

# The Genus *Rhithrogena* Eaton (Ephemeroptera: Heptageniidae) from Chinese Mainland, with Description of a New Species

ZHOU Chang-fa<sup>1</sup>, ZHENG Le-yi<sup>2</sup>

(1. Institute of Genetic Resources, College of Life Sciences, Nanjing Normal University,  
Nanjing, Jiangsu 210097, China;

2. Department of Biology, Nankai University, Tianjin 300071, China)

**Abstract:** In present paper the genus *Rhithrogena* Eaton from Chinese mainland, including a new species to science (*Rhithrogena lutea*, sp. nov.), 2 new record species from China (*R. bajkova*e Sowa, *R. lepnevae* Brodsky) and 3 known species [*R. wuyinensis* (Gui *et al.*) (comb. nov.), *R. trispina* Zhou *et* Zheng, *R. orientalis* You (= *R. sangangensis* You, new synonym)] are revised based on the imaginal specimens. A key to 7 species imagoes is provided. All materials in this study are deposited in Nanjing Normal University.

**Key words:** Ephemeroptera; Heptageniidae; *Rhithrogena*; Chinese mainland

**CLC number:** Q969.21+3.4

**Document code:** A

**Article ID:** 1000-7482(2004)02-0081-05

The genus *Rhithrogena* was erected by Eaton in 1881, including some species previously placed in genus *Heptagenia* and some new species. From then on, according to Soldán (2001), more than 120 species of *Rhithrogena* were described. In Oriental region, 12 species have been reported (Ulmer, 1912; Hubbard and Peters, 1978; Braasch, 1981, 1984; Braasch and Soldán, 1986; Kang and Yang, 1994; You, 1990; Zhou and Zheng, 2001).

From the work of Sowa (1984), Belfiore (1987), Sartori & Oswald (1988) and Sartori & Sowa (1992), this genus was divided into 10 groups. But their exact definitions and species included need further confirm and check.

In Chinese mainland, 4 species have been reported on imaginal stages (Braasch, 1999; You, 1990; Zhou & Zheng, 2001). Here in we revise this genus of Chinese mainland based on imagoes except *Rhithrogena tianshanica* Brodsky (1930) (firstly reported from China by Braasch, 1999) because the specimens of it can not be checked.

**Received date:** 2002-10-14

**Foundation item:** This work was supported by National Natural Sciences Foundation of China (30300037)

*Rhithrogena* Eaton, 1881

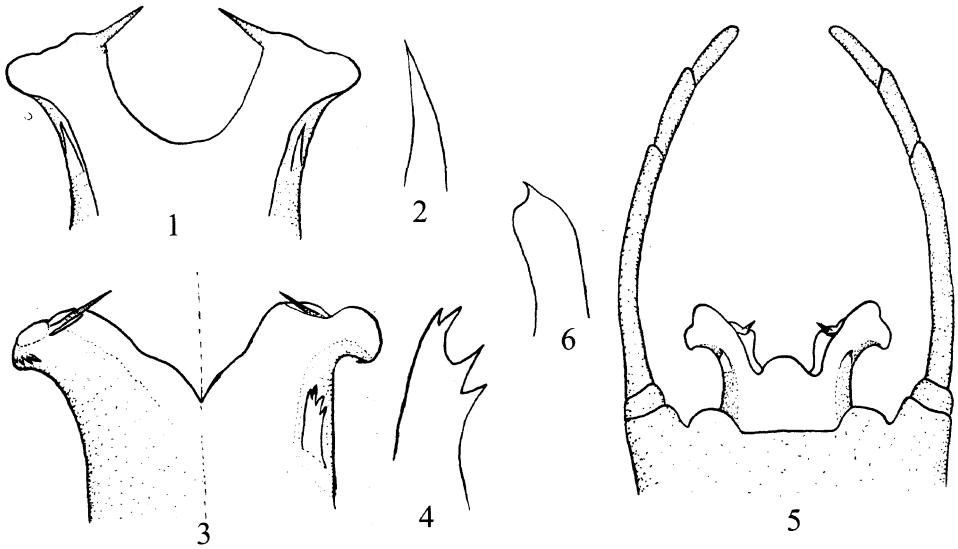
*Rhithrogena* Eaton, 1881: 23. Type species: *Rhithrogena semicolorata* (Curtis, 1834), from Europe (originally described in *Baetis*).

