

Descriptions of *Matrona oreades* spec. nov. and *Matrona corephaea* spec. nov. from China (Odonata: Calopterygidae)

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Abstract

Matrona oreades Hämäläinen, Yu & Zhang, spec. nov. (holotype ♂, China, Gansu, Wenxian, Bikou, alt. 950m, 9/13 vii 2005) and *Matrona corephaea* Hämäläinen, Yu & Zhang, spec. nov. (holotype ♂, China, Zhejiang, West Tianmushan, alt. 700m, 8 viii 2007) are described and illustrated for both sexes. These two species differ markedly from the members of the *Matrona basilaris* species group by their sparser venation and absence of bluish-white reticulation at the wing base.

Key words: Odonata, Calopterygidae, *Matrona*, new species, China, *corephaea*, *oreades*

Introduction

Our knowledge of the calopterygid damselflies assigned to the genus *Matrona* Selys, 1853 is still surprisingly inadequate, although they are striking and conspicuous insects. Selys Longchamps (1853) established *Matrona* as a subgenus of the genus *Calopteryx* Leach with *Matrona basilaris* Selys, 1853 from “Nord de la Chine” as the only known species. Later, Selys Longchamps (1888) stated that the type specimens [presently in IRSN, Brussels] of *M. basilaris* came from the Shanghai area and north China. Other named *Matrona* taxa (as given in the original nomenclatorial combination, including type locality) are *Matrona nigripectus* Selys, 1879 from “Khasyia Hills (Bengale)” [Khasia Hills, Meghalaya, India], *Matrona kricheldorffi* Karsch, 1892 from “Omi-shan, p. Kiating, China occidentalis” [Emeishan, Sichuan, China], *Neurobasis (Matrona) basilaris japonica* Foerster, 1897 from “Japan” [Ryukyus, Japan] and *Matrona cyanoptera* Hämäläinen & Yeh, 2000 from “Northern Taiwan, Taipei, Neishwangsi”.

Mature males of these named *Matrona* taxa have an area at the wing base of variable extent, which, when viewed from an oblique angle, appears milky, since the transverse crossveins are bluish white. Otherwise, the wings of mature males are mainly dark, with wing tips often hyaline or subhyaline. Reticulation of the wings is dense or very dense, especially in the hindwings. This *M. basilaris* –group also includes a few undescribed taxa, specimens of which are available in various collections. A thorough revision of this group is needed. It should be noted here that *M. nigripectus*, a taxon possibly restricted to north-eastern India, Burma, Thailand and Laos, is undoubtedly the most widely misinterpreted taxon in the genus. Although its occurrence in southern Yunnan might be expected, this is not yet confirmed; all published records of *nigripectus* (ranked as subspecies of *basilaris*) from several provinces of China appear to be incorrect and refer to other taxa in the *Matrona basilaris* –group (see Hämäläinen 2004), or even to one of the new species described below. We rank *M. nigripectus*, *M. cyanoptera* and *M. japonica* as good species. *M. kricheldorffi*, described from a teneral male and female specimen, appears to be synonym of *M. basilaris*, as originally pointed out by Needham (1930).

The calopterygid material recently collected by the junior authors in China contained two brownish winged *Matrona* species, which differ considerably from *M. basilaris* and its allies. These new species, described below as *M. oreades* spec. nov. and *M. corephaea* spec. nov., have a much sparser venation and they do not have any bluish white crossveins at the wing base.

***Matrona oreades* Hämäläinen, Yu & Zhang, spec. nov.**

(Figs. 1, 3–4, 7, 9, 11, 13)

Material studied: **Holotype** ♂: China, Gansu, Wenxian, Bikou, alt. 950m, 9/13 vii 2005, Yu Xin leg. Deposited at Institute of Entomology, Life Sciences College of Nankai University, Tianjin, China. **Paratypes:** 9 ♂, 4 ♀, China, Gansu, Wenxian, Bikou, alt. 950m, 9/13 vii 2005, Yu Xin leg.; 1 ♂, China, Gansu, Wenxian, July 2000, local collector leg., ex coll. A. Sasamoto. **Other material:** 2 ♂, 1 ♀, China, Sichuan, Emeishan, June 2002, local collector leg., coll. H. Karube; 1 ♂, 1 ♀, China, Sichuan, Emeishan, alt. 700 m, 18 viii 2010, Zhang Haomiao leg.; 1 ♂, China, Sichuan, Qingchenghoushan, alt. 1350 m, 31 viii 2010, Zhang Haomiao leg.

