

Milkweed Assassin Bug (Suggested Common Name) *Zelus longipes* Linnaeus (Insecta: Hemiptera: Reduviidae) ¹

Megha Kalsi and Dakshina R. Seal²

Introduction

Zelus longipes Linnaeus is commonly called the 'milkweed assassin bug', as it closely resembles the milkweed bug, *Oncopeltus fasciatus* (Dallas). It is also known as the 'longlegged assassin bug' and the 'Zelus assassin bug' (Bug Guide). Members of the genus *Zelus* belong to the subfamily Harpactorinae and are diurnal in nature. They are generalist predators feeding on a wide range of soft-bodied prey in garden and fields, such as mosquitoes, flies, earthworms, cucumber beetles, and caterpillars (fall armyworm, rootworm, etc.).

Distribution

Zelus longipes is widely distributed in southern North America (Gulf Coast and South Atlantic states; southern California and southwestern Arizona in the United States), Central America, South America (except Chile) through central Argentina, and the West Indies (Hart 1986, Melo 2005, Wolf & Reid 2001, Cogni et al. 2000).

Description and Life Cycle

This species exhibits great variation in size and color, which resulted in confusion in correct species identification in the past. The greatest color variation is observed in West Indies populations where individuals may be orange-brown, brownish-black, and even entirely black (Hart 1986). The



Figure 1. Adult milkweed assassin bug, *Zelus longipes* Linnaeus, showing its long legs and beak (stylet), sitting on a sweet corn tassel. Photograph by: Megha Kalsi, University of Florida

United States populations are distinctively orange and black in color. Adults and nymphs have a pear-shaped head, constricted neck and long hairy legs. Their piercing and sucking mouthparts have a three-segmented beak, which, when at rest, is bent and held under the thorax in a groove.

Adults: Males are smaller than females. In California and Arizona populations, males averaged 16.1 mm and females 18.4 mm in length, while in Gulf Coast populations, males

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2. Megha Kalsi and Dakshina R. Seal, Department of Entomology and Nematology, University of Florida-IFAS, Tropical Research and Education Center, Homestead, FL 33031

and females averaged 16.8 mm and 18.2 mm, respectively. In females, the terminal abdominal segment is platelike or flattened, while in males it is cuplike or rounded (Hart 1986). Adults are known to overwinter.

Adult *Zelus longipes* can be differentiated from other *Zelus* species based on the following morphological characteristics:



Figure 2. Adult female milkweed assassin bug, *Zelus longipes* Linnaeus, sitting on a sweet corn tassel. Photograph by: Megha Kalsi, University of Florida



Figure 3. Adults milkweed assassin bugs, *Zelus longipes* Linnaeus, mating in sweet corn field. Photograph by: Megha Kalsi, University of Florida

- In the pronotum, humeral angles are unarmed and rounded,
- Dorsal surface of insect ranges from brownish-red to brownish-black in color,
- Parameres (or lateral lobes of male genital organ) are cylindrical and long, surpassing 1/4 the length of median lobes.

Eggs: The eggs are cylindrical and elongate in shape, non-ornamented, brown in color, with a light brown, cap-like structure (called the operculum) which has a central pore with a funnel-shaped opening. The egg can be divided into two parts: the operculum (which is attached to the anterior pole of the egg) and main eggshell or chorion (Wolf & Reid 2000). Each egg measures 2.0-2.3 mm in overall length while the appendage is 0.5 mm long (known to be longest among all bugs). The rest of the main eggshell measures 1.5 mm in length. The main eggshell is widest at the posterior pole (0.53 mm) and narrows near the anterior pole (0.32 mm). The anterior pole is flat and is attached to the anterior appendage at a distinct waist-shaped junction. Viewed sideways, the eggshell appears to be laterally flattened with a slight curvature inwards (Wolf and Reid 2000).

