

# *Blepharicera* Macquart (Diptera: Blephariceridae), new record from Xizang, China with description of one new species

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**Abstract:** The genus *Blepharicera* Macquart, 1843 is recorded from Xizang, China for the first time with the species *B. xizangica* sp. nov. which is described and illustrated as new to science. This new species is distinguished from congeners mainly by body color and male genitalia. A key to Chinese *Blepharicera* species is presented.

**Key words:** net-winged midge; Blepharicerinae; taxonomy; key

中国西藏新纪录属——网蚊属 *Blepharicera* 暨一新种记述（双翅目：网蚊科）

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**摘要:** 记述我国西藏网蚊科 1 新纪录属——网蚊属 *Blepharicera* 及其 1 新种: 西藏网蚊 *B. xizangica* sp. nov.。新种主要通过体色和雄性腹部末端特征与其近缘物种区分。本文还提供了网蚊属中国种类的分种检索表。

**关键词:** 网蚊; 网蚊亚科; 分类; 检索表

## Introduction

Family Blephariceridae (net-winged midge) is a small dipteran family with approximately 320 described species in 28 genera (Jacobson *et al.* 2011). Seven genera occur in China: *Agathon* von Röder, 1890, *Apistomyia* Bigot, 1862, *Bibiocephala* Osten Sacken, 1874, *Blepharicera* Macquart, 1843, *Horaia* Tonnoir, 1930, *Neohapalothrix* Kitakami, 1938 and *Philorus* Kellogg, 1903 (Kang & Yang 2012, 2014, 2015; Kitakami 1931, 1950; Mannheims 1938). *Blepharicera* is the genus with the most species and the widest distribution in China. Until now, eight species of *Blepharicera* were known to occur in seven provinces in China (Kang & Yang 2014).

Xizang is one of the regions with the highest biodiversity in China. However, no *Blepharicera* species had been recorded in Xizang before. In this paper, the genus *Blepharicera* Macquart, 1843 is now recorded from Xizang, China for the first time. One new

species, *B. xizangica* **sp. nov.**, is described and illustrated, increasing the number of Chinese *Blepharicera* species to nine. A key to Chinese *Blepharicera* species is also presented.

## Material and methods

Specimens for this study were collected from Chayu, Xizang, China in 2014 and deposited in the Entomological Museum of China Agricultural University, Beijing, China (CAU). Adults were collected by insect net and stored in 75% ethanol in the field. Photographs were captured by a Canon EOS 90D digital camera. Genitalia were prepared by boiling the apical portion of the abdomen in lactic acid for 0.5 hours. Specimens were examined and illustrations prepared by using a ZEISS Stemi 2000-C stereomicroscope. After examination, the removed abdomen was transferred to fresh glycerine and stored in a microvial pinned under the specimen.

Structural terminology is based primarily on McAlpine (1981) and Courtney (2000). The following abbreviations are used in figures: cerc – cercus; d pa – dorsal paramere; ep – epandrium; gf – genital fork; gl – gonocoxal lobe; gs – gonostylus; gx – gonocoxite; hyd – hypandrium; hyp v – hypogynial valve; st 8 – eight sternite.

## Taxonomy

### *Blepharicera* Macquart, 1843

*Blepharicera* Macquart, 1843: 61. Type species: *Blepharicera limbipennis* Macquart, 1843 (by original designation).

*Asthenia* Westwood, 1842: 94. Type species: *Asthenia fasciata* Westwood, 1842 (monotypy).

*Blepharocera* Loew, 1858: 107 (unjustified emendation).

*Parablepharocera* Kitakami, 1931: 97. Type species: *Blepharicera shirakii* Alexander, 1922 (by original designation).

Head. Dichoptic in male and subholoptic in female. Compound eyes in male often with small, hemispherical dorsal division and narrow callis oculi; compound eyes in female typically with enlarged, flattened dorsal division and wide callis oculi; ommatidia in dorsal division larger in diameter than in ventral division. Antennae with 13 flagellomeres.

Thorax. Legs slender, mid coxa of female with setose median outgrowth; femora slightly expanded distally; mid tibial spurs usually absent, hind tibial spurs often present; claws nonsetate dorsally. Wing venation as follows: Vein R with 3 branches; veins R<sub>4</sub> and R<sub>5</sub> separate for entire length; cross vein r-m present and cross vein bm-cu absent; vein M<sub>2</sub> detached.

