

## Description of a New Species of the Genus *Setalunula* Chao & Yang (Diptera, Tachinidae) from Japan

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**Abstract** A new species of the genus *Setalunula* Chao & Yang (Tachinidae, Exoristinae, Eryciini), *S. japonica* sp. nov., is described from Japan. This is the second species of the genus. *Setalunula blepharipoides* Chao & Yang, the type species of the genus, is redescribed and new distribution data are added. Diagnostic features of the genus are briefly discussed.

**Key words:** Insecta, Diptera, Tachinidae, *Setalunula*, new species, Japan.

### Introduction

The monotypic genus *Setalunula* was erected by Chao and Yang (1990) for a new tachinid species from China, *S. blepharipoides* Chao & Yang. This large (13–15 mm in body length) tachinid is characterized by a setose lunula and wide parafacial. At a glance it resembles the genus *Blepharipa* Rondani (in the tribe Goniini) that is common in East Asia, but it differs in having two or three frontal setae and an ovolarviparous reproductive habit (i.e. females lay large and fully incubated eggs in contrast to females of the microovolarviparous *Blepharipa*, which lay minute eggs no more than 0.2 mm in length). This genus appears to belong to the tribe Eryciini, as first suggested by Chao and Yang (1990). We discovered a second species of *Setalunula*, this one from Japan, collected from the Imperial Palace (central Tokyo) and Odamiyama (Shikoku). We describe this new species below.

*Setalunula blepharipoides* Chao & Yang was originally recorded from southern and southwestern China (Chao and Yang, 1990). We add northern Thailand and Nepal to the distribution of this species. It is commonly written that there is a close faunal relationship between western Japan and northern fringe of the Oriental Region rang-

ing from southeastern slope of the Himalayas through northern Thailand to southwestern China. The finding of this Japanese species appears to represent an example of this faunal relationship.

It is interesting that this new species was found in only a very restricted area of central Tokyo and Shikoku and that this large tachinid had not been collected before in Japan despite efforts to collect Japanese tachinids over many years.

### Materials and Methods

Material has been studied from the following collections:

- BLKU Biosystematics Laboratory, Graduate School of Social & Cultural Studies, Kyushu University, Fukuoka, Japan
- CNC Canadian National Insect Collection, Agriculture and Agri-Food Canada, Ottawa, Canada
- CMU Department of Biology, Chiangmai University, Chiangmai, Thailand
- IZCAS Institute of Zoology, Chinese Academy of Sciences, Beijing, China
- KIZ Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming, China
- NSMT National Museum of Nature and Sci-

ence, Tokyo

SEHU Systematic Entomology, Hokkaido University, Sapporo, Japan

Terminology used in descriptions follows McAlpine (1981). In the male terminalia the terms pregonite and postgonite are adopted following Sinclair (2000) instead of the gonopod and paramere of McAlpine (1981). Measurements were made in a similar manner to Shima (1996). Adults were examined with a Leica MZ12 stereoscopic microscope and first instar larvae were examined with a Nikon Optiphot microscope. Images of specimens and structure were taken with a Canon EOS Kiss XII digital camera. Eighteen to 20 images were taken of a specimen or a structure at different focal planes, then blended in Combine ZM software. Images of first instar larvae were taken with a Nikon Coolpix P5100 digital camera attached to a Nikon Optiphot microscope.

### Description

#### *Setalunula* Chao & Yang, 1990

*Setalunula* Chao and Yang, 1990: 77. Type species: *Setalunula blepharipoides* Chao & Yang, 1990 (by original designation).

*Male and female.* Large eryciine flies (13–15 mm body length); frons wide, vertex about 1/3 of head width or more; parafacial wide, more than 1.5 times as wide as 1st flagellomere at middle height; gena slightly narrower than profrons; face flattened, without carina, lower margin not produced forward; occiput flat; lunula with 1 pair of rather strong and 1–2 pairs of fine setulae; inner vertical seta strong; outer vertical seta absent in male, at most weakly developed in female; ocellar seta present; 2–3 reclinate orbital setae; 2 proclinate orbital setae in female, absent in male; fronto-orbital plate with dense hairs; parafacial bare; facial ridge with fine setae on at most lower 1/3; vibrissa nearly level with lower margin of face; occiput with 2–3 rows of fine short black hairs; antenna falling short of lower margin of face; 1st flagellomere 3–5 times as long as pedicel; arista bare, basal 2 aristomeres

