

On the identity of some Oriental Acroneuriinae taxa (Plecoptera: Perlidae), with an annotated checklist of the subfamily in the realm

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Abstract. The monotypic Taiwanese genus *Mesoperla* Klapálek, 1913 is redescribed on the basis of a male syntype specimen, and its affinities are re-evaluated. The single female type specimen of further two Oriental monotypic genera, *Kalidasia* Klapálek, 1914 and *Nirvania* Klapálek, 1914, are confirmed to be lost or destroyed respectively; both genera are considered as nomina dubia. The Sichuan endemic *Acroneuria grahami* Wu & Claassen, 1934 is redescribed on the basis of male holotype. Distinctive characters of the genus *Brahmana* Klapálek, 1914 consisting of five, inadequately known Oriental species are discussed. *Flavoperla needhami* (Klapálek, 1916) and *Sinacroneuria sinica* (Yang & Yang, 1998) comb. novae are suggested for an Indian species originally described in *Gibosia* Okamoto, 1912 and a Chinese species originally described in *Acroneuria* Pictet, 1841. At present, 62 species of Acroneuriinae, classified in 10 valid genera are reported from the Oriental Realm but 29 species are inadequately known. A key is presented to distinguish males of the Asian Acroneuriinae genera. Asian distribution of each genera are detailed and depicted on a map.

Keywords. Stoneflies, Acroneuriinae, redescription, new combinations, nomen dubium, China, Taiwan, Indian subcontinent.

INTRODUCTION

The subfamily Acroneuriinae Klapálek, 1914 was established for Perlidae Latreille, 1802 taxa having hammer on male sternum 9. The concept of the subfamily became widely accepted and Perlidae was divided into two subfamilies; Perlinae and Acroneuriinae. Later, Illies (1966), recognized as distinctive features of Acroneuriinae the modified male paraprocts, lack of hemitergites 10, and occipital row of setae being irregular, incomplete or absent on larvae (Zwick 2000).

Contrary to Perlinae where the genera are well defined and their limits are clear and widely accepted (Sivec *et al.*, 1988), supraspecific classification of Acroneuriinae still raise some problems. The system of Nearctic taxa can be considered well defined both at generic and specific level (Stark & Gaufin 1976, Stark 2004). Also the Neotropical taxa received a generic synopsis (Stark 2001) and, though many new species are

still expected to be found, there are relatively few nomina dubia or poorly known species left (Froehlich 2010). However, the Asian Acroneuriinae species are poorly defined and lack comprehensive review, despite of recent efforts done on regional faunas or certain genera (Inada 1998, Li & Wang 2014, Li *et al.*, 2014, Stark & Sivec 2008a, 2008c, 2008d, Uchida 1990, Uchida *et al.*, 2011).

The distribution of Acroneuriinae covers all of the Nearctic, Neotropics and Oriental realms, and the eastern part of the East Palaearctic (DeWalt *et al.* 2016). It is divided into three tribes, among which the Anacroneuriini Stark & Gaufin, 1976 is restricted to the Neotropics and southern portion of the Nearctic, while Acroneuriini Klapálek, 1914 spreads over most of the subfamily's range except the Neotropics. Kiotinini Uchida, 1990 is an Asian tribe having also an eastern Nearctic genus however; it is not throughout accepted as it was described in a thesis.

During our visits to the Natural History Museum, Vienna (DM, April 2013), National Museum of Natural History, Washington D.C. (WHL, July 2014) and the National Museum Prague (DM, July 2014) we were searching for type specimens of certain Asian stoneflies. Several poorly-known taxa were already reported and described as an outcome of these projects (Li *et al.*, 2015, Murányi & Li 2013, 2015, Murányi *et al.*, 2015). In this paper the Oriental Acroneuriinae types of these collections are enumerated, redescribed or complementarily described. In addition, we present an annotated checklist of the subfamily from the Oriental realm, supplementing with their status, distribution and availability of type specimens.

MATERIAL AND METHODS

The specimens examined are stored dry in the Department of Entomology, Natural History Museum, National Museum Prague, Czech Republic, and in ethanol vials in the Department of Invertebrate Zoology, National Museum of Natural History, Washington D.C., USA.

Specimens' terminalia was cleared in KOH. Terminalia kept in the same ethanol vial, or for each dried specimen are stored in a microvial with glycerine pinned beneath the specimen. Drawings were made with the aid of a drawing tube applied to a Nikon SMZ800 microscope. Further illustrations were made with Nikon D70s and Leica C cameras. Terminology mainly follows Sivec & Stark (2008c).

Distributional data were compiled from literature information from various sources referenced in Plecoptera Species File (PSF) (DeWalt *et al.*, 2016).

TAXONOMY

Acroneuria grahamia Wu & Claassen, 1934

(Figures 1–6)

Acroneuria grahamia Wu & Claassen, 1934: 126. (original description of male); Wu 1935a: 309. (catalog).

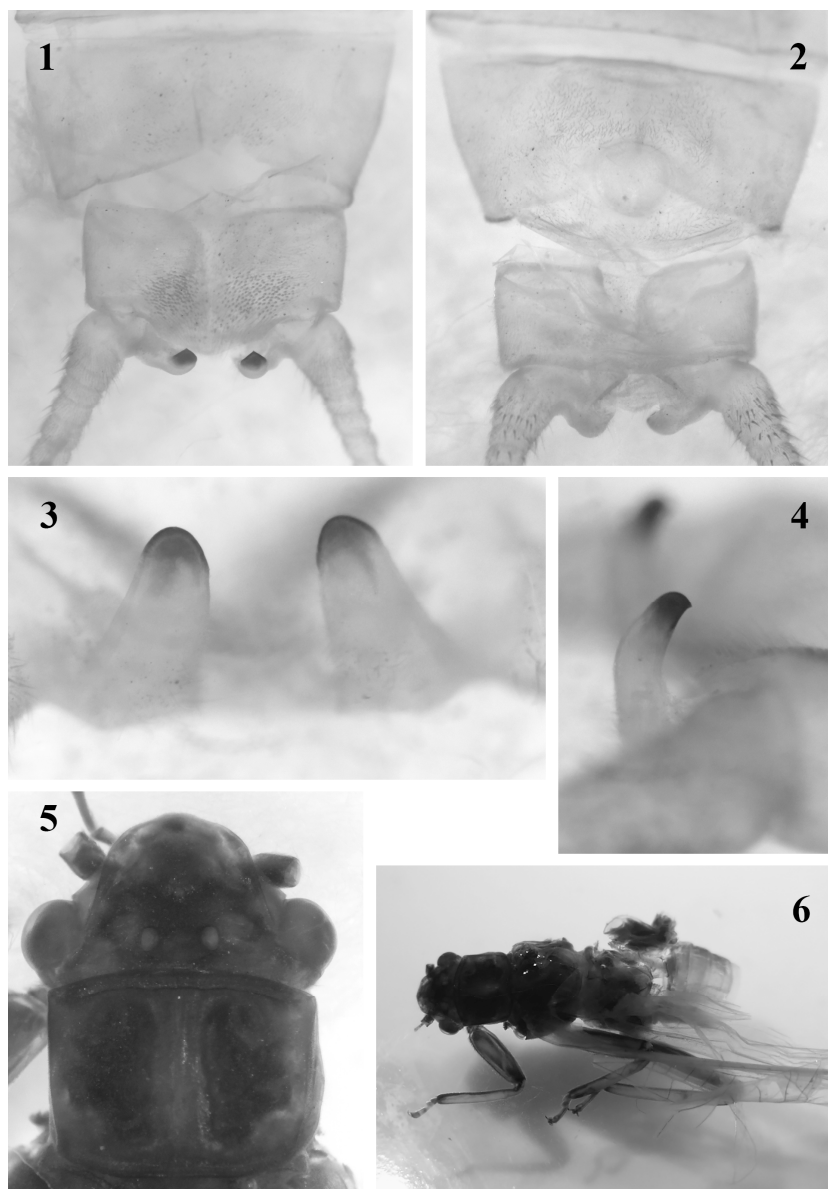
Acroneuria grahamia Wu & Claassen, 1934: Wu 1938: 132. (monograph); Banks 1940: 175. (description of female, new records from Sichuan and Yunnan); Claassen 1940: 174. (catalog); Illies 1966: 308. (catalog); Du 1995: 154. (monograph); Du *et al.* 1999: 63. (checklist); Du 2000: 80. (note on neotype designation by Wu); DeWalt *et al.*, 2016 (catalog).

Type locality. Szechuan (Sichuan Province, without exact locality).

Material examined. *Sichuan:* no exact locality, viii.1928, leg. D.C. Graham: Holotype ♂ (USNM, in vial) (Labels: No. 113 / *Acroneuria grahamia* W-C / male holotype; Szechuan Aug. 1928 / Graham (handwritten); TYPE No. 55239 U.S.N.M. (red label)).

Description. Adult habitus (Figs. 5–6): Large sized species, general colour reddish brown. Tricoellate. Head mostly dark brown with distinct, pale occipital and frontal patches. Occipital ridge not defined, occipital suture indistinct, tentorial callosities and M-line distinct; paired wrinkle presents between M-line and the lateral margins. Eyes and ocelli large; distance between posterior ocelli more than two times diameter of one ocellus. Scape dark brown, rest of antennae lacking but said to be lighter in the original description. Pronotum square, narrower than head with eyes. Its ground colour brown, with prominent dark rugosities. Meso- and metanotum brown with dark brown pattern. Legs brown with darker distal portions on femora, tibiae longitudinally striped; femora and tibiae slightly dilated. Wings hyaline, veins brown. Abdomen pale, only the apex of male paraprocts are brown.