Abdomen. 10-segmented, segment 8 reduced, especially tergite 8. Male terminalia: epandrium simple, subquadrate; cercus prominent, often bilobate; gonocoxite subrectangular, typically fused with hypandrium ventrolaterally; gonostylus lobed or bilobate; gonocoxal lobe typically simple, glabrous, extending from inner base of gonocoxite. Female terminalia: sternite 8 typically bilobate; genital fork X-shaped or Y-shaped, sclerotized; hypogynial valve broad basally, narrowed slightly to base of apical valves; spermathecae usually three in number.

### Check list of Chinese species

- Blepharicera asiatica* (Brodsky, 1930) (Yunnan, Guangxi); also Afghanistan; India; Pakistan; Russia; Sri Lanka  
*Blepharicera dimorphops* Alexander, 1953 (Fujian)  
*Blepharicera hainana* Kang & Yang, 2014 (Hainan)  
*Blepharicera hebeiensis* Kang & Yang, 2014 (Hebei, Shanxi)  
*Blepharicera macropyga* Zwick, 1990 (Hainan)  
*Blepharicera taiwanica* Kitakami, 1937 (Taiwan)  
*Blepharicera uenoi* Kitakami, 1937 (Taiwan)  
*Blepharicera xizangica* **sp. nov.** (Xizang)  
*Blepharicera yamasakii* Kitakami, 1950 (Heilongjiang)

### Key to Chinese *Blepharicera* species

(Excepting *B. uenoi* Kitakami which was published based on larvae)

1. Dorsal division of eyes large in male, at least 1/2 the size of ventral division ..... 2
- Dorsal division of eyes small in male, at most 1/10 the size of ventral division (Fig. 2A) ..... 4
2. Ultimate flagellomere shorter than penultimate flagellomere in male (Fig. 2A); Rs 1.5 times as long as r-m; gonostylus bilobate, ventral lobe membranous and glabrous ..... *B. taiwanica*
- Ultimate flagellomere longer than penultimate flagellomere in male; Rs as long as r-m (Fig. 1C), or slightly longer than r-m; gonostylus not bilobate (Figs 2B, 2C), or if bilobate, ventral lobe with two braches ..... 3
3. Wing transparent without colour, Rs slightly curved medially, a little longer than r-m; epandrium rectangular, posterior margin concave; 10th tergite bilobate, each lobe conical; hypandrium triangular in dorsal view, forming an elliptic sclerite in lateral view ..... *B. macropyga*
- Wing light brown, Rs straight, as long as r-m; epandrium semicircular, posterior margin rounded; 10th tergite transverse, bilobate, each lobe elliptical; hypandrium trapezoidal in dorsal view, not forming an elliptic sclerite in lateral view ..... *B. hainana*
4. Rs as long as r-m (Fig. 1C) ..... 5
- Rs at least 1.2 times as long as r-m ..... 6
5. First sternum dark brown, 2nd to 7th sterna dark brown; apex of dorsal paramere with pointed and downcurved projection in side view ..... *B. asiatica*
- First sternum pale, 2nd to 7th sterna pale with dark brown stripes laterally; apex of dorsal paramere flat in side view ..... *B. xizangica* **sp. nov.**
6. Mid coxae bearing a conical process in male, which is about half as long as trochanter and with dense with black stiff bristles towards tip ..... *B. yamasakii*
- Mid coxae not bearing a process like above ..... 7
7. Posterior margin of epandrium not distinctly concave medially; cercal lobes semicircular; gonostylus bilobate and strongly notched apically ..... *B. dimorphops*
- Posterior margin of epandrium concave medially, V-shaped; cercal lobes conical; gonostylus not bilobate and slightly notched apically ..... *B. hebeiensis*

### *Blepharicera xizangica* **sp. nov.** (Figs 1–3)

Description. Male. Body length 3.00–4.00 mm, wing length 4.50–5.00 mm, wing width 1.50–2.00 mm.

