

VOLTINISM IN *NEOGERRIS HESIONE* (HETEROPTERA: GERRIDAE) IN SOUTHERN ILLINOIS¹

Steven J. Taylor², J. E. McPherson³

ABSTRACT: Voltinism in *Neogerris hesione* was studied in southern Illinois during 1989 and 1990. This species apparently overwintered as eggs, which hatched during late April and early May. First and second instars were found from late April through late September, third instars from early May through late September, fourth instars from mid-May through late September, fifth instars from mid-May through the third week of September, and adults from late May through early November. The sequences of peaks for instars and adults strongly indicates that this species is trivoltine in southern Illinois.

The waterstrider *Neogerris hesione* (Kirkaldy) occurs from New York, Michigan, and Nebraska south to Florida and Texas; it also occurs in Cuba, Panama (Smith 1988), and Central America (Nieser 1994). Smith (1988) reported it from Alaska, but, judging from Andersen's (1982) world distribution map of the genus (p. 366), this location probably is invalid. It is found throughout the southern two thirds of Illinois (Taylor 1996) and, because it has been collected in central and south central Wisconsin (Hilsenhoff 1986), probably occurs in northern Illinois.

Little has been reported on this insect's life history. It occurs in a variety of habitats but seems to prefer ponds, lakes, and pools of streams (Taylor 1996). It has been collected in September in Wisconsin (Hilsenhoff 1986) and in October in Missouri (Froeschner 1962). Herring (1950), in northern Florida, collected adults from April through December, excluding June, and nymphs in April and from September through November. Kittle (1980), in Arkansas, collected adults from May to November; and Wilson (1958), in Mississippi, collected nymphs as early as 1 April and as late as 15 November. Kittle (1977) reported that of 60 mating pairs collected in northwest Arkansas, 1 pair (2%) was taken in August, and 18 (30%) and 41 pairs (68%) were taken in September and October, respectively. Wilson (1958) observed mating as late as 15 November. Osborn and Drake (1915) believed this species overwinters as eggs.

Drake and Harris (1934) stated that macropterous adults were rare in the North and common in the South. This is supported by Hilsenhoff (1986), who reported apterous adults as common in Wisconsin (macropterous adults pre-

¹ Received November 17, 1997. Accepted January 12, 1998.

² Center for Biodiversity, Illinois Natural History Survey, 607 E. Peabody Dr., Champaign, IL 61820 USA

³ Department of Zoology, Southern Illinois University at Carbondale, Carbondale, IL 62901-6501 USA.

sumably being rare); and by Herring (1950), who reported macropterous adults as common in northern Florida. Kittle, however, stated that of 136 adults from northwest Arkansas (1977) and 182 adults from Arkansas (1980), 92 and 90%, respectively, were apterous, the remainder macropterous. Similarly, Wilson (1958) found that in Mississippi, about 95% of the adults were apterous, the remainder macropterous.

During 1989 and 1990, we studied voltinism in a population of this species at President's Pond on the Southern Illinois University at Carbondale campus, Jackson County, Illinois (see Taylor [1996] for detailed description of pond). The roughly triangular 0.29 hectare (0.71 acre) pond is connected at its northern end to an adjacent lake by a narrow channel (approximately 2-5 m wide, 2 m deep). Water depth along the eastern margin (where the present study was conducted) 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 narrow, dense band of cattails (*Typha angustifolia* L.). The southern border consisted 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 aquatic plants reached the water surface, duckweeds built up into dense mats. The duckweeds (i.e., *Lemna minor* L., *Spirodela polyrhiza* (L.) Scheiden, and *Wolffia papulifera* Thompson) tended to move around the pond because of air currents unless they were partially anchored in the underlying aquatic vegetation.

This paper presents information on voltinism in *N. hesione*, 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. Sampling was limited to an area along the eastern shore 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 gerromorphan fauna.

