

**SYNOPSIS OF THE ORIENTAL MAYFLY GENUS
EATONIGENIA (EPHEMEROPTERA: EPHEMERIDAE)¹**

W. P. McCAFFERTY

Department of Entomology, Purdue University,
West Lafayette, IN 47907, U.S.A.

ABSTRACT. The burrowing mayfly genus *Eatonigenia* Ulmer is distributed throughout tropical Asia and contains six nominal species, including four species previously described in the genus as well as *Eatonigenia chinei* (Dang) [= *Heterogenesia chinei* Dang], New Combination, and *Eatonigenia philippina* (Navas) [= *Hexagenia philippina* Navas], New Combination. *Heterogenesia* Dang (described in the family Palingeniidae) is shown to be a junior synonym of *Eatonigenia*, New Synonym. Catalogue information is given for each of the species, and names are maintained pending further associations of larval and adult stages becoming available.

Eatonigenia Ulmer is one of several genera of burrowing mayflies of the superfamily Ephemeroidea that occur in the Oriental Region (McCafferty, 1973). There have been four species formally described in the genus up to this time. *Eatonigenia* is apparently endemic to the Orient. It is not yet known from the fossil record. It belongs to a complex of phylogenetically related genera in the family Ephemeridae, including the Palearctic *Denina* McCafferty (known from the Paleogene only), the Western Hemisphere *Hexagenia* Walsh (Recent and Paleogene), the Holarctic *Litobrancha* McCafferty (Recent and Paleogene), and the Afrotropical *Eatonica* Navas (Recent). *Eatonigenia* and *Eatonica* are hypothesized to be sister groups (McCafferty, 1973, 1987; McCafferty & Gillies, 1979) and together are most closely related to *Litobrancha* (McCafferty & Sinitshenkova, 1983).

Comparative descriptions of *Eatonigenia* and its species were presented by McCafferty (1973). Since then, however, the discovery of an obscure publication (not appearing in any abstracting services) written by Dang (1967) revealed that a species clearly belonging to *Eatonigenia* has been described incorrectly as a new genus, *Heterogenesia*, in the family Palingeniidae. The latter generic name, thus, must be suppressed and the species reassigned. Another species previously described as *Hexagenia* (*H. philippina* Navas) from the Philippines also requires formal recombination to *Eatonigenia*.

The following synopsis is offered in order to address these necessary nomenclatural revisions as well as to provide a reference for entomologists or freshwater biologists in Asia and elsewhere who may have to work with this genus. Although there are potential species synonymies in the genus, due particularly to some species being known only in the larval stage and others being known only from male and/or female adults, all species names are maintained at this time. The present names should be used until such time that rearings and more larval-adult associations can be made since synonymies cannot be accurately assessed without them in this case, and the following nomenclature serves well as a "working" classification at this relatively primitive stage of systematic knowledge concerning the genus.

1. Purdue Experiment Station Journal No. 12583.

Genus *Eatonigenia* Ulmer

Eatonigenia Ulmer, 1937. Arch Hydrobiol. Suppl., 16: 479. Type species: *Hexagenia chaperi* Navas, 1935. Original designation.

Heterogenesia Dang, 1967. Tập san Sinh vật Địa Học, 6: 159. **New synonym.** Type species: *Heterogenesia chinei* Dang, 1967. Original designation.

Eatonigenia chaperi (Navas).

Hexagenia chaperi Navas, 1935. Broteria, 31: 99. [Male adults]. Type locality: Java. Type deposition: Paris Museum.

Eatonigenia chaperi: Ulmer, 1939. Arch Hydrobiol. Suppl., 16: 479.

Larva: McCafferty, 1973. Oriental Ins., 7: 55.

Distribution: Borneo, Java, Thailand.

Note: The adult redescription by McCafferty (1973) was based on new material from Thailand. Plesiotypes were deposited at the University of Utah, Salt Lake City, and Purdue University, West Lafayette, Indiana. The larval description was based on associated material from Thailand.

Eatonigenia chinei (Dang), comb. nov.

Heterogenesia chinei Dang, 1967. Tập san Sinh vật Địa Học, 6: 159. [Larvae]. Type locality: Vietnam. Type deposition: ?Hanoi.

Distribution: Vietnam.

Note: This species was originally described as a new genus of the family Palinigeniidae. It is, however, clearly a member of the genus *Eatonigenia*. Since the species description is incomplete and based on larvae, the adult stage remaining unknown, it is difficult to ascertain whether or not it represents a separate species. It is highly possible that it will eventually prove to be a synonym of *E. seca* or *E. chaperi* based on its distribution. The species name is valid in terms of adhering to rules of zoological nomenclature, and I am maintaining it until it can be compared with other materials of *Eatonigenia*.

Eatonigenia indica (Chopra)

Hexagenia indica Chopra, 1924. Rec. Indian Mus., 26: 416. [Female adults]. Type locality: India. Type deposition: Zoological Survey of India (presumably lost).

Eatonigenia indica: McCafferty, 1973. Oriental Ins., 7: 57.

Larva: Unknown.

Distribution: India.

Note: According to Hubbard (1985) the holotype of this species cannot be located in the collections of the Zoological Survey of India in Calcutta, although there is a catalogue number for the specimen.

Eatonigenia philippina (Navas), comb. nov.

Hexagenia philippina Navas, 1933. Mem. Pontif. Accad. Romana Sci. Nuovi Lincei, 17: 88. [Female adults]. Type locality: Philippines. Type deposition: Paris Museum.

Larva: Unknown.

Distribution: Philippines.

Note: Both Spieth (1941) and McCafferty (1973) have suggested that this species belongs to the genus *Eatonigenia*. It is highly unlikely that the American genus *Hexagenia* occurs in tropical Asia.

Eatonigenia seca McCafferty

Eatonigenia seca McCafferty, 1973. Oriental Ins., 7: 57. [Male and female adults]. Type locality: Thailand. Type deposition: University of Utah.

Larva: Unknown.

Distribution: Thailand.

Eatonigenia trirama McCafferty

Eatonigenia trirama McCafferty, 1973. Oriental Ins., 7: 59. [Larvae]. Type locality: India. Type deposition: University of Utah.

Distribution: India.

Note: The adults of this species remain unknown. As a result there is a possibility that the name will prove to be synonymous with *E. indica*, based on distribution, or even *E. seca*, based on size and color characteristics. It is, however, distinct from the larvae of *E. chaperi* and also apparently from *E. chineii*.

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