Male terminalia (Figs. 1–4). Abdominal segments 1–8 unmodified, all antecosta weak but entire, interrupted only on sternum and tergum 10. No hair brushes nor laterocaudal spurs, but segments 8–9 strongly sclerotized laterocaudally. Sternum 9 moderately elongated and with short, rounded posterior lobe that covers only part of sternum 10 in natural position. Hammer large and round, positioned more caudad than in center, occupies one fourth of segment's width and more than one third of segment's length; posterior lobe lightly colored posteriolaterad to hammer but dark



Figures 1–6. *Acroneuria grahamia* Wu & Claassen, 1934, holotype male. 1 = terminalia relaxed with KOH, dorsal view; 2 = terminalia relaxed with KOH, ventral view; 3 = paraprocts, caudal view; 4 = paraprocts, lateral view; 5 = head and pronotum, dorsal view; 6 = specimen without terminalia, dorsal view. Not to scale.

medially, its posterior margin thickened. Sternum 10 sclerotized only laterally, antecosta interrupted in medial third of segment width. Tergum 9 with few and indistinct sensilla basiconica positioned in paired posterior field laterally to midline. Tergum 10 with distinct and dense sensilla basiconica, positioned in paired posterior field laterally to midline, occupy half of segment's length and two thirds of segment's width; median line pale and

runs from the interrupted antecosta to the hardly distinguishable epiproct sclerite. Paraproct strong, base pale but apex darker than terminal segments. In lateral view, anterior edge broad V-shaped and with small apical tooth, posterior edge basally straight than strongly curved; in caudal view, broad rounded nearly straight. Cercus broken, covered with moderately long setae, each segment bears apical row of strong but short ventral

and longer lateral setae. Aedeagus lacks distinct armature or sclerite; detailed study or artificial evertion was not possible, due to the specimen's condition.

Female, egg and larva. Unknown.

Affinities. Though the aedeagus of the holotype cannot be studied in details, structure of the terminalia, size and coloration of the holotype confirm its identity as an *Acroneuria*. On the basis of the distribution of sensilla basiconica patches, robust paraprocts with broad rounded apex in caudal view, size of hammer and the faded but still visible head pattern, it can be distinguished from the Asian congeners. However, some of those, e.g. *A. nobiliata* Enderlein, 1909a, are poorly known.

Distribution. The holotype lacks further locality details than 'Szechuan'. However, its collecting date is more specified, August 1928. According to the author's diaries available in the Smithsonian Institution Archives (<https://transcription.si.edu/project/7026>), David Crocket Graham spent that month on a collecting expedition to Ningyuenfu, the present day Xichang city of the Liangshan Yi Autonomous Prefecture in the south of Sichuan Province. Besides the holotype, the species is known only from three females reported by Banks (1940) from Sichuan and Yunnan, but their conspecificity is questionable. The two other *Acroneuria* known from Sichuan are *A. morsei* Du, 2000, described from Guanxian (presently Dujiangyan city), and *A. omeiana* Wu, 1948, described from Mt. Emei, both were found in central Sichuan.

Remarks. Du (2000) noted a neotype designed by Wu was found among the remnants of the Wu Collection. As the holotype still exists, the neotype designation is invalid. The species name was misspelled since Wu (1938).

***Brahmana* Klapálek, 1914**

(Figures 16–17)

Brahmana Klapálek, 1914: 60. (original description in a key); Klapálek, 1916: 62. (detailed description, designa-

tion of type species, description of two new species and assignation of a further one, all from India and Nepal); Wu 1938: 129. (key); Claassen 1940: 180. (catalog); Wu 1962: 150. (description of a further species from China); Illies 1966: 326. (catalog); Zwick 1973a: 273. (catalog); Du 1995: 158. (monograph); Du & He 2001: 370. (generic checklist of China); DeWalt *et al.*, 2016 (catalog).

Type species. *Brahmana suffusa* (Walker, 1852).

Further species included. *B. benigna* (Needham, 1909); *B. chrysostoma* Klapálek, 1916; *B. flavomarginata* Wu, 1962; *B. microphthalma* Klapálek, 1916.

Material examined. India. West Bengal State, Darjeeling District, Kurseong subdivision, N26° 52', E88°16', 1400m, leg. P. Braet: *Brahmana chrysostoma* Klapálek, 1916 1♀ paralectotype (NMP, box VII.13: pinned) (Labels: Kurseong / leg. P. Braet; Typus; *Brahmana chryso...* (handwritten); Lectotypus / *Brahmana* / *chrysostoma* Klp. ♀ / det. P. Zwick 1980 (handwritten)).

Affinities. The genus was first proposed in a key for the newly introduced subfamily *Acroneuriinae*, without detailed description or any species attributed (Klapálek 1914). Soon after, detailed description together with type species designation, description of two new species and assignation of a further species to *Brahmana* was published (Klapálek 1916). Distinctive characters of the genus were listed as follows: head triocellate, short and inserted in the pronotum, eyes unusually small, hind ocelli set close to each other, pronotum wide and not angled, anterior portion slightly enlarged, female subgenital plate large and covering most of sternum 9, male hammer large, paraprocts claw-like, no anal crossveins and hindwing A2 vein straight. Among the five species classified in the genus, three are known only from the female types (*B. chrysostoma*, *B. microphthalma* and *B. suffosa*), and no types of the other two are available (*B. benigna* and *B. flavomarginata*). Thus, the differences between the male terminalia of *Acroneuria* and *Brahmana* are hard to understand, especially as the *Brahmana* aedeagus remained unknown. The wing characters

also do not seem distinctive enough, even individual variation between the lectotype and paralectotype of the type species was reported (Kimmins 1970). However, characters of the short head and its insertion into the pronotum like that of a Peltoperlidae seem to be decisive (Figs. 16–17), and this Oriental genus should be considered valid but poorly known, apparently closely related to *Acroneuria*.

***Flavoperla needhami* (Klapálek, 1916)
comb. nov.**

Perla duvaucelii Pictet, 1841: Needham 1909: 189. (redescription of the male);

Gibosia needhami Klapálek, 1916: 62. (nom. nov. on the basis of the specimens and description given as *Perla duvaucelii* by Needham 1909); Claassen 1940: 154 (catalog); Illies 1966: 335. (catalog); Zwick & Sivec 1980: 133. (lectotype designation, complementary description); DeWalt *et al.*, 2016 (catalog).

Type locality. Kulu, Ostindia (India, Himachal Pradesh State, Kullu District, Kullu, N31°35' E77°06').

Remarks. Klapálek (1916) named this species on the basis of the redescription given by Needham (1909) on Indian specimens he attributed to *Perla duvaucelii* Pictet, 1841. The species was assigned to *Gibosia* Okamoto, 1912. The genus *Flavoperla* Chu, 1929 was described later on the basis of a Chinese species, but soon placed in synonymy with *Gibosia* (Wu 1935). Recently, *Flavoperla* is reconsidered as valid (Uchida 1990, Harper 1994), though its distinction from *Gibosia* still remained problematic and based mostly on the habitus (Sivec & Strak 2008a). However, given from its small size and pale coloration, this Indian species should be considered as a *Flavoperla* instead of the dark colored and large *Gibosia*.

***Kalidasia* Klapálek, 1914 nomen dubium**

Kalidasia Klapálek, 1914: 60. (original description in a key); Klapálek, 1916: 64. (detailed description, designation and description of type species); Wu 1938: 129. (key); Claassen 1940: 182. (catalog); Illies 1966: 338. (catalog); DeWalt *et al.*, 2016 (catalog).

Type species. *Kalidasia radiata* Klapálek, 1916. Monotypic.

Remarks. Similarly to *Brahmana*, this monotypic genus was first proposed in the key of Acroneuriinae (Klapálek 1914) and the type species was described later, together with the more detailed description of the genus (Klapálek 1916). The genus and species was known from the single female holotype, that is apparently lost. In the original description it was stated to be deposited in the Natural History Museum, Vienna, but we did not find there, nor in the Klapálek Collection in Prague.

The type locality was not specified, only East India ('Vých. Indie') indicated that perhaps refers the old geographical/geopolitical meaning covering all of the Indian Subcontinent, as 'West India' was used referring to Indochina.

The genus is considered to be very close to *Brahmana* but different in having small and trapezoid pronotum, one crossvein between veins A2 and A3, and lack of produced female subgenital plate. The brief description and diagnosis may refer to a large sized *Acroneuria* or even a *Claassenia* Wu, 1934 of reduced subgenital plate, as well as a distinct genus indeed. Given that the type is lost and by lack of concrete type locality there is no chance to collect topotypes, the genus and species must be considered nomen dubium.

***Mesoperla* Klapálek, 1913**

Mesoperla Klapálek, 1913: 121. (original description); Klapálek, 1914: 56. (key, included in Perlinae); Klapálek, 1923: 110. (monograph); Claassen 1940: 126. (catalog); Illies 1966: 344. (catalog, transferred to Acroneuriinae); Du & He 2001: 370. (generic checklist of China); DeWalt *et al.*, 2016 (catalog).

Type species. *Mesoperla crucigera* Klapálek, 1913. Monotypic.