Four 60 m transects 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 were pooled, providing a broad sampling of the habitat. 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. Nymphal instars were distinguished by size of the dorsal sclerites on the thorax and abdomen, the overall degree of sclerotization, and, to a lesser extent, body size. Fifth instars and adults were distinguished from younger instars and from each other by the extent of development of the external genitalia and by presence of wings in macropterous adults.

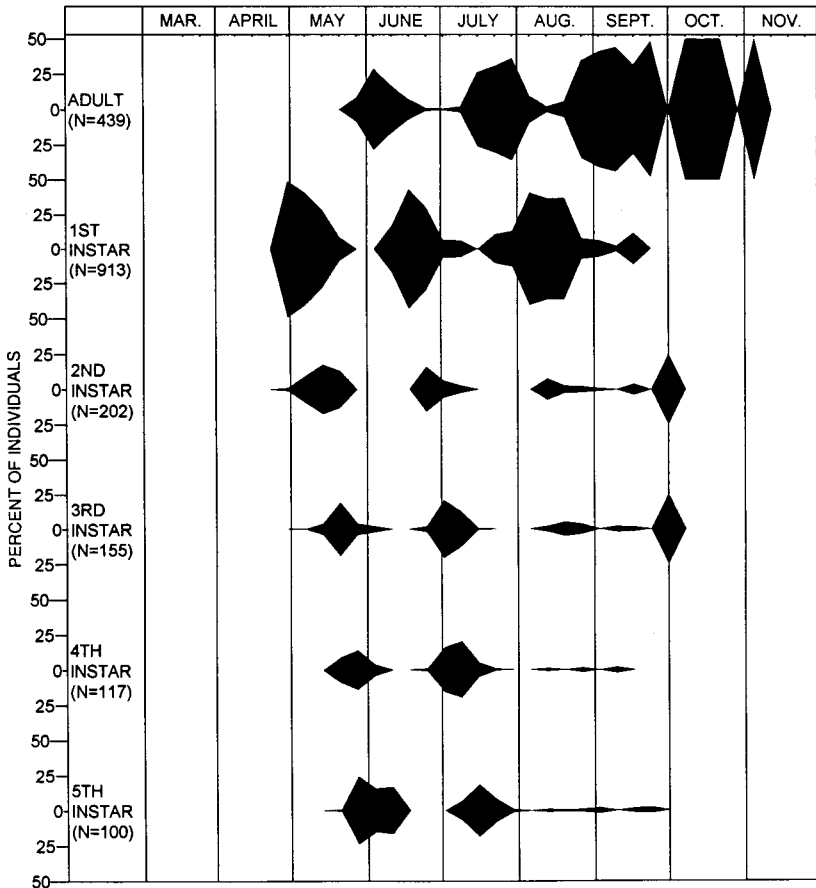


Figure 1. Percent of individuals in each stage per sample of *N. hesione* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1989. Beginning and end points of each shaded area represent sample dates preceding and following collection of specimens, respectively.

RESULTS AND DISCUSSION

Neogerris hesione, which apparently overwintered as eggs in southern Illinois, was active from late April through early November (Figs. 1-4). First and second instars were found from late April through late September, third instars from early May through late September, fourth instars from mid-May through late September, fifth instars from mid-May through the third week of September, and adults from late May through early November.