Etymology. The specific epithet, *oreades*, is the Latinised form of *ορειαδες*, the mountain nymphs of ancient Greek mythology. A noun in apposition.

Diagnosis. A pale brownish winged *Matrona* species without any milky coloured reticulation at wing bases, fore- and hindwings similarly coloured, wing tips narrowly darkened. Reticulation of wings less dense than in *M. basilaris*.

Description of male (Figs. 1, 3). **Head:** Eyes in living specimens largely pale bluish, brown in the upper part. Labium mainly pale, tips of lateral lobes black. Labrum light blue, bordered narrowly by black at apical border; base of mandibles light blue. Anteclypeus shining metallic blue with green reflections; postclypeus shining metallic blue. Frons and vertex metallic blue with green reflections; shining blue in young specimens. Antennae with scape and pedicel conspicuously creamy yellow; apical segments black (Fig. 7).

Thorax: Prothorax metallic green. Synthorax metallic green with conspicuous bluish tint middorsally. Pale yellow area restricted to the level anterior to stigma and around metepimeron; on metepimeron the metallic green colour restricted to form a narrow median triangle. Ventral side of synthorax pale yellowish. Legs: coxa yellow, trochanters yellow below, black above; femora blackish brown with flexor surface yellowish at base, more extensively so in hind legs; tibiae blackish brown, hind tibiae moderately bent (Fig. 1, 3).

Both wings pale toffee brown, wing tips narrowly darkened (Fig. 9). Venation brown, darker brown in major veins at wing base. Wings moderately narrow; hindwing length/breadth ratio 3.3–3.6. Reticulation sparse for the genus, best seen in the number of intercalary veins and density of crossveins in the area defined by CuP and the wing border (Fig. 13). Median space with 3–6 partly reticulated crossveins. Cubital field with 17–22 crossveins in forewing, 18–25 in hindwing. Quadrangle with 11–15 crossveins in forewing, 12–17 in hindwing. Antenodals (the first series) number 42–51 in forewing and 37–45 in hindwing.

Abdomen shining metallic blue throughout, also with the lower edges of tergites metallic. Sternites blackish, except on S1, S2, S8, S9 and the distal half of S8, which are partly pale brown or yellowish. Appendages black, except the basal part of the inferiors which is pale yellowish on the underside; shaped as in *M. corephaea* spec. nov. (cf. Fig. 15). Penis similar to that of *M. corephaea* spec. nov. (cf. Figs. 16–17).

Measurements (mm): Gansu specimens – abdomen + appendages 50–56; hind wing 37–40; Sichuan specimens – abdomen + appendages 56–58; hind wing 40–41.5.

Description of female (Fig. 4). Colour pattern of head similar to the male, but postclypeus, frons and vertex shining metallic green. Thorax coloured as in male, but the metallic green triangle on metepimeron is narrower. Legs as in male. Wings (Fig. 11) pale brown. Tip of fore wing less markedly darkened, but tip of hindwing more broadly darkened than in male. At upper hind wing margin the darker coloration extends basad to halfway between nodus and pseudopteroostigma; at lower wing margin reaching only slightly basad of the pseudopteroostigma. Veins and crossveins pale brown. White pseudopteroostigmata in both wings, covering 7–10 cells. In hindwing the length/breadth ratio is 3.5. Median space furnished with 3–6 partly reticulated crossveins. Cubital space with 19–22 crossveins in forewing, 20–24 in hindwing. Quadrangle with 12–15 crossveins in forewing, 14–16 in hindwing. Antenodals (the first series) number 44–50 in forewing and 38–45 in hindwing.

Abdomen dark with metallic green and brownish hues; lower lateral side paler, yellowish brown on S1–2 and S9–10, darker brown in the intermediate segments; a pale middorsal band on S8–10, narrower on S8 and covering the apical 2/3rd of the segment.