***Mesoperla crucigera* Klapálek, 1913**

(Figures 7–15)

Mesoperla crucigera Klapálek, 1913: 121. (original description of male); Klapálek, 1923: 110. (monograph); Banks 1937: 272. (report of a probable female from Taiwan); Claassen 1940: 126. (catalog); Illies 1966: 345. (catalog); Du *et al.* 1999: 64. (species checklist of China); Sivec &

Yang 2001: 402. (species checklist of Taiwan); DeWalt *et al.*, 2016 (catalog).

Type locality. Formosa, Suisharyo (Taiwan, Chiayi County, Alishan Mts., Shui, N23°31' E120°48').

Material examined. Taiwan. Chiayi County, Alishan Mts., Shui, N23°31' E120°48', x.1911, leg. H. Sauter: 1♂ syntype (NMP, box VII.5: pinned, terminalia is in microvial) (Labels: Suisharyo F / H. Sauter; TYPUS; Cotype (red label); MESOPERLA / crucigera Klp. / Klapálek det.).

Description. Adult habitus (Figs. 12–13, 15): Medium sized species, general colour yellowish brown. Triocellate. Head yellowish brown with distinct dark medial stripe from occiput to labrum, occupies the whole area between ocelli and most of the frons anterior to M-line. Occipital ridge not defined, occipital suture indistinct, tentorial callosities and M-line distinct; a wrinkle presents between M-line and the lateral margins. Eyes and ocelli are small; distance between posterior ocelli about four times diameter of one ocellus. Antennae darker than head but scape, pedicell and basal antennomeres pale. Pronotum square, anterior edges slightly angled; narrower than head with eyes. Its ground colour pale brown, with prominent, darker rugosities and a darker medial stripe. Meso- and metanotum brown with dark brown pattern. Legs pale brown, femora and tibiae slightly dilated; wings hyaline, veins brown. Abdomen pale, only the male paraprocts brown.

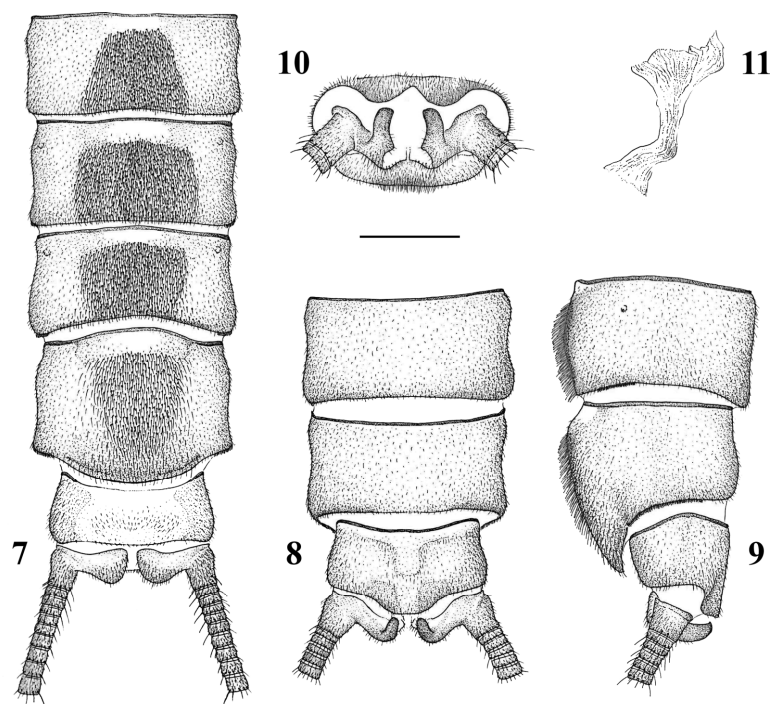
Male terminalia (Figs. 7–11, 14): Abdominal segments covered with soft and pale hairs, sterna 5–9 bear distinct hair brushes and segments 7–9 with laterocaudal spurs but none with sensilla basiconica. All antecosta strong and entire, interrupted only on sternum 10. Ventral hair brushes occupy about half of segment length, start from a little behind antecosta and distributed to posterior edge, the strongest and denser setae occur on sternum 7. The hair brush possesses sharp edge on all but sternum 9, where the strong setae mixed with fine hairs on lateral and caudal edge of the brush. Laterocaudal spurs small on segments 7–8, but on

segment 9 it occupies half of the posterior margin in lateral view. Sternum 9 elongated and with well developed rounded posterior lobe covering sternum 10 in natural position, but lacks any trace of hammer. Sternum 10 sclerotized only laterally, antecosta interrupted in medial three fourth of segment width. Terga all simple, tergum 10 with indistinct, bald median line in the anterior half and medially protruding posterior portion that dark colored on its lateral sides, but lacks distinguishable epiproct sclerite. Paraproct medium sized, darker than terminal segments. In lateral view, anterior edge straight and with small apical tooth, posterior edge regularly curved; in caudal view, inner basal lobe present and the rounded apex slightly bent inwards. Cercus long, covered with moderately long setae, each segment bears apical row of stronger ventral and inner lateral setae. Aedeagus lacks distinct armature or sclerite, covered by small scale-like setae; artificial eversion was not possible.

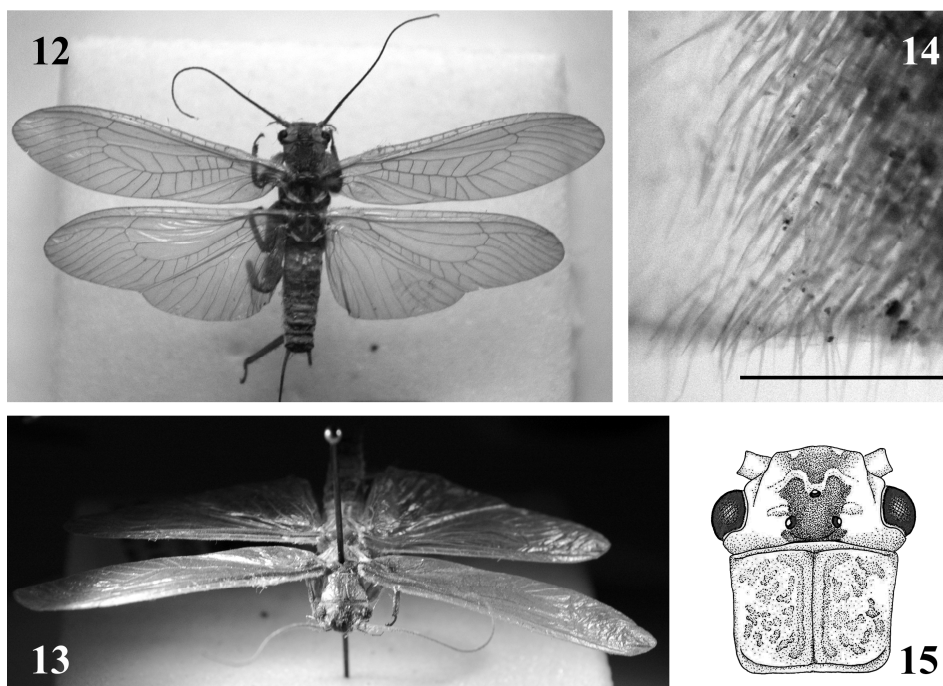
Female. Unknown; Banks (1937) reported but not described a female from Taiwan that may belongs to *Mesoperla*.

Egg and larva. Unknown.

Affinities. The male terminalia of *Mesoperla crucigera* is rather simplified lacks most modifications but of distinct ventral brushes, slightly developed sternum 9 lobe and paraprocts. Due to the lack of hammer on sternum 9, Klapálek (1914) classified it as a Perlinae that has no modified 10th hemitergites. However, modified paraprocts clearly support its classification in Acroneuriinae, as later Illies (1966) proposed. Though uncommon, lack of hammer occurs in other Acroneuriinae, like *Perlesta* Banks, 1906 or the strongly modified *Caroperla* Kohno, 1946. The combination of presence of distinct ventral hair brush on terminal segments with lack of hammer, sensilla basiconica and distinct epiproct already distinguish *Mesoperla* from all other Acroneuriinae genera. However, affinities within the subfamily cannot be concluded, especially as the female, egg and larva are still unknown.



Figures 7–11. *Mesoperla crucigera* Klapálek, 1913, syntype male. 7 = terminalia relaxed with KOH, ventral view; 8 = terminalia relaxed with KOH, dorsal view; 9 = terminalia relaxed with KOH, lateral view; 10 = terminalia relaxed with KOH, caudal view; 11 = uneverted aedeagus. Scale 1 mm.



Figures 12–15. *Mesoperla crucigera* Klapálek, 1913, syntype male. 12 = habitus, dorsal view; 13 = habitus, anterodorsal view; 14 = scales of the ventral hair brush on sternum 7; 15 = head and pronotum, dorsal view. Scale 0.5 mm for Fig. 14, 1 mm for Fig. 15; Figs. 12–13 not to scale.

Distribution. The four male syntypes were collected in the Alishan Ranges of Central Taiwan, no additional specimens with detailed locality were reported since. Most probably endemic to Taiwan.

***Nirvania* Klapálek, 1914 nomen dubium**

(Figure 18)

Nirvania Klapálek, 1914: 61. (original description in a key); Klapálek, 1916: 64. (detailed description, designation and description of type species); Claassen 1940: 183. (catalog); Illies 1966: 346. (catalog); DeWalt *et al.*, 2016 (catalog).

Nirvania Klapálek, 1914: Wu 1938: 131. (key).

Type species. *Nirvania pertristis* Klapálek, 1916. Monotypic.

