

Spined Soldier Bug, *Podisus maculiventris* (Say) (Insecta: Hemiptera: Pentatomidae)¹

David B. Richman, Frank W. Mead, and Thomas R. Fasulo²

Introduction

The spined soldier bug, *Podisus maculiventris* (Say), is a medium-sized predatory stink bug which preys on a wide variety of other arthropods, especially larval forms of Lepidoptera and Coleoptera (Mukerji and LeRoux 1965). The adult has a prominent spine on each "shoulder."

Distribution

This stink bug is the most common predatory stick bug in North America and ranges from Mexico, the Bahamas, and parts of the West Indies, north into Canada. It has also be introduced into other countries as part of classical biological control programs (De Clercq 2008).

Description

Egg: The egg is approximately 1 mm in diameter, with long projections around the operculum that are especially characteristic of *Podisus* spp. Eggs are laid 17 to 70 at a time in loose oval masses.



Figure 1. Dorsal view of an adult spined soldier bug, *Podisus maculiventris* (Say), feeding on a mating pair of sumac flea beetles, *Blepharida rhois* (Forster) (Coleoptera: Chrysomelidae). Credits: Lyle J. Buss, University of Florida

1st instar: This instar has a length of 1.3 to 1.5 mm. The head width, including the eyes, is 0.6 mm and the humeral is 0.9 mm wide. The 1st instar

1. This document is EENY-231 (IN387), one of a series of Featured Creatures from the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Published: August 2001. Reviewed: March 2008. Revised August 2010. This document is also available on Featured Creatures website at <http://entomology.ifas.ufl.edu/creatures>. Please visit the EDIS website at <http://edis.ifas.ufl.edu>.

2. David B. Richman and Frank W. Mead, Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville, FL.; Thomas R. Fasulo, University of Florida.

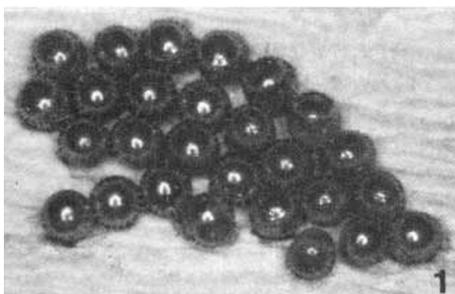


Figure 2. Eggs of the spined soldier bug, *Podisus maculiventris* (Say). Credits: Division of Plant Industry

nymph of *P. maculiventris* has a blackish head and thorax and reddish abdomen with black dorsal and lateral plates.



Figure 3. First instar nymphs of the spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude



Figure 4. Size of first instar nymphs of the spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude

2nd instar: This instar has a length 2.5 to 3.0 mm. The head width is 0.9 mm and the humeral is 1.3 mm wide. As in other asopine nymphs, the 2nd instar nymph begins to feed on other insects. This species is

highly cannibalistic. The 2nd instar resembles the 1st instar.



Figure 5. Second instar nymph of the spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude

3rd instar: This instar has a length 3.5 to 4.0 mm. The head width is 1.3 mm and the humeral is 2.0 mm wide. The 3rd instar nymph has a black head and thorax while the the abdomen is reddish with black, orange and white maculations. The central bar-shaped markings are white and the lateral markings orange.



Figure 6. Third instar nymph of the spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude

4th instar: This instar has a length approximately 6 mm. The head width is 1.7 mm and the humeral is 3.2 mm wide. The colorations and patterns of the 4th instar nymph are similar to that of the 3rd instar nymph, but the wing pads become noticeable.



Figure 7. Fourth instar nymph of the spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude

5th instar: This instar has a length 8 to 10 mm. The head width is 2.2 mm and the humeral is 4.8 mm wide. The wing pads are prominent in the 5th instar, and the head and thorax become mottled with brown. The abdominal markings are white or tan, and black.



Figure 8. Fifth instar nymph of the spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude

Adult: The adult male is approximately 11 mm long. The head width is 2.3 mm and the humeral, including spines, is 7.6 mm wide. Females are slightly larger (De Clercq 2008). Adult *P. maculiventris* resemble the adult *Alcaeorrhynchus grandis* (Dallas) in being a mottled brown in color, but with a difference in size as *A. grandis* adults are over 15 mm long and have only one spine on each humeral angle. These spines project outward, not forward as in *Podisus macronatus* Uhler. Each hind femur of *P. maculiventris* has two blackish dots at apical 3rd.



Figure 9. Dorsal view of a spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude



Figure 10. Front lateral view of a spined soldier bug, *Podisus maculiventris* (Say). Credits: Michael R. Patnaude

Life Cycle

Kirkland (1896), Stoner (1930), Esselbaugh (1949), Mukerji and LeRoux (1965), Warren and Wallis (1971) and Richman and Whitcomb (1978) reported on the rearing of *P. maculiventris*. Their studies differed markedly in temperatures and photoperiods, consequently the time from egg to adult varied from 27 to 38 days, with the egg stage lasting five to nine days. The shortest time was reported for Florida specimens (Richman and Whitcomb 1978). Reported longevities for adults are from one to four months (De Clercq 2008).

Early instars are highly gregarious and usually remain in the same location. However, they become more solitary with each molt.

Food consumption, prey size, and energetics of *P. maculiventris* were detailed by Mukerji and LeRoux (1969a, b, c). The work by Couturier (1938) is a landmark study on the bionomics of this bug. Records in the Florida State Collection of Arthropods

indicate that *P. maculiventris* is active all year in peninsular Florida, but often does not appear until spring in the "panhandle" counties. In Canada and the northern or central U.S., the spined soldier bug usually has two to three generations per year and hibernates as an adult from October to April (De Clercq 2008).

