

## Immature Stages of *Zelus longipes* (Heteroptera, Reduviidae, Harpactorinae)

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### ABSTRACT

The egg and five instars of the harpactorine *Zelus longipes* Linné are described and illustrated. Descriptions include morphological characters and measurements of specimens reared in the laboratory.

### INTRODUCTION

The predatory assassin bugs are among the largest and most morphologically diverse group of true bugs. The subfamily Harpactorinae is characterized by the presence of: a cylindrical postocular region, a quadrate cell on the hemelytra, a well developed apical spur on the foretibia, all their members are diurnal. The genus *Zelus* Fabricius is characterized by a rostral segment II 1.3-2.2 times the length of segment I and segment III 1/2 times the length of segment I; antennal segment I and III long and slender, II and IV short and slender; pro- and metafemora long and slender, subequal in length and diameter; abdomen unflared, not depressed; pygophore with parameres and undivided median process; dorsal phallosclerite primitively semi-cylindrical, struts with recurved apical fusion, pedicel short (Hart 1972). It is comprised of 60 species (Maldonado Capriles 1990) and is the largest genus in the Neotropics (Schuh and Slater 1995). *Zelus longipes* Linné is distributed in southern North America, Central America, and South America, except Chile. Hart (1986) made a revision of the genus, and keyed the species from North America to northern Mexico, and in 1987 keyed the species from the West Indies. Fracker and Usinger (1949) provided a generic key to the nymphs of Nearctic reduviids including *Zelus*. Descriptions of immature stages of *Zelus* spp. were done for a few species: *Z. exsanguis* (Stal) was studied by Readio (1927) and Edwards (1966); *Z. tetracanthus* Stal, by Readio (1927) and Swadener and Yonke (1973), and *Z. leucogrammus* (Perty) was studied by Habib (1976), Coscarón and Gorríti (1999) and Coscarón et al. (2002). The species included in this genus are important predators of agricultural plagues (Gravena, 1983; Bueno and Berti, 1991). *Z. tetracanthus* was found in open fields of red clover, golden rod and ragweed (Swadener and Yonke, 1973), Whitcomb and Bell (1964) observed this species feeding on bollworm larvae in Arkansas (USA) cotton fields. Amaral Filho and Fagundes (1996) studied the biology and reproductive behavior of *Z. longipes*; they collected specimens in soybean, cotton and corn fields. According to Unigarro (1958) *Z. longipes* is considered a voracious predator during all its life cycle and it would be used as a biocontrol agent. In this paper, we describe the eggs and five immature stages of *Zelus longipes*.

## MATERIALS AND METHODS

The material studied consists of eggs and specimens reared in the laboratory at the Instituto de Biología, UNICAMP (Universidade Estadual do Campinas), Campinas, São Paulo, Brazil. The methodology for rearing the specimens is described in Amaral Filho and Fagundes (1996). The material was preserved in 70% ethanol. The terminology used for morphology follows that of Coscarón et al. (1998) and Bradshaw and McPherson (2002). The means and ranges of the descriptions are based on ten measurements, given in millimeters and were taken according to Swadener and Yonke (1973). The morphological characters were observed using a Wild M-5 binocular microscope. Illustrations were made with a drawing tube attachment. Scanning electron micrographs of eggs and fifth instar were made from specimens mounted on stubs, sputter-coated, and observed with a JEOL T-100 SEM.

## RESULTS

**Eggs** (Figs. 1-2)

Length 2.20-2.40 (mean=2.30), width 0.66-0.73 (mean=0.68), diameter of operculum 0.43-0.56 (mean=0.49). Ova of regular masses of brown eggs cemented at their base and margins. Cylindrical and elongated, chorion smooth, covered by a mucilaginous substance. Operculum light brown with a central pore. Without ornamentation.

