), the wing with a right-angled anal lobe and a scarcely protruded costal extension, and the double-layered inferior volsella with a rounded apex.

Later, Liu *et al.* (2014a: 24) recorded *R. (P.) imperfectus* Makarchenko & Makarchenko, 2005 from Palaearctic China based on many specimens. These records have no detailed morphological account. However, at least two voucher specimens (NK 08301, 09290) collected from Shaanxi Province do not belong to the true *R. (P.) imperfectus* because of the presence of two distinct acrostichal setae in the specimen NK 09290, and of more than 20 short acrostichal setae in the specimen NK 08301, which was confirmed by our close examinations of the vouchers.

Until now, the female and immature forms are unknown.

***Rheocricotopus (P.) insularis* Makarchenko & Makarchenko, 2005**

Rheocricotopus (Psilocricotopus) insularis Makarchenko & Makarchenko, 2005: 129.

Rheocricotopus (Psilocricotopus) insularis – Ashe & O’Connor 2012: 564.

Type material

Holotype

RUSSIA – **Sakhalin** • ♂; Kuril Isls., Shashkotan Is., unnamed stream flowing down from Mt Pikovaya; 12 Aug. 1996; V. Teslenko leg.; FEBRAS.

The type specimen of *Rheocricotopus (P.) insularis* was not examined.

Distribution

The present species has been known only from the type locality, the Russian Far East.

Remarks

The species was described based on a male from Shiashkotan Island, Kuril Islands in the Russian Far East. The male is similar to that of *R. (P.) togakuroasi* (Sasa & Okazawa, 1992: 105) in the following combination: antennal ratio near 1.0; humeral pit large and oval; wing with a slightly reduced anal lobe; relatively high foreleg ratio of 0.80. According to Makarchenko & Makarchenko (2005: 129), the male has two-grouped anteprenotal setae medially and laterally, and an apically pointed, wedge-shaped inferior volsella. Although these features are unclear in the damaged holotype male of *R. (P.) togakuroasi*, the newly collected males from Japan possess lateral anteprenotals only, and a triangular but apically rounded inferior volsella.

The female and the immature stages are unknown until now.

***Rheocricotopus (P.) oiraprimus* Sasa, 1991**

Fig. 6, Table 5

Rheocricotopus oiraprimus Sasa, 1991: 72.

Rheocricotopus (Psilocricotopus) longiligulatus Yamamoto & Yamamoto, 2017: 75. **Syn. nov.**

Eukiefferiella amamipubescia [nec Sasa, 1990] – Sasa & Okazawa 1992: 108.

Rheocricotopus (*Psilocricotopus*) *oiraprimus* – Sæther *et al.* 2000: 161. — Ashe & O'Connor 2012: 566. — Yamamoto & Yamamoto 2014: 297.

Rheocricotopus (*Psilocricotopus*) *imperfectus* [nec Makarchenko & Makarchenko, 2005]. – Liu *et al.* 2014a: 24, partim.

Material examined

Holotype of *Rheocricotopus oiraprimus*

JAPAN – Aomori • ♂; Towada, Oirase River; 2 Jul. 1990; M. Sasa leg.; NSMT, NSMT 5989 [No. 202:51].

The type specimens of *R. (P.) longiligulatus* were not examined.

Other material examined

CHINA – Shaanxi • 1 ♂; Ankang, Ningshan, Xunyangba; 33°54' N, 108°54' E; 17 Aug. 1994; W.J. Bu leg.; NK 09290 [labelled as "*R. imperfectus*"].

JAPAN – Shizuoka • 1 ♂; Aoi-ku, Ashikubo, Funatoike Pond, stream; 35°2' N, 138°22' E; 77 m a.s.l.; 10 Oct. 1981; H. Niitsuma leg.; PCHN • 1 ♂; Aoi-ku, Ushizuma, Abe River; 35°4' N, 138°22' E; 99 m a.s.l.; 26 Oct. 1994; H. Niitsuma leg.; PCHN.

Description

Male (n = 3)

Total length 2.3–2.6, 2.5 mm.

COLOURATION. Head dark brown on vertex. Thorax largely blackish brown except yellow pleural membrane and HP. Abdomen (Fig. 6A–B) variously bicoloured; T I entirely yellow; T II or II–V yellow with lateral and middle longitudinal dark brown bands, or extensively dark brown; T IV–IX or VI–IX entirely dark brown. Legs largely brown; P₁ darker than P_{2–3}; all fe somewhat paler in anterior part.

HEAD. Temporals 2–4, 3. AR 0.49–0.52, 0.51. Clypeus with 9–12, 10 setae. Lengths (µm) of Pm_{1–5}: 34–37 (2); 44–59 (2); 106–118 (2); 116–118 (2); 214 (2), respectively. Pm₄/Pm₃ 1.0–1.1 (2); Pm₅/Pm₄ 1.8–1.9 (2). Pm₃ with 3–4, 3 SCl on circular depression.

THORAX. Aps 4–8, 6, divided into 2 groups. Ac 4 (2) near to apex of Scu, longest 20–25 (2) µm long; Dc 9–14, 12, including 2–4, 3 H; Pa 3; Scts 8 (2). HP (Fig. 6C) large, circular, and occasionally indistinct in part.

WING (Fig. 6D). Length 1.7–1.8, 1.7 mm. C moderately projected, extension 54–64, 58 µm long. VR 1.1. R with 4–6, 5 setae; R₁ and R₄₊₅ without setae. AnL much reduced. Sq with 0–2, 1 seta.

LEGS. P₁ with ti spur 39 (2) µm long; P₂ with 2 ti spurs 22–23, 23 and 18–20, 19 µm long; P₃ with 2 ti spurs 47–52, 49 and 22–23, 22 µm long. P₂ with one Sch on ta₁. P₃ with ti comb of 12–13, 12 bristles. Lengths and proportions of legs as in Table 5.

ABDOMEN. Hypopygium (Fig. 6E) with AnP pointed apically, bearing 7–9, 8 lateral setae. Gc 165–185, 175 µm long, 2.9–3.0, 3.0 × as long as broad at middle, with SVo thick, roundly protruded; IVo triangular. Gs (Fig. 6F) 76–81, 80 µm long; CD distinct, triangular or quadrate. HR 2.16–2.27, 2.20.

Pupa and larva

Unknown.

Distribution

This species has been known from Palaeartic Japan. Here, a record from Oriental China (Shaanxi) is added.

Remarks

A re-examination of the holotype male of *R. (P.) oiraprimus* Sasa, 1991 disclosed that actually eight scutellar setae are present and AR is 0.52, not 16 and 0.41, respectively, as in the original description (Sasa 1991: 72). Although the hypopygium is mounted in a supine position on the slide, a crista dorsalis is distinct at the subapex of gonostylus. The acrostichal setae are indistinct because of the poor mounting.

We re-examined the voucher specimens identified as *R. (P.) imperfectus* by Liu *et al.* (2014a: 24). One (NK 09290) of these specimens possesses strong anteprenotal setae in two groups and a few strong acrostichal setae near the apex of scutum. The male is well consistent with that of *R. (P.) oiraprimus* in

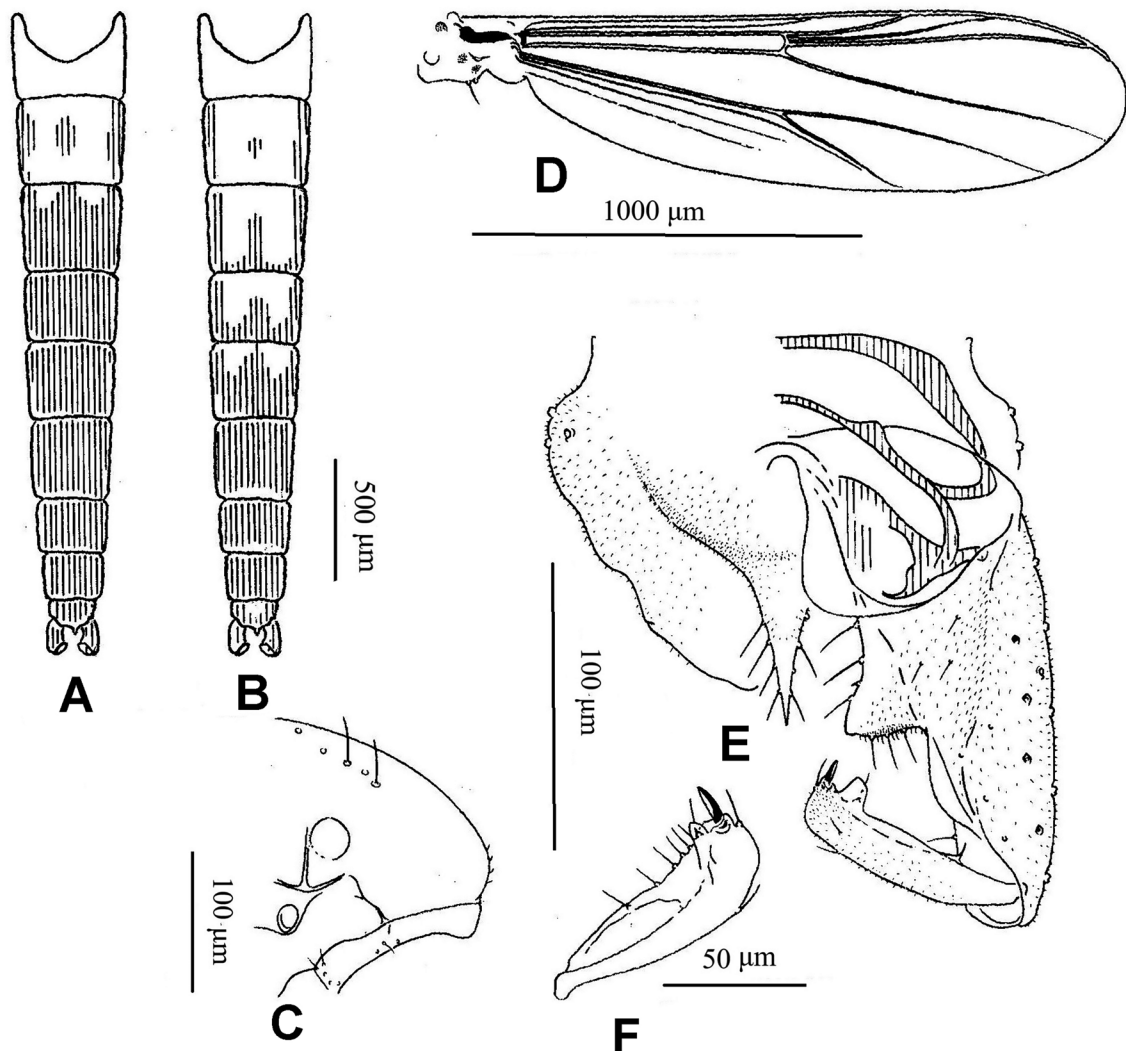


Fig. 6. *Rheocricotopus (P.) oiraprimus* Sasa, 1991. A–E. ♂ (PCHN). F. Holotype, ♂ (NSMT-I-Dip 5989). A–B. Abdominal colour pattern, showing variation. C. Thorax with humeral pit, lateral view. D. Wing. E. Hypopygium, dorsal view. F. Gonostylus.

Table 5. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *oiraprimus* Sasa, 1991, ♂♂ (n = 3).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	656–755	735–804	598–627	353–382	265–274	196–206	98–108	0.78–0.81	2.2–2.3	2.0–2.9 (2)
	706	774	614	372	271	203	105	0.79	2.2	–
P2	657–745	617–696	343–402	167–196	127–147	69–88	69–78	0.56–0.58	3.6–3.8	2.3–2.7
	696	657	372	183	137	78	75	0.57	3.6	2.5
P3	637–735	706–774	421–470	216–235	176–196	88–108	78–88	0.60–0.62	3.1–3.2	3.1–3.3 (2)
	679	742	451	225	186	101	85	0.61	3.1	–

morphological features, although the apices of hypopygial gonostylus are crushed. This is the first record of *R. (P.) oiraprimus* in the Oriental region.

The features of this male comply with the description of *R. (P.) longiligulatus* Yamamoto & Yamamoto, 2017, and thus are conspecific although the holotype of the latter species were not examined here. The female adult was described under *R. (P.) longiligulatus* by Yamamoto & Yamamoto (2017: 78) from Tokushima, Japan. According to them, tergite IX is elevated, but undivided.

Sasa & Okazawa (1992: 108) redescribed *Eukiefferiella amamipubescia* Sasa, 1990 based on two males from Toyama Prefecture, Japan. After re-examinations of these vouchers, Yamamoto *et al.* (2015: 108) concluded that these specimens belong to *R. (P.) oiraprimus*.

The male is similar to that of *R. (P.) bifasciatus* Wang & Zheng, 1991 in the bicoloured abdomen, the rounded humeral pit, the wing with a much-reduced anal lobe and a moderately extended costal vein, a triangular inferior volsella, and a distinct crista dorsalis, but is separable by the anteprenotal setae located in medial and lateral groups, the scutum anteriorly with a few strong acrostichal setae (longest setae 20–25 μm), the tergite II with lateral and middle dark brown bands, the legs with uniformly brown tibiae, and a thick, roundly protruded superior volsella. The male of *R. (P.) bifasciatus* is characterized by the anteprenotal setae positioned laterally only, the many relatively weak acrostichal setae (longest setae 10–12 μm), the entirely yellow tergite II, the legs distinctly bicoloured (tibia dark brown, apically with a broad white band), and the thin, triangular superior volsella.

Rheocricotopus (P.) robacki (Beck & Beck, 1964)

Trichocladius robacki Beck & Beck, 1964: 204.

Rheocricotopus kenorensis Sæther, 1969: 88.

Rheocricotopus (Psilocricotopus) robacki – Sæther, 1986: 79. — Ashe & O’Connor 2012: 567. — Liu *et al.* 2014a: 25.

Type material

Holotype

USA – Florida • ♂; Clay, Peter’s Creek; 23 May 1963; W.M. Beck and E.C. Beck leg.; USNM.

Specimens of *Rheocricotopus (P.) robacki* were not examined.

Distribution

Rheocricotopus (P.) robacki has been known from the Nearctic region for a long time. Although not all the specimens labelled as *R. (P.) robacki* in China have been re-examined, the distribution of the species in China is highly doubtful.

Remarks

Liu *et al.* (2014a: 25) reported the species from Palaearctic and Oriental China for the first time. However, these records of males have no morphological account. We re-examined four of these vouchers: NK 07945 from Xizang Autonomous Region, NK 21134 from Xinjiang Uygur Autonomous Region, and NK 24090 and 24091 from Jiangxi Province. All are hard to allocate to *R. (P.) robacki*: all have distinct acrostichal setae, although in one specimen (NK 24091) we found only four somewhat large setal marks near the scutal apex. According to Sæther (1969: 88, as *R. kenorensis* Sæther, 1969), the male of *R. (P.) robacki* has very weak and short acrostichal setae, less than 8 µm long. One (NK 07945) of the examined specimens belongs to *R. (P.) valgus* Chaudhuri & Sinharay, 1983 and two (NK 24090 and 24091) are very similar to those of *R. (P.) monovittatus* sp. nov., which is described here as new to science. The remaining (NK 21134) has bicoloured mid and hind legs, which are dark brown but broadly paler on the base of femur and the subapex of tibia. This contradicts the original description of *R. (P.) robacki* by Beck & Beck (1964: 204), who wrote: “legs and abdominal tergites blackish brown”.

Rheocricotopus (P.) serratus Liu, Lin & Wang, 2014

Fig. 7, Table 6

Rheocricotopus (Psilocricotopus) serratus Liu, Lin & Wang, 2014a: 28.

Rheocricotopus (Psilocricotopus) brachypus [nec Wang & Zheng, 1991] – Liu *et al.* 2014a: 19.

Type material

Holotype of *Rheocricotopus (P.) serratus*

CHINA – **Yunnan** • ♂; Dali, Eryuan, Niujie, Mici River; 26°25' N, 99°98' E; 25 May 1996; C.F. Zhou leg.; BDN, BDN 10058.

Other material examined

CHINA – **Hubei** • 1 ♂; Hefeng; 29°91' N, 110°3' E; 16 Jul 1999; B.C. Ji leg.; NK, NK 13894 [labelled “*Rheocricotopus (Psilocricotopus) brachypus*”]. – **Xizang** • 1 ♂; Nyingchi, Bayi, Shergmla Mountain; 29°64' N, 94°36' E; 28–30 Sep. 1997; T. Solhøy and J. Skartveit leg.; NK, NK 005 [labelled “*Rheocricotopus (Psilocricotopus) brachypus*”]. – **Anhui** • 1 ♂; Anhui, Lu'an, Jinzhai, Qingshan; 31°26' N, 115°56' E; 180 m a.s.l.; 2 May 2014; H.Q. Tang leg.; JNU. – **Guangdong** • 1 ♂; Fengkai, Heishiding NNR; 23°30' N, 111°47' E; 315 m a.s.l.; 20 Mar. 2021; H.Q. Tang leg.; JNU. – **Yunnan** • 1 ♂; Ruili, Mengxiu, Mengxiu Reservoir; 24°30' N, 97°43' E; 1675 m a.s.l.; 26 Oct. 2016; H.Q. Tang leg.; JNU, JNU 161124020 • 1 ♂; Pingbian, Daweishan National Forest Park, stream; 22°54' N, 103°42' E; 2150 m a.s.l.; 5 Jun. 2017; H.Q. Tang leg.; JNU, JNU 170613013 • 1 ♂; Jinping, Ma'andi, 22°46' N, 103°31' E; 1350 m a.s.l.; 8 Jun. 2017; H.Q. Tang leg.; JNU, JNU 170723008 • 1 ♂; Dali, Cangshan National Geopark, Qingbi Stream, Tianque Bridge; 25°39' N, 100°09' E; 2350 m a.s.l.; 20 May 2018; H.Q. Tang leg.; JNU, JNU 181210050 • 1 ♂; same data as for preceding; 14 Feb. 2022; X.F. Li leg.; JNU. – **Sichuan** • 1 ♂; Huili, Liuhua; 27°05' N, 102°23' E; 1540 m a.s.l.; 26 Apr. 2021; J.Y. Shi leg.; JNU, JNU 21092021.

Description

Male (n = 8)

Total length 2.5–3.2, 2.9 (7) mm.

COLOURATION. Body mostly dark brown. Thorax dark brown with somewhat paler pleural membrane; HP pale yellow; scutal vittae indistinct. Abdominal tergites and legs brown.

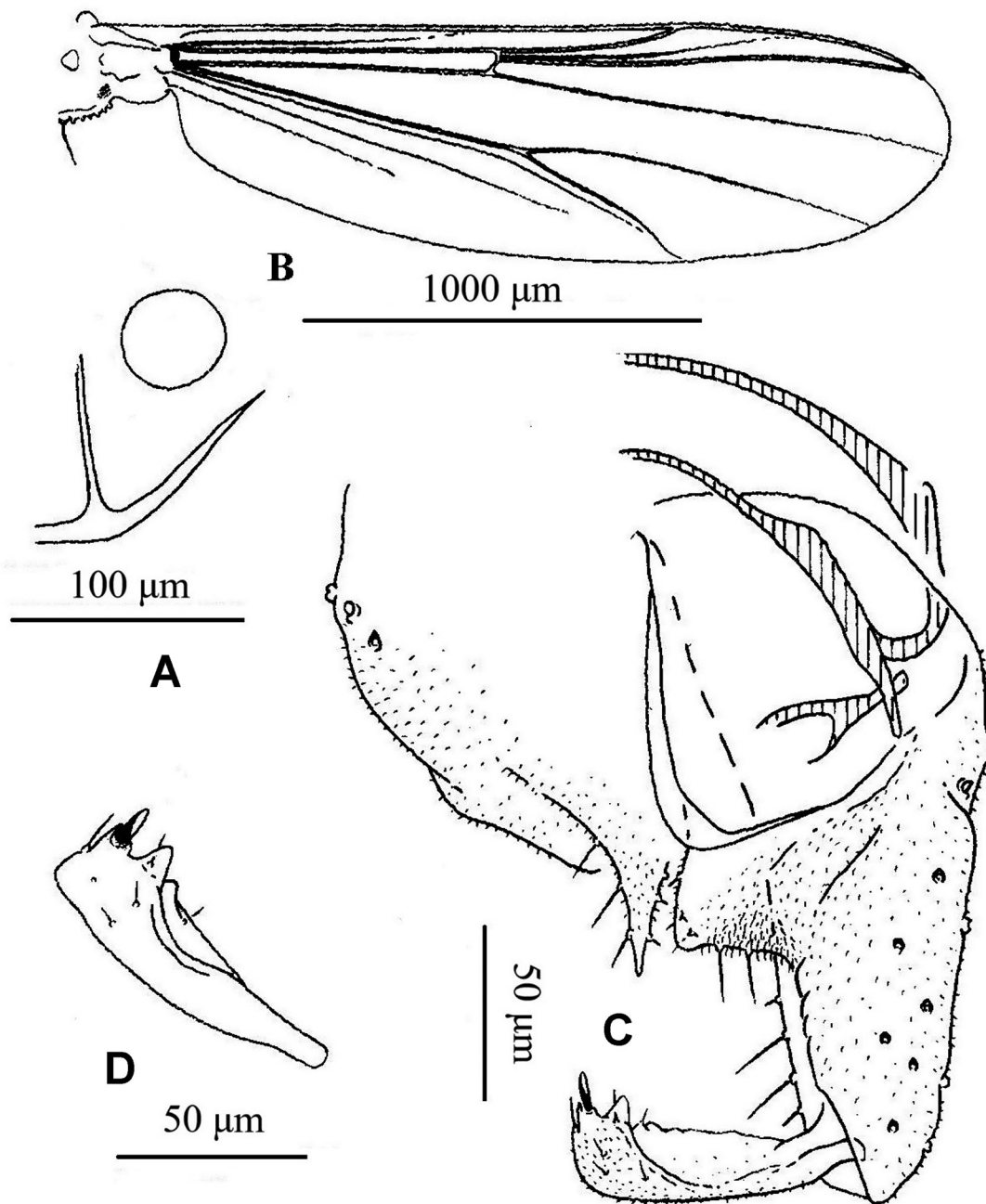


Fig. 7. *Rheocricotopus* (*P.*) *serratus* Liu, Lin & Wang, 2014, ♂ (JNU 181210050). **A.** Humeral pit. **B.** Wing. **C.** Hypopygium, dorsal view. **D.** Gonostylus.

Table 6. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) serratus* Liu, Lin & Wang, 2014, ♂♂ (n = 8).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	637–843 731	725–960 845	578–813 697 (7)	323–451 384 (7)	225–323 281 (7)	157–225 203 (7)	88–108 101 (7)	0.75–0.86 0.82 (7)	2.1–2.5 2.4 (7)	1.9–2.3 2.0 (6)
P2	627–813 720	608–804 718	343–490 413	167–235 202 (7)	118–167 146 (7)	69–88 77 (7)	69–88 74 (7)	0.51–0.61 0.57	3.4–4.1 3.8 (7)	1.5–2.9 2.4 (5)
P3	627–872 771	735–1029 880	441–647 550	245–343 295	196–255 225 (7)	98–147 120 (7)	88–98 92 (7)	0.58–0.65 0.62	2.8–3.2 3.0 (7)	3.4–4.5 4.0 (5)

HEAD. Temporals 3–4, 4 (7). AR 0.56–0.88, 0.78. Clypeus with 10–15, 13 setae. Lengths (μm) of Pm_{1-5} : 30–39, 35 (7); 44–59, 53 (7); 91–130, 111 (7); 128–172, 154 (6); 209–276, 245 (7), respectively. Pm_4/Pm_3 1.1–1.6, 1.4 (5); Pm_5/Pm_4 1.4–1.8, 1.6 (6). Pm_3 with 1–4, 2 (7) SCL.

THORAX. Lateral Aps 3–6, 5 (7); Ac 7–18, 12 (7), longest 12–20, 17 (7) μm long; Dc 5–10, 7 (7), including 0–1, 0 (7) H; Pa 3 (7); Scts 4–11, 8 (6). HP (Fig. 7A) oval, moderately large.

WING (Fig. 7B). Length 1.6–2.3, 2.0 mm. C extension slightly projected, 30–42, 36 (7) μm long. VR 1.1 (7). R with 3–6, 4 setae; R_1 bare; R_{4+5} 0–3, 1 seta. AnL obtuse. Sq with 8–15, 10 setae.

LEGS. P_1 with ti spur 42–52, 48 μm long; P_2 with 2 ti spurs 15–25, 20 and 15–22, 19 μm long; P_3 with 2 ti spurs 44–54, 50 and 17–25, 20 μm long. P_2 with 0–3, 2 (7) Sch on ta_1 . P_3 with ti comb of 11–16, 13 (6) bristles. Lengths and proportions of legs as in Table 6.

ABDOMEN. Hypopygium (Fig. 7C) with AnP pointed apically, bearing 6–8, 7 (7) lateral setae. Gc 185–221, 205 μm long, 3.2–3.8, 3.5 (6) \times as long as broad at middle, with SVo triangular, thin; IVo triangular, apically blunt. Gs (Fig. 7D) 74–89, 84 μm long, with CD narrow, relatively large, and triangular. HR 2.21–2.72, 2.46.

Female, pupa and larva

Unknown.

Distribution

This species has been known from several provinces in Oriental China.

Remarks

The species was described based on males from Yunnan, Zhejiang and Sichuan provinces, and Xizang Autonomous Region. In the original description, the authors (Liu *et al.* 2014a: 29 fig. 15) drew a huge, sawtooth-shaped crista dorsalis as occupying the apical half of gonostylus. Although they regarded the strange crista dorsalis as a discriminator of the species from the other members of this genus, a closer re-examination of the holotype disclosed that the specimen is teneral and armed with a moderately large, sharp, tooth-like crista dorsalis on the subapex of gonostylus. Further, we re-examined two voucher specimens (NK 13894, NK 005) identified as *R. (P.) brachypus* Wang & Zheng, 1991 by Liu *et al.* (2014a: 19). It was concluded that these belong to *R. (P.) serratus*, not to *R. (P.) brachypus*, mainly because of the higher values of antennal ratio (AR 0.93 in NK 13894, 0.67 in NK 005) and the LR_{1-3} (0.86, 0.61 and 0.62, respectively in NK 13894; 0.82, 0.61 and 0.61, respectively in NK 005), the oval, large humeral pit, and the simple, triangular inferior volsella.

The morphological features of this male are consistent with those of males newly collected from Yunnan, Sichuan, and Anhui provinces in Oriental China. The male is characterized by the moderately large, oval humeral pit; the antennal ratio less than 1.0, but more than 0.5; the scutum with distinct acrostichal setae; the wing with an obtuse anal lobe and a slight costal extension; the triangular, thin superior volsella; and the relatively large, usually sharpened tooth-like, crista dorsalis.

The male is similar to that of *R. (P.) chapmani* (Edwards, 1935) in having the large and ovoid humeral pits, a scutum with distinct acrostichal setae, a triangular crista dorsalis, but separable by the lower antennal ratio (AR 0.56–0.88) and the higher foreleg ratio (LR₁ 0.75–0.86). According to Sæther (1986: 77), in *R. (P.) chapmani* the antennal ratio is 1.18–1.29 and the LR₁ is 0.70–0.74.

Rheocricotopus (P.) tibialis Wang & Zheng, 1991

Rheocricotopus tibialis Wang & Zheng, 1991: 99.

Rheocricotopus (Psilocricotopus) tibialis – Sæther *et al.* 2000: 161.

Rheocricotopus (Rheocricotopus) tibialis – Ashe & O'Connor 2012: 572. — Liu *et al.* 2014b: 105.

Type material

Holotype

CHINA – Sichuan • ♂; Mt Jinfo; 29° N, 107°6' E; 1800 m a.s.l.; 9 May 1986; X. Wang and L. Cheng leg.; NKU.

Photographs of the holotype specimen of *R. tibialis* provided by X. Lin (SHOU) were examined.

Distribution

The holotype was collected from Mt Jinfo in Sichan Province (now Chongqing Municipality), Oriental China. Later, the species was recorded from the Palaearctic China, too, but it requires a re-examination and re-consideration.

Remarks

The species was first described for a single male from Sichan Province in Oriental China. According to the original description (Wang & Zheng 1991: 104), the male has the following features: abdomen bicoloured with yellow segments I and IV; humeral pit large and ovoid; foreleg ratio high (LR₁ 0.9); wing with a well-projected costal extension, a much-reduced anal lobe, and squamal setae reduced in number. Further, from photographs of the holotype male taken by X. Lin (pers. comm. 2022) we confirm that the gonocoxite possesses a relatively thin, triangular superior volsella and a triangular inferior volsella with a small, beak-like apex, and there is only a small corner projected inwardly on the subapex of the gonostylus as in Fig. 11H (*R. (P.) valgus* Chaudhuri & Sinharay, 1983) and the crista dorsalis is indistinct. Although the authors (Wang & Zheng 1991: 104) wrote: “Crista dorsalis of gonostylus absent”, the size and prominence may look different depending on the mounting orientation, not only the individual variation. The bicoloured abdomen and the cuneiform wing often occur in the subgenus *Psilocricotopus*, rather than *Rheocricotopus* s. str. Thus, the species is tentatively placed in the subgenus *Psilocricotopus* until the immature stages and more adult male specimens of this species are available. Liu *et al.* (2014b: 105) recorded several males from Sichuan and Hubei provinces, and Ningxia Hui Autonomous Region in China. These voucher specimens should be re-examined focusing on the crista dorsalis.

The male resembles that of *R. (P.) amamipubescius* (Sasa, 1990) in having ovoid humeral pits; wings with a very long costal extension, a much-reduced anal lobe, and squamal setae reduced in number; and the gonostylus with no crista dorsalis, but differs from it in the bicoloured abdomen with a yellow

segment IV, the triangular and relatively thin superior volsella, and the inferior volsella with a beak-like apex.

The female adult and the immature stages are yet unknown.

Rheocricotopus (P.) togakuroasi (Sasa & Okazawa, 1992)

Figs 8–9, Table 7

Rheocricotopus (Paracricotopus) togakuroasi Sasa & Okazawa, 1992: 105.

Rheocricotopus (Paracricotopus) akagisecundus Kikuchi & Sasa, 1994: 114. **Syn. nov.**

Rheocricotopus gotocedeus Sasa & Suzuki, 2001a: 145. **Syn. nov.**

Rheocricotopus (Psilocricotopus) akagisecundus – Sæther *et al.* 2000: 160, as *R. (P.) agakisecundus* (misspelling). — Ashe & O’Connor 2012: 559. — Yamamoto & Yamamoto 2014: 296.

Rheocricotopus (Psilocricotopus) togakuroasi – Sæther *et al.* 2000: 161.

Paracricotopus togakuroasi – Ashe & O’Connor 2012: 456. — Yamamoto & Yamamoto 2014: 285. — Namayandeh & Ghaderi 2025: 152.

Rheocricotopus (Psilocricotopus) gotocedeus – Ashe & O’Connor 2012: 564. — Yamamoto & Yamamoto 2014: 296.

Type material

Holotype of *Rheocricotopus (Paracricotopus) togakuroasi*

JAPAN – **Toyama** • ♂; Toga, Momose; 11 Aug. 1990; T. Okazawa and M. Sasa leg.; NSMT, NSMT-I-Dip 4757 [No. 189: 51].

The holotype specimens of *R. (Paracricotopus) akagisecundus* and *R. gotocedeus* were not examined.

Other material examined

JAPAN – **Shizuoka** • 1 ♀ (pharate) with Le, 2 L; Shimizu, Yanbara, Yanbara River; 35°3′ N, 138°27′ E; 170 m a.s.l.; 17 May–13 Jun. 1988; H. Niitsuma leg.; PCHN • 1 Pe; Suruga-ku, Yoshida River; 35°59′ N, 138°26′ E; 49 m a.s.l.; 8 Feb. 1988; H. Niitsuma leg.; PCHN • 1 ♂; Aoi-ku, Ashikubo; 35°2′ N, 138°21′ E; 84 m a.s.l.; 15 Feb. 1996 (emerged 26 Mar. 1996); H. Niitsuma leg.; PCHN • 1 ♂ with Pe, 1 ♂ (pharate); Aoi-ku, Dainichi Pass, unnamed stream; 35°11′ N, 138°15′ E; 1100 m a.s.l.; 4 May 1998 (emerged 10 May 1998); H. Niitsuma leg.; PCHN • 1 ♂ with Pe; same data as for preceding; 28 Mar 2001 (emerged 7 Apr. 2001); PCHN • 1 Pe with Le; same data as for preceding; 16 Sep 2022; PCHN. – **Fukushima** • 1 ♂ with Pe and Le, 1 P with Le; Iwaki, Yaguki; 37°8′ N, 140°54′ E; 123 m a.s.l.; 15 Aug. 2001 (emerged 30 Aug. 2001); H. Niitsuma leg.; PCHN • 1 ♂ with Pe; same data as for preceding; 18 Mar. 2007 (emerged 29 Mar. 2007); PCHN.

CHINA – **Sichuan** • 1 ♂; Liangshan, Huili, Liuhua; 27°5′ N, 102°23′ E; 1540 m a.s.l.; 26 Apr. 2021; J.Y. Shi leg.; JNU.

Description

Male (n = 6)

Total length 2.2–3.1, 2.5 mm.

COLOURATION. Head dark brown on vertex. Body mostly yellowish brown with thorax darkened on 3 scutal vittae, Sct, Pn and Pe; occasionally thorax entirely dark brown except pale HP and its surroundings. Legs uniformly dark brown.

HEAD. Temporals 3–5, 4. AR 0.81–1.0, 0.9. Clypeus trapezoid with 10–15, 13 setae. Lengths (μm) of Pm_{1-5} : 37–47, 40 (4): 52–62, 57 (4); 98–148, 120 (5); 111–160, 134 (5); 209–303, 246 (5), respectively. Pm_4/Pm_3 1.1–1.3, 1.1 (5); Pm_5/Pm_4 1.6–1.9, 1.8 (5). Pm_3 with 2–4, 3 SCl; occasionally 1 (2) SCl present on Pm_4 .

THORAX (Fig. 8A). Lateral Aps 1–6, 4 (5). Ac 10–15, 13, longest 20–28, 24 μm long; Dc 7–10, 9, including 1–3, 2 H; Pa 3, 3. Scts 4–8, 6. HP large, oval; usually dorsal part indistinct in outline.

WING (Fig. 8B). Length 1.5–2.5, 1.9 mm. C extended moderately beyond end of R_{4+5} ; extension 44–64, 55 μm long. VR 1.1–1.2, 1.1. R with 5–17, 9 setae. R_1 and R_{4+5} usually bare; occasionally R_1 with 1 (2) seta, R_{4+5} with 2 (1) setae. AnL developed, obtuse. Sq with 5–8, 6 setae.

LEGS. P_1 with ti spur 46–57, 51 μm long; P_2 with 2 ti spurs, 18–25, 20 and 15–22, 18 μm long; P_3 with 2 ti spurs, 39–52, 46 and 15–22, 19 μm long. P_2 with 1–5, 3 Sch on ta_1 . P_3 with ti comb consisting of 10–12, 11 bristles. Lengths and proportions of legs as in Table 7.

ABDOMEN. T I–VIII (Fig. 8C) with setae irregularly arranged. Hypopygium (Fig. 8D) with Anp pointed apically, bearing 8–11, 9 (5) lateral setae. Gc 157–212, 182 μm long, 3.2–4.0, 3.5 \times as long as broad at middle; SVo (Fig. 8E) thin, roundly protruded; IVo simple, triangular, with blunt apex. Gs (Fig. 8F) 79–101, 89 μm long, slender, tending to protrude outwards at subapex, with low, broad and apically rounded CD. HR 1.9–2.3, 2.0.

Pharate female (n = 1)

COLOURATION. Vertex dark brown. Thorax yellow with dark brown 3 vittae, Sct, Pn and Pe. Abdomen yellowish brown. SCa pale yellow.

HEAD. Temporals 4 or 5. Antenna 5-segmented with terminal Fm 89 μm long.

THORAX. Ac present. Dc 8, including 2 H; Pa 3.

GENITALIA. S VIII with 8 setae in total. T IX (Fig. 8F) undivided, with 12 setae. Cercus 77 μm long. No 94 μm long. SCa 69 μm long, 1.2 \times as long as broad.

Pupa (n = 8)

Total length 2.8–3.8, 3.1 mm.

COLOURATION. Exuviae pale brown with dark abdominal Apo and middle and posterior spines on abdomen.

CEPHALOTHORAX. FA (Fig. 9A) weakly rugose, with FS 44–49, 47 (5) μm long. Scutum weakly pebbled dorsally. Thoracic horn (Fig. 12L) 261–389, 309 (7) μm long, 3.7–5.1, 4.4 (5) \times as long as broad. Lengths (μm) of Pc_{1-3} : 111–167, 133 (5); 185–221, 198 (5); 57–111, 74 (5), respectively. Lengths (μm) of Dc_{1-4} : 57–79, 69 (5); 30–69, 45 (5); 17–44, 29 (5); 39–76, 58 (5), respectively. These dorsocentral setae arranged in straight line. Distances (μm) of Dc_1 – Dc_2 , Dc_2 – Dc_3 , Dc_3 – Dc_4 : 69–91, 80 (5); 39–91, 60 (5); 15–20, 18 (5), respectively; distance ratio of Dc_1 – Dc_2 to Dc_2 – Dc_3 0.92–1.75, 1.42 (5).

ABDOMEN (Fig. 9B). T I–II without spinulation; T III–VI and VIII each with sporadic, faint, more or less extensive spinulation; T VII with faint median spinulation; T IX with anterior spinulation. T IV–VI usually with median strong spine patch, occasionally without these median spines; T IV with 0–7, 2 median spines, longest 2–7, 4 (5) μm long; T V with 0–10, 5 median spines, longest 5–15, 10 (7) μm long; T VI with 0–20, 10 median spines, longest 10–17, 13 (7) μm long. T II with rows of hooklets on

posterior margin. T III–VIII each with rows of spines on posterior margin. Anteriorly directed spinules present, posterior to hooklet or spine rows on T II–V. S V–VI each with rows of spines, occasionally of 2 or 3 spines, on posterior margin. PSB present on segments II–III. Segment I with 2 L-setae; II–VI each with 3 L-setae; VII with 4 LS-setae; VIII with 4–5, 4 (4) LS-setae, or 1 simple L- and 4 LS-setae (3). $L_{1,2}$ -setae on segments II–VI long, nearly $\frac{1}{2} \times$ as long as segment length, some of them apically split. AL 221–265, 245 (5) μm long, 1.9–2.1, 2.0 (5) \times as long as broad, with 5–11, 8 lateral taeniae on posterior $\frac{1}{3}$ – $\frac{1}{2}$.

Larva (n = 6)

Total length 3.5 (1) mm. Length of head capsule 387–411 (2) μm .

COLOURATION. Head yellow with darkened PM.

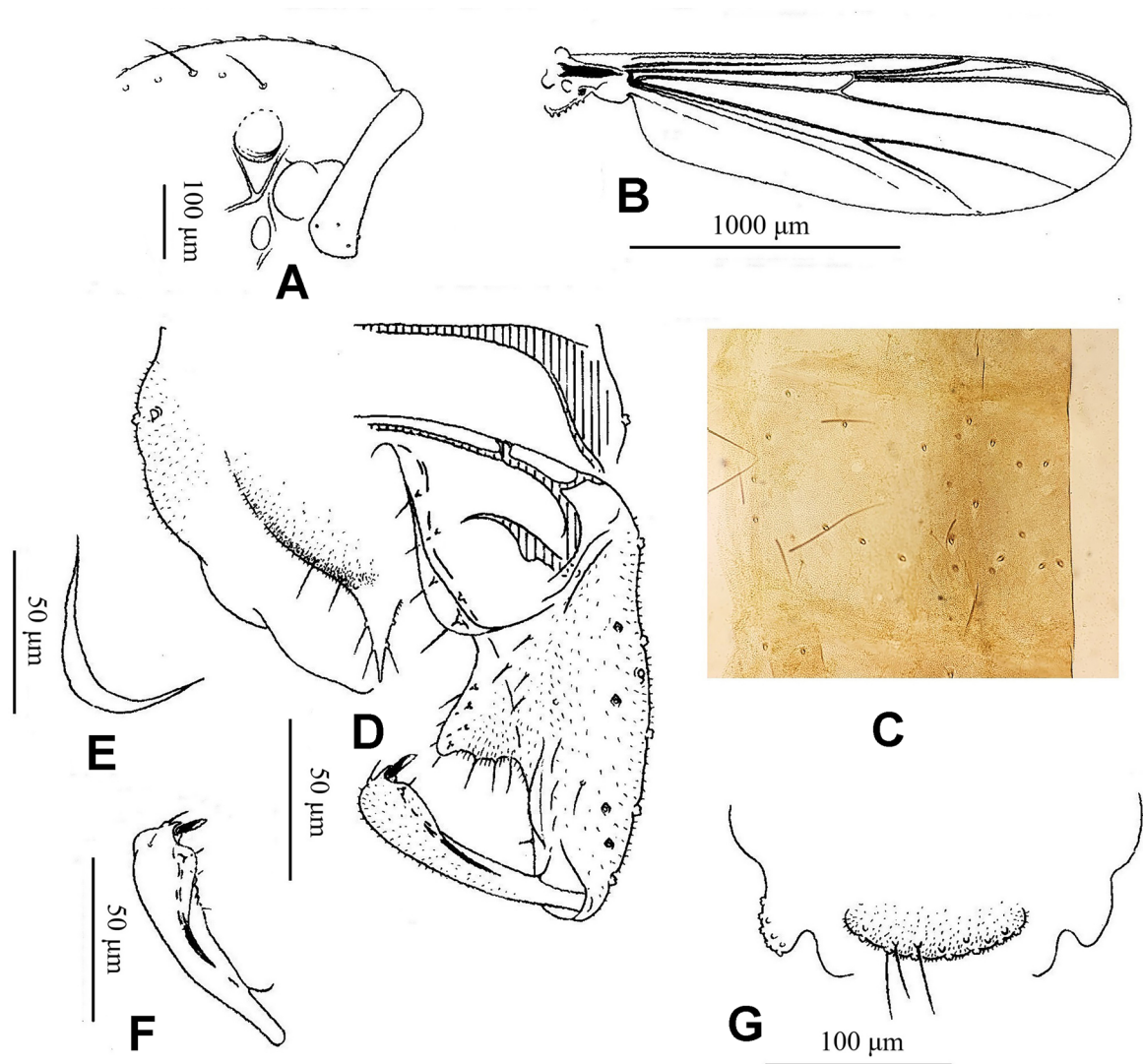


Fig. 8. *Rheocricotopus (P.) togakuroasi* (Sasa & Okazawa, 1992). **A–B, D–F.** ♂ (PCHN). **C.** Holotype, ♂ (NSMT-I-Dip 4757). **G.** ♀ (PCHN). **A.** Thorax with humeral pit, lateral view. **B.** Wing. **C.** Tergite IV, showing setal arrangement. **D.** Hypopygium, dorsal view. **E.** Superior volsella. **F.** Gonostylus, showing variation. **G.** Genitalia, dorsal view, showing tergite IX.