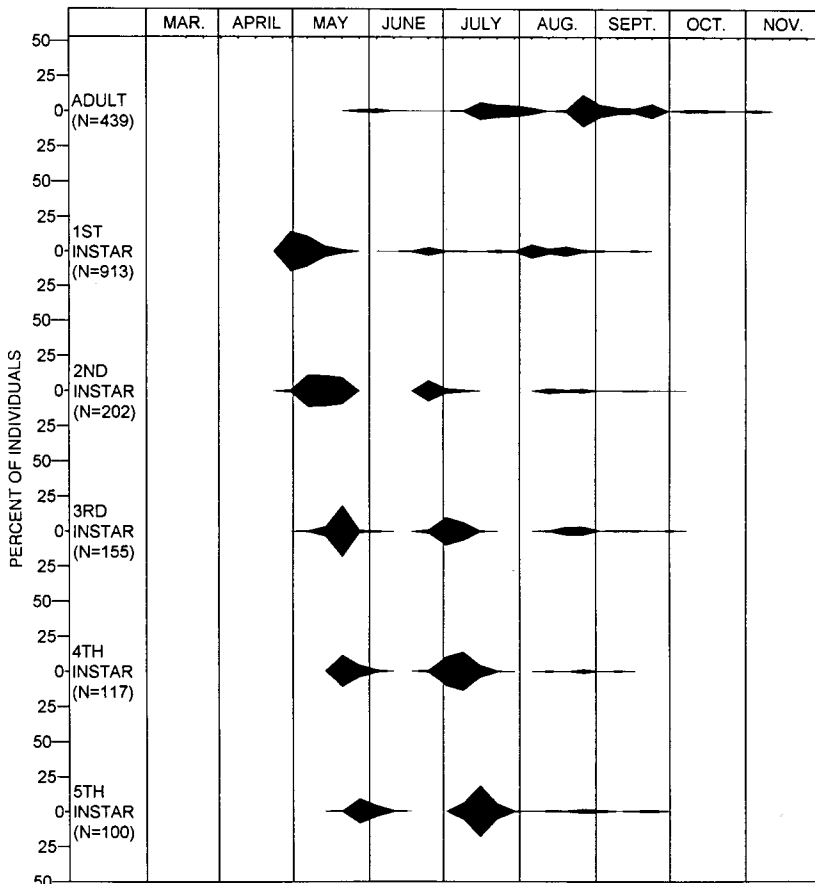


Figure 2. Percent in each sample of total individuals of same stage of *N. hesione* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1989. Beginning and end points of each shaded area represent sample dates preceding and following collection of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

This species apparently is trivoltine in southern Illinois. Most fifth instars of the first generation became adults between late May and mid-June. Most first instars of the second generation were found in mid- to late June and became adults during mid- to late July. The third generation was less clearly distinguishable than the first and second, but fifth instars of this generation apparently appeared in August and September and reached adults beginning in late August - early September. Abundance of adults was greatest in the third generation (Figs. 2, 4). These third generation adults, then, laid the overwintering eggs.