**First instar** (Fig. 3)

Body elongate. Color light brown. Total length 2.07-3.16 (mean=2.61). Head pyriform light brown with sparse setae. In some specimens, two dark postocular spots. Postocular region very convex. Length of head 0.63-0.90 (mean=0.80), width of head 0.50-0.51 (mean=0.50). Clypeus brown, setose. Eyes prominent, reddish brown. Width of eye 0.20-0.25 (mean=0.22), interocular space 0.28-0.33 (mean=0.31). Ocelli absent. First rostral segment light brown, segments II and III dark brown, short thin setae present. Rostral length 0.80-1.08 (mean=0.94), ratio of length of segments ca. 1:1.38:0.58. Antenna cylindrical and filiform, setose. Segments I to III brown, segment IV paler. One pale band in middle of segment I. Antenna 3.86-4.18 long (mean=3.98), ratio of length of segments ca. 1:0.31:0.50:0.76. Neck differentiated. Pronotum with two anterolateral setose protuberances. Setae and median sulcus present. Pronotum 0.33-0.43 long (mean=0.37), width of pronotum 0.46-0.55 (mean=0.48). Pronotum and mesonotum light brown, metanotum darker. Propleura light brown, meso and metapleura darker. Legs dark brown except coxa light brown, setose. Femora with two pale bands equidistant of its apex and base (in some specimens forefemora with only the distal band). Foretibia with an apical short setose tubercle. Tarsi brown. Wing pads absent. Abdomen rounded, light brown tinged with orange, with sparse setae. Last segments darker than previous ones. Abdominal length 0.58-1.50 (mean=0.93), width 0.42-0.58 (mean=0.50), widest at V-VI segments.



**Second instar** (Fig. 4)

Body more elongate than previous instar. Color pale brown, tinged with orange. Total length 3.98-4.62 (mean=4.26). Head more elongate than first instar. Postocular region convex, longer than anteoocular region, with two conspicuous elongate brown spots. Length of head 0.94-1.20 (mean=1.08), width of head 0.63-0.73 (mean=0.67). Eyes prominent, reddish brown. Width of eye 0.12-0.28 (mean=0.22), interocular space 0.30-0.40 (mean=0.35). Clypeus black and setose. Rostral segment I light brown, II and III dark brown, almost black. Rostrum 1.23-1.43 long (mean=1.36), ratio of segment lengths ca. 1: 1.62: 0.66. Antenna setose, brown with two pale bands on segment I equidistant of the extremes. Antenna 5.57-5.88 long (mean=5.70), ratio of segments lengths of ca. 1: 0.33: 0.57: 0.61. Thorax light brown, tinged with orange. Posterior border of posterior lobe of pronotum black. Pronotum 0.43-0.56 long (mean=0.50), width of pronotum 0.66-0.73 (mean=0.70). Mesonotum light brown, with scattered dark spots, metanotum darker. Thoracic pleura as previous instar. Wing pads 0.32-0.40 long (mean=0.35), dark brown, almost black. Legs black, coxa lighter basally. Forefemur with one pale band (in some specimens there appears a proximal band), median and hind femora as in previous instar. Abundant setae on tibia. Abdominal color as in previous instar, setae present. Scent glands faintly visible on abdominal segments III-VI. Segments IV and V with small dorsal dots, segments VIII, IX, and X black. Abdominal length 1.90-2.36 (mean=2.14), abdominal width 0.76-1.13 (mean=0.93). Connexivum not differentiated.

**Third instar** (Fig. 5)

Body elongate. Total length 5.19-6.20 (mean=5.73). Head pyriform, uniformly orange, with setae. Length of head 1.45-1.64 (mean=1.56), width of head 0.70-0.83 (mean=0.78). Postocular region as previous instar. Clypeus black, setose. Eyes reddish brown. Width of eye 0.32-0.40 (mean=0.36), interocular space 0.40-0.60 (mean=0.48). Color of rostra segments as second instar. Rostral length 1.58-1.80 (mean=1.71), ratio of segment lengths ca. 1: 1.68: 0.21. Antennal color and band pattern as previous instar (in some specimens the proximal band is absent). Antenna 7.15-7.59 long (mean=7.50), ratio of segment lengths ca. 1: 0.26: 0.66: 0.52. Thorax orange tinged with brown, setose. Pronotum 0.69-0.83 long (mean=0.76), width of pronotum 0.83-0.96 (mean=0.89). Mesonotum orange, with two anterolateral brown spots distally (some specimens without spots), metanotum darker. Thoracic pleura as previous instar. Legs as second instar. Wing pads dark brown, almost black. Length of wing pads 0.66-1.27 (mean=0.84). Abdomen rounded, orange, setae present. Abdominal length 2.21-3.04 (mean=2.64), abdominal width 1.16-1.46 (mean=1.30). Scent glands openings visible on abdominal segments III-V, consisting of a pale papillae in the middle of an irregular dark brown spot. Segment VI with a dark spot in the same position as scent glands in previous segments; segment VII orange, remaining segments black. Connexivum not well differentiated, with only ventral black spots on each segment.

