Cryptophaea, a new euphaeid genus and three new species of Caloptera damselflies from Thailand (Odonata: Euphaeidae, Calopterygidae)

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The euphaeid specimens from Doi Suthep (North Thailand) identified and redescribed by Asahina in 1987 as *Schmidtiphaea schmidi* are not conspecific with the holotype of *S. schmidi* Asahina, 1978, from Manipur (North-east India), but represent a distinct new species described as *Cryptophaea saukra* gen. & spec. nov. *Bayadera vietnamensis* van Tol & Rozendaal, 1995 and *Schmidtiphaea yunnanensis* Davies & Yang, 1996, are transferred to the genus *Cryptophaea* gen. nov. *Anisopleura trulla* spec. nov. from South Thailand is described and "*Caliphaea confusa* sensu Asahina, 1985" from Doi Inthanon (North Thailand) is described as *C. angka* spec. nov.

Introduction

Damselflies of the calopterygoid families (Caloptera) reach their maximum diversity in South-east Asia. In Thailand, where the odonate fauna is already fairly well known, 12% of the known species belong to the Caloptera. Most species are conspicuously coloured and among the first insects noticed along forest streams, but some montane species are retiring and rarely observed. In the latest checklist of Thai dragonflies (Hämäläinen & Pinratana, 1999) 38 Caloptera species were listed, including one unnamed *Anisopleura* species, which is described here as a new species. In addition the identity of two Thai Caloptera species - previously listed as *Schmidtiphaea schmidi* Asahina, 1978 and *Caliphaea confusa* Hagen, 1859 - is re-evaluated, both being described as new species.

Schmidtiphaea Asahina, 1978 - a misinterpreted genus (Euphaeidae)

Asahina (1978) described a single euphaeid specimen with curiously narrow wings and a long abdomen from the mountains of Manipur State (North-east India) as representing a new genus and species - *Schmidtiphaea schmidi*. Later Asahina (1987) received for study euphaeid specimens with similarly narrow wings and long abdomen found at Doi Suthep in Chiang Mai, North Thailand. Although the author pointed out several discrepancies, he wrote "I believe our Assamese and Thai damselflies belong, at least, to the category of a single specific status" and he re-described *S. schmidi* based on this new material.

The obvious differences in these two well illustrated descriptions (Asahina (1978,

1987) caused me to doubt that they represent a single species. Courtesy of Dr Masaaki Tomokuni (National Science Museum, Tokyo) I received on loan both the holotype of *S. schmidi* and the male specimen from Doi Suthep, which Asahina (1987) used for illustrations in his revised description of *S. schmidi*. A comparison of these specimens (and additional "*schmidi*" specimens from Doi Suthep in coll. Hämäläinen and coll. Pinratana) shows striking differences in the proportional length of fore and hind wings, and in venation, structure of penis and colour pattern. These taxa undoubtedly represent distinct species and the one from Doi Suthep is a new species.

In his definition of the genus *Schmidtiphaea*, Asahina (1978) pointed out, besides several venational characters, the extreme long and slender abdomen, very narrow wings, large pterostigma situated markedly apicad. However, he did not indicate that in *Schmidtiphaea* the hind wing is as long as the fore wing and that pterostigma is clearly broader in the hind wing - both characters unique in the family Euphaeidae. *Schmidtiphaea* undoubtedly is a rather aberrant, well defined genus. Unfortunately the anal appendages of the single known specimen are badly deformed (see fig. 1 in Asahina, 1978) and their true structure remains unknown.

On the other hand, Asahina's (1987) "*S. schmidi*" from Doi Suthep (fig. 1) has the hind wing slightly shorter than the fore wing, the pterostigma in fore and hind wing of nearly the same size, and placed less apicad than in the holotype of *schmidi* (fig. 3). More differences are to be found in the venational details as follows. Petiolation is long, extending to the level of the third in the fore wing and of fourth antenodal in the hind wing, whereas in *schmidi* petiolation is shorter, reaching between the first and second antenodal in the fore wing and to the level of the second antenodal in the hind wing. There are 3-5 crossveins in the cubital space in both wings; (in *schmidi* two in the fore wing and one in the hind wing). IA runs parallel to the wing margin, with only one cell row separating them; (in *schmidi* IA is curved distally and separated from the margin by two cell rows in this section). The length of quadrangle is only about one third of the length of the median space; (in *schmidi* about half of the length in fore wing and slightly more in hind wing). The nodus is situated closer to the wing base. Finally the structure of the terminal lobe of penis is different. The characters of the Doi Suthep taxon differ so strongly from *S. schmidi* that it cannot even be placed in the genus *Schmidtiphaea*. On the other hand the very long petiolation, many crossveins in the cubital space, the shape of IA and the proportionally long abdomen and narrow wings do not match *Bayadera* either. Establishment of a new genus seems necessary. I therefore designate *Cryptophaea* gen. nov. with *C. saukra* spec. nov. (from Doi Suthep) as the type species.

Schmidtiphaea yunnanensis Davies & Yang, 1996, and *Bayadera vietnamensis* van Tol & Rozendaal, 1995, are transferred here to *Cryptophaea* gen. nov. Van Tol & Rozendaal (1995) considered the original generic combination of *vietnamensis* to be only preliminary, but they did not place it in *Schmidtiphaea* due to clear differences. However, recently Wilson & Reels (2003) transferred *vietnamensis* to the genus *Schmidtiphaea*.

Cryptophaea gen. nov.