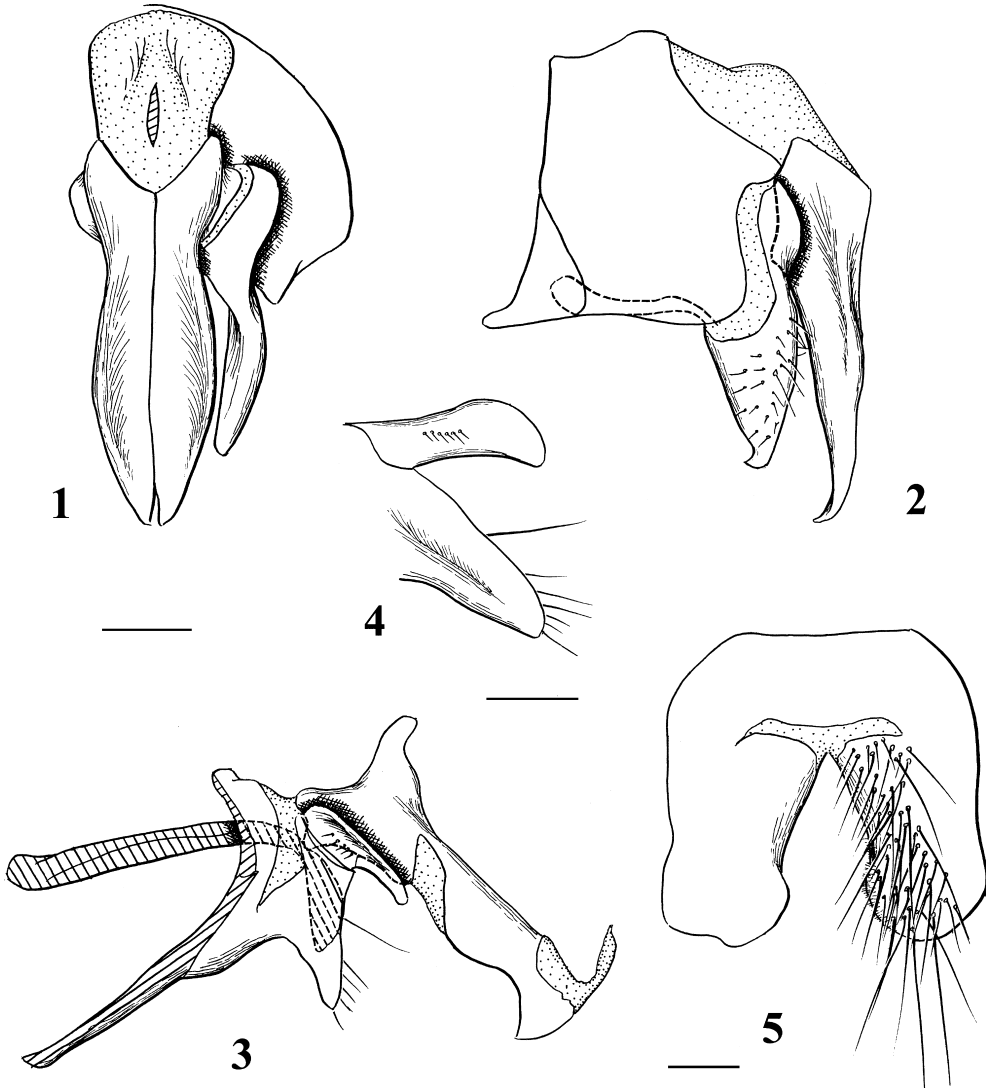
very short, 3rd aristomere thickened on at most basal 2/5; prementum short, about 1/4 as long as eye height; labella large; palpus well clavate; eye bare. Prosternum with several fine hairs on each side; proepisternum bare, proepisternal seta strong; 3–4 postpronotal setae, 3 basal setae set nearly in a straight line; 3 pre- and 3 postsutural acrostichal setae; 3 pre- and 4 postsutural dorsocentral setae; 1 pre- and 3 postsutural intra-alar setae; 2 notopleural setae; 3 postsutural supra-alar setae, anterior seta stronger than 1st postsutural intra-alar seta; 2–4 katepisternal setae; anepimeral seta strong, almost reaching to posterior margin of upper calypter; katepimeron bare; 2–3 pairs of discal scutellar setae; 3 marginal scutellar setae, namely basal, subapical and apical setae, apical setae strong and crossed horizontally, one fine seta present between basal and subapical setae and between subapical and basal setae. Wing with costa bare below beyond subcosta; basal node of vein M with 2–3 fine setulae; bend of vein M nearly right-angled or obtuse-angled, closer to wing margin than to dm-cu crossvein. Hind coxa bare on posterodorsal margin; hind tibi without preapical posterodorsal seta. Abdomen with syntergum 1+2 excavated to posterior margin; discal setae absent on 3rd and 4th terga; abdomen of male without sexually modified hairing.