Head (Fig. 2A) uniformly dark brown with dark brown hairs. Compound eyes dichoptic, interocular ridge absent; compound eye divided, callis oculi absent; dorsal division

contiguous with ventral, 1/20 as large as ventral division; dorsal division with 7–8 rows of ommatidia, ommatidia brownish yellow, larger in diameter, with pubescence; ventral division black with pubescence. Ocellar brown. Scape and pedicel elliptic, brown with brown hairs; first flagellomere cylindrical, basal 1/2 brownish yellow, apical 1/2 brown, with brown hairs; other flagellomeres cylindrical, brown with brown hairs; ultimate flagellomere 0.8 times length of penultimate flagellomere. Clypeus rectangular, brown, twice as long as the width; labrum brown; labellum brown with brownish black hairs; mandibles absent; proboscis about 0.56 times length of head width. Palpus with five segments, 1st segment short; 2nd and 3rd segments cylindrical, brownish yellow with dark brown hairs; 4th segment cylindrical, swollen apically, brownish yellow with dark brown hairs; 5th segment slender, brownish yellow with dark brown hairs; relative length of distal four segments as 1.0 : 1.8 : 2.3 : 4.9.

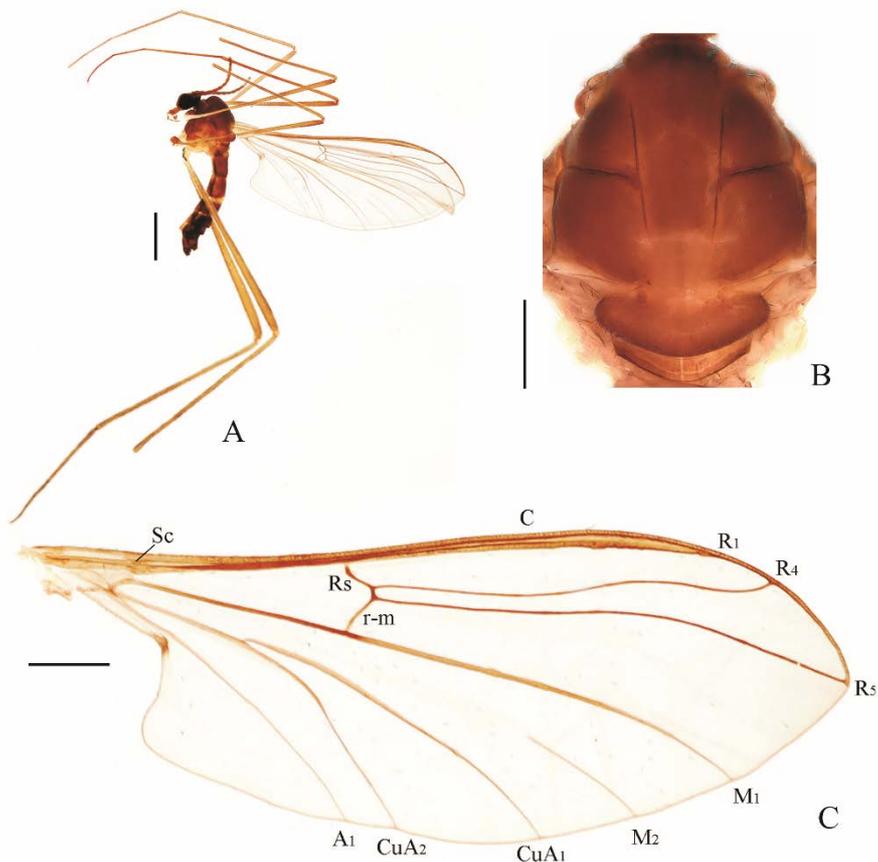


Figure 1. *Blepharicera xizangica* **sp. nov.** A. Habitus of male, lateral view; B. Thorax, dorsal view; C. Wing. Scale bars = 1.0 mm (Fig. A); 0.25 mm (Fig. B); 0.50 mm (Fig. C).

Thorax (Fig. 1B). Pronotum and propleuron brown without hairs. Mesonotum brown with middle area of posterior margin brownish yellow; scutellum brown with numerous hairs grouped at posterolateral corner; metanotum brown; episternum brown; epimeron light brown. Relative length of femur, tibiae and 1st to 5th tarsomeres in fore leg as 20 : 16.3 : 10 : 4.2 :

