TWO MAYFLY GYNANDROMORPHS (EPHEMEROPTERA)[1]

By Richard H. Daggy

During a survey of the mayfly fauna of Minnesota over the period 1936–1941, large numbers of mayfly adults were examined from all parts of the state. In the course of the study, two interesting gynandromorphs were noted. Since this condition has not commonly been reported in the mayfly literature, these two unique specimens are described below.

The first, a specimen of *Blasturus nebulosus* (Walker), occurred in a large series of this species collected by the writer from Mille Lacs Lake, Mille Lacs Co., Minnesota, on June 3, 1937.

The dimorphism so characteristic of most mayflies is especially striking in *B. nebulosus*. Males, in general, are smaller than the females and have the fore wings conspicuously marked with a brown cloud over the distal third, while in the female the wings are unmarked. The compound eyes of the male are very large while those of the female are much smaller. The fore legs of the male are much longer than those of the female, and the presence of forceps and penes lobes form a conspicuous structure peculiar to the male. Usually the caudal filaments are relatively longer in the male than in the female. In general, the above characteristics apply to the different sexes of most species of mayflies.

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In general appearance, this first gyanndromorph most resembles an ordinary female imago, but the writer's attention was first attracted when the "female" bore the external genitalia of the male sex. Further examination disclosed a mosaic type of gynandomorphism in which the left side showed certain male characteristics while the right side showed almost all female characteristics.

The body size (12 mm.) and wing length (12 mm.) are those of the average female in this species. The two fore wings appear similar and are wholly unlike the male in lacking the familiar brown cloud so distinctive of that sex in this species. One slight wing difference was discovered. A minute part of the wing along the margin between vein M_1 and the intercalary between M_1 and M_2 (Needham-Traver system) showed a trace of the typical brown cloud of the male. This minute pigmented area occurred on the left or "male" side. The cloud, although very faint, shows some relation to the male wing, but the pigment will probably fade out entirely in alcohol as so frequently occurs even in normal male wings in time.

The compound eyes are those of the female and show no differences nor any resemblance to the relatively huge eyes of the normal male. The left ocellus ("male" side) is fully twice the size of the right ("female") side), and the median ocellus is deflected slightly to the left. The lateral ocelli are conspicuously larger in the normal male when compared with those of the normal female.

Unfortunately, the fore legs and median caudal filament are lacking. Any difference in length of left and right fore legs would have been of great interest since the fore legs differ greatly in length in normal males and females. The other legs showed no apparent differences on the two sides.

The dorsal abdominal color pattern is symmetrical and is characteristic of the normal female. The ventral markings of the gynandromorph are decidedly abnormal. Typically, the male is darker than the female ventrally. In this specimen, the thoracic venter and first abdominal sternum are distinctly divided into two halves—the left or "male" half is solidly blackish-brown while the right or "female" half is entirely pale. A midventral dividing line along the other sterna is distinct in that the two halves of any one sternum do not resemble each other in color pattern. This pattern is not a continuation of the thoracic pattern just described but seems to separate a patchwork of dark and light colored areas. Sterna 2–3 are essentially alike on each side, but 5, 6 and 8 show more dark areas on the right, while 7 and 9 have the dark markings on the left. Light and dark markings are equally distributed on 4 but in different patterns on each half sternum.

The external genitalia are almost wholly male. The left or "male" side shows the normal penis and normal forceps limb, but the right or "female" side lacks the penis, and the forceps limb is rudimentary (see Fig. 1). The caudal filaments are asymmetrical—the left or "male" filament is distinctly thicker and longer (33 mm.) than the right or "female" filament (23 mm.). In normal males, the caudal filaments are always stouter and longer than in the female.

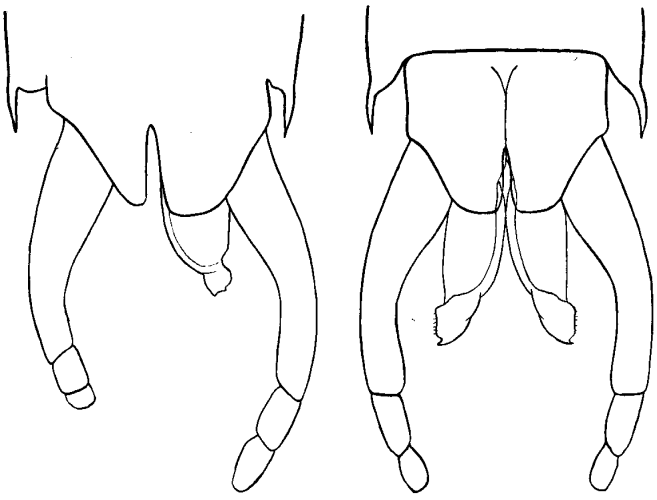

Fig. 1. Genitalia of the normal male, *Blasturus nebulosus*, and of the gynandromorph.

Oddly enough, the second gynandromorph noted in this study of Minnesota mayflies occurred in the same genus. This specimen, identified as *Blasturus cupidus* (Say), was taken at Taylor's Falls, Minnesota, on the St. Croix River, May 31, 1938, by the writer.

At first glance, the dried specimen appeared to be a normal female, even to the extent of having the abdomen packed with eggs in the usual manner. The coloration and size were those of the normal female. The eyes were conspicuously different, however, that on the left being large, the size of the normal male eye. There was no difference in the relative lengths of the fore legs, their length being that of the normal female. The genitalia are especially peculiar. Forceps limbs are present, but the right one, corresponding to the side with the "female" eye, is stunted. The left forceps limb, on the side with the "male" eye, is apparently the size of the normal male. No penes lobes

are discernible. Unfortunately, the right fore wing and right caudal filament are missing in this unusual specimen.

Needham, Traver and Hsu (1935), p. 114, record the occurrence of a gynandromorph in which a species of *Stenonema* (*interpunctatum* group) combines male and female characteristics. It resembles the *Blasturus nebulosus* gynandromorph described above in that it is predominately female. In the *Stenonema* gynandromorph, the left half possesses the male coloration on the dorsum of the thorax and the half-forceps and single penis at the end of segment 9. The head, legs and caudal filaments are those of the female. This specimen was collected by J. R. Traver on Lake Erie, July 7, 1934.

Spieth and Ide (1939) have described four more gynandromorphs from North American material occurring in their collections. The species involved are *Leptophlebia mollis* (Hagen), *Stenonema terminatum* (Walsh), *Stenonema rubromaculatum* (Clemens), and *Potamanthus flaveola* (Walsh). Various combinations of male and female characteristics were observed in these specimens. In the gynandromorph of *Leptophlebia mollis*, the characteristics of the female were present at the anterior end, those of the male at the posterior end, including well developed male genitalia. The others showed a mosaic mixture of characteristics of both sexes.

The two gynandromorphs described in this paper, one described by Needham, Traver, and Hsu, and the four noted by Spieth and Ide make a total of seven described mayfly gynandromorphs for North America.

Tiensuu (1937) has summarized the European literature in regard to this interesting condition in European mayflies. Previous to the publication of his paper, the only intersexes discussed in this literature were of the same species, *Baetis rhodani* Pictet. Tiensuu describes five new anomalies from material collected in Finland. The three intersexes described include specimens of *Baetis scambens* Eaton, *Baetis* sp, (? *bioculatus*) and *Cloeon praetextum* Bengston. All of these individuals show peculiar intersexual mingling of male and female characteristics, although they are not bilaterally symmetrical.

Literature Cited.

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