HEAD. CI 0.7 (1). PM 207–239, 221 μm long. Dorsal surface (Fig. 9C) with frontoclypeolabrum and lateral labral sclerites. Labrum with bifid SI. At least one pair of ChB apically bifid. Lengths (μm) of 1st–5th antennal segments: 68–85, 78 (5); 23–28, 25 (5); 7–8, 8 (5); 6–7, 6 (5); 7 (5) respectively. AR 1.6–1.8, 1.7 (5). First segment (Fig. 9D) 3.4–4.5, 4.0 (5) \times as long as broad, with RO located 0.10–0.18, 0.15 (5) from base and single SA located 0.10–0.14, 0.12 (4); apically with BI 41 (1) μm long, reaching 4th segment; Abl 23–26, 24 (3) μm long. Second segment apically with LO 8–10, 9 (5) μm long, and St 2–3, 3 (4) μm long. Pm 64–70, 67 (5) μm long. Mandible (Fig. 9E) 127–143, 136 (4) μm long; Si with

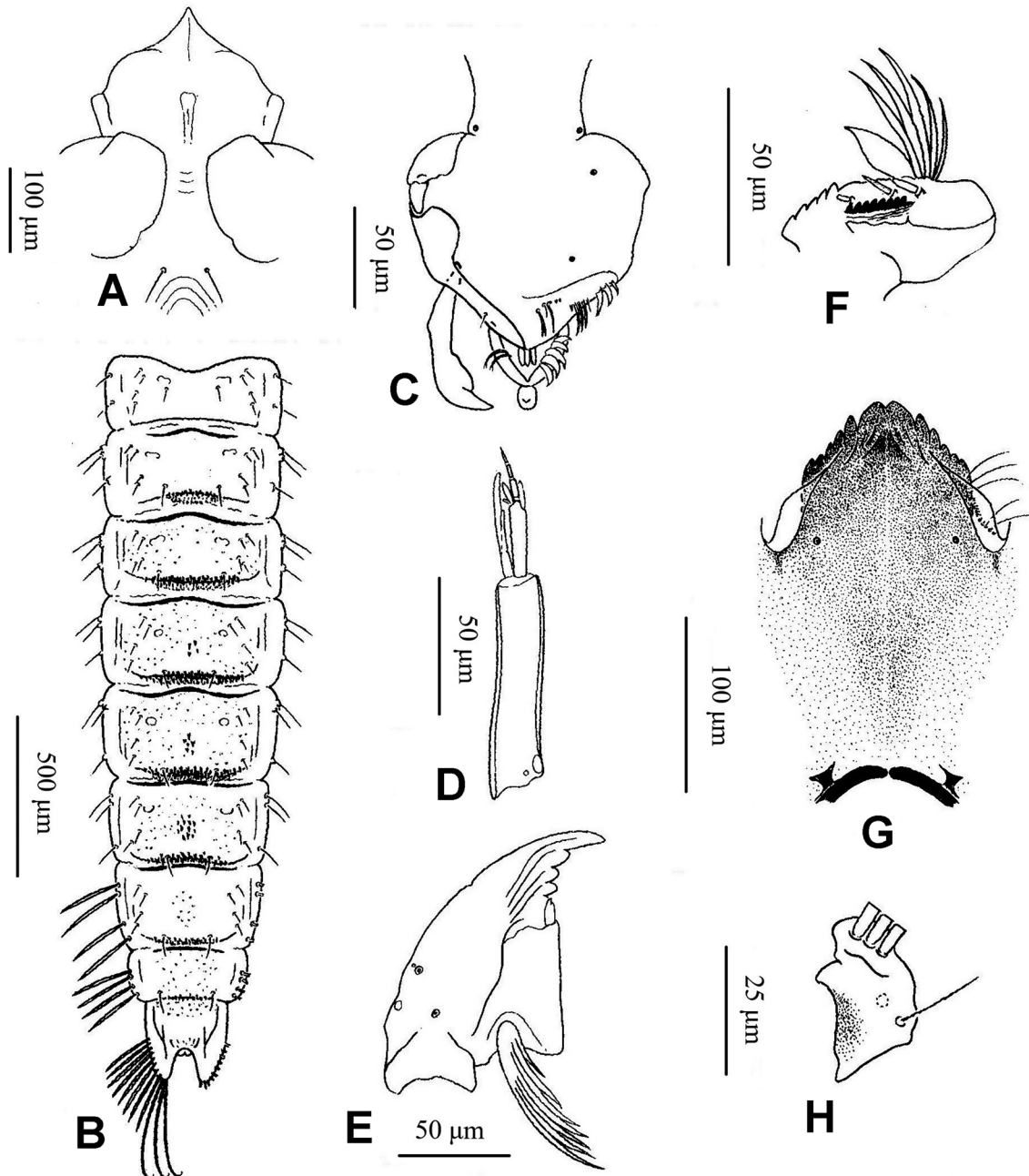


Fig. 9. *Rheocricotopus* (*P.*) *togakuroasi* (Sasa & Okazawa, 1992). **A–B.** Pupa (PCHN). **C–H.** Larva (PCHN). **A.** Frontal apotome. **B.** Abdomen, dorsal view. **C.** Labro-epipharyngeal region. **D.** Antenna. **E.** Mandible. **F.** Maxilla. **G.** Postmentum. **H.** Procercus.

Table 7. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) togakuroasi* (Sasa & Okazawa, 1992), ♂♂ (n = 6).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	627–882	696–941	568–755	343–421	265–323	186–225	98–118	0.80–0.86	2.1–2.4	2.1–2.8
	742	799	663	385	297	209	105	0.83	2.2	2.4 (5)
P2	588–843	588–833	333–480	167–225	108–176	59–88	69–88	0.57–0.61	3.5–4.1	2.1–3.3
	694	691	405	193	136	74	74	0.59	3.8	2.8 (5)
P3	588–882	696–1019	421–608	216–314	176–265	88–118	78–98	0.60–0.63	3.0–3.2	3.0–3.9
	709	831	506	261	211	105	88	0.61	3.1	3.4

6 or 7 branches. Maxilla (Fig. 9F) with PG consisting of 9 distinct teeth; anterior LCh 2.7–4.5, $3.4 \times$ as long as broad. M (Fig. 9G) with 2 simple median teeth; combined width of these median teeth 31–34, 33 μm . Amp 13–20, 17 μm wide at most, with 15–17, 16 beard setae beneath.

BODY. With setae 98–148, 135 μm long. Pc (Fig. 9H) 33–34, 34 (4) μm long, 1.7–1.8, 1.7 (4) \times as long as broad, with 1 spur and 3 anal setae. PP with 15 or 16 claws, small claws somewhat squashed.

Distribution

The species has been known only from Palaeartic Japan. Here, a record is added from Oriental China (Sichuan).

Remarks

Sasa & Okazawa (1992: 105–106) described this species based on a single male from Toyama Pref., Japan, and wrote: “The distribution of setae on abdominal tergites are arranged into two transverse rows and thus it has characters typical of the genus *Paracricotopus* Thienemann and Harnish, 1932”. However, a re-examination of the holotype disclosed that the tergal setae actually are irregularly arranged (see Fig. 8C). Additionally, humeral pits are large on the postpronotum as written in the original description (Sasa & Okazawa 1992: 106), “scutum with a pair of large humeral pits”. The species does not belong to the genus *Paracricotopus*, but to the genus *Rheocricotopus*.

Specimens collected recently from Japan show the following features: male with a low, broad and apically rounded crista dorsalis; pupa usually with a median spine patch on each of the tergites IV–VI; and larval head capsule yellow with a largely dark brown postmentum. These features are unique in subgenus *Psilocricotopus*. The pupa especially is highly unusual among described pupae of *R. (Psilocricotopus)* in having rounded spine patches on the abdominal tergites IV–VI, a feature usual in pupae of *Rheocricotopus* (s. str.).

Although we could not examine the holotypes of *Paracricotopus akagisecundus* Kikuchi & Sasa, 1994 and *Rheocricotopus gotocedeus* Sasa & Suzuki, 2001a, these species may be junior synonyms of *R. (P.) togakuroasi*. Judging from the original descriptions, we found no significant difference between *R. (P.) togakuroasi* and these two species. The holotypes of both species were not found, thus should be considered lost.

Rheocricotopus (P.) tokarakeleus Sasa & Suzuki, 1995

Fig. 10, Table 8

Rheocricotopus tokarakeleus Sasa & Suzuki, 1995: 270.

Eukiefferiella amamipubescia [nec Sasa, 1990] – Sasa & Suzuki 1993: 114.

Rheocricotopus (Psilocricotopus) tokarakeleus – Sæther *et al.* 2000: 161. — Ashe & O'Connor 2012: 567. — Yamamoto & Yamamoto 2014: 297 — Fu *et al.* 2016: 266.

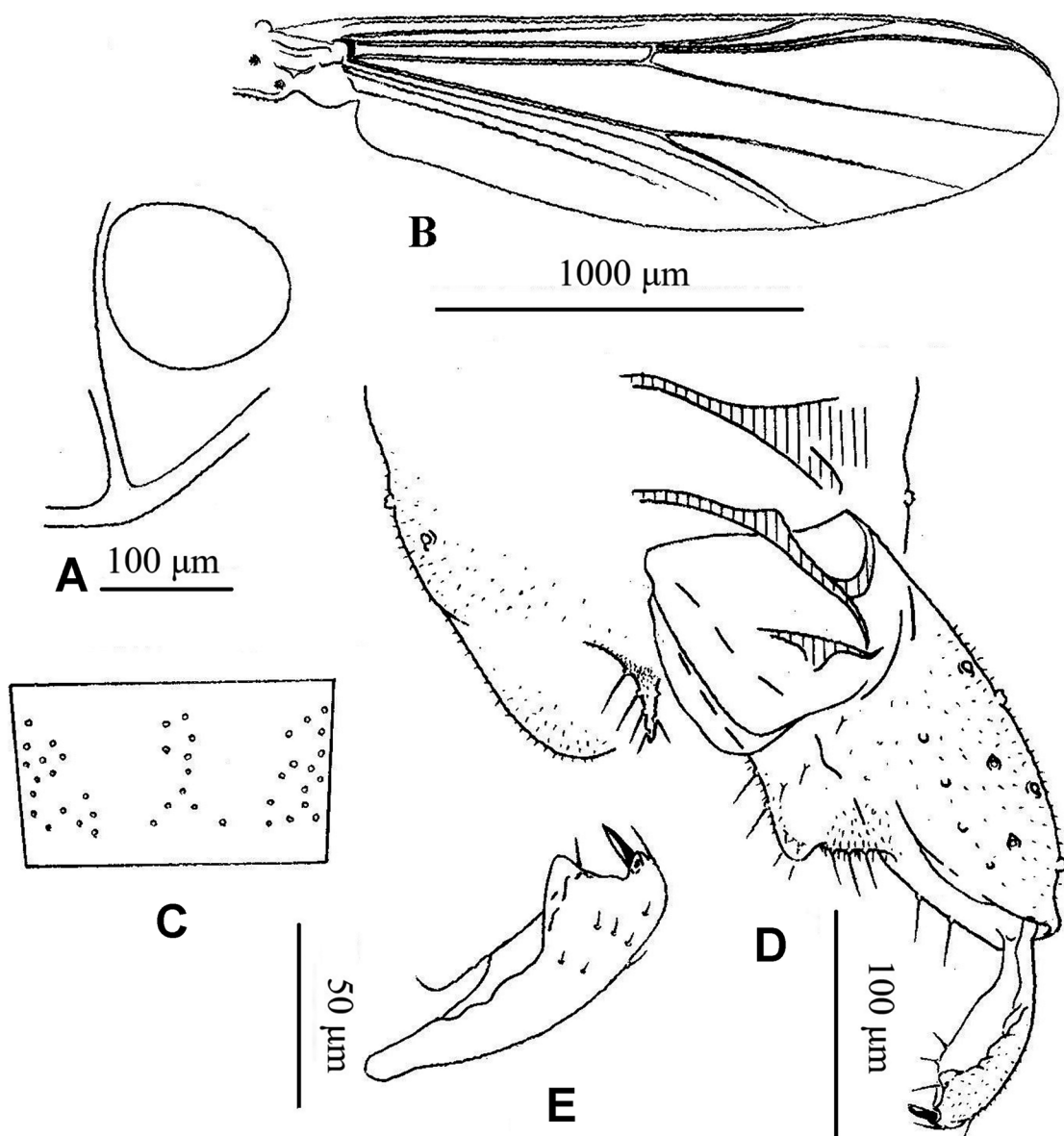


Fig. 10. *Rheocricotopus (P.) tokarakeleus* Sasa & Suzuki, 1995, holotype, ♂ (NSMT I-Dip-5003). A. Humeral pit. B. Wing. C. Setal arrangement on tergite IV. D. Hypopygium, dorsal view. E. Gonostylus.

Table 8. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) tokarakeleus* Sasa & Suzuki, 1995, ♂ (n = 1).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV
P1	823	970	–	–	–	–	–	–	–
P2	735	745	500	225	147	78	78	0.67	3.7
P3	–	–	–	–	–	–	–	–	–

Type material

Holotype of *Rheocricotopus tokarakeleus*

JAPAN – Kagoshima • ♂; Tokara Isls., Kuchinoshima Is.; 19 May 1994; T. Suzuki leg.; NSMT, NSMT-I-Dip 5003 [labelled “*Rheocricotopus tokarahumeralis*, No. 287:37”].

Description

Male (n = 1)

Total length 3.2 mm.

COLOURATION. Thorax brown with 3 darkened vittae and pale humeral pits. Abdomen and legs brown.

HEAD. Temporals 3. Antennae damaged; AR more than 0.8, at most 1.4. Clypeus with 14 setae.

THORAX. Lateral Aps 6; Ac 9, longest 15 μm long; Dc 15, including 4 H; Pa 4; Scts 8. HP (Fig. 10A) very large, ovoid, 127 μm long.

WING (Fig. 10B). Length 2.2 mm. C extended much beyond end of R_{4+5} , extension 93 μm long. VR 1.1. AnL developed, nearly right-angled. Sq with at least 5 setae.

LEGS. P_1 and P_3 lost. P_2 with 2 Sch on ta_1 . Lengths and proportions of legs as in Table 8.

ABDOMEN. T II–VII (Fig. 10C) with setae separated distinctly in 3 groups; setal grouping obscure on T VIII. Hypopygium (Fig. 10D) with AnP pointed apically, bearing 8 lateral setae. Gc 226 μm long with triangular, thin SVo; IVo triangular, double-layered, with dorsally bare, blunt apex. Gs (Fig. 10E) 98 μm long, with CD triangular, relatively large. HR 2.30.

Female, pupa and larva

Unknown.

Distribution

The species is known only from Kagoshima Prefecture in Oriental Japan.

Remarks

The species was described from a single male collected from Tokara Islands in Oriental Japan. The holotype was badly damaged in mounting. Although Fu *et al.* (2016: 267) gave palpomere lengths in their redescription of the holotype, these are in fact unmeasurable.

The male may key to *R. (P.) tirolus* Lehmann, 1969 in Langton & Pinder (2007: 138), but differs in the large ovoid humeral pit and the well-extended costal vein. According to Lehmann (1969: 371 fig. 11a, 374 fig. 17b), the male of *R. (P.) tirolus* has small, dorsoventrally elongate, ovoid humeral pits and a slightly extended costa. In Lehmann (1969: 377), the male may key to *R. (P.) glabricollis* (Meigen, 1830)

(as *R. gouini*). However, the former has a thin, triangular superior volsella and a double-layered inferior volsella, whereas the latter is armed with a roundly projected, somewhat thick superior volsella and a simple inferior volsella (Lehmann 1969: 366 fig. 2).

Sasa & Suzuki (1993: 114) redescribed *Eukiefferiella amamipubescia* from Amami-Oshima Island, Kagoshima Prefecture in Oriental Japan. Based on a re-examination of a voucher specimen, Yamamoto *et al.* (2015: 108) synonymized the species with *R. tokarakeleus*.

***Rheocricotopus (P.) valgus* Chaudhuri & Sinharay, 1983**

Fig. 11, Table 9

Rheocricotopus valgus Chaudhuri & Sinharay, 1983: 402.

Rheocricotopus (Psilocricotopus) valgus – Bhattacharyay *et al.* 1991: 347. — Hazra *et al.* 1998: 76. — Ashe & O'Connor 2012: 568.

Type material

Holotype

INDIA – West Bengal • ♂; Darjeeling; 17 Nov. 1974; S.K. Das Gupta; BU 54.

A photograph of the holotype specimen of *R. valgus*, provided by N. Hazra, BU, was examined.

Other material examined

INDIA – **Sikkim** • 2 ♂♂; Tadong; 14 Aug. 1996; S. K. Prashad leg.; BU.

CHINA – **Fujian** • 1 ♂; Longyan, Shanghang, Meihuashan NNR; 25°20' N, 116°53' E; 780 m a.s.l.; 16 Nov. 2012; H.Q. Tang leg.; JNU, JNU MHS-128. – **Guangdong** • 3 ♂♂; Guangzhou, Huangpu, Huangma, upstream of Jinyuan River; 23°13' N, 113°26' E; 122 m a.s.l.; 29 Mar 2016; H.Q. Tang leg.; JNU, JNU 170208001, 170208002, 170208004. – **Yunnan** • 1 ♂ with Pe, 1 Pe; Xishuangbanna, Jinhong, Banna Primitive Forest Park; 22°01' N, 100°53' E; 1050 m a.s.l.; 20 Mar. 2019; H.Q. Tang leg.; JNU, JNU 190328002. – **Sichuan** • 1 ♂; Liangshan, Huili, Yundian, Majiagou; 27°04' N, 102°16' E; 1560 m a.s.l.; 27 Apr. 2021; J.Y. Shi leg.; JNU, JNU 20192057. – **Xizhang** • 1 ♂; Shigatse, Nyalam (Nielamu); 27°98' N, 85°98' E; C.Y. Deng leg.; 21 Sep. 1987; NK, NK 07945 [labelled as “*Rheocricotopus (Psilocricotopus) robacki*”].

Description

Male (n = 6)

Total length 3.0–3.5, 3.3 (4) mm.

COLOURATION. Thorax dark brown, with yellow pleural membrane. Abdomen (Fig. 11A) bicoloured; T I, VIII–IX entirely yellow; T II–III mainly brown, anteriorly with narrow transverse yellow band; T IV and VI mainly yellow, posteriorly with narrow transverse brown band; T V and VII yellow, posteriorly with broad transverse brown band; hypopygial Gc and Gs brown. Leg P₁ (Fig. 11B) largely dark brown, with fe yellow on basal 2/3; P₂₋₃ (Fig. 11C) brown, with fe yellow, occasionally bearing small dark patch on basal 1/3–1/2.

HEAD. Temporals 1–5, 3. AR 1.0–1.2, 1.1 (5). Clypeus with 10–13, 12 setae. Lengths (µm) of Pm₁₋₅: 30–42, 36; 49–59, 54; 108–125, 116; 148–175, 166; 197–283, 245, respectively. Pm₄/Pm₃ 1.4–1.6, 1.4; Pm₅/Pm₄ 1.1–1.6, 1.5. Pm₃ with 4–6, 5 (3) SCL.

THORAX. Lateral Aps strong, 3–5, 4 (3). Ac 8–14 (2), and longest 15 (2) μm long; Dc 13–15, 14 (4) including 2–3, 2 (4) H; Pa 3–5, 4 (4); Scts 8, 8 (4). HP absent.

WING (FIG. 11D). Length 2.1–2.4, 2.3 (5) mm. C extended much beyond end of R_{4+5} , extension 86–123, 98 μm long. VR 1.1, 1.1. R with 0–2, usually no seta; R_1 and R_{4+5} bare. AnL obtuse. Sq with 7–11, 9 (5) setae.

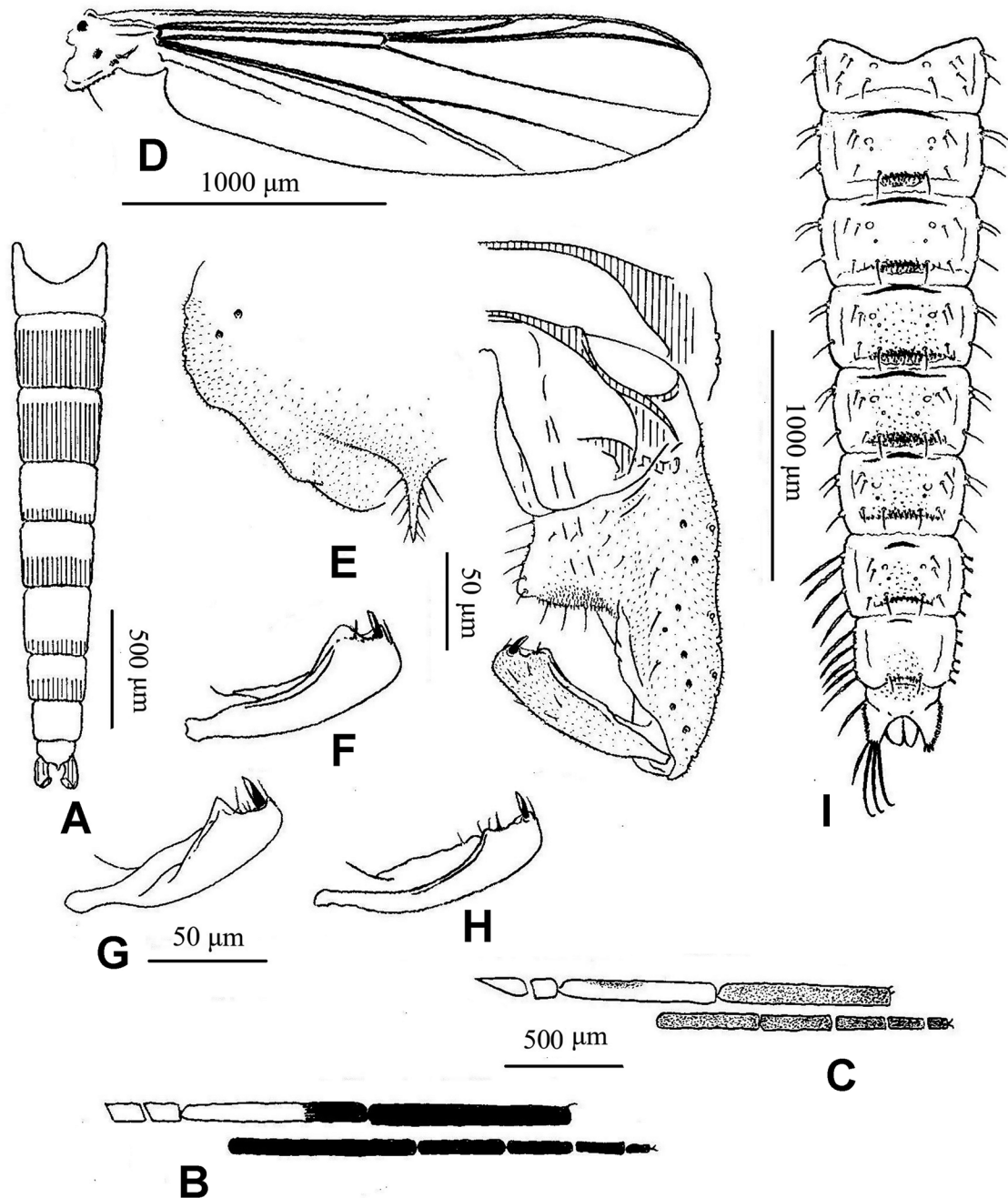


Fig. 11. *Rheocricotopus (P.) valgus* Chaudhuri & Sinharay, 1983. **A–H.** ♂ (JNU 170208001). **I.** Pupa (JNU 170308002). **A.** Abdominal colour pattern. **B.** Colour pattern of foreleg. **C.** Colour pattern of mid leg. **D.** Wing. **E.** Hypopygium, dorsal view. **F–H.** Gonostylus, showing variation. **I.** Abdomen, dorsal view.

Table 9. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *valgus* Chaudhuri & Sinharay, 1983, ♂♂ (n = 5).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	764–882 855	843–1029 980	755–951 880 (4)	441–519 492 (4)	343–402 382 (4)	265–294 284 (4)	137–157 147 (3)	0.89–0.92 0.91 (4)	2.0–2.1 2.1 (3)	2.3–2.5 2.3 (3)
P2	715–804 774	696–794 762	451–519 502	206–235 221	137–167 157	78–98 84	78–88 80	0.64–0.68 0.66	3.6–4.0 3.8	2.1–2.4 2.3
P3	755–862 833	882–1039 1000	559–647 621	294–333 319	245–274 261	137–157 147 (4)	108 108 (4)	0.61–0.63 0.62	2.9–3.0 3.0 (4)	3.0–3.6 3.4

LEGS. P_1 with ti spur 57–66, 62 (5) μm long; P_2 with 2 ti spurs 22–25, 23 (5) and 20–25, 21 (5) μm long; P_3 with 2 ti spurs 49–54, 52 (5) and 25–27, 25 (5) μm long. P_2 with 2–8, 5 (5) Sch on ta₁. P_3 with ti comb of 10–12, 11 (5) bristles. Lengths and proportions of legs as in Table 9.

ABDOMEN. Hypopygium (Fig. 11E) with AnP pointed apically, bearing 7–10, 9 lateral setae. Gc 229–246, 237 μm long, 3.0–3.6, 3.2 \times as long as broad at middle, with SVo triangular, thin, apically rounded; IVo triangular, simple and rounded apically. Gs (Fig. 11F–H) 93–103, 99 μm long; CD preapical, triangular, occasionally small or indistinct. HR 2.27–2.53, 2.39.

Pupa (n = 2)

Total length 3.8–4.2 mm.

COLOURATION. Exuviae brown with dark abdominal Apo and posterior spines on abdomen.

CEPHALOTHORAX. FA lost. Thoracic horn 363–372 μm long, and 3.8–4.6 \times as long as broad. Lengths (μm) of Pc₁₋₃: 98–111, 185, 39–74, respectively; these setae arranged in triangle. Lengths (μm) of Dc₁₋₄: 79–86, 49–62, 37–39; 44–84, respectively. Distances (μm) of Dc₁–Dc₂, Dc₂–Dc₃, Dc₃–Dc₄: 86–113, 59–81, 20–22, respectively; these setae arranged in line. Distance ratio of Dc₁–Dc₂ to Dc₂–Dc₃ 1.1–1.9.

ABDOMEN (Fig. 11I). T I–III without spinulation, T VI–VI with more or less extensive spinulation, T VII–VIII with posteromedial spinulation, T IX with anterior spinulation, these spinules very faint and sporadic. Rows of spines present on posterior margins of T II–VIII, these spines of T II positioned on large marginal protrusion. Anteriorly directed spinules present, posterior to spine rows on T II–V, in 2–3 rows. S IV–VII with rows of spines on posterior margin. PSB present, but small, on A II–III. Segment I with 2 L-setae; II–VI each with 3 L-setae, VII with 4 LS-setae, VIII with 5 LS-setae; some L-setae apically split on A II–VI. AL 281–305 μm long, 2.1–2.3 \times as long as broad, with 14–16 lateral taeniae on posterior $\frac{2}{3}$; male genital sac nearly as long as AL.

Distribution

This species is also distributed in Oriental China (Sichuan, Fujian, Guangdong, Yunnan and Xizang), in addition to northern India.

Remarks

The adults and the immature stages were described by Chaudhuri & Sinharay (1983: 404) and Hazra *et al.* (1998: 76), respectively, from India. Males and pupae were also collected from Oriental China.

The male is characterized by the bicoloured legs and abdomen; the antennal ratio ca 1.0; the thorax without humeral pits; the wing with an obtuse anal lobe, a well-projected costal extension and usually

bare veins R, R1 and R4+5; the very high foreleg ratio (LR_1 ca 0.9); the thin, triangular superior volsella; the simple, triangular inferior volsella; and the triangular crista dorsalis. Chaudhuri & Sinharay (1983: 405 fig. 3d) drew a very large humeral pit in the original description, and Hazra *et al.* (1998: 80) wrote: “The presence of large oval humeral pit, ... aligns it strongly with the *chalybeatus*-group of Sæther (1985).” However, Hazra (pers. comm. 2024) recently informed us that the mounted types are impossible to examine the lateral thorax, and that males newly collected from Darjeeling and Sikkim Himalayas in the 1990s have no humeral pit. Further, he (pers. comm. 2025) provided us with photographs of two males of them, collected by S.K. Prashad, including a photograph of the holotype. Although these photographs are whole images of specimens, their colour patterns of body and legs are consistent with those of the Chinese population.

Indian pupae have an anterior spinulation on the tergites II–III, VII–VIII, according to Hazra *et al.* (1998: 76, 78 fig. 2d). In Chinese pupae, however, the tergal spinules are sporadic and very faint, and the tergites II–III, VII–VIII lack anterior spinulation. In the Indian material, the relatively strong sternal spinulation may be visible through the tergites.

Liu *et al.* (2014a: 25) recorded *R. (P.) robacki* (Beck & Beck, 1964) from several different localities in China. However, our re-examinations of the voucher specimens revealed that these include at least one male specimen of *R. (P.) valgus* (NK 07945 from Xizang Autonomous Region). The specimen nearly satisfies the aforementioned features of *R. (P.) valgus*.

***Rheocricotopus (P.) calviculus* Wang & Sæther, 2001**

Rheocricotopus (Psilocricotopus) calviculus Wang & Sæther, 2001: 237.

Rheocricotopus (Psilocricotopus) calviculus – Ashe & O’Connor 2012: 560.

Type material

Holotype

CHINA – Shaanxi • ♂; Zhouzhi, Banfangzi; 33°49' N, 108°00' E; 1200 m a.s.l.; 7 Aug. 1996; B.C. Ji leg.; NKU, NKU 04428.

Distribution

The species has been known from Shaanxi and Hubei provinces in Oriental China (Lin *et al.* 2020: 284 fig. 2).

Remarks

We re-examined the holotype collected from Shaanxi Province in China (Wang & Sæther 2001: 237) and confirmed it is a member of the *orientalis* group. However, a large, oval humeral pit is present in the male.

The male resembles that of *R. (Psilocricotopus) orientalis* Wang, 1995 in the abdominal colouration: tergites I and IV entirely pale yellow, the remaining entirely or mostly dark brown. However, it is separable from the latter by the absence of posterior rounded lobes in the anal tergite.

The female and the immature stages are unknown.

***Rheocricotopus (P.) constrictus* Yan & Wang, 2004**

Rheocricotopus (Psilocricotopus) constrictus Yan & Wang, 2004: 560.

Rheocricotopus (*Psilocricotopus*) *constrictus* – Ashe & O'Connor 2012: 563.

Type material

Holotype

CHINA – Hubei • ♂; Xianfeng, Luoheba; 29°40' N, 109°08' E; 400 m a.s.l.; 25 Jul. 1999; B.C. Ji leg.; NKU 13983.

Distribution

The species has been known only from Hubei Province in Oriental China.

Remarks

A re-examination of the holotype confirmed the species is a member of the *orientalis* group. The anal point is constricted in the middle (Yan & Wang 2004: 561), which discriminates the species from other known members of this genus. Additionally, a pale, oval and large humeral pit is observed in the holotype.

The female and the immature stages are unknown.

Rheocricotopus (*P.*) *kongi* Lin & Wang, 2020

Fig. 12A

Rheocricotopus (*Psilocricotopus*) *kongi* Lin & Wang in Lin *et al.*, 2020: 286.

Type material

Holotype

CHINA – Hainan • ♂; Baisha, Yinggeling NNR; 19°05' N, 109°30' E; 3 Dec. 2010; F.Q. Kong leg.; NKU XL-1857.

Paratype

CHINA – Hainan • 1 ♂; same data as for holotype; NKU XL-1853.

Distribution

So far, this species is known only from the type locality, Hainan Province in Oriental China.

Remarks

We re-examined the holotype and one paratype. Although in the holotype the hypopygium is crushed during the mounting procedure (see Lin *et al.* 2020: 288 fig. 5), the paratype can be seen to have two projections, a triangular, bare ventral projection and a rounded, setigerous inner projection, behind the inferior volsella which is short, stout, apically lump-like (Fig. 12A). The feature separates the species from others in this genus.

Further, the authors (Lin *et al.* 2020: 289) wrote in the original description: “A pale and oval humeral pit presents in *R. kongi* sp. n., which not fitting the diagnosis of the *R. orientalis* group (Wang & Sæther 2001)”. Indeed, this species possesses a large and oval humeral pit.

The female and the immature stages are unknown.

***Rheocricotopus (P.) orientalis* Wang, 1995**
Figs 12B–J, Table 10

Rheocricotopus (Rheocricotopus) orientalis Wang, 1995: 37.

Rheocricotopus (Psilocricotopus) orientalis – Sæther *et al.* 2000: 161. — Lin *et al.* 2020: 290.

Rheocricotopus (Rheocricotopus) orientalis – Ashe & O’Connor 2012: 571.

The type specimen of *R. (s. str.) orientalis* was not examined.

Material examined

CHINA – **Guangdong** • 1 ♂; Jiangmen, Taishan, Mt Beifeng; 22°10′ N, 112°55′ E; 230 m a.s.l.; 7 Jul. 2012; H.Q. Tang leg.; JNU • 1 ♂; Guangzhou, Huangpu, Jinyuan; 23°13′ N, 113°26′ E; 120 m a.s.l.; 29 Sep. 2016; H.Q. Tang leg.; JNU, JNU 161009005 • 1 ♂; Guangzhou, Zengcheng, Zhengguo, Lan stream; 23°20′ N, 113°58′ E; 230 m a.s.l.; 4 Jan. 2020; Y.R. He leg.; JNU, JNU LX09 • 1 ♂ (pharate); Zhaoqinag, Fengkai, Heishiding NNR; 23°27′ N, 111°51′ E; 310 m a.s.l.; 20 Mar. 2021; Z.X. Li leg.; JNU, JNU 24021901 • 5 ♂♂; same data as for preceding; 5 Nov.–15 Dec. 2021; Z.X. Li leg.; JNU, JNU 24041001 to 24041002, HSD39 • 5 ♀♀; same data as for preceding; 5–20 Apr. 2022; H.Q. Tang leg.; JNU, JNU 24040902, 24040904 • 3 Pe; same data as for preceding; 22 Apr. 2022; JNU, JNU 24041002 • 2 ♀♀; same data as for preceding; 3 Nov. 2022; JNU, JNU 24040903 • 1 ♀; Maoming, Xinyi, Mt Yunkai NNR; 22°16′ N, 111°11′ E; 1130 m a.s.l.; 12 May 2020; S.X. Luo leg.; JNU.

Description

Male (n = 8)

Total length 2.1–2.5, 2.3 mm.

COLOURATION. Head dark brown on vertex. Thorax mostly dark brown, with yellow pleural membrane; scutal vittae indistinct. Abdomen (Fig. 12B) bicoloured; T I and IV entirely yellow, remaining tergites dark brown. Legs brown.

HEAD. Temporals 2–4, 3. AR 0.35–0.41, 0.38. Clypeus with 7–9, 8 setae. Lengths (µm) of Pm_{1–5}: 27–32, 29; 47–54, 51; 98–113, 106; 108–128, 114; 219–266, 235, respectively. Pm₄/Pm₃ 1.0–1.1, 1.1; Pm₅/Pm₄ 1.9–2.2, 2.1. Pm₃ with numerous SCl on 2 subapical oval depressions.

THORAX. Lateral Aps 2–4, 3 (7). Ac 14–19, 17, longest 12–15, 13 µm long; Dc 6–8, 7, including 1–3, 2 H; Pa 3; Scts 4–5, 4. HP (Fig. 12C) large, oval, occasionally indistinct; usually sclerotized posterior margin partly visible.

WING (Fig. 12D). Length 1.4–1.9, 1.6 mm. AnL much reduced; wing cuneiform, widest at around end of Cu₁. C extension 93–123, 106 (7) µm long. VR 1.1–1.2, 1.1. R with 7–14, 10 (7) setae; R₁ with 3–6, 4 (7) setae; R₄₊₅ with 5–8, 7 (7) setae. Sq with 1–2, 1 seta.

LEGS. P₁ with ti spur 25–30, 28 µm long; P₂ with 2 ti spurs 15–20, 16 and 12–17, 14 µm long; P₃ with 2 ti spurs 37–42, 40 and 15–20, 17 (7) µm long. P₃ with ti comb of 12–13, 12 (7) bristles. Sch absent. Lengths and proportions of legs as in Table 10.

ABDOMEN. Hypopygium (Fig. 12E) with T IX bearing setiferous, rounded, posterolateral lobes; AnP stout, with 12–18, 14 (7) lateral setae. Gc 143–157, 150 µm long, 3.4–4.4, 3.9 × as long as broad at middle, with SVo thin, triangular, rounded at apex; IVo 59–64, 61 µm long, digitate with apical and ventral fine setae, and longitudinal row of ventral long setae. Gs 81–86, 84 µm long, medially with triangular, well-developed CD. HR 1.7–1.9, 1.8.

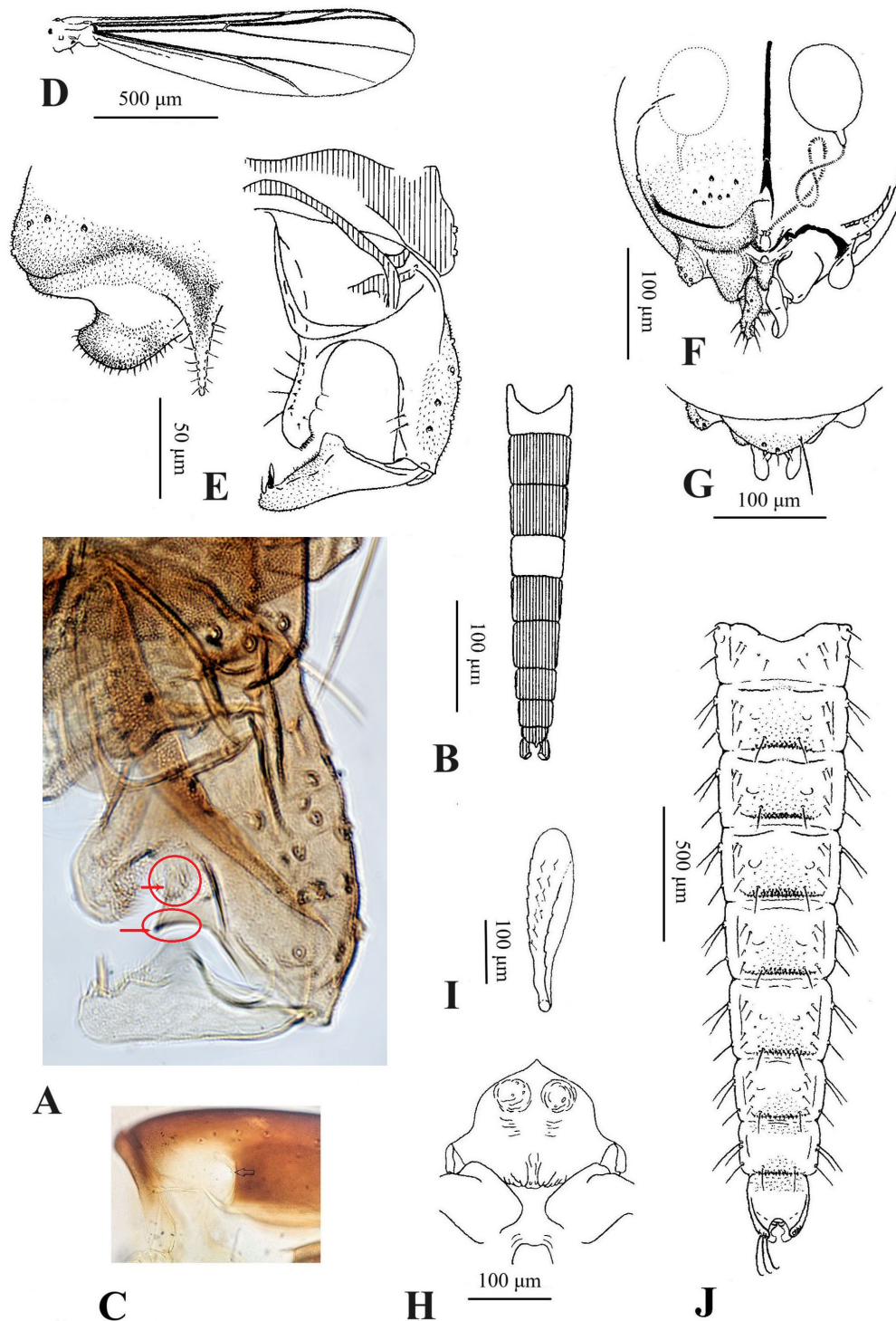


Fig. 12. A. *Rheocricotopus (P.) kongi* Lin & Wang, 2020, ♂ (NKU, XL-1853). B–J. *R. (P.) orientalis* Wang, 1995. B–E. ♂ (JNU161009005). F–G. ♀ (JNU 24040903). H–J. Pupa (JNU 24041002). A. Hypopygium, dorsal view (two red arrows showing ventral and inner projections). B. Abdominal colour pattern. C. Thorax, lateral view (arrow showing humeral pit). D. Wing. E. Hypopygium, dorsal view. F. Genitalia, ventral view. G. Genitalia, dorsal view. H. Frontal apotome. I. Thoracic horn. J. Abdomen, dorsal view.

Table 10. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *orientalis* Wang, 1995, ♂♂ (n = 8) and ♀♀ (n = 8).