*Male terminalia.* 5th sternum with V-shaped cleft, with dense long hairs on posterior lobe; 6th tergum entire, constricted on anterior margin; 6th sternum asymmetrical, separated from syntergosternum 7+8 on left side and articulated with the latter on right side; syntergosternum 7+8 short, at most slightly longer than 6th tergum; cerci narrow and long, weakly excavated on dorsal surface, apical portion narrowly separated; surstylus shorter than cerci, apex curved ventrally and pointed; pregonite long triangular in shape, with hairs on dorsal margin; postgonite rounded apically, with fine or strong hairs on outer surface; epiphallus narrow and rather long; distiphallus nearly long rectangular in lateral view, dorsodistal portion membranous, distal margin with minute spinules.

Female terminalia. Elongate, nearly 1/2 as long as abdomen; 6th tergum longitudinally divided into 2 hemitergites; 6th and 7th spiracles on ventral margin of 6th tergum; 6th sternum narrowed posteriorly, rounded at apex, nearly as long as 5th sternum; 7th tergum divided into 2 hemitergites; 7th sternum narrowed posteriorly, apex rounded; 8th tergum of small hemitergites, without hair; 8th sternum small, broadly excavat-

ed on anterior portion, without hair; epiproct well developed, without hair.

*Remarks.* *Setalunula* species are ovularviparous and apparently belong to the tribe Eryciini of the subfamily Exoristinae. Among members of Eryciini, however, it is not easy to place any of them close to *Setalunula* in morphological features. *Setalunula* is unique in having setulose lunula, but is not very peculiar in other features



Figs. 1-5. Male terminalia of *Setalunula japonica* sp. nov. 1, Epandrium, cerci and surstylus in dorsal view, hairs omitted; 2, same in lateral view, hairs on epandrium and cerci omitted; 3, hypandrium, pre- and postgonite and aedeagus in lateral view; 4, pregonite and postgonite in lateral view; 5, 5th sternum in ventral view, hairs on right side omitted. Scales, 0.2 mm for 1-3, 0.1 mm for 4, 0.15 mm for 5.

among members of this tribe. This genus rather resembles *Blepharipa* or *Euhygia* in general appearance, but they are members of the micro-ovolarviparous Goniini.

The male terminalia of *Setalunula* are characteristic in having short fine or long strong setulae on the median portion of the outer surface of the postgonite (Figs. 4, 8). This feature is not usually found in Exoristinae, and only some species of *Paratryphera* (tribe Ethillini of Exoristinae) have strong peg-like setulae on the basal and median portion of the outer surface of the postgonite (e.g., Tschorsnig, 1985). The female terminalia are not much different from generalized form of ovolarviparous Eryciini, though the epiproct appears to be larger than in the others.

***Setalunula japonica* sp. nov.**

(Figs. 1–7, 13–14, 16–17)

*Setalunula* sp.: Yamamoto, 2000: 979.

*Setalunula* sp.: Shima, 2006: 283.

*Body length.* 13.5–14.2 mm.

