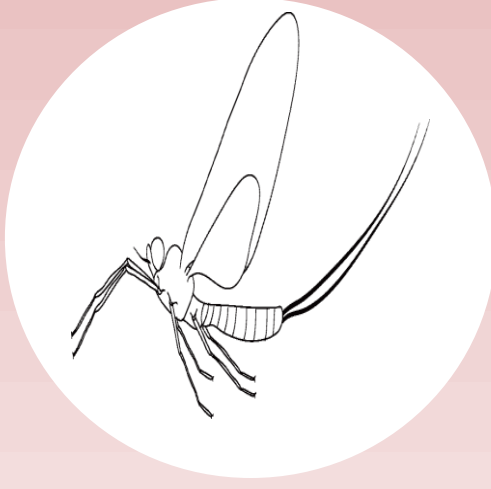


DNA barcoding reveals possible cryptic species in *Potamanthus* Pictet (Ephemeroptera: Potamanthidae)



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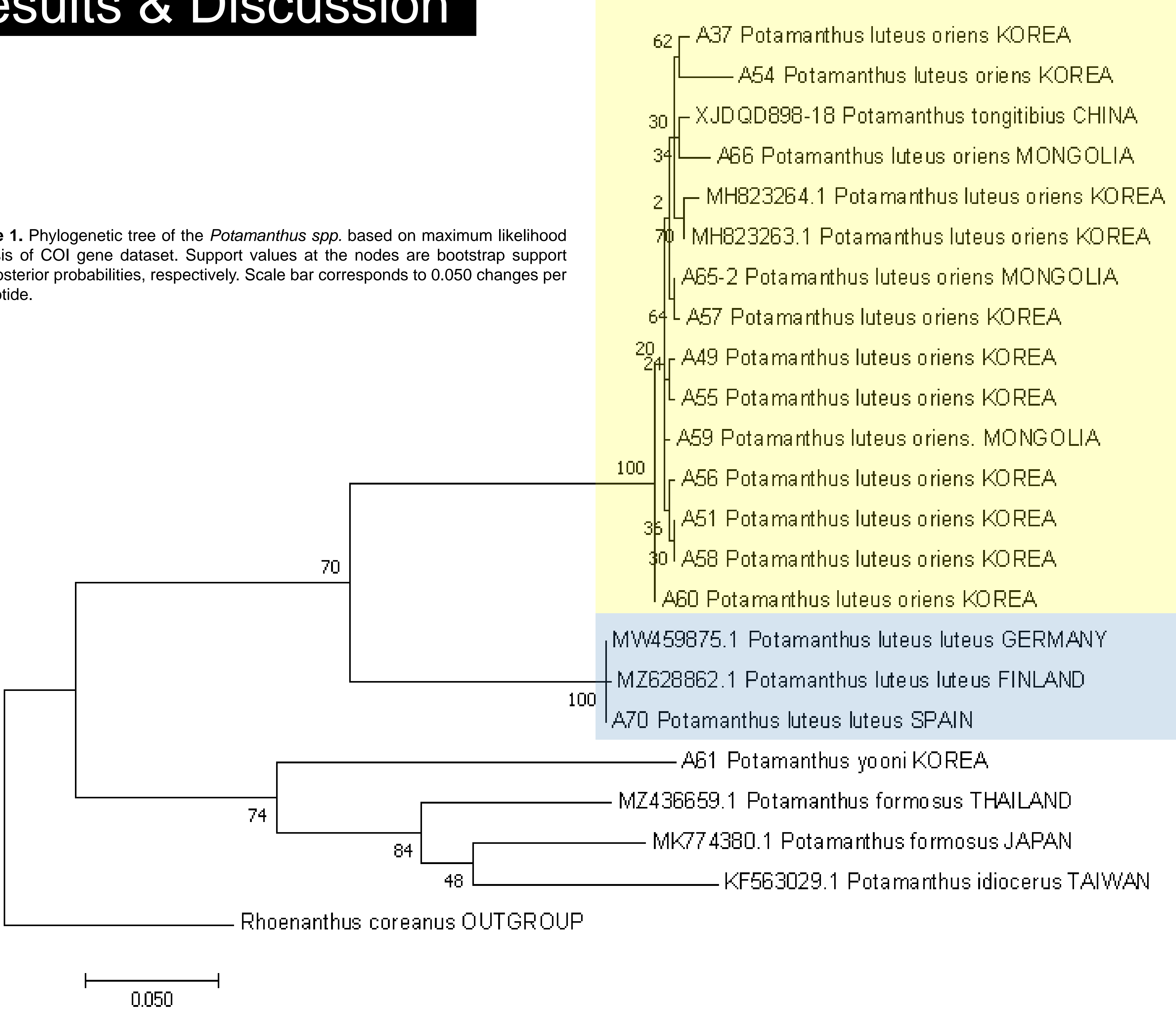
Abstract