2.3 : 1 : 1, in mid leg as 23 : 19 : 11.6 : 4.6 : 2.4 : 1 : 1, in hind leg as 25.8 : 23.7 : 9.2 : 2.7 : 1.7 : 1 : 1. Fore coxa light brown with brow hairs; mid and hind coxae pale with brown hairs; trochanters pale, anterior margin with black spot apically, with brown hairs; fore and mid femora pale basally and gradually darken to brown apically, with brownish black hairs; hind femur pale basally and gradually darkens to brownish yellow apically, with brown hairs; fore and mid tibiae brown with brown hairs; hind tibia brownish yellow with brown hairs; fore and mid tarsomeres brown with brown hairs; hind tarsomere brownish yellow with brown hairs; claw brown. Tibial spurs 0–0–0. Wing (Fig. 1C) hyaline, slightly brown, apical 1/3 of sc brown; veins brown. Sc rudimentary, not ending at base of Rs; Rs slightly curved basally, as long as r-m; R<sub>4</sub> wavy, the length from end of R<sub>1</sub> to end of R<sub>4</sub> shorter than length from end of R<sub>4</sub> to end of R<sub>5</sub>; r-m straight, including angle between r-m and Rs less than 90 degrees; the length from end of M<sub>1</sub> to end of M<sub>2</sub> as long as the length from end of M<sub>2</sub> to end of CuA<sub>1</sub>. Base of halter pale, apex of halter brown with brown hairs.

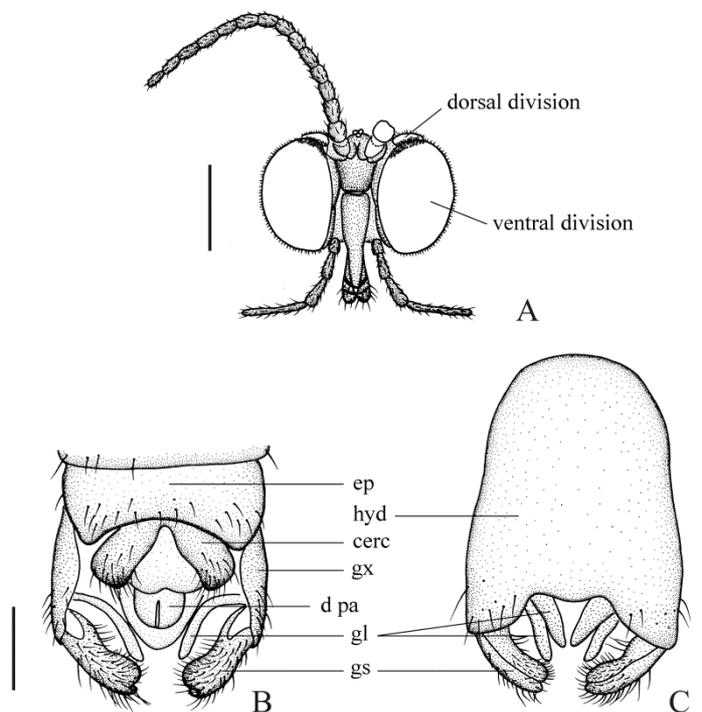


Figure 2. *Blepharicera xizangica* sp. nov. A. Male head, frontal view; B. Male genitalia, dorsal view; C. Male genitalia, ventral view. Scale bars = 0.25 mm (Fig. A); 0.10 mm (Figs B, C).

Abdomen. First tergum brown with middle area pale, 2nd tergum brown, 3rd to 5th terga brown with basal 1/4 brownish yellow, 6th to 8th terga brown; 1st sternum pale, 2nd to 7th sterna pale with dark brown stripes laterally; abdomen with brown hairs. Male genitalia (Figs 2B, 2C) brown. Epandrium rectangular, posterior margin concave medially, with several brown hairs; 10th tergite bilobate, each lobe (= cercus) conical, lateral margin bulging, medial margin sinuous, posterior margin rounded medially, with several brown hairs; anal cone round,

posterior margin concave medially; gonostylus swollen and slightly notched, with uniform hairs; gonocoxal lobe bifurcated, outer gonocoxal lobe transparent, slender, bar-like, inner gonocoxal lobe fusiform, transparent; hypandrium rectangular, 1.3 times as long as wide, slightly narrow basally, posterior margin concave, with several brown hairs; tip of dorsal paramere with a long and slender concavity, flat in side view.