*Male.* Head black in ground color, pale brownish on lower parafacial and gena below eye, velvety brown on frontal vitta and dark brownish on lunula; fronto-orbital plate, parafacial, face, gena, postorbit and occiput with dense whitish pruinosity, fronto-orbital plate appearing grayish with direction of light; antenna black; palpus reddish yellow. Vertex about 1/3 of head width; frontal vitta weakly widened anteriorly, subequal in width to fronto-orbital plate at middle; parafacial wide, about 2.5 times as wide as 1st flagellomere at middle height; gena about 1/4 of eye height, genal dilation occupying lower 1/2 of gena. Inner vertical seta about 2/5 as long as eye height; ocellar seta rather fine, slightly more than 1/2 length of inner vertical seta; 2 subequally long reclinate orbital setae, about as long as ocellar seta, posterior seta shifted outside; 11–13 frontal setae, lowest seta nearly level with base of arista; a row of strong hairs and 2–3 rows of fine short hairs outside row of frontal setae, not descending below lowest frontal seta; parafacial

bare; facial ridge with several strong hairs on lower 1/4; gena with dense fine short hairs on genal dilation; postocular setae short and dense. Antenna falling short of lower margin of face by about 1/2 length of 1st flagellomere; pedicel with a long seta about 1.5 times as long as its own length; 1st flagellomere about 3.5 times as long as wide, 3 times as long as pedicel. Palpus subequal in length to 1st flagellomere.

Thorax black in ground color, scutellum weakly reddish brown on apical portion, with rather dense grayish white pruinosity, the pruinosity somewhat bluish gray-white on dorsum; dorsum with 5 narrow longitudinal vittae, median vitta absent on presutural area and diffusing marginally on postsutural scutum. Katepisternum with 2–3 setae, if 3, then lower seta very fine; scutellum with 3 discal setae; basal scutellar seta about 1.5 times as long as scutellum and slightly longer than subapical seta, the latter slightly longer than apical seta; distance between bases of two subapical scutellar setae about twice that between basal and subapical setae of corresponding side.

Wing hyaline, very slightly tinged with pale brown on anterior portion; costa between veins  $R_1$  and  $R_{2+3}$  slightly more than 3/4 length of that between  $R_{2+3}$  and  $R_{4+5}$ ; bend of vein M obtuse-angled, about 1.5 times closer to wing margin than to dm-cu crossvein; last section of vein CuA1 about 1/2 as long as dm-cu crossvein, the latter sinuate.

Legs black, pulvilli brownish. Fore tibia with 2 posterior setae; mid tibia with 1 anterodorsal, 2 posterodorsal and 1 ventral setae; hind tibia with a closely set row of anterodorsal setae, middle seta stronger than others, and 3–4 ventral setae. Claws and pulvilli longer than 5th tarsomere.

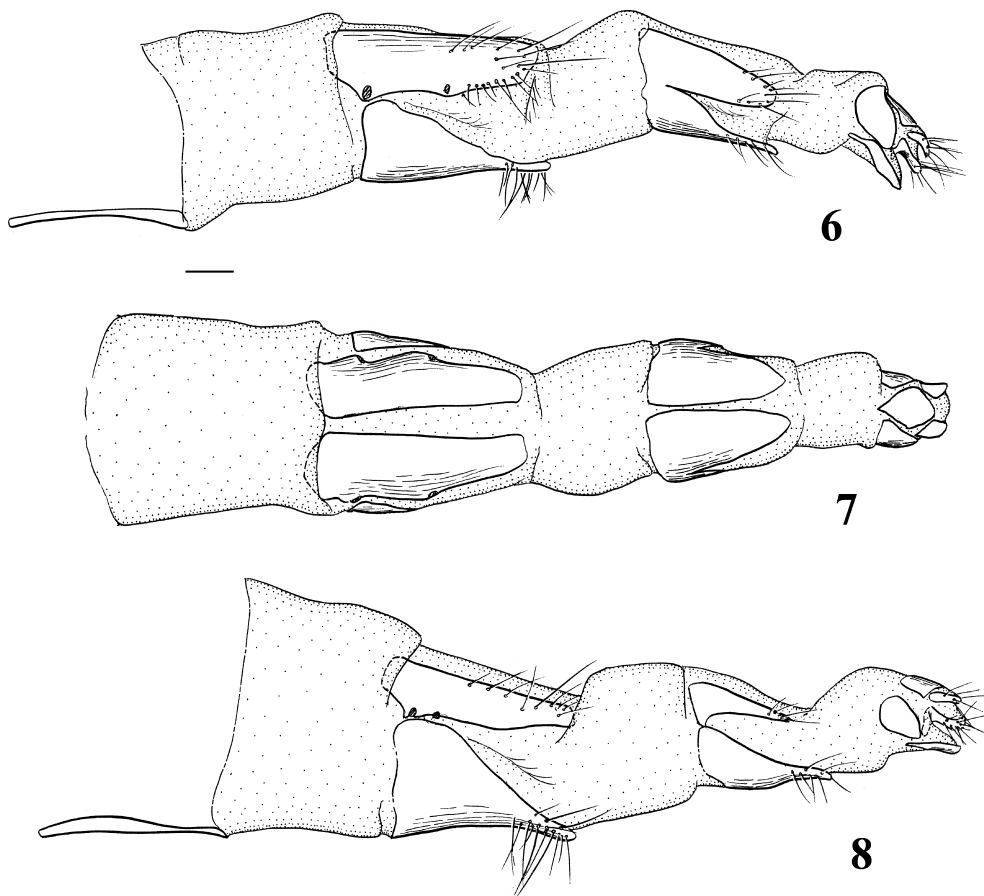
Abdomen black in ground color, dorsum with rather dense whitish pruinosity on anterior 1/2 of 3rd tergum and 1/4 of 4th, the pruinosity diffusing posteriorly on 3rd tergum, black on posterior 3/4 of 4th tergum and entire 5th, mid-dorsal longitudinal vitta weakly developed; venter with thin whitish pruinosity on anterior 1/2 of 3rd and 2/3 of 4th terga. Hairs on abdominal dorsum dense short fine and recumbent; syntergum 1+2 and

