Description of the Immature Stages of *Sigara (Aphelosigara) tucma*

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**ABSTRACT.** Descriptions of the last three nymphal instars of the water boatman *Sigara (Aphelosigara) tucma* Bachmann (Hemiptera: Heteroptera: Corixidae) are provided, for the first time, for specimens collected in northern Argentina; the egg is redescribed. Adults and nymphs were collected in the field. The eggs were obtained by dissection from females. The immature stages were fixed for microscopic examination and illustration and were described with an emphasis on morphometry and chaetotaxy of selected structures. The last three nymphal instars of *S. tucma* can be easily recognized by the body and head lengths and widths; the number of transverse sulcations of the rostrum; the chaetotaxy of trochanteri, protibiotarsi, midlegs, metatibia, and metatarsi; and the grade of development of the wing pads. The eggs of the genus *Sigara* can be distinguished by the size and the chorionic surface. The chaetotaxy of the mesonotum, metafemur, and metatibia distinguish groups of species belonging to the last nymphal instar of the genus *Sigara*. A key to the last three nymphal instars of the species of *Sigara* from Argentina is provided.

**Key Words:** Heteroptera, Corixidae, egg, nymph, chaetotaxy

The cosmopolitan genus *Sigara* Fabricius (Hemiptera: Heteroptera: Corixidae) includes ~70 species in America of medium- to large-sized water boatmen (Morrone et al. 2004). *Sigara* is placed within the tribe Corixini, subfamily Corixinae and is divided into various subgenera (Hungerford 1948a). The genus *Sigara* is represented in Argentina by 18 species, 17 belonging to the subgenus Tropocorixa Hutchinson and one to the subgenus Aphelosigara Hungerford (Bachmann 1981). The immature stages of *Aphelosigara tucma* Bachmann are studied in the present contribution. The genus in America is distributed from Canada to southern Argentina, in Santa Cruz Province and Malvinas Islands (Hungerford 1948a; Bachmann 1960, 1961b, 1962a, 1979; Hungerford and Matsuda 1961; Contartese and Bachmann 1986; Arnett 1993; Morrone et al. 2004). *S. tucma* is only known from a few localities in Argentina (from Salta to Córdoba Provinces) (Bachmann 1981; Morrone et al. 2004). It seems to be frequent in small lentic water bodies with moderate amounts of submergent vegetation (aquatic mosses mainly), at altitudes of 1,500 m a.s.l. in the mountains of northwestern Argentina (Bachmann 1981).

The systematics of the adults of *Sigara* were studied by Hutchinson (1940), Hungerford (1948a), and Bachmann (1960, 1961a,b, 1962a–d, 1963, 1966, 1979, 1981, 1987), and they are comparatively well known, but there are few descriptions of the immature stages available in the literature. Only the eggs of 12 species of *Sigara* have been described (Poisson 1933; Hungerford 1948b; Fernando 1965; Bachmann 1981; Konopko 2012, 2013b). According to the nymphs, there are brief descriptions of the first nymphal instar emphasizing the chaetotaxy of European species of *Sigara*: *S. (Sigara) concinna* (Fieber), *S. (S.) lateralis* (Leach), *S. (S.) striata* (L.), and *S. (Subsigara) falleni* (Fieber) (Cobben and Moller Pillot 1960); the last nymphal instar of *Sigara (Subsigara) fossarum* (Leach), *S. (S.) scotti* (Douglas & Scott), *S. (S.) falleni*, *S. (S.) distincta* (Fieber), *S. (Sigara) striata*, *S. (S.) dorsalis* (Leach), *S. (S.) semistriata* (Fieber), *S. (S.) venusta* (Douglas & Scott), *S. (S.) limitata* (Fieber), *S. (S.) lateralis*, *S. (S.) nigrolineata* (Fieber), *S. (S.) concinna*, *S. (S.) stagnalis* (Leach), *S. (S.) selecta* (Fieber), and *S. (S.) hellensi* (Sahlberg) (Cobben and Moller Pillot 1960; Nieser 1969); and the last three nymphal instars of *S. (Subsigara) fossarum*, *S. (S.) scotti*, *S. (S.) falleni*, *S. (S.) distincta*, *S. (Sigara) striata*, *S. (S.) semistriata*, *S. (S.) limitata*, *S. (S.) nigrolineata*, *S. (S.) lateralis*, and *S. (Sigara) janssont* (Lucas (Janssont 1969; López et al. 1996). Melo and Scheibler (2011) presented descriptions of the five nymphal instars of *S. (Tropocorixa) jensenthaerugi* Jacewski. All the species mentioned above were treated very superficially and were not described in detail, making comparisons difficult. Recently, Konopko (2012, 2013b) described in detail the five nymphal instars of two species of *Sigara (S. tropocorixae) schadei* (Hungerford) and *S. (T.) santiaguenis* (Hungerford) with an emphasis on morphometry and chaetotaxy. Thus, the last two works and this contribution attempt to study the nymphal morphology of *Sigara* in a broader sense, based on comparative approach.