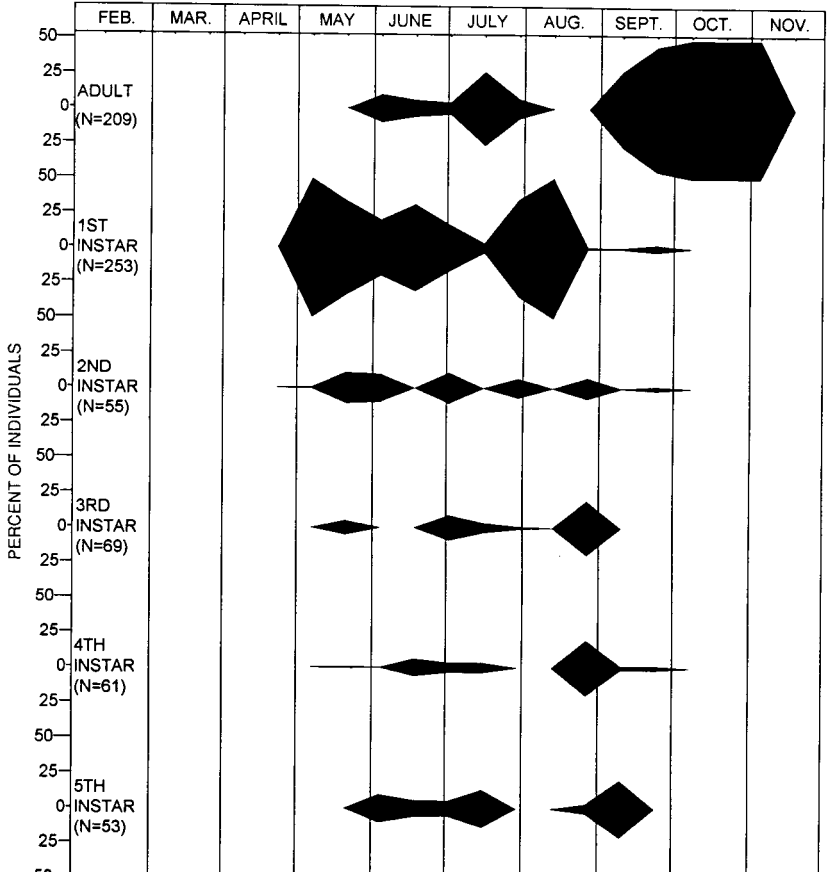


Figure 3. Percent of individuals in each stage per sample of *N. heslone* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1990. Beginning and end points of each shaded area represent sample dates preceding and following collection of specimens, respectively.

Most individuals were apterous. Of 648 adults collected during this study, only three (0.46%) were macropterous. All three were males collected in 1989, 1 in August and 2 in September. Also, three fifth instars (2♂♂, 1♀) collected in early June 1989 had well developed wing pads and, presumably, would have become macropterous adults.

Riding behavior, typically associated with copulation and pre- and post-copulatory mate-guarding in Gerridae (see literature review by Spence and Andersen [1994]), was observed shortly after the first appearance of adults in late May and again from mid-July through early November.

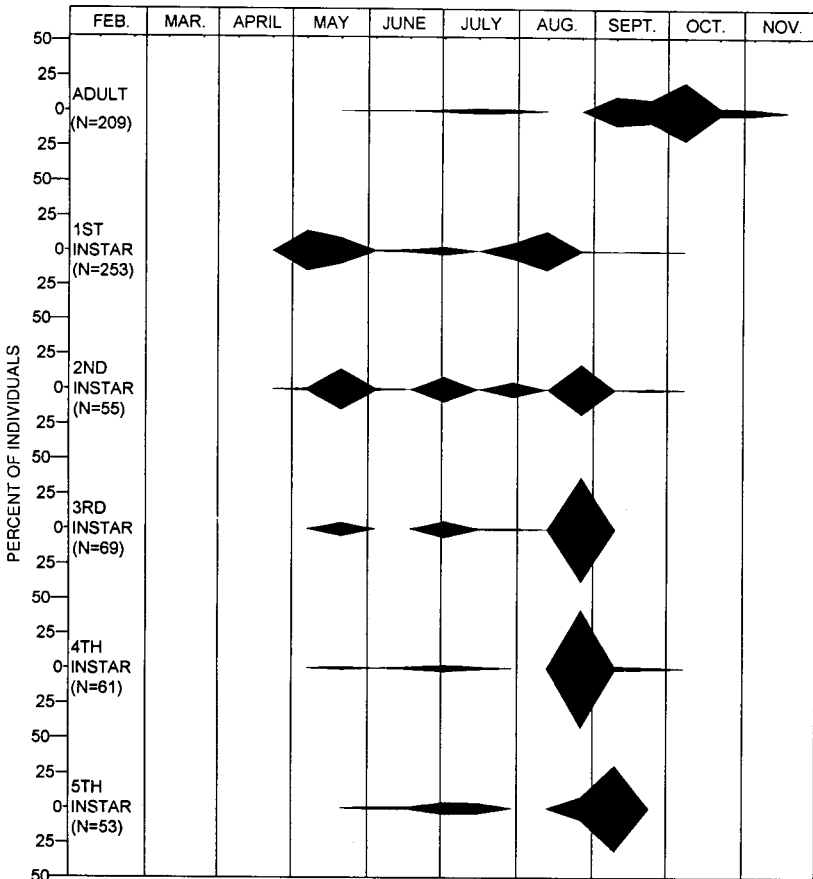


Figure 4. Percent in each sample of total individuals of same stage of *N. hesione* collected at President's Pond, Southern Illinois University at Carbondale campus, Jackson County, during 1990. Beginning and end points of each shaded area represent sample dates preceding and following collection of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