Material examined. Vietnam. Lào Cai Province, Sa Pa District, Thanh Phú, N22°15' E103° 59', 400–500m): labels and pin of the destroyed ♀ holotype (NMP, box VII.13) (Labels: Muong-Bo (handwritten); Tonkin; TYPE; Nirvania / pertristis Klp (Klapálek's handwrite)).

Remarks. Similarly to *Brahmana* and *Kalidasia*, this monotypic genus was first proposed in the key of Acroneuriinae (Klapálek 1914) and the type species was described later, together with the more detailed description of the genus (Klapálek 1916). The genus and species was known from the single female holotype that was totally destroyed by Dermestidae, and only its pin and labels remained in the National Museum Prague (Fig. 18). Distinctive characters of the genus were pointed as follows: head biocellate, occipital region not prolonged, pronotum with narrow median stripe, female lacks produced subgenital plate, and several wing venation characters that would separate it from *Anacroneuriini* and *Kiotiniini*. There are several other Perlidae described or reported from the vicinity of the type locality of *N. pertristis*, including biocellate Acroneuriinae like *Hemacroneuria violacea* Enderlein, 1909b, *H. marginalis* Sivec & Stark, 2008d or *Sinacroneuria biocellata* Sivec & Strak, 2008b. As the

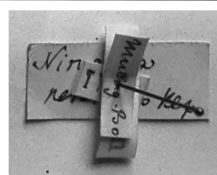
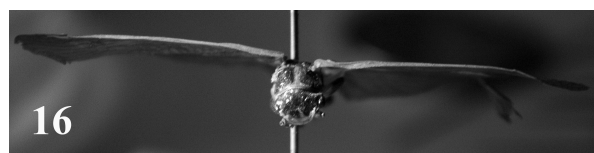
single type was destroyed and the original description is rather brief, it is undoubtedly better to consider both the genus and species as nomen dubium than to transfer any of the properly described or redescribed species from Sa Pa.

***Sinacroneuria sinica* (Yang & Yang, 1998) comb. nov.**

Acroneuria sinica Yang & Yang, 1998: 41. (original description of the male); DeWalt *et al.*, 2016 (catalog).

Type locality. China, Zhejiang Province, Longwangshan.

Remarks. The aedeagus of this species also has the Y-arm sclerites characteristic for *Sinacroneuria* Yang & Yang, 1995a (Yang & Yang 1998: Fig. 9-12). Thus, it should be considered as a further species of that genus.



Figures 16–18. *Brahmana* Klapálek, 1914 and *Nirvania* 1914 type specimens. 16 = *Brahmana chrysostoma* Klapálek, 1916, paralectotype female, habitus, frontal view; 17 = *Brahmana chrysostoma* Klapálek, 1916, paralectotype female, habitus, dorsal view; 18 = *Nirvania pertristis* Klapálek, 1916, labels and pin of the destroyed holotype female. Not to scale.

Key to the males of Asian Acroneuriinae genera

1. First cercal segment modified, longer than segment 10. *Caroperla*
First cercal segment unmodified. 2.
2. Sternum 9 lacks hammer 3.
Sternum 9 with distinct hammer. 4.
3. Sterna 5–9 with distinct hair brush. *Mesoperla*
Sterna lack hair brush. *Perlesta*
4. Paraprocts longer than segment 10, apex spatulated *Niponiella*
Paraprocts much shorter than segment 10, apex not spatulated. 5.
5. Tergum 10 with pair of lateral spines or knobs. 6.
Tergum 10 lacks paired lateral modifications. 9.
6. Hammer stalked, posterior ocelli set closer to eyes than to each other. 7.
Hammer not elevated, posterior ocelli set closer to each other. 8.
7. Pale, small sized species, epiproct weakly fused to tergum 10. *Flavoperla*
Dark, large sized species, epiproct fully isolated. *Gibosia*
8. Tergum 10 with lateral spines, epiproct distinct. ...
..... *Kiotina*
Tergum 10 with lateral knobs, epiproct indistinguishable. *Hemacroneuria*
9. Head short and inserted in the wide pronotum, eyes small. *Brahmana*
Head not inserted in the usually rectangular pronotum. 10.
10. Aedeagus with distinct, Y-shaped sclerite.
..... *Sinacroneuria*
Aedeagus lacks sclerite. 11.
11. Epiproct distinct and separated. 12.
Epiproct indistinct. *Acroneuria*
12. Aedeagus with well developed spine patches, hammer rectangular. *Calineuria*
Aedeagus lacks distinct spine patches, hammer oval. *Xanthoneuria*

Checklist of the Oriental Acroneuriinae

Acroneuriini Klapálek, 1914

Genera included. East Palaearctic: Xanthoneuria Uchida, 2011 (in. Uchida *et al.* 2011). **East Palaearctic** and **Nearctic**: *Calineuria* Ricker, 1954. **Nearctic**: *Attaneuria* Ricker, 1954, *Beloneuria* Needham & Claassen, 1925, *Doroneuria* Needham & Claassen, 1922, *Eccoptura* Klapálek, 1921, *Hansonoperla* Nelson, 1979, *Hesperoperla* Banks, 1938, *Perlinella* Banks, 1900. **Nearctic** and **Oriental**: *Acroneuria* Pictet, 1841. **Oriental**: *Brahmana* Klapálek, 1914, *Mesoperla* Klapálek, 1913, *Sinacroneuria* Yang & Yang, 1995a.

Nomina dubia: *Kalidasia* Klapálek, 1914 (Oriental), *Nakaharia* Navás, 1916 (East Palaearctic), *Nirvania* Klapálek, 1914 (Oriental).

***Acroneuria* Pictet, 1841**

(Figure 19)

Type species. Perla (Acroneuria) arenosa Pictet, 1841.

Further species included. 19 Nearctic species besides the type species, and the 16 Oriental species enumerated herein. Not known from the Palaearctic, neither from the Pacific region of the Nearctic.

Synonym. Nosatura Navás, 1918, type species *Perla carolinensis* Banks, 1905.

Acroneuria apicalis Stark & Sivec, 2008c

Sivec & Stark 2008c: description of male, female and egg; holotype and paratypes from Vinh Phu Province of Vietnam.

Known only from northern Vietnam. Holotype and paratypes are in the Royal Ontario Museum, Toronto, Canada, further paratypes in the Institute of Ecology and Biological Resources, Hanoi, Vietnam and Slovenian Museum of Natural History, Ljubljana, Slovenia. Larva is unknown.

Acroneuria azunensis Stark & Sivec, 2008c

Sivec & Stark 2008c: description of male, female and egg; holotype and paratypes from Gia Lai Province of Vietnam.

Known only from southern Vietnam. Holotype and paratypes are in the Royal Ontario Museum, Toronto, Canada, further paratypes in Institute of Ecology and Biological Resources, Hanoi, Vietnam, the Bill Stark Collection, Clinton, Mississippi, USA and Slovenian Museum of Natural History, Ljubljana, Slovenia. Larva is unknown.

Acroneuria bachma Cao & Bae, 2007

Cao & Bae 2007: description of male, female, and putative larva; holotype from Thua Thien-Hue Province of Vietnam.

Sivec & Stark 2008c: complementary description of male, confirmation of larval association; further records from Thua Thien-Hue Province.

Known only from central Vietnam. Holotype and paratypes are in Seoul Women's University Aquatic Insect Collection, Seoul, South Korea.

Acroneuria distinguenda Zwick, 1977

Zwick 1977: description of male; holotype from Bhutan.

Sivec 1981: description of female; first report from Nepal.

Known only from Bhutan and Nepal. Holotype is in Natural History Museum of Basel, Switzerland. Larva is unknown.

Acroneuria grahamia Wu & Claassen, 1934

Wu & Claassen 1934: description of male; holotype from Sichuan Province of China.

Banks 1940: description of female; new records from Sichuan and Yunnan.

Present paper: redescription of male, on the basis of the holotype.

Known from Sichuan and Yunnan. Holotype is in the National Museum of Natural History, Washington D.C., USA. Larva is unknown, association of female needs to be confirmed.

Acroneuria hainana Wu, 1938

Wu 1938: description of male and female; holotype and allotype from Hainan Province of China.

Du 2002: transfer to *Sinacroneuria* Yang & Yang, 1995a.

Li *et al.*, 2014: stat. rev. in *Acroneuria*.

Known only from the types, collected in Hainan. Holotype and allotype were deposited in Fan Memorial Institute of Biology, Beijing, China, but must be considered lost. Larva is unknown. Redescription on the basis of topotypes is needed.

Acroneuria magnifica Cao & Bae, 2007

Cao & Bae 2007: description of male, female, egg and larva; holotype from Lao Cai Province of Vietnam.

Sivec & Stark 2008c: complementary description of male; further records from Lao Cai Province.

Known only from northern Vietnam. Holotype and paratypes are in Seoul Women's University Aquatic Insect Collection, Seoul, South Korea.

Acroneuria morsei Du, 2000

Du 1995: manuscript description.

Du 2000: description of male and female; holotype and paratypes from Sichuan Province of China.

Known only from the types, collected in Sichuan. Holotype and paratypes are in Insect Collection of Yangzhou University, Yangzhou, Jiangsu, China. Larva is unknown.

Acroneuria multiconata Du, 2000

Du 1995: manuscript description.

Du 2000: description of male and female; holotype and paratypes from Shaanxi Province of China.

Du & Sivec 2005: first record from Gansu Province of China.

