

**Description of *Echo candens* sp. nov.
from western Yunnan, China
(Odonata: Calopterygidae)**

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Abstract. A new calopterygid damselfly species *Echo candens* sp. nov. (holotype ♂ from Dehong, Yunnan, China) is described and illustrated for the male sex. The supposed female of this species is shown in a field photograph, taken in Kachin State in Burma. The new species is compared with known species in genus *Echo* and a key to males of all species is provided.

Key words. Dragonfly, damselfly, Zygoptera, new species, key

Introduction

Echo Selys, 1853 is a small Oriental genus of calopterygid damselflies. Presently four species are included in the genus: *Echo margarita* Selys, 1853 (type species of the genus), *E. uniformis* Selys, 1879, *E. modesta* Laidlaw, 1902 and *E. perornata* Yu & Hämäläinen, 2012 (see Hämäläinen in KARJALAINEN & HÄMÄLÄINEN 2013: 206).

Echo margarita is known to occur in north-eastern India and in the adjacent areas of northern Burma and south-western Yunnan. The subspecies *E. margarita tripartita* Selys, 1879 was synonymized with the nominate form by HÄMÄLÄINEN (2013). *Echo perornata* is known only from Motuo area in south-eastern Tibet. For the distribution map of these two species, see YU & HÄMÄLÄINEN (2012: Fig. 13). *Echo modesta* occurs in Peninsular Malaysia and in southern and western Thailand, the northernmost known record being from Mae Hong Son Province in north-western Thailand. The species is also known from southern Burma. *Echo uniformis* is endemic to Sumatra and the adjacent small Island of Engano.

During a field survey of the Odonata fauna of Yunnan in April–November 2014, the first author (H-mZ) collected a series of male specimens of a conspicuous new *Echo* species in Dehong Prefecture in south-western Yunnan. It is described here.

***Echo candens* sp. nov.**
(Figs 1, 2a, 2b, 2c, 3a, 4a)

Material studied

Holotype ♂. China, Yunnan Province, Dai & Jingpo autonomous prefecture of Dehong, Yingjiang County, Nabang Town (24°38'27"N, 97°35'14"E), alt. 1,005 m, 08-vii-2014, Hao-miao Zhang leg. Deposited in the Collection of Aquatic Animals, Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan City, Hubei Province, China.

Paratypes (all from the same area in Yingjiang County as the holotype, Hao-miao Zhang leg.). 2♂, Nabang Town, alt. 1,005 m, 08-vii-2014; 1♂, Nabang Town, alt. 1,005 m, 10-vii-2014; 1♂, Nabang Town, alt. 780 m, 07-vii-2014; 1♂, Fengzhang Town, alt. 1,020 m, 01-vii-2014.

Etymology

The species epithet *candens* is an adjective derived from the Latin verb *candere*, which means 'to glow shining white'. This refers to the distinctive white pruinescence on the head and dorsum of the synthorax in the male of this species.

Male (holotype) (Fig. 1)

Head – Eyes dark brown in life (Fig. 3a). Labium black, middle lobe slightly pruinose. Labrum, anteclypeus, and postclypeus black with metallic green lustre. Frons and vertex dark metallic green, with a distinct, whitish pruinose patch, of irregular shape, extending to the level of lateral ocelli (Fig. 1).

Thorax – Prothorax dark metallic green, lower side of middle lobe slightly pruinose white. Synthorax shining metallic green, the dorsal and lateral parts (including mesepisterna and mesokatepisterna) with dense white

pruinescence, this being less developed laterally than on dorsum, but well developed on metepimeron. Venter of synthorax partly pruinosed. Legs black with all coxae pruinosed and slight pruinescence present on anterior margin of fore-femora.

