

With kind regards to
Mike Hubbard
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**Life Stages of a South Indian Burrowing Mayfly,
Ephemera (Aethephemera) nadinae
McCafferty and Edmunds 1973 (Ephemeroptera: Ephemeridae)**

by

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The egg, male and female imagines and subimagines of a burrowing mayfly, *Ephemera (Aethephemera) nadinae* McCafferty and Edmunds from South India are described and illustrated for the first time based on extensive collections from Palni and Cardamom hills, including rearing and light trapping.

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INTRODUCTION

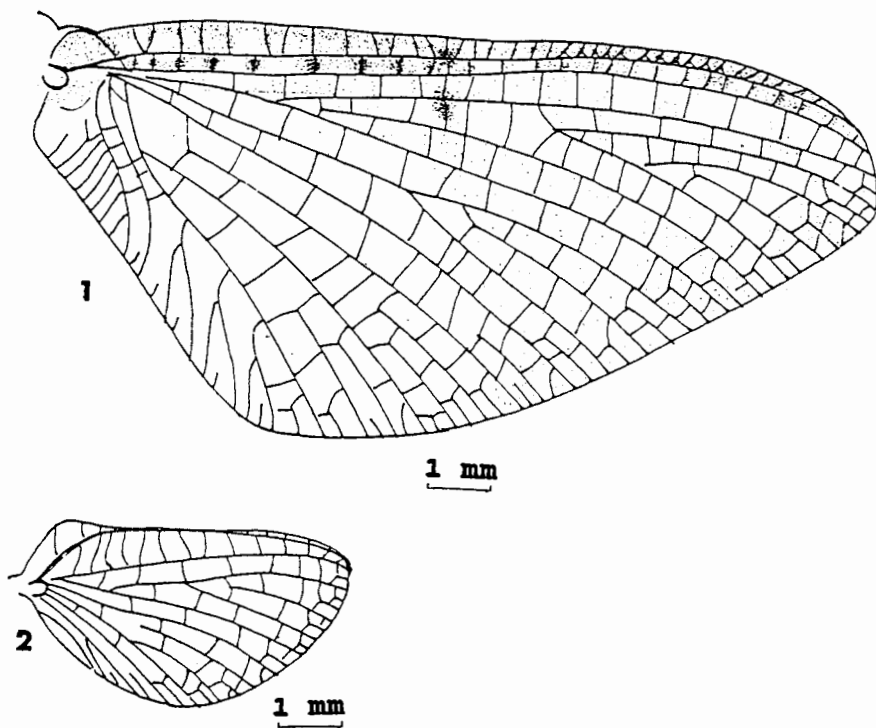
McCafferty and Edmunds (1973) described a new species of *Ephemera*, *E. nadinae* based on female and male nymphs collected from the Kodaikanal (1600 m) region of the Palni hills of South India. They established a new subgenus, *Aethephemera* within the genus *Ephemera*, for *E. nadinae*. Subsequently, Balasubramanian *et al.*, (in press) have done bioecological studies of *E. nadinae* in Kurangani stream of Western Ghats of South India. Based on extensive collections from Palni and Cardamom hills which included rearing and light trapping, the egg, male and female imagines and subimagines of *E. nadinae* are described and illustrated for the first time.

***Ephemera nadinae* McCafferty and Edmunds 1973
(Figs. 1-9)**

Ephemera nadinae McCafferty and Edmunds 1973 Pan Pac. Entomol. 49: 300-307.

Male imago (in alcohol): Length: body, 14.5 mm; forewings, 14 mm. Eyes grey. Dorsal half of ocelli reddish brown, basal half dark reddish brown. Antennae ochre, flagellum pale ochre. Head ochre.