Diagnosis.— Euphaeids with small and slender thorax, narrow hyaline wings and very long abdomen; abdomen/wing length ratio 1.4-1.5. Fore wings slightly longer

than hind wings, of about the same shape and breath (5-6 mm at the broadest point). Petiolation long, extending to the distance of about two thirds (fore wing) or three fourths (hind wing) from the base to arculus to the level of third or fourth antenodal. Cubital space with 3-6 crossveins. R2 in contact with R+M for some distance after its origin. Nodus situated clearly basal to the middle of wing. R3 arises 2-4 cells distal to nodus. IA running parallel to the wing border, only one cell row separating them throughout. Discoidal cell elongate, at least 4 times longer than broad; however, due to long petiolation only about 1/3th of the length of the median space. Discoidal cell entire or with one crossvein. Pterostigma of nearly the same shape in both wings, very slightly shorter in hind wing. Legs, especially fore femora and tibiae in males, very hairy. Male anal appendages twice the length of S10, superiors strongly bent inwards and downwards; inferiors short, acutely pointed.

Bayadera Selys, 1853, differs from *Cryptophaea* by having shorter abdomen (only 1.1-1.2 times longer than wings), much shorter petiolation of wings, having only 1 crossvein in cubital space and IA being curved and being separated from wing border with 2 or more cell rows, at least at its distal end. *Schmidtiphaea* Asahina, 1978, which superficially resembles *Cryptophaea* in the shape of thorax, wings and abdomen, conspicuously differs by having fore and hind wings equally long, pterostigma of hind wing being broader and longer and placed abnormally apicad, and in many venational details discussed above.

Type species *Cryptophaea saukra* spec. nov.

Etymology.— Kryptos (Gr.) = hidden or concealed. *Cryptophaea* are rather retiring insects, inhabitants of shadowy streams in forested mountain slopes.

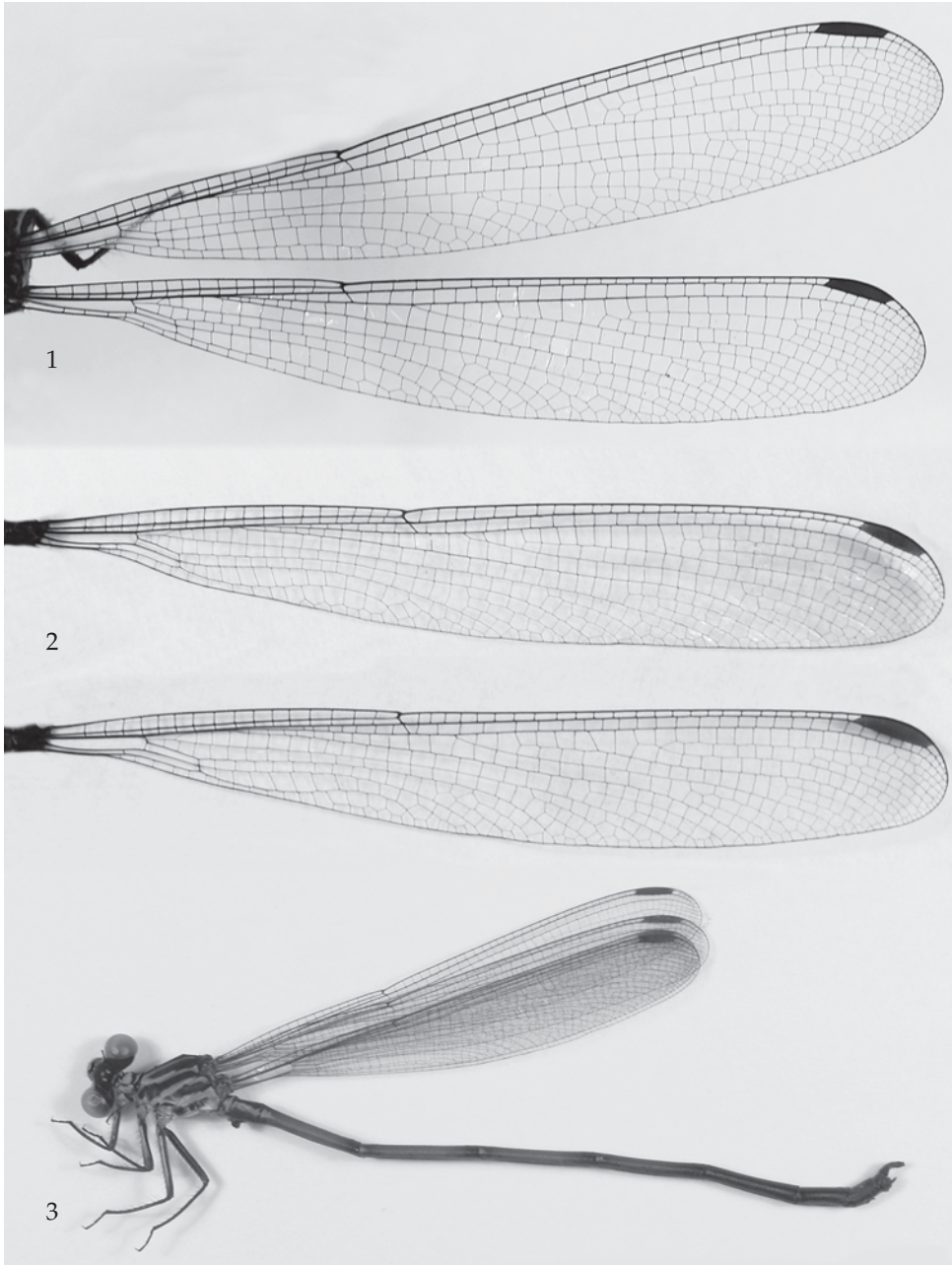
Cryptophaea saukra spec. nov.
(figs 1-2, 4-8)

Schmidtiphaea schmidi [not Asahina, 1978]; Asahina, 1987: 34-37, figs 1-5, 7 (description of ♂); Davies & Yang, 1996: 150-151, figs 24-25 (description of ♀); Hämäläinen & Pinratana, 1999: 8, 31.

