

VOLTINISM IN *MERRAGATA BRUNNEA* (HETEROPTERA:
GERROMORPHA: HEBRIDAE) IN SOUTHERN ILLINOIS

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ABSTRACT

Voltinism in *Merragata brunnea* Drake was studied in southern Illinois during 1989 and 1990. This species overwintered as adults, which became active in early March. First instars were found from mid-May through mid-September, second instars from mid-May through mid-October, third instars from early June through mid-October, fourth instars from late May through early November, fifth instars from late May through late October, and adults from early March through mid-November. The sequences of peaks of nymphal instars and adults indicate that this species is bi- or trivoltine in southern Illinois.

Key Words: *Merragata brunnea*, voltinism, southern Illinois, life history

RESUMEN

Se estudió el voltinismo en *Merragata brunnea* Drake en el sur de Illinois durante 1989 y 1990. *Merragata brunnea* invernaron como adultos, los que se activaron a principios de marzo. Se encontraron instares del primer estadio desde mediados de mayo a mediados de septiembre, del segundo estadio de mediados de mayo a mediados de octubre, del tercer estadio de principios de junio a mediados de octubre, del cuarto estadio de finales de mayo a principios de noviembre, del quinto estadio de finales de mayo a finales de octubre, y adultos de principios de marzo a mediados de noviembre. La secuencia de crestas de instares ninfales y de adultos indica que esta especie es bi- o trivoltina en el sur de Illinois.

The velvet water bug *Merragata brunnea* Drake, based on scattered records, occurs from New Jersey south to Florida, and west to Minnesota, Nebraska, and Texas; it also occurs in "S. Canada" (Polhemus and Polhemus 1988). In Illinois, it has been found only in the southernmost counties (i.e., Alexander, Jackson, Johnson, Massac, and Union) (Taylor 1996).

Little has been reported on this insect's life history. It occurs in a variety of habitats (e.g., lakes, ponds, swamps, roadside ditches, and rivers) and often is associated with floating vegetation (Taylor 1996). It has been collected in various months from April to November in New Jersey (Chapman 1959), Minnesota (Bennett and Cook 1981), Illinois (Taylor 1996), Missouri (Froeschner 1949), and Mississippi (Wilson 1958); and during most of the year from January to December in Florida (Chapman 1958). Porter (1950) noted that of 127 adults he examined from across much of the range of the species, 5 were collected in April, 4 in May, 84 in July, and 34 in August.

Wilson (1958) reported that of 65 specimens he examined from Mississippi, 1 had been collected in May, 2 in July - September, 60 in September, and 2 in October.

Both brachypterous and macropterous adults have been reported. Adults primarily are brachypterous in Florida (Chapman 1958), Minnesota (97.5% of 81 adults; Bennett and Cook 1981), and Wisconsin (97% of 301 adults; Hilsenhoff 1986).

Porter (1950) reared this species in the laboratory and briefly described the immature stages. He reported the incubation period and stadia for the egg and first through fifth instars as 8-12, 3-6, 3-4, 3-4, 5-6, and 5-6 days, respectively.

During 1989 and 1990, we studied voltinism in a population of this species at President's Pond on the campus of Southern Illinois University at Carbondale, Jackson County, Illinois (see Taylor [1996] for detailed description of pond). President's Pond is a roughly triangular 0.29 hectare (0.71 acre) pond. It is connected at the northern end to the adjacent Lake on the Campus by a narrow channel (approximately 2-5 m wide, 2 m deep). Along the eastern shore (where the present study was conducted), water depth increased sharply between 1 and 2 m from shore and commonly exceeded 2 m at 2.5 m from shore.

Floating, emergent, and shoreline vegetation associated with the pond was diverse (Taylor 1996). The western margin was bordered by a dense, but narrow, band of cattails (*Typha angustifolia* L.). The southern border was comprised of a riprap dam covered with soil and crossed by a paved road. The eastern margin was bordered by overhanging trees and other vegetation. During the summer, the pond filled with a dense growth of aquatic vascular plants and filamentous algae. Near the shoreline, and wherever the aquatic plants reached the water surface, duckweeds built up into dense mats. Air currents tended to move the duckweeds (i.e., *Lemna minor* L., *Spirodela polyrhiza* (L.) Scheiden, and *Wolffia papulifera* Thompson) around the pond unless the plants were partially anchored in the underlying aquatic vegetation.

This paper presents information on voltinism in *M. brunnea*, including times of occurrence of the adults and nymphal instars.