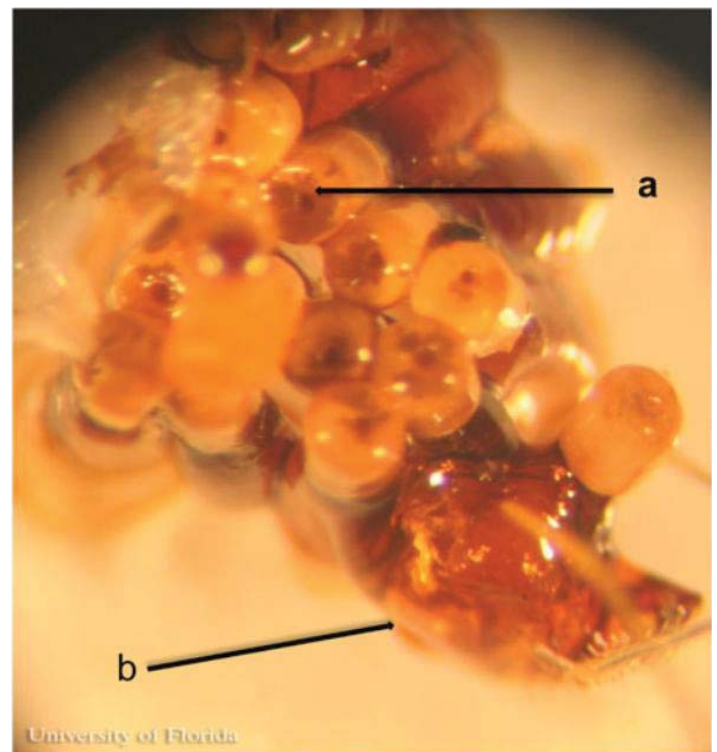


Figure 4. Eggs of the milkweed assassin bug, *Zelus longipes* Linnaeus, showing the central pore (a) in the operculum of one egg, and the mucilaginous layer (b) surrounding the main eggshells but not the operculums. Photograph by: Megha Kalsi, University of Florida

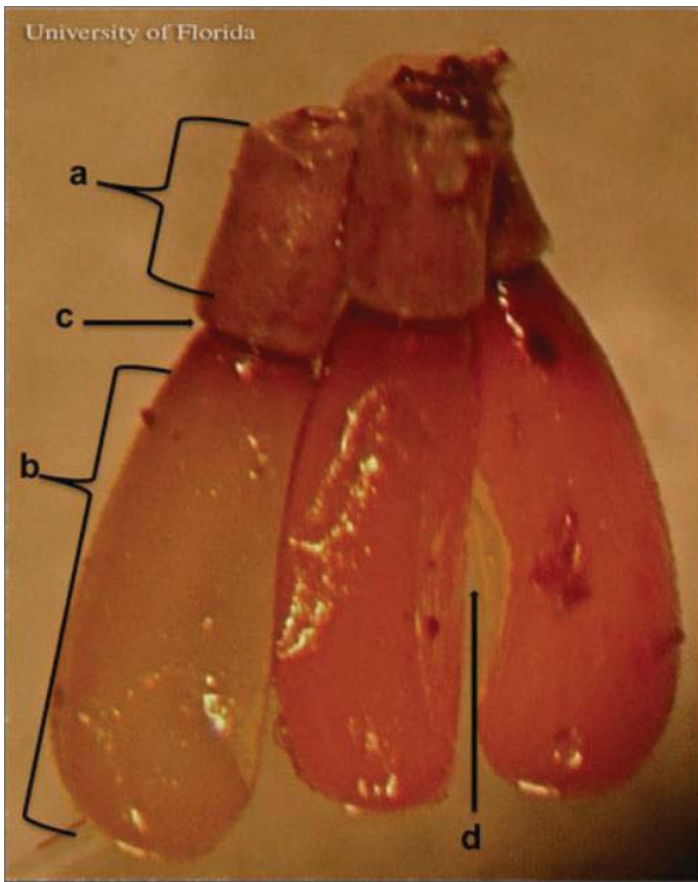


Figure 5. Lateral view of eggs of the milkweed assassin bug, *Zelus logipes* Linnaeus, showing the operculum (a), the main eggshell (b), the waist-like junction (c), and the egg flattened at one side with a slight curve inwards (d). Photograph by: Megha Kalsi, University of Florida

The main eggshell has a smooth surface. The anterior appendage exhibits a highly diversified architecture internally when viewed under SEM (Scanning electronic microscope). The cylindrical outer layer of the anterior appendage is called a veil, which is continuous with the main eggshell and roughly equal in diameter. The veil folds inwards at the anterior pole forming a double layer, and within this are many honeycomb-like structures. The function of the veil is to regulate humidity for the developing embryo. Partially removing the veil exposes a topographical arrangement of the important components of the anterior appendage that are micropyles (present at the base of veil) and operculum. The micropyles help in gaseous exchange while the operculum is a plate-like structure attached to the anterior part of the egg that is lifted during hatching. Eggs are laid in a cluster of 15 or more, cemented at the base, and covered with viscous material (except for the anterior appendage, as its function is to protect the aeropyles from clogging) (Wolf and Reid 2000).