Male	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	706–882 773	774–931 843	637–784 706	333–402 369	245–294 265	176–206 187	88–98 90 (7)	0.80–0.86 0.84	2.5–2.6 2.5 (7)	1.4–2.8 1.8
P2	657–784 704	637–764 685	402–500 450	147–176 162	98–127 115	59–69 66	49–69 59	0.63–0.67 0.66	4.3–4.8 4.6	1.6–2.4 2.0
P3	715–853 767	794–960 862	490–588 523	206–235 219	167–196 179	88–108 97	69–78 72	0.59–0.62 0.61	3.7–3.9 3.8	1.7–3.1 2.4
Female	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	774–902 830 (7)	833–960 882 (7)	715–794 751 (6)	382–412 394 (6)	274–304 284 (6)	186–216 199 (6)	78–98 90 (6)	0.85–0.89 0.86 (6)	2.5–2.6 2.5 (6)	–
P2	686–804 742	666–794 724	441–519 473	157–186 168	108–127 118	59–78 67 (7)	59–69 62 (7)	0.63–0.67 0.65	4.5–4.9 4.7 (7)	–
P3	735–892 797	843–1000 908	519–588 554 (7)	216–245 225 (7)	176–196 185 (7)	88–98 94 (7)	69–78 74 (7)	0.59–0.63 0.62 (7)	3.8–4.0 3.9 (7)	–

Female (n = 8)

Total length 2.1–2.7, 2.3 mm.

COLOURATION. Similar to male. SCa pale.

HEAD. Temporals 3–5, 4. Lengths (μm) of Fm_{1-5} : 66–74, 70 (5); 57–66, 61 (5); 66–69, 67 (5); 59–71, 66 (5); 74–89, 80 (5), respectively. AR 0.28–0.33, 0.30 (5). Clypeus with 7–13, 9 setae. Lengths (μm) of Pm_{1-5} : 25–34, 30 (6); 47–54, 50 (6); 98–123, 109 (6); 106–140, 118 (6); 226–315, 267 (6), respectively. Pm_4/Pm_3 1.0–1.1, 1.1 (6); Pm_5/Pm_4 2.1–2.5, 2.3. Pm_3 with numerous SCL on 2 subapical oval depressions.

THORAX. Lateral Aps 2–5, 3 (6). Ac 15–21, 18 (7); Dc 6–8, 7 including 2–3, 2 H; Pa 3; Sct 3–4, 4.

WING. Length 1.6–1.8, 1.7 mm. C extension 118–148, 130 (7) μm long. VR 1.1, 1.1 (6). R with 11–17, 14 (7); R_1 with 6–9, 8 (7); R_{4+5} with 14–22, 18 (6) setae. Sq with 1–2, 1 (7) seta.

LEGS. P_1 with one ti spur 22–30, 24 (7) μm long; P_2 with 2 ti spurs, both 15–17, 16 μm long; P_3 with 2 ti spurs 37–49, 42 and 15–20, 17 μm long respectively, and with ti comb of 12–14, 13 (7) bristles. Lengths and proportions of legs as in Table 10.

GENITALIA (Fig. 12F). S VIII with 6–9, 8 setae. Gp VIII divided into rounded VIL and narrow DmL; ApL distinct between VIL and DmL. T IX (Fig. 12G) undivided with 7–12, 9 setae including 2–6, 4 short setae. Gc IX well developed with 8–11, 9 setae on each side. Ce 44–71, 60 (6) μm long. No 111–130, 121 μm long. SCa 81–96, 91 (7) μm long, 1.2–1.3, 1.2 (3) \times as long as broad, with conical neck; duct looped.

Pupa (n = 4)

Total length 3.2 (2) mm.

COLOURATION. Exuviae pale brown with dark Apo and posterior spine rows on abdomen.

CEPHALOTHORAX. FA (Fig. 12H) with short, blunt and somewhat pebbled warts. FS absent. Thoracic horn (Fig. 12I) 274–294, 282 (3) μm long, and 4.3–4.7, 4.4 (3) \times as long as broad. Lengths (μm) of Pc_{1-3} : 98–113, 107 (3); 81–98 (2); 44–62, 52 (3), respectively; these arranged in triangle. Lengths (μm) of Dc_{1-4} : 57–62 (2); 62 (1); 30–44 (2); 34–49 (2), respectively. Distances (μm) of $\text{Dc}_1\text{--Dc}_2$, $\text{Dc}_2\text{--Dc}_3$, $\text{Dc}_3\text{--Dc}_4$: 62–69 (2); 47–54 (2); 12 (2), respectively; these setae arranged in line; Distance ratio of $\text{Dc}_1\text{--Dc}_2$ to $\text{Dc}_2\text{--Dc}_3$, 1.1–1.5 (2).

ABDOMEN (Fig. 12J). T I without spinulation; T II–VI more or less extensive spinulation; T VII with triangular, posteromedial spinule patch; T VIII with anterior and posteromedial spinule patches; T IX with anterior spinule patch. Spine rows present on posterior margins of T II–VIII; these rows well developed, longest spine 25–30, 27 μm on T VIII. Conjunctives III/IV–V/VI and posterior margins of T III–V without anteriorly directed spinules. S IV–VII each with rows of spines on posterior margin. PSB absent. Segment I with 2 L-setae, II–VIII each with 3 L-setae, some L-setae apically split. $L_{1,2}$ -setae relatively long on A II–VIII, these almost $\frac{1}{2} \times$ as long as segment length; L_3 -seta slightly shorter than $L_{1,2}$ -setae. AL 221–239, 228 μm long, 2.0–2.2, 2.1 (3) \times as long as broad, without lateral taeniae; male genital sac slightly longer than AL.

Larva

Unknown.

Distribution

Rheocricotopus orientalis is known only from Guangdong Province in Oriental China.

Remarks

Rheocricotopus orientalis was originally placed in subgenus *Rheocricotopus*, but subsequently, together with related species, transferred to subgenus *Psilocricotopus* by Sæther *et al.* (2000: 161). We examined adult females, pupal exuviae and pharate male recently collected from Guangdong Province in China, and found that the female tergite IX is not divided into two protrusions, and the pupa possesses no frontal seta, no median spine or spinule patch on the tergites III–VI, and distinct caudal spines on the tergites VII and VIII. In addition, the pupa is very similar to that of *R. (P.) albulus* sp. nov. described here in those abdominal segments II–VIII bear three L-setae only and the anal lobe is without lateral taeniae. Therefore, this species belongs to subgenus *Psilocricotopus*. Within *Rheocricotopus*, the species is unique in the male tergite IX posterolaterally with setiferous rounded lobes, and in the pupal frontal apotome with short, blunt and pebbled warts.

Wang & Sæther (2001: 237) re-examined the holotype and wrote: “a lighter area mistakenly was taken as a humeral pit and there is no humeral pit in *R. orientalis*.” We examined sixteen adult specimens, consisting of eight males and eight females, newly collected from Guangdong Province, and found that in ten (63%) of them the sclerotized margin of a paler humeral pit is partly visible and in the remainder the structure is indistinct. Actually, all adults of the *orientalis* group, including *R. (P.) bannaensis* sp. nov. described here as a new member of this group, possess oval and large humeral pits.

Rheocricotopus (P.) villiculus Wang & Sæther, 2001

Rheocricotopus (Psilocricotopus) villiculus Wang & Sæther, 2001: 238.

Rheocricotopus (Psilocricotopus) villiculus – Ashe & O’Connor 2012: 568.

Type material

Holotype

CHINA – Henan • ♂; Xinyang, Mt Jigong, Jigongshan NNR; 31°48' N, 114°04' E; 700 m a.s.l.; 11 Jul. 1997; Y.Z. Du leg.; NKU, NKU 012777.

Distribution

The species is known from Henan, Zhejiang and Jiangsu provinces in Oriental China (Lin *et al.* 2020: 284 fig. 2).

Remarks

Although in the original description of this species, the authors (Wang & Sæther 2001: 238) wrote: “no humeral pit”, our re-examination of the holotype revealed that the male has large, oval humeral pits. The species is a typical member of the *orientalis* group, characterized by a pair of posterolateral setal tufts on the tergite IX, which is a unique feature as a discriminator from the other members. However, Wang & Sæther (2001: 239) wrote: “The inferior volsella on one side is lost or reduced. It thus may seem unwarranted to describe a species based on a single specimen which, in addition, could be aberrant.”

The female, the pupa and the larva are unknown.

Rheocricotopus (P.) bannaensis sp. nov.

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Fig. 13, Table 11

Diagnosis

Male

Abdomen bicoloured, with tergites I, IV and VII yellow, remaining tergites dark brown. AR relatively low (less than 0.5). Humeral pit large, oval. Wing cuneiform with very long costal extension. Inferior volsella digitate with a longitudinal row of setae. Crista dorsalis large, triangular, located at middle of gonostylus.

Female

Tergites I, IV and VII yellow, remaining tergites dark brown.

Etymology

From the type locality, Xishuangbanna, abbreviated as ‘Banna’ in Chinese.

Type material

Holotype

CHINA – Yunnan • ♂; Xishuangbanna, Yiwu, Guafengzhai; 22°00' N, 101°35' E; 1360 m a.s.l.; 26 Apr. 2017; J. Chen leg.; JNU, JNU 170429003.

Paratypes

CHINA – Yunnan • 1 ♂; Xishuangbanna, Mengla, Bubang, Xishuangbanna Tropical Rainforest National Park, Wangtianshu Scenic Area; 21°37' N, 101°35' E; 710 m a.s.l.; 25 Apr. 2017; J. Chen leg.; JNU, JNU 170511007 • 1 ♀; Honghe, Pingbian, Daweishan NNR; 22°55' N, 103°41' E; 1800 m a.s.l.; 14 Jun 2017; J. Chen leg.; JNU.

Description

Male (n = 2)

Total length 2.0–2.1 mm.

COLOURATION. Head dark brown on vertex. Thorax mostly dark brown with yellow pleural membrane; scutal vittae indistinct. Abdomen (Fig. 13A) bicoloured; T I, IV and VII entirely yellow, remaining tergites dark brown. Legs brown.

HEAD. Temporals 2. AR 0.36–0.37. Clypeus with 6–9 setae. Lengths (μm) of Pm_{1-5} : 27–32, 44–49, 101–113, 113–123, 231–239, respectively. Pm_4/Pm_3 1.1, Pm_5/Pm_4 1.9–2.0. Pm_3 with at least 8 SCL on 2 subapical oval depressions.

THORAX (Fig. 13B). Lateral Aps 2. Ac 12 (1), longest 12 (1) μm long; Dc 5, including 1 H; Pa 3; Scts 4. HP oval, relatively large, its posterior margin partly visible.

WING (Fig. 13C). Length 1.4–1.5 mm. AnL much reduced; wing cuneiform, widest at around end of Cu_1 . C extension 74–91 μm long. VR 1.1. R with 3–6 setae; R_1 and R_{4+5} bare. Sq with 0–1 seta.

LEGS. P_1 with ti spur 27 μm long; P_2 with 2 ti spurs, both 15 μm long; P_3 with 2 ti spurs 34–39 and 15–17 μm long. P_2 without Such. P_3 with ti comb of 11–12 bristles. Lengths and proportions of legs as in Table 11.

ABDOMEN. Hypopygium (Fig. 13D) with AnP robust, bearing 17 lateral setae. Gc 135–148 μm long, 3.8–3.9 \times as long as broad at middle, subapically with triangular posteromedial projection; SVo thin, triangular, rounded at apex; IVo digitate, 52–59 μm long with apical and ventral fine setae, and longitudinal row of long ventral setae. Gs 74–76 μm long, medially with well-developed, triangular CD. HR 1.8–2.0.

Female (n = 1)

Total length 2.1 mm.

COLOURATION. Similar to male. SCa pale.

HEAD. Temporals 4. Lengths (μm) of Fm_{1-5} : 47, 32, 44, 27, 54, respectively. AR 0.36. Clypeus with 6 setae. Lengths (μm) of Pm_{1-5} : 32, 57, 108, 121, 278, respectively. Pm_4/Pm_3 1.1, Pm_5/Pm_4 2.3. Pm_3 with numerous SCL on 2 oval depressions.

THORAX (Fig. 13E). Lateral Aps 4. Ac 17, Dc 6, including 2 H; Pa 3; Sct 3. HP oval, large.

WING. Length 1.9 mm. C extension very long, 135 μm long. VR 1.1. R, R_1 and R_{4+5} with 11, 7 and 18 setae, respectively. Sq bare.

LEGS. P_1 with one ti spur 34 μm long; P_2 with 2 ti spurs 22 and 20 μm long; P_3 with 2 ti spurs 52 and 22 μm long, and with ti comb of 13 bristles. Lengths and proportions of legs as in Table 11.

GENITALIA (FIG. 13F). Gp VIII divided into rounded VIL and narrow DmL; ApL distinct. S VIII with 6 setae. T IX (Fig. 13G) undivided, with 9 setae including 4 short setae. Gc IX with 11 setae on each side. No 140 μm long. Ce 57 μm long. SCa and ducts damaged.

Pupa and larva

Unknown.

Distribution

Rheocricotopus bannaensis sp. nov. is known only from Yunnan Province in Oriental China.

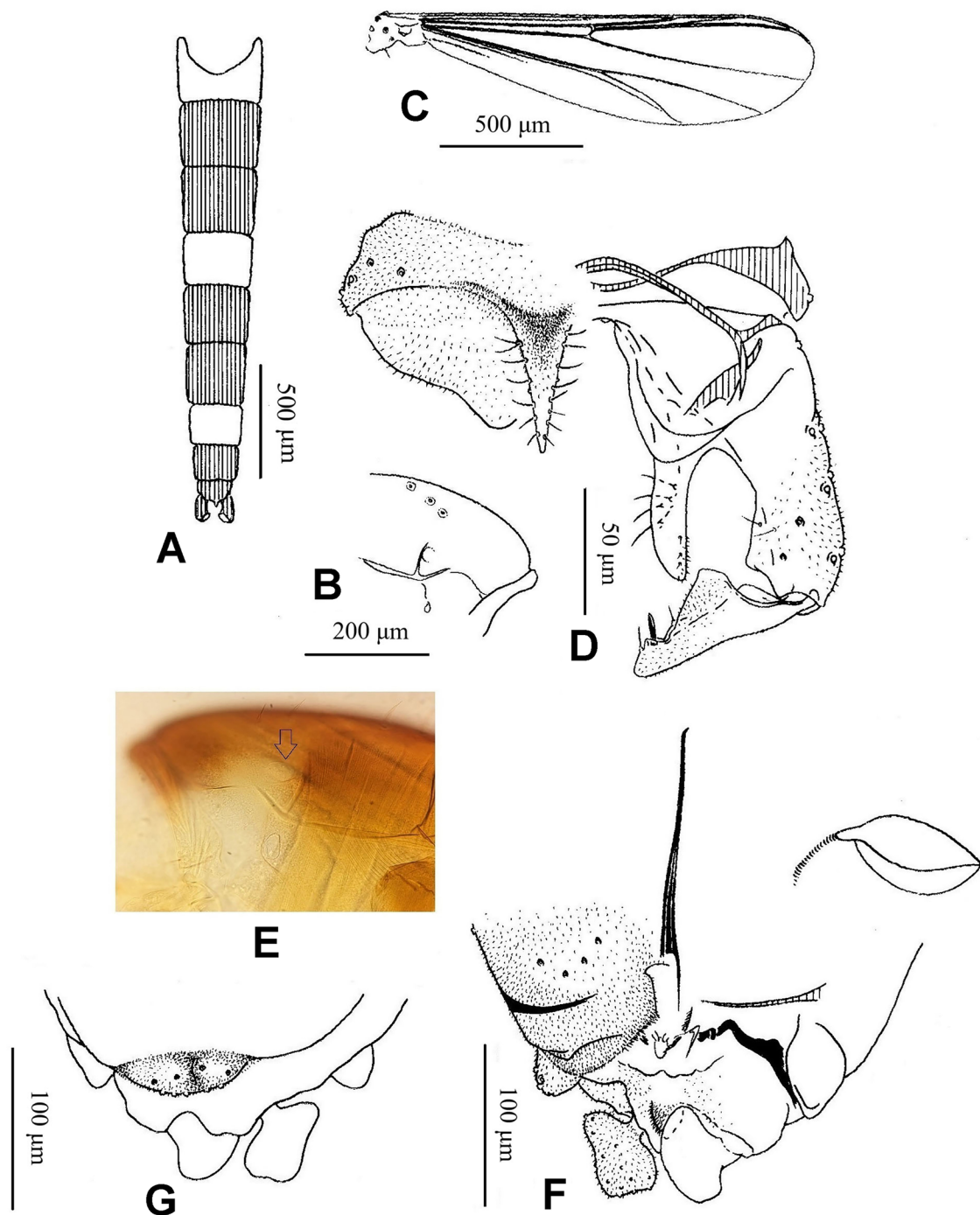


Fig. 13. *Rheocricotopus* (*P.*) *bannaensis* sp. nov. **A–D.** Holotype, ♂ (JNU 170429003). **E–G.** Paratype, ♀ (JNU). **A.** Abdominal colour pattern. **B.** Thorax with humeral pit, lateral view. **C.** Wing. **D.** Hypopygium, dorsal view. **E.** Thorax, lateral view (arrow showing humeral pit). **F.** Genitalia, ventral view. **G.** Genitalia, dorsal view, showing tergite IX.

Table 11. Lengths (µm) and proportions of legs of *Rheocricotopus* (*P.*) *bannaensis* sp. nov., ♂♂ (n = 2) and ♀ (n = 1).

Male	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	715–735	784–804	627–647	343	245–255	176–186	88	0.80	2.5	2.0–2.1
P2	657–666	627–637	392–402	147	108	59	59	0.63	4.5–4.6	2.1 (1)
P3	706–735	794–813	480–490	206	167	88–98	69	0.60	3.7–3.8	2.6–2.8
Female	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	951	931	872	441	314	206	98	0.94	2.6	–
P2	843	813	519	196	137	78	69	0.64	4.5	–
P3	931	1019	647	284	235	127	88	0.63	3.5	–

Remarks

The species belongs to the *orientalis* group based on a cuneiform wing with a well-extended costal vein and few squamal setae, the bicoloured abdomen, the very long inferior volsella, and the large crista dorsalis located in the mid-gonostylus (Wang & Sæther 2001: 239–240). Within the species group, the male most resembles that of *R. (P.) villiculus* Wang & Sæther, 2001 in the largely dark brown abdomen with entirely yellow tergites I, IV and VII, but differs in the entirely dark brown tergite II, the relatively low antennal ratio (AR less than 0.4), the mid tibia is normally with two spurs, in addition to an anal tergite without lateral setal tufts. According to Wang & Sæther (2001: 238–239), the male of *R. (P.) villiculus* is characterized by a yellowish median patch on tergite II, the relatively high antennal ratio (AR 0.6), the mid tibia with only one spur, and the anal tergite with a pair of setal tufts on the base of anal point.

Rheocricotopus (P.) albulus sp. nov.

[urn:lsid:zoobank.org:act:AF7E61C1-8946-48DE-9D37-724065943320](https://doi.org/10.3897/zoobank.org/AF7E61C1-8946-48DE-9D37-724065943320)

Fig. 14, Table 12

Diagnosis

Male

Abdomen bicoloured, with tergites I and IV entirely or largely yellow, remainings entirely dark brown. Humeral pit oval, large. Wing cuneiform with a few squamal setae and distinct costal extension. Foretibia bicoloured, subapically with a broad whitish band. Anal point robust with blunt apex. Superior volsella plate-like, roundly protruded. Inferior volsella triangular, apically rounded. Crista dorsalis distinct, triangular.

Pupa

Frontal setae absent. Segments II–VIII with only 3 L-setae; anal lobe without setal fringe.

Etymology

From the Latin ‘*albulus*’ (‘whitish’), referring to the broadly whitish foretibia of the adult.

Type material

Holotype

CHINA – Yunnan • ♂; Xishuangbanna, Yiwu, Guafengzhai; 22°00' N, 101°35' E; 1360 m a.s.l.; 26 Apr. 2017; J. Chen leg.; JNU, JNU 170512011.

Paratype

CHINA – Yunnan • 1 ♂ (paratype); Ximeng, Lake Mengsuo, stream near Laomoye; 22°38' N, 99°35' E; 1270 m a.s.l.; 20 Jan. 2015; H.Q. Tang leg.; JNU.

Description

Male (n = 2)

Total length 2.0 (1) mm.

COLOURATION. Head dark brown on vertex. Thorax mostly dark brown except yellow pleural membrane; scutal vittae indistinct. Abdomen (Fig. 14A–B) bicoloured; T I and IV entirely yellow, remaining tergites dark brown; occasionally T IV with anterior narrow transverse dark band. Legs (Fig. 14C) brown to dark brown, with foretibia broadly whitish bearing dark brown basal $\frac{1}{3}$ and distal end.

HEAD. Temporals 2–3. AT 0.40–0.56. Clypeus with 7–8 setae. Lengths (μm) of Pm_{1-5} : 32 (1), 54 (1), 103 (1), 116 (1), 224 (1), respectively. Pm_4/Pm_3 1.1 (1), Pm_5/Pm_4 1.9 (1). Pm_3 with numerous SCL on 2 oval depressions.

THORAX. Lateral Aps 4–6. Ac 13–16, longest 12–15 μm long; Dc 5–6, including 1–2 H; Pa 3; Scts 4. HP (Fig. 14D) oval, large.

WING (Fig. 14E). Length 1.6 (1) mm. AnL much reduced; wing cuneiform, widest at around end of Cu_1 . C extension 62 (1) μm long. VR 1.1 (1). R with 2 (1) setae; R_1 and R_{4+5} bare. Sq with 0–1 seta.

LEGS. P_1 with single ti spur 32–39 μm long; P_2 with 2 ti spurs 22 and 20 μm long; P_3 with 2 ti spurs 42–49 and 20–22 μm long. P_2 without Sch. P_3 with ti comb of 12 bristles. Lengths and proportions of legs as in Table 12.

ABDOMEN (Fig. 14F). T II–III with one pair of longitudinal, lateral setal rows, IV–VII with 2 pairs of longitudinal, lateral setal rows. Hypopygium (Fig. 14G) with AnP robust, apically blunt, bearing 8 lateral setae. Gc 145–175 μm long, 3.6 (1) \times as long as broad at middle, with SVo thin, roundly projected; IVo simple, triangular, with rounded apex. Gs 71–74 μm long, with subapical, triangular CD. HR 2.0–2.4.

Pupa (n = 1)

Total length 3.6 mm.

COLOURATION. Exuviae pale brown with dark abdominal Apo.

CEPHALOTHORAX. FA (Fig. 14H) weakly rugose; FS absent. Thoracic horn 294 μm long, and 3.0 \times as long as broad. Pc_{1-3} arranged in triangle. Lengths (μm) of Dc_{1-4} : 49, –, 25, 25, respectively. Distances (μm) of Dc_1 – Dc_2 , Dc_2 – Dc_3 , Dc_3 – Dc_4 : 52, 76, 15, respectively; these setae arranged in line. Distance ratio of Dc_1 – Dc_2 to Dc_2 – Dc_3 0.68.

ABDOMEN (Fig. 14I). Tergal spinulation indistinct; at least T IV with weak, extensive spinulation, T IX with anterior spinulation; these spinules sporadic and faint. Spine rows present on posterior margins of T II–VIII; these spines strong on T VII–VIII. Posterior margins of T II–V and conjunctives III/IV–V/VI without anteriorly directed spinules. S IV–VII each with rows of spines on posterior margin. PSB present, but small, on A II–III. Segment I with 2 L-setae, II–VIII each with 3 L-setae, some L-setae apically split. $\text{L}_{1,2}$ -setae relatively long at least on A II–IV, these almost $\frac{1}{2}$ \times as long as segment length; L_3 -seta slightly shorter than $\text{L}_{1,2}$ -setae. AL 246 μm long, 1.9 \times as long as broad, without lateral taeniae; male genital sac 1.1 \times as long as AL.

Female and larva

Unknown.

Distribution

The species is known only from Yunnan Province in Oriental China.

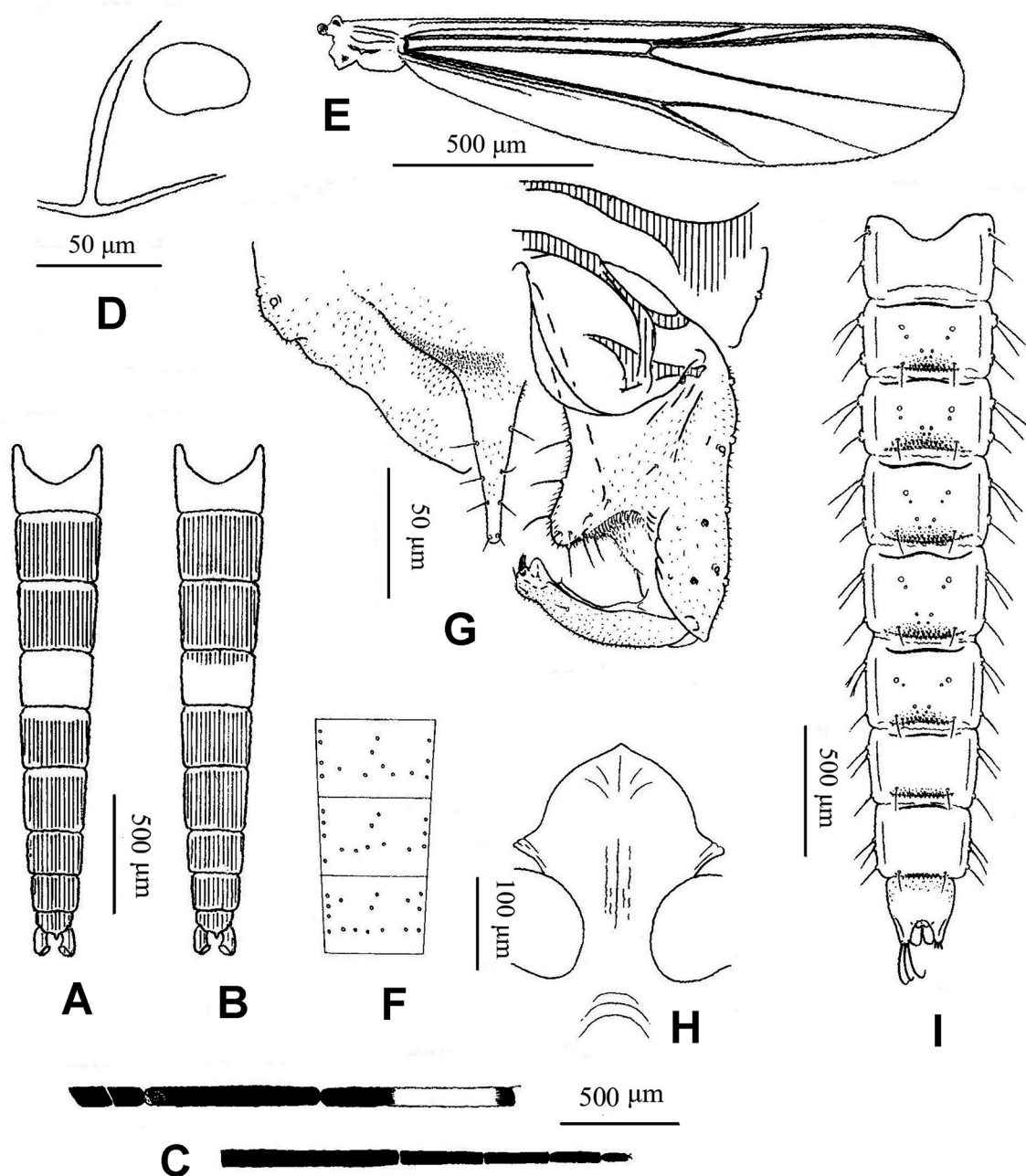


Fig. 14. *Rheocricotopus* (*P.*) *albus* sp. nov. **A.** ♂ (JNU). **B–G.** Holotype, ♂ (JNU 170512011). **H–I.** Paratype, pupa (JNU). **A–B.** Abdominal colour pattern, showing variation. **C.** Foreleg colour pattern. **D.** Humeral pit. **E.** Wing. **F.** Setal arrangement on tergites II–IV. **G.** Hypopygium, dorsal view. **H.** Frontal apotome. **I.** Abdomen, dorsal view.

Table 12. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) albulus* sp. nov., ♂ (n = 1).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	784	804	627	343	255	176	88	0.78	2.6	1.9
P2	706	647	382	157	108	59	59	0.59	4.5	1.9
P3	715	784	451	196	167	88	78	0.58	3.7	2.5

Remarks

In the key by Sæther (1986: 69), the male will not pass couplet 2 due to the oval, large humeral pits and a low antennal ratio of 0.4. In Lehmann (1969: 377), the male will key to that of *R. (P.) godavarius* Lehmann, 1969 because of the bicoloured abdomen and the cuneiform wing with a few squamal setae, but differs from it in the oval and large humeral pit. According to Lehmann (1969: 361–362, 372 fig. 14b) and Sæther (1986: 72), *R. (P.) godavarius* has indistinct, small humeral pits consisting of several small holes.

The pupa is characterized by the absences of frontal setae and anteriorly directed spinules on the posterior margins of tergites II–V and conjunctives III/IV–V/VI, the abdominal segments II–VIII with three L-setae only on each side, and the anal lobe lacking of setal fringe, and the combination of these features is unique in *Rheocricotopus*. The pupa resembles that of *R. (P.) tirolus* Lehmann, 1969 in the lack of frontal setae and the anal lobe lacking a setal fringe, but *R. tirolus* has median spinules on the conjunctives III/IV and IV/V, and four L-setae on the segments VI–VIII, whose L_4 -setae are short or vestigial, and taeniate on the segment VIII (Sæther 1986: 76).

Rheocricotopus (P.) beibengensis sp. nov.

[urn:lsid:zoobank.org:act:A37CDD0C-9EC6-4AD4-973A-11C5EEFA19EA](https://zoobank.org/urn:lsid:zoobank.org:act:A37CDD0C-9EC6-4AD4-973A-11C5EEFA19EA)

Fig. 15, Table 13

Diagnosis

Male

Humeral pit large, circular. AR very low (less than 0.5). Scutum with rows of acrostichal setae. Wing cuneiform with a moderately long costal extension. Fore LR very high (more than 0.9). Superior volsella thin, triangular. Inferior volsella triangular with beak-like apex. Gonostylus sharply turned up apically, with small, subapical crista dorsalis.

Etymology

From the type locality, ‘Beibeng’, where is a small border township located in southern Xizang Autonomous Region.

Type material

Holotype

CHINA – Xizang • ♂; Nyingchi, Medog, Beibeng Township; 29°13' N, 95°07' E; 1400 m a.s.l.; 9 Aug. 2015; H.Q. Tang leg.; JNU, JNU 25121501.

Description

Male (n = 1)

Total length 1.7 mm.

COLOURATION. Body mostly dark brown with thorax yellow on pleural membrane; HP paler. Legs brown.

HEAD. Temporals 5. AR 0.33. Clypeus with 9 setae. Lengths (μm) of Pm_{1-5} : 27, 37, 71, 89, 172, respectively. Pm_4/Pm_3 1.2, Pm_5/Pm_4 1.9. Pm_3 with 3 SCl on one circular depression.

THORAX. Lateral Aps 3; Ac 9, longest 13 μm long; Dc 5, including 1 H; Pa 3; Scts 2. HP (Fig. 15A) moderately large, circular.

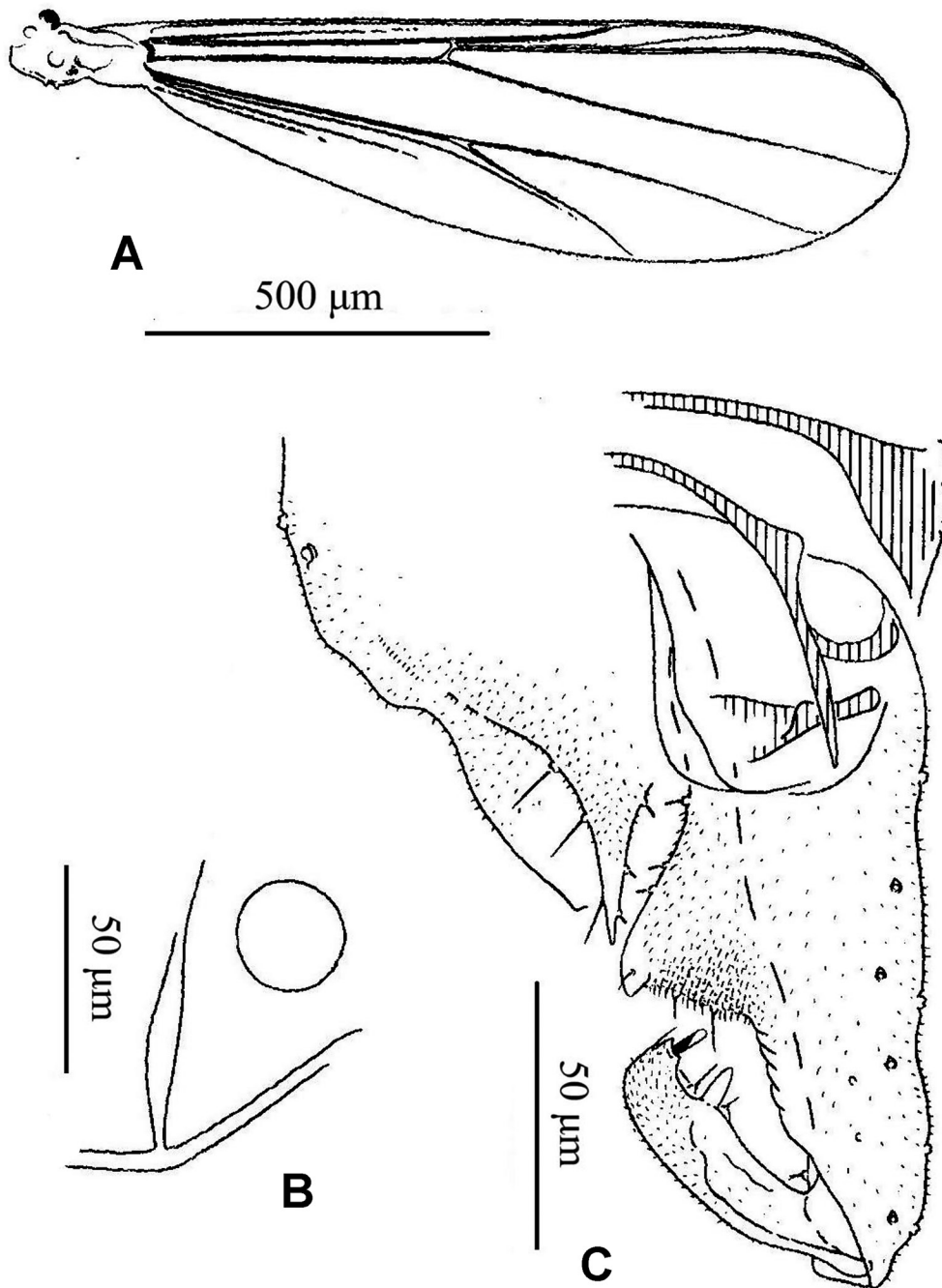


Fig. 15. *Rheocricotopus* (*P.*) *beibengensis* sp. nov., holotype, ♂ (JNU 25121501). A. Wing. B. Humeral pit. C. Hypopygium, dorsal view.

Table 13. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) beibengensis* sp. nov., ♂ (n = 1).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	500	480	461	284	206	147	78	0.96	2.0	2.5
P2	451	431	235	118	78	39	49	0.55	3.9	2.3
P3	480	519	314	157	127	69	69	0.60	3.1	4.2

WING (Fig. 15B). Length 1.3 mm. AnL much reduced, wing cuneiform. C extension well projected, 62 μm long. VR 1.1. R with 2 setae, R₁ and R₄₊₅ bare. Sq with 2 setae.

LEGS. P₁ with single ti spur 30 μm long, P₂ with 2 ti spurs 15 and 13 μm long, P₃ with 2 ti spurs 36 and 16 μm long. P₂ without Sch. P₃ with ti comb of 12 bristles. Lengths and proportions of legs as in Table 13.

ABDOMEN. Hypopygium (Fig. 15C) with AnP triangular, apically pointed, bearing 6 lateral setae. Gc 165 μm long with thin, triangular SVo; IVo triangular, apically with small, nearly bare, beak-like apex. Gs 59 μm long, sharply curved upwards at apex; CD small, slender, placed at subapex. HR 2.79.

Female, pupa and larva

Unknown.

Distribution

This species is known only from the type locality, Medog, Xizang Autonomous Region, in Oriental China.

Remarks

The male is similar to that of *R. (P.) imperfectus* in the combination of the gonostylus sharply up-turned apically, the low antennal ratio (AR ca 0.3), the wing with a reduced anal lobe and a moderately long costal extension, and the inferior volsella with a beak-like projection, but is distinct in the presence of acrostichal setae. According to Makarchenko & Makarchenko (2005: 129), the male of *R. (P.) imperfectus* has no acrostichal seta. This species also resembles *R. (P.) chalybeatus* if omitting the acrostichals, but can be separated from the latter by the cuneiform wing, the relatively low antennal ratio and the far-distant location of crista dorsalis from the apical megaseta. In the latter, the wing lobe is well developed, the antennal ratio is ca 1.0, and the crista dorsalis is tightly close to the megaseta.

Rheocricotopus (P.) binotatus sp. nov.

[urn:lsid:zoobank.org:act:2DB1E3E1-D7C7-4D36-94F0-AD188BEF6C63](https://doi.org/10.21203/rs.3.rs-11311111/v1)

Fig. 16, Table 14

Diagnosis

Male

Abdomen bicoloured, usually with tergites I and IV entirely or largely yellow, remaining tergites brown to dark brown. AR very low (less than 0.5). Humeral pit large, oval. Wing cuneiform with a very long costal extension and bare squama. Fore LR high (ca 0.9) Superior volsella triangular, thin. Inferior volsella triangular, apically rounded. Crista dorsalis triangular, occasionally large.

Etymology

From the Latin ‘*binotatus*’ (‘bi-noted’), referring to the largely brown abdomen with two yellow tergites.

Type material

Holotype

CHINA – Yunnan • ♂; Jinping, Ma'andi, unnamed stream; 22°46' N, 103°31' E; 1360 m a.s.l.; 8 Jun. 2017; J. Chen leg.; JNU, JNU 170723009.

Paratypes

CHINA – Yunnan • 3 ♂♂; Puer, Ximeng, Mengsuo, Wangmo brook; 22°18' N, 99°36' E; 1215 m a.s.l.; 24 Apr. 2022; Y.J. Liang leg.; JNU, JNU 23020507 • 1 ♂; Anning, Qinglongxia, Shuishenqiao; 25°3' N, 102°20' E; 1770 m a.s.l.; 27 Apr. 2017; J. Chen leg.; JNU 170811008. – Xizang • 1 ♂; Nyingchi, Medog,

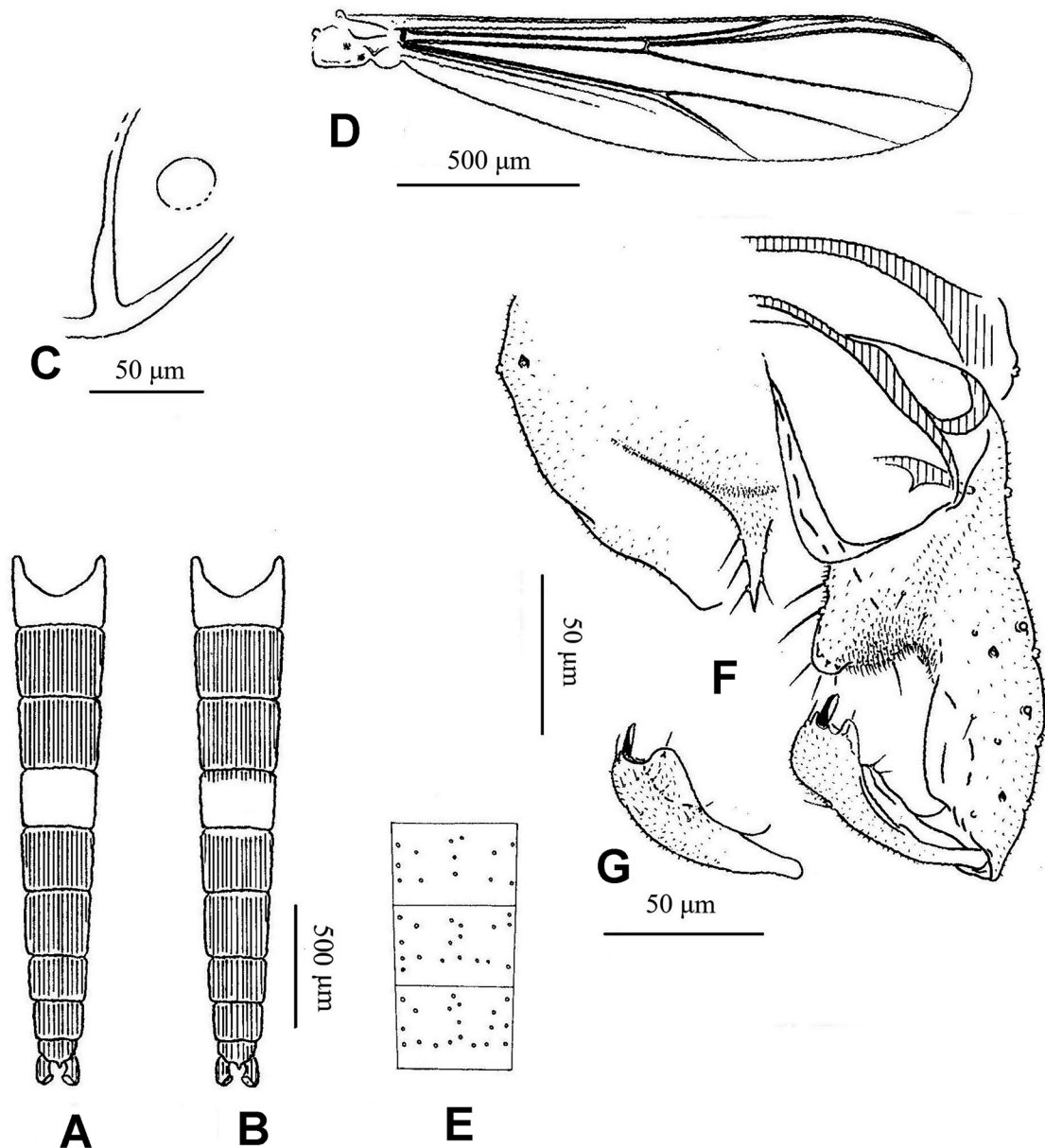


Fig. 16. *Rheocricotopus* (*P.*) *binotatus* sp. nov. **A, C, G.** ♂ (JNU 23020507). **B, D–F.** Holotype, ♂ (JNU 170723009). **A–B.** Abdominal colour pattern, showing variation. **C.** Humeral pit. **D.** Wing. **E.** Setal arrangement on tergites II–IV. **F.** Hypopygium, dorsal view. **G.** Gonostylus.