MATERIALS AND METHODS

Samples were collected weekly from 18 March to 25 November 1989, and biweekly from 11 February to 2 December 1990, along the eastern shore. Sampling was confined to this area because (1) the cattails along the western shoreline prevented use of the quadrat sampler (see below); (2) the riprap shoreline of the southern border was unnatural and, often, disturbed by fishermen; and (3) the water surface along the eastern shore, which was a mosaic of open water, duckweeds, and emergent stems, supported a diverse gerrormorphan fauna.

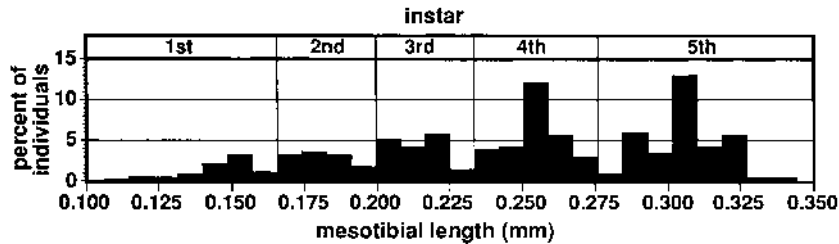


Fig. 1. Approximate instars of *M. brunnea* (n = 340), as delineated by mesotibial length. Specimens collected in 1989 and 1990 from President's Pond, Southern Illinois University at Carbondale campus, Jackson County.

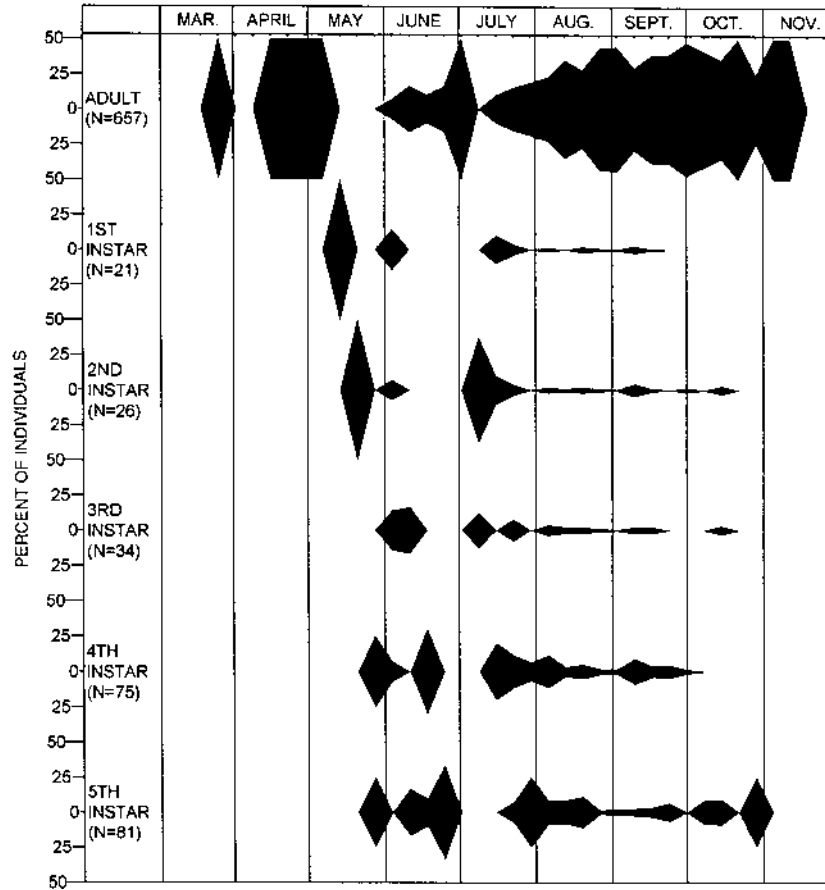


Fig. 2. Percent of individuals in each stage per sample of *M. brunnea* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1989. Beginning and end points of each shaded area represent sample dates preceding and following collection of specimens, respectively.

Four transects, 60 m in length, were made parallel to a relatively uniform section of the eastern margin at 0, 0.5, 1.0, and 1.5 m from the shoreline. Each sample was collected with a floating quadrat sampler (0.25 x 0.25 x 0.05 m), with four replicates placed randomly along each transect; the resulting 16 quadrat samples, which provided a broad sampling of the habitat, were then pooled. Prior to each sample, the collector (SJT) stood for approximately three minutes to allow the insects to acclimate to the disturbance; then, the sampler was placed on the surface of the water. Specimens were removed with a fine mesh nylon net, preserved in alcohol, and sorted in the laboratory.