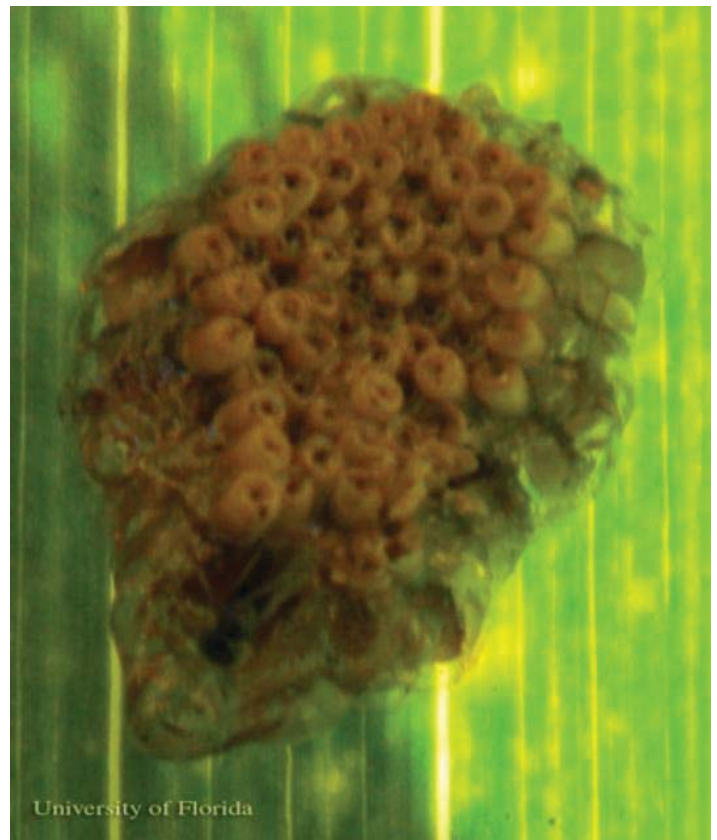


Figure 6. An egg mass of the milkweed assassin bug, *Zelus logipes* Linnaeus, surrounded by a mucilaginous layer and laid on the lower surface of a sweet corn leaf. Notice that the egg operculums are not covered. Photograph by: Megha Kalsi, University of Florida



Figure 7. An adult female milkweed assassin bug, *Zelus logipes* Linnaeus, ovipositing eggs in a cage. Photograph by: Megha Kalsi, University of Florida

Nymphs: *Zelus longipes* passes through five nymphal instars before developing into adults.

First instar: The body is elongated with a differentiated neck and is light brown in color, measuring 2.61 mm in length. The head is pyriform in shape, measuring 0.80 mm in length and 0.50 mm wide with sparse setae. The prominent reddish-brown eyes are 0.22 mm wide (ocelli are absent). The antennae are filiform, setose and 3.98 mm long. The legs are dark brown in color, except for the coxa that is light brown. The abdomen is dark brown to orange in color, and appears round in form with a few setae on the last segments. This stage lacks wing pads (Melo et al. 2005).



Figure 10. A mass of first instar nymphs of the milkweed assassin bug, *Zelus logipes* Linnaeus, hatching out of eggs laid on a sweet corn leaf. Photograph by: Megha Kalsi, University of Florida



Figure 8. First instar nymphs of the milkweed assassin bug, *Zelus logipes* Linnaeus, hatching out of the eggs and slowly extending their legs. Photograph by: Megha Kalsi, University of Florida



Figure 11. First instar nymph of the milkweed assassin bug, *Zelus logipes* Linnaeus, feeding on a nymph of the minute pirate bug, *Orius insidiosus* (Say). Photograph by: Megha Kalsi, University of Florida



Figure 9. First instar nymph of the milkweed assassin bug, *Zelus logipes* Linnaeus, showing dorsal view (left and center) and ventral view (right). Photograph by: Megha Kalsi, University of Florida

Second instar: The body now is more elongated measuring 4.26 mm in length with pale brown color and orange tinge (Melo et al. 2005). The head is also more elongated, 1.08 mm long and 0.67 mm wide, compared to the previous instar. The legs are black with lightly colored coxa. And the abdomen is rounded and setose with faintly visible sweat glands. Wing pads are now present, and are dark brown to black in color and 0.35 mm long.



