

# A NEW SPECIES OF *BAETIS* (EPHEMEROPTERA) FROM PONDS IN THE CANADIAN ARCTIC, WITH BIOLOGICAL NOTES

D. M. LEHMKUHL

Department of Biology, University of Saskatchewan, Saskatoon

## Abstract

*Can. Ent.* 105: 343-346 (1973)

*Baetis bundyi* new species is described from nymphs which were collected from tundra ponds in the central Canadian arctic (62.45 N., 94.27 W.). Based on measurements of a series of nymphs the eggs must hatch in early July and adults emerge in August. A table is presented for separating this species from other known arctic *Baetis*.

Despite the widespread occurrence, the abundance, and thus the ecological importance of the genus *Baetis* in the flowing waters of North America, the taxonomy of this group remains in a state of confusion. This has been largely because of the lack of "good" taxonomic characters for separating species, but Müller-Liebenau (1969) in her treatment of European *Baetis* has demonstrated the validity of many taxonomic characters and her work provides a model for work on North American species.

This paper describes a hitherto unknown species of *Baetis* which is unusual in that it inhabits the edges of shallow ponds in the tundra. While other species of this genus are known from the arctic, these as well as all temperate *Baetis* known to me, occur in flowing water only. Adults of the present species have not been obtained but Edmunds and Allen (1966) have justified, providing good judgment is used, the describing of mayfly species from nymphs alone, since it is this stage that is most frequently collected and is ecologically the most interesting.

## *Baetis bundyi* new species

Figs. 1-8

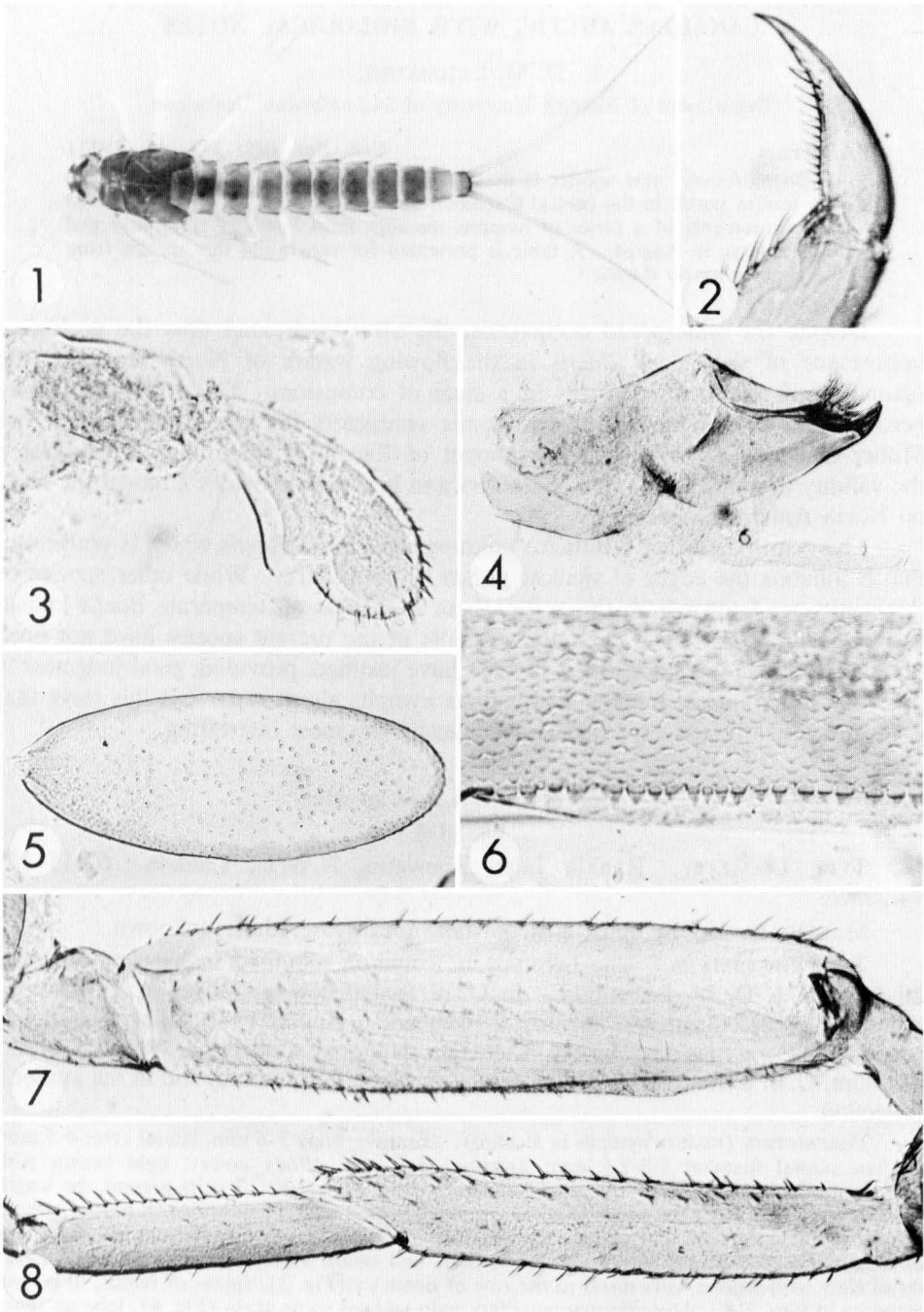
TYPE LOCALITY. Rankin Inlet, Keewatin, N.W.T., Canada. 62.45 N., 94.27 W.