Wings – Hyaline, with pale brownish tint; in certain angles showing slight greenish violet iridescence. Pterostigma dark brown, rectangular, lateral margins oblique, covering 6-7.5 underlying cells in fore wing and 7.5-9.5 in hind wing. Fore wing with 34-37 antenodals (in the first series), median space with 7-8 cross-veins, cubital space with 16-18 cross-veins, quadrangle with 6 cross-veins. Hind wing with 29-31 antenodals (in the first series), median space with 7-8 cross-veins, cubital space with 15 cross-veins, quadrangle with 7 (in right wing) and 5 (in left wing) cross-veins.



Figure 1. *Echo candens* sp. nov., holotype male; habitus and anterior view of head.

Abdomen – S1 dark brown with the apical part metallic green on dorsum. The other segments black with slight metallic greenish shine; this becoming less distinct towards the apical segments. Anal appendages (Figs 2a, 2b) black, superiors longer than S10, inferiors shorter than the superiors.

Penis (Fig. 2c) – Glans with apically bifurcated Y shaped median process and a pair of relatively broad, convex, down-curved lateral processes.

Measurements [mm] – Total length 57.0; abdomen (including anal appendages) 45.0; hind wing 38.0.

Variability in paratype males

All paratypes are mature males with similar dense white pruinescence on the dorsum of the synthorax as in the holotype. The pruinescence on the sides of synthorax and the legs is also quite similar, but with slight variation. There are small variations in venation details.

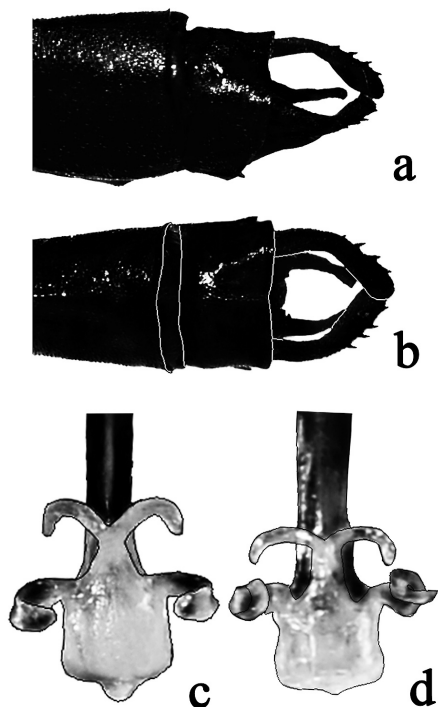


Figure 2. *Echo candens* sp. nov., paratype male and *Echo modesta* male, specimen from Cameron Highlands, Peninsular Malaysia; (a, b) *E. candens*, anal appendages, (a) oblique lateral view, (b) dorsal view; (c, d) structure of penis, (c) *E. candens*, (d) *E. modesta*.

Measurements [mm] –Total length 52.0–56.0; abdomen (including anal appendages) 41.0–45.0; hind wing 35.0–35.5.

Female (Fig. 4a)

No specimens have been collected. However, we are quite sure that a female damselfly photographed in N'mai Hka river valley, Kachin State in Burma, ca 210 km north of the type locality of *E. candens*, is the female of this species (Fig. 4a). Since no specimens are available, the female is not formally described here, but some characters separating it from its congeners are discussed below.

Distribution

Presently known from south-western Yunnan, China, and the adjacent north-eastern part of Kachin state in Burma.

Notes on biology

At the type locality the male damselflies were found at seepages and on very small, 20–30 cm wide, streamlets adjacent to a large waterfall. Altogether four males were found there perching on leaves in rather shady spots, no more than ca 10 cm above the water surface. One male was collected at a narrow streamlet nearby, a semi-open site receiving only a limited amount of sunshine. The damselflies were very wary. When disturbed they flew higher to nearby trees. During a visit to Yingjiang County in June-July 2014 only fully mature, obviously rather old, males were found. On a later visit to the type locality in mid-September 2014, no *E. candens* individuals were seen, but a female of *E. margarita* was recorded. In October-November 2014 again, no *E. candens* were seen, but several *E. margarita* were present. This suggests that *E. candens* may be an early season species; the early date (18-v-2011) when the mature female was photographed (Fig. 4a) supports this conclusion.