**Fourth instar** (Fig. 6)

Body elongate. Total length 6.45-8.23 (mean=7.14). Head as previous instar. Postocular region longer than anteoocular region, less convex. Length of head 1.83-2.15 (mean=2.05), width of head 0.95-1.01 (mean=0.97). Eyes as previous instar. Width of eye 0.41-0.50 (mean=0.44), interocular space 0.51-1.20

(mean=0.69). Rostral segments II and III black, segment I orange, darker distally. Rostral length 2.21-2.67 (mean=2.37), ratio of segment lengths ca. 1:1.79:0.76. Antenna black, light brown distally, with two pale bands: one at first third and the other at second third of first segment. Segments II and III setose. Antenna 9.78-10.63 long (mean=10.23), ratio of segment lengths ca. 1:0.34:0.89:0.49. Thorax orange. In most specimens, the posterior border of posterior lobe of pronotum, black. Median sulcus present. Pronotum length 0.88-1.01 (mean=0.94), width of pronotum 1.01-1.20 (mean=1.13). Mesonotum and metanotum as previous instar. Legs black, forefemur with one pale band, median and hind femora with two pale bands (in some specimens the proximal band not well developed). Setae present. Wing pads 1.20-1.45 long (mean=1.37), black and setose. Abdomen more elongate than third instar, setose. Abdominal length 2.33-3.48 (mean=2.67), abdominal width 0.95-1.58 (mean=0.65). Scent glands openings as previous instar, dorsal spots more conspicuous, with a yellow posterior area. Connexivum as previous instar. Sterna VI and VII with black distal spots, remaining sterna black.

#### **Fifth instar** (Fig. 7)

Body elongate and orange. Total length 10.76-12.02 (mean=11.29). Head elongate, pyriform and orange, with two postocular black spots. Postocular region as previous instar. Length of head 2.53-3.04 (mean=2.77), width of head 1.20-1.39 (mean=1.26). Eyes prominent and black. Width of eye 0.51-0.63 (mean=0.56), interocular space 0.63-0.88 (mean=0.73). Clypeus black, with setae. Rostral length 2.53-3.16 (mean=2.87), ratio of segment lengths ca. 1:1.63:0.56, color as fourth instar. Antenna filiform and black, with the same band pattern as previous instar. Segment II with 5 trichobothria as Figs. 8-9. Abundant setae on three last segments. Antenna 14.30-14.81 long (mean=14.56), ratio of segment lengths segments ca. 1:0.37:0.94:0.43. Thorax dark orange, without granulations or setae. Pronotum 1.26-1.39 long (mean=1.35), width of pronotum 1.64-1.77 (mean=1.72). Color and shape as previous instar. Mesonotum light orange, with two anterolateral dark brown almost black spots, and two small dark spots distally. Propleura orange except inferior border, meso and metapleura as previous instars. Spiracles on caudal margins of proepimeron and mesepimeron. Scutellum light orange, prominent, short with rounded edges. Legs black, forefemur with one pale band distally, median and hind femora with two pale bands equidistant from the extremes. Setae more abundant on tibia. Wing pads 3.35-3.79 long (mean=3.54), black, with setae.

Abdomen orange, setae present. Abdominal length 4.68-5.44 (mean=4.97), abdominal width 1.64-1.90 (mean=1.77). Scent glands as previous instar. Segment VI with a large dorsal black spot, segment 7 with a large quadrangular black spot, both sterna black, remaining segments black. Lateral edges of abdomen with a thin, white, almost yellow stripe. Connexivum not well developed, ventral black spots larger than in fourth instar. In some specimens there are laterodorsal light brown circular spots.

Observations: we confirm the distribution and number of trichobothria on the antenna of subfamily Harcatorinae, as mentioned in Wygodzinsky and Lodhi (1989) (Figs. 8-9).