MATERIAL. 35 nymphs, all from type locality. Adults unknown.

TYPE SPECIMENS. The holotype is a nymph mounted in balsam, collected 28 July 1972, D. M. Lehmkühl. In U. of Saskatchewan Collection. Paratopotypes: 34 nymphs from type locality, 28 July and 1 August 1972, D. M. Lehmkühl, collector. Paratypes are in the Canadian National Collection, Royal Ontario Museum, U. of Saskatchewan Collection, U.S. National Museum, and in the author's collection.

DESCRIPTION (mature nymphs in alcohol). *Length*: body 5-6 mm, lateral cerci 4-5 mm, median caudal filament 1.5-2.5 mm; antennae 5-6 mm. *Body color*: light brown with indistinct paired dark spots on dorsum of abdomen (Fig. 1). *Gills*: 7 pairs present, the length of each is about 3 times the width (Fig. 5), each gill with a sclerotized brownish border around the entire circumference, gill surface marked with small circles; first (anterior) gill small,  $\frac{1}{2}$  as long as the second; gill margins with fine hairs and small, widely spaced serrations. *Legs*: tarsal claw *without* fine hairs distal to the row of denticles (Fig. 2), spines of femur, tibia, and tarsus as in Figs. 7-8. *Mouthparts*: maxillary palp *without* spine at tip (Fig. 4), lobe on inner margin of labial palp not greatly enlarged (Fig. 3), prostheca of both mandibles well developed, not reduced to feather-like form. *Abdominal tergites*: hind margin and surface sculpturing of dorsal abdominal segments as in Fig. 6.

DIAGNOSIS. The species keys to *Baetis pavidus* Grandi in the key to European *Baetis* by Müller-Liebenau (1969). McDunnough (1936) reported two species of



FIGS. 1-8. *Baetis bundyi* n. sp., for comparison with my description, Table I, and that of Müller-Liebenau (1969). 1, general view of nymph, 4.5 mm actual body length; 2, tarsal claw with denticles; 3, labial palp; 4, maxilla and palp; 5, abdominal gill; 6, abdominal tergite, denticles on posterior border and markings on surface; 7, femur; 8, tibia and tarsus.

Table I. A comparison of the nymphs of the known species of *Baetis* from the central Canadian arctic

|  | Total length (mm) | "Tails"                                   | Gill width length ratio (gill 3) | Tibia and claws  |
|--|-------------------|---|----------------------------------|--|
| <i>B. hudsonicus</i><br>(from Ide 1937)            | 7.5-8.5           | 3, equal length                           | 4/10                             | -  |
| <i>B. foemina</i><br>(from McDunnough 1936)        | 4                 | 2   | 4/10                             | -  |
| <i>B. lapponica</i><br>(from Müller-Liebenau 1969) | 4.5-6             | 2   | 8/10                             | With row of fine hairs along outer margin of tibia and 2 fine bristles near tip of tarsal claw |
| <i>B. bundyi</i>                                   | 5-6               | 3, middle $\frac{1}{2}$ length of lateral | 3.5/10                           | Without fine hairs on tibia or tarsal claw   |

*Baetis* from the arctic (Lake Harbor, Baffin Island) and Ide (1937) described one from Churchill, Man. The species are compared in Table I.

ETYMOLOGY. It is my pleasure to name the species after my wife, Bundy Suzanne Lehmkuhl.