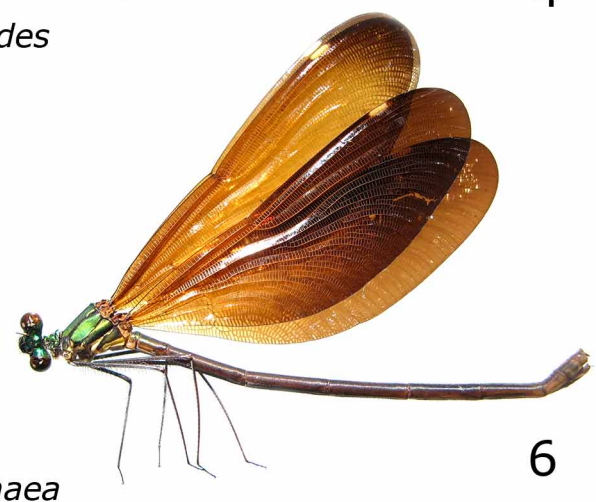
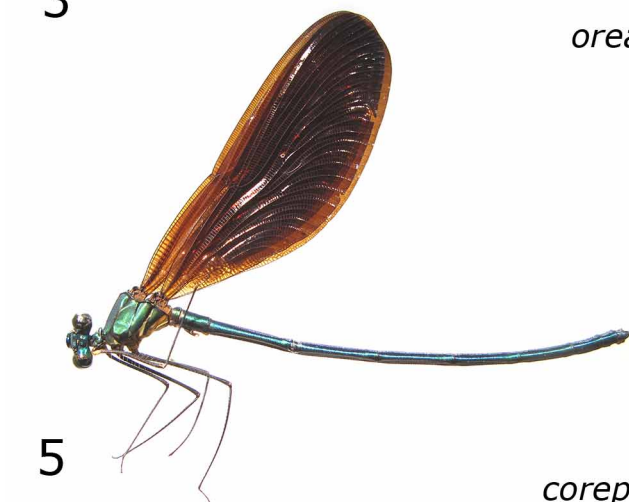
Measurements (mm): Gansu specimens – abdomen + appendages 47–51.5; hind wing 40–45; Sichuan specimens – abdomen + appendages 51–56.5; hind wing 44–47.5.

Distribution. Gansu, Sichuan (including Chongqing), Hupei. In addition to the material listed above we have confirmed records of this species from:

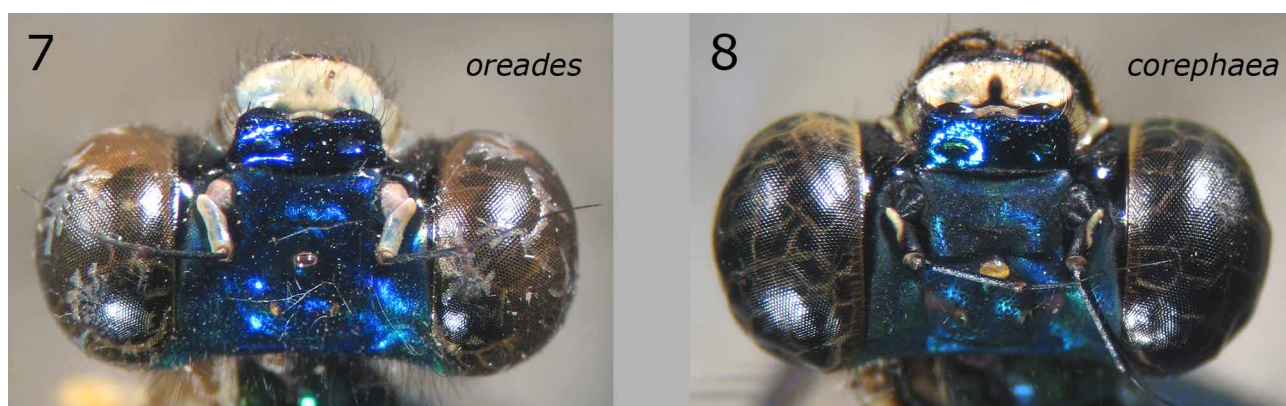
- Chongqing: Jiangjin County, 2009–2010 (photos by Evan Bowen-Jones; this paper)
- Hupei: Shuisapa valley, Sang-Hou-Ken. A male specimen in the collections of RMNH (Leiden), labelled “Hupeh-Szechuan border, Sang-Hou-Ken, 19.7.1948, Gressitt & Djou”. It should be noted here that Asahina (1969), who had studied the same specimen, considered it to be “an abnormally pale coloured male” of *M. b. basilaris*. Later, Hämäläinen (unpublished) wrongly thought this specimen to be *M. kricheldorffi*. This led to the following erroneous statement on the status of *M. kricheldorffi* in Hämäläinen & Yeh (2000, p. 4): “It should also be briefly pointed out that *M. kricheldorffi* Karsch, 1892 is a distinct, good species, so far known only from Sichuan”.