Known from Shaanxi and Gansu. Holotype and paratypes are in Insect Collection of Yangzhou University, Yangzhou, Jiangsu, China. Larva is unknown.

Acroneuria nobiliata Enderlein, 1909a

Enderlein 1909a: description of female as *Acroneuria* (*Niponiella*) *nobiliata*; holotype from Lang Son Province of Vietnam (Manson-Gebirge = Mt. Mau Son).

Klapálek 1909a: description of male and female of *Acroneuria ampla* Klapálek, 1909; syntypes are from the same serie like the type of *A. nobiliata*.

Klapálek 1909b: proposing the synonymy of the two species; classification as *Acroneuria s.s.*

Zwick 1973b: redescription of the holotype; notes on the priority between the two names.

Known only from the type locality in northern Vietnam. Holotype of *A. nobiliata* is in Institute

of Zoology, Polish Academy of Sciences, Warsaw, Poland. Syntypes of *A. ampla* were stated to be deposited in the Natural History Museum Berlin, Germany; probably no specimen was left in the Klapálek Collection deposited in the National Museum Prague. Larva is unknown. If available, the male type should be redescribed.

Acroneuria omeiana Wu, 1948b

Wu 1948b: description of male and female; holotype, allotype and paratype from Sichuan Province of China.

Known only from the types, collected in Sichuan. Holotype, allotype and paratype were deposited in Yenching University Collection, Beijing, China, but must be considered lost. Larva is unknown. Redescription on the basis of topotypes needed.

Acroneuria personata Harper, 1976

Harper 1976: description of male and female; holotype and paratypes from Nepal.

Zwick 1977: complementary description of male; first record from Bhutan.

Sivec 1981: complementary description of female.

Known from Nepal and Bhutan. Holotype and paratypes are in the Collection of the Faculty of Agriculture of Hokkaido University, Sapporo, Japan. Larva is unknown.

Acroneuria zhejiangensis Yang & Yang, 1995b

Yang & Yang 1995b: description of male and female; holotype and paratypes from Zhejiang Province of China.

Known only from the types, collected in Zhejiang. Holotype and paratypes are in Entomological Museum of China Agricultural University, Beijing, China. Larva is unknown.

Acroneuria VN-A sensu Stark & Sivec (2008c)

Sivec & Stark 2008c: description of female and egg from Lao Cai Province of Vietnam.

Known only from the single female collected in northern Vietnam. The specimen is in the Royal Ontario Museum, Toronto, Canada. Association of male will be needed for formal description.

Acroneuria ? *sp. 1* sensu Sivec (1981)

Sivec 1981: description of female and egg from Nepal.

Known only from a single female collected in Nepal. The specimen is in the Slovenian Museum of Natural History, Ljubljana, Slovenia. Association of male will be needed for formal description.

Acroneuria ? *sp. 2* sensu Sivec (1981)

Sivec 1981: description of female and egg from Nepal.

Known only from the single female collected in Nepal. The specimen is in the Slovenian Museum of Natural History, Ljubljana, Slovenia. Association of male will be needed for formal description.

***Brahmana* Klapálek, 1914**

(Figure 20)

Type species. *Perla (Perla) suffusa* Walker, 1852.

Further species included. Four Oriental species enumerated herein.

Brahmana benigna (Needham, 1909)

Needham 1909: description of male as *Perla benigna*; holotype from Sikkim State of India.

Klapálek 1916: key, and transfer to *Brahmana*.

Known only from the holotype, collected in Sikkim. The holotype was deposited in the Indian Museum, Kolkata, India. Though the specimens deposited in India are very probably lost, Zwick & Sivec (1980) found some of Needham's Indian types retained in his collection in the Cornell University, Ithaca, New York. Female and larva are unknown. If the type exists, male redescription is needed.

Brahmana chrysostoma Klapálek, 1916

Klapálek 1916: description of female; lectotype from Sikkim, paralectotype from West Bengal State of India.

Kimmins 1970: lectotype designation.

Known only from the types, collected in Sikkim and northern area of West Bengal. Lectotype is in the British Museum of Natural History, London, United Kingdom. The paralectotype was stated to be deposited in 'Mus. Brussel' (Klapálek

1916) but, as detailed above, it remained in the National Museum Prague. Male and larva are unknown.

Brahmana flavomarginata Wu, 1962

Wu 1962: description of male and female; holotype, allotype and paratype from Yunnan Province of China.

Du 1995: new distribution data from Oriental China, including Guangxi.

Du & Sivec 2005: first record from Shaanxi Province of China.

Known from Yunnan, Shaanxi and Guangxi. In his thesis, Du (1995) enumerated several additional localities from all over the Oriental regions of continental China, and also proposed a new species. However, these data were not formally published. Holotype, allotype and paratype were deposited in Institute of Zoology of Academia Sinica, Beijing, China, but must be considered lost. Larva is unknown. Redescription on the basis of topotypes is needed.

Brahmana micropthalma Klapálek, 1916

Klapálek 1916: description of female; holotype from Meghalaya State of India.

Known only from the holotype, collected in Meghalaya. Holotype was stated to be deposited in the Natural History Museum, Vienna, Austria. We were not able to locate it, neither in Vienna nor in the National Museum Prague, therefore it must be considered lost. Male and larva are unknown. Redescription on the basis of topotypes is needed.

Brahmana suffusa (Walker, 1852)

Walker 1852: description of female as *Perla* (*Perla*) *suffusa*; lectotype and paralectotype from Nepal.

Klapálek 1916: key, and transfer to *Brahmana* as its type species.

Kimmins 1970: lectotype designation and complementary description.

Known only from Nepal on the basis of the two syntype specimens. Lectotype and paralectotype are in the British Museum of Natural History, London, United Kingdom. Male and larva are unknown. Redescription of the female is needed.

Mesoperla Klapálek, 1913

(Figure 21)

Type species. *Mesoperla crucigera* Klapálek, 1913. Monotypic.

Mesoperla crucigera Klapálek, 1913

Klapálek 1913: description of male: syntypes from Taiwan.

Banks 1937: report of a probable female from Taiwan.

Present paper: redescription of male, on the basis of a syntype.

Known only from Taiwan. In the original description, Klapálek (1913) did not state the depository of the four male syntypes. Three are held in the Deutschen Entomologischen Institutes, Berlin, Germany, like most of his specimens published from Taiwan (Petersen & Gaedike, 1968), while the fourth remained in his collection and now kept in the National Museum Prague, Czech Republic. Female and larva are unknown.

Sinacroneuria Yang & Yang, 1995a

(Figure 22)

Type species. *Sinacroneuria orientalis* Yang & Yang, 1995a.

Further species included. The nine Oriental species enumerated herein. *Nishineuria cornuta* Uchida, 1990, a not yet validated species from Palaeartic Japan may also belong here, and a further Oriental species is under description (Li *et al.*, in preparation).

Sinacroneuria bicornuata Stark & Sivec, 2008b

Sivec & Stark 2008c: description of male; holotype from Sichuan Province of China.

Li *et al.*, 2014: complementary description of male, on the basis of holotype.

Known only from the holotype, caught in Sichuan. Holotype is in the National Museum of Natural History, Washington D.C., USA. Female and larva are unknown.

Sinacroneuria biocellata Stark & Sivec, 2008b

Sivec & Stark 2008c: description of male; holotype from Lao Cai Province of Vietnam.

Known only from the holotype, caught in northern Vietnam. Holotype is in the Royal Ontario Museum, Toronto, Canada. Female and larva are unknown.

Sinacroneuria dabiेशana Li & Murányi, 2014

Li *et al.*, 2014: description of male and female; holotype and paratypes from Henan Province, further paratypes from Hubei Province of China.

Known from Henan and Hubei. Holotype and paratypes are in the Insect Collection of Henan Institute of Science and Technology, Xinxiang, Henan, China, further paratypes are in the Department of Zoology, Hungarian Natural History Museum, Budapest, Hungary, and in the Entomological Museum of China Agricultural University, Beijing, China. Larva is unknown.

Sinacroneuria flavata (Navás, 1933)

Navás 1933: description of female as *Kamimuria flavata*; holotype from Zhejiang Province of China.

Illies 1966: nomen dubium.

Du *et al.*, 1999: transfer to *Sinacroneuria*.

Known only from the holotype, caught in Zhejiang. Holotype is in the National Museum of Natural History, Paris, France. Male and larva are unknown. Since the type exists, it is not a nomen dubium as stated by Illies (1966) but redescription of the female is needed.

Sinacroneuria longwangshana (Yang & Yang, 1998)

Yang & Yang 1998: description of male as *Acroneuria longwangshana*; holotype and paratype from Zhejiang Province of China.

Du *et al.*, 2001: transfer to *Sinacroneuria*.

Known only from the types, collected in Zhejiang. Holotype and paratype are in Entomological Museum of China Agricultural University, Beijing, China. Female and larva are unknown.

Sinacroneuria orientalis Yang & Yang, 1995a

Yang & Yang 1995a: description of male and female; holotype and paratype from Anhui Province of China.

Known only from the types, collected in Anhui. Holotype and paratype are in Entomological Museum of China Agricultural University, Beijing, China. Larva is unknown.

Sinacroneuria quadriplagiata (Wu, 1938)

Wu 1938: description of male as *Acroneuria quadriplagiata*; holotype from Zhejiang Province of China.

Du *et al.*, 2001: transfer to *Sinacroneuria*.

Known only from the holotype, caught in Zhejiang. Holotype was deposited in Heude Museum, Shanghai, China, but must be considered lost. Female and larva are unknown. Redescription on the basis of topotypes is needed.

