

# A Preliminary Study on the Genus *Caenis* (Ephemeroptera: Caenidae) from Chinese Mainland, with Description of a New Species

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**Abstract:** Five species of the genus *Caenis* from Chinese mainland are reviewed. Among them, *C. parviforcipis* (Zhou *et al.*) (nov. comb.) is transferred from the genus *Brachycercus*. The larvae of the *C. sinensis* Gui *et al.* are described for the first time. The previously reported *C. nigroforceps* Zhou *et al.* is recognized as a new synonym of the *Caenis rivulorum* Eaton, and the report of *C. nigropunctata* Klapálek from China is confirmed. Both imagos and larvae of a new species *C. melanoleuca*, sp. nov. are described and illustrated in detail.

**Key words:** Ephemeroptera; Caenidae; *Caenis*; revision; Chinese mainland

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The genus *Caenis* was established by Stephens in 1835. In worldwide scope, this genus has been well known (Malzacher, 1984, 1986a, 1986b, 1990a, 1990b, 1991, 1993, 1995; Provonsha, 1990). In China, Kang & Yang (1994, 1996) and Tong & Dudgeon (2002) reported 11 species based on larvae from Taiwan and Hong Kong. However, in Chinese mainland, only 3 species of *Caenis* have been reported previously (Ulmer, 1936; Zhou *et al.*, 1997; Gui *et al.*, 1999). In the present paper, all known species plus a new one from Chinese mainland are revised. All specimens in this study are deposited in Nanjing Normal University.

1. *Caenis parviforcipis* (Zhou, Gui *et Su*, 2000), nov. comb. (Figs.1,8)

*Brachycercus parviforcipis* Zhou, Gui *et Su*, 2000, *Entomol. Sin.*, 7(2): 132.

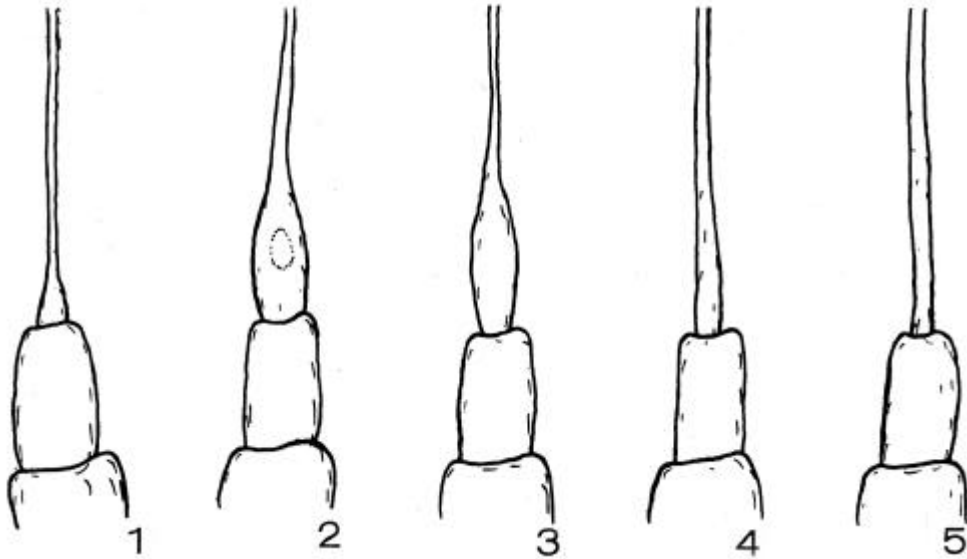
Remarks: this species can be distinguished from others in the genus by two characters: 1) with short forceps (less than penes); 2) foretarsi less than foretibiae (ratio of them=1.0:1.5).

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The forceps of this species has no suture. Therefore it is transferred to *Caenis* from *Brachycercus*.

Materials examined: holotype (♂ imago) and paratype (1 ♂ imago), Songhuaba reservoir, Kunming, **Yunnan** Province, 01-VI-1996, leg. by WANG Bei-xing & ZHOU Chang-fa.



Figs.1~5 Imaginal antennae of 5 species of *Caenis* from China

1. *Caenis parviforcipis*; 2. *Caenis sinensis*.; 3. *Caenis nigropunctata*; 4. *Caenis rivulorum*; 5. *Caenis melanoleuca*, sp. nov.