Adults could be distinguished from nymphs by their well-developed external genitalia and the presence of wings, even in the brachypterous form. Nymphal instars were difficult to separate because they are small and show little progressive change

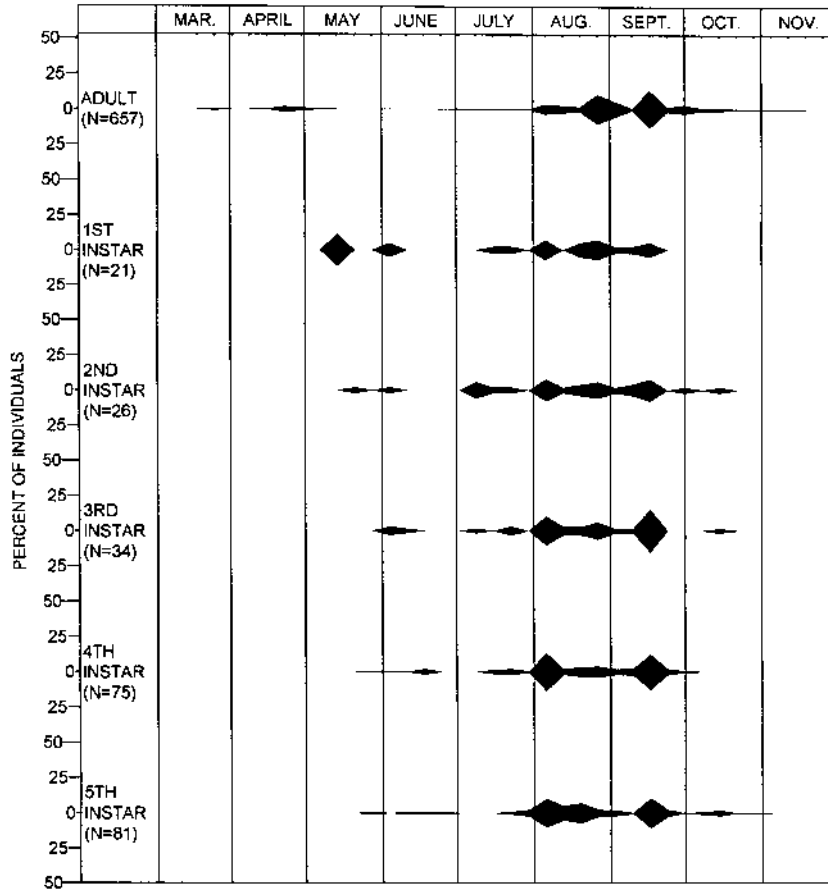


Fig. 3. Percent in each sample of total individuals of same stage of *M. brunnea* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1989. Beginning and end points of each shaded area represent sample dates preceding and following collection of specimens, respectively.

in external characters during development. However, we found that mesotibial length was a useful character for distinguishing instars, although separation between instars was not complete (Fig. 1).

RESULTS AND DISCUSSION

In southern Illinois, this species overwintered as adults, which were active from early March through mid-November (Figs. 2-5). Some adults were collected in mid-February in 1990, indicating that the species can be active during warm spells in winter. No eggs were collected. First instars were found from mid-May through mid-September, second instars from mid-May through mid-October, third instars from early