The main goals of this contribution are: 1) to redescribe the egg and to describe and illustrate, for the first time, the last three nymphal instars of *S. tucma*, including a detailed morphometric and chaetotaxic analysis of selected structures, (2) to compare the eggs and the nymphs of the species of *Sigara* described up to the moment, 3) to establish the nymphal characters useful in identifying instars and species of *Sigara*, and 4) to provide an identification key to the last three nymphal instars of the species of *Sigara* from Argentina.

**Material and Methods**

Adults and nymphs of *S. tucma* have been collected in the field, fixed, and preserved in 96% ethanol. The eggs were obtained by dissection from females. The material is held in the collection of the División de Entomología, Museo Argentino de Ciencias Naturales ‘Bernardino Rivadavia’ (MACN), Buenos Aires, Argentina.

The taxonomic descriptions of the eggs and nymphs were performed using a Leitz stereomicroscope (at magnifications up to 144×). For each nymph only differences with the previous nymph description are emphasized. Some nymphal specimens were cleared in lactic acid, dissected, and mounted on glass slides in polyvinyl-lacto-glycerol. Observations (at magnifications up to 1,000×) and drawings were made using an Olympus CX31 compound microscope equipped with a...
drawing tube. Drawings were scanned and digitally edited. The key to identify the last three nymphal instars of the species of *Sigara* is based on the Argentinian species described up to now.

**Morphometric and Chaetotaxic Analysis**

Alcohol-preserved material was observed in a Petri dish with 96% ethyl alcohol. Nymphal structures were measured utilizing a Leitz stereo-microscope equipped with a micrometric ocular. Paired structures of each individual were considered independently. The interpretation of the chaetotaxy of the legs follows the one stated in Konopko et al. (2010a).

The following material was measured: eggs, 10; instar III, one specimen; and instars IV–V, five specimens each (Table 1). The chaetotaxy of the following material was studied: instar III, one specimen; and instars IV–V, five specimens each. Figures 15–16, 18–19, and 21–22 show the position of spines, setae, and bristles on the legs.

**Results**

*Sigara (Aphelosigara) tucma*

**Material Examined.** Argentina. **Salta Province:** pothole on route 19, near Aguas Blancas, 1 instar IV, 7 instar V, 19.XI.2003, S. Mazzucconi coll. (MACN); National Park El Rey, ditch that empties in Sala stream, 1 instar III, 9 instar IV, 3 instar V, 10.XI.2003, S. Mazzucconi coll. (MACN). **Tucumán Province:** San Javier, 15.III.1961 and 18–28.I.1971, 23 dissected eggs, A. Bachmann coll. (MACN) (Figs. 1–24; Tables 1–3).