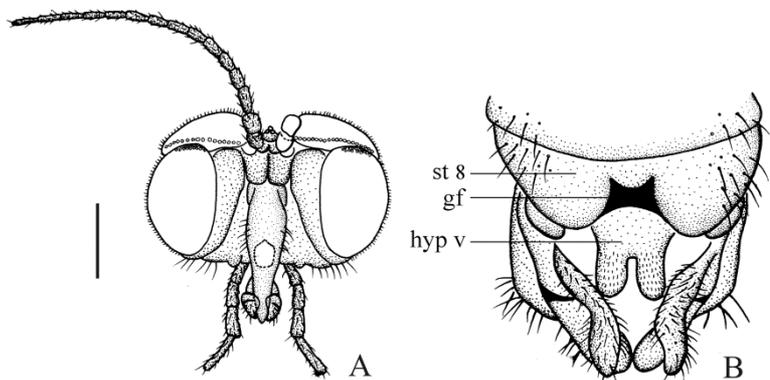


Figure 3. *Blepharicera xizangica* sp. nov. A. Female head, frontal view; B. Female terminal, ventral view. Scale bars = 0.25 mm (Fig. A); 0.10 mm (Fig. B).

Female. Body length 4.75–5.25 mm, wing length 6.00–6.75 mm, wing width 2.00–2.50 mm.

Head (Fig. A) uniformly dark brown with dark brown hairs. Compound eyes subholoptic, interocular ridge present; compound eye divided, callis oculi present; dorsal division separated from ventral, as large as ventral division; dorsal division with about 20 rows of ommatidia, ommatidia orange red, larger in diameter, with pubescence; ventral division black with pubescence. Scape elliptic, dark brown with brown hairs; pedicel conical, dark brown with brown hairs; first flagellomere cylindrical, constricted medially, basal 2/3 brownish yellow, apical 1/3 brownish black, with brownish black hairs; other flagellomeres cylindrical, tapering apically, brownish black with brownish black hairs; ultimate flagellomere 1.3 times length of penultimate flagellomere. Labrum brown; labellum pale with brown hairs; mandibles brown; proboscis about 0.58 times length of head width. Palpus with five segments, 1st segment short, brownish yellow with brownish black hairs; 2nd to 4th segments cylindrical, brownish yellow with brownish black hairs; 5th segment slender, cylindrical, brownish yellow with brownish black hairs; relative length of distal four segments as 1.0: 1.0: 1.3: 1.9. Tibial spurs 0–0–0. Terminalia (Fig. 3B): 8th sternite bilobate, medial depression W-shaped, with 8–10 hairs laterally; genital fork X-shaped; hypogynial valve broad basally, bilobate posteriorly, each lobe round apically, intervalvular area U-shaped, with short hair; spermathecae three in number.

Immature stages unknown.

**Holotype.** ♂(CAU), China, Xizang, Chayu, 2330 m, 05-VIII-2014, Yan LI. **Paratypes.** 4♂8♀(CAU), same data as holotype.

**Etymology.** The specific epithet *xizangica* (adjective, feminine) refers to the type locality Xizang.

Diagnosis. Dorsal division contiguous with ventral, 1/20 as large as ventral division in male. Rs as long as r-m. Tenth tergite bilobate, each lobe conical, lateral margin bulging, medial margin sinuous, posterior margin rounded medially; gonostylus swollen and slightly notched; tip of dorsal paramere with a long and slender concavity, flat in side view. Genital fork X-shaped in female.

### Discussion

*Blepharicera xizangica* **sp. nov.** is very similar to *B. asiatica* widely distributed in China, Russia, Afghanistan, Pakistan, Sri Lanka and India, but can be separated by the sterna of the abdomen being pale with dark brown lateral stripes at 2nd to 7th sterna, and the apex of the dorsal paramere being flat in side view. In *B. asiatica*, the sterna of the abdomen are dark brown, the apex of the dorsal paramere has a very pointed and downcurved projection in side view (Zwick 1990). This new species is also very similar to *B. indica* (Brunetti, 1911) distributed in Afghanistan, Pakistan, Sri Lanka and India, but it can be separated from the latter by the apex of the gonostylus being swollen and slightly notched, and the apex of the dorsal paramere being flat in side view. In *B. indica*, the apex of the gonostylus is not swollen and notched, and the apex of the dorsal paramere resembles a simple finger and has a downcurved sclerotized anterior shield (Zwick 1990).