Type material.— Holotype, ♂, Thailand, [Chiang Mai province], Doi Suthep, 23.v.1987, K. Kitagawa leg. Deposited in the National Science Museum (Tokyo); right wings removed and mounted separately on glass. Paratypes [all from Doi Suthep (alt. 1150 m), possibly from the same stream as the holotype]; 4 ♂♂, 8.vi.1991, M. Hämäläinen (3 ♂♂) and Somnuk Panpichit (1 ♂) leg.; 3 ♂♂, 1 ♀, 10.vi.1991, M. Hämäläinen (1 ♂) and Somnuk Panpichit (2 ♂♂, 1 ♀) leg.; 1 ♂, 25.vi.1990, Somnuk Panpichit leg.; 2 ♂♂, 13.vii.1996, Somnuk Panpichit leg. Paratypes deposited in RMNH (Leiden), coll. Hämäläinen and coll. Pinratana (Bangkok).

Description.— For convenience, some characters of the new species are compared here with those of the holotype male (the single known specimen) of *Schmidtiphaea schmidi*, although this is not a related species. Since figures 1-5 (reproduced in this paper as figs 4-8), and 7 in Asahina (1987) have been made of the present holotype of *C. saukra*, they are referred to in this description.

Male.— Labrum, base of mandibles and genae greenish olive, this colour reaching the level of antennae bases. Anteclypeus black. Postclypeus largely black, in most specimens with a pair of oval olive-green markings laterally at base; in one specimen the whole posterior half of postclypeus olive green. Head above black, occipital mar-



Figs 1, 3, *Cryptophaea saukra* gen. nov. & spec. nov., ♂; fig. 2, *Schmidtiphaea schmidi* Asahina, 1978. 1, 2, wings [partial darkening of wings is artificial]; 3, habitus.

gin narrowly yellow in the middle. [In *S. schmidi* labrum, base of mandibles, ante- and postclypeus and anterior part of frons to the level of base of antennae are uniform zinc blue; genae brownish. Head above black.]

Thorax. Both prothorax and synthorax black, conspicuously patterned with greenish olive (fig. 3; for more details, cf. fig. 4). [In *S. schmidi* prothorax is uniform brown. Synthorax is dark brown on dorsum, paler on sides, with narrow and obscure yellowish bands above humeral and the first lateral sutures and along the second lateral suture]. Coxae largely pale greenish olive with irregular brown marking antero-basally. Trochanters and femora distinctly bicolorous, dark brown above, olive yellow below. Tibiae and tarsi uniform dark brownish. Femora and tibiae very hairy on flexor surface, excessively hairy in the fore legs, where the hairs are longer than the spines. [In *S. schmidi* legs are uniform brownish, not markedly hairy.]

Wings (fig. 1, and fig. 7 in Asahina, 1987). Hyaline with black venation. Narrow in shape. Petiolation long, ending usually between third and fourth antenodal in fore wing and between fourth and 5th antenodal in hind wing. [In *S. schmidi* petiolation is much shorter, ending between first and second and at second antenodal, respectively (fig. 2)]. Crossveins in cubital space number 3-4 in fore and 4-5 in hind wing. [In *S. schmidi* only 2 crossveins in fore wing and 1 in hind wing]. The length of quadrangle in fore wing is about one third of the length of the median space [in *S. schmidi* about half of the length]. Pterostigma is not situated so aberrantly apicad as in *S. schmidi*. Pterostigma brown, of nearly the same size in fore and hind wing [whereas in *S. schmidi* pterostigma in hind wing is clearly longer and broader than in fore wing]. One cell row between IA and the wing border in both wings [in *S. schmidi* two cell rows in the distal part of the anal field].

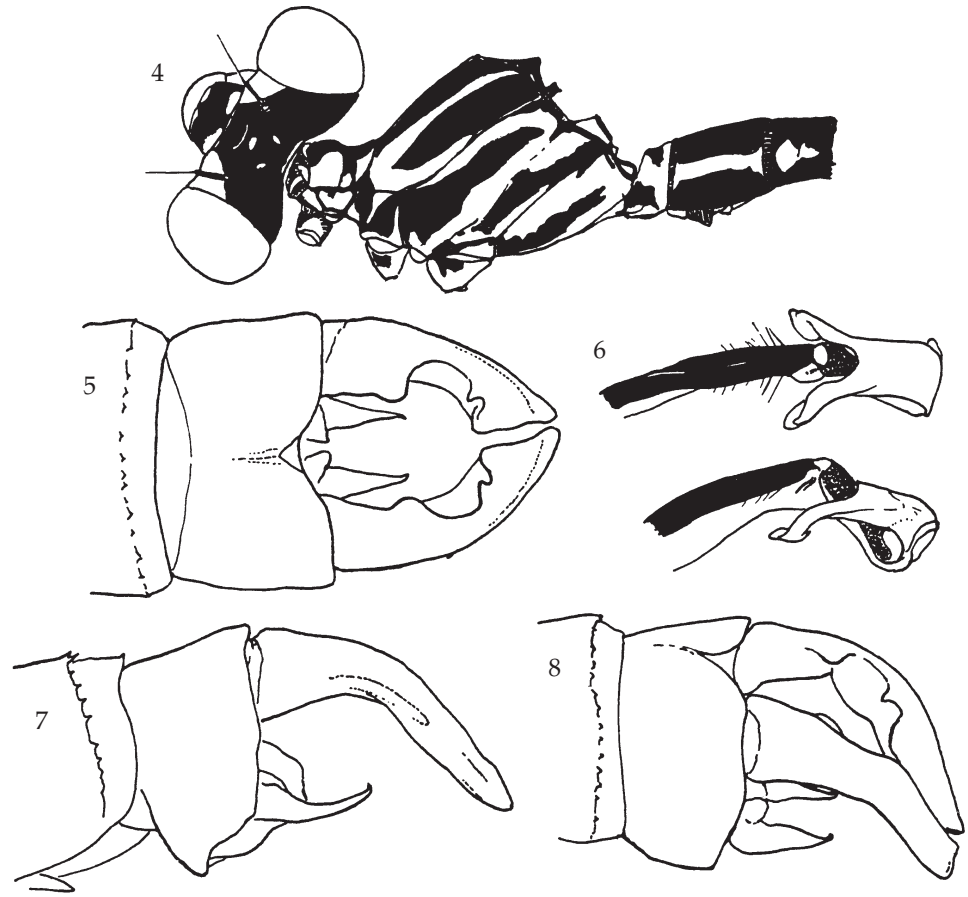
Abdomen long and slender (fig. 3); brown, darker brown on S1-2 and around segmental rings on S3-7. Apex of S7 and S8-10 black. S1 with large pale markings, S2 with pale band on sides, S3 with a small pale basal marking. In S4-6 only a tiny pale basal spot visible. A faint narrow mid-dorsal line on S 2-9. [In *S. schmidi* abdomen is uniform brown; S 1-2 with obscure paler markings laterally; pale mid-dorsal line on S2-9 as in *saukra*]. Appendages black, shaped as in figs 5, 7, 8. [In the holotype of *S. schmidi* appendages are badly broken, see fig. 1 in Asahina (1978). Presently the apex of abdomen is still more fragmented and no clue of the shape of appendages is visible].