3rd tergum with 1 lateral marginal seta, without median marginal and discal setae; 4th tergum with a row of short marginal setae; 5th tergum with rows of short discal and marginal setae mixed with strong bristle-like hairs; venter with dense short fine recumbent hairs.

**Terminalia.** 5th sternum quadrate, with deep V-shaped posteromedian cleft; cerci in dorsal view weakly constricted on basal 1/3, widened to median portion and narrowed to apex, in lateral view nearly straight and weakly curved at apex; surstylus in lateral view long triangular in shape, apical portion curved ventrally, with rather dense hairs; pregonite long triangular in shape, with a row of hairs on dorsal margin; postgonite with a row of minute hairs on median portion of outer

surface; epiphallus rather broad at base and narrow on apical 2/3.

**Female.** Differing from male as follows: Vertex about 3/8 of head width; frontal vitta slightly narrower than fronto-orbital plate at middle; parafacial about 2 times as wide as 1st flagellomere at middle height; gena about 2/9 of eye height; inner vertical seta about 1/2 as long as eye height; outer vertical seta about 2/5 as long as inner seta; ocellar seta fine, slightly longer than outer vertical seta; 2–3 subequally long reclinate orbital setae, about 1/2 as long as inner vertical seta; 2 strong proclinate orbital setae, subequal in length to inner vertical seta; antenna falling short of lower margin of face by about length of pedicel; 1st flagellomere about 2.5



Figs. 6–8. Female terminalia. 6, *Setahunula japonica* sp. nov., lateral view; 7, same, dorsal view; 8, *S. blepharipoides* Chao & Yang, lateral view. Scale, 0.3 mm.

times as long as wide, about 3.5 times as long as pedicel; palpus darkened on basal 1/2, more strongly clavate; 3–4 katepisternal setae; claws and pulvilli short, distinctly shorter than 5th tarsomere; 3rd abdominal tergum with whitish pruinosity on anterior 2/3; syntergum 1+2 and 3rd tergum each with 2 short median marginal setae. Terminalia: 6th tergum divided into two long quadrate hemitergites, with rather fine hairs on posterior 1/2; 6th sternum narrowed posteriorly, with fine hairs on posterior 1/3, posterior margin rounded; 7th spiracle on mid-ventral portion of 6th tergum; 7th tergum divided into long-triangular hemitergites, fused with 7th sternum on anteroventral portion, with several hairs on posterior 1/3; 7th sternum narrowed posteriorly, anteroventral portion narrowly incised, posterior margin rounded, with fine hairs on posterior 1/3; epiproct rather large, sagittate in form.

*First instar larva.* Thoracic segments and 1st to 8th abdominal segments each bearing 6–8 rows of minute spinules on anterior margin, several strong spinules mixed on anteroventral margin of thoracic segments and 1st and 2nd abdominal segments, the spinules sparse on mid lateral portion of each segment and on 8th abdominal segment; cephalopharyngeal skeleton evenly narrowed anteriorly and shaply pointed at anterior apex, lateral plate well developed.