FIGURES 1–2. Male damselflies photographed in the field. **1)** *Matrona oreades* spec. nov., Chongqing, 19 July 2009, photo by Evan Bowen-Jones; **2)** *M. corephaea* spec. nov., Zhejiang, Tianmushan, 29 June 2008, photo by Mo Shanlian.



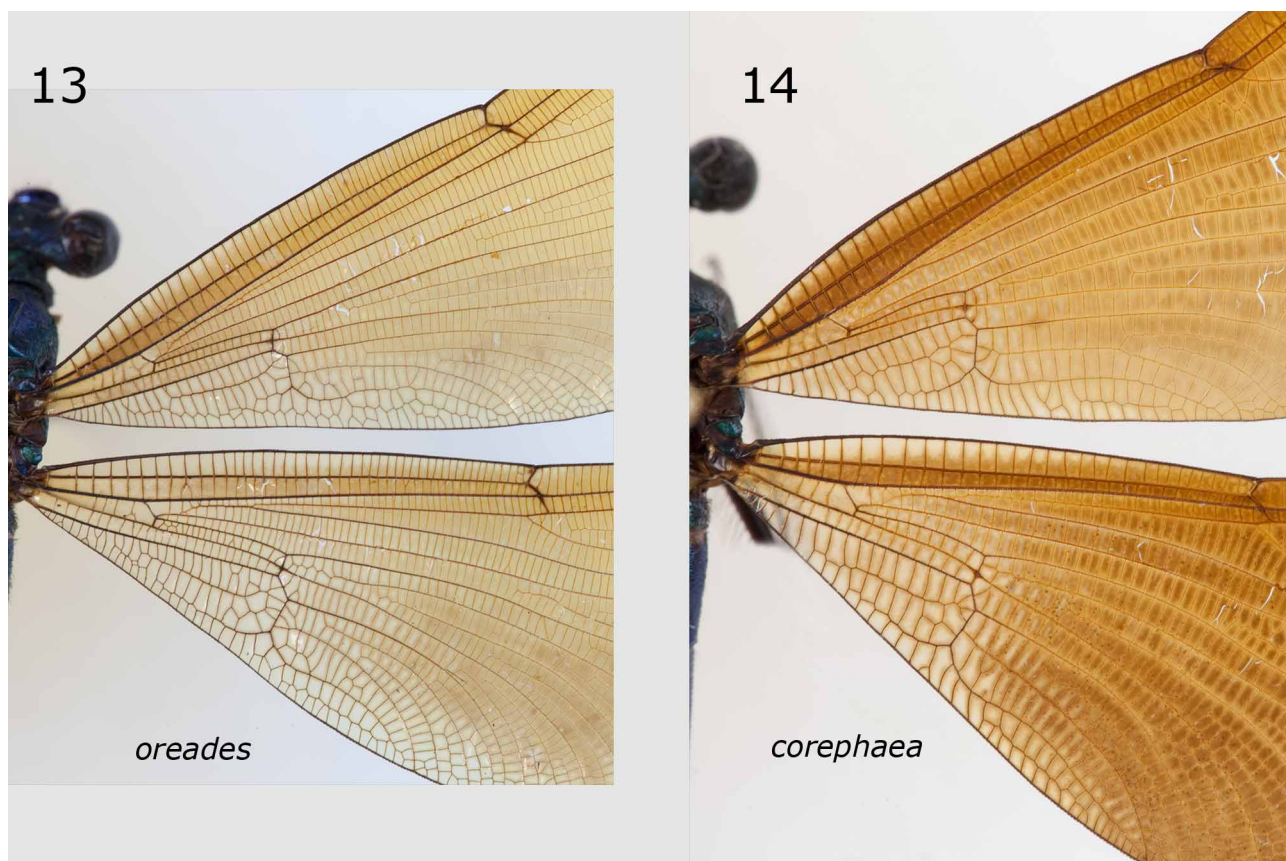
FIGURES 3–6. Habitus of type specimens. **3)** *Matrona oreades* spec. nov., holotype male from Wenxian; **4)** *M. oreades* spec. nov., paratype female from Wenxian; **5)** *M. corephaea* spec. nov., holotype male from Tianmushan; **6)** *M. corephaea* spec. nov., paratype female from Qingliangfeng. Not in scale.