Penis. See fig. 6.

Measurements.— Hind wing 33-36 mm, abdomen 48-52.5 mm.

Female.— Davies & Yang (1995) gave a thorough description of a female from Doi Suthep, which is not repeated here. The single female specimen in the present material (from the same site as the first female) is smaller in size (abdomen 36.5 mm, hind wing 33 mm) than the first female (abdomen 38.8 mm, hind wing 35.6 mm). There is a minor difference in the colour pattern of the postclypeus. The brownish-yellow colour in the postclypeus is restricted to two narrow baso-lateral markings (cf. fig. 24 in Davies & Yang, 1995).

Distribution and habitat.— So far known only from Doi Suthep mountain in Chiang Mai, North Thailand, where it occurs at a well shaded montane streamlet (about 1 m broad) in hill evergreen forest at the altitude of 1150-1200 m. Most of the specimens have been spotted perching on twigs of fallen trees along the stream when rays of sun penetrate to the site. Other Caloptera species recorded at the same stream include



Figs 4-8, *Cryptophaea saukra* gen. nov. & spec. nov., ♂. 4, anterior part of body; 5, 7, 8, caudal appendages, dorsal, lateral and oblique dorsal aspect, respectively; 6, penile organ. After Asahina (1987).

Noguchiphaea yoshikoae Asahina, 1977 and *Caliphaea thailandica* Asahina, 1977. *C. saukra* seems to have a rather short flight period in the beginning of the rainy season. The few available records date from late May to mid July.

Comparative notes.— Besides *C. saukra*, two other *Cryptophaea* species are presently known:

- *Cryptophaea vietnamensis* (van Tol & Rozendaal, 1995), **comb. nov.**

Originally described as *Bayadera vietnamensis* by 3 males from Nghe Tinh province, central Vietnam. Recently recorded also from Laos (Yokoi & Kano, 2002) and Guangxi, southern China (Wilson & Reels, 2003). Wilson & Reels (2003) provided the first detailed description of the female sex and transferred the species to the genus *Schmidtiphaea*. I have studied 6 males and 2 females collected by myself in Lak Sao area, Laos on 27-29.iv.2002 and 1 male and 1 female from Tam Dao, northern Vietnam (ex coll. Karube).

- *Cryptophaea yunnanensis* (Davies & Yang, 1996), **comb. nov.**

Described as *Schmidtiphaea yunnanensis* in both sexes by 2 males and 4 females from Jiangcheng Co., Yunnan. I have not studied specimens of this taxon, but the detailed and illustrated description by Davies & Yang (1996) clearly points out that it belongs in the new genus.

There are clear differences in the structure of male anal appendages in these three species. In *vietnamensis* the apical half of the superior appendage is more abruptly bent downwards, more conspiciously hollowed and ridged than in the other species; seen from lateral view its apex has a distinct ventral bulge (cf. figs 15-16 in van Tol & Rozendaal, 1995). *Yunnanensis* has proportionally shorter inferior appendages than *saukra*. In dorsal view, the tips of the superiors are rounded in *yunnanensis*, but triangular in *saukra* (cf. fig. 5 and Davies & Yang, 1996, fig. 19).

According to Davies & Yang (1996) *C. yunnanensis* is "much smaller and more delicate than its congener *S. schmidi* [meaning *saukra* in the present sense, of which species the first author had also studied male specimens]". However, the measurements for the male (abdomen 47 mm, hind wing 33 mm) are within the range of variation in *saukra*. There are minor differences in the colour pattern of the two species, especially in the head and prothorax. Superficially their synthorax is quite similarly striped. On the other hand *yunnanensis* differs in having unicoloured brownish femora.

In females of *saukra* and *yunnanensis* the synthorax is quite similarly patterned with similar pale (bluish or olivaceus) colour as in males, but in *vietnamensis* the female synthorax is more strikingly and broadly coloured with bright orange.

Etymology.— Saukra (adjective), after the modern Greek word meaning graceful, denoting the attractive appearance of the male damselfly.