Table 14. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *binotatus* sp. nov., ♂♂ (n = 6).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	676–921 763	676–921 768	578–843 688	333–461 382	235–323 270	176–216 192 (5)	78–118 96 (5)	0.86–0.93 0.89	2.3–2.4 2.4 (5)	1.9–2.1 2.0 (5)
P2	647–843 723 (5)	588–794 674 (5)	363–510 454 (3)	157–206 186 (3)	118–157 140 (3)	69–88 82 (3)	59–78 69 (3)	0.60–0.64 0.63 (3)	4.0–4.1 4.1 (3)	2.1–2.3 2.2 (3)
P3	676–892 759 (5)	745–1009 847 (5)	441–627 532 (4)	206–274 240 (4)	157–216 189 (4)	98–118 108 (4)	78–88 83 (4)	0.59–0.63 0.61 (4)	3.4–3.6 3.5 (4)	2.4–2.6 2.5 (4)

Beibeng, Hanmi waterfall, No. 3 bridge; 29°14' N, 95°8' E; 970 m a.s.l.; 11 Aug. 2015; H.Q. Tang leg.; JNU.

Description

Male (n = 6)

Total length 1.9–2.4, 2.2 (4) mm.

COLOURATION. Head brown to dark brown on vertex. Thorax mostly dark brown except yellow pleural membrane and pale HP; scutal vittae indistinct. Abdomen (Fig. 16A) bicoloured; T I and IV entirely yellow, remaining tergites brown to dark brown; occasionally T IV (Fig. 16B) with narrow anterior dark band, T V with narrow anterior yellow band. Legs brown to dark brown.

HEAD. Temporals 2–4, 3. AR 0.24–0.44, 0.30. Clypeus with 5–8, 7 setae. Lengths (μm) of Pm_{1-5} : 22–34, 29; 49–62, 52; 91–123, 102; 101–135, 116; 199–300, 240 (5), respectively. Pm_4/Pm_3 1.0–1.2, 1.1, Pm_5/Pm_4 1.8–2.2, 2.0 (5). Pm_3 with numerous SCl on 2 oval depressions.

THORAX. Lateral Aps 4–8, 6 (4). Ac 8–12, 11 (4), longest 11–16, 14 (3) μm long; Dc 5–6, 6 (4), including 1–2, 2 (4) H; Pa 3 (4); Scts 4 (4). HP (Fig. 16C) moderately large, oval.

WING (Fig. 16D). Length 1.4–2.0, 1.6 mm. AnL much reduced, wing cuneiform. C extended well beyond end of R_{4+5} , extension 86–123, 101 μm long. VR 1.1. R with 5–12, 9 setae; R_1 with 0–1, 1 seta; R_{4+5} with 0–3, 2 setae. Sq bare.

LEGS. P_1 with single ti spur 37–42, 39 (5) μm long; P_2 with 2 ti spurs 20–25, 23 (4) and 20–25, 21 (3) μm long; P_3 with 2 ti spurs 39–49, 44 (5) and 17–22, 20 (4) μm long. P_2 without Sch. P_3 with ti comb of 11–13, 12 (5) bristles. Lengths and proportions of legs as in Table 14.

ABDOMEN (Fig. 16E). T II–VII laterally with 2 pairs of longitudinal rows of setae, VIII with irregularly scattered setae. Hypopygium (Fig. 16F) with AnP apically pointed, bearing 6–11, 8 lateral setae. Gc 160–185, 168 (5) μm long, 2.7–4.1, 3.4 (5) \times as long as broad at middle, with SVo thin, triangular, rounded at apex; IVo somewhat double-layered, with apically rounded dorsal lobe. Gs (Fig. 16G) 64–79, 69 (5) μm long; CD triangular, occasionally large, arising from apical half of Gs. HR 2.3–2.5, 2.4 (5).

Female, pupa and larva

Unknown.

Distribution

The new species is known from Yunnan Province and Xizang Autonomous Region in Oriental China.

Remarks

The male most resembles that of *R. (P.) albulus* sp. nov. in the oval and large humeral pit, the largely brown abdomen with yellow tergites I and IV; the wedge-shaped wing with squamal setae reduced in number and a long costal extension; and the apically rounded triangular inferior volsella, but differs from it in the entirely brown to dark brown foretibia, and the relatively slender anal point with a sharply pointed apex. In the latter, the foretibia is whitish except the dark brown basal $\frac{1}{3}$ and distal end, and the anal point is stout and apically rounded.

The male is somewhat similar to that of *R. (P.) godavarius* Lehman, 1969 also in the bicoloured abdomen with whitish tergites I and IV, the cuneiform wing with a bare squama and a well-projected costal extension, but separable by the moderately large humeral pit. According to Lehmann (1969: 355), in *R. (P.) godavarius* the small humeral pit is composed of partly fused small holes.

Rheocricotopus (P.) chinogodavarius sp. nov.

[urn:lsid:zoobank.org:act:A8CA2B84-409B-4D28-978A-AC16975F929A](https://doi.org/10.3896/BI.2023.170724006)

Fig. 17, Table 15

Diagnosis

Male

Abdomen bicoloured, with tergite I entirely yellow, tergites II–IV entirely or partly dark brown, tergites V–IX entirely dark brown. Legs largely dark brown with apex of tibia and base of basitarsus broadly whitish. Humeral pit large, oval. Wing cuneiform with a distinct costal extension. Fore LR very high (ca 0.9). Superior volsella plate-like, low. Inferior volsella triangular.

Crista dorsalis triangular, more or less conspicuous, positioned at about middle of gonocoxite.

Etymology

From the type locality China, and *Rheocricotopus (P.) godavarius* Lehmann, the male of which somewhat resembles that of the present species.

Type material

Holotype

CHINA – Yunnan • ♂; Jinping, Ma'andi, unnamed stream; 22°46' N, 103°31' E; 1360 m a.s.l.; 8 Jun. 2017; J. Chen leg.; JNU, JNU 170724006.

Paratypes

CHINA – Yunnan • 2 ♂♂; Lijiang, Yulong, Jiuhe, 99-lakes scenic spot, Lake Tiancai; 26°38' N, 99°43' E; 3900 m a.s.l.; 18 Aug. 2023; H.Q. Tang leg.; JNU.

Description

Male (n = 3)

Total length 2.1–2.9, 2.5 mm.

COLOURATION. Head dark brown on vertex. Thorax mostly dark brown except yellow pleural membrane and pale HP; scutal vittae indistinct. Abdomen (Fig. 17A–C) bicoloured. T I entirely yellow. T II mostly yellow with mesal longitudinal, and anterior and posterior transverse dark bands; or with posterior transverse dark band only. T III entirely dark brown; or yellow with mesal and lateral longitudinal, and anterior and posterior transverse dark bands. T IV yellow with mesal longitudinal, and anterior and posterior transverse dark bands; or mesal longitudinal short band only. T V–IX entirely dark brown.

Legs (Fig. 17D–E) dark brown, with whitish bands on ti and ta_1 ; fe and Ta_{2-5} entirely dark brown in all legs. P_1 whitish on apical $\frac{2}{3}$ – $\frac{3}{4}$ of ti and basal $\frac{1}{2}$ of ta_1 . P_2 and P_3 somewhat paler on apical half of ti and basal half of ta_1 .

HEAD. Temporals 7–14, 9. AR 0.38 (1). Clypeus with 4–8, 6 setae. Lengths (μm) of Pm_{1-5} : 25–37, 32; 49–74, 62; 103–160, 134; 125–155, 140; 221–290, 257, respectively. Pm_4/Pm_3 1.0–1.2, 1.1; Pm_5/Pm_4 1.8–1.9, 1.8. Pm_3 with 4–9, 6 SCl on 2 oval depressions.

THORAX. Lateral Aps 5–8, 6. Ac 7–17, 13; longest 15–17, 16 μm long; Dc 5–8, 6, including 1 H; Pa 3–4, 3; Scts 4 (2). HP (Fig. 17F) large, oval.

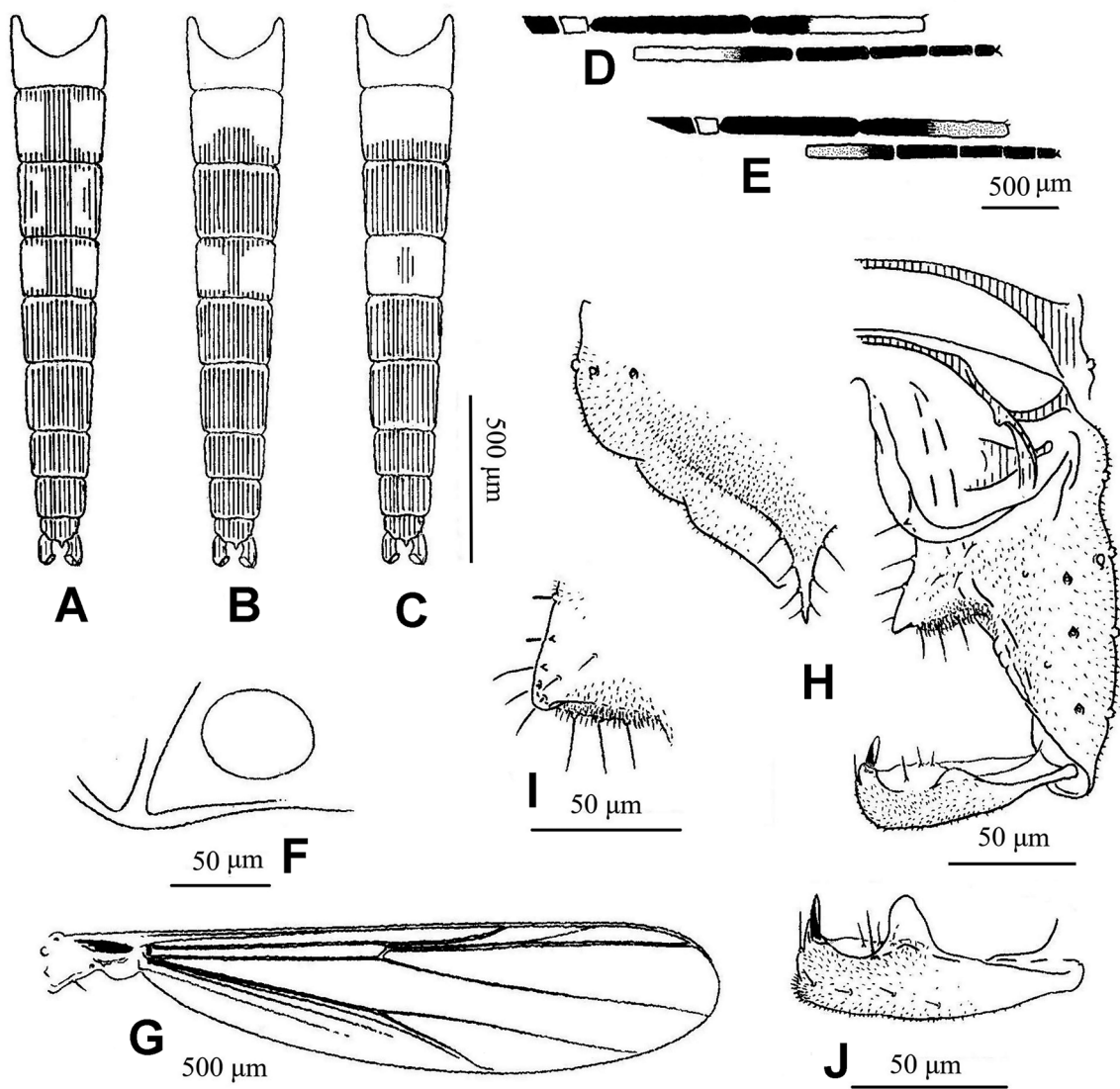


Fig. 17. *Rheocricotopus (P.) chinogodavarius* sp. nov. **A, D–H.** Holotype, ♂ (JNU 170724006). **B–C, I–J.** Paratype, ♂ (JNU). **A–C.** Abdominal colour pattern, showing variation. **D.** Colour pattern of foreleg. **E.** Colour pattern of mid leg. **F.** Humeral pit. **G.** Wing. **H.** Hypopygium, dorsal view. **I.** Inferior volsella, showing variation. **J.** Gonostylus, showing variation.

Table 15. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *chinogodavarius* sp. nov., ♂♂ (n = 3).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	696–921	794–980	706–882	392–480	274–333	196–225	98–108	0.89–0.90	2.3–2.5	1.9–2.9
	813	872	781	428	297	203	101	0.89	2.4	2.3
P2	647–921	617–862	392–539	186–265	118–186	69–108	59–98	0.60–0.63	3.5–3.8	1.9–3.0
	794	745	461	225	157	91	82	0.62	3.6	2.6
P3	696–980	813–1098	480–706	235–363	176–284	98–147	78–108	0.59–0.64	3.0–3.4	2.9–3.4
	849	964	598	310	238	124	95	0.62	3.2	3.2

WING (Fig. 17G). Length 1.6–2.7, 2.2 mm. C extended moderately beyond end of R_{4+5} , extension 57–98, 81 μm long. VR 1.0–1.1, 1.1. R with 4–10, 7 setae, R_1 and R_{4+5} bare. Sq with 1–4, 2 setae. AnL much reduced.

LEGS. P_1 with ti spur 34–37, 36 μm long; P_2 with 2 ti spurs 15–20, 18 and 15–17, 16 μm long; P_3 with 2 ti spurs 39–47, 43 and 17–20, 18 μm long. P_2 without Sch. P_3 with ti comb of 11–16, 13 bristles. Lengths and proportions of legs as in Table 15.

ABDOMEN. Hypopygium (Fig. 17H) with AnP pointed apically, bearing 7–11, 9 lateral setae. Gc 153–204, 179 μm long, 3.2–3.9, 3.4 \times as long as broad at middle. SVo thin, roundly protruded, IVo (Fig. 17I) triangular. Gs (Fig. 17J) 74–91, 84 μm long, nearly parallel-sided, apically truncated, with CD triangular, somewhat variable in size, more or less conspicuous, positioned at about middle. HR 2.1–2.2, 2.1.

Female, pupa and larva

Unknown.

Distribution

The species is known only from Yunnan Province in Oriental China.

Remarks

The male somewhat resembles that of *R. (P.) godavarius* Lehmann, 1969 from Nepal in the bicoloured abdomen, the low antennal ratio (AR less than 0.4), the wing with a distinct costal extension and a much-reduced anal lobe, the plate-like superior volsella, and distinct, triangular crista dorsalis, but differs from it in the large oval humeral pit, the wing with squamal setae, the bicoloured legs with broad whitish bands on the tibia and the basitarsus, and the distinct, occasionally very large, crista dorsalis located around the middle of gonostylus. According to Lehmann (1969: 361–362; 363 fig. 19c, 370 fig. 9, 372 fig. 14b), the latter has an indistinct small humeral pit, wings with a bare squama, evenly brownish to brown legs, and a smaller crista dorsalis on the subapex of gonostylus.

Rheocricotopus (P.) fasciolatus sp. nov.

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Fig. 18, Table 16

Diagnosis

Male

Abdomen bicoloured, with tergite I entirely yellow; tergites II–III, V and IX entirely dark brown; tergites IV, VI–VII largely yellow, bearing anterior and posterior narrow transverse dark bands; tergite VIII yellow on anterior half, dark brown on posterior half. AR very low (0.2). Scutum with a few acrostichal setae near apex. Humeral pit oval, large. Wing cuneiform, with a bare squama and a well-developed costal extension. Fore LR high (ca 0.9). Superior volsella triangular, plate-like. Inferior volsella triangular, apically rounded. Crista dorsalis triangular, somewhat large.

Etymology

From the Latin ‘*fasciolatus*’ (‘fasciolate’), referring to the yellow-banded abdominal tergites I, IV, VI–VIII of the adult.

Type material

Holotype

CHINA – Yunnan • ♂; Xishuangbanna, Mengla, Bubang, Xishuangbanna Tropical Rainforest National Park, Wangtianshu Scenic Area; 21°37' N, 101°35' E; 730 m a.s.l.; 25 Apr. 2017; H.Q. Tang and J. Chen leg.; JNU, JNU 170509002.

Description

Male (n = 1)

Total length 2.4 mm.

COLOURATION. Head dark brown on vertex. Thorax largely dark brown with yellow pleural membrane; scutal vittae indistinct. Abdomen (Fig. 18A) bicoloured; T I entirely yellow; T II–III, V and IX entirely dark brown; T IV, VI–VII largely yellow with anterior and posterior narrow transverse dark bands; T VIII yellow on anterior half, dark brown on posterior half. Legs dark brown, with femur somewhat paler on basal $\frac{1}{4}$ – $\frac{1}{3}$.

HEAD. Temporals 3. AR 0.2. Clypeus with 10 setae. Lengths (μm) of Pm_{1-5} : 39, 66, 135, 133, 283, respectively. Pm_4/Pm_3 0.98, Pm_5/Pm_4 2.1. Pm_3 with numerous SCL on 2 oval subapical depressions.

THORAX. Lateral Aps 3. Ac 3 near to apex of scutum, longest 10 μm long; Dc 7 including 2 H; Pa 3; Scts 4. HP (Fig. 18B) large, oval, indistinct in ventral half.

WING (Fig. 18C). Length 1.8 mm. AnL much reduced; wing cuneiform, widest at around end of Cu_1 . C extension very long, 111 μm long. VR 1.1. R with 8 setae, R_1 without setae, R_{4+5} with 3 setae. Sq without setae.

LEGS. P_1 with ti spur 34 μm long; P_2 with at least one ti spur 15 μm long; P_3 with 2 ti spurs 49 and 20 μm long. P_2 without Sch. P_3 with ti comb of 13 bristles. Lengths and proportions of legs as in Table 16.

ABDOMEN (Fig. 18D). T III–VII laterally with one pair of longitudinal setal rows; occasionally anterior seta of a row absent. Hypopygium (Fig. 18E) with AnP pointed apically, bearing 7 lateral setae. Gc 185 μm long and $3.8 \times$ as long as broad at middle, with SVo triangular, rounded at apex; IVo triangular,

rounded apically. Gs 81 μm long, roundly convex in outer margin, subapically with triangular, relatively large CD. HR 2.27.

Female, pupa and larva

Unknown.

Distribution

The species is known only from the type locality, Yunnan Province in Oriental China.

Remarks

The male is most similar to that of *R. (P.) binotatus* sp. nov. in the bicoloured abdomen with entirely or substantially yellow tergites I and IV; the moderately large, oval humeral pit; the cuneiform wing with

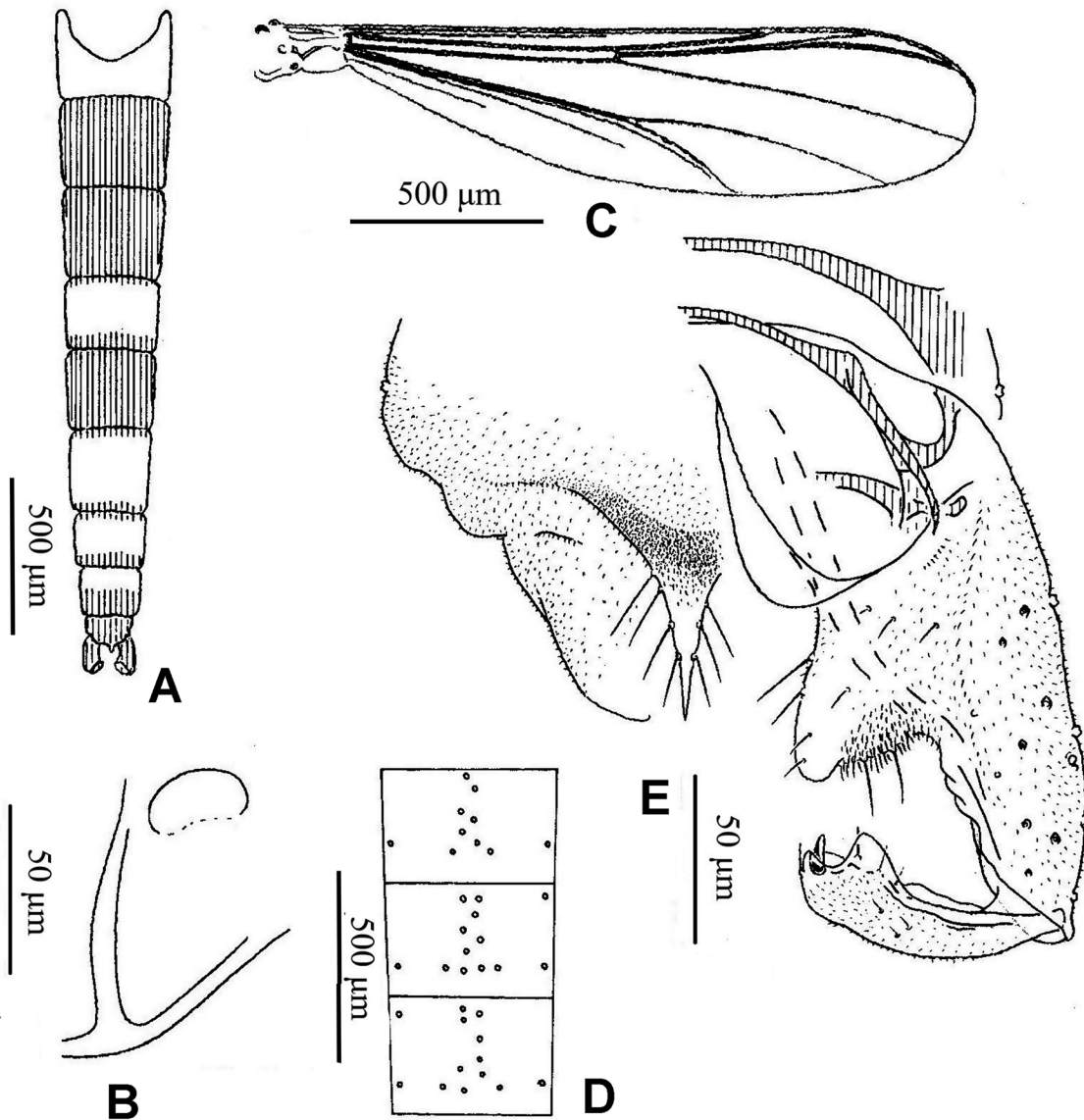


Fig. 18. *Rheocricotopus (P.) fasciolatus* sp. nov., holotype, ♂ (JNU 170509002). A. Abdominal colour pattern. B. Humeral pit. C. Wing. D. Setal arrangement on tergites II–IV. E. Hypopygium, dorsal view.

Table 16. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) fasciolatus* sp. nov., ♂ (n = 1).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	931	960	833	431	294	206	108	0.87	2.6	1.9
P2	833	794	480	196	137	78	69	0.60	4.4	2.5
P3	941	1058	617	274	225	127	88	0.58	3.7	2.8

a very long costal extension and a bare squama; the triangular, apically rounded superior volsella; and the distinct, triangular crista dorsalis, but distinct from it in the largely yellow tergites VI–VIII and the scutum with a few acrostichal setae near the apex. In the latter, the tergites VI–VIII are entirely brown, and the scutum has rows of about ten acrostichal setae.

The male also resembles that of *R. (P.) valgus* Chaudhuri & Sinharay, 1983 in the abdominal colouration: tergites II–III entirely brown, VI–VII yellow each with a posterior brown band, but differs from it in the low antennal ratio (AR 0.2), large oval humeral pit, and cuneiform wing without squamal setae. In the latter, however, the antennal ratio is higher (AR 1.0–1.2), humeral pits are absent, and the wings have an obtuse anal lobe and a setal fringe on the squama (see the present redescription of *R. (P.) valgus*).

Rheocricotopus (P.) hanmiensis sp. nov.

[urn:lsid:zoobank.org:act:7FF66C02-2CF4-48CA-AA8A-E2ED13B8CAC4](https://zoobank.org/act:7FF66C02-2CF4-48CA-AA8A-E2ED13B8CAC4)

Fig. 19, Table 17

Diagnosis

Male

Abdomen bicoloured with tergites I and II largely yellow, each bearing a darkened posteromedial patch; remaining tergites entirely brown. AR ca 0.5. Humeral pit large, circular. Wing cuneiform with a short but distinct costal extension. Superior volsella triangular, thin. Inferior volsella triangular, apically rounded. Crista dorsalis triangular, distinct, placed at subapex of gonostylus.

Etymology

From the type locality, Hanmi Waterfall in Xizang Autonomous Region, China.

Type material

Holotype

CHINA – **Xizang** • ♂; Nyingchi, Medog, Beibeng, Hanmi waterfall, No. 3 bridge; 29°14' N, 95°08' E; 970 m a.s.l.; 11 Aug. 2015; H.Q. Tang leg.; JNU, JNU 251215A1.

Paratype

CHINA – **Xizang** • 1 ♂; same data as for holotype; JNU.

Description

Male (n = 2)

Total length 2.1–2.4 mm.

COLOURATION. Body mostly dark brown; thorax with pale humeral pits. Abdomen (Fig. 19A) bicoloured; T I–II pale brown each with darkened posteromedian patch; T III–IX entirely dark brown. Legs uniformly brown.

HEAD. Temporals 2–4. AR 0.47–0.48. Clypeus with 12–13 setae. Lengths (μm) of Pm_{1-5} : 34–37, 54–64, 121–162, 128–167, 209–246, respectively. Pm_4/Pm_3 1.0–1.1, Pm_5/Pm_4 1.5–1.6. Pm_3 with 1 SCL on subapex.

THORAX. Lateral Aps 2–5; Ac 7–8, longest 15 μm long; Dc 4–5, including 0–1 H; Pa 3; Scts 4 (1). HP (Fig. 19B) distinct, moderately large, circular.

WING (Fig. 19C). Length 1.7–2.0 mm. C extension moderately produced, 49–52 μm long. VR 1.1. R with 4–6 setae, R_1 with 0–1 seta, R_{4+5} bare. AnL much reduced, wing widest at around end of Cu_1 . Sq with 3–4 setae.

LEGS. P_1 with single ti spur 37–39 μm long; P_2 with 2 ti spurs of equal length, 22 μm long; P_3 with 2 ti spurs 42–49 and 25 (1) μm long. P_2 with 3–5 Sch on ta_1 . P_3 with ti comb of 12–13 bristles. Lengths and proportions of legs as in Table 17.

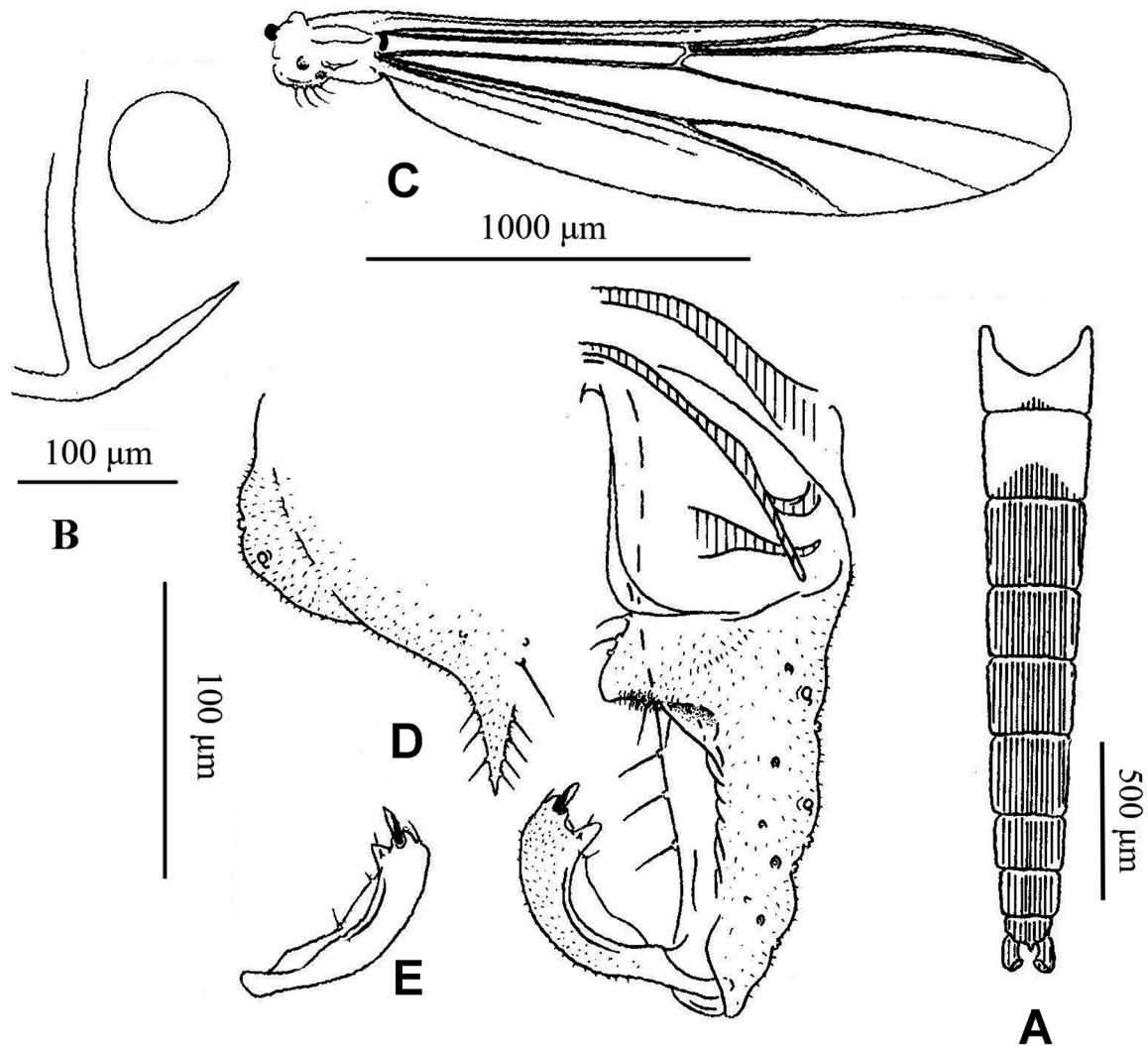


Fig. 19. *Rheocricotopus* (*P.*) *hanmiensis* sp. nov., holotype, ♂ (JNU 251215A1). A. Abdominal colour pattern. B. Humeral pit. C. Wing. D. Hypopygium, dorsal view. E. Gonostylus.

Table 17. Lengths (µm) and proportions of legs of *Rheocricotopus (P.) hanmiensis* sp. nov., ♂♂ (n = 2).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	696–902	774–990	–	–	–	–	–	–	–	–
P2	676–833	657–813	382–480	186–216	137–157	78–88	69–78	0.58–0.59	3.6–3.9	1.9–2.3
P3	696–853	794–1009	480–608	255–294	196–235	108–127	78–88	0.60	3.1–3.3	3.0–3.2

ABDOMEN. Hypopygium (Fig. 19D) with AnP pointed apically, bearing 5–6 basal and 6–8 lateral setae. Gc 204–221 µm long with SVo triangular, thin; IVo triangular, apically rounded. Gs (Fig. 19E) 66–71 µm long, roundly convex in outer margin, subapically with CD triangular, distinct. HR 3.10.

Female, pupa and larva

Unknown.

Distribution

The new species is known only from the type locality, Xizang Autonomous Region in Oriental China.

Remarks

The male resembles that of *R. (P.) oiraprimus* Sasa, 1991 in the large circular humeral pit; the bicoloured abdomen; the low antennal ratio (AR ca 0.5); the cuneiform wing with a short costal extension; the simple, triangular inferior volsella; and the triangular, distinct crista dorsalis. However, the male differs from it in the yellow tergite II with a darkened posteromedial patch, the anteprenotum with lateral setae only, and the thin, triangular superior volsella. In *R. (P.) oiraprimus*, the abdomen has yellow tergite II with lateral and middle longitudinal darkened patches; the anteprenotum has both median and lateral setae; and the superior volsella is thick, roundly protruded.

Rheocricotopus (P.) masarui sp. nov.

[urn:lsid:zoobank.org:act:AA635D3F-1D0D-4EC0-9CEA-976DC1B173F1](https://zoobank.org/act:AA635D3F-1D0D-4EC0-9CEA-976DC1B173F1)

Fig. 20, Table 18

Rheocricotopus (Psilocricotopus) glabricollis [nec Meigen, 1830] – Makarchenko & Makarchenko 2005: 126.

Diagnosis

Male

Abdomen brown, with faint, median, dark I- or inverted T-shaped markings on tergites I–IV. AR high (ca 1.5). Acrostichal setae long (15–25 µm). Humeral pit large, quadrate. Wing with a well-developed anal lobe, a distinct costal extension and a well-developed squamal fringe. Superior volsella thin, roundly protruded. Inferior volsella triangular, with beak-like apex. Crista dorsalis distinct, tooth-like.

Pupa

Exuviae small-sized (3.0–4.0 mm long). Frontal setae bifid on prefrons.

Etymology

Named in honor of the late Dr Masaru Yamamoto (Shimonoseki, Japan) in recognition of his contribution to taxonomic studies on the East Asian chironomid fauna.

Type material

Holotype

CHINA – **Sichuan** • ♂; Liangshan, Puge, Qiaowo; 27°30' N, 102°27' E; 1447 m a.s.l.; 3 May 2021; J.Y. Shi leg.; JNU, JNU 211013H03B.

Paratypes

CHINA – **Jilin** • 1 ♂ with Pe; Antu, Mt Changbai; 42°03' N, 128°03' E; 1835 m a.s.l.; 11 Aug. 2022; H.Q. Tang leg.; JNU, JNU 22082001. – **Inner Mongolia** • 2 ♂♂; Arxan National Forest Park, site 11; 47°33' N, 120°52' E; 958 m a.s.l.; 9 Sep. 2023; Z.Y. Ni leg.; JNU, JNU 23102801. – **Guangdong** • 1 ♂ (pharate), 1 Pe; Shaoguan, Renhua, Hongshan; 25°15' N, 113°36' E; 500 m a.s.l.; 16 Feb. 2023; Y.R. He and X. Dong leg.; JNU, JNU 23021901. – **Yunnan** • 1 ♂; Lyuchun, Mt Huanglian NNR; 22°50' N, 102°14' E; 1355 m a.s.l.; 22 Apr. 2017; H.Q. Tang leg.; JNU, JNU170521006. – **Sichuan** • 1 ♂; same data as for holotype; 23 Apr. 2021; JNU, JNU 21101204B.

Description

Male (n = 3)

Total length 3.2–3.4, 3.3 mm.

COLOURATION. Body mostly dark brown. Head dark brown on vertex. Thorax dark brown on 3 scutal vittae, Pe, Sct and Pe. Abdomen (Fig. 20A–C) brown with faint, dark markings; T I with I-shaped dark marking or more extensively dark brown; II–IV or II–V each with median I- or inverted T-shaped marking, occasionally these markings very faint; T V or V–VI with broad, triangular marking; T VII–IX entirely dark brown. All legs uniformly brown to dark brown.

HEAD. Temporals 4–6, 5. AR 1.4–1.6, 1.5. Clypeus with 13–17, 15 setae. Lengths (µm) of Pm_{1–5}: 34–44, 41; 64–74, 67; 111–128, 121; 155–167, 160; 229–258, 245, respectively. Pm₄/Pm₃, 1.3–1.4, 1.3; Pm₅/Pm₄, 1.5–1.6, 1.5. Pm₃ with 4 SCL.

THORAX. Lateral Aps 4–5, 4; occasionally one weak seta present medially. Ac 8–14, 12, longest 17–25, 22 µm long; Dc 15 (2), including 3–6, 5 H, usually biserial anteriorly; Pa 4–6, 5; Scts 6–12 (2). HP (Fig. 20D) large, nearly quadrate, 118–137, 127 µm long, 108–137, 121 µm high.

WING (Fig. 20E). Length 2.0–2.3, 2.2 mm. C extension well developed, 64–79, 74 µm long. VR 1.0–1.1 (2). R with 5 setae, R₁ and R₄₊₅ bare. AnL well developed. Sq with 12–14, 13 setae.

LEGS. P₁ with single ti spur 59 µm long; P₂ with 2 ti spurs of equal length, 20–22 (2) µm; P₃ with 2 ti spurs 54–59, 56 and 22–25, 23 µm long. P₂ with 5–8, 6 Sch on ta₁; P₃ with 0–3, 2 Sch on ta₁. P₃ with ti comb of 11–12, 11 bristles. Lengths and proportions of legs as in Table 18.

ABDOMEN. T II–VIII (Fig 20F–G) each with setae separated in 3 groups. Hypopygium (Fig. 20H) with AnP (Fig. 20I) pointed apically, bearing 5–6, 6 lateral setae. Gc 229–239, 233 µm long with SVo thin, roundly protruded; IVo triangular with beak-like apex. Gs (Fig. 20J) 93–98, 97 µm long, roundly convex in outer margin, tending to project outwards as weak subapical heel; CD triangular, distinct. HR 2.33–2.47, 2.41.

Pupa (n = 4)

Total length 3.2–4.3, 3.8 mm.

COLOURATION. Exuviae brown with dark Apo and posterior spines on abdomen.

CEPHALOTHORAX. FA (Fig. 20K) weakly rugose with FS bifid, 25–42, 33 μm long. Scutum extensively granular. Thoracic horn (Fig. 20L) 357–431, 408 μm long, 3.4–3.8, 3.5 \times as long as broad. Lengths (μm) of Pc_{1-3} : 140–167, 151; 197–221, 212; 93–111, 100, respectively. Lengths (μm) of Dc_{1-4} : 69–101, 84 (3); 52–74, 62 (3); 44–49, 47 (3); 62–98, 76, respectively. Distances (μm) of Dc_1 – Dc_2 , Dc_2 – Dc_3 , Dc_3 – Dc_4 :

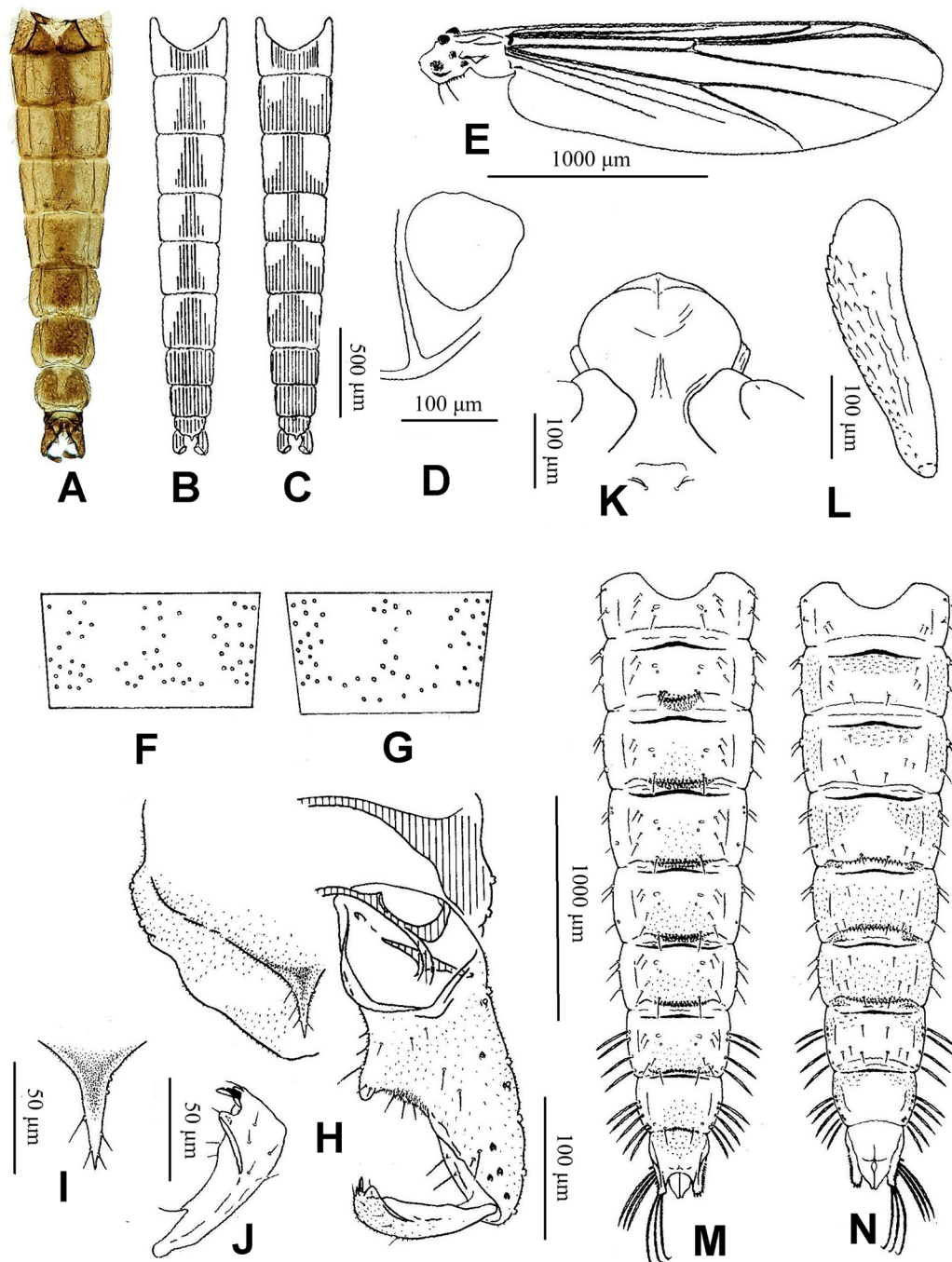


Fig. 20. *Rheocricotopus (P.) masarui* sp. nov. A–B, E–H. Holotype, ♂ (JNU 211013H03B). C–D, I–J. Paratype, ♂ (JNU 22082001). K–N. Pupa (JNU 22082001). A–C. Abdominal colour pattern, showing variation. D. Humeral pit. E. Wing. F. Setal arrangement on tergite II. G. Setal arrangement on tergite IV. H. Hypopygium, dorsal view. I. Anal point. J. Gonostylus. K. Frontal apotome. L. Thoracic horn. M. Abdomen, dorsal view. N. Abdomen, ventral view.

