

THE LIFE HISTORY AND ECOLOGY OF THE WHITE MAY FLY, *Ephoron album* SAY, IN LAKE ERIE

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Large populations of *Ephoron album* nymphs were discovered along the shores of South Bass Island in the summer of 1948. From 1948 until the summer of 1950, numerous experiments and observations were made on the various phases of the life history and ecology of this species. The nymphs inhabit the shallow gravel and sand shoals in Lake Erie where they make burrows and feed on the plankton, filamentous algae, and plant detritus distributed over the bottom. Distribution records indicate that this species is usually confined to an area extending across North America between 40 and 50 degrees north latitude. The effect of temperature on the hatching of the eggs appears to be the limiting factor controlling the distribution.

Ephoron album females produced an average of 908 eggs per female. In the one evening of August 4 (1949) 442,235 eggs per square meter were collected in a battery jar placed on the bottom in about 18 inches of water below a mating swarm. The ovoid shaped eggs were approximately .372 mm. by .213 mm. Since they require about 8 to 9 months for hatching in Lake Erie, they must overwinter in the egg stage. Laboratory experiments indicated that temperatures near the freezing point followed by temperatures above 10°C were necessary for the hatching of the eggs. Eggs which had been frozen into blocks of ice gave better hatching results than those that had been kept at 1.3°C.

First instar nymphs average .850 mm. in length exclusive of the caudal filaments. There are no gills in this stage. In the laboratory this stage lasts for about 5 days. The second instar nymphs have six pairs of short gill filaments on abdominal segments 2 to 7. In the third instar nymphs, the gill filaments on abdominal segments 2 to 7 are approximately twice the length of those of the second instar. In this stage there is a pair of small gills on the first abdominal segment. In the fourth instar nymphs, the gills

are flattened and have a fringe of small filaments along the edges. The mandibular tusks first become prominent in the fifth and sixth instars. The eyes of the males grow faster than those of the females. The females show a concurrent increase in length with the development of their eggs. The nymphs complete their growth in approximately 3 months. In Lake Erie the eggs begin to hatch about the first of May and the subimagos begin to emerge about the first of August.

The emergence of subimagos always occurs at dusk when the maximum light readings on a Western Master Photoelectric Meter indicate a range from .2 to 6.5 foot-candles. The males immediately settle on the water or on some object on shore, molt within about a minute, and join the mating flight. The females do not molt the second time, but fly directly into the swarm, mate, expel their eggs, and die. The longest period from the emergence of the first individual until all individuals were dead was 1 hour and 41 minutes. The actual emergence period was shorter than this and was estimated to be approximately 30 minutes.

Eggs removed from an apparently unfertilized female, reared in captivity, produced many nymphs. Parthenogenesis has not been reported for this species; therefore, further experiments are being conducted as a check on this observation.

Ephoron album nymphs live in the same habitat as *Ephemera simulans*. Although both belong to the same family, competition between the two species appears to be negligible. *Ephemera simulans* nymphs grow during the late summer and fall, then emerge about the time the overwintering eggs of *Ephoron album* begin to hatch. The *Ephoron album* nymphs grow rapidly and emerge before the next generation of *Ephemera simulans* nymphs become large enough to be serious competitors.

A comparison of the number of eggs laid and the number of nymphs found indicates that the potential production of *Ephoron album* is 454 times as great as the actual production in Lake Erie. The nymphs and adults are important as a source of food for fish, especially in the late summer, after the emergences of *Ephemera* and *Hexagenia*.