A new *Anisopleura* species (Euphaeidae) from South Thailand

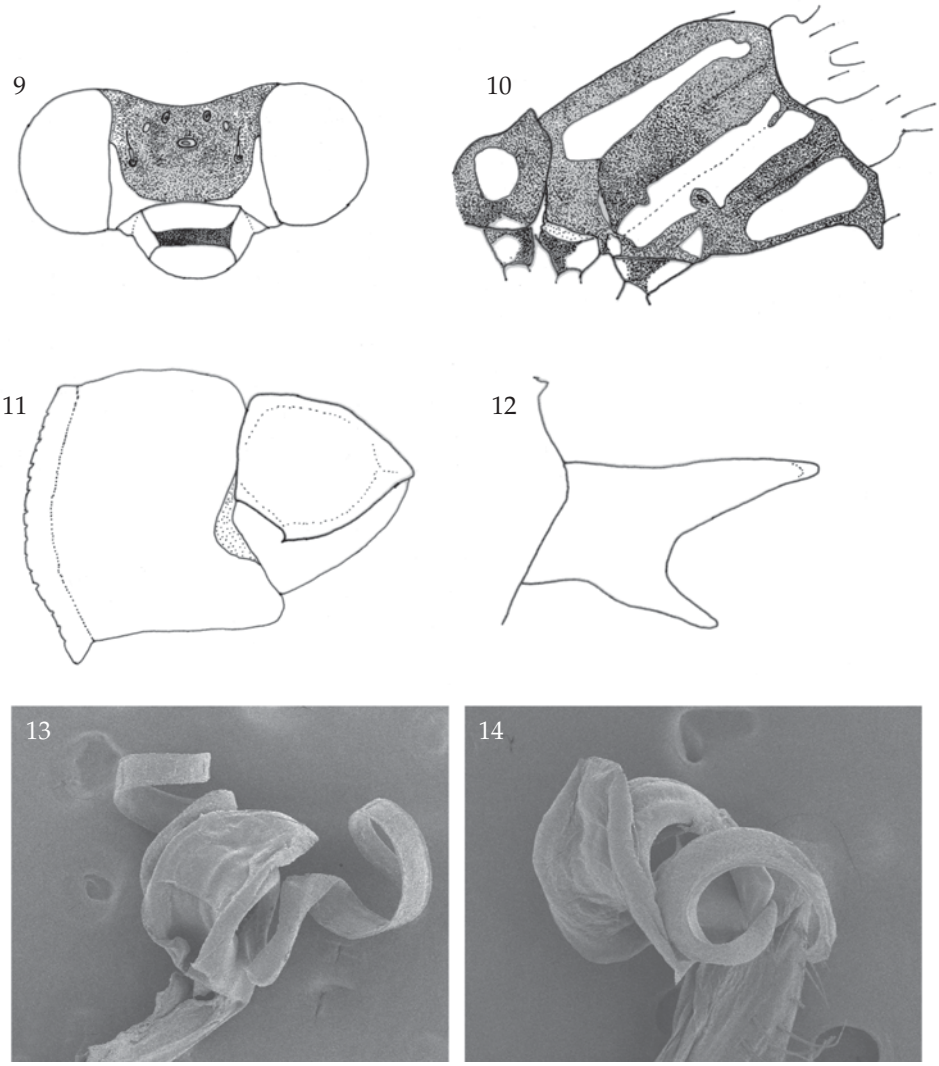
Previously ten species of the genus *Anisopleura* Selys, 1853, have been described; one however, *A. kusumi* Sahni, 1965, is a synonym. These damselflies occur in montane and submontane streams in regions southwards and eastwards of the Himalayan range, from Himachal Pradesh in the west to Zhejiang in the east. The discovery of an *Anisopleura* species in southern Thailand was somewhat unexpected, although several other "northern" odonate species occur in the same Khao Poh Ta mountains in Ranong and Phangnga provinces.

Anisopleura trulla spec. nov.
(figs 9-13, 15)

Anisopleura sp. Hämäläinen & Pinratana, 1999: 8, 29, 123.

Type material.— Holotype, ♂, Thailand, Phangnga province (near Ranong border), lower slopes of Khao Poh Ta (alt. ca 200 m), 5.iv.1997, Somnuk Panpichit leg. Deposited in RMNH (Leiden). Paratypes from the same site and collector as the holotype; 1 ♂, 3.iii.1991, 2 ♂♂, 4.iv.1997. Paratypes placed in coll. Pinratana (Bangkok) and coll. Hämäläinen.

Description of male.— Head (fig. 9). Labium black. Face largely orange yellow, anteclypeus black. Most of frons and vertex black, the yellow colour along the edge of



Figs 9-13, *Anisopleura trulla* spec. nov. ♂; fig. 14, *A. qingyuanensis* Zhou, 1982. 9, head, oblique frontal view; 10, thorax, lateral view; 11, S10 and superior anal appendages (partly overlapped), dorsal view; 12, superior anal appendages, lateral view; 13, 14, penis head, dorso-lateral view. [Figures not to scale].

the eyes extends behind the level of the antennae bases. Antennae black. Tiny yellow streaks beside lateral ocelli.

Thorax (fig. 10).— Prothorax black with large rounded orange dot in the middle lobe; lateral edge of middle lobe narrowly yellow. Synthorax black with orange yellow stripes. Antehumeral stripe broad, narrowed apicad. Two broad lateral stripes, one extending on both sides of the first lateral suture, the other covering most of metepimeron. Synthorax below black with yellow patches. Legs black with coxa

broadly yellow at sides. Femora furnished with distinct yellow basal streaks. In the fore femur the streak is on the inner surface and very short, whereas in the middle and hind femora the streak is on the lower half of the outer surface, extending two thirds of the length of the femur in the middle leg and three fourths in the hind leg.

Wings (fig. 15).— Narrow, fore wing 5.5 times longer than broad. Hyaline without distinct yellow tinge at base. Apex of fore wing narrowly darkened. Pterostigma dark brown; long, covering 4-5 underlying cells. Costal border of hind wing distinctly kinked. Cubital space with 1-2 crossveins. Discoidal cell entire. Antenodals number 16-20 in fore wing, 15-17 in hind wing.