Sinacroneuria sinica (Yang & Yang, 1998)

Yang & Yang 1998: description of male as *Acroneuria sinica*; holotype and paratypes from Zhejiang Province of China.

Present paper: transfer to *Sinacroneuria*.

Known only from the types, collected in Zhejiang. Holotype and paratypes are in Entomological Museum of China Agricultural University, Beijing, China. Female and larva are unknown.

Sinacroneuria wui (Yang & Yang, 1998)

Yang & Yang 1998: description of male as *Acroneuria wui*; holotype from Zhejiang Province of China.

Du *et al.*, 2001: transfer to *Sinacroneuria*.

Known only from the holotype, collected in Zhejiang. Holotype is in Entomological Museum of China Agricultural University, Beijing, China. Female and larva are unknown.

Sinacroneuria yiui (Wu, 1935a)

Wu 1935a: description of male as *Mesoperla yiui*; holotype from Jiangxi Province.

Wu 1938: transfer to *Acroneuria*.

Banks 1940: complementary description of male, on the basis of a specimen from Sichuan.

Yang & Yang 1998: redescription of male, on the basis of similar head and leg pattern, material from Zhejiang.

Du *et al.*, 2001: transfer to *Sinacroneuria*.

Known from Jiangxi and Zhejiang. Holotype was deposited in the Yenching University Collection, Beijing, China, but must be considered lost. The male reported from Sichuan by Banks (1940) clearly refers to another species. Female and larva are unknown.

Kiotinini Uchida, 1990

Genera included. East Palaearctic: *Niponiella* Klapálek, 1907. **East Palaearctic and Oriental:**

Caroperla Kohno, 1946, *Flavoperla* Chu, 1929, *Gibosia* Okamoto, 1912, *Kiotina* Klapálek, 1907. **Nearctic and Oriental:** *Perlesta* Banks, 1906. **Oriental:** *Hemacroneuria* Enderlein, 1909b.

***Caroperla* Kohno, 1946**

(Figure 23)

Type species. *Caroperla pacifica* Kohno, 1946.

Further species included. The two Oriental species enumerated herein, besides the Honshu endemic type species. Further two, yet unnamed species were reported from Palaeartic Japan (Inada 1998).

Caroperla longiseta Sivec & Stark, 2010

Sivec & Stark 2010: description of male, female, larva and egg; holotype, paratypes and additional specimens from Chiang Mai Province of Thailand.

Known only from northern Thailand. Holotype and paratypes are in Slovenian Museum of Natural History, Ljubljana, Slovenia.

Caroperla siveci Li & Wang, 2014

Li & Wang 2014: description of male, female and egg; holotype and paratypes from Fujian Province of China.

Known only from the types, collected in Fujian. Holotype and paratypes are in Entomological Museum of China Agricultural University, Beijing, China. Larva is unknown.

***Flavoperla* Chu, 1929**

(Figure 24)

Type species. *Flavoperla biocellata* Chu, 1929.

Further species included. The eight Oriental species enumerated herein, and further five species from the Pacific isles of the East Palaeartic, up to Sakhalin. Further three, yet unnamed species reported from Palaeartic Japan as *Gibosia* sp. 2, 3, 4 (Inada 1998) probably also belong to *Flavoperla*.

Flavoperla biocellata Chu, 1929

Chu 1929: description of male and female; holotype and allotype from Zhejiang Province of China.

Wu 1935b: synonymy of *Gibosia* Okamoto, 1912 and *Flavoperla*.

Wu 1938: redescription on the basis of the original description.

Uchida 1990: revalidation of *Flavoperla*.

Known only from the types, collected in Zhejiang. Holotype and allotype were in Chu's collection in Hangzhou, Zhejiang, China, but must be considered lost. Larva is unknown. Redescription on the basis of topotype is needed.

Flavoperla dao Stark & Sivec, 2010a

Stark & Sivec 2008a: description of male, female and egg; holotype and paratypes from Bac Kan Province of Vietnam.

Known only from northern Vietnam. Holotype and paratypes are in the Royal Ontario Museum, Toronto, Canada, further paratypes in Institute of Ecology and Biological Resources, Hanoi, Vietnam. Larva is unknown.

Flavoperla hmong Stark & Sivec, 2010a

Stark & Sivec 2008a: description of male, female and egg; holotype and paratypes from Lao Cai Province of Vietnam, further paratypes are from Thua Thien-Hue Province.

Known from northern and central Vietnam. Holotype and paratypes are in the Royal Ontario Museum, Toronto, Canada, further paratypes in Institute of Ecology and Biological Resources, Hanoi, Vietnam, and in the Museum of Zoology of the Humboldt University, Berlin, Germany. Larva is unknown.

Flavoperla lucida (Klapálek, 1913)

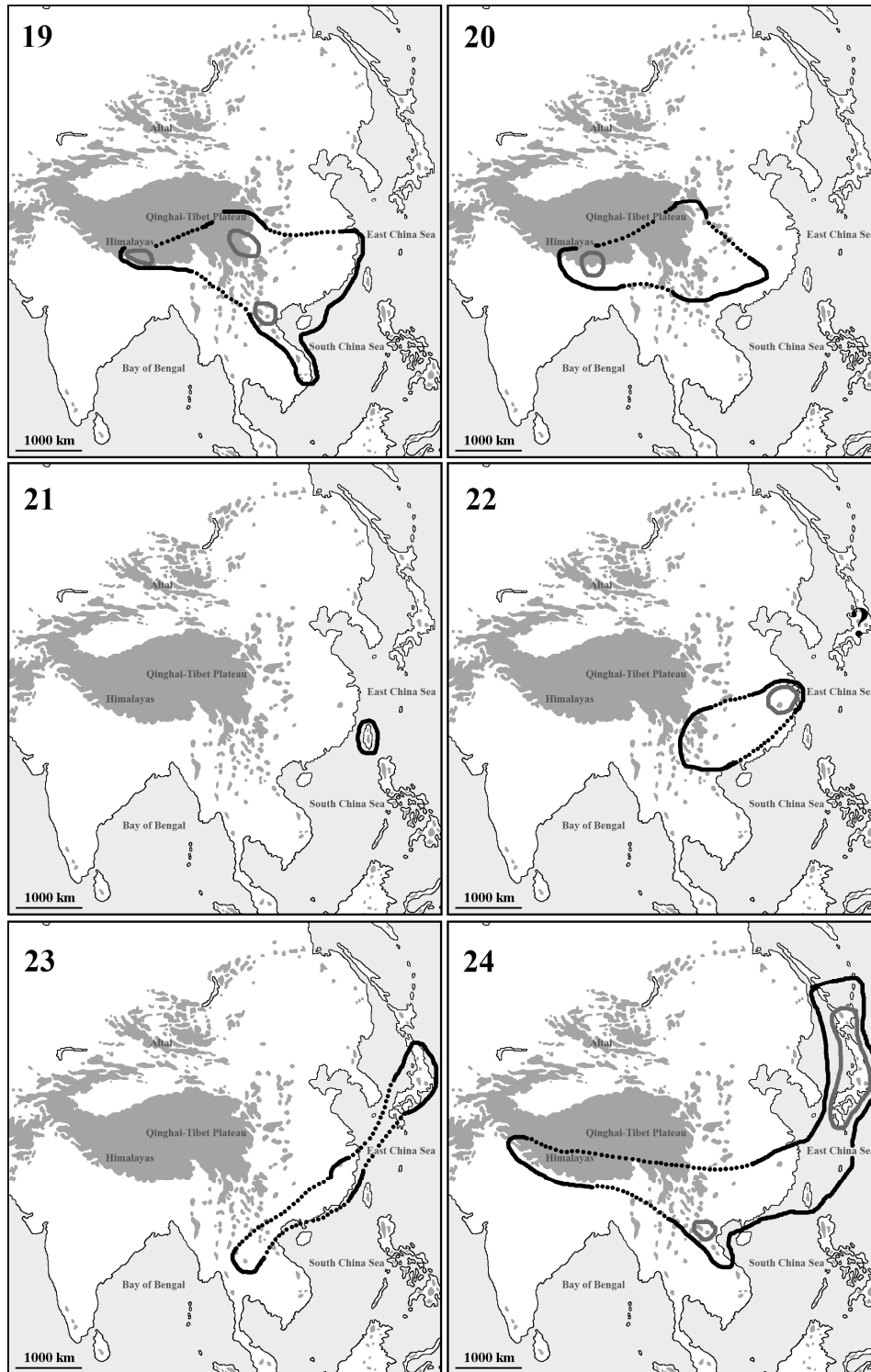
Klapálek 1913: description of male as *Kiotina lucida*; holotype from Taiwan.

Klapálek 1916: transfer to *Gibosia* Okamoto, 1912.

Banks 1937: further record from Taiwan.

Uchida 1990: transfer to *Flavoperla*.

Known only from Taiwan. Holotype exists in the Collection of the Deutschen Entomologischen Institutes, Berlin, Germany (Petersen & Gaedike 1968). Female and larva are unknown. Redescription of the male is needed.



Figures 19–24. Asian distribution of the Acroneuriinae genera. 19 = *Acroneuria* Pictet, 1841; 20 = *Brahmama* Klapálek, 1914; 21 = *Mesoperla* Klapálek, 1913; 22 = *Sinacroneuria* Yang & Yang, 1995; 23 = *Caroperla* Kohno, 1946; 24 = *Flavoperla* Chu, 1929. Black line delimitate areas where at least one species occur (dotted where only expected), while dark grey lines delimitate areas where more than one species occur; grey areas are above 2000 meters asl.