FIGURES 7–8. Head of male, frontal view. **7)** *Matrona oreades* spec. nov., paratype from Wenxian; **8)** *M. corephaea* spec. nov. paratype from Tianmushan. Not in scale.



FIGURES 9–12. Wings. **9)** *Matrona oreades* spec. nov. paratype male from Wenxian; **10)** *M. corephaea* spec. nov. paratype male from Tianmushan; **11)** *Matrona oreades* spec. nov. female from Emeishan; **12)** *M. corephaea* spec. nov. female paratype from Tianmushan. Not in scale.



FIGURES 13–14. Close up of wing bases. **13)** *Matrona oreades* spec. nov. male from Emeishan; **14)** *M. corephaea* spec. nov. paratype male from Wenxian. Not in scale.

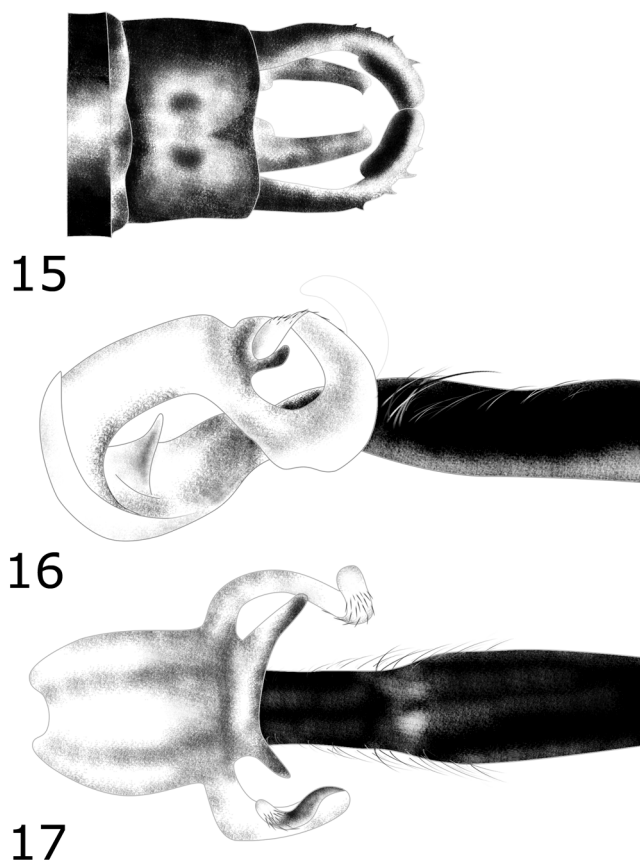
Remarks on biology. *M. oreades* has been found in mountain streams at an altitude of ca 700–1400 m. In Wenxian this species was found on a stream with both rocky or gravely substrates, between 1–4 metres in width. On sunny days they always stayed along the stream, perching conspicuously on rocks or riparian vegetation. The males usually established territories and fought. The Wenxian records were made between June and mid July and the flight period is expected to extend at least until early August. July is the period of greatest adult activity with fully mature males and females occurring simultaneously. This species is less alert than *Matrona basilaris*, thus it is easier to capture. Other odonate species on the same streams included: *Bayadera* sp., *Caliphaea consimilis* McLachlan, *Coeliccia cyanomelas* Ris and *Stylogomphus* sp.