Table 18. Lengths (µm) and proportions of legs of *Rheocricotopus* (*P.*) *masarui* sp. nov., ♂♂ (n = 3).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	764–795 778	833–911 875	735–774 748	363–382 376	274–294 284	196–216 206	118–127 121	0.81–0.88 0.86	2.3–2.5 2.4	1.6–2.0 (2) –
P2	735–784 768	715–764 745	421–441 434	196–206 199	147–157 150	88–98 91	88 88	0.58–0.59 0.58	3.5–3.8 3.7	2.2–2.5 2.4
P3	725–804 764	862–970 921	529–598 568	265–284 278	225–235 229	127 127	98–108 105	0.60–0.64 0.62	3.0–3.1 3.1	2.5–4.2 3.5

22–106, 68; 57–96, 76; 30–86, 51, respectively; these setae linear arranged; distance ratio of Dc_1 – Dc_2 to Dc_2 – Dc_3 0.23–1.87, 1.05.

ABDOMEN (Fig. 20M–N). Length 2.7–3.3, 3.0 mm. T I–II without spinulation; T III–VIII each with sporadic, weak posteromedian spinulation; T IX with anterior spinulation. S I and IX without spinulation. S II–III with relatively strong, anterior spinulation; S IV with anterolateral spinulation; S V–VI with more or less extensive spinulation; S VII–VIII with anterolateral spinulation. Spine rows on posterior margins of T II–VIII; some posterior spines recurved on T II; posterior spines on T VIII long and strong, longest 17–27, 24 µm long. Anteriorly directed spinules present, posterior to spine rows on T II–V. S IV–VII with rows of spines on posterior margin; posterior spines small, sporadic on S VII. PSB present on A II–III. Segment I with 2 L-seta; II–VI each with 3 L-setae, VII with 4 LS-setae, VIII with 5 LS-setae; some L-setae apically split on A II–VI. AL 294–363, 338 µm long, 2.1–2.5, 2.3 × as long as broad, with 12–22, 18 lateral taeniae on posterior $3/5$ – $3/4$; male genital sac nearly as long as AL.

Female and larva

Unknown.

Distribution

The new species is known from Oriental and Palaearctic China, and the Russian Far East.

Remarks

The male will key to that of *R. (P.) glabricollis* (Meigen, 1830) in Lehmann (1969, as *Rheocricotopus gouini* (Goetghebuer, 1936)), Sæther (1986) and Langton & Pinder (2007), but differs in faint dark markings on the tergites I–IV, and the distinctly beak-like apex of inferior volsella. Under the name *Spaniotoma (Trichocladus) glabricollis*, Edwards (1929: 330) wrote briefly: “abdomen rather dull blackish brown”. The male of *R. (P.) glabricollis* possesses a simple, triangular inferior volsella, according to Edwards (1929: 329 fig. 5b, as *Spaniotoma*), Goetghebuer (1932: 57 fig. 95, as *Trichocladus*), Lehmann (1969: 366 fig. 2, as *R. gouini*), Sæther (1986: 87 fig. 11d) and Langton & Pinder (2007: 80 fig. 189b).

The pupa will key to that of *R. (P.) atripes* (Kieffer, 1913) in Langton (1991) and Sæther (1986), but differs in the bifid frontal seta and a larger thoracic horn (357–431 µm in length). According to Langton (1991: 108 fig. 46b), in the latter, the frontal seta is simple and the thoracic horn is 300–350 µm long.

Makarchenko & Makarchenko (2005: 126) redescribed *R. (P.) glabricollis* based on a single male from Sakhalin Island, Russia. However, the shape of inferior volsella (Makarchenko & Makarchenko 2005: 127 fig. 5) is more similar to that of *R. (P.) masarui* sp. nov. than to that of *R. (P.) glabricollis*. Further, according to E. Makarchenko (pers. comm. 2023), each of tergites II–IV have a faint dark marking and

possibility tergite V has a very faint marking. Therefore, the Russian species is conspecific with *R. (P.) masarui* sp. nov.

***Rheocricotopus (P.) monovittatus* sp. nov.**

[urn:lsid:zoobank.org:act:7AEB1E75-CB86-48E4-B2DA-DEE68C31F1C1](https://zoobank.org/act:7AEB1E75-CB86-48E4-B2DA-DEE68C31F1C1)

Fig. 21, Table 19

Diagnosis

Male

Abdomen largely dark brown, with tergite I entirely yellow, and tergites II bearing an anterior yellow band. AR relatively high (near 1.0). Scutum with 4 strong acrostichal setae near apex; longest more than 25 μm long. Humeral pit large, circular. Wing with an obtuse anal lobe and a very short costal extension (length 15–20 μm). Superior volsella thin, triangular. Inferior volsella triangular with a beak-like apex. Crista dorsalis small, triangular.

Etymology

From the Greek ‘*mono-*’ (praef.) (‘one’), and the Latin ‘*vittatus*’ (‘banded’), referring to the whitish anterior band on the abdomen.

Type material

Holotype

CHINA – **Guangdong** • ♂; Fengkai, Heishiding NNR, site 3; 23°27' N, 111°51' E; 310 m a.s.l.; 5 Apr. 2022; H.Q. Tang leg.; JNU, JNU 23032701.

Paratypes

CHINA – **Guangdong** • 2 ♂♂; Xinyi, Mt Yunkai NNR; 22°16' N, 111°11' E; 1130 m a.s.l.; 12 May 2020; S.X. Luo leg.; JNU, JNU 24033120.

Description

Male (n = 3)

Total length 2.4–2.8 (2) mm.

COLOURATION. Body mostly dark brown. Thorax dark brown with yellow or whitish pleural membrane; 3 scutal vittae distinct, dark brown. Abdomen (Fig. 21A) bicoloured; T I entirely yellow; T II largely dark brown with anterior, narrow transverse yellow band; T III–IX uniformly dark brown. Legs entirely dark brown.

HEAD. Temporals 3. AR 0.97 (1). Clypeus with 12–14, 13 setae. Lengths (μm) of Pm_{1-5} : 30–37 (2), 39–44 (2), 64–69 (2), 93 (2), 160 (1), respectively. Pm_4/Pm_3 1.4–1.5 (2), Pm_5/Pm_4 1.7 (1). Pm_3 with 1–2, 1 SCl; Pm_4 without SCl.

THORAX. Lateral Aps 3–5 (2). Ac 4 (2), located near apex of scutum, longest 27 (1) μm long; Dc 7–10 (2), including 1–3 (2) H; Pa 3 (2); Scts 6–9 (2), uniserial. HP (Fig. 21B) circular, moderately large, its margin faintly visible in a pale pleural area.

WING (Fig. 21C). Length 1.5 mm. C extension very short, 15–20, 17 μm long. VR 1.1. R with 3–4, 4 setae; R_1 and R_{4+5} bare. AnL developed, obtuse. Sq with 7 setae.

LEGS. P_1 with single ti spur 37–39, 39 μm long; P_2 with 2 ti spurs 15–17 (2) and 12–15 (2) μm long; P_3 with 2 ti spurs 37–39, 39 and 15–20, 17 μm long. P_2 with one Sch on ta_1 . P_3 with ti comb of 9–11, 10 bristles. Lengths and proportions of legs as in Table 19.

ABDOMEN. Hypopygium (Fig. 21D) with AnP triangular, pointed apically, bearing 6–8, 7 lateral setae. Gc 148–160, 155 μm long, 3.0–3.4, 3.2 \times as long as broad at middle, with SVo thin, triangular, apically rounded; IVo triangular, apically somewhat beak-shaped. Gs (Fig. 21E) 66–69, 67 μm long, gently curved upwards at apex, with CD preapical, small and triangular. HR 2.22–2.41, 2.31.

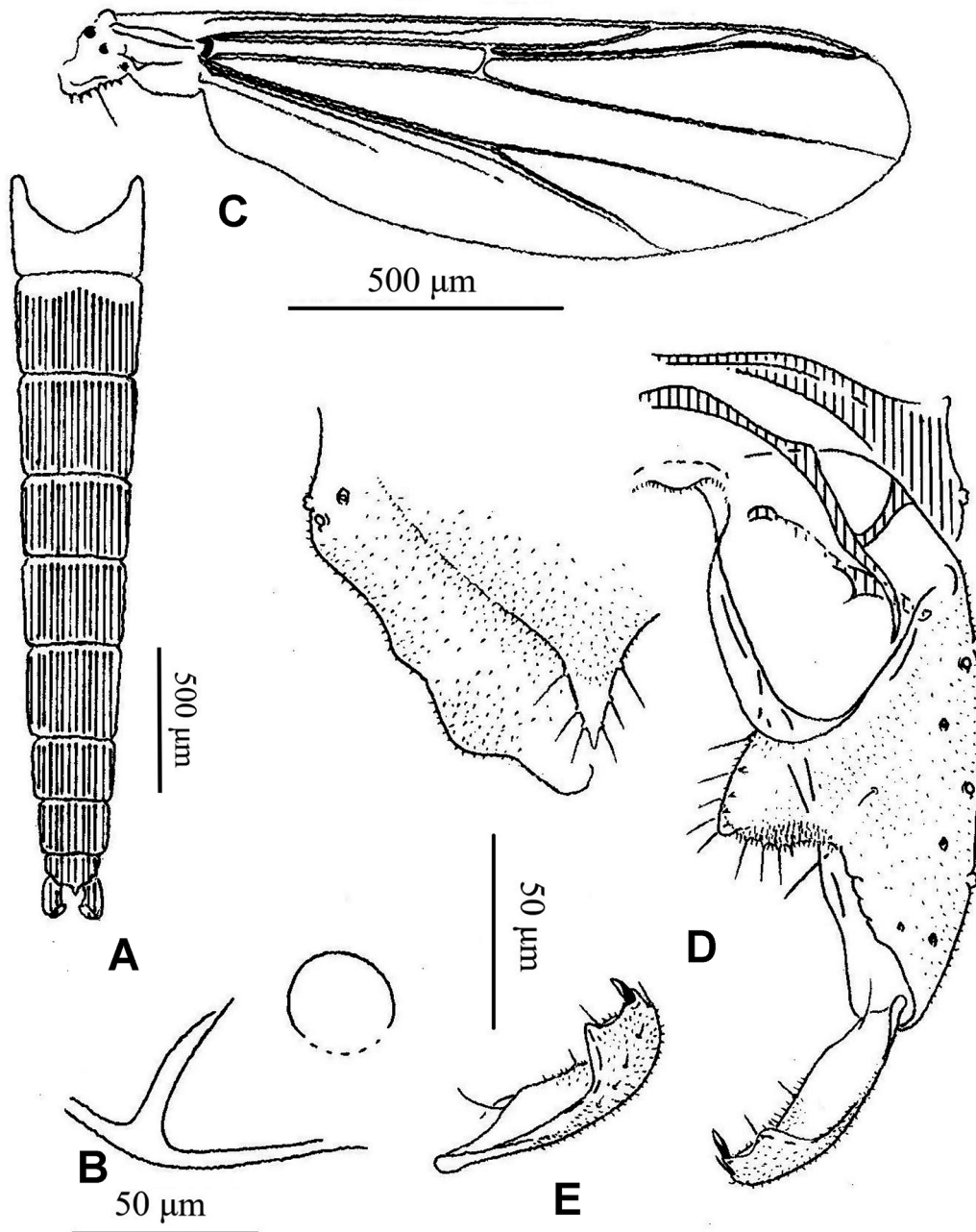


Fig. 21. *Rheocricotopus (P.) monovittatus* sp. nov. A–D. Holotype, ♂ (JNU 23032701). E. Paratype, ♂ (JNU 24033120). A. Abdominal colour pattern. B. Humeral pit. C. Wing. D. Hypopygium, dorsal view. E. Gonostylus.

Table 19. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) monovittatus* sp. nov., ♂♂ (n = 3).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	529–549	608	421 (1)	284 (1)	235 (1)	167 (1)	88 (1)	0.69 (1)	2.0 (1)	1.9 (1)
	539	608	–	–	–	–	–	–	–	–
P2	461–490	470–480	255–265	127–137	88–98	49	49	0.53–0.56	3.7–3.9	2.5–3.1
	480	477	261	131	95	49	49	0.55	3.8	2.8
P3	470–480	568–578	343 (1)	176 (1)	147 (1)	78 (1)	78 (1)	0.60 (1)	2.9 (1)	4.6 (1)
	477	572	–	–	–	–	–	–	–	–

Female, pupa and larva

Unknown.

Distribution

The species occurs only in Guangdong Province in Oriental China.

Remarks

The male is similar to that of *R. (P.) hanmiensis* sp. nov. in the combination of following features: bicoloured abdomen with largely yellow tergite I, anteriorly yellow and posteriorly dark brown tergite II, and uniformly dark brown tergites III–IX; entirely brown legs; and moderately large, circular humeral pit, but separable from it by the high antennal ratio (AR ca 1.0), the longer acrostichal setae (longest setae more than 25 μm) located near the apex of scutum, the inconspicuous costal extension (length 15–20 μm), and the hypopygial anal point with lateral setae only. The latter has antennae of a relatively low antennal ratio (AR ca 0.5); 7–8 shorter acrostichal setae (longest setae 15 μm) along the scutal midline; a moderately long costal extension (ca 50 μm); and an anal point with basal as well as lateral setae.

The male specimens (NK 24090 and 24091) from Jiangxi Province, China, identified as *R. (P.) robacki* (Beck & Beck, 1964) by Liu *et al.* (2014a: 25) are very similar to those of *R. (P.) monovittatus* sp. nov. in the position and the reduced number of acrostichal setae, the wing with a very short costal extension and an obtuse anal lobe, and the triangular inferior volsella with a somewhat beak-shaped apex. However, it will remain unclear if these species are conspecific until more material is available.

Rheocricotopus (P.) nippobifasciatus sp. nov.

[urn:lsid:zoobank.org:act:032182DE-9C3F-4F22-9E3F-8487EE62CECF](https://zoobank.org/act:032182DE-9C3F-4F22-9E3F-8487EE62CECF)

Fig. 22, Table 20

Diagnosis

Male

Abdomen bicoloured. Tergites I, II and IV entirely yellow; tergite V brown, anteriorly with a transverse yellow band; remaining tergites entirely brown. AR somewhat low (less than 1.0). Humeral pit large, oval, distinct. Wing cuneiform with a well-developed costal extension. Fore LR high (ca 0.9). Superior volsella roundly protruded, thin. Inferior volsella triangular, with rounded apex. Crista dorsalis small, but distinct.

Female

Antenna with terminal flagellomere shorter than combined length of 3rd and 4th flagellomeres. Spermathecal duct looped.

Etymology

From the type locality Nippon, Japan, and *Rheocricotopus* (*P.*) *bifasciatus*, the male of which is very similar to that of the present species.

Type material

Holotype

JAPAN – **Shizuoka** • ♂; Ikawa, Dainichi Pass, stream; 35°11' N, 138°15' E; 1100 m a.s.l.; 29 Aug. 1999; H. Niitsuma leg.; NSMT, NSMT-I-Dip 36256.

Paratypes

JAPAN – **Shizuoka** • 4 ♂♂; same data as for holotype; NSMT, NSMT-I-Dip 36257 to 36260 • 1 ♂; same data as for holotype; 13 Sep. 1998; NSMT, NSMT-I-Dip 36261 • 7 ♂♂; same data as for holotype; 16 Jun. 2000; NSMT, NSMT-I-Dip 36262 to 36268 • 2 ♀♀; same data as for holotype; 16 Jun. 2000; NSMT, NSMT-I-Dip 36269 to 36270 • 1 ♂; Aoi-ku, Ashikubo; 35°2' N, 138°22' E; 77 m a.s.l.; 4 Apr. 1987; H. Niitsuma leg.; NSMT, NSMT-I-Dip 36271 • 1 ♂♂; Shimizu, Ihara River; 35°4' N, 138°27' E; 202 m; 30 Jun. 1990; H. Niitsuma leg.; NSMT, NSMT-I-Dip 36272 to 36273.

Description

Male (n = 15)

Total length 2.0–2.5, 2.3 mm.

COLOURATION. Head dark brown on vertex. Thorax largely blackish brown except yellow pleural membrane and HP, and pale to dark brown preepisternum. Abdomen (Fig. 22A) bicoloured; T I, II, IV entirely yellow; T V brown with transverse yellow band on anterior $\frac{1}{4}$ – $\frac{1}{2}$; remainings brown. Legs dark brown; P₁ somewhat darker than P_{1,2}.

HEAD. Temporals 4–6, 5. AR 0.53–0.63, 0.57 (14). Clypeus with 5–9, 7 setae. Lengths (µm) of Pm_{1–5}: 34–44, 39 (11); 57–69, 63 (11); 123–162, 136 (11); 123–160, 139 (11); 239–310, 277 (11), respectively. Pm₄/Pm₃ 1.0–1.1, 1.0 (11); Pm₅/Pm₄ 1.7–2.2, 2.0 (11). Pm₃ with 7–17, 12 (14) SCl on 2–3, 3 (14) oval depressions.

THORAX. Lateral Aps 1–4, 2. Ac 10–20, 14 (13), and longest 10–16, 13 (13) µm long; Dc 6–10, 8 including 1–2, 2 H; Pa 2–3, 3 (14); Scts 4–5, 4 (13). HP (Fig. 22B) large, oval, occasionally indistinct in part.

WING (Fig. 22C). Length 1.7–2.2, 1.9 mm. C well extended beyond end of R₄₊₅, extension 74–123, 93 µm long. VR 1.1. R with 8–14, 10 setae; R₁ with 1–5, 2 setae, and R₄₊₅ with 1–6, 4 setae. AnL much reduced. Sq with 0–2, 1 seta.

LEGS. P₁ with ti spur 34–42, 39 µm long; P₂ with 2 ti spurs both 16–23, 19 µm long; P₃ with 2 ti spurs 37–46, 42 and 17–23, 20 µm long. P₂ with 0–2 Sch on ta₁, usually Sch absent. P₃ with ti comb of 12–14, 13 (14) bristles. Lengths and proportions of legs as in Table 20.

ABDOMEN. Hypopygium (Fig. 22D) with AnP pointed apically, bearing 7–15, 10 lateral setae. Gc 160–187, 172 µm long, 3.0–3.7, 3.4 (13) × as long as broad at middle, with SVo thin, roundly protruded; IVo apically rounded, occasionally with small apical projection. Gs (Fig. 22E) 74–84, 78 µm long, roundly convex in outer margin; subapically with CD small but distinct. HR 2.06–2.29, 2.20.

Female (n = 2)

Total length 2.5–2.7 mm.

COLOURATION. Similar to male. SCa yellow.

HEAD. Temporals 5–6. Antenna 5-segmented; Fm_5 98–106 μm long, shorter than combined length of Fm_3 and Fm_4 ; AR 0.35–0.38. Clypeus with 7–8 setae. Lengths (μm) of Pm_{1-5} : 39–44, 64, 138–140, 140–153, 271 (1), respectively. Pm_4/Pm_3 1.0–1.1; Pm_5/Pm_4 1.9 (1). Pm_3 with 8–14 SCl on 2–3 depressions.

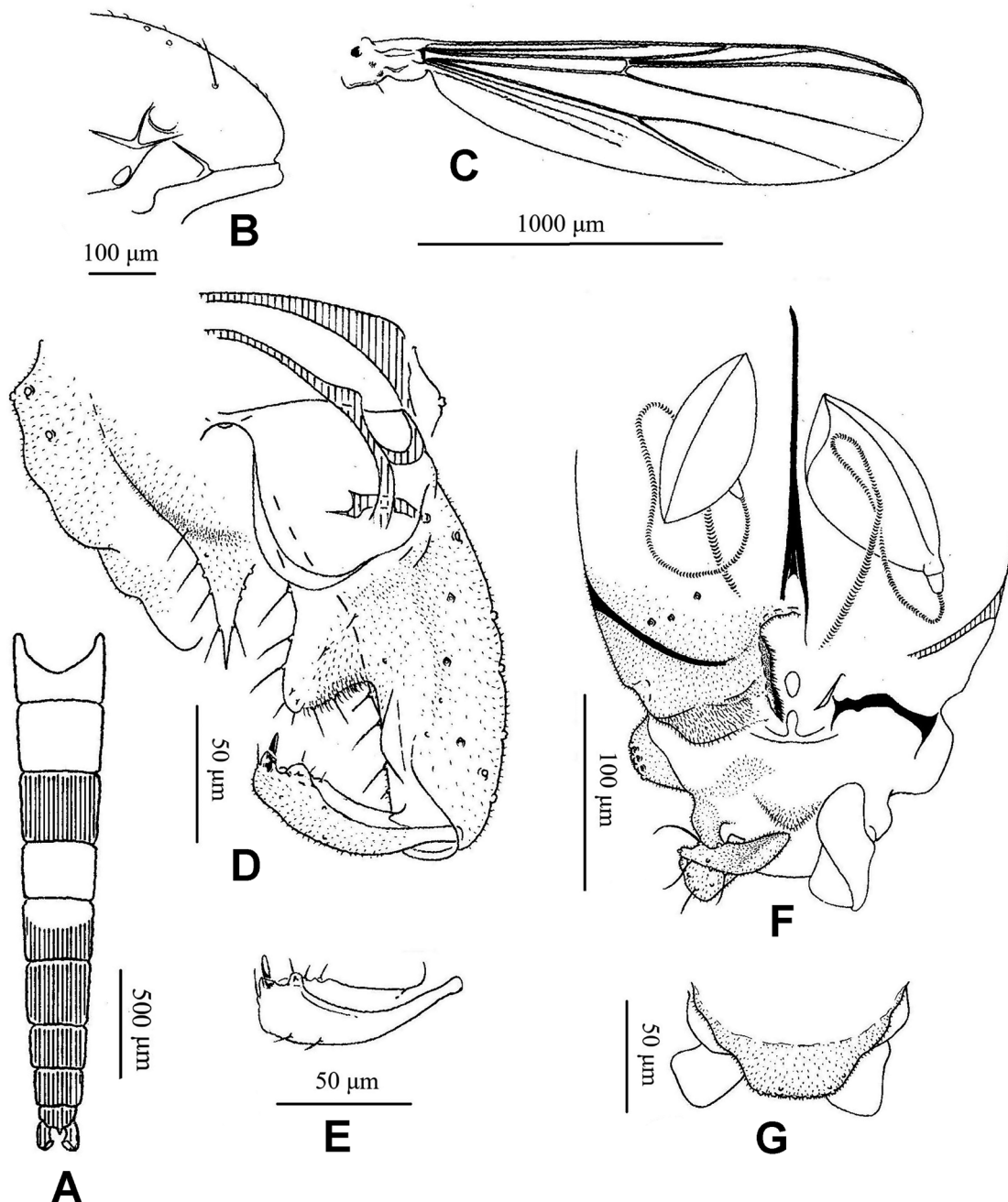


Fig. 22. *Rheocricotopus (P.) nippobifasciatus* sp. nov. **A–D.** Holotype, ♂ (NSMT-I-Dip 36256). **E.** Paratype, ♂ (NSMT-I-Dip 36262). **F–G.** Paratype, ♀ (NSMT-I-Dip 36269). **A.** Abdominal colour pattern. **B.** Thorax with humeral pit, lateral view. **C.** Wing. **D.** Hypopygium, dorsal view. **E.** Gonostylus. **F.** Genitalia, ventral view. **G.** Genitalia, dorsal view, showing tergite IX.

Table 20. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *nippobifasciatus* sp. nov., ♂♂ (n = 15) and ♀♀ (n = 2).

Male	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	764–951	813–1009	715–892	392–481	254–333	186–225	98–118	0.84–0.90	2.3–2.5	1.6–2.2
	826	870	752	412	287	198	104	0.86	2.4	1.9
P2	735–892	686–843	431–539	186–225	127–157	69–88	59–78	0.60–0.64	4.0–4.3	1.9–2.9
	786	734	453	194	137	76	71	0.62	4.1	2.3
P3	784–960	872–1068	559–676	255–314	206–245	108–127	78–108	0.61–0.64	3.2–3.5	2.3–3.0
	834	926	581	274	218	112	89	0.63	3.4	2.6
Female	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	882	911	784–804	431	304	206	108	0.86–0.88	2.5	–
P2	804–823	774	470–480	196–206	137	59–78	69–78	0.61–0.62	4.1–4.5	–
P3	872–882	960–980	598–608	274–284	216–225	108–118	88–98	0.62	3.4–3.5	–

THORAX. Lateral Aps 2–3. Ac 20–21; Dc 8 including 2–3 H; Pa 3. Sct 4.

WING. Length 1.9 mm. C extension well projected. VR 1.1. R with 16 setae; R₁ with 9 setae; R₄₊₅ with 23–28 setae. Sq with 1–2 setae.

LEGS. P₁ with ti spur 18–21 μm long; P₂ with 2 ti spurs 20–21 and 18–20 μm long; P₃ with 2 ti spurs 44–47 and 23–25 μm long. P₂ with 4–6 Sch on ta₁; P₃ with 1 (1) Sch on ta₁. P₃ with ti comb of 14 bristles. Lengths and proportions of legs as in Table 20.

GENITALIA (Fig. 22F). S VIII with 6 setae. T IX (Fig. 22G) undivided, with 9–10 setae. Gc IX with 7–8 setae on each side. Ce 64–66 μm long. No 98–106 μm long. SCa 103–108 μm long; spermathecal duct looped.

Pupa and larva

Unknown.

Distribution

The species is known from Palaearctic Japan only.

Remarks

The male is similar to that of *R. (P.) bifasciatus* Wang & Zheng, 1991 in the abdominal colour pattern of tergites I–II, IV entirely yellow and tergites III, VI–IX brown; the large, oval humeral pit; the wing with a much-reduced anal lobe and a long costal extension; the gonostylus with a small, preapical crista dorsalis, but separable from it by the largely brown tergite V with an anterior, transverse yellow band; and the smaller male antennal ratio (AR 0.50–0.65). According to the original description (Wang & Zheng 1991: 104) of *R. (P.) bifasciatus*, the tergite V is entirely black, and the antennal ratio is 0.9.

***Rheocricotopus (P.) protuberans* sp. nov.**

[urn:lsid:zoobank.org:act:BD992B4C-9BEF-4833-B876-FCFD5EE39E7C](https://doi.org/10.3897/ejt.1037.1037)

Fig. 23, Table 21

Diagnosis

Male

Abdomen and legs dark brown. AR near 1.0. Anteprenotal setae divided in medial and lateral groups. Humeral pit large, oval. Wing with obtuse anal lobe, short costal extension and well-developed squamal fringe. Superior volsella roundly protruded, thin. Inferior volsella triangular, simple. Crista dorsalis very large, conspicuous, occupying apical $\frac{2}{3}$ of gonostylus, obtuse or right-angled at apex.

Etymology

From the Latin ‘*protuberans*’ (‘protuberant’), referring to the conspicuous crista dorsalis.

Type material

Holotype

CHINA – **Xizang** • ♂; Lhoka, Nagarze, Lake Yamdrok; 28°56′ N, 90°42′ E; 4427 m a.s.l.; 18 Jul. 2014; H.Q. Tang leg.; JNU, JNU 160206012.

Paratype

CHINA – **Xizang** • 1 ♂; same data as for holotype; JNU.

Description

Male (n = 2)

Total length 2.9–3.1 mm.

COLOURATION. Head dark brown on vertex. Body entirely dark brown except pale HP. Legs dark brown.

HEAD. Temporals 2. AR 0.85–0.88. Clypeus with 11 setae. Lengths (μm) of Pm_{1-5} : 37–42, 59–69, 116–128, 148–160, 204–246, respectively. Pm_4/Pm_3 1.3, Pm_5/Pm_4 1.4–1.5. Pm_3 with more than 10 SCL.

THORAX. Lateral Aps 2, and medial Aps 3. Ac 10–12, longest 12–17 μm long; Dc 7–8, including 0–1 H; Pa 3; Scts at least 4. HP (Fig. 23A) large, oval.

WING (Fig. 23B). Length 2.2–2.4 mm. C extended slightly beyond end of R_{4+5} , extension 25–44 μm long. VR 1.1. R with 5–6 setae, R_1 and R_{4+5} bare. AnL obtuse. Sq with 15–18 setae.

LEGS. P_1 with single ti spur 39–44 μm long; P_2 with 2 ti spurs 22 (1) and 15–20 μm long; P_3 with 2 ti spurs 47–49 and 17–20 μm long. P_2 without Sch. P_3 with ti comb of 13–14 bristles. Lengths and proportions of legs as in Table 21.

ABDOMEN. Hypopygium (Fig. 23C) with AnP pointed apically, bearing 7–8 lateral setae. Gc 185–192 μm long, 2.7–2.8 \times as long as broad at middle, with SVo roundly protruded; IVo triangular, simple. Gs 86–91 μm long; CD triangular, obtuse or right-angled at apex, very large, occupying apical $\frac{2}{3}$ of Gs. HR 2.11–2.14.

Female, pupa and larva

Unknown.

Distribution

The species is known from the type locality, Xizang Autonomous Region in Oriental China.

Remarks

The male resembles that of *R. (P.) serratus* in the antennal ratio of nearly 1.0, the large oval humeral pit, and the wing with an obtuse anal lobe, a well-developed squamal fringe and a costal vein slightly extended, but differs from it in the antepronotal setae divided into medial and lateral groups, and the crista dorsalis conspicuously large, obtuse or right-angled at the apex, the shape of which is unique among the known males of this genus including the *orientalis* group with a large median crista dorsalis. In the latter, antepronotal setae are located laterally only, and the crista dorsalis is much smaller, sawtooth-shaped, acute-angled at the apex.

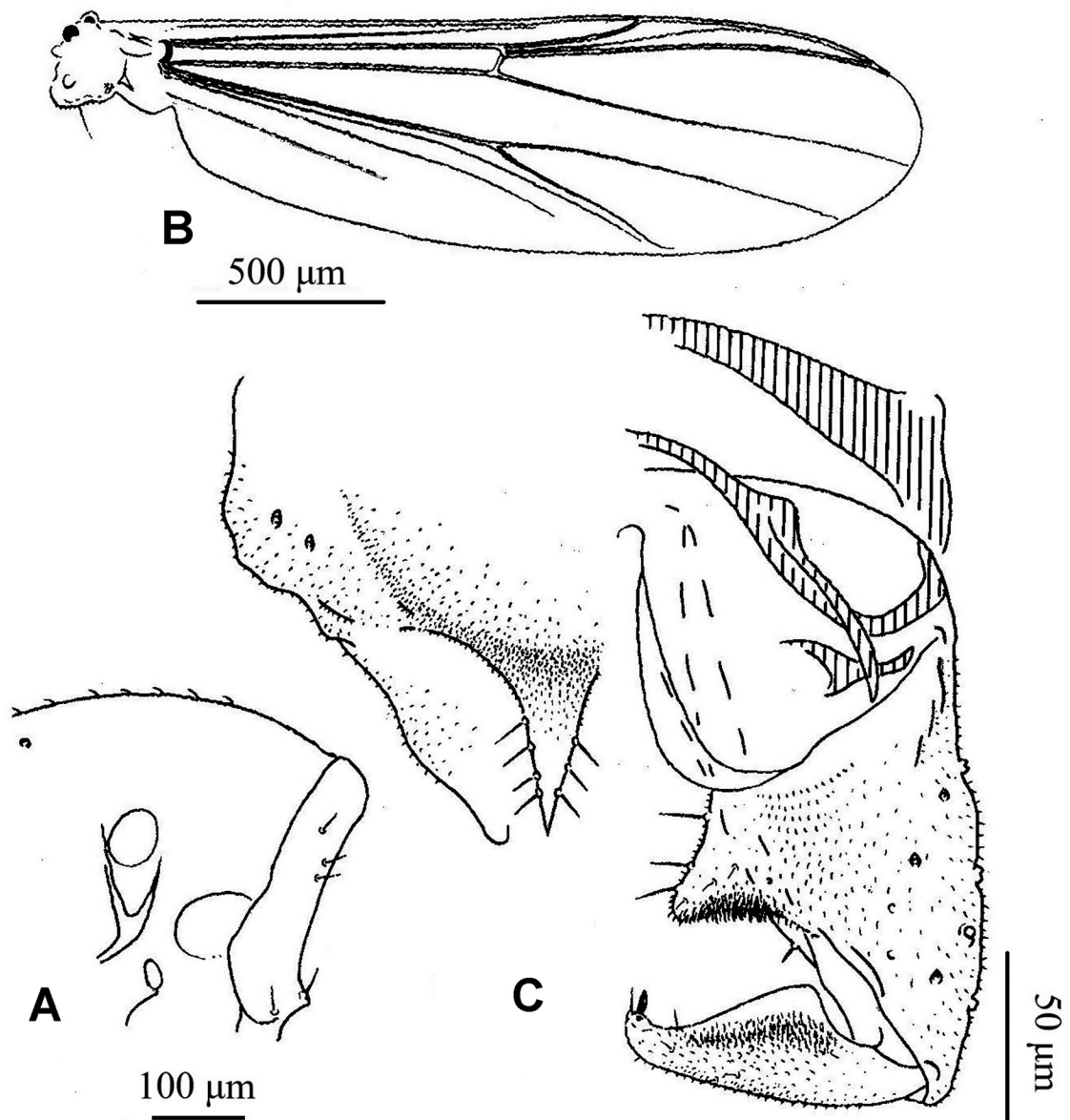


Fig. 23. *Rheocricotopus (P.) protuberans* sp. nov., holotype, ♂ (JNU 160206012). A. Thorax with humeral pit, lateral view. B. Wing. C. Hypopygium, dorsal view.

Table 21. Lengths (μm) and proportions of legs of *Rheocricotopus (P.) protuberans* sp. nov., ♂♂ (n = 2).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	676–715	755–862	608–706	294–314	225–245	147–157	98–108	0.81–0.82	2.6–2.8	2.5
P2	706–755	676–755	372–402	196–206	147–157	88	78–88	0.53–0.55	3.4–3.5	3.5
P3	706–784	843–931	490 (1)	265 (1)	206 (1)	118 (1)	98 (1)	0.58 (1)	3.0 (1)	4.2 (1)

The male is similar also to that of *R. (P.) insularis* Makarchenko & Makarchenko, 2005 in the antennal ratio close to 1.0, the anteprenotal setae located medially and laterally, and the wing with an obtuse anal lobe, but separable from it by the wing with a slight costal extension (25–44 μm long) and the conspicuously large crista dorsalis. According to Makarchenko & Makarchenko (2005: 128 figs 6–7; 129), the latter has wings with a well-developed costal extension (96 μm long), and much-smaller crista dorsalis.

Rheocricotopus (P.) yunnanensis sp. nov.

[urn:lsid:zoobank.org:act:5772F43C-1F60-4B57-AB6C-9F1FE2B5E683](https://zoobank.org/act:5772F43C-1F60-4B57-AB6C-9F1FE2B5E683)

Fig. 24, Table 22

Diagnosis

Male

Abdomen bicoloured; tergites I, II and IV yellow, remaining tergites dark brown. AR relatively low (less than 0.5). Humeral pit large, oval. Wing cuneiform, with a distinct costal extension and a few setae on squama. Superior volsella triangular, thin, rounded at apex. Inferior volsella triangular, double-layered, rounded at apex. Gonostylus with crista dorsalis preapical, triangular, occasionally slender.

Etymology

From the type locality, Yunnan Province in China.

Type material

Holotype

CHINA – **Yunnan** • ♂; Honghe, Jinping, Ma'andi; 22°46' N, 103°31' E; 1350 m a.s.l.; 8 Jun. 2017; J. Chen leg.; JNU, JNU 170723007.

Paratypes

CHINA – **Yunnan** • 2 ♂♂; Pingbian, Daweishan NNR; 22°54' N, 103°42' E; 2150 m a.s.l.; 4 Jun. 2017; J. Chen leg.; JNU, JNU 17061406, 170614009.

Description

Male (n = 3)

Total length 2.1– 2.3 (2) mm.

COLOURATION. Head dark brown on vertex. Thorax dark brown with yellow pleural membrane; scutal vittae indistinct. Abdomen (Fig. 24A) bicoloured, largely dark brown with yellow T I–II, IV. Legs uniformly dark brown except somewhat paler bases of all fe.

HEAD. Temporals 4–8, 6. AR 0.36–0.45, 0.40. Clypeus with 7–8, 8 setae. Lengths (μm) of Pm_{1-5} : 25–34, 30; 47–52, 49; 86–98, 91; 101–116, 107; 207 (1), respectively. Pm_4/Pm_3 1.1–1.2, 1.2; Pm_5/Pm_4 1.8 (1). Pm_3 with 4–5 (2) SCL on 2 depressions.

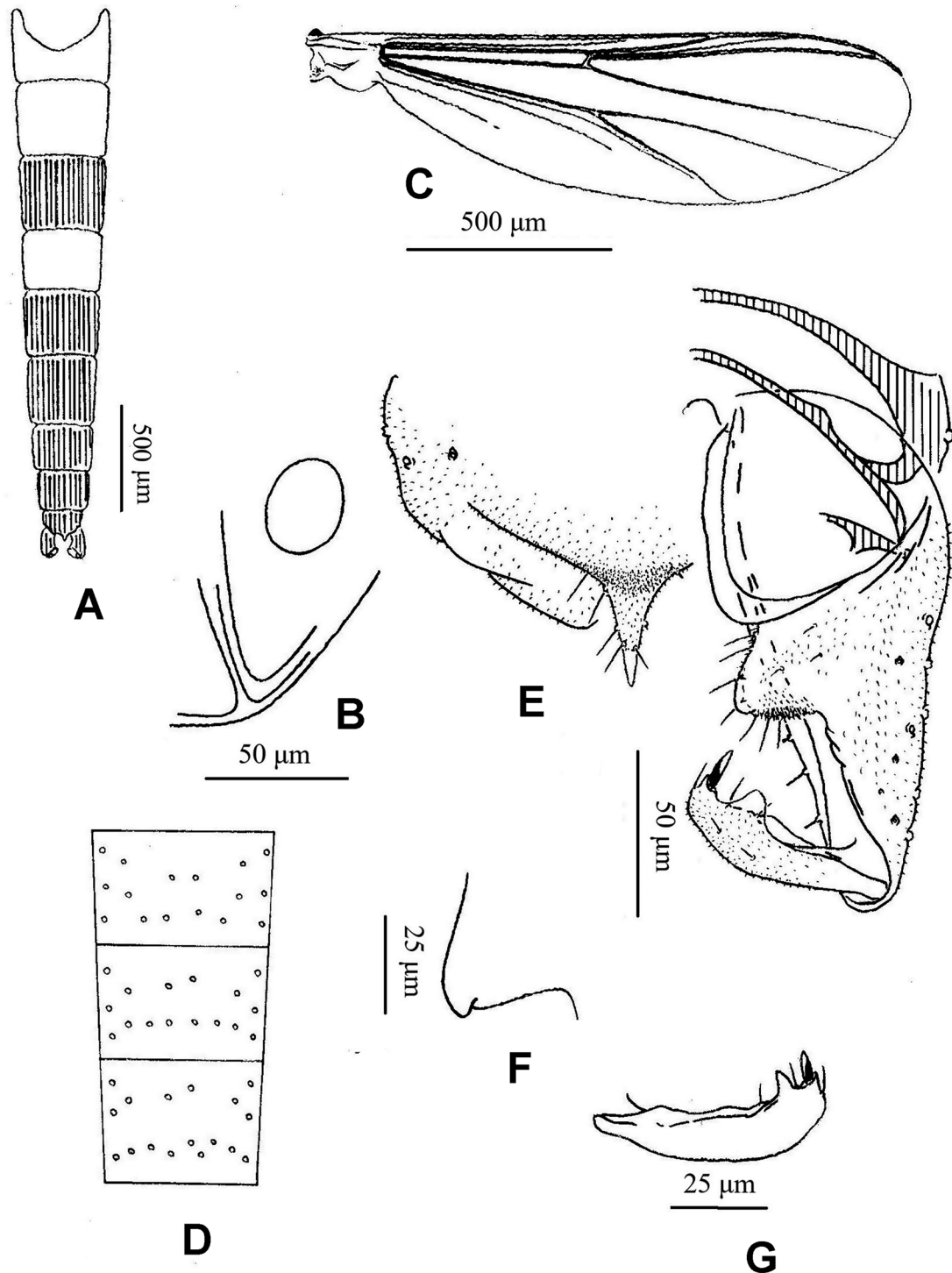


Fig. 24. *Rheocricotopus* (*P.*) *yunnanensis* sp. nov. **A–C, E.** Holotype, ♂ (JNU 170723007). **D, F.** Paratype, ♂ (JNU 170614009). **G.** Paratype, ♂ (JNU 17061406). **A.** Abdominal colour pattern. **B.** Humeral pit. **C.** Wing. **D.** Setal arrangement on tergites II–IV. **E.** Hypopygium, dorsal view. **F.** Superior volsella. **G.** Gonostylus.

Table 22. Lengths (μm) and proportions of legs of *Rheocricotopus* (*P.*) *yunnanensis* sp. nov. ♂♂ (n = 3).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	598–637	676–715	549–568	314–323	225	157–167	88	0.77–0.83	2.3–2.4	1.7–1.9 (2)
	614	693	559	317	225	163	88	0.81	2.3	–
P2	568–608	559–588	323–333	147–157	108–118	59–69	59	0.55–0.60	3.6–4.1	2.3–2.5 (2)
	588	572	330	150	111	62	59	0.58	3.9	–
P3	578–627	686–715	412–421	206–216	167	88–98	69–78	0.59–0.61	3.1–3.2	2.6–2.9 (2)
	604	699	418	209	167	91	75	0.60	3.2	–

THORAX. Lateral Aps 2–4, 3. Ac 7–12, 9; longest 12–15, 13 μm long; Dc 7, including 1–2, 1 H; Pa 3; Scts 4–5 (2). HP (Fig. 24B) oval, moderately large.

WING (Fig. 24C). Length 1.4–1.6, 1.5 mm. C extension moderately long, 49–69, 59 μm . VR 1.1–1.2, 1.1. R with 5 setae, R_1 and R_{4+5} bare. AnL much reduced. Sq with 1–3, 2 setae.

LEGS. P_1 with single ti spur 34–37, 36 μm long; P_2 with 2 ti spurs 15–20, 16 and 12–20, 16 μm long; P_3 with 2 ti spurs 34–39, 37 and 15–17, 16 μm long, respectively. P_2 without Sch. P_3 with ti comb of 11–14, 12 bristles. Lengths and proportions of legs as in Table 22.

ABDOMEN (Fig. 24D). T II–VII with 2 pairs of longitudinal, lateral setal rows; T VIII with irregularly arranged setae. Hypopygium (Fig. 24E) with AnP pointed apically, bearing 7–9, 8 lateral setae. Gc 150–165, 158 μm long, 3.3–3.9, 3.6 \times as long as broad at middle; SVo triangular, thin, rounded at apex; IVo (Fig. 24F) triangular, double-layered and rounded at apex. Gs 62–64, 63 μm long, nearly parallel-sided in dorsal view; with CD (Fig. 24G) preapical, triangular, occasionally slender. HR 2.3–2.7, 2.5.