*Holotype.* Male, Imperial Palace, Tokyo, 24.x.2005, S. Shinonaga (NSMT).

*Paratypes.* 1 female, same locality as holotype, 17.vii.2001, S. Shinonaga (BLKU); 1 female, Oda-cho, Ehime, 25.viii.1996, E. Yamamoto (BLKU).

*Etymology.* The specific name is taken from the country of origin of this species.

*Distribution.* Japan (Honshu, Shikoku).

*Remarks.* This species closely resembles *S. blepharipoides*, but differs from it in its shorter antenna and narrower gena. The male terminalia differ from those of *S. blepharipoides* in having shorter and wider cerci and only short fine hairs on the postgonite.

### *Setalunula blepharipoides* Chao & Yang

(Figs. 8–12, 15, 18–19)

*Setalunula blepharipoides* Chao and Yang, 1990: 78.

This species was described in detail by Chao and Yang (1990). Added here are some measurements, features and the structure of the terminalia.

*Male.* Vertex about 1/3 of head width, or slightly more; gena about 2/9 of eye height; parafacial about 2 times as wide as 1st flagellomere at middle height; gena about 2/7 of eye height; 2–3 reclinate orbital setae; ocellar seta finer than, but usually as long as, reclinate orbital seta; 1st flagellomere about 4 times as long as wide and 3–3.2 times as long as pedicel; palpus subequal in length to 1st flagellomere. Katepisternum usually with 2 setae, rarely 3, anterior seta shorter; scutellum with 2 pairs of discal setae; basal scutellar seta subequal in length to subapical seta and about 1.5 times as long as scutellum; apical scutellar seta only slightly shorter than subapical seta. Bend of vein M nearly right-angled, or weakly rounded. Abdominal syntergum 1+2 with 2 fine median marginal setae; 3rd tergum with 2 rather strong median marginal setae. Terminalia: Cerci in dorsal view weakly constricted on basal 1/3, median longitudinal portion shallowly excavated on posterior 1/2, in lateral view nearly straight, weakly curved ventrally on apical portion; surstylus in lateral view narrowed posteriorly, apex curved and pointed; pregonite triangular in form, with 4–5 strong marginal hairs; postgonite with 2–3 long and strong hairs on outer median portion; epiphallus narrow and long, weakly inclined posteriorly; distiphallus long quadrate in shape in lateral view, with minute spinules on distal margin, dorsodistal portion membranous.