Differential diagnosis

Male. The hyaline winged *E. candens* male can be easily distinguished from its two Chinese congeners, *E. margarita* and *E. perornata*, in which the wings are strongly marked with opaque areas. Both sexes of *E. margarita*

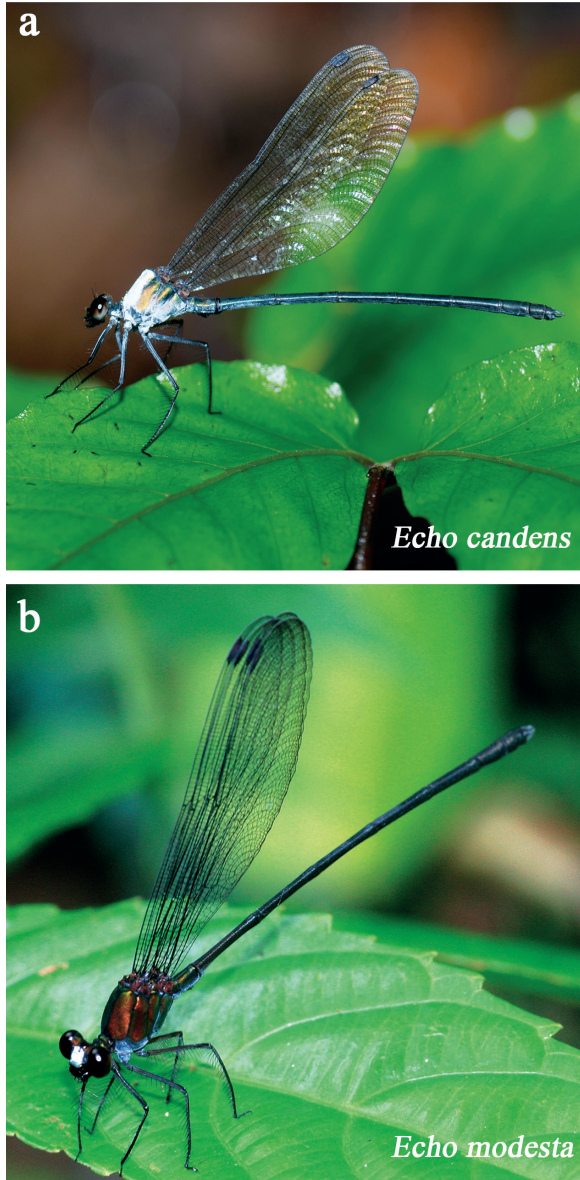


Figure 3. Photographs of live male damselflies; (a) *Echo candens* sp. nov., paratype male, 7th July 2014. Photograph by H-mZ; (b) *Echo modesta*, from Khao Phanom Bencha, Krabi, Thailand, 23rd November 2007. Photograph by MH.

