

THE MALE OF *BAETIS MACDUNNOUGHII* IDE AND NOTES ON PARTHENOGENETIC POPULATIONS WITHIN *BAETIS* (EPHEMEROPTERA:BAETIDAE)^{1, 2}

W.P. McCafferty³, D.K. Morihara⁴

ABSTRACT: The discovery of males of *Baetis macdunnoughi* Ide in Indiana and Illinois indicates that the species is parthenogenetic only in northern populations. Somewhat similar reproductive phenomena involving other North American *Baetis* species suggest that obligatory, thelytokous parthenogenesis is an adaptation to relatively colder environments. The male imago of *B. macdunnoughi* is described for the first time and is similar to *Baetis pygmaeus* (Hagen).

Baetis macdunnoughi Ide has previously been known only from females (Ide, 1937). Suspected thelytokous parthenogenesis was confirmed for Wisconsin populations in laboratory experiments by Bergman and Hilsenhoff (1978). We have recently examined males of *B. macdunnoughi* from southern Indiana and southern Illinois. Of 55 larvae, 22 were males. One adult male was reared and is described below.

Parthenogenesis in this species therefore may be apparently completely developed only in Canadian and Wisconsin populations. Populations in Illinois and Indiana (where the sex ratio appears to be approximately 1:1) are known only from southern unglaciated regions of these states. Reproductive differences between the northern and the possibly older, isolated southern populations are evidently being maintained by this geographic disjunction.

Interestingly, a similar relationship of southern, sexually reproducing populations and northeastern, completely parthenogenetic populations is present in *Baetis hageni* Eaton (Bergman and Hilsenhoff, 1978). *B. hageni* and *B. macdunnoughi* are not closely related, and the similar reproductive phenomenon may be a result of historical population adaptations to climatic or temperature regime differences between northern and southern areas.

An hypothesis that parthenogenesis in certain *Baetis* is related to cold adaptation is supported by the additional observation that *Baetis foemina* McDunnough and *Baetis hudsonicus* Ide are both known only from the

¹Received August 24, 1978.

²Purdue University Agricultural Experiment Station Journal No. 7287.

³Department of Entomology, Purdue University, West Lafayette, IN 47907

⁴Max-Planck-Institut für Limnologie, 232 Plön, Postfach 165, Germany (West)

Canadian Tundra and are both known only as females. Also in some populations of the western *Baetis bicaudatus* Dodds, only females are known (Dodds, 1923), and a correlation with cold mountainous environments may possibly exist.

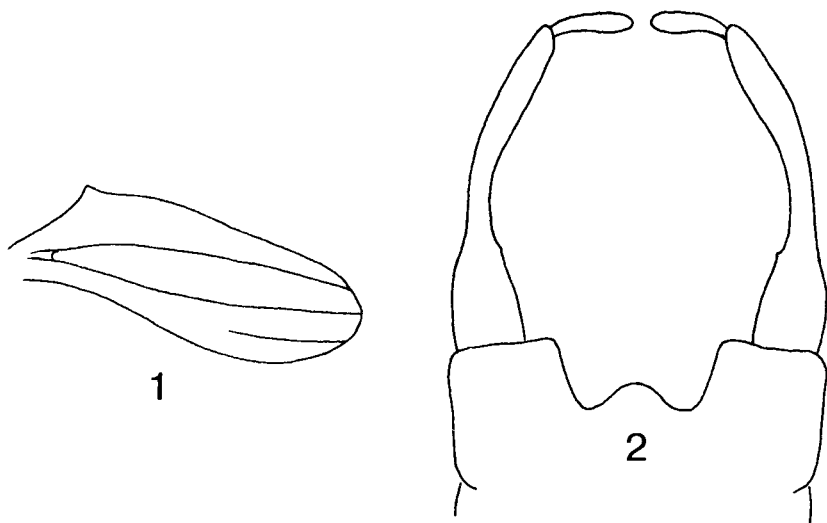
Parthenogenesis is evidently the most selectively favored form of reproduction in relatively colder, or stressed, environments for some species. Mayflies with parthenogenetic potential may therefore be capable of existing in certain environments that they would otherwise be incapable of. A selective advantage for parthenogenesis could result either when populations are too small to insure high frequencies of mate acquisition or when climatic conditions conducive to mating are highly limited or unpredictable.

Known parthenogenesis in six other *Baetis* species in North America and Europe is apparently facultative, deuterotokous, and non-geographic (Degrange, 1960; Bergman and Hilsenhoff, 1978). This type of parthenogenesis may be expected in many mayfly species (McCafferty and Huff, 1974; Huff and McCafferty, 1974).

The following description of the adult male of *B. macdunnoughi* confirms this species' close relationship with *Baetis pygmaeus* (Hagen).

Baetis macdunnoughi Ide

Adult Male – Length of body 3.5 mm, fore wing 3.8 mm, hind wing 0.7 mm. Head brown; antennal flagella paler. Thorax and coxae brown; remaining leg segments translucent, tinted with brown; fore legs with femora and tarsi slightly shorter than tibiae.



Figs. 1 and 2. *Baetis macdunnoughi* adult male. 1. Hind wing. 2. Genitalia, ventral view.

Wings hyaline. Fore wings with marginal intercalaries absent from first interspace. Hind wings (Fig. 1) with prominent, acute costal projection; anterior margin beyond costal projection undulate; 2 longitudinal veins and 1 long intercalary. Abdominal segments 2-6 translucent white, tinted with brown; spiracles faintly pigmented; segments 7-10 opaque, tawny brown, with terga darker than sterna; forceps white, tinted with brown; cerci white. Genitalia in ventral view (Fig. 2) with basal enlargement of forceps conical; elongate portion broad in apical 2/3; terminal segment long and slender, more than 4 times longer than wide.

Material Examined – 1 ♂ imago lab reared, IN: Perry Co., Poison Cr. approx. 5 mi. NW Derby. V-14-1976. A.V. Provonsha, M. Minno. Deposited in the Purdue University Entomological Research Collection.

LITERATURE CITED

- Bergman, E.A. and W.L. Hilsenhoff. 1978. Parthenogenesis in the mayfly genus *Baetis* (Ephemeroptera:Baetidae). Ann. Entomol. Soc. Amer. 71:167-168.
- Degrange, C. 1960. Recherches sur la reproduction des Ephéméroptères. Trav. Lab. Hydrobiol. Grenoble 51:7-193.
- Dodds, G.S. 1923. Mayflies from Colorado. Trans. Amer. Entomol. Soc. 49:93-114.
- Huff, B.L., Jr. and W.P. McCafferty. 1974. Parthenogenesis and experimental reproductive biology in four species of the mayfly genus *Stenonema*. Wasmann J. Biol. 32:247-254.
- Ide, F.P. 1937. Descriptions of Eastern North American species of baetine mayflies with particular reference to the nymphal stages. Can. Entomol. 69:219-231, 235-243.
- McCafferty, W.P. and B.L. Huff, Jr. 1974. Parthenogenesis in the mayfly *Stenonema femoratum* (Say) (Ephemeroptera:Heptageniidae). Entomol. News. 85:76-80.