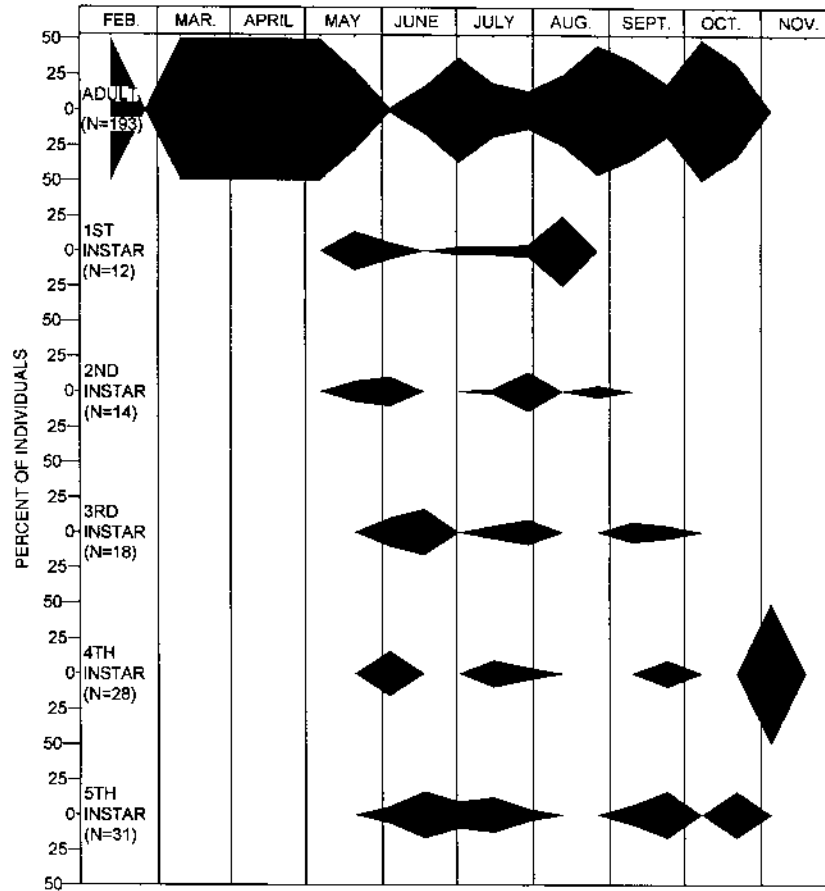


Fig. 4. Percent of individuals in each stage per sample of *M. brunnea* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1990. Beginning and end points of each shaded area represent sample dates preceding and following collection of specimens, respectively.

June through mid-October, fourth instars from late May through early November, and fifth instars from late May through late October.

Merragata brunnea is bi- or trivoltine in southern Illinois. Most fifth instars of the first generation became adults in June, and first instars of the second generation were found in July. The second generation apparently reached adults in late July and August. The second and third generations were not readily distinguishable but a third generation apparently occurred, with fifth instars found in September and October and the resulting adults appearing shortly thereafter. It cannot be determined whether these generations corresponded to the apparent numerical peaks in July and September reported by Porter (1950) and Wilson (1958), respectively.

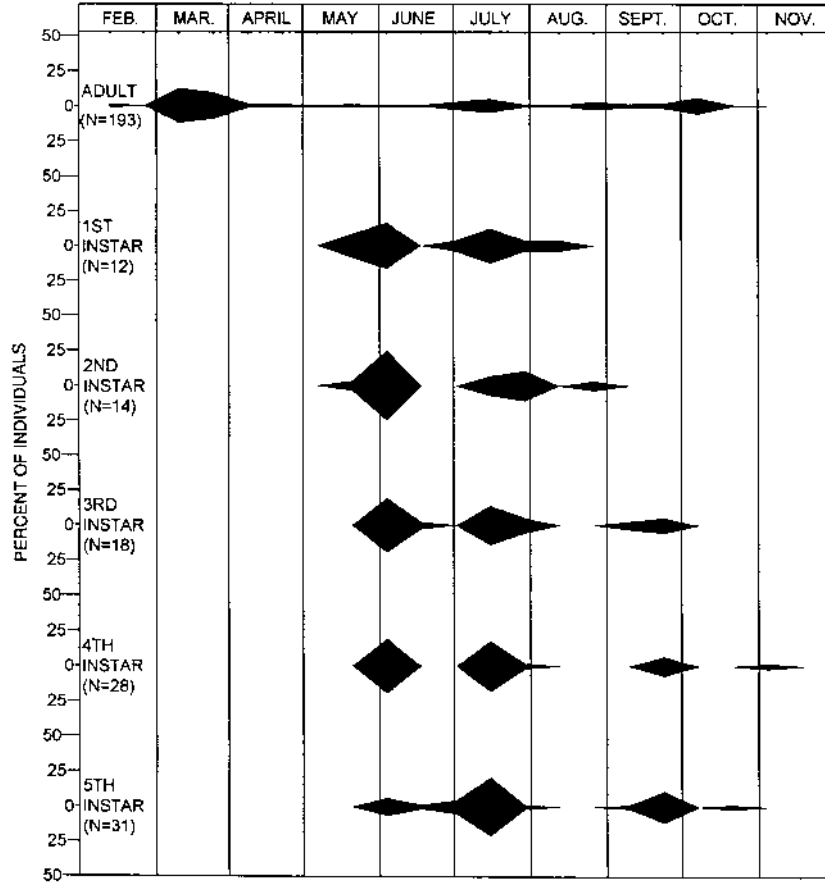


Fig. 5. Percent in each sample of total individuals of same stage of *M. brunnea* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1990. Beginning and end points of each shaded area represent sample dates preceding and following collection of specimens, respectively.

Of the 850 adults collected during this study, 474 were males and 376 were females; of these, 844 were micropterous ($\delta\delta$, 99.6%, $n=472$; ♀♀ , 98.9%, $n=372$), and six were macropterous, thus corroborating the findings of Bennett and Cook (1981), Chapman (1958), and Hilsenhoff (1986). The six macropterous adults were collected in April (1 ♀), July (2 ♀♀), and August (2 $\delta\delta$, 1 ♀).

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