1. *Rhithrogena bajkova*e Sowa, 1973, new record (Figs. 1~2)

*Rhithrogena bajkova*e Sowa, 1973: 24. Types: adults, from Russia.

Remarks: apex of penis lobe has a distinct spine, titillators are tampered.

Materials examined: 1 ♂, Tangwang River, Yichun City, **Heilongjiang** Province, 27-VII-1993, leg. by LI You-wen & SUN Chang-hai.



Figs. 1~6 Male genitalia of some species of *Rhithrogena* from China

1~2. *Rhithrogena bajkova*e Sowa: 1. penes (ventral view); 2. apex of titillator; 3~4. *Rhithrogena lepneva* Brodsky: 3. dorsal view of penes (left) and ventral view (right); 4. apex of titillator; 5~6. *Rhithrogena orientalis* You: 5. genitalia; 6. apex of titillator

2. *Rhithrogena lepneva* Brodsky, 1930, new record (Figs. 3~4)

*Rhithrogena lepneva* Brodsky, 1930a: 39. Types: male, from Russia.

Remarks: male imago similar to *Rhithrogena bajkova*e Sowa, but they can be distinguished by following characters: 1. adults of *Rhithrogena bajkova*e brown, those of *Rhithrogena lepneva* yellow; 2. the spines on apex of penis lobes of *Rhithrogena lepneva* are smaller than those of the former; 3. titillators of *Rhithrogena lepneva* divide into 4 denticles, but those of *Rhithrogena bajkova*e do not divide.

Materials examined: 50 ♂♂ 10 ♀♀, Weihe River, Shangzhi City, **Heilongjiang** Province, 16-VII-1993; 30 ♂♂ 5 ♀♀, Yongshen River, Yichun City, **Heilongjiang** Province, 30-VII-1993; 30 ♂♂, Balai River, Tieli City, **Heilongjiang** Province, 05-VIII-1993. leg. by LI You-wen & SUN Chang-hai.

3. *Rhithrogena orientalis* You, 1990 (Figs. 5~6)

*Rhithrogena orientalis* You, 1990: 60. Types: male (destroyed), Sangang, Fujian Prov.

*Rhithrogena sangangensis* You, 1990: 60. Types: male (destroyed), Sangang, Fujian Prov. new synonym.

Remarks: *Rhithrogena orientalis* is similar to *Rhithrogena bajkovae* Sowa and *Rhithrogena lepnevae* Brodsky because all of them have spines on gonopores. The *Rhithrogena orientalis* You can be separated from them by the shape of penis and titillators.

Materials examined: ♂ (neotype), 3 ♂ 4 ♀ ♀, Sangang, **Fujian** Province, VII-1982, leg. by YOU Da-shou.

4. *Rhithrogena wuyiensis* (Gui *et al.*, 1999), comb. nov. (Figs. 7-9)

*Paegniodes wuyiensis* Gui, Zhou *et Su*, 1999: 336. Types: male, Sangang, Fujian.