Female, pupa and larva

Unknown.

Distribution

The species is known from Yunnan Province in Oriental China only.

Remarks

The male resembles that of *R. (P.) bifasciatus* Wang & Zheng, 1991 in the entirely yellow tergites I–II, IV and dark brown tergites III, V–IX; the moderately large, oval humeral pit; the wing with a distinct costal extension and a much-reduced anal lobe, but differs from it in the lower antennal ratio, the entirely dark brown tibiae of all legs. The antennal ratio is 0.36–0.45 in the former, whereas in the latter it is 0.9 (Wang & Zheng 1991: 100). Further, the latter has bicoloured tibiae with broadly whitish apices.

The male is also similar to that of *R. (P.) chinogodavarius* sp. nov. in the relatively low antennal ratio (AR less than 0.5), the large, oval humeral pit; the cuneiform wing with a distinct costal extension, but separated by the entirely yellow tergites II and IV; the entirely dark brown tibiae; and the smaller crista dorsalis. In the latter, the tergites II and IV possess brown bands or markings, the dark brown tibia has a broad white band on the apex, and the crista dorsalis is large, placed in mid-gonostylus.

Subgenus *Rheocricotopus* Brundin, 1956

Rheocricotopus Brundin, 1956: 118. Type species: *Chironomus effusus* Walker, 1856, by original designation.

Rheocricotopus – Ashe & O'Connor 2012: 568. — Yamamoto & Yamamoto 2014: 297.

Type species

Chironomus effusus Walker, 1856, by original designation.

Emended diagnosis

Male

Superior volsella plate-like, horn-like or digitate (the *reduncus* group).

Remarks

Subgeneric diagnoses have been given by Sæther (1986: 92) and Cranston *et al.* (1989: 234, in key) for the adult; Coffman *et al.* (1986: 204, in key) and Sæther (1986: 92) for the pupa; and Sæther (1986: 92) and Andersen *et al.* (2013: 254, in key) for the larva. The diagnosis for the adult male is emended to accommodate the *R.* (s. str.) *reduncus* group.

Generally, the male of *Rheocricotopus* s. str. has an unicoloured abdomen; wings with a more or less developed, obtuse to right-angled anal lobe; well-developed, digitate, horn-shaped or roundly protruded superior volsellae; antennal ratio more than 0.6; and relatively low leg ratio (LR₁ less than 0.8). However, these features appear weak as discriminators from subgenus *Psilocricotopus* Sæther. Further, this subgenus includes the species with a large humeral pit consisting of a large hole and a small hole and the species with a small humeral pit consisting of fused several small holes. Therefore, it is necessary to incorporate information from the pupa and larva.

The subgenus *Rheocricotopus* currently includes four species groups: the *effusus* group, the *fucipes* group, the *tuberculatus* group and the *reduncus* group.

Rheocricotopus (s. str.) *effusus* (Walker, 1856)

Chironomus effusus Walker, 1856: 180.

Orthocladus (*Trichocladus*) *striatus* Malloch, 1915: 517.

Cricotopus rivicola Kieffer, 1921: 804.

Orthocladus (*Dactylocladius*) *dorieri* Goetghebuer in Goetghebuer & Dorier, 1932: 65.

Trichocladus holosericeus Goetghebuer in Gouin, 1936: 167.

Trichocladus brunensis Goetghebuer, 1937: 275.

? *Rheocricotopus himalayensis* Chaudhuri & Sinharay, 1983: 398. **Syn. nov.**

Rheocricotopus baishanensis Wang & Zheng, 1991: 102. **Syn. nov.**

Rheocricotopus effusus – Brundin 1956: 118. — Lehmann 1969: 356. — Wang & Zheng 1991: 102.

Rheocricotopus (*Rheocricotopus*) *effusus* – Sæther 1986: 103. — Sæther *et al.* 2000: 161. — Makarchenko & Makarchenko 2005: 129. — Ashe & O'Connor 2012: 569.

Type material

Holotype of *Rheocricotopus baishanensis*

CHINA – Jilin • ♂; Mt Changbai; 42°0' N, 128°6' E; 23 Jun. 1986; NKU.

Photographs of the holotype of *R. baishanensis* provided by X. Lin (SHOU) were examined. Type specimens of *Chironomus effusus* and *R. himalayensis* were not examined.

Distribution

The species is known around the world including Oriental and Palaearctic China, and the Russian Far East.

Remarks

Makarchenko & Makarchenko (2005: 129) redescribed briefly *R. (s. str.) effusus* (Walker, 1856) based on adult males from Sakhalin Island in the Russian Far East. Wang & Zheng (1991: 102) also gave a brief redescription of the male based on a specimen from Sichuan Province in Oriental China. The mensural data of the males from both the regions are nearly consistent with those from Europe (Sæther 1986: 103; Sæther & Schnel 1988: 72, table 1), although the structure of the humeral pit is disregarded in these redescriptions.

Wang & Zheng (1991: 102) described *R. (s. str.) baishanensis* Wang & Zheng, 1991 based on a single male from Jilin Province in Palaearctic China, and wrote: “Allied to *R. effusus* in AR, LR, but lacking crista dorsalis and the shape of anal superior volsella, caudomesal projection and humeral pit also different.” The photographs of the holotype taken by X. Lin (pers. comm. 2022) show that the hypopygium is mounted somewhat diagonally on the slide. A closer examination of the photographs revealed that the humeral pit is composed of a large and a small hole, and the large hole is elliptical and almost $0.4 \times$ as wide as its length, although wrinkled by the mounting procedure, and that the hypopygium possesses a posteriorly projected, horn-shaped superior volsella on the base of gonocoxite and a low crista dorsalis on the subapex of gonostylus. *Rheocricotopus (s. str.) baishanensis* is a junior synonym of *R. (s. str.) effusus*.

Further, Liu *et al.* (2014b: 101) gave a diagnosis and many collection records for the male, not associated with the immature stages, of *R. (s. str.) effusus* from Palaearctic and Oriental China, but their diagnosis cannot reliably separate the species from *R. (s. str.) tamahumeralis* Sasa, 1981. There is a possibility that some or all specimens belong to *R. (s. str.) tamahumeralis*. In both males, the humeral pit consists of a large hole and a small hole. The large hole is elliptical in *R. (s. str.) effusus* according to Lehmann (1969: 372 fig. 13a), whereas it is triangular or trapezoid in our Japanese and Chinese specimens of *R. (s. str.) tamahumeralis*.

The male of *R. (P.) himalayensis* Chaudhuri & Sinharay, 1983 resembles those of *R. (s. str.) effusus* and *R. (s. str.) tamahumeralis* in the gonostylus with a roundly convex outer margin, and the mensural data. In *R. (P.) himalayensis*, the superior volsella looks extended posteriorly, beak-like, in the drawing by the authors (Chaudhuri & Sinharay 1983: 400 fig. 1f), which shows that the species belongs to the subgenus *Rheocricotopus*, not *Psilocricotopus*. Concerning *R. (R.) effusus*, Goetghebuer (1932: 59) wrote: “lobe anal à peine obtus”, and Lehmann (1969: 378) mentioned in the couplet 9 of the key for males: “Wings with a well-developed anal lobe (as in fig. 18a)”. Therefore, the male wing of *R. (s. str.) himalayensis* may be more similar to that of *R. (s. str.) effusus* with a nearly right-angled anal lobe, rather than that of *R. (s. str.) tamahumeralis* with an obtuse anal lobe. However, *R. (s. str.) himalayensis* cannot be confidently treated as a junior synonym of *R. (s. str.) effusus*, because the structure of humeral pit is not reported in the original description (Chaudhuri & Sinharay 1983: 398). Thus, *R. (P.) himalayensis* Chaudhuri & Sinharay is tentatively treated here as a junior synonym of *R. (s. str.) effusus*.

Rheocricotopus (s. str.) pauciseta Sæther, 1969

Rheocricotopus (Rheocricotopus) pauciseta Sæther, 1969: 89.

Rheocricotopus (Rheocricotopus) pauciseta – Sæther 1971: 1247 fig. 6c; 1250 fig. 8d; 1986: 98. — Makarchenko & Makarchenko 2005: 130. — Ashe & O’Connor 2012: 572.

Type material

Holotype

CANADA – **British Columbia** • ♂ with Pe and Le; Haney, University of British Columbia Forestry Farm, Marion Lake; 15 July 1967; A.L. Hamilton and O.A. Sæther leg.; CNC, CNC 9990.

No specimens of *R. (s. str.) pauciseta* were examined.

Distribution

A distribution of this species in Oriental China is highly doubtful. Thus, it remains known only from North America and the Russian Far East.

Remarks

The species was first described based on males, pupae and larvae from Nearctic Canada by Sæther (1969: 89). A male from Sakhalin Island in the Russian Far East, used in a redescription by Makarchenko & Makarchenko (2005: 130) nearly satisfies the definition by Sæther (1969, 1971).

According to Sæther (1969, 1971), the male is characterized by small, indistinct humeral pits, consisting of partly fused small holes; the wing with an obtuse anal lobe and a short costal extension; the relatively low antennal ratio (AR 0.60–0.83); and the hypopygium with a triangular, stout, and horn-like superior volsella; and a double-layered inferior volsella bearing an apically narrowed dorsal lobe; without crista dorsalis.

Liu *et al.* (2014b: 104) recorded 5 male and 2 female adults of this species from Sichuan Province in Oriental China. We examined 3 male voucher specimens (NK 11614, 12268, and 12269) of them. As a result, we found the specimens differ from true *R. (s. str.) pauciseta* Sæther, 1969 because of the large humeral pit consisting of two parts and the horn-like slender superior volsella as in *R. (s. str.) nepalensis* Lehmann, 1969 and *R. (s. str.) tamahumeralis* Sasa, 1981.

The female is unknown.

Rheocricotopus (s. str.) reduncus Sæther & Schnell, 1988

Rheocricotopus (Rheocricotopus) reduncus Sæther & Schnell, 1988: 66.

Rheocricotopus (Rheocricotopus) reduncusoides Namayandeh & Beresford, 2018: 22. **Syn. nov.**

Rheocricotopus (Rheocricotopus) reduncus – Sæther *et al.* 2000: 161. — Makarchenko & Makarchenko 2005: 134. — Ashe & O'Connor 2012: 572.

Type material

Holotype

NORWAY – **Sogn & Fjordane** • ♂; Luster, Jostedøla River at inlet to small lake; 23 July 1986; A. Fjellheim and Ø.A. Schnell leg.; ZMB [No.116].

Type specimens of *R. (s. str.) reduncus* and *R. (s. str.) reduncusoides* were not examined.

Distribution

To date, the species is known from North Europe and the Russian Far East in the Palaearctic region, and Canada in the Nearctic region.

Remarks

Originally, the species was described based on males and pupae from Norway by Sæther & Schnell (1988: 66). Later, Makarchenko & Makarchenko (2005: 134) briefly redescribed a male from Sakhalin Island in the Russian Far East. The features are nearly consistent with those of the Norwegian material, although the antennal ratio is somewhat high (ca 1.2 in the Russian material vs 0.83–0.90 in the Norwegian material), but this is likely to fall within geographical variation.

Rheocricotopus (R.) reduncusoides Namayandeh & Beresford, 2018 was described based on males from Canada. The authors separated it from *R. (s. str.) reduncus* by some measurement and count data, and the shapes of superior volsella, inferior volsella and sternapodeme. Mensural data look like individual variations, and the slight differences in the hypopygium may be individual variations, but also related to orientation or pressure from the coverslip. Although the immature stages are unknown, the species is a junior synonym of *R. (s. str.) reduncus* Sæther & Schnell, 1988.

The female and the larva are unknown.

Rheocricotopus (s. str.) tamahumeralis Sasa, 1981 Figs 25–26, Table 23

Rheocricotopus tamahumeralis Sasa, 1981: 92.

Rheocricotopus (Rheocricotopus) tamahumeralis – Sasa & Okazawa 1992: 103. — Sæther *et al.* 2000: 161. — Ashe & O’Connor 2012: 572. — Yamamoto & Yamamoto 2014: 298. — Fu *et al.* 2016: 270.

Type material

Holotype

JAPAN – **Tokyo** • ♂ with Pe; tributary Minamiasakawa River of Tama River; 2 Jan. 1980; M. Sasa leg.; NSMT, NSMT-I-Dip 4527 [No. 56: 01].

Other material examined

JAPAN – **Fukushima** • 2 ♂♂, 1 Pe; Iwaki, Yaguki; 37°8′ N, 140°54′ E; 123 m a.s.l.; 5–10 May 2014; H. Niitsuma leg.; PCHN. – **Kanagawa** • 2 ♂♂, 2 Pe; Kiyokawa, Miyagase; 35°30′ N, 139°12′ E; 290 m a.s.l.; 23 Feb. 1994 (emerged 25–28 Mar. 1994); H. Niitsuma leg.; PCHN • 2 ♂♂, 2 Pe; 1 ♀ with 1 Pe; same data as for preceding; 7 Feb. 1998 (emerged 7 Mar. 1998); PCHN. – **Shizuoka** • 1 L; Ikawa, Dainichi Pass, stream; 35°11′ N, 138°15′ E; 1100 m a.s.l.; 15 Sep. 1996; H. Niitsuma leg.; PCHN • 6 ♂♂ with 6 Pe, 3 ♀♀ with 3 Pe and 1 Le, 5 Pe, 3 Le; same data as for preceding; 4 May 1998 (emerged 10–30 May 1998) • 1 ♂ with 1 Pe, 2 ♀♀ with 2 Pe, 1 ♀ (pharate); Uchimaki River; 35°01′ N, 138°20′ E; 122 m a.s.l.; 20 Apr. 1997 (emerged 25–28 Apr. 1997); H. Niitsuma leg.; PCHN • 1 ♂ with 1 Pe, 1 ♀ with 1 Pe and 1 Le; Shimizu, Ihara River; 35°4′ N, 138°27′ E; 202 m a.s.l.; 15 Mar. 1990 (emerged 20.iii.1990); H. Niitsuma leg.; PCHN • 1 ♀ with 1 Pe; Aoi-ku, Ashikubo, Harada River; 35°2′ N, 138°22′ E; 77 m a.s.l.; 8 Apr. 1995 (emerged 25 Apr. 1995); H. Niitsuma leg.; PCHN. – **Tochigi** • 1 ♀ with 1 Pe; Ichikai, Miage; 36°36′ N, 140°7′ E; 115 m a.s.l.; 18 Mar. 1989 (emerged 25 Mar. 1989); H. Niitsuma leg.; PCHN.

CHINA – **Jilin** • 1 ♂ with 1 Pe; Antu, Mt Changbai, north slope; 42°03′ N, 128°03′ E; 1835 m a.s.l.; 11 Aug. 2022; H.Q. Tang leg.; JNU, JNU 22082002. – **Jiangsu** • 1 ♂; Lianyuangang, Mt Yuntai, site 2; 34°40′ N, 119°19′ E; 400 m a.s.l.; 8 May 2014; H.Q. Tang leg.; JNU. – **Zhejiang** • 1 ♂, 1 ♀; Xianju, south gate of Xianju National Park; 28°43′ N, 120°34′ E; 110 m a.s.l.; 10 Nov. 2019; H.Q. Tang leg.; JNU 191118001. – **Guangdong** • 1 ♂ (pharate); Shaoguan, Renhua, Zhongshan; 25°15′ N, 113°36′ E; 500 m a.s.l.; 15 Feb. 2023; Y.R. He and X. Dong leg.; JNU, JNU 23022307. – **Hainan** • 1 ♂; Qiongzhang,

Limuling, Mt Limu; 19°10' N, 109°45' E; 830 m a.s.l.; 15 Apr. 2016; H.Q. Tang leg.; JNU. – **Yunnan** • 2 ♂♂; Nujiang, Fugong, seep in Mt Biluo; 26°33' N, 98°54' E; 1790 m a.s.l.; 15 Oct. 2017; H.Q. Tang leg.; JNU, JNU 171027023, 171027025 • 1 ♂ (teneral), 1 ♂ (pharate); Shangri-La, Gezan, unnamed stream; 28°03' N, 99°46' E; 3130 m a.s.l.; 19 Jun. 2018; H.Q. Tang leg.; JNU, JNU 180706008 • 1 ♂; Dali, Qingbi stream; 25°39' N, 100°09' E; 2350 m a.s.l.; 14 Feb. 2022; X.F. Li leg.; JNU • 2 ♂♂ with 2 Pe, 1 ♀ (pharate), 4 Pe; Ximeng, Mengsuo, Lake Mengsuo; 22°38' N, 99°35' E; 1270 m a.s.l.; 26 Apr. 2022; Y.J. Liang leg.; JNU.

Description

Male (n = 23)

Total length 1.9–3.0, 2.4 (22) mm.

COLOURATION. Body mostly dark brown with pale pleural membrane, including HP, on thorax.

HEAD. Temporals 2–7, 4 (21). AR 0.73–1.27, 1.00. Clypeus trapezoid with 8–18, 11 setae. Lengths (µm) of Pm₁₋₅: 30–42, 35 (21); 39–69, 57 (21); 76–160, 109 (21); 91–160, 114 (21); 145–246, 197 (18), respectively. Pm₄/Pm₃ 0.9–1.3, 1.0 (21); Pm₅/Pm₄ 1.5–2.1, 1.7 (18). Pm₃ with 1–8, 3 (21) SCl; occasionally 1 (1) SCl present on Pm₄.

THORAX (Fig. 25A). Lateral Aps 0–6, 2 (19). Ac 11–26, 20 (21), and longest 13–23, 17 (21) µm long; Dc 6–16, 11 (20), H absent; Pa 1–5, 3 (21). Scts 4–11, 6 (17). Humeral pit (Fig. 25B–D) consisting of large, triangular or rectangular pit, and small elongate pit; large pit 0.43–0.81, 0.63 (22) × as wide as its length; occasionally small pit indistinct partly.

WING (Fig. 25E). Length 1.4–2.5, 1.8 (21) mm. C extension slightly projected, 20–49, 35 (22) µm long. VR 1.0–1.1, 1.1 (21). R basally with 3–10, 5 (22) setae; R₁ and R₄₊₅ usually without setae, very rarely each with 1 (1) seta. AnL obtuse. Sq with 0–8, 4 (22) setae.

LEGS. P₁ with single ti spur 37–54, 43 (22) µm long; P₂ with 2 ti spurs 18–25, 21 (21) and 16–22, 19 (21) µm long, respectively; P₃ with 2 ti spurs 39–52, 45 (22) and 15–25, 19 (22) µm long, respectively, and ti comb of 12–15, 13 (18) bristles. Mid ta₁ usually without Sch, occasionally with 5 (1) Sch. Lengths and proportions of legs as in Table 23.

ABDOMEN. Hypopygium (Fig. 25F) with AnP sharply pointed, bearing 7–14, 11 (22) lateral setae. Gc 138–229, 184 µm long, 3.3–4.1, 3.7 (22) × as long as broad at middle; SVo (Fig. 25G–H) posteriorly projected, apically pointed or blunted; IVo (Fig. 25I–J) triangular, usually with bare beak-like, occasionally blunt, dorsal apex. Gs (Fig. 25K–N) 59–98, 75 µm long, roundly convex in outer margin, with low and broad CD; occasionally CD indistinct. HR 2.25–2.69, 2.47.

Female (n = 9)

Total length 1.6–2.7, 2.0 mm.

COLOURATION. Similar to male. SCa brown.

HEAD. Temporals 2–5, 3. Antenna 5-segmented; Fm₅ 101–123, 109 µm long, nearly as long as combined length of Fm₃ and Fm₄; AR 0.40–0.49, 0.45. Clypeus with 8–13, 12 setae. Lengths (µm) of Pm₁₋₅: 30–39, 35 (6); 49–57, 53 (6); 86–98, 92 (6); 98–118, 107 (6); 192–219, 203 (6), respectively. Pm₄/Pm₃ 1.1–1.2, 1.2 (6); Pm₅/Pm₄ 1.7–2.1, 1.9 (6). Pm₃ with 2–5, 4 SCl; Pm₄ without Scl.

THORAX. Lateral Aps 2–5, 3 (7). Ac 19–29, 23 (8); Dc 11–15, 14, including 1–4, 2 H; Pa 3–4, 3. Scts 5–6, 6 (8).

WING. Length 1.5–2.1, 1.7 mm. C extension slightly projected. VR 1.0–1.1, 1.0. R with 5–11, 9; R_1 with 0–7, 4; R_{4+5} with 13–19, 15 setae. AnL obtuse. Sq with 3–9, 5 setae.

LEGS. P_1 with single ti spur 24–28, 26 μm long. P_2 with 2 ti spurs, both 16–21, 18 μm long; without Sch on ta_1 . P_3 with 2 ti spurs 42–46, 44 and 16–23, 18 μm long; with comb of 11–14, 13 bristles. Lengths and proportions of legs as in Table 23.

GENITALIA (Fig. 25O). S VIII with 8–15, 12 setae; Gca distinct. Gp VIII divided into rounded VII and narrow DmL; ApL distinct between VII and DmL. T IX (Fig. 25P) divided into 2 protrusions, with 11–19, 14 setae in total. Gc IX well developed with 6–10, 7 setae on each side. PgP triangular. Ce 51–74, 61 μm long. No 101–128, 110 μm long. L without microtrichia. SCa ovoid, 81–89, 85 (2) μm long, 1.3–1.5, 1.4 (2) \times as long as broad, with conical neck placed somewhat asymmetrically; ducts without loop.

Pupa (n = 30)

Total length 2.5–3.6, 3.0 mm.

COLOURATION. Exuviae generally pale brown; Apo, and central and posterior spines on abdominal tergites dark.

CEPHALOTHORAX. FA (Fig. 26A) weakly rugulose, with FS 57–111, 81 (18) μm long. Thoracic horn (Fig. 26B) club-shaped, 241–308, 266 μm long, 4.1–5.8, 5.0 (18) \times as long as broad. Lengths (μm) of Pc 1–3: 44–74, 57 (28); 27–59, 39 (27); 17–39, 26 (28), respectively. Three Pc arranged in triangle. Length (μm) of Dc_{1-4} : 44–74, 57 (28); 27–59, 39 (27); 17–39, 26 (28); 30–69, 45 (29), respectively. Four Dc arranged in straight line; last 3 grouped. Distances (μm) of Dc_1 – Dc_2 , Dc_2 – Dc_3 , Dc_3 – Dc_4 : 101–157, 122 (29); 12–57, 22 (28); 12–47, 21 (28), respectively.

ABDOMEN (Fig. 26C). T I without any spinulation. T II and VIII with triangular patch of posteromedian spinules. T III–V with more or less extensive spinulation. T VI with posterior spinulation. T VII with vertically long patch of median spinules. T IX with anterior spinulation. Weak anterolateral spinulation present on T II–VIII. T IV–VI with one median rounded patch of spines; weak to strong median spine patch (Fig. 26D) frequently present on T III. Rows of simple spines present on posterior margins of T II–VII; posterior spines of T II not recurved, smaller than those of T III–VI; posterior spines on T VII (Fig. 26E) usually weak, occasionally strong. Anteriorly directed spinules posterior to spine rows on T II–V. PSB somewhat low on A II–III. Usually A I with 1 L-seta, II–IV each with 3 L-setae, V–VI each with 4 L-setae, VII with 4 LS-setae, VIII with 5 LS-setae; occasionally A IV with 4 L-setae, V with 3 L-setae. AL 197–258, 224 μm long, 1.7–2.2, 2.0 (27) \times as long as broad, with 9–16, 12 lateral taeniae on posterior $\frac{2}{3}$ – $\frac{4}{5}$; male genital sac 1.0–1.2, 1.1 (6) as long as AL.

Larva (n = 6)

Total length 4.0 (1) mm. Length of head capsule 358 (1) μm .

COLOURATION. Head yellow with dark brown M, apical $\frac{2}{3}$ of mandible, and Po.

HEAD (Fig. 26F). IC 0.68 (1). PM 172–192, 184 (5) μm long. Dorsal surface with frontoclypeus, labral sclerite and lateral sclerites. Labrum with bifid SI. Lengths (μm) of 1st to 5th antennal segments: 49–55, 53 (5); 13–16, 14 (5); 7–9, 8 (5); 5–6, 5 (5); 6–7, 7 (5), respectively. AR 1.5–1.7, 1.5 (5). First segment (Fig. 26G) 2.9–3.7, 3.2 (5) \times as long as broad, with ring organ located 0.15–0.20, 0.17 (5) from base and 2 SA located 0.09–0.19, 0.14 (5) and 0.50–0.66, 0.60 (5), respectively, from base; with Bl 29–33, 31 (2) μm long, reaching 4th segment; with Abl 10–15, 12 (3) μm long. Second segment apically with LO 7–8, 7 (5) μm long, and St 2–3, 3 (4) μm long. Labrum with Pm 59–65, 63 (5) μm long. Mandible (Fig. 26H) 114–124, 119 (5) μm long, with apical tooth and 3 inner teeth; apical tooth shorter than

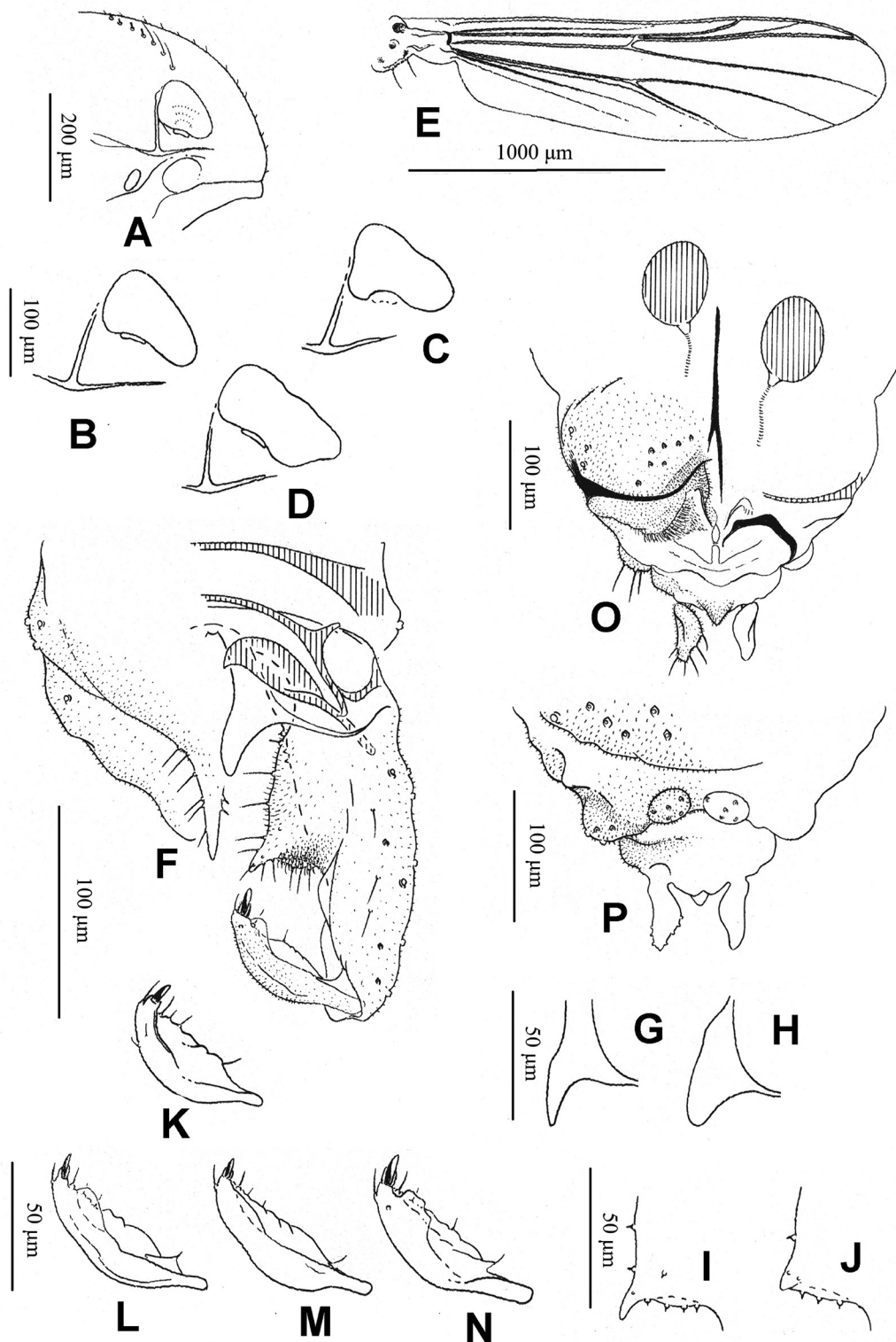


Fig. 25. *Rheocricotopus* (s. str.) *tamahumeralis* Sasa, 1981. **A–N.** ♂ (PCHN). **O–P.** ♀ (PCHN). **A.** Thorax with humeral pit, lateral view. **B–D.** Humeral pit, showing variation. **E.** Wing. **F.** Hypopygium, dorsal view. **G–H.** Superior volsella, showing variation. **I–J.** Inferior volsella, showing variation. **K–N.** Gonostylus, showing variation. **O.** Genitalia, ventral view. **P.** Genitalia, dorsal view.

combined width of these inner teeth; Si bearing 6–7 weakly serrated branches. Maxilla (Fig. 26I) with PG consisting of minute, indistinct teeth; anterior LCh 3.0–4.0, 3.5 (5) × as long as broad. M (Fig. 26J)

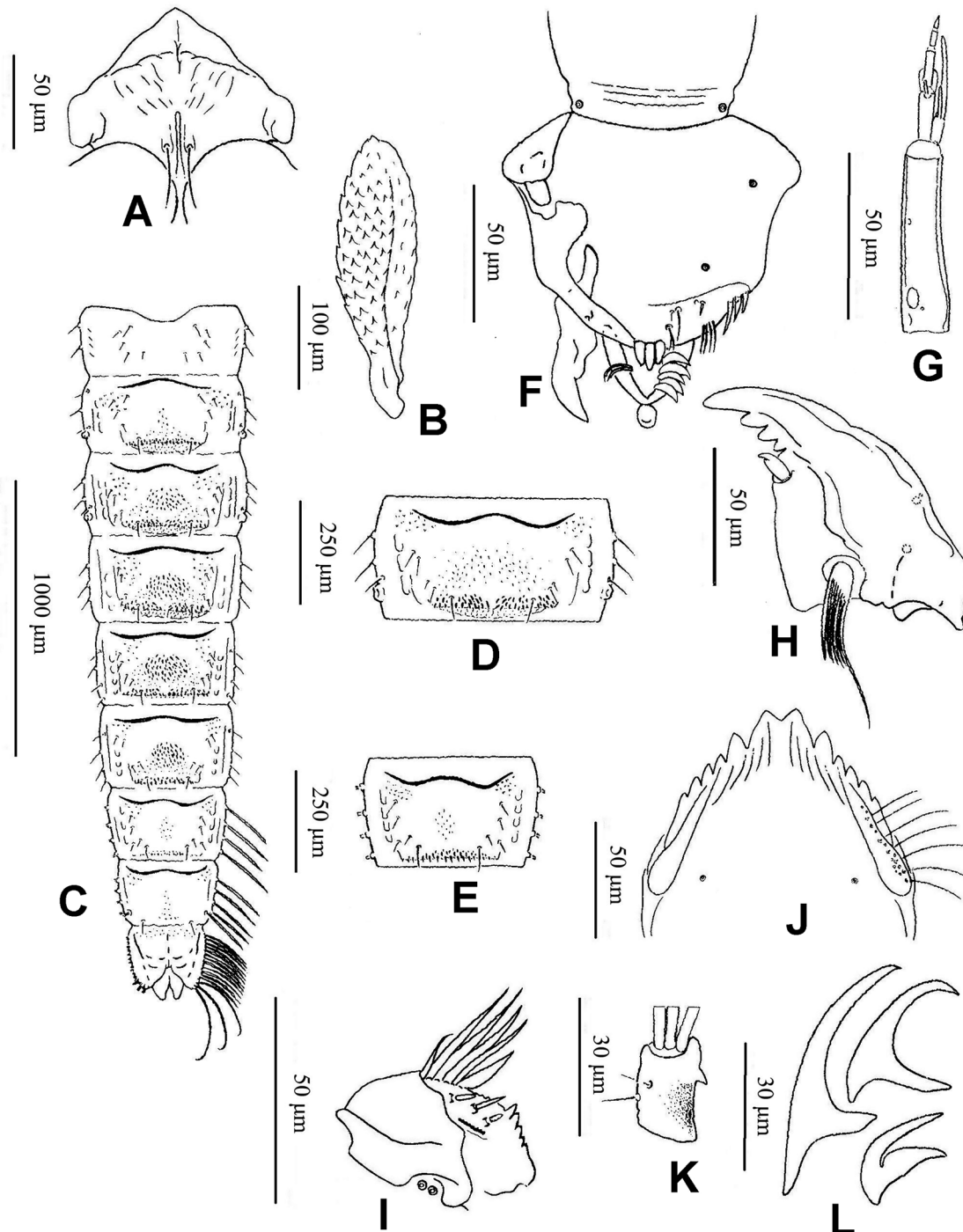


Fig. 26. *Rheocricotopus* (s. str.) *tamahumeralis* Sasa, 1981. **A–E.** Pupa (PCHN). **F–L.** Larva (PCHN). **A.** Frontal apotome. **B.** Thoracic horn. **C.** Abdomen, dorsal view. **D.** Segment III, dorsal view, showing variation. **E.** Segment VII, dorsal view. **F.** Labro-epipharyngeal region. **G.** Antenna. **H.** Mandible. **I.** Maxilla. **J.** Mentum. **K.** Procercus. **L.** Posterior parapod claws.

Table 23. Lengths (μm) and proportions of legs of *Rheocricotopus* (s. str.) *tamahumeralis* Sasa, 1981, ♂♂ (n = 22) and ♀♀ (n = 9).

Male	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	510–902	598–1078	412–823	255–441	176–323	118–206	78–110	0.69–0.79	2.4–2.7	1.7–2.5
	635	765	561 (21)	315 (21)	221 (21)	144 (21)	90 (21)	0.73 (21)	2.5 (21)	2.1 (18)
P2	519–951	529–931	265–519	157–284	108–206	59–118	59–88	0.50–0.57	3.3–3.7	2.1–3.0
	686 (21)	681 (21)	361 (20)	197 (20)	143 (20)	78 (20)	73 (20)	0.53 (20)	3.5 (20)	2.6 (19)
P3	490–931	588–1127	323–686	186–353	147–274	69–137	69–98	0.54–0.63	2.9–3.2	2.7–3.6
	649 (21)	788 (21)	458 (20)	240 (20)	193 (20)	95 (20)	81 (20)	0.58 (20)	3.1 (20)	3.1 (18)
Female	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	519–676	608–813	412–608	235–323	167–225	108–147	69–98	0.68–0.76	2.5–2.7	–
	568	672	478	270	189	123	84	0.71	2.6	–
P2	549–735	549–725	255–363	137–196	108–137	59–78	59–78	0.46–0.51	3.6–3.9	–
	614	610	296	161	118	65	69	0.49	3.7	–
P3	529–676	598–813	323–451	176–245	147–196	69–98	69–98	0.52–0.57	3.0–3.5	–
	576	677	370	195	159	76	76	0.55	3.2	–

with 2 median and 5 pairs of lateral teeth; median tooth without accessory tooth; combined width of 2 median teeth 24–29, 27 (5) μm . VmP 11–20, 14 μm wide at most, with 16–22, 20 beard setae beneath.

BODY. With setae, 54–73, 62 (4) μm long. Pc (Fig. 26K) 23–24, 23 (3) μm long, 1.4–1.8, 1.6 (3) \times as long as broad, with single spur and 3 AS. PP with 16 claws; small claws (Fig. 26L) squashed in shape.

Distribution

The species has been known from Palearctic Japan and China, and Oriental China.

Remarks

The species was described based on adults and pupae from a tributary river of the Tama in Tokyo, Japan. In the original description of the male, Sasa (1981: 92–93, 132 fig. 18) drew a rectangular humeral pit with no additional pit, and wrote “ R_{2+3} ending closer to tip of R_1 than to that of R_{4+5} ” and “Gonostylus without preapical tooth”. A re-examination of the holotype, a dissected teneral male with its pupal exuviae, revealed that it has large, nearly triangular humeral pits each with a small, ellipsoid hole with partly indistinct margin; superior volsellae projecting backwards; and triangular inferior volsellae each with a narrow apical projection. The specimen has 12 acrostichal setae, lacks sensillum chaeticum (Sch) on the mid basitarsomere, the wing seems to have an obtuse anal lobe. From the many specimens collected recently from Japan and China, it is evident that the humeral pit of this species consists of a large hole and a small hole, the vein R_{2+3} ends midway between tips of R_1 and R_{4+5} and the gonostylus usually possesses a low inconspicuous crista dorsalis. Further, Sasa (1981: 93) mistook the prealar setae for the supraalar setae in the female description. Thus, the species belongs to the *effusus* group in Sæther (1986: 98) and the male is very similar to that of *R.* (s. str.) *effusus* (Walker, 1856) in the large humeral pit consisting of two holes, the beak-like superior volsella, and some numerical data, e.g., number of lateral setae on anal point 7–14, AR 0.73–1.27, LR_1 0.69–0.79, LR_3 0.54–0.63, but may be separable from the latter by the broader, triangular, occasionally rectangular large hole of humeral pit, and the obtuse anal lobe of the wing. According to Edwards (1929: 330), Lehmann (1969: 372 fig. 13a) and Moubayed-Brell & Ashe (2019: 38 fig. 10), the male of *R.* (s. str.) *effusus* possesses a large, long oval-shaped hole in

the humeral pit, and Lehmann (1969: 378) wrote in couplet 9 of his key “Wings with a well-developed anal lobe (as in fig. 18a)” and showed a right-angled anal lobe.

Troublingly, the partially indistinct small hole in the humeral pit and the gonostylus without distinct crista dorsalis occur in Japanese and Chinese populations of *R. (s. str.) tamahumeralis*. The former may come from insufficient sclerotization in teneral adults. The latter may be caused by individual variations, as well as differing orientations on the slide. The male with both the features may be inseparable from that of *R. (s. str.) nepalensis* Lehmann, 1969. Sæther (1986: 65) wrote: “*R. (R.) tamahumeralis* and *R. (R.) nepalensis* are very close and may well show up to be conspecific.” It is not clear whether these species are conspecific or not until the immature stages and more adult specimens of *R. (s. str.) nepalensis* are available.

Some pupae of *R. (s. str.) tamahumeralis* are similar to those of *R. (s. str.) effusus* in having 11–16 lateral taeniate on the anal lobe, but clearly different from it. The pupa of *R. (s. str.) tamahumeralis* is characterized by the tergite III frequently with a median spine patch, the tergites VII–VIII each with a small median spinule patch (I-shaped on T VII, inverted T-shaped on T VIII), whereas in the latter, the tergite III usually has no median spine patch, each of the tergites VII–VIII has a relatively large spinule patch (Lehmann 1969: 376 fig. 21b; Sæther 1986:105; Coffman *et al.* 1986: 277 fig. 9.59d; Langton & Visser 2003 fig. 045.1). In addition, it is peculiar to have distinct posterior spines on the tergite VII, which can occasionally be nearly as large as those on the tergite VI. Sæther (1986: 62) wrote: “Caudal margin of tergites II–VI or III–VI (*Rheocricotopus* s. str.) or II–VIII or III–VIII (*Psilocricotopus*) with spines: (Occasionally very weak caudal spines are present on tergite VII or VII–VIII also in *Rheocricotopus* s. str.)”.

The larva of *R. (s. str.) tamahumeralis* is distinct from that of *R. (s. str.) effusus* in the few beard hairs beneath the ventromental plate. It is 16–22, 20 (n = 6) in the former, whereas 25–31, 28 (n = 9) in the latter according to Sæther (1986: 105). Although many larvae are unknown in this genus, *R. (R.) tamahumeralis* has a frontoclypeus separated from the labral sclerite, which is an important feature to identify this larva.

***Rheocricotopus (s. str.) tatequintus* Sasa, 1996**

Fig. 27, Table 24

Rheocricotopus tatequintus Sasa, 1996a: 32.

Rheocricotopus (Rheocricotopus) tatequintus – Sæther *et al.* 2000: 161. — Ashe & O’Connor 2012: 572. — Yamamoto & Yamamoto 2014: 298. — Fu *et al.* 2016: 271.

Type material

Holotype

JAPAN – Toyama • ♂; Mt Tate; 9 Apr. 1986; M. Sasa leg.; NSMT, NSMT-I-Dip 4998 [No. 284: 58].

Paratypes

JAPAN – Toyama • 2 ♂♂, 1 ♀; same data as for holotype; NSMT, NSMT [No. 284: 59–61].

Description

Male (n = 3)

Total length 3.0–3.3, 3.2 mm.

COLOURATION. Thorax black, abdomen and legs uniformly dark brown.

HEAD. Temporals 2–3, 3 (2). AR 1.13–1.16, 1.14. Clypeus with 6–8, 7 (2) setae. Lengths (μm) of Pm_{1-5} : 34–37 (2); 54–64 (2); 130–148 (2); 143–148 (2); 221–229 (2), respectively. Pm_4/Pm_3 1.0–1.1 (2); Pm_5/Pm_4 1.6 (2). Pm_3 with 1 (1) SCL.

THORAX. Lateral Aps 4 (2), and medial Aps 0–2 (2). Ac 28 (1), and longest 22 (1) μm long; Dc 14–15 (2) including 2–3 (2) H; Pa 3 (2). HP (Fig. 27A) composed of large hole and small hole; large hole oblong, 0.26–0.28 (2) \times as high as long.

WING (Fig. 27B). Length 2.3–2.4, 2.4 mm. C extension slightly projected, 42–59, 48 μm long. VR 1.0–1.1, 1.0. R with 9–12, 10 setae, R_1 and R_{4+5} without setae. AnL obtuse. Sq with at least 4.