Recently, DNA barcoding studies have helped to solve taxonomic issues in many insect groups. In the mayfly genus *Potamanthus* Pictet (Potamanthidae), the species with wide distributional range often possess regional or local variations as shown in the Palearctic *Potamanthus luteus* (Linnaeus, 1767). This species was originally described from Europe (neotype locality: England), and it is distributed across Eurasian continent to East Asia. This species was further separated into two subspecies, European *P. luteus luteus* and East Asian *P. luteus oriens* Bae & McCafferty, 1991, based on morphological characters and geological barriers. Our DNA barcode analysis using the *COI* gene from specimens from Europe, Korea, and Mongolia also substantiate the separation of the two subspecies taxa. However, because the genetic distance between the two subspecies groups are considerably large (mean interspecific genetic distance = 13.2%, mean intraspecific genetic distance = 0.15%), further comprehensive genetic and morphologic data are needed to delineate the species categories.

Keywords: Ephemeroptera, DNA barcoding, *Potamanthus luteus*, cryptic species, species category

Results & Discussion

Figure 1. Phylogenetic tree of the *Potamanthus* spp. based on maximum likelihood analysis of *COI* gene dataset. Support values at the nodes are bootstrap support and posterior probabilities, respectively. Scale bar corresponds to 0.050 changes per nucleotide.



DIAGNOSIS

Male imago: Both species forewings with dark pigmentation on crossveins. Penes of *P. luteus oriens* are more squared-shaped than *P. luteus luteus*, which are irregular and round-shaped (Fig. 2C-D); tips of penes of *P. luteus oriens* are more long, thin, and pointed than *P. luteus luteus* (Fig. 2C-D); *P. luteus oriens* apical penial lobes are not round; apical penial lobes less prominent and elongated than *P. luteus luteus*; basal penial lobes absent or significantly reduced (Fig. 2C-D); *P. luteus oriens* has round-shaped and prominent penial lobes; V-shape cleft from median emargination in *P. luteus oriens* is wide; *P. luteus luteus* has also a clear V-shaped median emargination but with narrow cleft, similar to a brace (Fig. 2C-D).

Larva: Mandibular tusks of *P. luteus oriens* are covered with dense rows of spiniform setae from outer-lateral area to middle area, covering all or half of tusks; tips of tusks curved convergently, elongated and very sharp (Fig. 3C-D); *P. luteus luteus* mandibular tusks lack of dense rows of spiniform setae, or if present are very scarce, instead short hairlike setae; tips of tusks almost straight, short, and not significantly pointed (Fig. 3C-D). Abdominal tergum of *P. luteus oriens* display 3 thin-pale stripes at middle and two lateral rows of pale dots except at tergum X (Fig. 3A-B).; in *P. luteus luteus* an elliptical-shaped pale band followed by rows of pale equilateral-triangular-shaped rows, and no rows of pale dots present (Fig. 3A-B).

DISCUSSION

The morphological differences and genetic distance between these two subspecies are obvious and considerably high, at least in the Korean, Mongolian and Spanish specimens reviewed in this study. However, due that these two subspecies have a wide distribution, it would be necessary to carry on a comprehensive comparison under a morphological and molecular approach using more specimens from different countries before determine the correct category of *P. luteus oriens*. To this point, we can conclude that this species might be arisen to a species status with further evidence. Also, it will be necessary to do this comparison among specimens of *P. luteus oriens* with the Chinese and geographic isolated *P. huoshanensis* Wu, 1987, which male genitalia seems similar in shape with *P. luteus oriens* but different in forewings pigmentation (Fig. 2) (Li & Zhou 2022).