Flavoperla needhami (Klapálek, 1916)

Needham 1909: description of male as *Perla duvaucelii* Pictet, 1841; syntypes from Himachal Pradesh State of India.

Klapálek 1916: nom. n. *Gibosia needhami* Klapálek, 1916 on the basis of the specimens of Needham.

Zwick & Sivec 1980: lectotype designation, complementary description, first record from West Bengal State of India.

Present paper: transfer to *Flavoperla*.

Known from the Siwalik and Lesser Himalayan Ranges of the Himalayas, from Himachal Pradesh and West Bengal States of India. 'Kulu' is the type locality of further three species described by Needham in the same paper: *Kamimuria ione* (Needham, 1909), *Neoperla indica* Needham, 1909 and *Cryptoperla torva* Needham, 1909. In their case, it is specified as 'Kulu, W. Himalayas', thus it should refer to Kullu or Kulu, the capital of Kullu District in Himachal Pradesh. The two syntypes were stated to be deposited in the Indian Museum, Kolkata, India, but fragments of one specimen was found in Needham's collection in the Cornell University, Ithaca, New York, and it was designated as lectotype (Zwick & Sivec 1980). Female and larva are unknown. A detailed redescription of the male would be needed.

Flavoperla ovalolobata (Wu, 1948b)

Wu 1948b: description of male as *Gibosia ovalolobata*; holotype from Fujian Province of China.

Uchida 1990: transfer to *Flavoperla*.

Known only from the holotype, collected in Fujian. Holotype was deposited in Yen-ching University Collection, Beijing, China, but must be considered lost. Female and larva are unknown. Redescription on the basis of topotype needed.

Flavoperla pallida Stark & Sivec, 2010a

Stark & Sivec 2008a: description of male, female and egg; holotype and paratype from Lao Cai Province of Vietnam.

Known only from the types caught in northern Vietnam. Holotype and paratype are in the Royal Ontario Museum, Toronto, Canada. Larva is unknown.

Flavoperla thoracica (Okamoto, 1912)

Kawai 1968a: description of male of *Gibosia linguambita* Kawai, 1968a; holotype and paratypes from Okinawa Prefecture of Japan.

Uchida 1990: synonymy of *Gibosia linguambita* with *Kiotina (Gibosia) thoracica*, transfer to *Flavoperla*.

Inada 2013: first record from Amami Island of Kagoshima Prefecture.

Shimura *et al.* 2014: larval records of a *Flavoperla* sp. from Amami Island, probably also refer to *F. thoracica*.

Widespread species in Palaearctic Japan, enters the Oriental Realm down to Okinawa Island. Syntypes of *F. thoracica* were deposited in the Tohoku University, Sapporo, Japan, but presently kept in the Lake Biwa Museum, Kusatsu, Japan. Holotype and paratypes of *G. linguambita* were deposited in the Bishop Museum, Honolulu, Hawaii.

***Gibosia* Okamoto, 1912**

(Figure 25)

Type species. Kiotina angusta Klapálek, 1907.

Further species included. As enumerated below. Generic identity of both further species are questionable, but a further, yet unnamed species was reported from Palaearctic Japan as *Gibosia* sp. 1 (Inada 1998).

Gibosia bispinata Wu, 1962

Wu 1962: description of male; holotype from Yunnan Province of China.

Stark & Sivec 2008a: questioning generic identity, may belong to *Flavoperla* Chu, 1929.

Known only from the holotype, collected in Yunnan. Holotype was deposited in Institute of Zoology of Academia Sinica, Beijing, China, but possibly lost. Female and larva are unknown. Redescription on the basis of topotypes needed.

Gibosia perspicillata Klapálek, 1916

Klapálek 1916: description of female; five syntypes from Hong Kong, one syntype from North China without further details.

Wu 1938: redescription on the basis of the original description.

Kimmins 1970: designation of the North China syntype as lectotype.

Known only from the type specimens, originated from Hong Kong and an unspecified locality in Palaearctic North China. All syntypes were

stated to be deposited in the British Museum of Natural History, London, United Kingdom. However, only three females exist there, and the one from North China was designed as lectotype while the further two from Hong Kong as paralectotypes (Kimmins 1970). We found no syntypes left in the Klapálek Collection in Prague. Despite that existence of male syntypes is evidently written in the German version of the original description (Klapálek 1916: page 80: '3 ♀, 2 ♂ aus Hong Kong, 1 aus Nordchina'; preceding Czech section, page 60: 3 ♀, 2 z Hong-Kongu, 1 ze Sev. Číny'), the fact that the male terminalia was not described contradict their then presence.

Wu (1938) erroneously noted that the later lectotype from North China is a male, its gender was not specified in neither the Czech nor the German text. Since the male is unknown, generic identity is questionable. Given from the small size and pale coloration, it is very probably not a *Gibosia*. Moreover, due to the huge distance between the two localities, conspecificity of the lectotype and the paralectotypes is also in question.

***Hemacroneuria* Enderlein, 1909b**

(Figure 26)

Type species. *Hemacroneuria violacea* Enderlein, 1909b.

Further species included. The two Oriental species enumerated herein.

***Hemacroneuria malickyi* Stark & Sivec, 2008d**

Stark & Sivec 2008d: description of male, female and egg; holotype and paratypes from Vinh Phúc Province of Vietnam.

Known only from northern Vietnam. Holotype and paratypes are in the Slovenian Museum of Natural History, Ljubljana, Slovenia. Larva is unknown.

***Hemacroneuria marginalis* Stark & Sivec, 2008d**

Stark & Sivec 2008d: description of male, female, and larva; holotype and paratypes from Lao Cai Province of Vietnam.

Known only from northern Vietnam. Holotype and paratypes are in the Royal Ontario Museum, Toronto, Canada, further paratypes in the Museum of Zoology of the Humboldt University, Berlin, Germany.

***Hemacroneuria violacea* Enderlein, 1909b**

Enderlein 1909b: description of male and female; syntypes from Lang Son Province of Vietnam (Manson-Gebirge = Mt. Mau Son).

Klapálek 1916: transfer to *Kiotina* Klapálek, 1907.

Zwick 1973b: redescription of male and female; lectotype designation; transfer to *Acroneuria* Pictet, 1841; first record from Fujian Province of China.

Stark & Sivec 2008d: redescription of male; further record from Lao Cai Province of Vietnam.

Known from northern Vietnam and Fujian. Lectotype and paralectotype are in the Institute of Zoology of Polish Academy of Sciences, Warsaw, Poland. Larva is unknown.

***Kiotina* Klapálek, 1907**

(Figure 27)

Type species. *Acroneuria (Kiotina) pictetii* Klapálek, 1907.

Further species included. Three East Palaearctic species besides the type species and the 13 Oriental species enumerated herein. Further one, yet unnamed species reported from Palaearctic Japan as *Kiotina* sp. KM (Nio & Inada 2005). Most of the Chinese species are inadequately known, and at least two of them very probably belong to another genus.

Synonym. *Schistoperla* Banks, 1937, type species *Schistoperla collaris* Banks, 1937.

***Kiotina albopila* (Wu, 1948b)**

Wu 1948b: description of male as *Gibosia albopila*; holotype and paratype from Fujian Province of China.

Du 1995: transfer to *Kiotina* Klapálek, 1907.

Stark & Sivec 2008a: questioning generic identity, may belong to *Flavoperla* Chu, 1929.

Known only from the types, collected in Fujian. Holotype and paratype were deposited in Yen-ching University Collection, Beijing, China, but must be considered lost. Female and larva are

unknown. Redescription on the basis of topotypes needed.

Kiotina bifurcata Stark & Sivec, 2008d

Stark & Sivec 2008d: description of male; holotype from Fujian Province of China.

Known only from the holotype, collected in Fujian. Holotype is in the Alexander Koenig Zoological Research Institute and Zoological Museum, Bonn, Germany. Female and larva are unknown.

Kiotina chekiangensis (Wu, 1938)

Wu 1938: description of male and female as *Atoperla chekiangensis*; holotype and allotype from Zhejiang Province of China.

Illies 1966: transfer to *Gibosia* Okamoto, 1912.

Du *et al.*, 1999: transfer to *Kiotina* Klapálek, 1907.

Known only from the types, collected in Zhejiang. Holotype and allotype were deposited in Heude Museum, Shanghai, China, but must be considered lost. Larva is unknown. Redescription on the basis of topotypes is needed.

Kiotina chiangi (Banks, 1939)

Banks 1939: description of male as *Atoperla chiangi*; syntypes from Guangdong Province of China.

Illies 1966: transfer to *Perlinella* Banks, 1900.

Du *et al.*, 1999: transfer to *Kiotina* Klapálek, 1907.

Known only from the two syntypes, collected in Guangdong. The type locality information was written as 'Yim Na San, Kwantung, China, 14 June (Gressitt coll.)' (Banks 1939). Kwantung would refer to the Kwantung Leased Territory that existed in Liaoning Province from 1898 to 1945, but most probably it is mistyped and refers to Kwangtung, the old name of Guangdong, because further insects were collected by L. E. Gressitt in the neighbouring Hainan and Guangxi during the same month. Syntypes were deposited in the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts. Female and larva are unknown. Redescription of the male is needed.