Abdomen.— Abdomen black with orange yellow markings as follows. S1 broadly yellow at sides. S2 with broad dorso-lateral stripe, slightly narrower in the middle. S3-S7 with small dorso-lateral spots at base, connected in middorsum in younger specimens, but broadly separate in older ones. Narrow dorso-lateral stripes on S3-S5, becoming narrower and shorter in each segment; S6 with only a trace of a stripe at base. S7-S10 black, except for the basal dorso-lateral spots at base of S7.

Anal appendages.— Black. In dorsal view, superiors broad and flattened; dorsal surface shallowly hollowed forming a spoon shaped structure (fig. 11). In lateral view, the ventral edge conspicuously bifurcated forming a robust fork, directed interiorly (fig. 12). Inferiors rudimentary.

Penis.— Lateral appendages of penis head long, flattened and curled (fig. 13).

Measurements.— Hind wing 28-29.5 mm, abdomen 34-36 mm.

Female unknown.

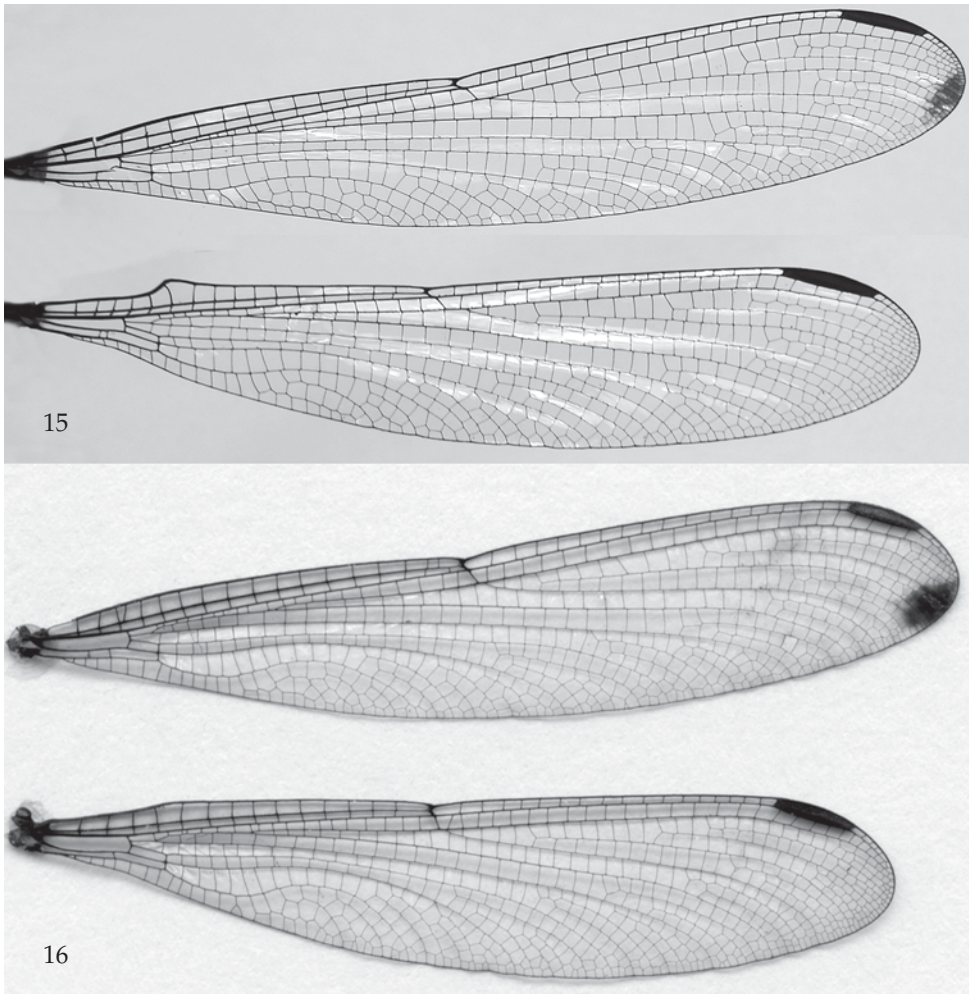
Comparative notes.— In the structure of the male anal appendages and in the basic colour pattern of head, thorax and abdomen, *A. trulla* spec. nov. resembles most *A. qingyuanensis* Zhou, 1982, a species described from Zhejiang, East China (Zhou, 1982), but later found also from Guangdong and Guangxi (Wilson & Reels, 2003). From this species I have been able to study some specimens of both sexes from Guangdong kindly send by K.D.P. Wilson. *A. qingyuanensis* differs markedly from *trulla* in the following points:

- lateral appendages of penis much shorter (fig. 14).
- the ventro-lateral fork of superior appendages more robust and situated more apicad.
- costal border of hind wing weakly kinked only (fig. 16).
- basal portion of wings strongly tinged with yellow nearly to the level of nodus.
- pale dots beside lateral ocelli much larger.
- antehumeral stripe is narrower and the upper lateral stripe more irregular.

Wilson (pers. comm.) wrote that in teneral specimens of the Guangdong populations of *qingyuanensis* the pale markings are predominantly cyan blue. As the insect matures its main colouration changes through blue green to greenish yellow. Due to a lack of teneral specimens we do not yet know if a similar change takes place in *trulla*.

It should be mentioned here that in coll. Karube are a few specimens from Vietnam and Laos, which seem to be very close or identical to *A. qingyuanensis*. Another recently described Chinese species, *A. zhengi* Yang, 1996, from Shaanxi has also broadly bifurcate superior appendages, but of rather different shape; the superiors also have a sharp interior spine (Yang, 1996).