## 2. *Caenis sinensis* Gui, Zhou et Su, 1999 (Figs.2,6,9)

*Caenis sinensis* Gui, Zhou et Su, 1999, Fauna Ins. Fujian Vol. 1: 343.

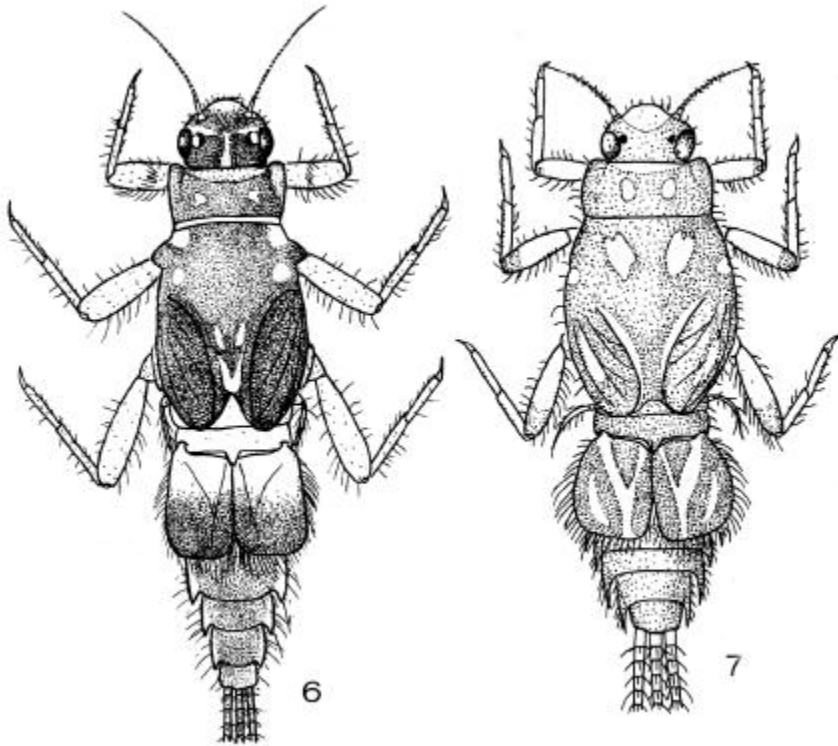
Mature larvae (first described, fig.6): body length 2.5~3.2 mm, caudal filaments 1.5~2.0 mm. Body yellow to pale brown, legs pale. Vertex yellowish brown with pale ecdysis suture. Ocelli pale, compound eyes dark black. Thorax with diffuse pale dots and marks. Anterolateral angles of pronotum expanded forwards slightly, lateral margins with sparse hairs. Mesonotum with distinct expanded anterolateral lobes, semioval in shape. Forefemora each with a row of transverse spines. Legs with dense setae and spines wholly, femora, tibiae and tarsi subequal in length. Abdominal terga 1,2,10 pale, while terga 7~9 pale brown dorsally. Anterior half of gill capsule much paler than posterior half. Gill capsule with indistinct Y-shape ranges, free margins with dense setae. Terga 7~9 with sharp posterolateral projections. Sternum 9 with convex posterior margin. Three filaments pale, with sparse setae between segments.

Remarks: *C. sinensis* is similar to *C. horaria* (Linnaeus, 1758) because both of them have expanded antennal base which further with hollow (Fig.2), forceps of them are similar too. However, the foretibiae of *C. sinensis* are subequal to foretarsi, both of them shorter than forefemora (ratio of femora : tibiae : tarsi=1.0 : 0.7 : 0.7), while tibiae of *C. horaria* are longer than femora (femora : tibiae=0.53~0.58, see Malzacher, 1986b). Moreover, *C. horaria* has a finger-like spine on abdominal tergum 2, while *C. sinensis* has no such spine. Third,

forceps of *C. sinensis* has a indistinct mesal subapical tubercle (Fig. 9), while *C. horaria* has a tapered forceps. The larvae of *C. sinensis* can be separated from those of latter by having obvious mesonotal projections.