## ACKNOWLEDGMENTS

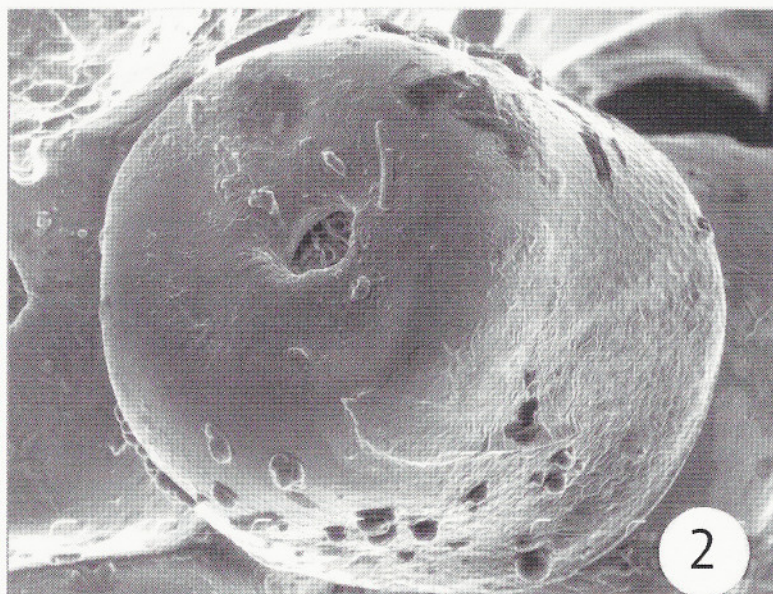
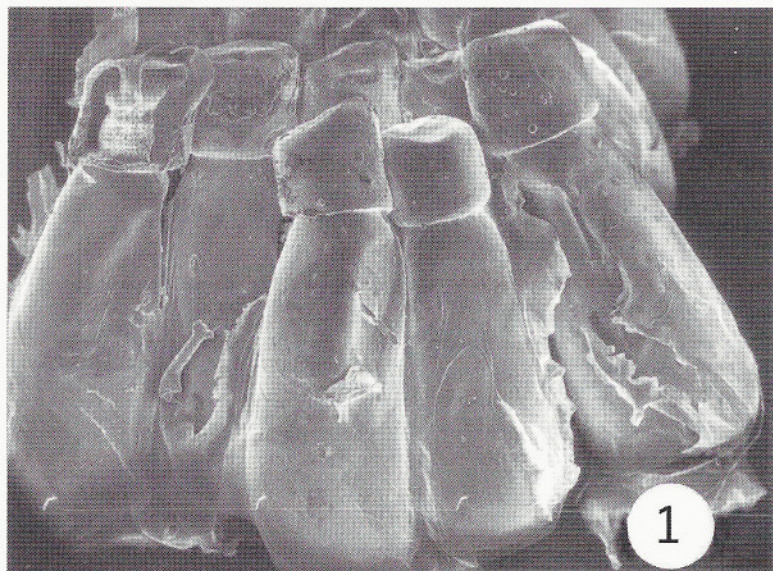
We express our gratitude to Thomas J. Henry (Systematic Entomology Laboratory, USDA, Washington, D.C.) for the critical reading of the manuscript and to the UNICAMP people for rearing the reduviids. This work was supported by the Consejo Nacional de Investigaciones Científicas (CONICET PIP Number 0545), National Geographic Foundation grant number 7104-01 and the Universidad Nacional de La Plata, Argentina.

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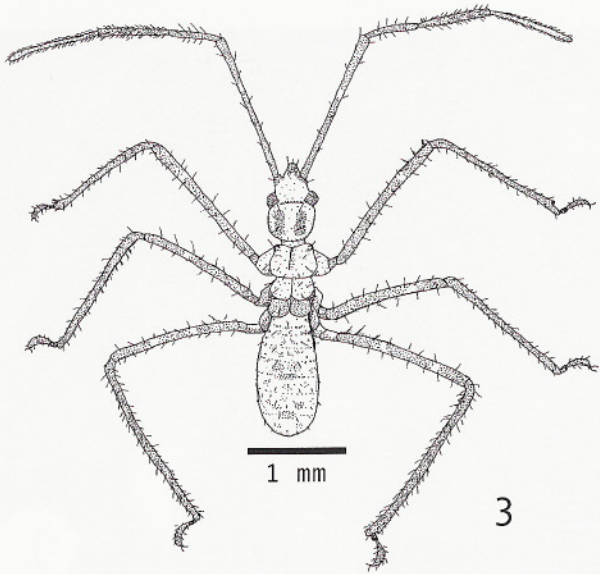
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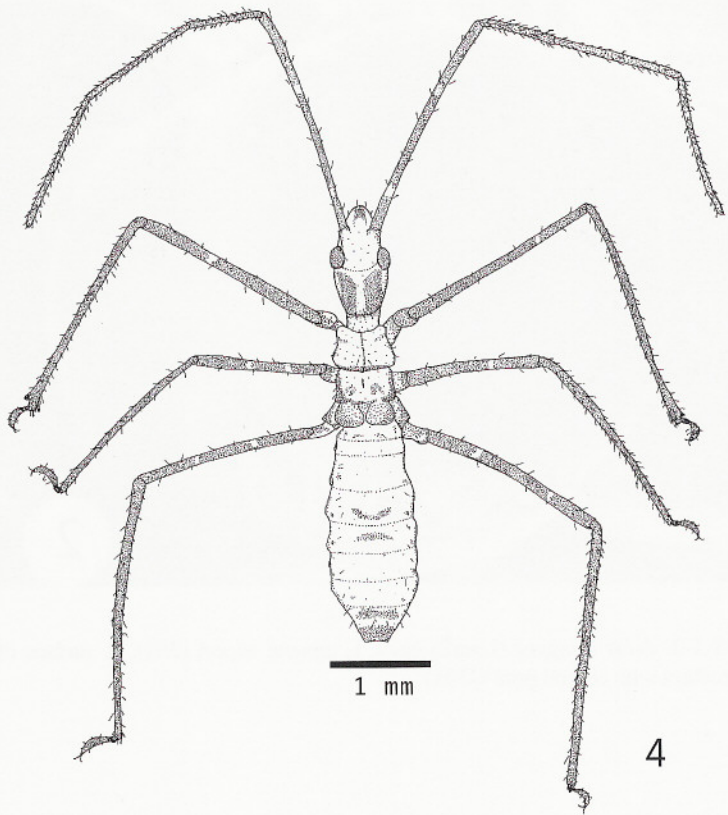