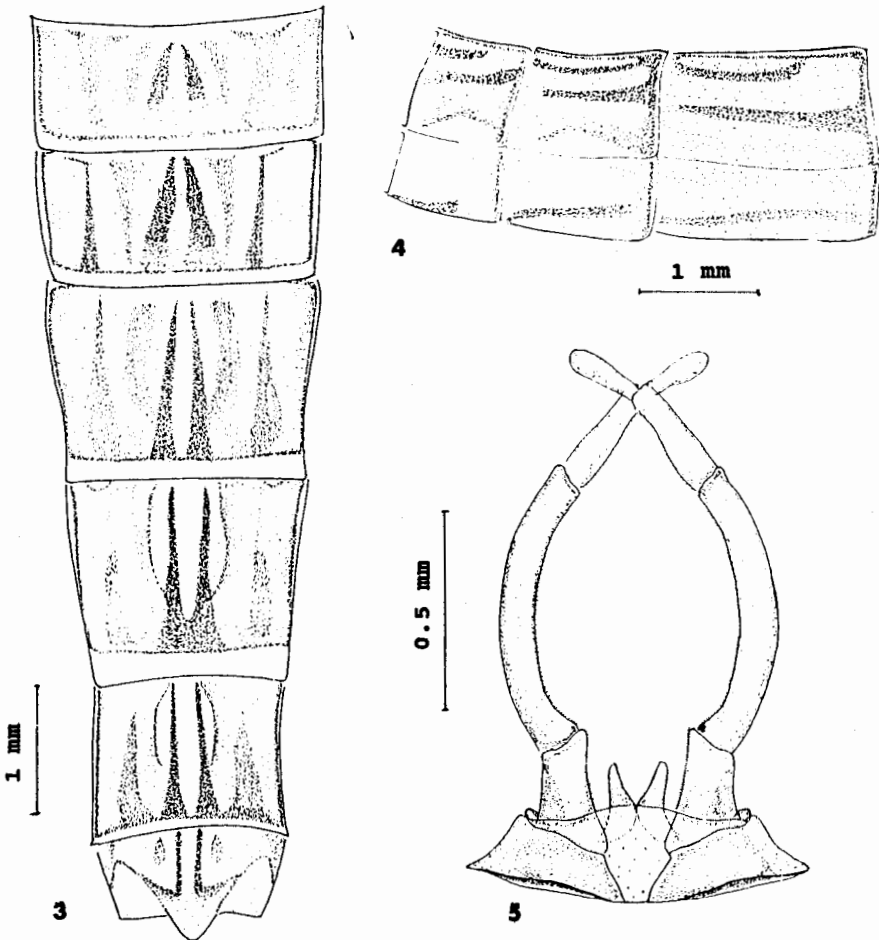
Pronotum reddish brown with two dark brown longitudinal submedian stripes separated by a transparent zone; mesonotum with light brown submedian stripes; median scutal hump and lateral mesoscutellar humps brown; metanotum brown; prosternum, mesosternum and metasternum pale yellow. Legs: Coxae, trochanters and femora of forelegs pale yellow, tibiae and tarsi pale reddish brown; claws dark reddish brown; middle and hind legs uniformly washed with pale yellow except claws dark reddish brown. Forewings (fig. 1): membrane hyaline, except costal and subcostal areas translucent yellowish brown; dark brown spots at bullae of veins Sc and R₁; anterior five cross veins at the base of subcostal region with dark brown clouds; longitudinal veins and cross veins dark brown; cross veins in distal costal area anastomosed. Hindwings: membrane hyaline; cross veins and vein Sc dark brown, remainder of longitudinal veins light brown (Fig. 2). Abdomen: terga yellowish brown, tergum 1 posterior two thirds washed with dark brown except a median concave portion; tergum 2 similar to tergum 1 but posterior 1/4 washed with dark brown, terga 3-9 with three pairs of brown longitudinal stripes, the middle darker brown stripes starting from the anterior edge



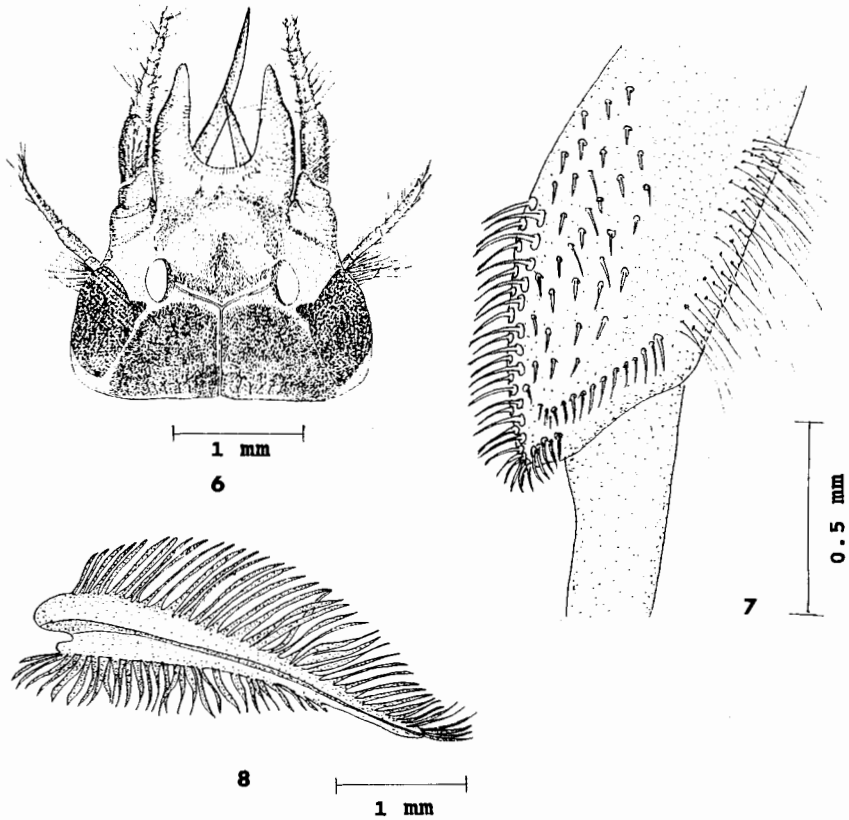
Figs. 1, 2. *Ephemera nadinae*, male imago: 1. fore wing; 2. hind wing.