At Emeishan (near Wannian Temple, at the altitude of 700m), one pair was found after 17:00h, 18th August 2010. The weather was cloudy on that day and it had been raining for about one week previously. The female was found very close to a stream. She was perching on a leaf amongst dense vegetation, about 0.5m above the stream. The stream was very close to a busy road leading to the peak of Emeishan (Jinding), but the female was evidently not disturbed by the constant noise. The male was found upstream and was perching in sunlight about 20cm above the ground near a ditch bordered by dense vegetation. It did not appear to be territorial, but was perched, waiting for prey. The habitat here was a stream with a high gradient and dense vegetation. Species co-occurring on this stream included: *Caliphaea consimilis*, *Chlorogomphus tunti* Needham, *Chlorogomphus n. nasutus* Needham and *Megalestes distans* Needham.

In Qingchenghoushan, one male was found maintaining a territory on a stream with steep gradient at 1350m altitude. About 15:00h on 31st August 2010, it was perching on a leaf in the sun about 1m above the stream. It was very active, and flew higher when disturbed. This particular stream was not badly affected by the earthquake in May 2008, which destroyed many other river and stream habitats in the area. Species co-occurring in this stream included: *Caliphaea consimilis*, *Bayadera melanopteryx* Ris, *Planaeschna* spp. and *Megalestes distans*.

According to the information received by Evan Bowen-Jones, in Jiangjin County in Chongqing this species has been recorded from a same stream with *Matrona basilaris*, at an altitude of 920m. A female was photographed ovi-

positing in a low plant in the stream, with the male guarding 30cm away. The flight period of *M. oreades* in Sichuan spans from June to at least early September.



FIGURES 15–17. *Matrona corephaea* spec. nov., paratype male from Wenxian. **15)** anal appendages, dorsal view; **16)** penis head, lateral view; **17)** penis head, dorsal view. Not in scale.

***Matrona corephaea* Hämäläinen, Yu & Zhang, spec. nov.**

(Figs. 2, 5–6, 8, 10, 12, 14–17)

Material. **Holotype** ♂: China, Zhejiang, West Tianmushan, alt. 700m, 8 viii 2007, Yu Xin leg. Deposited at the Institute of Entomology, Life Sciences College of Nankai University, Tianjin, China. **Paratypes:** 4 ♂, 4 ♀, Zhejiang, West Tianmushan, alt. 380m, 25/28 vi 2008, Zhang Haomiao leg.; 1 ♂, Zhejiang, Qingliangfeng, alt. 600m, 12 viii 2007, Yu Xin leg.; 2 ♂, 1 ♀, China, Zhejiang, Qingliangfeng, alt. 900m, 13/14 viii 2007, Yu Xin leg. **Other material:** 1 ♀, China, Hunan, Mt. Hupingshan, 07 viii 2009, Yuanxin leg.; 1 ♂, 1 ♀, China, Guizhou, Tongren, Mt. Fanjingshan, alt. 1100m, 17 vii 2008, Zhang Haomiao leg.

Etymology. The specific epithet, *corephaea*, (a Latinized form of the Greek compound *κορη* = ‘maiden’ and *φατα* ‘dusky’), = ‘dusky maiden’, in reference to the dark brownish wings of this damselfly species. A noun in apposition.

Diagnosis. A brownish winged *Matrona* species without any milky coloured reticulation at the wing bases, hindwing darker brown than forewing; in hindwing veins look paler than the wing membrane. Wing tips darkened, more extensively so in hindwing. Reticulation of wings relatively open as in *M. oreades*.

Description of male (Fig. 2, 5). Head: Eyes in the living specimens largely dark brown with lower section pale greenish. Labium mainly pale, median lobe darkened at base. Labrum mainly pale bluish, bordered with black; a dark median basal triangle; base of mandibles black with a pale spot. Anteclypeus black with a paler marking in the middle; postclypeus metallic bluish. Frons and vertex dark metallic green; antennae dark with an obscure, pale spot at base of pedicel (Fig. 8).