Materials examined: 100 ♂♂, Baijing, Huishui County, 10-IX-2000, leg. by LI Chuan-ren & ZHOU Chang-fa; 1 ♂1 ♀ (subimago), Jiangkou County, IX-1994, leg. by DU Yu-zhou; 20 ♂♂, Chang Ming, Guiding County, 08-IX-2000, leg. by LI Chuan-ren & ZHOU Chang-fa; 1 ♂30 ♀♀40 larvae, Sang Lang, Wangmu County, 15-IX-2000, leg. by LI Chuan-ren & ZHOU Chang-fa; 2 larvae, Luokun, Luodian County, 13-IX-2000, leg. by LI Chuan-fen & ZHOU Chang-fa; 100 ♂♂50 ♀♀, Tong Ming, Xishui County, 28-IX-2000, leg. by YU Hai-li & ZHOU Chang-fa (above all from **Guizhou** Province); 3 ♂♂1 ♀ (subimago); Sanggang, Wuyi mountain, **Fujian** province, 10-VII-1995, leg. by Ying Ling & Zhou Changfa; 100 ♂♂, Xu Jin, Yixing County, **Jiangsu** Province. VII-1980, leg. by Wu Tian; 18 ♂♂, Dongxing village, Yingxin County, **Jiangsu** Province., 15-V-1995, leg. by ZHU Chao-dong; 1 ♂, Tangkuo, Yellow mountain, **Anhui** Province. VI-1987, leg. by WU Tian; 3 ♂♂6 ♀♀ (subimagos), Sihai, Yangqing County, Beijing, 01-IX-1994, leg. ZHANG Bao-hua & ZHOU Chang-fa; 2 larvae, Wulong bridge, Mt. Hua, **Shaanxi** Province., VII-1993, leg. by LU Lang & SUN Chang-hai.

Distribution: Guizhou, Fujian, Jiangsu, Anhui, Beijing, Shaanxi provinces.



Figs. 6~7 Larval habituses of two species of *Caenis*

6. *Caenis sinensis*.; 7. *Caenis melanoleuca*, sp. nov.

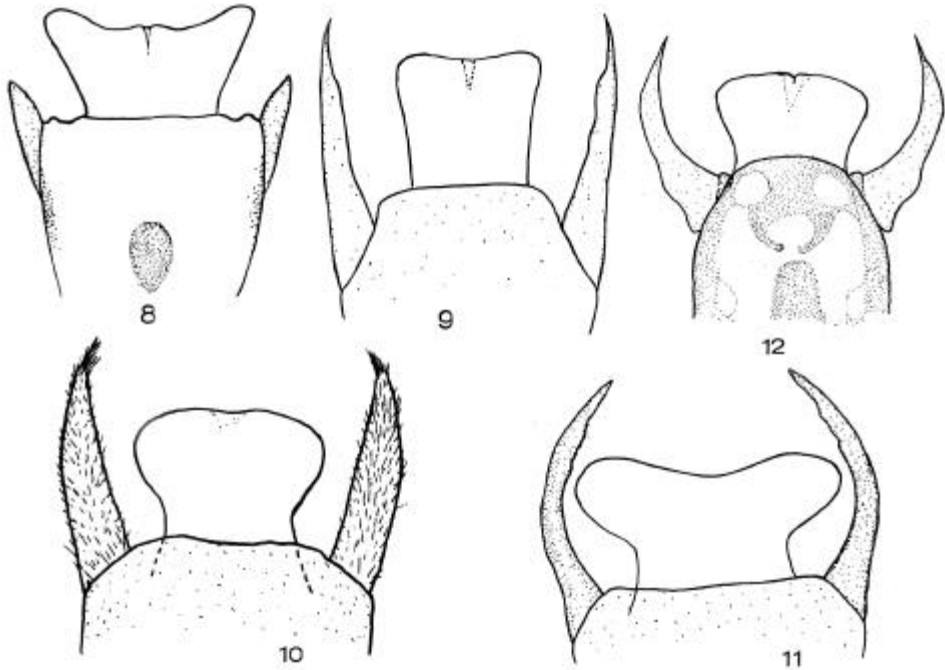
3. *Caenis nigropunctata* Klapalek, 1905 (Figs.3,10)

*Caenis nigropunctata* Klap á lek, 1905, *Mitt Nat. Mus. Hambutg.*: 104.

*Caenis nigropunctata*- Ulmer, 1936: *Peking Nat. His. Bull.*, 10(3): 208.

*Caenis nigropunctata*- Ulmer, 1939-1940, *Archiv. Hydrobiol., suppl.*, 16:520.

Remarks: the adults of this species have base broadened antennae (Fig.3) and forceps body with dense tiny setae on surface. A tuft of spines locate on the forceps apex (Fig.10). The larvae of this species are brown, pronota with irregular dark marks and anterior margins of them longer than posterior ones.



