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ENTOMOLOGY

Distribution and Emergence Patterns of Mayflies *Ephemera simulans* (Ephemeroptera: Ephemeridae)

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ABSTRACT—Analyses of collections made during the years 1961-1964 reveal that *Ephemera simulans* is widely distributed in the lake regions of Minnesota and Wisconsin. The period of maximum emergence in central Minnesota and northern Wisconsin occurs during the last three weeks in June, the peak in extreme northern Minnesota about two weeks later.

Collections of Mayflies in the lake regions of Minnesota and Wisconsin during the years 1961-1964 revealed three species, *Hexagenia bilineata* (Say), *Hexagenia limbata* (Serville), and *Ephemera simulans* (Walker) were predominant. One or more of these species is usually present when shoreline residents and motorists experience nuisance problems with Mayflies in the areas studied. All three species are large and tend to emerge *en masse*.

H. bilineata was collected only from the Mississippi River and its tributaries. *H. limbata* was collected from lakes, rivers, and streams. *E. simulans* was collected from lakes and rivers. *H. limbata* was usually found in association with *E. simulans*.

A comprehensive review of the biology of *E. simulans* has been presented by Britt (1962). The effects of respiration and substrate upon distribution have been reported by Ericksen (1964). *E. simulans* has been previously reported from Minnesota by Needham, Traver, and Hsu (1935) and by Daggy (1941). The species has been reported from Wisconsin by Baker (1924).

For this study specimens were recorded according to the state, county and respective latitude of places where gathered, proceeding from south to north. Locations of the collecting points are presented in Figure 1.

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Minnesota Locations

RUM R., Anoka Co., 7-VI-63. GREEN L., Kandiyohi Co., 11-VI-62, 12-VI-62. MISSISSIPPI R., Stearns Co., 9-VI-63, 8-VI-64. GRINDSTONE L., Pine Co., 14-VI-63, 10-VI-64. MILLE LACS L., Mille Lacs Co., 4-VI-61, 9-VI-61, 20-VI-61, 26-VI-62, 4-VII-63, 7-VII-63, 10-VII-63, 11-VII-63, 22-VII-63, 12-VI-64, 23-VI-64, 21-VII-64. BATTLE L., Otter Tail Co., 30-VI-62, 19-VI-63, 9-VII-63, 27-VI-64. WHITE SAND L., Crow Wing Co., 5-VI-61, 6-VI-61. OTTER TAIL L.,

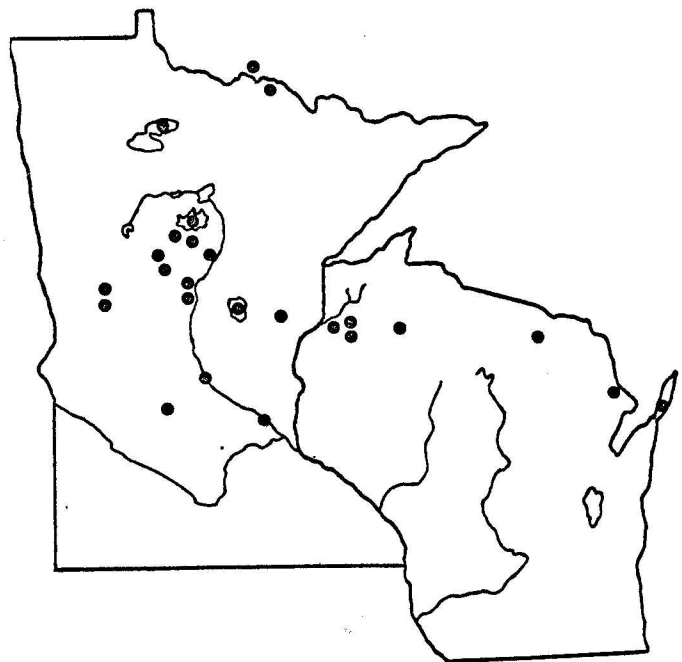


FIGURE 1.—Emergence records of *Ephemera simulans* in Minnesota and Wisconsin in 1961-1964. Each dot indicates a body of water from which one or more collections was made.

Otter Tail Co., 9-VI-61, 12-VI-61, 27-VI-61, 23-VI-63, 26-VI-63, 28-VI-63, 11-VII-63. GULL L., Cass Co., 15-VI-63. NORTH LONG L., Crow Wing Co., 4-VI-61, 22-VI-61, 8-VI-64, 16-VI-64. GOODRICH L., Crow Wing Co., 8-VI-61. PINE R., Cass Co., 8-VI-61, 10-VI-61. PINE MOUNTAIN L., Cass Co., 11-VI-61. WOMAN L., Cass Co., 7-VI-61, 12-VI-61, 11-VI-63. WEBB L., Cass Co., 5-VI-61, 9-VI-61, 23-VI-63. LEECH L., Itasca Co., 1-VI-61, 8-VI-61, 19-VI-61, 22-VI-61, 23-VI-61, 9-VI-62, 15-VI-62, 25-VI-62, 4-VI-63, 11-VI-63, 24-VI-63, 21-VI-64. UPPER RED L., Beltrami Co., 1-VII-61, 2-VII-61, 29-VI-62, 3-VII-63, 2-VII-64, 3-VII-64. KABETOGAMA L., St. Louis Co., 25-VI-61, 1-VII-63, 28-VI-64, 29-VI-64. RAINY L., Koochiching Co., 18-VI-62, 8-VII-62, 26-VI-64.

Wisconsin Locations

GREEN BAY OF LAKE MICHIGAN, Door Co., 30-VI-62, 27-VI-63, 18-VII-63. NOQUEBAY L., Marinette Co., 22-V-62, 27-V-62, 1-VI-63, 4-VI-63, 2-VII-63. TOMAHAWK L., Washburn Co., 5-VI-63. CRANBERRY L., Vilas Co., 5-VI-64. DES MOINES L., Burnett Co., 2-VI-62. NICABOYNE L., Burnett Co., 30-V-63, 30-VI-63. ROUND L., Sawyer Co., 24-VI-64.

The earliest reported emergence within the two-state area was from Noquebay Lake in eastern Wisconsin on May 22, 1962. The latest emergence was from Mille Lacs Lake in east-central Minnesota on July 22, 1963. The peak emergence period in the band which extends across central Minnesota and northern Wisconsin occurred during the last three weeks in June. The peak emergence period in extreme northern Minnesota occurred about two weeks later—during the last week in June and the first week in July. Mille Lacs Lake had the widest range of emergence dates—June 9, 1961, to July 22, 1963. On small lakes where the collectors took pains

to gather the earliest emergents each year, it appears that the time of initial emergence varies within a 15-day period from year to year. No tendency is evident for emergence to occur on the same date from several lakes in the same vicinity.

Acknowledgment

This study was supported in part by a grant from the National Science Foundation.

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