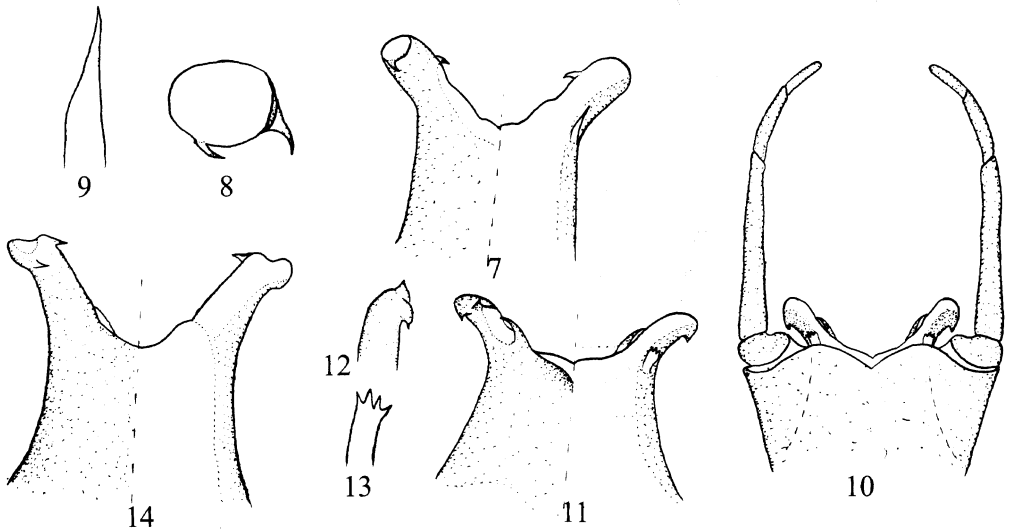
Remarks: two denticles on the apex of panis. titillators sharp.

Materials examined: ♂ (holotype), Sangang, **Fujian** Province, 12-VII-1995, leg. by YING Ling & ZHOU Chang-fa; 1 ♂, Sanmuping, Tianmu Mountain, **Zhejiang** Province, 07-VII-1998; 1 ♂, same as the former, 30-VII-1998, leg. by ZHAO Ming-shui.

5. *Rhithrogena trispina* Zhou *et* Zheng, 2001 (Figs. 10-13)

*Rhithrogena trispina* Zhou *et* Zheng, 2001: 323. Types: male, female, from Zhejiang, China.

Remarks: each penis lobe with 3 spines, gonopore located near the apex of penis lobe.



Figs. 7-14 Genitalia of some species of *Rhithrogena* from China

7-9. *Rhithrogena wuyiensis* (Gui *et al.*): 7. dorsal view of penes (left) and ventral view (right); 8. apex of penis lobe (apical view); 9. titillator; 10-13. *Rhithrogena trispina* Zhou *et* Zheng: 10. genitalia (ventral view); 11. dorsal view of penes (left) and ventral view (right); 12. apex of penis lobe (lateral view); 13. titillator; 14. dorsal view of penes of *Rhithrogena lutea*, sp. nov. (left) and ventral view (right)

6. *Rhithrogena lutea*, sp. nov. (Fig. 14)

Male imago: body length 8.0 mm, fore wing 8.5 mm, hind wing 2.5 mm, fore leg 6.8 mm, cerci 15.0 mm. Body brown. Upper part of compound eyes gray, low part dark, two eyes contiguous dorsally. Nota with irregular dark stripes and dots. Fore femora dark brown, tibiae and tarsi dark. Ratio of forefemur: tibia: tarsus=1.8 : 2.2 : 2.8, arrangement of 5 tarsal segments in descent =2, 3, 4, 5, 1, among them, first segment 0.25 times as long as second one. Middle and hind legs dark brown. Hind tarsi less than half of tibiae, segment I almost same

as segment II in length. Each femora with a distinct dark dot located at middle. Wings transparent, with clear yellow veins. Terga brown, each with a pair of dark median stripes dorsally and a pair of oblique stripes laterally.

Genitalia (Fig. 14): combined length of two apical segments of forceps subequal to half of segment II. Subgenital plate with two semi-oval projections. Two penis fused basally and divergent apically. Penis stem membranous in middle while sclerotized laterally. One pairs of membranous vesicle located at the base of divergence of two penis. Penal lobe truncated. Gonopore located on the apex of penal lobe, 2 spines on the margin of it. The dorsal spines visible in dorsal view, the inner spines visible both in dorsal and ventral view. Cerci yellowish brown, with reddish brown circles.