In northern Thailand two other *Anisopleura* species occur, *A. furcata* Selys, 1891, and



Figs. 15, *Anisopleura trulla* spec. nov.; fig. 16. *A. qingyuanensis* Zhou, 1982. 15, 16, wings.

A. subplatystyla Fraser, 1927. Unfortunately, Fraser's (1927, 1928, 1934) figures of the male anal appendages of *subplatystyla* are rather misleading, as Lahiri (1987) has commented. From *subplatystyla* material kept in the BMNH (London) I have studied a few specimens from the type locality Shillong, Assam, collected by T. Bainbrigge Fletcher (one male specimen with the same date as the lectotype) and compared them with specimens of *yunnanensis* Zhu & Zhou, 1999, collected recently in Yunnan. Seen from the lateral view the appendages of these taxa look quite similar, but in dorsal view the appendages of *subplatystyla* do not widen as abruptly as in *yunnanensis* (cf. figs. 5-6 in Zhu & Zhou, 1999). The colour pattern of *subplatystyla* and *yunnanensis* is very similar.

Etymology.— Trulla (a noun in apposition) - from the Latin word for scoop or spoon, illustrating the shape of male anal appendages in dorsal view.

Status of the *Caliphaea* taxon (Calopterygidae) from Doi Inthanon, North Thailand

In the literature, *Caliphaea confusa* Hagen in Selys, 1859, has been reported from Nepal (type locality), Darjeeling area in West Bengal, Bhutan, Assam (in the old broad sense; records from Arunachal Pradesh, Meghalaya, Manipur and Mizoram), Northeast Burma, North Thailand, North Vietnam, Yunnan and Sichuan. A preliminary study of some specimens in a few collections identified as *C. confusa* indicates that they represent at least three distinct species, two of them being new species. Further study of material from the whole range of *C. confusa* (sensu lato) is under work, but the specimens from North Thailand are treated already here.

T.W. Donnelly collected a series (10 ♂♂ + 2 ♀♀) of a *Caliphaea* at Doi Inthanon (Chiang Mai province) on 23 June 1980 and identified the specimens as *C. confusa*. A male specimen from this series is at RMNH (Leiden), bearing an extra identification label "*Caliphaea confusa* Selys det. M.A. Lieftinck 1981". Asahina (1985), who had received another male of this series for study, also listed it as *Caliphaea confusa*, although he pointed out and figured clear differences in the structure of male anal appendages and in some other details. I have studied two male specimens from Donnelly's series and several specimens collected by myself at Doi Inthanon in 1998-2002. They were compared with topotypical male specimens of *C. confusa* from Nepal (Godavari and Pokhara, ex coll. G.S. Vick) as well as specimens of both sexes from Shillong (Assam) all from the RMNH collection. The Doi Inthanon specimens differ markedly from the Nepalese ones in the shape of male anal appendages, structure of penis head, shape of prothorax, wing breadth and other characters and represent a new species clearly distinct from *C. confusa*.

Caliphaea angka spec. nov.
(figs 17, 18, 21, 22)

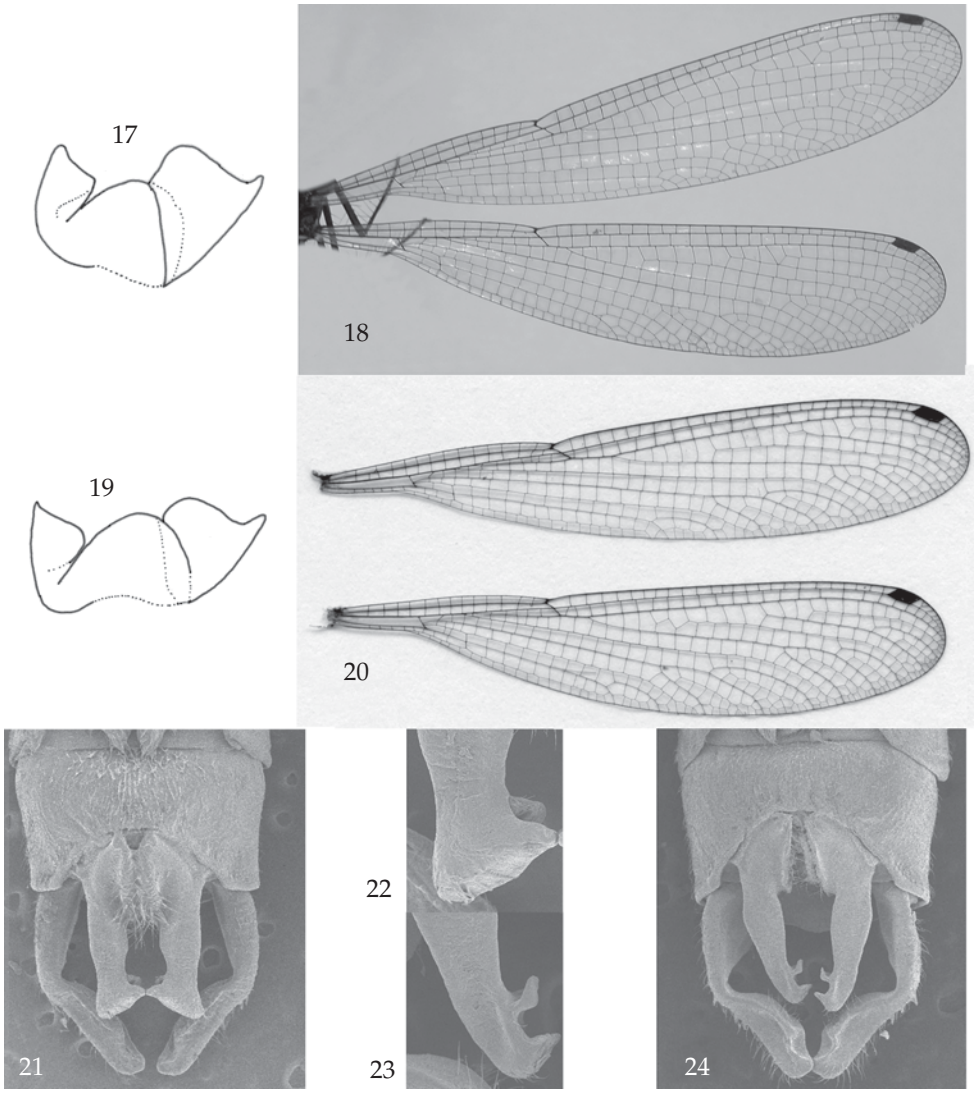
Caliphaea confusa [not Hagen, 1859]; Asahina, 1985: 3-4, figs 2-3 (description of ♂); Hämäläinen & Pinratana, 1999: 7, 20; Pinratana & Hämäläinen, 1999: 151.