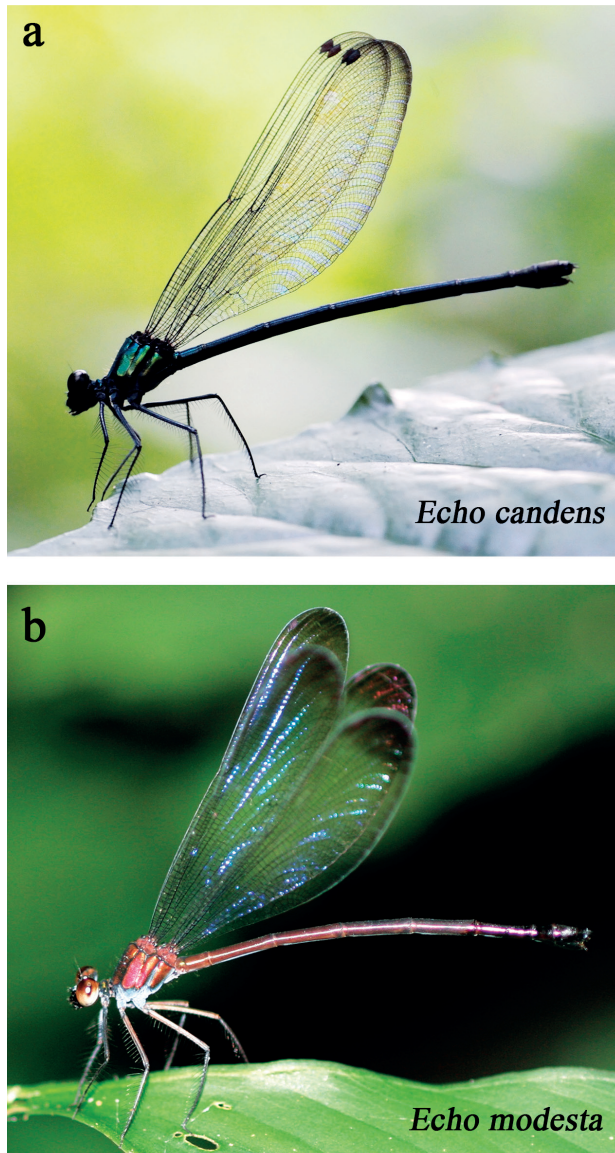


Figure 4. Photographs of live female damselflies; (a) supposedly *Echo candens* sp. nov., from the village of Wusuk, N'Mai Hka valley, Kachin State, Burma, 18th May 2011. Photograph by Jeremy Holden; (b) *Echo modesta*, from Ban Tiam, Phangnga, Thailand, 27th December 2006. Photograph by MH.

(Figs 5a, b) have the wing tips distinctly opaque and in both sexes of *E. perornata* (Figs 5c, d) both wings have a narrow dark umber transverse band distal to nodus and wing tips darkened with the same colour.

Males of *E. candens* (Fig. 3a), *E. modesta* (Fig. 3b), and *E. uniformis* all have hyaline wings. *Echo uniformis* can be separated from the other two by its shorter pterostigma and lack of pruinescent markings on the head and thorax in mature specimens. By contrast both *E. modesta* (Fig. 3b) and *E. candens* (Fig. 1) have similar striking white pruinescent marking on the frons and vertex in mature males, but only in *E. candens* is the dorsum of thorax (mesepisterna) pruinescent white. In all of more than 200 male