BIOLOGY. The specimens were collected along the shores in small ponds near the village of Rankin Inlet. While no specimens were present in the last week of June, 1971, nymphs with the following size distribution were collected 28 July - 1 August 1972: 2.0-2.5 mm, 1; 2.6-3 mm, 1; 3.1-3.5 mm, 7; 3.6-4 mm, 8; 4.1-4.5 mm, 6; 4.6-5 mm, 9; 5.1-5.5 mm, 2; 5.6-6 mm, 1. In terms of total length the smallest nymphs were less than half the length of the largest nymphs. In terms of biologically significant groups (Lehmkuhl 1970) wherein I = newly hatched, II = young nymphs, III = half grown nymphs, IV = mature nymphs and V = wing pads black indicating adults are emerging, all nymphs were clumped in groups III (18 specimens) and IV (17). This means that all nymphs were at least half grown in terms of maturity but adults were not yet emerging. Based on the facts that no nymphs were present in June and that arctic winters arrive early, it seems safe to infer that there is one generation per year, with nymphs hatching in early July and adults emerging in early August. Since the ponds were shallow and most certainly freeze solid in winter, the eggs must pass the winter in the frozen state.

DISCUSSION. The genus *Baetis* is widespread in the world and it contains many species with over 50 being known in North America. It is often abundant in numbers of individuals; in favorable conditions there may be hundreds of specimens of several species on a square foot of stream bottom (Lehmkuhl 1969). The success of these insects is probably related to certain aspects of their life cycle and biology. I have observed mating flights of *Baetis* high in the air (about 60 ft) and this exposure to winds would ensure dispersal of egg-bearing females. Good power of dispersal is shown by the occurrence of several species of *Baetis* on islands such as the Canary Islands, the nearest of which is about 100 km from the coast of Africa (Müller-Liebenau 1971).

The life cycle in the genus is flexible. Illies (1959) found that in a given egg mass some eggs hatched soon after being laid while others did not hatch until much later. I have used this fact to explain the presence of two types of life cycles in *B. bicaudatus* Dodds in Oregon: in a spring-fed river with favorable conditions

year around, there are two generations per year; in a summer-warm stream the summer generation is killed by the heat but delayed hatching provides recruits for a fall and winter generation (Lehmkuhl 1969). In addition, parthenogenesis is common in mayflies (Degrange 1960).

*Baetis* spp. are the only mayflies which have been found to date on the open tundra. In view of their good dispersal potential and flexible life cycles, it is not unusual that they should be found there.

#### Acknowledgments

I should like to thank Dr. R. G. Williamson of the Arctic Research and Training Center for his hospitality during my visits to Rankin Inlet. This research was supported by the Institute for Northern Studies, University of Saskatchewan. John Waddington prepared the plate.

#### References

- Degrange, C. 1960. Recherches sur la reproduction des Éphéméroptères. Lab. Hydrobiol., Grenoble, France. 193 pp.
- Edmunds, G. F., Jr. and R. K. Allen. 1966. The significance of nymphal stages in the study of Ephemeroptera. *Ann. ent. Soc. Am.* **59**: 300-303.
- Ide, F. P. 1937. Descriptions of eastern North American species of baetine mayflies with particular reference to the nymphal stages. *Can. Ent.* **69**: 219-231, 235-243.
- Illies, J. 1959. Retardierte Schlupzeit von *Baetis* Gelegen (Ins. Ephem.). *Naturwissenschaften* **46**: 119-120.
- Lehmkuhl, D. M. 1969 (unpub.). Biology and downstream drift of some Oregon Ephemeroptera. Ph.D. Thesis, Oregon State Univ., Corvallis. 110 pp.
- 1970. The life cycle of *Rhithrogena morrisoni* (Banks) in western Oregon. (Ephemeroptera: Heptageniidae). *Pan-Pacif. Ent.* **46**: 124-127.
- McDunnough, J. 1936. A new arctic baetid (Ephemeroptera). *Can. Ent.* **68**: 32-34.
- Müller-Liebenau, I. 1969. Revision der europäischen Arten der Gattung *Baetis* Leach, 1815 (Insecta, Ephemeroptera). *Gewäss. Abwäss.* **48/49**: 1-214.
- 1971. Ephemeroptera (Insecta) von den Kanarischen Inseln. *Gewäss. Abwäss.* **50/51**: 7-40.

(Received 7 November 1972)