Thorax: Prothorax metallic green. Synthorax dull metallic green with bluish tint middorsally. Pale portions restricted to the level anterior to stigma and around metepimeron (Fig. 5). Ventrally pale yellowish. Legs largely black; hind coxa yellow, fore and middle coxa with yellow lateral markings. Hind tibiae moderately bent (Fig. 2, 5).

Wings coffee brown, hindwing clearly darker coloured (Fig. 10). Venation brown, in hindwing the veins and crossveins appear distinctly paler than the wing membrane, except at the wing base. Forewing with darker striation along the costal and subcostal fields; apical 1/4 of forewing obscurely paler, except for the extreme tip; base of forewing subhyaline. The apical 1/5 of the hindwing conspicuously darker brown; at the lower wing border the dark colour extends basad to half the wing length. Base of hindwing subhyaline to the level of the distal end of the quadrangle. Wings moderately broad, in hindwing the length/breadth ratio is 2.9–3.2. Reticulation sparse for the genus, best seen in the number of intercalary veins and density of crossveins in the area defined by CuP and the wing border (Fig. 14). Median space with 1–5 (usually 3) crossveins. Cubital space with 15–19 crossveins in forewing, 16–19 in hindwing. Quadrangle with 8–11 crossveins in forewing, 9–12 in hindwing. Antenodals (the first series) number 32–40 in forewing and 30–35 in hindwing.

Abdomen shining metallic blue throughout on dorsum and sides, with greenish tint on S6–7. Underside (including the lower edges of tergites) uniformly dark, except for the sternites of the two basal and apical segments, which pale or partly pale. Appendages black, except the basal part of the inferiors which is pale on the underside; shaped as in Fig. 15. Penis as in Figs. 16–17.

Measurements (mm): abdomen + appendages 54.5–55; hind wing 38–40.5.

Description of female (Fig. 6). Colour pattern of head and thorax similar to the male. Legs as in male. Wings (Fig. 12) coffee brown, hindwing clearly darker coloured. The tip of forewing darkened. The apical part of hindwing darker; at the upper wing margin the darker coloration extends basad to the level of the nodus; at the lower wing margin the darker coloration extends slightly more basad; in the middle of the wing it extends to halfway between the nodus and pseudoptero stigma. Veins and crossveins pale brown. White pseudoptero stigma in both wings, covering 5–7 cells. Wings proportionally narrower than in male; in hindwing length/breadth ratio 3.2. At wing base the reticulation is denser than in male. Median space with 2–5 reticulated crossveins. Cubital space with 18–21 crossveins in forewing, 18–21 in hindwing. Quadrangle with 12–14 crossveins in forewing, 14–15 in hindwing. Antenodals (the first series) number 40–47 in forewing and 32–36 in hindwing.

Abdomen dark metallic green with brownish tint; a narrow pale band middorsally on S8–10, on S8 covering the apical 2/3; lower lateral side of S8–10 brownish yellow, the same colour also at the apical end of S7.

Measurements (mm): abdomen + appendages 50.5–53.5; hind wing 40.5–43.5.

Remarks on biology. In Tianmushan this species can be found on streams with rocky or sandy substrates, between 2–6 metres in width. We even found them near a waterfall. In fine days they always stay along the streams, where they can be quite conspicuous, occasionally displaying their brown wings with a slow wing clap after a short flight. On rainy days they can be found perching on low-lying vegetation in the shady forest beside the streams. Unfortunately no mating behaviour was observed, but it is anticipated that the males establish territories and fight. Records were made between late June and early August. In late June both fully mature and teneral individuals occurred simultaneously, so apparently the species is on the wing at least from mid June to late August. Other odonate species on the same streams included: *Matrona basilaris* Selys, *Archineura incarnata* (Karsch), *Bayadera bidentata* Needham, *B. melanopteryx* Ris, *Philoganga robusta* Navás, *Periaeschna magdalena* Martin, *Chlorogomphus suzukii* Oguma, and *Macromia malleifera* Lieftinck.