Figs. 8~12 Male genitaliae of 5 species of *Caenis* from China

8. *Caenis parviforcipis*; 9. *Caenis sinensis*; 10. *Caenis nigropunctata*; 11. *Caenis rivulorum*; 12. *Caenis melanoleuca*, sp. nov.

Materials examined: 200 ♂♂ 100 ♂♂ (subimagos) 20 ♀♀ 20 ♀♀ (subimagos) 45 larvae, 1 ♂ 4 ♀♀ (all subimagos reared from larvae), Fengshan, Jinggu County, 08-IV-2001; 30 larvae 1 ♂ subimago (reared from larva), Mengxing, Mengla County, 20-III-2001; 50 larvae, Menglun, Mengla County, 25-III-2001; 30 ♂♂ 1 ♀ 40 larvae, Puwen, Jinghong city, 02-IV-2001; 100 larvae, Juhe river, Jingdong County, 13-IV-2001; 55 larvae, Longjie, Jingdong County, 10-IV-2001 (above all leg. by ZHOU Chang-fa from **Yunan** Province.); 12 larvae, Renlin, Huaping County, **Yunnan** Province, 30-V-1996, leg. by WANG Bei-xing & ZHOU Chang-fa; 10 larvae, Sanglong, Wangmu County, 15-IX-2000; 20 larvae, Luokun, Luodian County, 13-IX-2000; 50 larvae, Tongming, Xishui city, 29-IX-2000; 3 larvae, Jingsha, Chishui city, 22-IX-2000; 20 ♂♂ 4 ♀♀ 11 larvae, Changming, Guidin County, 08-IX-2000 (above all leg. by LI Chuan-ren & ZHOU Chang-fa from **Guizhou** Province): 10 ♂♂, Hengjian, Liyang County, **Jiangsu** Province, V-1995, leg. by ZHU Chao-dong.

Distribution: China (Yunnan, Guizhou, Jiangsu, Beijing); Java.

#### 4. *Caenis rivulorum* Eaton, 1884 (Figs.4,11)

*Caenis rivulorum* Eaton, 1884, *Trans. Linn. Soc. Lond.*, 2<sup>nd</sup> series: 143 (as *Caenis dimidiata* var. *rivulorum*).

*Caenis nivea* Bengtsson, 1917, *Ent. Tidskr.*, 38: 181. Synonymized by Saaristo, 1966, *Ann. Ent. Fenn.*, 32 (1):75.

*Caenis nigroforceps* Zhou *et al.*, 1997, *Entomotaxonomia*, 19(4): 270. new synonym.

Remarks: the males of this species have greatly incurved forceps which slightly serrated on inner margins. The forceps sclerorized significantly (Fig.10). The body, nota and gill covers of this species are uniform brown, pronota with straight lateral margins.

Materials examined: holotype and some paratypes (100 ♂♂ 100 ♀♀) of *Caenis nigroforceps* Zhou *et al.*, Longyuwan, Funiu mountain, **Henan** Province, 10-VII-1996, leg. by WANG Bei-xin & ZHOU Chang-fa; 10 ♂♂ 3 ♀♀, Yulin forest center, Sangzhi city, **Heilongjiang** Province., 16-VII-1993, leg. by LI You-wen & SUN Chang-hai.

Distribution: China (Henan, Heilongjiang); Europe; Russia.

#### 5. *Caenis melanoleuca*, sp. nov. (Figs.5,7,12)

Mature larvae (Fig.7): body length 4.0 mm~5.5 mm, caudal filaments 2.0~4.0 mm. Body dark brown with pale dots, 1 dot on clypeus, 1 pair on pronotum, 2 pairs on mesonotum. Wing buds with 1 pair. Legs pale but apex of femora dark brown. Legs with dense hairs. Tergum 2 with distinct single median tubercle, terga 3~9 with remarkable posterolateral projections. Gill capsule with pale Y-shaped range and a pale stripe. Sternum 9 expanded posteriorly and with smooth margin. Caudal filaments pale, with sparse setae between segments.