Economic Importance

This insect is a generalist predator with a broad host range, reportedly attacking 90 insect species over eight orders (De Clercq 2008), which includes several important economic pests. Reported prey include the larvae of Mexican bean beetle, European corn borer, diamondback moth, corn earworm, beet armyworm, fall armyworm, cabbage looper, imported cabbageworm, Colorado potato beetle, velvetbean caterpillar, and flea beetles (Hoffmann and Frodsham 1993). When prey are scarce, the spined soldier bug may feed on plant juices, but this feeding is not reported to cause plant damage (De Clercq 2008).

Podisus maculiventris is associated with several crops including alfalfa, apples, asparagus, beans, celery, cotton, crucifers, cucurbits, eggplant, potatoes, onions, soybeans, sweet corn and tomatoes (Stoner 1930, Hayslip et al. 1953, Whitcomb 1973, Deitz et al. 1976, Hoffmann and Frodsham 1993).

The effectiveness of this species in preying on economic pests resulted in its use in classical biological control programs in other countries, including Eastern Europe and Russia. However, this has not been successful in colder climates, perhaps due to an inability of overwinter. *Podisus maculiventris* eggs are also sold commercially for use in control programs and this has proven successful in controlling pests in European and North American heated greenhouses. Use in large area field crops is often not economically viable due to the production costs of raising the bug. In addition, naturally occurring populations often are not numerous enough to overpower large populations of pests in the spring. Pheromones have been used to draw naturally occurring and newly emerging populations of this stink bug to target crops in the spring (De Clercq 2008).

Selected References

- Costello SL, Pratt PD, Rayachhetry MB, Center TD. 2002. Morphology and life history characteristics of *Podisus mucronatus* (Heteroptera: Pentatomidae). *Florida Entomologist* 85: 344-350.
- Couturier A. 1938. Contribution a l'étude biologique de *Podisus maculiventris* Say, prédateur américain du doryphore. *Ann. Epiph. Phytogén.* (n.s.) 4: 95-165.
- De Clercq P, Wyckhuys KW, De Oliveira HN, Klapwijk JK. 2002. Predation by *Podisus maculiventris* on different life stages of *Nezara viridula*. *Florida Entomologist* 85: 197-202.
- De Clercq P. 2008. Spined soldier bug, *Podisus maculiventris* Say (Hemiptera: Pentatomidae: Asopinae). pp. 3508-3510. *In* Capinera JL. (editor.) *Encyclopedia of Entomology*, Vol 4. Springer, Heidelberg.
- Deitz LL, Van Duyn HW, Bradley Jr JR, Rabb RL, Brooks WM, Stinner RW. 1976. A Guide to the Identification and Biology of Soybean Arthropods in North Carolina. North Carolina Agricultural Experiment Station Technical Bulletin 238: 1-264.
- Esselbaugh CO. 1949. Notes on the bionomics of some Midwestern Pentatomidae. *Entomologica Americana* (n.s.) 28: 1-73.
- Hayslip NE, Genung WG, Kelsheimer EG, Wilson JW. 1953. Insects attacking cabbage and other crucifers in Florida. *Florida Agricultural Experiment Station Research Bulletin* 534: 1-57.
- Herrick NJ, Reitz SR. 2004. Temporal occurrence of *Podisus maculiventris* (Hemiptera: Heteroptera: Pentatomidae) in North Florida. *Florida Entomologist* 87: 587-590.
- Hoffmann MP, Frodsham AC. 1993. *Natural Enemies of Vegetable Insect Pests*. Cornell University, Ithaca, NY. 63 pp.
- Kirkland AH. 1896. Predaceous Hemiptera-Heteroptera, pp. 392-403. *In* Forbush EH, Fernald CH (eds.). *The Gypsy Moth, Porthetria dispar* (Linn.). Wright and Potter Printing Co., State Printers, Boston, Mass.

Mukerji MK, LeRoux EJ. 1965. Laboratory rearing of a Quebec strain of the pentatomid predator, *Podisus maculiventris* (Say) (Hemiptera: Pentatomidae). *Phytoprotection* 46: 40-60.

Mukerji MK, LeRoux EJ. 1969a. The effect of predator age on the functional response of *Podisus maculiventris* to the prey size of *Galleria mellonella*. *Canadian Entomologist* 101: 314-327.

Mukerji MK, LeRoux EJ. 1969b. A quantitative study of food consumption and growth of *Podisus maculiventris* (Hemiptera: Pentatomidae). *Canadian Entomologist* 101: 387-403.

Mukerji MK, LeRoux EJ. 1969c. A study of energetics of *Podisus maculiventris* (Hemiptera: Pentatomidae). *Canadian Entomologist* 101: 449-460.

Richman DB, Whitcomb WH. 1978. Comparative life cycles of four species of predatory stink bugs (Hemiptera: Pentatomidae). *Florida Entomologist* 61: 113-119.

Stoner D. 1930. Spined soldier-bug reared on celery leaf-tyer. *Florida Entomologist* 14: 21-22.

Warren LO, Wallis G. 1971. Biology of the spined soldier bug, *Podisus maculiventris* (Hemiptera: Pentatomidae). *Journal of the Georgia Entomological Society* 6: 109-116.

Whitcomb WH. 1973. Natural populations of entomophagous arthropods and their effects on the agroecosystem. *Proceedings of the Mississippi Symposium of Biological Control*. University Press of Mississippi. pp. 150-169.