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### References

- Alexander CP. 1953. Undescribed species of Nematocera Diptera. Part III. *Bulletin of the Brooklyn Entomological Society*, 48: 97–103.
- Bigot JMF. 1862. Diptères nouveaux de la Corse découverts dans la partie montagneuse de cette île par M. E. Bellier de la Chavignerie. *Annales de la Société Entomologique de France, Series 4*, 2: 109–114.
- Brodsky K. 1930. Zur Kenntnis der Wirbellosenfauna der Bergströme Mittelasiens. 3. Blepharoceridae. 1. Imagines. *Zoologischer Anzeiger*, 90: 129–146.
- Brunetti E. 1911. New Oriental Nematocera. *Records of the Indian Museum*, 4: 259–316.
- Courtney GW. 2000. Revision of the net-winged midges of the genus *Blepharicera* Macquart (Diptera: Blephariceridae) of eastern North America. *Memoirs of the Entomological Society of Washington*, 23: 1–99.
- Jacobson AJ, Curler GR, Courtney GW & Moulton JK. 2011. New species of *Blepharicera* Macquart (Diptera: Blephariceridae) from eastern North America, with discussion of the phylogenetic relationships and biogeography of all Nearctic species. *Systematic Entomology*, 36: 768–800.
- Kang Z & Yang D. 2012. Species of *Philorus* Kellogg from China with description of a new species (Diptera: Blephariceridae). *Zootaxa*, 3311: 61–67.
- Kang Z & Yang D. 2014. Species of *Blepharicera* Macquart from China with descriptions of two new species (Diptera: Blephariceridae). *Zootaxa*, 3866(3): 421–434.

- Kang Z & Yang D. 2015. New record of *Horaia* (Diptera: Blephariceridae) in China with descriptions of two new species. *Florida Entomologist*, 98(1): 118–121.
- Kellogg VL. 1903. The net-winged midges (Blepharoceridae) of North America. *Proceedings of the California Academy of Sciences, Series 3*, 3: 187–233.
- Kitakami S. 1931. The Blephariceridae of Japan. *Memoirs of the College of Sciences, Kyoto Imperial University*, 6: 53–108.
- Kitakami S. 1937. Supplementary notes on the Blephariceridae of Japan. *Memoirs of the College of Sciences, Kyoto Imperial University*, 12: 115–136.
- Kitakami S. 1938. A new genus and species of Blepharoceridae from Japan. *Memoirs of the College of Science, Kyoto Imperial University, Series B*, 14(2): 341–352.
- Kitakami S. 1950. The revision of the Blephariceridae of Japan and adjacent territories. *The Journal of Kumamoto Women's University*, 2: 15–90.
- Loew H. 1858. Ueber einige neue fliegengattungen. *Berliner Entomologische Zeitschrift*, 2: 101–122.
- Macquart JM. 1843. Description d'un nouveau genre d'insectes Diptères. *Annales de la Société Entomologique de France*, 1(2): 59–63.
- Mannheims BJ. 1938. Über das vorkommen der gattung *Curupira* in manschukuo nebst beschreibung der entwicklungsstadien zweier neuer Blepharoceriden aus anatolien und Süd-Chile. *Arbeiten über morphologische und taxonomische Entomologie aus Berlin-Dahlem*, 5(4): 328–333.
- McAlpine JF. 1981. Morphology and terminology, Adults. In: McAlpine JF, Peterson BV, Shewell GE, Teskey HJ, Vockeroth JR & Wood DM (Eds.), *Manual of Nearctic Diptera (Vol. 1)*. Biosystematic Research Centre, Ottawa, pp. 9–63.
- Osten Sacken CR. 1874. Report on the Diptera collected by Lieut. W. L. Carpenter in Colorado during the summer of 1873. *Annual Report of the United States Geological and Geographical Survey of the Territories for 1873*, 7: 561–566.
- Tonnoir AL. 1930. Notes on Indian blepharocerid larvae and pupae with remarks on the morphology of blepharocerid larvae and pupae in general. *Record of the Indian Museum*, 32(2): 161–214.
- von Röder V. 1890. Zwei neue nordamerikanische Dipteren. *Weiner Entomologische Zeitung*, 9: 230–232.
- Westwood JO. 1842. Description de l' *Asthenia fasciata*. *Guérin's Magazine of Zoology*, 12: 94.
- Zwick P. 1990. Systematic notes on Holarctic Blephariceridae (Diptera). *Bonner Zoologische Beitrage*, 41: 231–257.