Kiotina collaris (Banks, 1937)

Banks 1937: description of male and female as *Schistoperla collaris*; types from Taiwan.

Kawai 1968b: redescription of male as *Schistoperla collaris*.

Uchida 1990: transfer to *Kiotina* Klapálek, 1907.

Stark & Sivec 2008d: redescription of male and female, description of egg and larva; further records from Taiwan.

Known only from Taiwan. Types were deposited in the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts. Though gender and number of type specimens were not specified in the original description, Banks (1937) described both male and female. However, only a male, labelled as holotype, exists in the database of the MCZ (<http://140.247.96.247/mcz/index.php>).

Kiotina delicata Stark & Sivec, 2008d

Stark & Sivec 2008d: description of male; holotype and paratypes from Fujian Province of China.

Known only from the types, collected in Fujian. Holotype and paratypes are in the Alexander Koenig Zoological Research Institute and Zoological Museum, Bonn, Germany. Female and larva are unknown.

Kiotina kelloggi Wu & Claassen, 1934

Wu & Claassen 1934: description of female; holotype from Fujian Province of China.

Stark & Sivec 2008d: questioning generic identity, may be excluded from *Kiotina*.

Known only from the holotype, collected in Fujian. Holotype was deposited in Yenching University Collection, Beijing, China, but must be considered lost. Male and larva are unknown. Redescription on the basis of topotypes is needed. As already noted by Stark & Sivec (2008d), it is very probably not a *Kiotina*, because of its small sized subgenital plate.

Kiotina nigra (Wu, 1938)

Wu 1938: description of male and female as *Atoperla nigra*; holotype, allotype and paratypes from Zhejiang Province of China.

Illies 1966: transfer to *Gibosia* Okamoto, 1912.

Du *et al.*, 1999: transfer to *Kiotina* Klapálek, 1907.

Known only from the types, collected in Zhejiang. Holotype, allotype and one paratype were deposited in Heude Museum, Shanghai, China,

further two paratypes in Yenching University Collection, Beijing, China, but all must be considered lost. Larva is unknown. Redescription on the basis of topotypes is needed.

Kiotina quadrituberculata Wu, 1948b

Wu 1948b: description of male; holotype and paratype from Fujian Province of China.

Stark & Sivec 2008d: redescription of male, on the basis of topotypes.

Known only from Fujian. Holotype and paratype were deposited in Yenching University Collection, Beijing, China, but must be considered lost. Female and larva are unknown.

Kiotina resplendens Banks, 1939

Banks 1939: description of male and female; male syntype from Jiangxi, female syntype from Guangdong Province of China.

Known only from the two syntypes, male collected in Jiangxi and female in Guangdong. The type locality of the female is the same like of *K. chiangi* and refers to Guangdong, while that of the male also must be mistyped and should refer to Kiangsi, the old name of Jiangxi Province (Banks 1939: 'Hong San, Kiansi, China, 26 June'). Syntypes were deposited in the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts. Larva is unknown. Redescription of both male and female is needed.

Kiotina riukuensis Uéno, 1938

Uéno 1938: description of female and larva; holotype and paratype from Okinawa Prefecture of Japan.

Kawai 1967: first report from Yakushima Island of Kagoshima Prefecture of Japan.

Kawai 1968a: description of male; further records from Okinawa.

Stark & Sivec 2008d: redescription of male and female, description of egg; further records from Okinawa.

Inada 2013: first record from Amami Island of Kagoshima Prefecture, as *Kiotina ryukuensis*; larva reported as *Kiotina sp.* possibly also refers to this species.

Known only from the Ryukyu Isles. Holotype and paratype were deposited in the Ōtsu Hydrobiological Station of the Kyoto Imperial University, Ōtsu, Japan, but presently kept in the Lake Biwa Museum, Kusatsu, Japan.

Kiotina spatulata Wu, 1948b

Wu 1948b: description of male; holotype from Sichuan Province of China.

Known only from the holotype, collected in Sichuan. Holotype was deposited in Yenching University Collection, Beijing, China, but must be considered lost. Female and larva are unknown. Redescription on the basis of topotypes needed.

Kiotina sp. sensu Kawai (1968c)

Kawai 1968c: description of larva from Chiang Mai Province of Thailand.

Known only from larvae collected in northern Thailand. The specimens were in the Limnologische Flusstation of the Max-Planck-Institut für Limnologie, Schlitz, Germany. This collection is presently curated as the Collection of Prof. Peter Zwick, Schlitz, Germany. Association of adults will be needed for formal description.

***Perlesta* Banks, 1906**

(Figure 28)

Type species. *Perla (Perla) placida* Hagen, 1861.

Further species included. 29 Nearctic species besides the type species and the two Oriental species enumerated herein. Similar to *Acroneuria*, not known from the Palaearctic, neither from the Pacific region of the Nearctic.

Perlesta chaoi Wu, 1948a

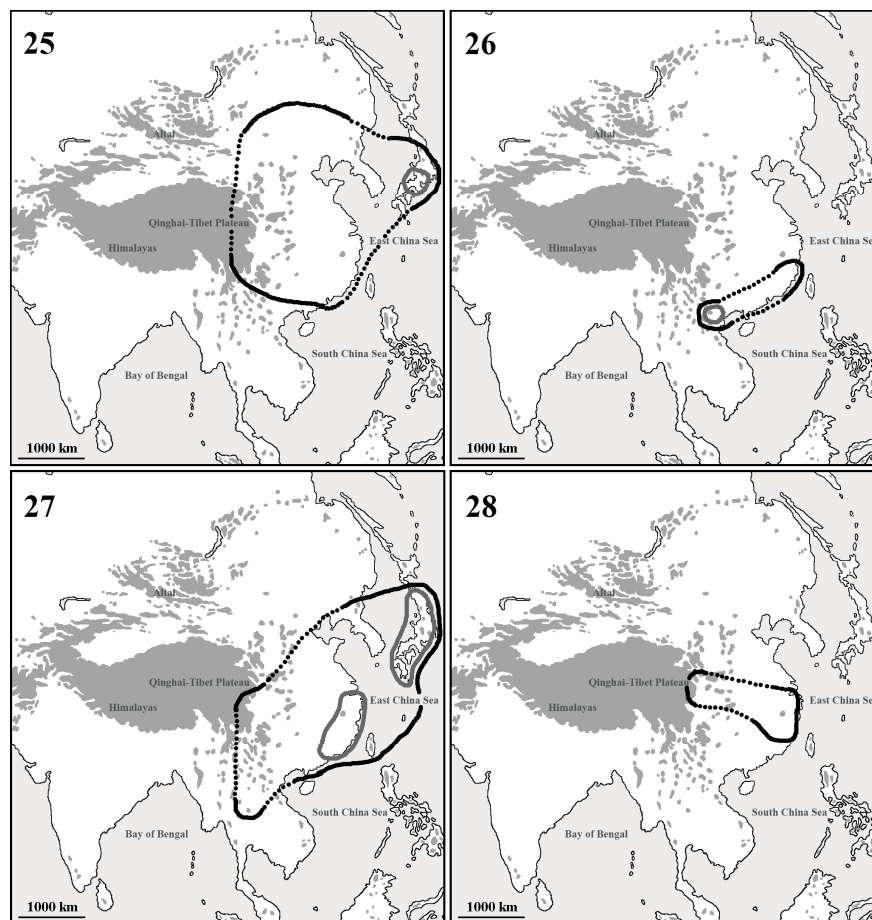
Wu 1948a: description of male; holotype and paratypes from Fujian Province of China.

Du & Sivec 2005: first records from Gansu and Shaanxi Provinces, mentioned one male neotype assigned by Wu from Gansu material.

Known from Fujian, Gansu and Shaanxi. Holotype was deposited in Yenching University Collection, Beijing, China, but must be considered lost. Female and larva are unknown. Redescription on the basis of topotypes is needed.

Perlesta spatulata Wu, 1938

Wu 1938: description of male and female; holotype, allotype and paratypes from Zhejiang Province of China.



Figures 25–28. Asian distribution of the Acroneuriinae genera. 25 = *Gibosia* Okamoto, 1912; 26 = *Hemacroneuria* Enderlein, 1909; 27 = *Kiotina* Klapálek, 1907; 28 = *Perlesta* Banks, 1906. Black line delineate areas where at least one species occur (dotted where only expected), while dark grey lines delineate areas where more than one species occur; grey areas are above 2000 meters.

Known only from the types, collected in Zhejiang. Holotype, allotype, and one paratype were deposited in Heude Museum, Shanghai, China, a further paratype in Yenching University Collection, Beijing, China, but all must be considered lost. Larva is unknown. Redescription on the basis of topotypes is needed.

DISCUSSION

The Acroneuriinae fauna of the Oriental Realm is presently contains 62 recognised species, classified in 10 genera of 2 tribes. Of the 62 species, 4 are not yet formally named as known only from females or larvae. Further 25 are inadequately known their specific status or generic assignment

is unsure. Only 5 species are known from all life stages (male, female, larva and egg).

Of the 10 genera known from the Oriental Realm, 4 are endemic to the region, 4 share its distribution with the East Palearctic while 2 with the East Nearctic; the latter two were not recorded from the Palearctic so far. The distribution of Oriental Acroneuriinae is limited to the continent and Hainan, Taiwan and the Ryukyus. They enter the Indian Subcontinent only in the Himalayan Region and a single species spreads westwards to the Western Himalayan ranges. Their known distribution in Indochina is also limited, no Acroneuriinae was found south of northern Thailand.

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