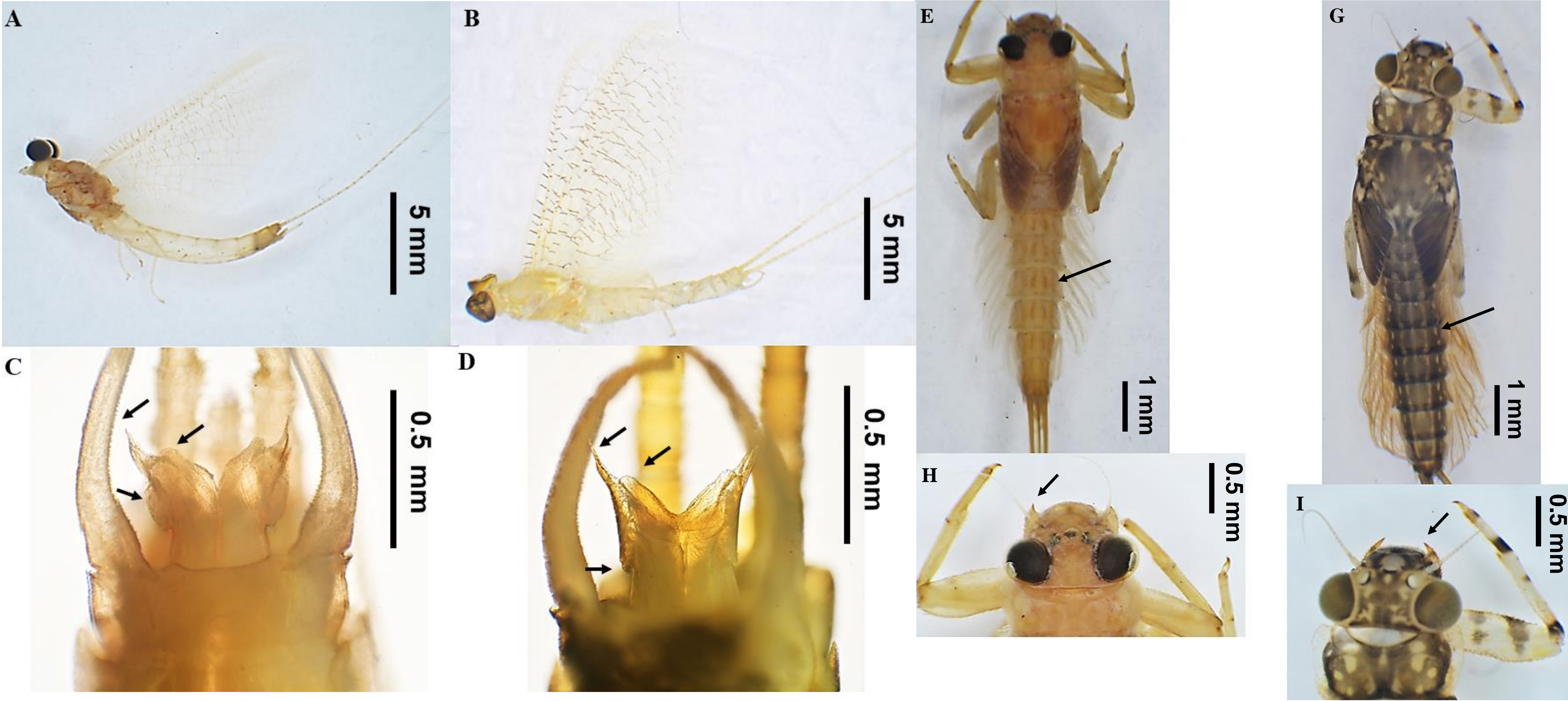


Figure 2. *Potamanthus* male imagoes: A, C, *P. luteus luteus* habitus and genitalia (penis) ventral view. B, D, *P. luteus oriens* habitus and genitalia (penis) ventral view. *Potamanthus* male larvae: E, H, *P. luteus luteus* habitus and head. G, I, *P. luteus oriens* habitus and head.

References

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