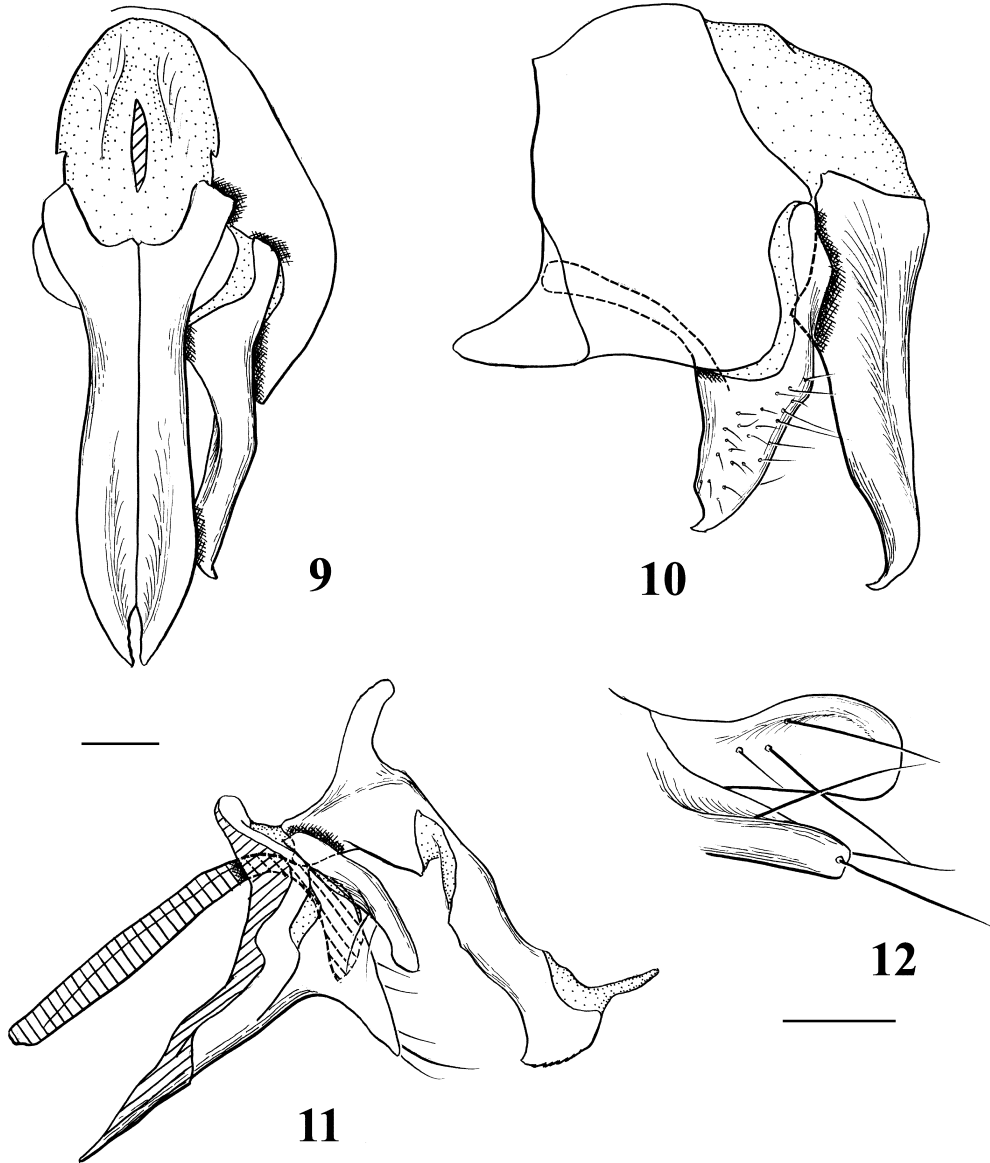
*Female.* Gena narrower than in male, about 1/4 of eye height; outer vertical seta absent as in male; ocellar seta very fine or absent; 2 strong proclinate orbital setae; 1st flagellomere about 4 times as long as pedicel; palpus more strongly clavate than in male, as long as 1st flagellomere.



Katepisternum with 2–3 setae. Median marginal setae on abdominal syntergum 1+2 and 3rd tergum stronger than in male. Terminalia: 6th tergum divided into two narrow long quadrate hemitergites, with a row of short hairs on upper margin; 7th tergum narrow and long triangular in shape, not fused with 7th sternum.

*First instar larva.* Almost same as in *S. japonica*: Anterior portion of cephalopharyngeal skeleton slightly shorter and broader than in *S. japonica*.

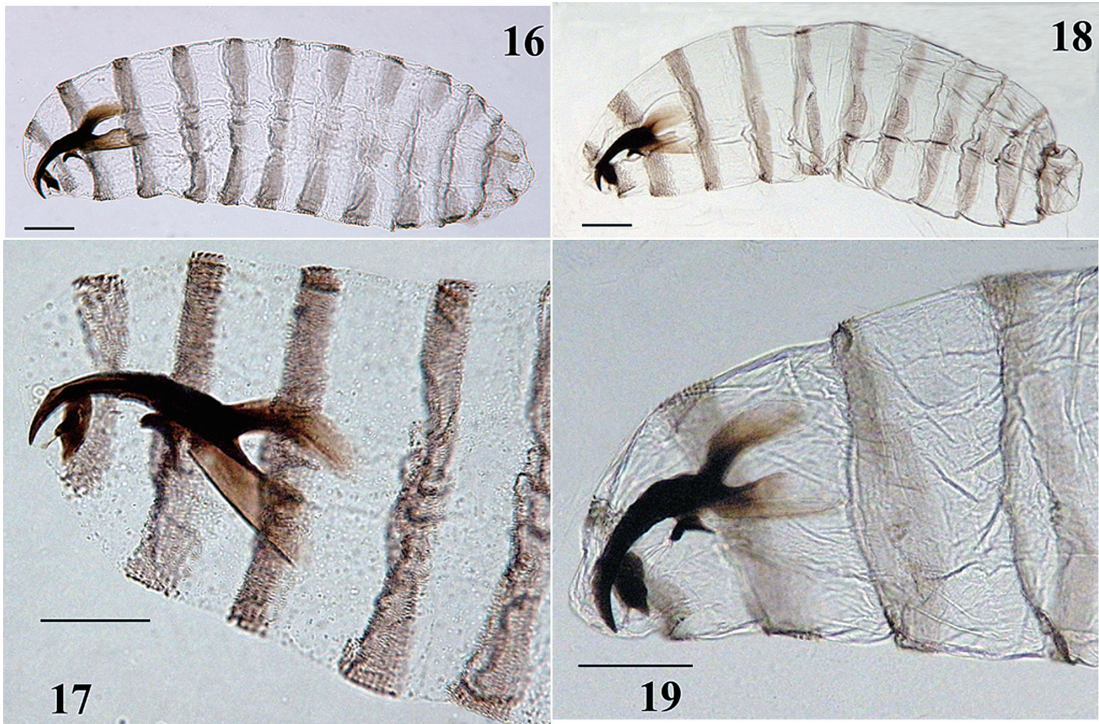
*Type material examined.* Holotype male of *Setalunula blepharipoides*, Longsheng, Guangxi, 740 m., 26.vi.1963, Y. Shi (IZCAS).