Male imago: body length 4.0 mm, caudal filaments 10.0~13.0 mm. Head and thorax dark brown, abdomen pale with diffuse brown marks. Antennae pale, pedicel 1.5 x as long as scape (Fig.5). Legs pale with brown femoral base. Forefemora : tibiae : tarsi=1 : 1.5 : 1.25. Wing with brown veins. Tergum 2 with finger-like spines on median posterior margin, terga 3~9 with rudimental posterolateral projections. Genitalia (Fig.12): forceps flat, curved inwards, surface smooth and sclerorized (in some individuals, forceps hide in the subgenital plate and penes and invisible in ventral view). Penis lobes fused together, posterior margin with slight median emargination. Subgenital plate with brown darks. Three filaments pale.

Female imago: body length 2.5 mm, caudal filaments 1.2 mm. Same as the male.

Diagnosis and discussion: male imago of *Caenis melanoleuca* sp. n. is unique in the genus because of flat, smooth, incurved and relatively longer forceps. All other known species have tiny club-shaped forceps. According to Malzacher (1984), this species can be put in *horaria*-lineage. In larval stage, the color pattern and relatively larger body contribute its species status.

Etymology: *melanoleuca* is composed by *melano-* (black) and *leucus* (white), indicates the dark brown larval body having obvious pale stripes and dots.

Holotype ♂, Baijing, Huixui County, **Guizhou** Province, 10-IX-2000; paratypes: 100 ♂♂ 5 ♀♀ 20 larvae, same as holotype; 30 ♂♂, Changming, Guiding County, **Guizhou** Province, 08-IX-2000, all leg. by LI Chuan-ren & ZHOU Chang-fa.

### Key to five species of *Caenis* from China (male imago)

1. Foretarsi shorter than forefemora; forceps not extend to posterior margin of penes ..... *Caenis parviforecipes*
- Foretarsi equal to or longer than forefemora; forceps extend out posterior margin of penes obviously..... 2
2. Forceps with a tuft of fine spines apically ..... *Caenis nigropunctata*
- Forceps apex without any spine ..... 3
3. Foretarsi equal to forefemora; forceps straight and tapered ..... *Caenis sinensis*
- Foretarsi longer than forefemora; forceps incurved obviously ..... 4
4. Forceps flattened ..... *Caenis melanoleuca*, sp. nov.
- Forceps rod-like, with slightly serrated inner margins ..... *Caenis rivulorum*

### Key to four species of *Caenis* from China (larva)

1. Posterolateral projections of abdominal terga 3~9 enlarged remarkably ..... *Caenis melanoleuca*, sp. nov.
- Posterolateral projections of abdominal terga 3~9 slightly enlarged ..... 2
2. Mesonotum with obvious anterolateral projections; Anterior half of gill cover paler than posterior half  
..... *Caenis sinensis*
- Mesonotum without anterolateral projection; Gill cover uniform brown ..... 3
3. Anterior margin of pronotum same as posterior one, pronotum uniform brown ..... *Caenis rivulorum*
- Anterior margin of pronotum longer than posterior one; pronotum with obvious dark brown marks  
..... *Caenis nigropunctata*

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## 我国大陆细蜉属 *Caenis* 修订及一新种描述

(蜉蝣目: 细蜉科)

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我国大陆细蜉属 *Caenis* 共知 5 种,其中短铗细蜉 *Caenis parviforcipis* (Zhou *et al.*), n. comb. 由短尾细蜉属 *Brachycercus* 转移而来;中华细蜉 *Caenis sinensis* Gui *et al.* 稚虫形态在本文中首次描述;另外从标本来看,已知的黑铗细蜉 *Caenis nigroforceps* Zhou *et al.* 实际为近岸细蜉 *Caenis rivulorum* Eaton 的新异名;本文描述 1 新种: 花斑细蜉 *Caenis melanoleuca*, sp. nov.; 第 5 种黑点细蜉 *Caenis nigropunctata* Klapalek 也根据标本得到了确认。文中还给出了以上 5 种成虫和 4 种稚虫的检索表。所有标本都保存在南京师范大学生命科学学院。

花斑细蜉 *Caenis melanoleuca*, 新种 (图 5, 7, 12)

正模: ♂, 贵州惠水县摆金镇附近河中, 2000-IX-10, 李传仁, 周长发采; 副模: 100 ♂♂ 5 ♀♀ 20 稚虫, 同正模; 30 ♂♂, 贵州贵定县昌明镇附近河中, 2000-IX-08, 李传仁, 周长发采。

新种成虫的尾铗呈独特的扁平状且强烈弯曲,稚虫身体呈明显黑白相间的条纹状且个体较大, 极易识别。

关键词: 蜉蝣目; 细蜉科; 细蜉属; 修订; 中国大陆