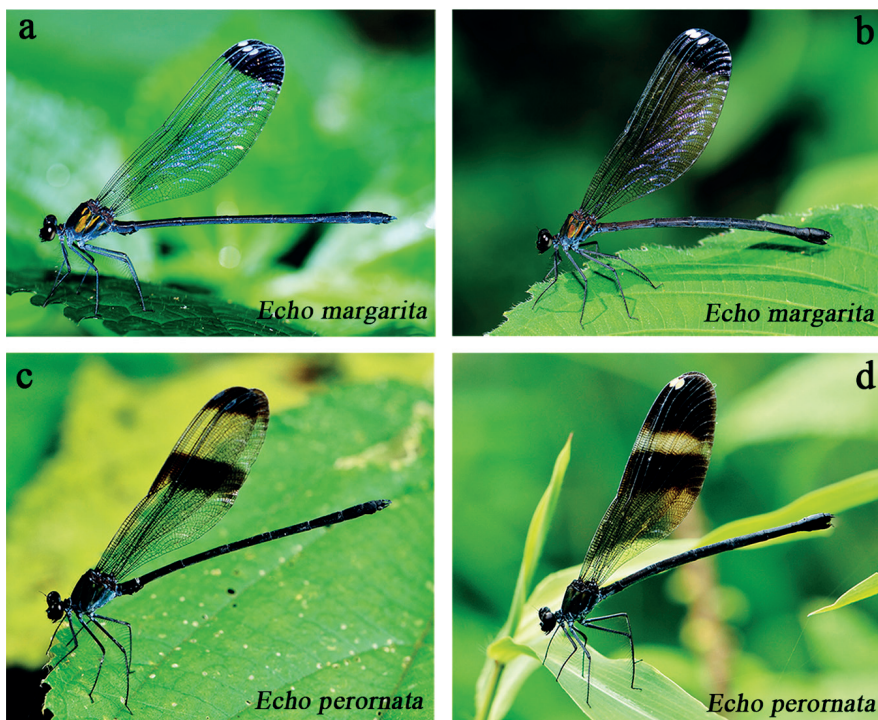


Figure 5. Photographs of live damselflies; (a, b) *Echo margarita* male (a) and female (b), from the type locality of *E. candens* in Yunnan, China, 3rd November 2014. Photographs by H-mZ; (c, d) *Echo perornata* male (c) and female (d), from Motuo, Tibet, China, 31st July 2012. Photographs by Chao Wu.

specimens of *E. modesta* from numerous localities in Thailand and Peninsular Malaysia studied by the second author (MH), the white pruinescence on the synthorax was restricted to the coxae, the infraepisterna, the anterior edge of the mesepimeron, anterior and lower edges of the metepisternum, to the metepimeron, and venter side of the synthorax. The pruinescence is always light, a little more distinct on the venter. Mesepisterna always lack pruinescence, with the exception of the anterior-most corner adjacent to mesinfraepisternum which is slightly pruinose in some old specimens.

Teneral males of *E. modesta* are without the pruinescent marking on the head. However, it develops as soon as the male reaches sexual maturity. The pruinescence on the synthorax develops only much later in life. Most collected specimens of *E. modesta* have pruinescence only on the head. Observations on *E. candens* made in the early part of its flight season are needed to determine if the pruinescence develops in a similar way in this species.

There are no clear consistent differences in the shape of the male appendages in *E. candens* (Fig. 2a, b) and *E. modesta*. The penis structure is also basically quite similar, but there seem to be clear differences. In *E. candens* (Fig. 2c) the lateral extensions of the Y shaped median process are set at a narrower angle than in *E. modesta* (Fig. 2d). The tips of the lateral processes are less curled in *E. candens* than in *E. modesta*.

Female. The supposed female of *E. candens* (Fig. 4a) has a dark metallic green thorax and blackish metallic abdomen, whereas in *E. modesta* female (Fig. 4b), the thorax and abdomen are paler brownish with a light metallic sheen. In *E. modesta* females the apical darkening of the wing tips shows clear geographic variation. In southern populations in Peninsular Malaysia the fore wing tip is almost hyaline and the hind wing tip only slightly marked. The tips of both wings are more distinctly darkened in more northerly populations. In Kanchanaburi populations the dark area starts 4–5 cell rows before the pterostigma in both wings. In *E. candens* the extent of the dark mark on the wing tips resembles that of *E. modesta* in Peninsular Malaysian populations. The females of *E. margarita* (Fig. 5b) and *E. perornata* (Fig. 5d) can easily be separated from the other species by the marking of the wings and by having whitish pterostigmata.

Key to the mature males of the genus *Echo*

- 1a – Wings hyaline, without opaque areas 2
 1b – Wings with opaque areas 4
 2a – Head with a distinct, white pruinulent, square-shaped marking
 on frons and vertex (Figs 1, 3b) 3
 2b – Head without any pruinescence on frons and vertex *E. uniformis*
 3a – Dorsum (mesepisterna) of synthorax with distinct white pruines-
 cence (Figs 1, 3a) *E. candens* sp. nov.
 3b – Dorsum (mesepisterna) of synthorax without pruinescence
 (Fig. 3b) *E. modesta*
 4a – Wings with opaque tips (Fig. 5a) *E. margarita*
 4b – Wings with opaque tips and with a separate opaque transverse
 band beyond nodus (Fig. 5c) *E. perornata*

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