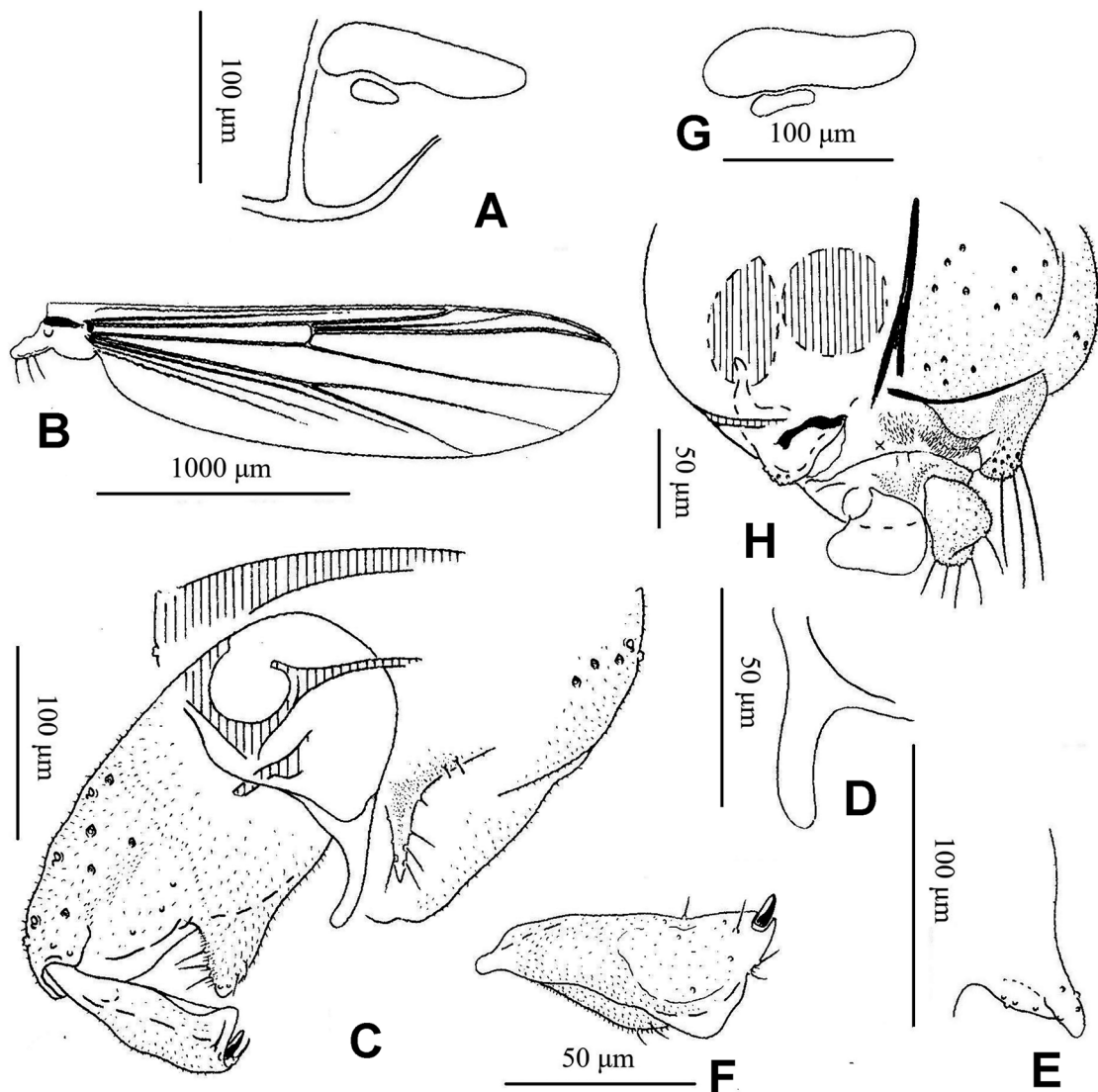


Fig. 27. *Rheocricotopus* (s. str.) *tatequintus* Sasa, 1996. A–C. Holotype, ♂ (NSMT I-Dip-4998). D–F. Paratype, ♂ (NSMT No. 284: 59). G–H. Paratype, ♀ (NSMT No. 284: 61). A, G. Humeral pit. B. Wing. C. Hypopygium, dorsal view. D. Superior volsella. E. Inferior volsella. F. Gonostylus. H. Genitalia, ventral view.

Table 24. Lengths (μm) and proportions of legs of *Rheocricotopus* (s. str.) *tatequintus* Sasa, 1996, ♂♂ (n = 3) and ♀ (n = 1).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	794–813	941–1009	666–706	372–382	255–274	167–186	108	0.70–0.71	2.6–2.7	1.9
	804	980	689	379	265	176	108	0.7	2.7	1.9 (2)
P2	823–882	833–892	441–461	245	167–186	98–108	88–98	0.50–0.53	3.4–3.6	1.3–1.8
	849	869	448	245	180	101	91	0.52	3.5	1.5
P3	833–882	1009–1058	568–588	294–304	225–245	118–137	98–108	0.55–0.57	3.1–3.3	1.1–1.6
	853	1036	578	297	238	127	101	0.56	3.2	1.4
P1	845	1014	700	386	266	169	97	0.69	2.8	–
P2	784	882	451	235	167	98	98	0.51	3.5	–
P3	843	1058	568	294	225	118	98	0.54	3.4	–

LEGS. P₁ with single ti spur 49–54, 52 μm long; P₂ with 2 ti spurs 20–22, 21 and 17–20, 18 μm long, respectively; P₃ with 2 ti spurs 47–49, 48 and 20 μm long and ti comb of 14–16, 15 bristles. Lengths and proportions of legs as in Table 24.

ABDOMEN. Hypopygium (Fig. 27C) with AnP pointed apically, bearing 12 (1) setae. Gc (Fig. 27D) 209–244, 231 μm long with finger-like, apically rounded SVo; IVo (Fig. 27E) triangular, apically with small dorsal projection. Gs 108–125, 117 μm long with convex outer margin; CD (Fig. 27F) low, somewhat broad. HR 1.92–2.06, 1.97.

Female (n = 1)

Total length 2.8 mm.

COLOURATION. Similar to male.

HEAD. Antenna 5-segmented. Lengths (μm) of Fm_{1–5}: 98, 69, 69, 59, 106. AR 0.36. Clypeus with 9 setae. Lengths (μm) of Pm_{1–5}: 37, 62, 138, 145, 241. Pm₄/Pm₃ 1.1, Pm₅/Pm₄ 1.7. Pm₃ with 2 SCL.

THORAX. HP (Fig. 27G) with 2 holes, large hole 0.27 \times as high as its length. Lateral Aps 3, medial Aps absent. Ac at least 17, Pa 3.

WING. Length 2.4 mm. C extension 98 μm long. VR 1.0. R with at least 17, R₁ with at least 10, R₄₊₅ with at least 31. Sq with 6 setae.

LEGS. P₁ with single ti spur 32 μm long; P₂ with 2 ti spurs, 22 and 20 μm long, respectively; P₃ with 2 ti spurs, 49 and 20 μm long, and with ti comb of 18 bristles. Lengths and proportions of legs as in Table 24.

GENITALIA (Fig. 27H). S VIII with about 20 setae. Gca distinct. Gp VIII divided into rounded VIL and DmL. Gc IX well developed, with 12 setae on each side. Ce 76 μm long. No 75 μm long. SCa 116 μm long.

Pupa and larva

Unknown.

Distribution

The species is known only from the type locality, Mt Tate in Toyama Prefecture, Palaearctic Japan.

Remarks

We re-examined the holotype male, two male and one female paratypes of *R. (s. str.) tatequintus* Sasa, 1996. Although all the types are severely damaged during the mounting procedures, a digitate superior volsella is recognized in the males. The female thorax has a large humeral pit consisting of two holes as in the male thorax.

Fu *et al.* (2016: 271) corrected the antennal ratio of 1.13–1.34 in the original description to 2.55 by their re-examination of the holotype, but our re-examination of all the male types (No. 284: 58–60), including the holotype (NSMT-I-Dip 4998, No. 284: 58), shows the true antennal ratio is 1.13–1.16, not such high re-calculated values.

The male is a member of the *reduncus* group as defined by Moubayed-Breil & Ashe (2019: 36) in having the superior volsellae finger-like, resembling that of *R. (s. str.) pyrenaicus* Moubayed & Ashe, 2019 in the humeral pit consisting of a large hole and a small hole, the apically rounded finger-like superior volsella, and crista dorsalis broad, distinct. However, in *R. (R.) tatequintus*, the male antennal ratio is somewhat higher (1.1–1.2), the female antennal ratio is lower (AR 0.36), and the male wing has no seta on veins R_1 and R_{4+5} , whereas in *R. (R.) pyrenaicus*, the male antennal ratio is 0.84, the female antennal ratio is 0.65, and each of the male R_1 and R_{4+5} possess two setae according to Moubayed & Ashe (2019: 41–42).

Rheocricotopus (s. str.) togapeniculus Sasa & Okazawa, 1992
Figs 28–29, Table 25

Rheocricotopus (Rheocricotopus) togapeniculus Sasa & Okazawa, 1992: 104.

Rheocricotopus kamimonji Sasa & Hirabayashi, 1993: 364. **Syn. nov.**

Rheocricotopus kurocedeus Sasa, 1996a: 19. **Syn. nov.**

? *Rheocricotopus fuscipes* [nec Kieffer, 1909] – Hirabayashi *et al.* 1998: 805.

Rheocricotopus (Psilocricotopus) kamimonji – Sasa & Tanaka 1998: 38. — Sæther *et al.* 2000: 161. — Ashe & O'Connor 2012: 565. — Yamamoto & Yamamoto 2014: 297.

Rheocricotopus (Psilocricotopus) kurocedeus – Sæther *et al.* 2000: 161, misspelled as *R. (Psilocricotopus) kurodeceus*. — Ashe & O'Connor 2012: 565. — Yamamoto & Yamamoto 2014: 297— Fu *et al.* 2016: 264.

Rheocricotopus (Rheocricotopus) togapeniculus – Sæther *et al.* 2000: 161. — Ashe & O'Connor 2012: 572. — Yamamoto & Yamamoto 2014: 298. — Fu *et al.* 2016: 273.

Rheocricotopus (Rheocricotopus) eminellobus [nec Sæther, 1969] – Makarchenko & Makarchenko 2005: 130.

Type material

Holotype of *Rheocricotopus (s. str.) togapeniculus*

JAPAN – Toyama • ♂; Toga, Toga River; 16 Apr. 1990 (emerged 24 Apr. 1990); T. Okazawa and M. Sasa leg.; NSMT, NSMT-I-Dip 4709 [No. 181: 29].

Holotype of *Rheocricotopus kurocedeus*

JAPAN – Toyama • ♂; Lake Kurobe; 14 Oct. 1994; M. Sasa leg.; NSMT, NSMT-I-Dip 4988 [284: 31].

Type specimen of *R. kamimonji* was not examined.

Other material examined

JAPAN – **Fukushima** • 1 ♂; Naraha, Kido River; 37°16' N, 140°58' E; 28 m; 24 Oct. 1991; H. Niitsuma leg.; PCHN • 1 ♂ with 1 Pe; Iwaki, Hisanohama, Obisa River; 37°08' N, 140°58' E; 18 m a.s.l.; 11 Apr. 1991; H. Niitsuma leg.; PCHN • 3 ♂♂ with 3 Pe, 4 ♀♀ with 3 Pe; Iwaki, Yaguki; 37°8' N, 140°54' E; 123 m a.s.l.; 3 Jan. 1997 (emerged 6–21 Jan. 1997); H. Niitsuma leg.; PCHN • 4 ♂♂ with 4 Pe; same data as for preceding; 2 Jan. 1998 (emerged 26 Jan. – 7 Feb. 1998); PCHN • 1 ♂ with 1 Pe; same data as for preceding; 20 Mar. 2000 (emerged 26 Mar. 2000); PCHN • 1 ♂ with 1 Pe; same data as for preceding; 15 Aug. 2001 (emerged 29 Aug. 2001); PCHN • 1 ♂ with 1 Pe; same data as for preceding; 14 Oct. 2002 (emerged 25 Oct. 2002); PCHN. – **Kanagawa** • 1 ♂ with 1 Pe; Kiyokawa, Miyagase; 35°30' N, 139°12' E; 290 m a.s.l.; 7 Feb. 1998 (emerged 28 Mar. 1998); H. Niitsuma leg.; PCHN. – **Miyagi** • 1 ♂ with 1 Pe; Shiroishi, Yukawa River, Kamasaki Hot Spring; 38°15' N, 140°34' E; 189 m a.s.l.; 1 Jan. 1997 (emerged 19 Jan. 1997); H. Niitsuma leg.; PCHN. – **Nagano** • 1 ♂ with 1 Pe; Kawakami; 35°58' N, 138°34' E; 1220 m a.s.l.; 20 Jun. 1991 (emerged 28 Jun. 1991); H. Niitsuma leg.; PCHN. – **Shizuoka** • 1 ♂ with 1 Pe and 1 Le, 1 ♂ with 1 Pe; Ikawa, Dainichi Pass, stream; 35°11' N, 138°15' E; 1100 m a.s.l.; 4 Mar. 2000 (emerged 9 Mar. 2000); H. Niitsuma leg.; PCHN • 1 ♂ with 1 Pe and 1 Le; same data as for preceding; 28 Mar. 2001 (emerged 9 Apr. 2001); PCHN • 1 ♂ with 1 Pe; Aoi-ku, Ikawa, River Well Ski Area; 35°12' N, 138°16' E; 1400 m a.s.l.; 15 Nov. 1997 (emerged 15 Feb. 1998); H. Niitsuma leg.; PCHN • 2 ♀♀ with 2 Pe; Aoi-ku, Kadoya River; 35°3' N, 138°22' E; 85 m a.s.l.; 21 Dec. 1997 (emerged 11 Jan. 1998); H. Niitsuma leg.; PCHN • 1 ♂; Aoi-ku, Ashikubo, stream; 35°2' N, 138°22' E; 77 m a.s.l.; 4 Apr. 1987; H. Niitsuma leg.; PCHN • 3 ♂♂ with 1 Pe; same data as for preceding; 15 Feb. 1996 (emerged 22–26 Feb. 1996); PCHN • 1 ♂ with 1 Pe; Aoi-ku, Kujiragaike Pond, unnamed stream; 35°02' N, 138°23' E; 80 m a.s.l.; 27 Nov. 1987 (emerged 15 Nov. 1987). H. Niitsuma leg.; PCHN. – **Tochigi** • 1 Pe; Ichikai, Miage; 36°36' N, 140°7' E; 116 m a.s.l.; 13 Apr. 1989; H. Niitsuma leg.; PCHN.

Description

Male (n = 26)

Total length 2.0–3.4, 2.5 mm.

COLOURATION. Thorax dark brown. Abdomen brown, usually somewhat darker on T V–IX. Legs uniformly brown.

HEAD. Temporals 3–7, 4. AR 0.89–1.20, 1.01. Clypeus with 8–16, 10 setae. Lengths (µm) of Pm₁₋₅: 25–44, 34 (24); 44–62, 52 (24); 86–135, 110 (24); 86–135, 113 (24); 160–231, 195 (24), respectively. Pm₄/Pm₃ 1.0–1.2, 1.0 (24); Pm₅/Pm₄ 1.5–1.9, 1.7 (24). Pm₃ with 2–6, 4 (25) SCL; Pm₄ occasionally with 1 (6) SCL.

THORAX. Lateral Aps minute, 0–3, usually absent (25). Ac 14–30, 20 (23), and longest 11–24, 17 µm long; Dc 4–8, 6 (25); H absent; Pa 2–5, 3; Scts 4–10, 6. HP (Fig. 28A) composed of fused several small holes, occasionally invisible.

WING (Fig. 28B). Length 1.6–2.5, 2.0 (25) mm. C extension slightly to moderately long, 25–66, 45 (24) µm. VR 1.1–1.2, 1.1 (25). R with 4–16, 8 setae; R₁ with 0–1 seta, usually bare, and R₄₊₅ with 0–6, 1 (25) seta. AnL obtuse. Sq with 2–14, 6 (25) setae.

LEGS. P₁ with ti spur 38–54, 44 µm long; P₂ with 2 ti spurs 15–23, 19 and 15–20, 18 µm long; P₃ with 2 ti spurs 38–51, 44 and 16–20, 18 (25) µm long. P₂₋₃ usually without Sch, each rarely with 1 (1) Sch on ta₁. P₃ with ti comb of 11–16, 13 (25) bristles. Lengths and proportions of legs as in Table 25.

ABDOMEN. Hypopygium (Fig. 28C) with AnP pointed apically, bearing 4–12, 7 (25) lateral setae. Gc145–192, 169 µm long with SVo (Fig. 28D) right-angled at apex to somewhat roundly protruded inwardly;

Ivo double-layered, dorsally with narrow dorsal protrusion. Gs (Fig. 28E) 59–79, 68 μm long, roundly convex in outer margin; CD absent. HR 2.19–2.84, 2.48 (25).

Female (n = 6)

Total length 2.2–2.7, 2.4 (5) mm.

COLOURATION. Similar to male. Sca dark brown

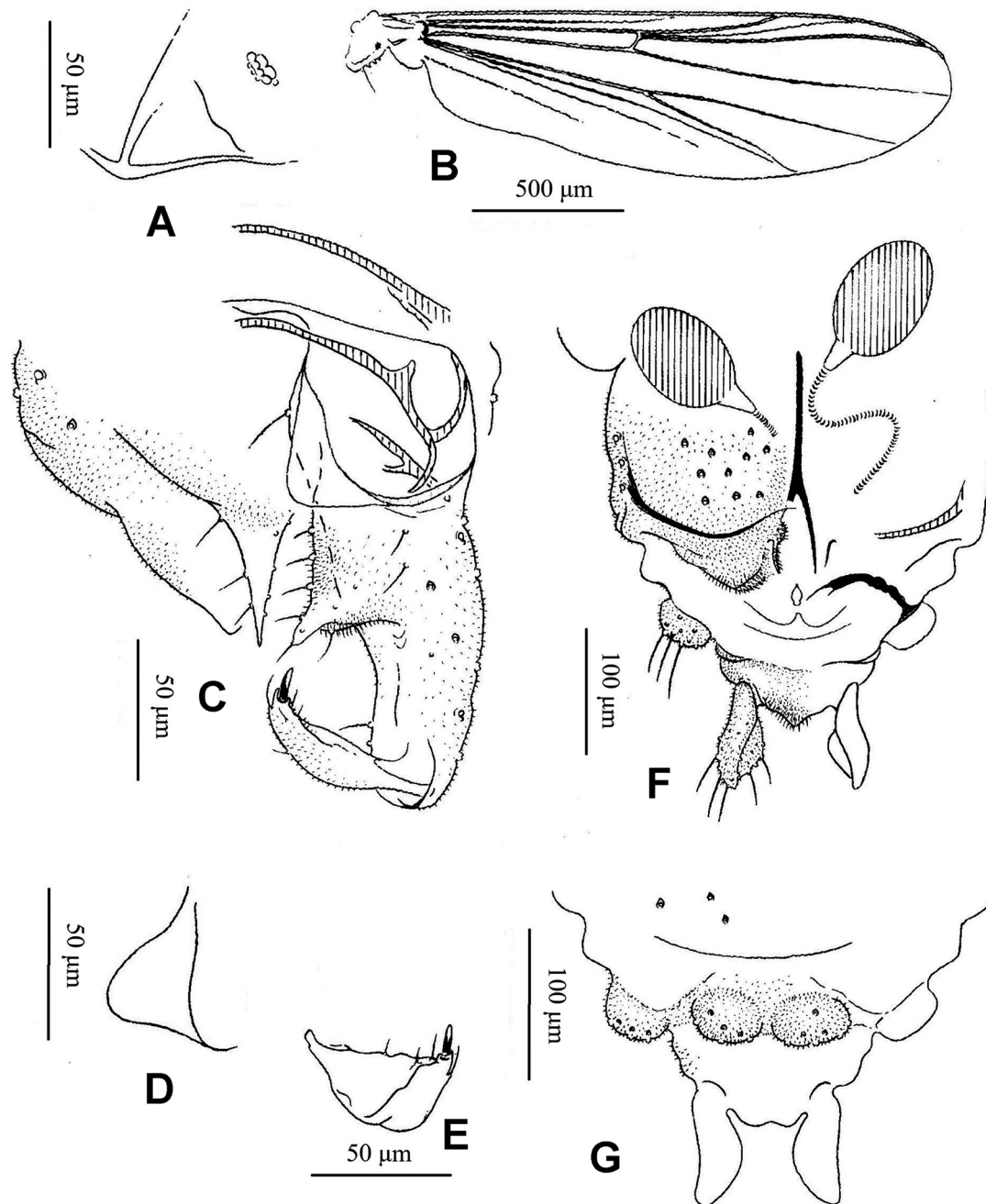


Fig. 28. *Rheocricotopus* (s. str.) *togapeniculus* Sasa & Okazawa, 1992. **A–E.** ♂ (PCHN). **F–G.** ♀ (PCHN). **A.** Humeral pit. **B.** Wing. **C.** Hypopygium, dorsal view. **D.** Superior volsella, showing variation. **E.** Gonostylus, showing variation. **F.** Genitalia, ventral view. **G.** Genitalia, dorsal view.

HEAD. Temporals 4–8, 6. Antenna 5-segmented; Fm_5 91–108, 98 μm long, shorter than combined length of Fm_3 and Fm_4 ; AR 0.36–0.43, 0.38. Clypeus with 9–14, 12 setae. Lengths (μm) of Pm_{1-5} : 37–44, 41 (4); 52–62, 58 (4); 108–128, 115 (4); 123, 123 (3); 209–234, 222 (4), respectively. Pm_4/Pm_3 1.1, 1.1 (3); Pm_5/Pm_4 1.7–1.8, 1.8 (3). Pm_3 with 3–7, 5 (5) SCL.

THORAX. Lateral Aps 2–3, 2 (5). Ac 16–29, 23 (4); Dc 9–15, 12 (5) including 1–4, 2 (5) H; Pa 2–6, 4. Sct 6–7, 7.

WING. Length 1.8–2.3, 2.1 mm. C extension moderately long. VR 1.0–1.1, 1.1. R with 14–23, 20; R_1 with 6–13, 10; R_{4+5} with 25–40, 35 setae. Sq with 7–10, 8 setae.

LEGS. P_1 with ti spur 23–28, 26 μm long; P_2 with 2 ti spurs 18–23, 20 and 16–20, 18 μm long; P_3 with 2 ti spurs 44–54, 48 and 16–20, 18 μm long. P_{2-3} each with ta_1 bearing 0–3, 2 Sch. P_3 with ti comb of 12–15, 13 bristles. Lengths and proportions of legs as in Table 25.

GENITALIA (Fig. 28F). S VIII with 14–19, 16 setae. T IX (Fig. 28G) divided into 2 protrusions, with 11–16, 13 setae in total. Gc IX with 7–12, 10 setae on each side. Ce 64–89, 77 μm long. No 103–119, 111 μm long. Sca 89–113, 103 (4) μm long, 1.4–1.8, 1.7 (4) \times as long as broad; neck conical; ducts without loop.

Pupa (n = 26)

Total length 2.4–3.7, 3.0 mm.

COLOURATION. Exuviae pale brown, darkened on apophyses, and central and posterior spines on abdominal tergites.

CEPHALOTHORAX. FA (Fig. 29A) weakly and sparsely pebbled, with FS 73–122, 92 (16) μm long. Thoracic horn 232–310, 273 (25) μm long, 3.3–6.1, 4.2 (14) \times as long as broad. Lengths (μm) of Pc_{1-3} : 135–197, 170 (21); 111–197, 152 (21); 44–123, 78 (21), respectively. Three precorneals arranged in triangle. Lengths (μm) of Dc_{1-4} : 34–74, 48; 27–79, 50; 12–42, 30; 25–74, 44, respectively. Distances (μm) of Dc_1 – Dc_2 , Dc_2 – Dc_3 , Dc_3 – Dc_4 : 62–123, 95; 22–86, 44; 10–44, 23, respectively. Dc_{2-4} usually arranged in straight line, occasionally in triangle.

ABDOMEN (Fig. 29B). T I–II without spinulation. T III–V each with more or less extensive spinulation. T VI–VII with posterior spinulation. T VIII with triangular, posterior spinule patch along median line. T IX with anterior spinulation. T IV–VI each with one median, rounded patch of spines, occasionally T III (Fig. 29C) with ill-defined median spine patch. Rows of simple spines present on posterior margins of T II–VIII; posterior spines weak on T II, VII–VIII, occasionally absent on T VIII. Anteriorly directed spinules present, posterior to spine rows on T II–V. PSB somewhat low on A II–III. Usually A I with 2 L-setae; II–IV each with 3 L-setae, occasionally IV with 4 L-setae; V–VI each with 4 L-setae, occasionally 3 L-setae; VII with 4 LS-setae; VIII with 5 LS-setae. AL 177–271, 226 (24) μm long, 1.6–2.0, 1.8 (24) \times as long as broad, with 8–16, 11 (24) lateral taeniae on basal $\frac{2}{3}$ – $\frac{3}{4}$; male genital sac 1.1–1.3, 1.2 (9) as long as AL.

Larva (n = 2)

COLOURATION. Head yellow with dark brown mentum, apical $\frac{2}{3}$ of mandible, and postoccipital margin.

HEAD. PM 187–197 μm long. Dorsal surface (Fig. 29D) with frontoclypeolabrum and lateral labral sclerites. SI bifid on labrum. Antenna (Fig. 29E) 5-segmented. Lengths (μm) of 1st to 5th antennal segments: 59, 16–18, 10–11, 7–8, 8, respectively. AR 1.3–1.4. First segment 3.0 \times as long as broad, with RO located 0.14 from base and 2 SA each located 0.13–0.14 and 0.28–0.31 from base; with blade 39–41 μm long, reaching apex of 4th segment. Second segment apically with LO 10 μm long, and St 3 μm

long. Labrum with Pm 62–65 μm long. Mandible (Fig. 29F) 119–127 μm long, with apical tooth shorter than combined width of 3 inner teeth; Si with 7 branches including 2 or 3 apically serrated branches. Maxilla (Fig. 29G) with PG consisting of 9 distinct teeth; anterior LCh 3.3–4.3 \times as long as broad. M (Fig. 29H) with 2 simple median teeth; combined width of 2 median teeth 26–27 μm . Vmp 16 μm wide at most, with 14–16 beard setae beneath.

BODY. With setae 62 μm long. Pc (Fig. 29I) 23 (1) μm long, 1.8 (1) \times as long as broad, with 2 spurs and 3 anal setae. Squashed small claws (Fig. 29J) present on PP.

Distribution

The species is known from Palearctic Japan and the Russian Far East.

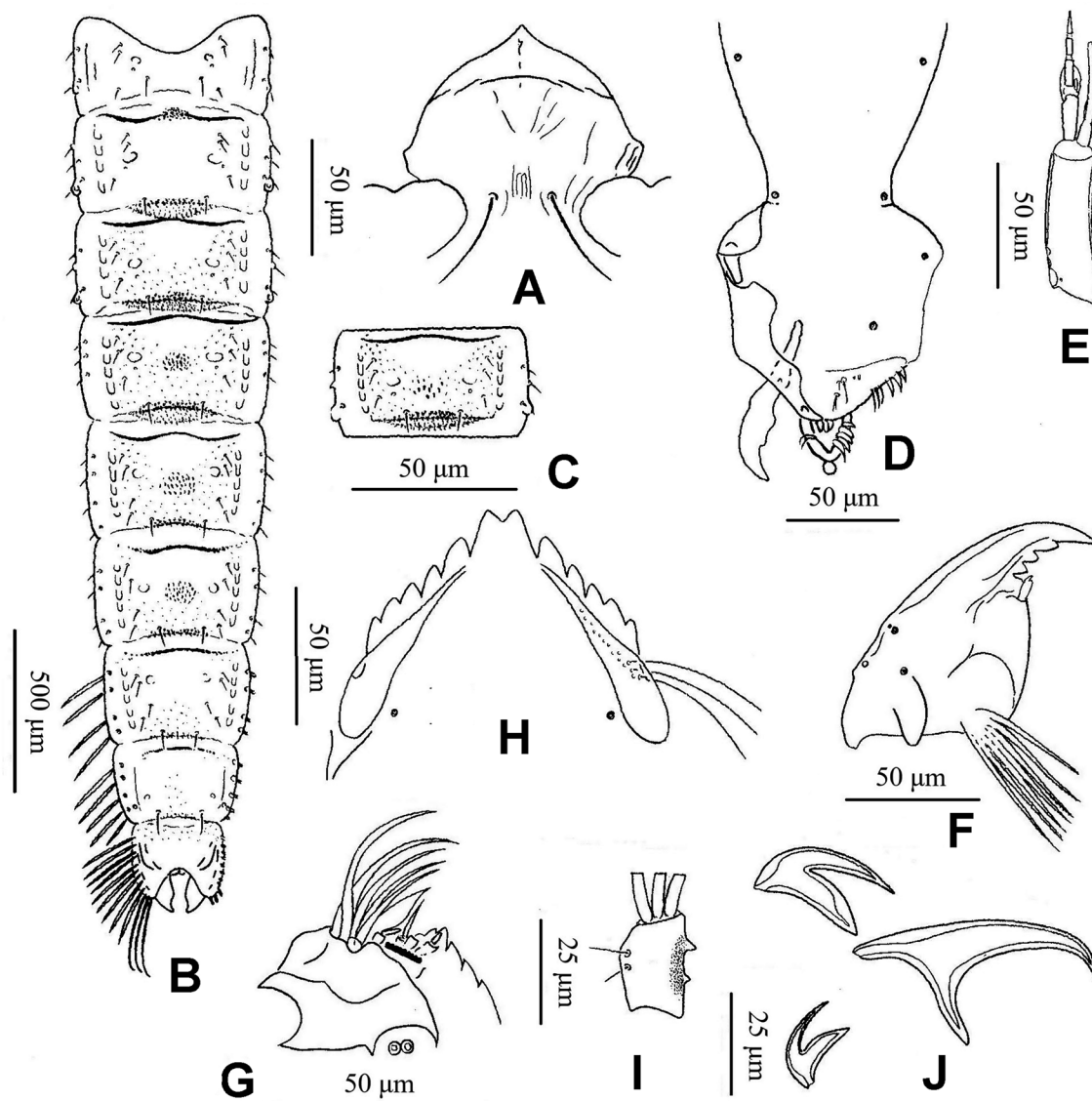


Fig. 29. *Rheocricotopus* (s. str.) *togapeniculus* Sasa & Okazawa, 1992. A–C. Pupa (PCHN). D–J. Larva (PCHN). A. Frontal apotome. B. Abdomen, dorsal view. C. Segment III, dorsal view, showing variation. D. Labro-epipharyngeal region. E. Antenna. F. Mandible. G. Maxilla. I. Procercus. J. Posterior parapod claws.

Table 25. Lengths (μm) and proportions of legs of *Rheocricotopus* (s. str.) *togapeniculus* Sasa & Okazawa, 1992, ♂♂ (n = 26) and ♀♀ (n = 6).

Male	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	549–745 642	608–853 725	461–637 549	274–382 317	196–265 230 (25)	127–186 154 (25)	78–108 92 (25)	0.74–0.80 0.76	2.3–2.5 2.4 (25)	2.0–2.8 2.3 (25)
P2	568–774 673	559–745 647	304–431 357	167–235 194	118–176 141	59–98 77	59–88 72	0.52–0.58 0.55	3.2–3.7 3.5	2.7–3.5 3.1 (25)
P3	529–774 642	627–882 754	382–539 456	206–294 240 (25)	167–235 195 (25)	69–137 97 (25)	59–108 82 (25)	0.58–0.63 0.60 (25)	2.8–3.3 3.0 (25)	3.5–5.5 4.3 (24)
Female	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	BR
P1	608–735 666	686–833 750	500–617 559	284–343 319	206–245 230	137–167 153	88–108 96	0.73–0.76 0.75	2.4–2.6 2.5	–
P2	647–774 701	617–725 675	323–382 358	176–206 193	127–157 140	69–88 77	69–78 75	0.51–0.54 0.53	3.5–3.7 3.6	–
P3	617–735 663	686–843 768	412–490 452	216–255 237	176–206 194	78–108 93	78–98 87	0.58–0.60 0.59	3.0–3.1 3.1	–

Remarks

Although the holotype was badly damaged during mounting, the double-layered inferior volsella with a dorsal protrusion and the gonostylus with no crista dorsalis and rounded outer margin are recognizable in the specimen. Additionally, the small humeral pit consisting of several (10–12), partly fused holes and the wing with an obtuse anal lobe and a slight costal extension are also distinctive in the specimen. More additional features were clarified in newly collected materials from Japan. The humeral pit is invisible in some specimens. The superior volsella is thick and nearly right-angled at the apex in dorsal view, but it also looks like a rounded protrusion in other views or by different pressure from the coverslip.

Rheocricotopus kamimonji Sasa & Hirabayashi, 1993 was described based on a single male from Nagano Prefecture in Palaeartic Japan. Although we have not examined the holotype, judging from the original description (Sasa & Hirabayashi 1993: 364) there is no significant difference between the males of *R.* (s. str.) *togapeniculus* and *R. kamimonji*. The latter species is a junior synonym of *R.* (s. str.) *togapeniculus*. The holotype of the latter may be lost.

Rheocricotopus kurocedeus Sasa, 1996 was described based on a single male from Toyama Prefecture, Japan. The author (Sasa 1996a: 19) wrote: “Gonostylus simple, ... with a long and stout megaseta but without preapical tooth.” Nevertheless, Fu *et al.* (2016: 265) wrote: “Gonostylus 70 μm long, with small triangularly pointed costa dorsalis [sic].” Our re-examination of the holotype showed a gonostylus lacking any crista dorsalis. Further, Sasa (1996a: 19) wrote: “it is closest to *R. togapeniculus* Sasa et Okazawa, 1992 and *R. kamimonji* Sasa et Hirabayashi, 1993, in that antennae are the normal type and AR is ca 1.0, and humeral pits are small, but differs also from both in the structure of inner lobes of gonocoxite and of anal point.” We compared the holotype male of *R. kurocedeus* to that of *R.* (s. str.) *togapeniculus*. Although the inferior volsella of the latter is deformed by a poor mounting procedure, it is distinctly recognizable that in the former, the inferior volsella is armed with a finger-like dorsal projection, not a rounded protrusion as shown in Fu *et al.* (2016: 264 fig. 3b–c). Additionally, there is no significant difference between both the structures of anal point. *Rheocricotopus kurocedeus* undoubtedly is a junior synonym of *R.* (s. str.) *togapeniculus*.

Makarchenko & Makarchenko (2005: 130) gave a brief re-description of *R. (s. str.) eminellobus* Sæther, 1969 belonging to the *fuscipes* group, based on males from Primorsky in the Russian Far East. The male of *R. (s. str.) eminellobus* is similar to that of *R. (R.) togapeniculus* in the small humeral pit and the gonostylus with no or indistinct crista dorsalis, but separable from it by the relatively thin, roundly protruded superior volsella and the somewhat broad, triangular inferior volsella (see Sæther 1969: 86 fig. 43, 1971: 1250 fig. 8f). The male of *R. (s. str.) eminellobus* sensu Makarchenko & Makarchenko (2005: 132 figs 16–17) has nearly triangular, thick superior volsellae and narrowly projected, finger-like inferior volsellae. The species is not true *R. (s. str.) eminellobus*, but belongs to *R. (s. str.) togapeniculus*.

Hirabayashi *et al.* (1998: 805) recorded a male of *R. (s. str.) fuscipes* (Kieffer, 1909) from the Oze Moor in Gunma, Japan but without any morphological account. The male of *R. (s. str.) fuscipes* also resembles that of *R. (s. str.) togapeniculus* in the small indistinct humeral pit, and the gonostylus roundly convex in outer margin, with indistinct or no crista dorsalis, but differs from it in the semicircular superior volsella, and the triangular inferior volsella without conspicuously projecting apex (Goetghebuer 1932: 57 fig. 93, as *Trichocladius dispar* Goetghebuer, 1913; Albu 1968: 462 fig. 8, as *R. dispar*; Lehmann 1969: 367 fig. 4, as *R. dispar* (Goetghebuer, 1913); Langton & Pinder 2007: 139 fig. 72g). So far, *R. (s. str.) fuscipes* has been known from Europe, North Africa and West Asia (Ashe & O'Connor 2012: 570). On the other hand, *R. (s. str.) togapeniculus* is distributed in Japan: Fukushima, Tochigi and Nagano Prefectures, near Gunma Prefecture. Although we have not examined their voucher specimen, there is a high possibility that the species is *R. (s. str.) togapeniculus*.

The pupa of *R. (s. str.) togapeniculus* will key to that of *R. (s. str.) tamahumeralis* in Sæther (1986). Indeed, these pupae are very similar to each other. However, the tergal spinulation of abdomen generally is weaker than that of *R. (s. str.) tamahumeralis*, and is absent on tergite II. The pupa of *R. (s. str.) tamahumeralis* has anterolateral and posteromedial spinulation on tergite II.

The ventromental plate with 14–16 beard setae beneath and the antennal ratio of 1.3–1.4 does not allow the larva of *R. (s. str.) togapeniculus* to key beyond couplet 8 in Sæther (1986). It resembles that of *R. (s. str.) tamahumeralis* in the number of beard setae underneath the ventromental plate and the value of antennal ratio, but differs in the fused frontoclypeolabrum. In *R. (s. str.) tamahumeralis*, the larva has a frontoclypeus separated from the labral sclerite.

***Rheocricotopus (s. str.) tshernovskii* Makarchenko & Makarchenko, 2005**

Rheocricotopus (Rheocricotopus) tshernovskii Makarchenko & Makarchenko, 2005: 134.

Rheocricotopus (Rheocricotopus) tshernovskii – Ashe & O'Connor 2012: 573.

Type material

Holotype

RUSSIA – **Sakhalin Is.** • ♂; Nogliksky District, basin of Chamgu River (eastern seacoasts); 743 m ASL; 13 Jul. 2003; V. Teslenko and T. Tiunova leg.; FEBRAS.

The type specimen of *R. (s. str.) tshernovskii* was not examined.

Distribution

To date, the species is known only from the type locality, the Russian Far East.

Remarks

The species was described based on a male and a mature pupa from Sakhalin Island, the Russian Far East by Makarchenko & Makarchenko (2005: 134).

The male is remarkably similar to that of *R. (s. str.) reduncus* Sæther & Schnell, 1988 in the indistinct humeral pit, the wing with a reduced anal lobe, and the hypopygium with caudally projecting finger-like superior volsellae, but is separable from it by the wing with a moderately long costal extension, 76–80 µm (E. Makarchenko pers. comm. 2023), the superior volsella with a shorter finger-like projection (28–32 µm long), and the gonostylus curved and expanded at distal one third (Makarchenko & Makarchenko 2005: 133 fig. 22). In the latter, the costal extension is slight, 35–59 µm long, the superior volsella possesses a relatively long projection (59–67 µm long including the base), and the gonostylus is gently curved at the middle and gradually narrowed towards the apex (Sæther & Schnell 1988: 66–67 fig. 1d).

The pupa is also distinct from that of *R. (s. str.) reduncus* in the abdominal segment VII with three simple L-setae, the tergite II with 35–37 small spines along the posterior margin, and the anal lobe with 14–15 lateral taeniae. According to Sæther & Schnell (1988: 67–68), the latter has three taeniate LS-setae on segment VII, 120–170 spines along the posterior margin of tergite II, and 16–20 lateral taeniae on the anal lobe.

The female and the larva are unknown.

Species excluded from the genus Rheocricotopus Brundin, 1956

Paracladius akansextus Sasa & Kaminura, 1987

Paracladius akansextus Sasa & Kaminura, 1987: 31.

Rheocricotopus shofukusecundus Sasa, 1998: 30. **Syn. nov.**

Paracladius akansextus – Sæther *et al.* 2000: 153. — Ashe & O’Connor 2012: 451. — Yamamoto & Yamamoto 2014: 284

Rheocricotopus (s. str.) shofukusecundus – Ashe & O’Connor 2012: 572. — Yamamoto & Yamamoto 2014: 298. — Fu *et al.* 2016: 269, as *R. (s. str.) shofukusecundus* (misspelled).

Type material

Holotype of *Paracladius akansextus*

JAPAN – Hokkaido • ♂; Teshikaga, Lake Kussharo; 13 Jun. 1982; K. Kamimura leg.; NSMT, NSMT-I-Dip 4583 [101: 56B].

Holotype of *Rheocricotopus shofukusecundus*

JAPAN – Toyama • ♂; Kurobe, Ikuji; 13 Mar. 1997; M. Sasa leg.; NSMT, NSMT-I-Dip 5101 [No. 329: 28].

Remarks

In a re-examination of the holotype of *R. shofukusecundus* Sasa, 1998, we found the male has a small dorsomedial extension in the hairy eye; at least 13 small pale marks of acrostichal setae, and many weak dorsocentral setae on the scutum; no superior volsella; and a posteriorly hooked inferior volsellae. In addition, the leg is not armed with pulvilli, although the author (Sasa 1998: 30) in the original description wrote: “Tip of tarsi V with an empodium, ... and a very small, brush-like pulvilli.” Due to poor mounting, the thoracic humeral areas are damaged. Although the author wrote: “scutum with a pair of large pale humeral pits”, it is quite possible that humeral pits are absent. Therefore, this male belongs

to *Paracladius* Hirvenoja, 1973, not to *Rheocricotopus* Brundin, 1956. There is no significant difference between this species and *P. akansexus* Sasa & Kaminura, 1987.

Paracricotopus brachypus (Wang & Zheng, 1991) comb. nov.

Rheocricotopus brachypus Wang & Zheng, 1991: 101.

Rheocricotopus (Psilocricotopus) brachypus – Sæther *et al.* 2000: 160. — Liu *et al.* 2014a: 19. — Ashe & O'Connor 2012: 560.

Type material

Holotype

CHINA – Guangdong • ♂; Fengkai, Heishiding NNR; 23°24' N, 111°24' E; 12 Apr. 1985; X. Wang & L. Cheng leg.; NK, NK 05517.

Remarks

A re-examination of the holotype of *R. brachypus* Wang & Zheng, 1991 showed the male has two distinct transverse rows of setae on the tergites II–VII. The species is a member of *Paracricotopus* Brundin, 1956, rather than *Rheocricotopus* Brundin, 1956. Further, the number of setae on the tergite VIII is ca 20, and these are irregularly arranged. The feature resembles that of *P. irregularis* Niitsuma, 1990. However, the male is separable from that of *P. irregularis* by the somewhat higher antennal ratio (AR 0.43), and having more setae on the tergites III–V (the number 24, 25 and 29, respectively). These tergal setae are not arranged strictly in a straight line, but are somewhat arched near the middle. In *P. irregularis*, the male antennal ratio is 0.24–0.30, the number of setae is 20–23 on the tergite III, 19–23 on the tergite IV, and 17–25 on the tergite V, and these tergal setae are arranged strictly in two rows except lateral setae (Niitsuma 1990). A new combination of *P. brachypus* (Wang & Zheng, 1991) is proposed here.