Female imago: body length 6.0~8.0 mm, cerci 10.0 mm. stergum 9 with shallow median emargination.

Diagnosis: in the genus *Rhithrogena*, *Rhithrogena lutea*, sp. nov. and the species *R. kimminsi* Thomas (1970) (*alpestris*-group *sensu* Sowa, 1984) has no titillators and gonopore located on the penis apex. *Rhithrogena lutea* sp. nov. can be differed from the latter by the more clear wing veins and different penes shape.

Holotype: ♂, Shuanghe River, Jiuzhaigou County (33° 17' N, 103° 54' E), Sichuan Province, 11-VIII-2000, leg. by XIE Qiang & ZHOU Chang-fa, Paratypes: 4 ♂ ♂ 10 ♀ ♀, same as the holotype.

#### Key to species of Chinese *Rhithrogena* (male imago)

1. Penal lobes with titillators (Figs.1,3, 5, 7, 10, 11)..... 2
- Penal lobes without titillator (Fig.14)..... *Rhithrogena lutea*, sp. nov.
2. Penal lobes with spine on gonopore (Figs.1, 3, 5) ..... 3
- Penal lobes without spine on gonopore although penis may has spines near the gonopore margin apically (Figs.7, 10, 11) ..... 5
3. Titillator with one apical spine (Figs. 2, 6) ..... 4
- Titillator with 4 apical spines (Fig.4) ..... *Rhithrogena lepnevae*
4. Apex of titillator tapered (Fig.2) ..... *Rhithrogena bajkovaevae*
- Apex of titillator sharpened dramatically (Fig.6) ..... *Rhithrogena orientalis*
5. Apex of titillator tapered (Fig.9) ..... *Rhithrogena wuyiensis*
- Apex of titillator separated into 4 denticels (Fig.13) ..... 6
6. Gonopore located apically at the penal lobe..... *Rhithrogena tianshanica*
- Gonopore located subapically at the penal lobe (Fig.11) ..... *Rhithrogena trispina*

#### REFERENCES

- [1] 归 鸿, 周长发, 苏翠荣. 蜉蝣目. 黄邦侃(主编): 福建昆虫志 (第1卷) [M]. 福州: 福建科技出版社, 1999, 324-346.
- [2] 尤大寿. 福建溪颈蜉属 *Rhithrogena* 二新种记述(蜉蝣目: 扁蜉科) [J]. 南京师大学报(自然科学版), 1990, 13(2): 60-63.
- [3] Belfiore C. Heptageniidae from Corsica and Sardinia. *Rhithrogena nuragica* n. sp., *R. eatoni* Esben-Petersen 1912, and *R. insularis* Esben-Petersen 1913 (Ephemeroptera) [J]. *Annls. Limnol.*, 1987, 23: 87-94.
- [4] Braasch D. Beitrag zur Kenntnis der Heptageniidae des Himalaya (Ephemeroptera) [J]. *Reichenbachia*, 1981, 19: 127-132.
- [5] Braasch D. Beitrag zur Kenntnis der Heptageniidae des Himalaya (II) (Ephemeroptera) [J]. *Reichenbachia*, 1984, 22: 45-50.
- [6] Braasch D. Eintagsfliegen aus dem Nordwesten von China (Insecta: Ephemeroptera) [J]. *Faunistische Abhandlungen*, 1999, 21(12): 211-214.
- [7] Braasch D, Soldán T. *Rhithrogena diehliana* n. sp. von Sumatra (Ephemeroptera, Heptageniidae) [J]. *Reichenbachia*, 1986, 24: 91-92.