Distribution. Confirmed records are available from Zhejiang, Hunan and Guizhou. It is possible that the records of ‘*M. kricheldorffi*’ from Guizhou (Mt Zhujia, Duyun and Chishui) and Hunan (Xiaoxi), presented in the unpublished MSc thesis by Zhou (2007) refer to *M. corephaea*, but the record of ‘*M. kricheldorffi*’ from Guangyuan in Sichuan may be *M. oreades*. Moreover, based on the colour photographs of specimens in Wang (2007, colour pl. 67), *M. corephaea* seems to occur also in Henan. Wang identified the figured specimens incorrectly as *Matrona basilaris nigripectus* (sic!) Selys. It remains to be seen whether all specimens reported as ‘*Matrona basilaris nigripectus*’ by Wang & al. (1990) from the following localities in Henan: “Sanmenxia, Lushi, Qihe forestry station”, “Luanchuan, Mt. Laojun”, “Neixiang, Getiaopa”, “Nanyang, Tongbai”, “Shuiliandong” and “Xinyang, Shangcheng, Jingangtai” are in fact *M. corephaea*.

He (2007, p. 162–163) includes four colour photos from unspecified localities in China identified as ‘*Matrona basilaris nigripectus* Selys’. The middle photo on p. 162 appears to show either *M. corephaea* (more likely) or *M.*

oreades female, the other two photos on p. 162 show *M. basilaris* male and female, but the photo on p. 163 shows male of *Atrocalopteryx atrata* (Selys).

Discussion

These two new species share definitive characters of the genus *Matrona*, such as the reticulated median space of the wings, lack of pterostigma in males and presence of whitish pseudopterostigma in females. The species also have curved hind tibiae similar to those found in other *Matrona* species; a character not noted in the original and subsequent definitions of the genus. Similarly curved hind tibiae are present also in species of the genus *Atrocalopteryx* Dumont & al., 2005. These two genera form a monophyletic clade in the revised molecular phylogeny tree by Dumont & al. (2007).

Although molecular data on *M. oreades* sp. nov. and *M. corephaea* sp. nov. are not yet available, based on structural characters, we consider them to form a distinct division within the genus, the *M. oreades* –species group. However *M. oreades* sp. nov. and *M. corephaea* sp. nov. can be separated by several characters. The most visible ones are given in Table 1.

TABLE 1. Differentiating characters of *Matrona oreades* spec. nov. and *M. corephaea* spec. nov.

Character	<i>Matrona oreades</i> male	<i>Matrona corephaea</i> male
colour of two basal segments of antennae	wholly pale yellow	black, with pale dot
wing colour	pale brown; both wings similarly coloured	darker brown; hindwing darker than forewing
wing shape	moderately narrow, hw length/breadth ratio 3.3–3.6	broad,er, hw length/breadth ratio 2.9–3.2
colour of venation	brown, in both wings veins are darker than the wing membrane	brown, in hindwing veins are paler than the wing membrane
	<i>Matrona oreades</i> female	<i>Matrona corephaea</i> female
colour of two basal segments of antennae	wholly pale yellow	black, with pale dot
hindwing colour	the apical darkening at hindwing margins extends basad only to the level of halfway between nodus and pseudopterostigma	the apical darkening at hindwing margins extends basad to the level of nodus

Moreover the species differ in many other characters. In *M. corephaea* male the venation at the wing base is slightly more open than in *M. oreades* male. This can be seen for example in the number of antenodals and number of crossveins in the median space, quadrangle and cubital field (cf. Figs. 13 and 14). The flexor surfaces of femora are darker in *M. corephaea*; in *M. oreades* they are extensively yellowish brown. In *M. corephaea* the labrum has broader black margins than in *M. oreades* (Figs 7–8). On the abdomen of *M. oreades* male, the lower edges of the tergites are shining metallic, whereas in *M. corephaea* they are blackish. In living specimens the eyes of *M. oreades* are only narrowly brown at top and broadly pale bluish below; in *M. corephaea* the eyes are brown in the upper 2/3rd and pale green in the lower section. In living specimens, the face of *M. oreades* appears predominantly bluish, whereas in *M. corephaea* it is generally dark.

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