Although Liu *et al.* (2014a: 19) wrote: “However, after examining the holotype, we find a medium, relatively shallow, ovoid humeral pit existing.”, we could not find any humeral pit in the holotype. In the original description, Wang & Zheng (1991: 101, fig 3c) drew six posteromedial setae on the anal tergite. However, these are not setae, but dust except one posterolateral seta.

Further, we re-examined the two voucher specimens (NK 13894 and 005) collected from Hubei Province and Xizang Autonomous Region by Liu *et al.* (2014a: 19) and believe they misidentified the males of *R. (P.) serratus* Liu, Lin & Wang, 2014 as those of *R. (P.) brachypus*. The latter is separable from that of *R. (P.) serratus* by low values of antennal ratio (AR 0.43) and LR_{1-3} (0.69, 0.47, and 0.56, respectively), absence of humeral pit (Wang & Zheng 1991: 101), as well as tergites II–VII each with two transverse rows of setae. In their voucher specimens, the antennal ratios are 0.67–0.93, and the LR_1 , LR_2 and LR_3 are 0.82–0.86, 0.61, 0.61–0.62 respectively. Additionally, these male specimens possess moderately large, oval humeral pits and irregularly arranged setae on the tergites II–VII.

Until now, *P. brachypus* was known only from the type locality, Heishiding NNR in Guangdong Province, Oriental China. The female and the immature are unknown.

Paracricotopus irregularis Niitsuma, 1990

Paracricotopus irregularis Niitsuma, 1990: 101.

Rheocricotopus tobatervicesimus Kikuchi & Sasa, 1990: 327. **Syn. nov.**

Paratrichocladius unabrevis Sasa, 1996b: 58. **Syn. nov.**

Rheocricotopus (Psilocricotopus) rotundus Liu, Lin & Wang, 2014a: 26. **Syn. nov.**

Rheocricotopus (Paracricotopus) tusimoeus Sasa & Suzuki, 1999: 82 – Yamamoto 2004: 102, as *Thalassosmittia*. — Ashe & O’Connor 2012: 616, as *Thalassosmittia*. — Yamamoto & Yamamoto 2014: 302, as *Thalassosmittia*. — Yamamoto *et al.* 2019: 63, as a junior synonym of *Paracricotopus irregularis*.

Paratrichocladius unabrevis – Sæther *et al.* 2000: 157. — Ashe & O’Connor 2012: 493. — Yamamoto & Yamamoto 2014: 289.

Paracricotopus irregularis – Sæther *et al.* 2000: 159. — Ashe & O’Connor 2012: 454. — Yamamoto & Yamamoto 2014: 284. — Yamamoto *et al.* 2019: 63.

Rheocricotopus (Psilocricotopus) tobatervicesimus – Ashe & O’Connor 2012: 567. — Fu *et al.* 2016: 265.

Type material

Holotype of *Rheocricotopus tobatervicesimus*

INDONESIA – North Sumatra • ♂; Lake Toba; 1 Jun. 1987; M. Kikuchi leg.; NSMT, NSMT-I-Dip 4784 [No. 200: 22].

Holotype of *Paracricotopus irregularis*

JAPAN – Shizuoka • ♂; Shimizu, Yanbara, 35°3’ N, 138°27’ E; 170 m a.s.l.; 23 Jun. 1985; H. Niitsuma leg.; NSMT.

Holotype of *Paratrichocladius unabrevis*

JAPAN – Toyama • ♂; Kurobe, Unazuki, shore of Kurobe River; 27 Jul. 1984; M. Sasa leg.; NSMT, NSMT-I-Dip 4983 [No. 279: 11];

Paratypes of *Paratrichocladius unabrevis*

JAPAN – Toyama • 2 ♂♂; same data as for holotype; NSMT, NSMT [No. 279: 12–13].

Paratype of *Rheocricotopus (P.) rotundus*

CHINA – Yunnan • ♂; Dali Bai, Eryuan, Niuji, Meici River; 26°25’ N, 99°98’ E; 25 May 1996; B.X. Wang leg.; NK, NK 09884.

Remarks

In the original description of *R. tobatervicesimus* Kikuchi & Sasa, 1990, the authors (Kikuchi & Sasa 1990: 327) wrote: “AR 0.45, ... pulvilli absent”, and moreover: “scutum with a pair of large humeral pits”. We re-examined the holotype and found that the adult male has a lower antennal ratio, well-developed pulvilli in all legs, and the humeral pit is indistinct. In the only antenna mounted on the slide, the first flagellomere is broken. Further, two transverse rows of setae are present on each of the abdominal tergites except the tergites I and VIII with irregularly arranged setae. Although the holotype is badly crushed during the mounting procedure, we confidently assign it to *Paracricotopus* Brundin. It is seemingly a junior synonym of *Paracricotopus irregularis* Niitsuma, 1990.

In the original description of *R. (P.) rotundus* Liu, Lin & Wang, 2014, the authors (Liu *et al.* 2014a: 26) wrote: “humeral pit moderately large, ovoid”. However, our re-examination of the paratype (NK 09884) revealed that the humeral pit is indistinct. In addition, the male has more or less distinct, two transverse rows of setae on the tergites II–VII and irregularly arranged setae on the tergite VIII. The male does not belong to *Rheocricotopus*, but to *Paracricotopus*. Thus, we conclude that *R. (P.) rotundus* is a junior synonym of *Paracricotopus irregularis* Niitsuma, 1990.

Although we have not examined the holotype of *Rheocricotopus* (*Paracricotopus*) *tusimoefeus* Sasa, 1999, the species was synonymized by Yamamoto *et al.* (2019: 63). The holotype (NSMT-I-Dip 51496) may be lost.

Incidentally, based on a re-examination of the type series, we note that *Paratrithocladus unabrevis* Sasa, 1996 is also a junior synonym of this species. The author wrote (Sasa 1996b: 58–59): “Anal point and virga absent, ninth tergite without long setae.” Although badly crushed, the holotype has an anal point, the apex of which is squashed by the coverslip. In the paratype of No. 279.12, a sharply pointed anal point with lateral setae is distinctly visible. All the males of the type series have setae arranged in two rows on the tergites II–VII, but irregularly on the tergites I and VIII.

Parorthocladus intermedius (Tokunaga, 1939) comb. nov.

Spaniotoma (*Trichocladus*) *intermedia* Tokunaga, 1939: 332.

Parorthocladus negoroi Yamamoto, 2011: 33. **Syn. nov.**

Orthocladus (*Euorthocladus*) *piloculatus* Kobayashi, 2012: 53. **Syn. nov.**

Rheocricotopus (*Rheocricotopus*) *intermedius* – Sasa & Kikuchi 1995: 58.

Orthocladus (*Euorthocladus*) *intermedius* – Sæther *et al.* 2000: 167.

Orthocladus (*Euorthocladus*) *piloculatus* – Ashe & O’Connor 2012: 421. — Yamamoto & Yamamoto 2014: 281.

Parorthocladus negoro – Ashe & O’Connor 2012: 496. — Yamamoto & Yamamoto 2014: 289.

Rheocricotopus (*Psilocricotopus*) *intermedius* – Ashe & O’Connor 2012: 565. — Yamamoto & Yamamoto 2014: 297.

Type material

Holotype of *Spaniotoma* (*Trichocladus*) *intermedia*

JAPAN – **Kyoto** • ♂ with P; Kibune; 25 Mar. 1936; M. Tokunaga leg.; KU [as alcoholic specimen, No.43-17].

Type specimens of *Spaniotoma* (*Trichocladus*) *intermedia*, *Parorthocladus negoroi* and *Orthocladus* (*Euorthocladus*) *piloculatus* were not examined.

Other material examined

JAPAN – **Tochigi** • 1 ♂; Nasushiobara, Hikinuma; 23 May 1985; H. Niitsuma leg.; PCHN.

CHINA – **Anhui** • 1 ♂; Lu’an, Qingshan; 31°26’ N, 115°56’ E; 180 m a.s.l.; 30 Apr. 2014; H.Q. Tang leg.; JNU. – **Fujian** • 1 ♂; Mt Wuyi NNR, Guadun; 27°44’ N, 117°38’ E; 1220 m a.s.l.; 13 Nov. 2012; H.Q. Tang leg.; JNU. – **Yunnan** • 1 ♂; Jinping, Ma’andi; 22°46’ N, 103°31’ E; 1350 m a.s.l.; 20 Apr. 2017; H.Q. Tang leg.; JNU 170514019.

Remarks

The description of *Spaniotoma* (*Trichocladus*) *intermedia* Tokunaga, 1939 is old and the name was treated as a nomen dubium by Ashe & Cranston (1990: 244). However, the description adequately satisfies morphological features of *Orthocladus* (*Euorthocladus*) *piloculatus* Kobayashi, 2012 and *Parorthocladus negoroi* Yamamoto, 2011. In the following male features, especially, the latter two species resemble *Spaniotoma* (*Trichocladus*) *intermedia*: antennal ratio relatively high ($AR \geq 0.8$); P_2 and P_3 with pseudospurs on ta_1 and ta_2 ; wing with R_{2+3} running close to R_1 and a very short costal extension; gonostylus slightly convex in outer margin, with a well-developed crista dorsalis. Although

there are no mentions of hairy eyes and legs without pulvilli in Yamamoto (2011), and of small humeral pits in Kobayashi (2012), these three species are conspecific.

Therefore, the male is characterized by the hairy eyes (as in *Parorthocladius tyurkini* Makarchenko & Makarchenko, 2015); the scutum without acrostichal setae; the legs with pseudospurs on mid and hind tarsomeres 1 and 2, and without pulvilli; the wing with R_{2+3} ending close to R_1 ; and the hypopygium with a virga and no plate- or finger-like superior volsella. A combination of male features such as this occurs in *Parorthocladius* Thienemann, 1935, rather than in *Orthocladius* v. d. Wulp, 1874 and *Rheocricotopus* Brundin, 1956. However, the male possesses small humeral pits consisting of several small holes as Tokunaga (1939: 332) wrote in the original description as “very minute humeral pits” and Yamamoto (2011: 33 fig. 2b) drew in the description of *Parorthocladius negoroi*, which perhaps is an unusual feature for *Parorthocladius*.

According to Tokunaga (1939: 332–333), the immature forms have the following features: in the pupa, frontal apotome with only paired tubercles but no setae, thorax without thoracic horns, tergites III–VIII each with spines along the caudal margin, and anal lobe without a lateral setal fringe and macrosetae; in the larva, labral seta S I bifid, antenna five-segmented, mandible with five teeth and a seta interna, mentum with a broad median tooth shallowly notched at the apex and six pairs of lateral teeth, procercus with six long anal setae, and posterior parapod with sixteen strongly curved claws. The combination of morphological features for the immature stages does not satisfy any taxon in modern systematics. Here, the species is tentatively assigned to *Parorthocladius* mainly based on adult morphology.

The type of *Spaniotoma intermedius* may be still extant in the Kyushu University Museum as an alcoholic specimen, but even so, its condition may be too poor to make necessary observations. The specimen labelled “NSMT-I-Dip 6791” as the holotype of *Ortho. (Eu.) piloculatus* does not belong to *Orthocladius* or *Parorthocladius*, and further it is labeled “*Pseudorthocladius tsurudai*, Holotype (with double crossed lines), Ozawa Green Park, 050423, MT”. Therefore, no types were examined.

Discussion

The humeral pit and the crista dorsalis are important characters in orthoclaadiine taxonomy, and have been treated as key characteristics even in assigning the species of *Rheocricotopus* to subgenera, namely, *Psilocricotopus* Sæther, 1986 and *Rheocricotopus* s. str. (Coffman *et al.* 1986: 204; Cranston *et al.* 1989: 234; Andersen *et al.* 2013: 254). However, there is intraspecific variation in the shape and size. In addition, the shape of crista dorsalis may look different depending on mounting orientation. The distinctness of humeral pit may vary depending on the method of clearing thoracic musculature. Indeed, species of the *orientalis* group, regarded as lacking humeral pits for a long while, actually have oval and large humeral pits when examined closely.

The male is very similar to that of *Paracricotopus* Brundin, 1956 in the hairy eyes, the well-developed pulvilli on the legs, the narrowly triangular anal point with microtrichia and lateral setae, and the gonocoxite with a plate-like superior volsella and a triangular inferior volsella, but distinct from it in the abdominal tergites with irregularly arranged setae. The latter has setae in two transverse rows on the tergites (Cranston *et al.* 1989: 219; Niitsuma 1990: 96).

The pupae of *Rheocricotopus (Psilocricotopus)* resemble those of the subgenera *Allopectrocladius* Wülker, 1956 and *Mesopsectrocladius* Laville, 1972 of the genus *Psectrocladius* Kieffer, 1906 in the frontal apotome without setae; the thoracic horn well developed, digitiform to club-shaped, usually covered with spinules; the abdominal tergites usually without median spine patches; the presence of sharply pointed, distinct posterior spines on the tergites VII–VIII; and the anal lobe with strong anal macrosetae or weak dorsal setae. However, the pupae differ from those of subgenera *Allopectrocladius*

and *Mesopsectrocladius* in the frontal apotome without warts and the anal lobe usually with less lateral taeniae, except *R. (P.) orientalis* having a pair of low anterior warts. The latter pupae have anteromedian warts on the frontal apotome, and a complete lateral fringe of taeniae on the anal lobe (Coffman *et al.* 1986: 199–200). The pupa of *R. (P.) togakuroasi* especially is similar to several pupae of *Psectrocladius* (*Allopsectrocladius*) in having several median spines on the tergites IV–VI, but separable from them by the frontal apotome without warts, the prefrons with frontal setae, and the anal lobe with several lateral taeniae on the posterior $\frac{1}{3}$ – $\frac{1}{2}$. The pupa of *Psectrocladius* (*Allopsectrocladius*) has anteromedian warts on the frontal apotome, no frontal seta, and many lateral taeniae on the almost full length of outer margin in the anal lobe (Coffman *et. al.* 1986: 199–200). Furthermore, some pupae of *Rheocricotopus* (s. str.) resemble those of subgenera *Monopsectrocladius* Wülker, 1956 and *Psectrocladius* of the genus *Psectrocladius*, and the genera *Doncricotopus* Sæther, 1981 and *Nanocladius* Kieffer, 1913 in having a single, rounded median patch of many spines or spinules on the tergites IV–VI and anal lobes with lateral taeniae and apical macrosetae, but differ from them in the frontal apotome without warts nor basal tubercles of frontal setae. The pupae of *Psectrocladius* have paired anteromedian warts on the frontal apotome, of *Doncricotopus* and *Nanocladius* have basal tubercles of frontal setae (Coffman *et. al.* 1986: 171, 187, 199).

The larva of *Rheocricotopus* is similar to those of some species of *Psectrocladius* (*Monopsectrocladius*) and *Psectrocladius* (s. str.) in the 5-segmented antennae with a ring organ near the base of first segment, the mentum with one or two median and five pairs of lateral teeth, the well-developed ventromental plate with a distinct beard beneath, the mandible with a branched seta interna and a seta subdentalis bearing an apical hook, and the procercus with a spur, but is separable from them by the bifid labral seta SI with two distinct branches except *R. (P.) glabricollis* (Meigen, 1830) having apically teathed SI (see Sæther 1986: 91 fig. 14b). The palmate SI, consisting of three to ten lobes occurs in *Psectrocladius* (*Monopsectrocladius*) and *Psectrocladius* (s. str.) (Cranston 1982: 122; Andersen *et al.* 2013: 250). In the identification manual for the larval Chironomidae of North and South Carolina, USA, however, Epler (2001: 7.123) wrote: “The SI is usually large and palmate in most *Psectrocladius* species, but differs from that in at least three taxa in the Southeast; most different is a *Ps. (Monopsectrocladius)* species commonly found in the Southeast in which the SI is trifid or occasionally bifid.” Still, the larva of *Psectrocladius* (*Monopsectrocladius*) is separable from those of *Rheocricotopus* by a single median tooth in the mentum, e.g., as in *R. (s. str.) tuberculatus* Caldwell, 1984 and *R. (s. str.) unidentatus* Sæther & Schnell, 1988. The larva of *Psectrocladius* (*Monopsectrocladius*) has a broad single median tooth with no lateral notch (Epler 2001: 7.124; Andersen *et. al.* 2013: 251), whereas in the larvae of *Rheocricotopus*, the median tooth possesses lateral notches (Caldwell 1984: 93 fig. 10; Sæther & Schnell 1988: 72 fig. 4d; Epler 2001: 7.135).

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References

- Albu P. 1968. Chironomide din Carpații românești (III). [Chironomids from the Romanian Carpathians (III)]. *Studii și Cercetări de Biologie, Série de Zoologie* 20 (5): 455–465. [In Romanian.]
- Andersen T., Sæther O.A., Cranston P.S. & Epler J.H. 2013. 9. The larvae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic Region – Keys and diagnoses. *In*: Andersen T., Cranston P.S. & Epler

- J.H. (eds) *The Larvae of Chironomidae (Diptera) of the Holarctic Region – Keys and Diagnoses. Insect Systematics and Evolution (Supplement) 66*: 189–386. Lund, Sweden.
- Ashe P. & Cranston P.S. 1990. Family Chironomidae. In: Soós Á. & Papp L. (eds) *Catalogue of Palaearctic Diptera. Vol. 2. Psychodidae – Chironomidae*: 113–499. Akadémiai Kiadó, Budapest.
- Ashe P. & O'Connor J.P. 2012. *A World Catalogue of Chironomidae (Diptera). Part 2A, B. Orthoclaadiinae*. Irish Biogeographical Society & National Museum of Ireland, Dublin.
- Beck Jr., W.M. & Beck E.C. 1964. New Chironomidae from Florida (Diptera). *Florida Entomologist* 47 (3): 201–207. <https://doi.org/10.2307/3493325>
- Bhattacharyay S., Ali A. & Chaudhuri P.K. 1991. Orthoclads of tribe Orthoclaadiini (Diptera: Chironomidae) from India. *Beiträge zur Entomologie* 41 (2): 333–349.
- Brundin L. 1956. Zur Systematik der Orthoclaadiinae (Dipt. Chironomidae). *Report from the Institute of Freshwater Research, Drottningholm* 37: 5–185.
- Caldwell B.A. 1984. Two new species and records of other chironomids from Georgia (Diptera: Chironomidae) with some observations on ecology. *Georgia Journal of Science* 42 (4): 81–96.
- Caspers N. & Reiss F. 1989. Die Chironomidae der Türkei. Teil I: Podonominae, Diamesinae, Prodiamesinae, Orthoclaadiinae. (Diptera, Nematocera, Chironomidae). *Entomofauna* 10 (8): 105–160.
- Chaudhuri P.K. & Sinharay D.C. 1983. A study on Orthoclaadiinae (Diptera, Chironomidae) of India. The genus *Rheocricotopus* Thienemann and Harnisch. *Entomologica Basiliensia* 8: 398–407.
- Coffman W.P., Cranston P.S., Oliver D.R. & Sæther O.A. 1986. 9. The pupae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Wiederholm T. (ed.) *Chironomidae of the Holarctic region – Keys and Diagnoses. Part 2. Pupae. Entomologica Scandinavica*, Supplement 28: 147–296. Lund, Sweden.
- Cranston P.S. 1982. A key to the larvae of the British Orthoclaadiinae (Chironomidae). *Freshwater Biological Association, Scientific Publications* 45: 1–152.
- Cranston P.S., Oliver D.R. & Sæther O.A. 1983. 9. The larvae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Wiederholm T. (ed.) *Chironomidae of the Holarctic Region. Part 1. Larvae. Entomologica Scandinavica*, Supplement 19: 149–291. Lund, Sweden.
- Cranston P.S., Oliver D.R. & Sæther O.A. 1989. 9. The adult males of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Wiederholm T. (ed.) *Chironomidae of the Holarctic region – Keys and Diagnoses. Part 3. Adult Males. Entomologica Scandinavica*, Supplement 34: 165–352. Lund, Sweden.
- Edwards F.W. 1929. British non-biting midges (Diptera, Chironomidae). *Transactions of the Entomological Society of London* 77: 279–430. <https://doi.org/10.1111/j.1365-2311.1929.tb00692.x>
- Epler J.H. 2001. *Identification Manual for the Larval Chironomidae (Diptera) of North and South Carolina. A Guide to the Taxonomy of the Midges of the Southeastern United States, Including Florida. Special Publication SJ2001-SP13*. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina, and St. Johns River Water Management District, Palatka, Florida.
- Fu Y., Huang J., Liu W., Fang X. & Wang X. 2016. Redescription of 13 holotypes of *Rheocricotopus* Brundin, 1956 (Diptera: Chironomidae) from the Sino-Indian Region. *Zootaxa* 4114 (3): 261–276. <https://doi.org/10.11646/zootaxa.4114.3.3>
- Goetghebuer M. 1932. Diptères. Chironomidae IV. (Orthoclaadiinae, Corynoneurinae, Clunioninae, Diamesinae). *Faune de France* 23: 1–204.

- Goetghebuer M. 1937. Ceratopogonidae et Chironomidae nouveaux ou peu connus d'Europe. (7^e note). *Bulletin et Annales de la Société entomologique de Belgique* 77 (6): 273–280.
- Goetghebuer M. 1939. Études biospéologiques. XVI (1). Deux Chironomidae (Diptera) de Roumanie. *Bulletin du Musée royal d'Histoire naturelle de Belgique* 15 (56): 1–2.
- Goetghebuer M. & Dorier A. 1932. Les métamorphoses d'*Orthocladius* (*Dactylocladius*) *dorieri* Goetghebuer. *Travaux du Laboratoire d'Hydrobiologie et de Pisciculture de l'Université de Grenoble* 23: 61–65.
- Gouin F. 1936. Métamorphoses de quelques Chironomides d'Alsace et de Lorraine avec la description de trois espèces nouvelles par M. Goetghebuer. *Revue française d'Entomologie* 3: 151–173.
- Hazra N., Som D.K. & Chaudhuri P.K. 1998. Immatures of *Rheocricotopus* (*Psilocricotopus*) *valgus* Chaudhuri & Sinharay of Darjeeling Himalaya with notes on ecology (Diptera: Chironomidae). *Annales de Limnologie* 34 (1): 75–82. <https://doi.org/10.1051/limn/1998008>
- Hazra N., Niitsuma H. & Chaudhuri P.K. 2016. *Checklist of Chironomid Midges (Diptera: Chironomidae) of the Oriental Region. Occasional Paper No. 376*. Zoological Survey of India, Kolkata.
- Hirabayashi K., Iwakum T. & Yamamoto M. 1998. Chironomid fauna and its diversity of Oze Area. In: The Oze Scientific Research Group (ed.) *Scientific Researches of the Oze Area in Central Japan*: 803–810. Japan Society for the Promotion of Science, Tokyo. [In Japanese.]
- Johannsen O.A. 1932. Orthoclaadiinae of the Malayan Subregion of the Dutch East Indies. *Archiv für Hydrobiologie Supplement* 9: 715–732.
- Kieffer, J.J. 1909. Diagnoses de nouveaux Chironomides d'Allemagne. *Bulletin de la Société d'Histoire naturelle de Metz* 26: 37–56. <https://doi.org/10.5962/bhl.part.13505>
- Kieffer J.J. 1921. Neue Chironomiden aus Mitteleuropa. *Archiv für Hydrobiologie Supplement* 2 (4): 785–808.
- Kikuchi M. & Sasa M. 1990. Studies on the chironomid midges (Diptera, Chironomidae) of the Lake Toba area, Sumatra, Indonesia. *Japanese Journal of Sanitary Zoology* 41 (4): 291–329. <https://doi.org/10.7601/mez.41.291>
- Kikuchi M. & Sasa M. 1994. Part 5. The chironomid species collected from fountain waters in Akagi and Kannami. In: *Some Characteristics of Water Quality and Aquatic Organism in the Chief Lakes in Toyama Prefecture (Lake Arimine, Kamiichigawa Reservoir)*, 1994: 112–124. Toyama Prefecture Environmental Research Center, Kosugi, Japan.
- Kobayashi T. 2012. A new distinctive species of the genus *Orthocladius* with hairy eyes from Japan (Diptera: Chironomidae). *Zootaxa* 3230: 52–58. <https://doi.org/10.11646/zootaxa.3230.1.2>
- Kobayashi T. & Endo K. 2008. Synonymic notes on some species of Chironomidae (Diptera) described by Dr. M. Sasa. *Zootaxa* 1712: 49–64. <https://doi.org/10.11646/zootaxa.1712.1.3>
- Langton P.H. 1991. *A Key to Pupal Exuviae of West Palaearctic Chironomidae*. Private publication.
- Langton P.H. & Pinder L.C.V. 2007. Keys to the adult male Chironomidae of Britain and Ireland. Volume 1. Introductory text, keys, references, checklist and index. Volume 2. Illustrations of the hypopygia and a supplement identifying sixteen species recently recorded from Britain and Ireland. *Freshwater Biological Association Scientific Publication* 64: 1–239 & 1–168.
- Langton P.H. & Visser H. 2003. *Chironomidae Exuviae – a Key to Pupal Exuviae of the West Palaearctic Region*. *World Biodiversity Database*. Expert Center for Taxonomic Information, Amsterdam. [CD-ROM Series.]

- Lehmann J. 1969. Die europäischen Arten der Gattung *Rheocricotopus* Thien. und Harn. und drei neue Artvertreter dieser Gattung aus der Orientalis (Diptera, Chironomidae). *Archiv für Hydrobiologie* 66 (3): 348–381.
- Lin X., Yu H., Wang Q., Bu W. & Wang X. 2020. DNA barcodes and morphology confirm a new species of *Rheocricotopus* (*Psilocricotopus*) *orientalis* group (Diptera: Chironomidae). *Zootaxa* 4768 (2): 282–290. <https://doi.org/10.11646/zootaxa.4768.2.9>
- Liu W., Lin X. & Wang X. 2014a. A review of *Rheocricotopus* (*Psilocricotopus*) *chalybeatus* species group from China, with the description of three new species (Diptera, Chironomidae). *ZooKeys* 388: 17–34. <https://doi.org/10.3897/zookeys.388.6316>
- Liu W., Song C. & Wang X. 2014b. Review of the subgenus *Rheocricotopus* (s. str.) Brundin, 1956 from China (Diptera, Chironomidae). *Pan-Pacific Entomologist* 90: 100–106. <https://doi.org/10.3956/2014-90.2.100>
- Makarchenko E.A. & Makarchenko M.A. 2005. Chironomids of the genus *Rheocricotopus* Thienemann et Harnisch, 1932 (Diptera, Chironomidae, Orthocladiinae) of the Russian Far East. *Euroasian Entomological Journal* 4 (2): 125–136. [In Russian.]
- Makarchenko E.A. & Makarchenko M.A. 2009. New findings of chironomids (Diptera, Chironomidae) in Far East and bordering territories. IV. Subfamily Orthocladiinae. *Euroasian Entomological Journal* 8 (1): 117–124.
- Makarchenko E.A. & Makarchenko M.A. 2015. A review of the genus *Parorthocladus* Thienemann, 1935 (Diptera: Chironomidae: Orthocladiinae) from the Russian Far East. *Zootaxa* 3974 (3): 413–423. <https://doi.org/10.11646/zootaxa.3974.3.8>
- Malloch J.R. 1915. The Chironomidae, or midges, of Illinois, with particular reference to the species occurring in the Illinois River. *Bulletin of the Illinois State Laboratory of Natural History* 10: 275–543. <https://doi.org/10.21900/j.inhs.v10.376>
- Moubayed-Breil J. & Ashe P. 2019. *Rheocricotopus* (s. str.) *costai* sp. n. and *R.* (s. str.) *pyrenaicus* sp. n., two relict species from glacial rheocrenes and streams in Corsica and the Eastern Pyrenees (Diptera: Chironomidae, Orthocladiinae). *Trakya University Journal of Nature Science* 20 (1): 35–46. <https://doi.org/10.23902/trkjnat.493928>
- Namayandeh A. & Beresford D.V. 2018. A new species in the *Rheocricotopus* (*R.*) *effusus* group from Canada with a review of the Nearctic species of *Rheocricotopus* and *Parametricnemus* (Chironomidae: Orthocladiinae). *Chironomus, Journal of Chironomidae Research* 31: 16–29. <https://doi.org/10.5324/cjcr.v0i31.2531>
- Namayandeh A. & Ghaderi E. 2025. A review of *Paracricotopus* (Brundin, 1947), with the description of two new species and redescription of the adult males of *Paracricotopus niger* (Kieffer, 1913) and *Paracricotopus uliginosus* (Brundin, 1947) sensu Sæther (1980) (Chironomidae: Diptera). *Zootaxa* 5569 (1): 138–158. <https://doi.org/10.11646/zootaxa.5569.1.5>
- Namayandeh A., Guerra S., Islam N., James T., Hudson P.L., Ghaderi E., Yusuf T., Vasquez A.A. & Ram J.L. 2024. New species and a fascinating diversity of Chironomidae (Diptera, Insecta) in and around an overlooked urban vernal pool. *ZooKeys* 1208: 133–163. <https://doi.org/10.3897/zookeys.1208.124495>
- Niitsuma H. 1990. *Paracricotopus* (Diptera, Chironomidae) from Japan, with description of a new species. *Japanese Journal of Entomology* 58 (1): 95–107.
- Ree H.I. 2013. Two new and three newly recorded species of Chironomidae (Diptera) from Korea. *Animal Systematics, Evolution and Diversity* 29 (3): 217–226. <https://doi.org/10.5635/ASED.2013.29.3.217>

- Sæther O.A. 1969. Some Nearctic Podonominae, Diamesinae, and Orthocladiinae (Diptera: Chironomidae). *Bulletin of the Fisheries Research Board of Canada* 170: 1–154.
- Sæther O.A. 1971. Notes on general morphology and terminology of the Chironomidae (Diptera). *Canadian Entomologist* 103: 1237–1260. <https://doi.org/10.4039/Ent1031237-9>
- Sæther O.A. 1977. Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. *Bulletin of the Fisheries Research Board of Canada* 197: 1–209.
- Sæther O.A. 1980. Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica scandinavica* Supplement 14: 1–51.
- Sæther O.A. 1986. A review of the genus *Rheocricotopus* Thieneman & Harnisch, 1932, with the description of three new species (Diptera, Chironomidae). In: Fittkau E.J. (ed.) *Beiträge zur Systematik der Chironomidae, Diptera. Spixiana* Supplement 11: 59–108.
- Sæther O.A. & Schnell Ø.A. 1988. Two new species of the *Rheocricotopus* (*R.*) *effusus* group (Diptera, Chironomidae). In: Fittkau E.J. (ed.) *Festschrift zu Ehren von Lars Brundin. Spixiana* Supplement 14: 65–74.
- Sæther O.A., Ashe P. & Murray D.A. 2000. A6. Family Chironomidae. In: Papp L. & Darvas B. (eds) *Contributions to a Manual of Palearctic Diptera (with Special Reference to Flies of Economic Importance). Appendix*: 113–334. Science Herald, Budapest.
- Sasa M. 1981. Studies on chironomid midges of the Tama River. Part 4. Chironomidae recorded at a winter survey. *Research Report from the National Institute for Environmental Studies* 29: 79–148.
- Sasa M. 1989. 3. Studies on the chironomid midges (Diptera, Chironomidae) of Shou River. In: *Some Characteristics of Nature Conservation within the Chief Rivers in Toyama Prefecture (the Upper Reach of Shou River), 1989*: 26–110. Toyama Prefecture Environment Pollution Research Center, Kosugi, Japan.
- Sasa M. 1990. Studies on the chironomid midges (Diptera, Chironomidae) of the Nansei Islands, southern Japan. *Japanese Journal of Experimental Medicine* 60 (3): 111–165.
- Sasa M. 1991. Annex. Studies on the chironomids of some rivers and lakes in Japan. Part 2. Studies on the chironomids of the Lake Towada area, Aomori. In: *Some Characteristics of Nature Conservation within the Chief Rivers in Toyama Prefecture (The Upper Reach of Jyoganji River, Hayatsuki River and Katakai River), 1991*: 68–81. Toyama Prefectural Environment Pollution Research Center, Kosugi, Japan.
- Sasa M. 1994. Part 1. Additional information on the Chironomidae of Japan, 1994. In: *Some Characteristics of Water Quality and Aquatic Organism in the Chief Lakes in Toyama Prefecture (Lake Arimine, Kamiichigawa Reservoir)*: 28–67. Toyama Prefecture Environmental Research Center, Kosugi, Japan.
- Sasa M. 1996a. A. Studies on the chironomids collected at the side of Kuroyon Lake and on the highlands of Mount Tate area, Toyama. In: *Some Characteristics of Water Quality and Aquatic Organism in the Chief Lakes in Toyama Prefecture, 1996*: 16–47. Toyama Prefectural Environment Science Research Center, Kosugi, Japan.
- Sasa M. 1996b. C. Studies on the chironomid species collected on the shore of Kurobe River at Unazuki, Toyama. In: *Some Characteristics of Water Quality and Aquatic Organism in the Chief Lakes in Toyama Prefecture (Lake Kurobe), 1996*: 57–60. Toyama Prefectural Environment Science Research Center, Kosugi, Japan.

- Sasa M. 1998. Part 1. Studies on the chironomids collected throughout the year in the Shofuku Garden, near the mouth of Kurobe River, Toyama. *Bulletin of Toyama Prefectural Environmental Science Research Center* 25 (3): 14–69.
- Sasa M. & Hasegawa H. 1988. Additional records of the chironomid midges from the Ryukyu Islands, southern Japan (Diptera, Chironomidae). *Japanese Journal of Sanitary Zoology* 39 (3): 229–256. <https://doi.org/10.7601/mez.39.229>
- Sasa M. & Hirabayashi K. 1993. Studies on the additional chironomids (Diptera, Chironomidae) collected at Kamikochi and Asama-Onsen, Nagano, Japan. *Japanese Journal of Sanitary Zoology* 44 (4): 361–393. <https://doi.org/10.7601/mez.44.361>
- Sasa M. & Kaminura K. 1987. Part II. Chironomid midges collected on the shore of lakes in the Akan National Park, Hokkaido (Diptera, Chironomidae). In: Yasuno M., Sugaya Y., Sasa M. and Kamimura K. (eds) *Studies on the Chironomid Midges of Lakes in the Akan National Park, Hokkaido. Research Report from the National Institute for Environmental Studies* 104: 9–61.
- Sasa M. & Kawai K. 1987a. Studies on chironomid midges of the stream Itachigawa, Toyama. *Bulletin of the Toyama Science Museum* 10: 25–72.
- Sasa M. & Kawai K. 1987b. Studies on chironomid midges of Lake Biwa (Diptera, Chironomidae). *Lake Biwa Study Monographs* 3: 1–119.
- Sasa M. & Kikuchi M. 1995. *Chironomidae (Diptera) of Japan*. University of Tokyo Press, Tokyo.
- Sasa M. & Okazawa T. 1992. Studies on the chironomid midges (Yusurika) of Toga-Mura, Toyama. Part 2. The subfamily Orthocladiinae. In: *Some Characteristics of Nature Conservation within the Chief Rivers in Toyama Prefecture (the Upper Reach of Kurobe River), 1992*: 92–204. Toyama Prefectural Environment Pollution Research Center, Kosugi, Japan.
- Sasa M. & Suzuki H. 1993. Part 9. Additional records of Chironomidae from Amami Island. In: *Some Characteristics of Water Quality and Aquatic Organism in the Chief Lakes in Toyama Prefecture (Lake Nawagaike), 1993*: 110–124. Toyama Prefecture Environment Pollution Research Center, Kosugi, Japan.
- Sasa M. & Suzuki H. 1995. The chironomid species collected on the Tokara Islands, Kagoshima (Diptera). *Japanese Journal of Sanitary Zoology* 46 (3): 255–288. <https://doi.org/10.7601/mez.46.255>
- Sasa M. & Suzuki H. 1999. Studies on the chironomid midges of Tsushima and Iki Islands, western Japan. Part 2. Species of Orthocladiinae and Tanypodinae collected on Tsushima. *Tropical Medicine* 41 (2): 75–132.
- Sasa M. & Suzuki H. 2000a. Studies on the chironomid species collected on Ishigaki and Iriomote Islands, southwestern Japan. *Tropical Medicine* 42 (1): 1–37.
- Sasa M. & Suzuki H. 2000b. Studies on the chironomid midges collected on Yakushima Island, southwestern Japan. *Tropical Medicine* 42 (2): 53–134.
- Sasa M. & Suzuki H. 2001a. Studies on the chironomid collected on Goto Islands, western Japan. *Tropical Medicine* 42 (3/4): 141–174.
- Sasa M. & Suzuki H. 2001b. Studies on the chironomid species collected at five localities in Hokkaido in September, 1998 (Diptera, Chironomidae). *Tropical Medicine* 42 (3/4): 175–199.
- Sasa M. & Suzuki H. 2001c. Studies on the chironomid species collected in Hokkaido in September, 2000. *Tropical Medicine* 43 (1/2): 1–38.
- Sasa M. & Tanaka N. 1998. Notes on the chironomid species collected in Gunma Prefecture in 1996–1997. *Annual Report of Gunma Prefecture Institute of Public Health and Environmental Sciences* 30: 37–46.

- Sasa M. & Tanaka N. 2000. Description of new species of Chironomidae collected with light traps at the side of Tone River, Gunma Prefecture. *Annual Report of Gunma Prefecture Institute of Public Health and Environmental Sciences* 32: 38–48.
- Sasa M. & Tanaka N. 2001. Studies on the chironomid midges collected with light traps during the summer season by the bridges of the Tone River, Gunma Prefecture. *Annual Report of Gunma Prefecture Institute of Public Health and Environmental Sciences* 33: 41–73.
- Sasa M., Kawai K. & Ueno R. 1988. 3. Studies on the chironomid midges of the Oyabe River, Toyama, Japan. In: *Some Characteristics of Nature Conservation within the Chief Rivers in Toyama Prefecture (The Upper Reach of Oyabe River)*, 1988: 26–85. Toyama Prefecture Environment Pollution Research Center, Kosugi, Japan.
- Sasa M., Kitami K. & Suzuki H. 2001. *Additional Studies on the Chironomid Midges Collected on the Shore of Lake Inawashiro (2001)*. The Hideyo Noguchi Memorial Foundation, Inawashiro, Japan.
- Tang H. & Niitsuma H. 2017. Review of the Japanese *Microtendipes* (Diptera: Chironomidae: Chironominae), with description of a new species. *Zootaxa* 4320 (3): 535–553.
<https://doi.org/10.11646/zootaxa.4320.3.8>
- Thienemann A. & Harnisch O. 1932. Chironomiden-Metamorphosen. IV. Die Gattung *Cricotopus* v. d. Wulp. *Zoologischer Anzeiger* 99 (5/6): 135–143.
- Tokunaga M. 1938. Chironomidae from Japan (Diptera), X. New of little-known midges, with descriptions of the metamorphoses of several species. *Philippine Journal of Science* 65 (4): 313–383.
- Tokunaga M. 1939. Chironomidae from Japan (Diptera), XI. New or little-known midges, with special reference to the metamorphoses of torrential species. *Philippine Journal of Science* 69 (3): 297–345.
- Walker F. 1856. *Insecta Britannica. Diptera. Vol. III*. Lovell Reeve Publishing Company, London.
- Wang X. 1995. *Rheocricotopus* (*R.*) *orientalis*, a new species from China (Diptera: Chironomidae). *Aquatic Insects* 17 (1): 37–40. <https://doi.org/10.1080/01650429509361567>
- Wang X. & Sæther O.A. 2001. Two new species of the *orientalis* group of *Rheocricotopus* (*Psilocricotopus*) from China (Diptera: Chironomidae). *Hydrobiologia* 444: 237–240.
<https://doi.org/10.1023/A:1017548204492>
- Wang X. & Zheng L. 1989. Two new species of the genus *Rheocricotopus* from China. *Entomotaxonomia* 11 (4): 311–313. [In Chinese.]
- Wang X & Zheng L. 1991. Notes on the genus *Rheocricotopus* from China (Diptera: Chironomidae). *Acta Zootaxonomica Sinica* 16 (1): 99–105. [In Chinese.]
- Wang X., Yan C. & Maa C. 2004. A new *Rheocricotopus* Thienemann & Harnischia (Diptera: Chironomidae) from Taiwan Province, China. *Entomologia Sinica* 11 (3): 239–242.
<https://doi.org/10.1111/j.1744-7917.2004.tb00244.x>
- Yamamoto M. 2004. A catalog of Japanese Orthocladiinae (Diptera: Chironomidae). *Makunagi/Acta Dipterologica* 21: 1–121.
- Yamamoto M. 2011. A new species of *Parorthocladius* Thienemann (Diptera: Chironomidae) from Toyama Prefecture, Honshu, Japan, with distributional data of some chironomid species. *Bulletin of the Toyama Science Museum* 34: 31–36.
- Yamamoto M. & Yamamoto N. 2014. Family Chironomidae. In: The Editorial Committee of Catalogue of the Insect of Japan (ed.) *Catalogue of the Insects of Japan, Vol. 8. Diptera (Part 1. Nematocera – Brachycera Aschiza)*: 237–362. Touka Shobo, Fukuoka, Japan. [In Japanese.]

Yamamoto M. & Yamamoto N. 2017. A new species of the genus *Rheocricotopus* Brundin from Japan (Diptera: Chironomidae: Orthoclaadiinae). *Japanese Journal of Systematic Entomology* 23 (1): 75–79.

Yamamoto M., Yamamoto N. & Kimura M. 2015. Taxonomic notes on Chironomidae (Diptera) from Okinawa Island, Japan, with the description of three new species. *European Journal of Environmental Science* 5 (1): 101–115. <https://doi.org/10.14712/23361964.2015.83>

Yamamoto N., Suzuki M. & Yamamoto M. 2019. Taxonomic notes on several Japanese chironomids (Diptera) described by Dr. M. Sasa and his coauthors. *Japanese Journal of Systematic Entomology* 25 (1): 63–72.

Yan C. & Wang X. 2004. A new species of the *orientalis* group of *Rheocricotopus* from China (Diptera, Chironomidae). *Acta Zootaxonomica Sinica* 29 (3): 560–562.

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