- [8] Brodsky K. Contributions to the fauna of Ephemeroptera of Southern Siberia [J]. *Entomol. Oboz.*, 1930a, 24 (1-2): 31-40.
- [9] Brodsky K. Zur kenntnis der mittelasiatischen Ephemeropteren. I. Imagines [J]. *Zool. Jahrb. Syst.*, 1930b, 59: 681-720.
- [10] Eaton A E. An announcement of new genera of the Ephemeridae [J]. *Ent. Mon. Mag.*, 1881, 17: 21-27.
- [11] Hubbard M D, Peters W L. A catalogue of the Ephemeroptera of the Indian subregion [J]. *Oriental Insects*, 1978, 9 (Suppl.): 1-43.
- [12] Kang S C, Yang C T. Heptageniidae of Taiwan (Ephemeroptera) [J]. *J. Taiwan Mus.*, 1994, 47: 5-36.
- [13] Kazanci N. *Rhithrogena anatolica* sp. n. (Ephemeroptera, Heptageniidae) from Turkey [J]. *Mitt. Schweiz. Ent. Ges.*, 1985, 58: 311-313.
- [14] Kluge N Y. *Rhithrogena eugeniae* sp. n. (Ephemeroptera, Heptageniidae) from Tadjikistan [J]. *Zool. Zhurn.*, 1983, 62: 1116-1118 (in Russian).
- [15] Sartori M, Oswald R. *Rhithrogena grischuna* n. sp., a new mayfly species from eastern Switzerland related to *Rh. hercynia* Landa, 1969 (Ephemeroptera; Heptageniidae) [J]. *Annl. Limnol.*, 1988, 24: 261-268.
- [16] Sartori M, Sowa R. New data on some *Rhithrogena* species from the Near- and Middle East (Ephemeroptera, Heptageniidae) [J]. *Aquatic Insects*, 1992, 14: 31-40.
- [17] Sowa R. Contribution à la connaissance des espèces européennes du genre *Rhithrogena* Eaton (Ephemeroptera, Heptageniidae) avec le rapport particulier aux espèces des Alpes et des Carpatés[C]. In: Landa V, Soldán T, Tonner M. (eds.): Proc. IVth Intern. Conf. Ephemeroptera, CSAV, 1984, 37-52.
- [18] Ulmer G. H. Sauter's Formosa-Ausbeute. Ephemeren[J]. *Entomol. Mitt.*, 1912, 1: 369-375.
- [19] Zhou C F, Zheng L Y. *Rhithrogena trispina* sp. n., a new species from China (Ephemeroptera: Heptageniidae)[J]. *Aquatic Insects*, 2001, 23(4): 323-326.

## 中国大陆溪螭蜉属 *Rhithrogena* 分类研究及一新种描述

(蜉蝣目: 扁蜉科)

周长发<sup>1</sup>, 郑乐怡<sup>2</sup>

(1. 南京师范大学生命科学学院遗传资源研究所, 江苏 南京 210097;

2. 南开大学生物系, 天津 300071)

本文对我国大陆地区溪螭蜉属 *Rhithrogena* 作了初步的分类研究。其中, 报道 1 新种(黄溪螭蜉 *Rhithrogena lutea*, sp. nov.)、2 个中国新记录种(贝氏溪螭蜉 *R. bajkova* Sowa 和赖氏溪螭蜉 *R. lepnevae* Brodsky), 并对其它 3 种[武夷溪螭蜉 *R. wuyinensis* (Gui et al.), comb. nov.、三刺溪螭蜉 *R. trispina* Zhou et Zheng 和东方溪螭蜉 *R. orientalis* You (= 三港溪螭蜉 *R. sangangensis* You, 新异名)]作了订正, 并给出了我国已知 7 种的成虫检索表。新种——黄溪螭蜉 *R. lutea*, sp. nov., (仅知成虫, 图 14)) 标本采自四川省九寨沟县双河镇附近河旁(正模 ♂, 副模 4 ♂♂ 10 ♀♀, 2000-VIII-11, 采集人为谢强和周长发), 区别于该属其它已知种的最明显特征就是阳茎无阳端突、生殖孔的边缘具 2 枚齿突。标本保存在南京师范大学生命科学学院。

关键词: 蜉蝣目; 扁蜉科; 溪螭蜉属; 中国大陆