and the other stripes starting from the posterior edge of the tergites; the outer and inner stripes fading to triangles at the posterior ends of terga 6-9; short slanting dark lines at lateral edges of terga 2-9; terga 3-10 margined with dark brown posteriorly; tergum 10 with paired lateral dark brown circular patch (Fig. 3-4). Genitalia yellowish; forceps segments 3 and 4 light yellow; penes blunt with apex narrower than median portion and subgenital plate concave as in Fig. 5. Caudal filaments yellowish, with dark brown annulations at articulations.

Male subimago (in alcohol): Colouration and markings similar to male imago.



Figs. 3-5. *Ephemera nadinae*, male imago: 3. dorsal view of abdominal segments 5-10; 4. lateral view of abdominal segments 4-6; 5. genitalia, ventral view.



Figs. 6-8. *Ephemera nadinae*, mature nymph: 6. head; 7. parts of tibia and tarsus of left prothoracic leg; 8. right gill 2.

Female imago (in alcohol): Length: body, 19.1-20.0 mm; forewings, 16.3-17.1 mm; hindwings, 5.0-6.0 mm. Colour and markings same as in male imago, slightly more distinct. Coxae, trochanters light yellowish brown, remaining portion of legs yellowish brown; sternum 9 with marks more like lines than spots, no dark posterior margination.

Female subimago (in alcohol): Colouration and markings similar to female imago except generally lighter; wings membranous, translucent pale white, longitudinal veins light brown.

Eggs: Barrel-shaped without attachment structures, micropyle funnelshaped, chorion sculptured with irregular pattern of ridges (Fig. 9).

Discussion: Applying the taxonomic criteria formulated by Peters and Edmunds (1970) for Ephemeroptera, McCafferty and Edmunds (1973) have established a new subgenus, *Aethephemera* for *E. nadinae* which is separated from all other species of *Ephemera* by a distinct gap of characters in the nymph namely, (1) the much reduced right mandibular tusk which is less than three fifths of length of left tusk (Fig. 6); and (2) tibiae of prothoracic legs with comb of stout apical setae at posterodorsal margin (Fig. 7), but no character gap is detectable in the imaginal stage.

Differential diagnosis: *Ephemera nadinae* can be distinguished from other species of *Ephemera* in the imagines by the following combination of characters: (1) dark brown spots at bullae of veins Sc and R₁ in the forewings (Fig. 1); (2) anterior five cross veins at the base of subcostal region of forewings with dark brown clouds; (3) penes blunt with apex narrower than median portion and the subgenital plate broadly concave as in Fig. 5 and (4) the distinctive abdominal colour pattern as illustrated in Fig. 3 and 4.

Ephemera nadinae can be differentiated from all other South Indian and Sri Lankan species of *Ephemera* by the following combination of characters in the imagines by (1) dark brown spots at bullae of veins Sc and R₁ in the forewings (Fig. 1); (2) penes blunt with apex narrower than median portion and the subgenital



Fig. 9. *Ephemera nadinae*, SEM view of egg, the scale line is 0.5 mm long.

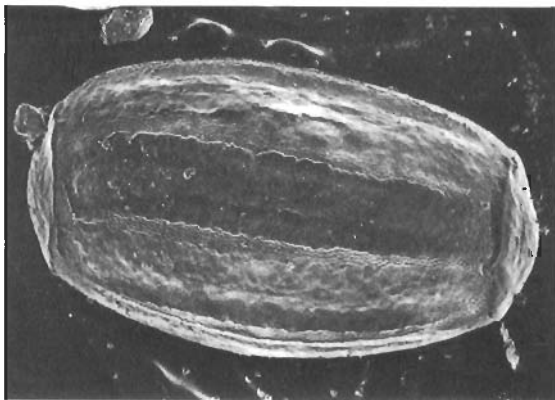


Fig. 9. *Ephemera nadinae*, SEM view of egg, the scale line is 0.5 mm long.

plate broadly concave as in Fig. 5 and (3) the distinctive abdominal colour pattern illustrated in Fig. 3 and 4 and in the nymphs by (1) thoracic notum brown; (2) abdominal sterna brown with pairs of prominent dark brown submedian longitudinal maculae on segments 7, 8 and 9 and (3) dorsal portion of gill 2 (Fig. 8) with inner margin produced ventrally at base.

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