Figure 12. Anterior view of a second instar nymph (a) and the exuvia (b) of the milkweed assassin bug, *Zelus longipes* Linnaeus. Photograph by: Megha Kalsi, University of Florida

Third instar: The body is elongated and 5.73 mm long (Melo et al. 2005). The head is 1.56 mm long and 0.78 mm wide. It is uniformly orange with setae. The antennae are 7.5 mm long, with color and banding similar to the previous instar. Legs and wing pad color are the same as the previous instar. The length of the wing pad now averages 0.84 mm.



Figure 13. Dorsal view of a third instar nymph and exuvia (insert) of the milkweed assassin bug, *Zelus longipes* Linnaeus. Photograph by: Megha Kalsi, University of Florida

The abdomen is rounded, with setae and visible scent gland openings.



Figure 14. Lateral view of a third instar nymph of the milkweed assassin bug, *Zelus longipes* Linnaeus. Head is to the right and the stylet (pointing to the rear in the resting position) is visible under the head. Photograph by: Megha Kalsi, University of Florida

Fourth instar: The total body length is 7.14 mm (Melo et al. 2005). The head width and length is 0.97 mm and 2.05 mm, respectively. Antennal length is now 10.23 mm, while the antennae are black and have two distal pale bands (light brown) on the first segment. The second and third antennal segments are setose. Legs are black with three pale bands, one on the fore femur and two on the median and hind femora. The wing pads are black, setose, and 1.37 mm in length. The abdomen is more elongated and setose as compared to previous instars, and measures 2.67 mm in length and 0.65 mm in width. The posterior portion is yellow in color with prominent black dorsal spots present on the VI and VII sternites.

Fifth instar: The orange body is elongated, measuring 11.29 mm (Melo et al. 2005). Head length and width is 2.77 mm and 1.26 mm, respectively. Eyes are conspicuously black. Antennae, measuring 14.56 mm in length, are similar to previous instars in regard to color, band patterns, and setae. The second segment of the antenna has five trichobothria (elongated, non-tapered setae), while the remaining three segments have abundant setae. The wing pads are 3.54 mm in length, setaceous, and black. The abdomen is orange, setaceous, and is 4.97 mm long and 1.77 mm wide. Lateral edges of the abdomen show thin whitish-yellow stripes.

Economic Importance

While a generalist predator, *Z. longipes* is also important as a predator of important economic pests such as the fall armyworm, *Spodoptera frugiperda* (Cogni et al. 2000), the Asian citrus psyllid, *Diaphorina citri* (Hall 2008), and the genista broom moth, *Uresiphita reversalis* Guenée (Carrel 2001).

While not a threat to humans, if not handled properly, a *Z. longipes* 'bite' can cause a burning sensation with swelling that may last for several days.

Feeding Behavior

The strategy *Z. longipes* uses to catch its prey is known as the "sticky trap strategy." Like many ambush bugs, *Z. longipes* attacks prey after hiding inside foliage with its forelegs raised in the air. The forelegs of *Z. longipes* are covered with a viscous material that acts as a glue, trapping



Figure 15. Adult milkweed assassin bugs, *Zelus longipes* Linnaeus, showing hiding or ambush behavior. Photograph by: Megha Kalsi, University of Florida



Figure 16. Adult milkweed assassin bug, *Zelus longipes* Linnaeus, lying in ambush (in the shadows upper left) with its forelegs raised just before attacking its prey, a cornsilk fly, *Euxesta stigmatias* Loew, (lower right). Photograph by: Megha Kalsi, University of Florida



Figure 17. Adult female milkweed assassin bug, *Zelus longipes* Linnaeus, paralyzing its prey, a cornsilk fly, *Euxesta stigmatias* Loew, by inserting stylets. Photograph by: Megha Kalsi, University of Florida



Figure 18. Adult female milkweed assassin bug, *Zelus longipes* Linnaeus, feeding on a cornsilk fly, *Euxesta stigmatias* Loew. Photograph by: Megha Kalsi, University of Florida

the prey. *Zelus longipes* then rapidly paralyzes its prey by inserting its stylets into the host body and prepares to feed through extra-oral digestion. Extra-oral digestion is a mode of digestion when a predator releases enzymes into its prey to dissolve the host's tissue, and later sucks up the dissolved liquid using its stylet as a straw (Wolf & Reid 2001). *Zelus*

longipes can feed on prey that may be up to six times their own size. But with increasing prey size the handling and feeding time for *Z. longipes* also increases, allowing them to become vulnerable to other predators (Cogni et al. 2000).



Figure 19. Nymph of the milkweed assassin bug, *Zelus longipes* Linnaeus, feeding on *Euxesta annonae* Fabricius, a picture-winged fly. Photograph by: Megha Kalsi, University of Florida

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