Type material.— Holotype: ♂, Thailand, Chiang Mai province, Doi Inthanon, alt. 1500 m, 18.v.1999, M. Hämäläinen leg. Deposited in RMNH, Leiden. Paratypes (all from Doi Inthanon, M. Hämäläinen leg. and kept in coll. Hämäläinen, if not otherwise stated): 2 ♂♂, alt. 1500 m, 18.v.1999; 2 ♂♂, alt. 1500 m, 8.xi.1998; 1 ♀, alt. 1500 m, 23.iv.1998; 1 ♀, alt. 1500 m, 15.x.1999; 1 ♀, alt. 1250 m, 12.x.1999; 1 ♀, alt. 1450 m, 26.v.2002; 2 ♂♂, alt. 1600 m, 23.vi.1980, T.W. Donnelly leg. (1 ♂ at RMNH, 1 ♂ in coll. Hämäläinen).

Description.— The description of the male is supplemented by comparative notes on topotypical (Nepal) specimens of *C. confusa*.

Male.— Head. Labium black. Labrum and clypeus metallic, with coppery or green reflections (depending on view), base of mandibles and adjacent portions of cheeks yellow, frons and vertex dark metallic green with obscure coppery glow, pedicel of antennae largely yellowish, flagellum black.

Thorax. Prothorax metallic coppery green; hind lobe distinctly more bulged than in *confusa* (cf. figs 17 and 19). Synthorax metallic green with coppery reflections on dorsum and on sides down to the level of the stigma. Metepimeron yellow with large metallic patch in the centre, larger in size than in *confusa*. Underside of thorax wholly



Figs 17, 18, 21, 22, *Caliphaea angka* spec. nov.; figs 19, 20, 23, 24, *Caliphaea confusa* Hagen. 17, 19, shape of prothorax, lateral view; 18, 20, wings; 21, 24, S10 and anal appendages, ventral view; 22, 23, tip of inferior appendage, ventral view. [Figures not to scale].

yellow. Trochanters wholly yellow, coxae yellow on inner side, outer side black, excepting the upper part which is yellow at base. Femora and tibiae all black.

Wings hyaline, clearly narrower proportionally than in *C. confusa* (cf. figs 18 and 20). Venation typical to the genus. Antenodals 13-16 in fore wing and 11-14 in hind wing. One crossvein in quadrangle. Pterostigma dark greyish brown (paler brown in *confusa*).

Abdomen coppery metallic, S8-10 pruinosed blue on dorsum. Sides of S1 broadly yellow in the lower half. Ventral side of S3-S10 black, with white pruinosity in aged

specimens. Segments 3-5 clearly constricted in the middle, more markedly so as in *confusa*. Segments 8-10 broadened, S8 proportionally slightly shorter than in *confusa*.

Anal appendages shaped differently from those of *confusa* (cf. figs 21 and 24). The apical half of superiors is less hollowed and less undulating in shape. Inferiors proportionally slightly thicker, the apex broadening outwards, the two interior processes (fig. 22) closer to each other than in *confusa* (fig. 23), partly overlapping in ventral view.

Penis head furnished with somewhat longer lateral appendages than in topotypical Nepalese *confusa* (cf. Asahina, 1976, fig. 17); appendages much narrower at apex.

Measurements.— Hind wing 28.5-30 mm, abdomen 38.5-39.5 mm.

Female.— Body coloured similarly as in male. In the single teneral specimen studied the abdomen is coppery metallic only in the apical 3 segments, basal ones metallic green. The spine arising from mesostigmal plate of moderate length, but clearly shorter than in females of *C. consimilis* McLachlan, 1894 from Sichuan. Wings hyaline, with distinct pale brownish tinge in mature specimens. Abdomen considerably thicker than in male; segments 3-4 clearly less constricted in the middle, S5 not constricted. Anal appendages black.

Distribution and habitat.— So far recorded only from Doi Inthanon, where the species occurs along small streams descending through hill evergreen forest at the altitude of 1600-1250 m. Other Caloptera species occurring at these streams include *Mnais yunosukei* (Asahina, 1990), *Noguchiphaea yoshikoae* Asahina, 1976, and *Anisopleura subplatystyla* Fraser, 1927.

Comparative notes.— From the structure of anal appendages there are no difficulties separating *C. angka* males from the other *Caliphaea* species. *Caliphaea* females are more difficult to tell apart (cf. Asahina 1976). I will attempt to shed more light on this problem once I have studied more material of all known taxa from within their entire range.

Etymology.— The name *angka* (noun in apposition) is derived from the Thai words "Ang" and "Ka". "Ang Ka", meaning the "tub-shaped pond where crows flocked", is the famous swampy basin near the top of Doi Inthanon (alt. 2565 m) and the source of streams where the new species occurs. Doi Inthanon was formerly called "Doi Ang Ka" or "Doi Ang Ka Luang".

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