Figs. 9–12. Male terminalia of *Setalunula blepharipoides* Chao & Yang. 9, Epandrium, cerci and surstylus in dorsal view, hairs omitted; 10, same in lateral view, hairs on epandrium and cerci omitted; 11, hypandrium, preand postgonite and aedeagus in lateral view; 12, pregonite and postgonite in lateral view. Scales, 0.2 mm for 9–11, 0.1 mm for 12.







Figs. 16–19. First instar larvae. 16–17, *Setalunula japonica* sp. nov.; 18–19, *S. blepharipoides* Chao & Yang. Scale, 0.1 mm.

*Additional material examined.* CHINA: 2 males 1 female, Nanping, 1500 m., Simao, Yunnan, 31.viii.1990, H. Shima (BLKU); 1 male 1 female, Dazhai, Simao, Yunnan, 31.viii.1990, X. Lin (KIZ); NEPAL: 1 male 1 female, Godavari, 5000 ft., Kathmandu, 23.vii.1967, Can. Nepal Exp. '67 (CNC); 1 male, Kuinibisona, Nepal, 6.vii.1968, T. Kumata (SEHU); 1 female, Kahre,

29.vii.1990, K. Kanmiya (BLKU); THAILAND: 1 male, Chiangmai University Campus, Chiangmai, 2.viii.1974 (CMU).

*Distribution.* China (Guangxi, Jiangxi, Yunnan), Nepal, Thailand. Newly recorded from Nepal and Thailand.

**Key to Species**

- 1. Antenna with 1st flagellomere about 4 times as long as pedicel in both sexes; gena wide, about 2/7 as wide as eye height in male, 1/4 in female; wing vein M nearly right-angled at bend . . . . . *S. blepharipoides* Chao & Yang
- 1st flagellomere about 3 times as long as pedicel in male, 3.5 times in female; gena narrower, about 1/4 as wide as eye height in male, 2/9 in female; bend of vein M obtuse-angled . . . . . *S. japonica* sp. nov.

Figs. 13–15. 13, Habitus of *Setalunula japonica* sp. nov. in lateral view; 14, head in profile of *S. japonica* sp. nov.; 15, head in profile of *S. blepharipoides* Chao & Yang.

### Acknowledgements

We are grateful to Dr S. Shinonaga, Tokyo Medical and Dental University, and Mr E. Yamamoto, Ehime Prefecture, for giving us opportunities to examine interesting material. We also thank the late Dr C.-m. Chao, Institute of Zoology, Chinese Academy of Science, Beijing, Dr P. Lecsawadi, Chiangmai University, Chiangmai, Dr X.-z. Liang, Kunmin Institute of Zoology, Kunming, Dr J. E. O'Hara, Agriculture and Agri-Food Canada, Ottawa, and Dr M. Suwa, Hokkaido University, Sapporo, for their help with material. Dr J. E. O'Hara, Invertebrate Biodiversity, Agriculture and Agri-Food Canada, Ottawa, kindly reviewed early draft of this paper. We thank very much for his help.

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