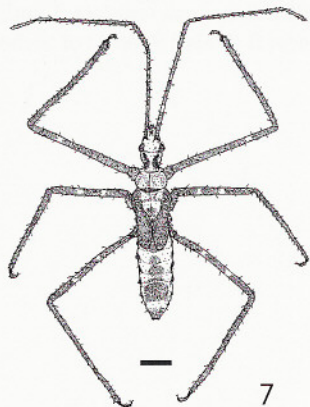
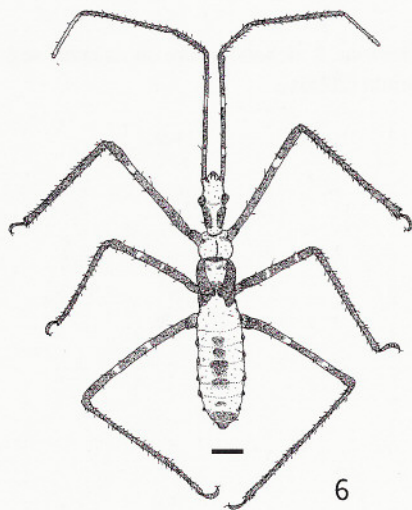
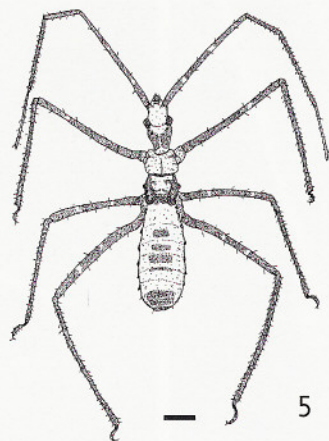
FIGS 1-2. *Zelus longipes* (Linn ) eggs. 1, general aspect (35x); 2, surface of operculum with central pore (150x).



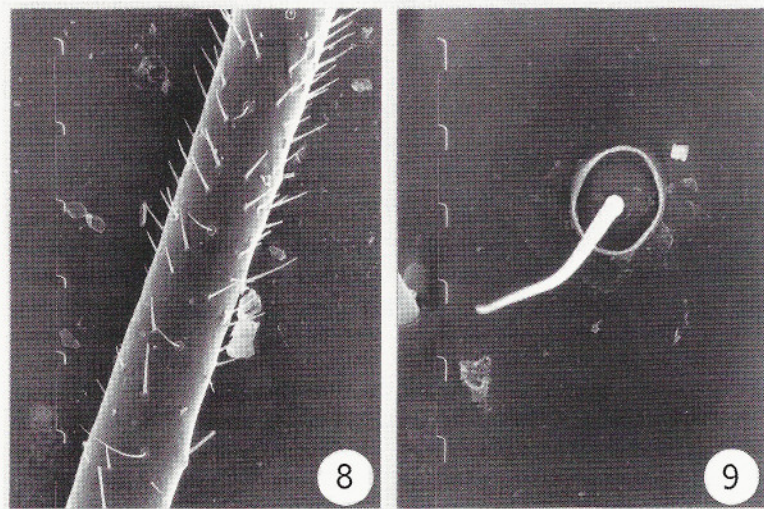
FIGS 3-4. *Zelus longipes* (LinnÉ). 3, first instar; 4, second instar. Scale line: 1 mm.







FIGS 5-7. *Zelus longipes* (LinnÉ). 5, third instar; 6, fourth instar; 7, fifth instar. Scale line: 1 mm.



FIGS 8-9. *Zelus longipes* (Linn ) fifth instar. 8, trichobothrium on antennal segment II (200x); 9, detail of trichobothrium (2000x).