The life history observations of Osborn and Drake (1915), Wilson (1958), and Kittle (1977) generally are supported by our data (Figs. 1-4). Differences in the times of occurrence of nymphs and adults reported here and by Herring (1950) and Wilson (1958) probably reflect the geographic locations of the three studies (i.e., southern Illinois, northern Florida, and Mississippi). Finally, the percentages of macropterous and apterous adults reported here are similar to those reported by Kittle (1977, 1980) and Wilson (1958).

ACKNOWLEDGMENTS

We thank the following for their critical review of this manuscript: R. A. Brandon, J. A. Beatty, B. M. Burr, Department of Zoology; D. Ugent, Department of Plant Biology, Southern Illinois University at Carbondale; and D. W. Webb and M. J. Wetzel, Center for Biodiversity, Illinois Natural History Survey.

LITERATURE CITED

- Andersen, N. M.** 1982. The semiaquatic bugs (Hemiptera, Gerromorpha). Phylogeny, adaptations, biogeography and classification. Entomograph Vol. 3. Scandinavian Science Press Ltd., Klampenborg, Denmark. 455 pp.
- Drake, C. J. and H. M. Harris.** 1934. III. The Gerrinae of the Western Hemisphere (Hemiptera). Ann. Carnegie Mus. 23:179-241.
- Froeschner, R. C.** 1962. Contributions to a synopsis of the Hemiptera of Missouri, Part V. Hydrometridae, Gerridae, Veliidae, Saldidae, Ochteridae, Gelastocoridae, Naucoridae, Belostomatidae, Nepidae, Notonectidae, Pleidae, Corixidae. Am. Midl. Nat. 67:208-240.
- Herring, J. L.** 1950. The aquatic and semiaquatic Hemiptera of northern Florida. Part I: Gerridae. Fla. Entomol. 33:23-32.
- Hilsenhoff, W. L.** 1986. Semiaquatic Hemiptera of Wisconsin. Gt. Lakes Entomol. 19:7-19.
- Kittle, P. D.** 1977. The biology of water striders (Hemiptera: Gerridae) in northwest Arkansas. Am. Midl. Nat. 97:400-410.
- Kittle, P. D.** 1980. The water striders (Hemiptera: Gerridae) of Arkansas. Ark. Acad. Sci. Proc. 34:68-71.
- Nieser, N.** 1994. A new species and a new status in *Neogerris* Matsumura (Heteroptera: Gerridae) with a key to American species. Storkia 3:27-37.
- Osborn, H. and C. J. Drake.** 1915. Additions and notes on the Hemiptera - Heteroptera of Ohio. Ohio Nat. 15:501-508.
- Smith, C. L.** 1988. Family Gerridae Leach, 1815, pp. 140-151. In T. J. Henry and R. C. Froeschner (eds.). Catalog of the Heteroptera or true bugs, of Canada and the continental United States. E. J. Brill, New York. 958 pp.
- Spence, J. R. and N. M. Andersen.** 1994. Biology of water striders: Interactions between systematics and ecology. Ann. Rev. Entomol. 39:101-128.
- Taylor, S. J.** 1996. Habitat preferences, species assemblages, and resource partitioning by Gerromorpha (Insecta: Heteroptera) in southern Illinois, with a faunal list and keys to species of the state. Ph.D. Dissertation, South. Ill. Univ. at Carbondale. xviii + 345 pp.
- Wilson, C. A.** 1958. Aquatic and semiaquatic Hemiptera of Mississippi. Tulane Stud. Zool. 6:115-170.