**Table 1. Measurements (in mm) of nymphal instars III–V of *S. (Aphelosigara) tucma***

| Measure | Instar III | Instar IV | Instar V |
|---------|------------|-----------|----------|
| BL      | 2.18       | 3.50–3.60  | 4.6–5.03 |
| BW      | 1.34       | 1.81–1.88  | 2.28–2.43|
| HL      | 0.50       | 0.74–0.77  | 0.97–0.99|
| HW      | 1.17       | 1.59–1.64  | 1.98–2.11|
| S       | 0.50       | 0.55–0.62  | 0.60–0.69|
| eW      | 0.45       | 0.57–0.60  | 0.74–0.84|
| A1L     | 0.10       | 0.12–0.13  | 0.15–0.17|
| A2L     | 0.31       | 0.45–0.48  | 0.50–0.57|
| A2W     | 0.08       | 0.10–0.12  | 0.10–0.12|
| AL      | 0.41       | 0.57–0.60  | 0.67–0.74|
| PL      | 0.55       | 1.02–1.09  | 1.24–1.36|
| FE1L    | 0.39       | 0.50–0.57  | 0.59–0.69|
| TITA1L  | 0.50       | 0.69–0.72  | 0.82–0.92|
| TITA1W  | 0.12       | 0.17–0.20  | 0.18–0.28|
| CIL1    | 0.11       | 0.18–0.20  | 0.20–0.23|
| L1C     | 0.88       | 1.21–1.29  | 1.42–1.61|
| FE2L    | 1.17       | 1.69–1.71  | 2.16–2.33|
| TI2L    | 0.55       | 0.77–0.79  | 0.97–1.07|
| TA2L    | 0.49       | 0.62–0.67  | 0.72–0.79|
| CL1L2   | 0.57       | 0.77–0.82  | 0.94–1.09|
| CL2L2   | 0.60       | 0.79–0.84  | 0.97–1.12|
| L1W     | 2.21       | 3.08–3.15  | 3.84–4.17|
| FE3L    | 0.77       | 1.04–1.07  | 1.31–1.36|
| T13L    | 0.69       | 0.97–1.02  | 1.22–1.36|
| T13W    | 0.15       | 0.22–0.27  | 0.25–0.30|
| TA3L    | 1.04       | 1.36–1.46  | 1.79–2.03|
| TA3W    | 0.15       | 0.22–0.25  | 0.27–0.32|
| CL1L3   | 0.18       | 0.18–0.19  | 0.19–0.21|
| CL2L3   | 0.19       | 0.19–0.20  | 0.20–0.22|
| L3L     | 2.50       | 3.37–3.55  | 4.32–4.76|
| G4      | 0.09       | 0.09       | 0.09–0.10|
| G5      | 0.08       | 0.08       | 0.09|
| D5      | 0.01       | 0.01       | 0.02|

Abbreviations: A1L, A2L, lengths of the antennal segments I and II; A2W, width of the antennal segment II; AL, length of antenna; BL, body length; BW, body width; CIL1, CL1L2/CL2L2, CL1L3/CL2L3, lengths of the claws(s) of the fore-, mid- and hindlegs; D4 and D5, scent gland openings diameter in segments IV and V; EL, egg length; EW, egg width; eW, width of an eye; FE1L, FE2L, FE3L, length of pro-, meso-, and metatibia; G4 and G5, distance between the scent gland openings on segments IV and V; HL, head length; HW, head width; L1L, L2L, L3L, length of fore-, mid-, and hindlegs; ML, micropyle length; OI, ocular index; PL, length of pterothorax; S, synthlipsis; SL, stalk length; T2A1L, T3A1L, length of mesotarsus and metatarsus; TITA1W, TITA1L, TITA1L, length of protibiotarsus, metatibia and metatarsus.
shorter than tibiotarsus, FE1/TITA1: 0.78. Procoxa short, subconical; anterior and posterior surfaces with abundant short, slender setae. Protrochanter short; anterior surface with abundant short, slender setae (two basal), and three basal campaniform sensilla; posterior surface with short, slender setae, and five basal campaniform sensilla. Profemur short and subrectangular; anterior surface with a hydrophobic setose area covering the basal half of the segment and six spines (two short, slender, simple; two long, stout, apically serrate; two simple, stout: one short and one long), and chloride cells (not illustrated; Fig. 15); anterodorsal surface with 15–19 spines, and chloride cells; anteroven- tral surface with 21–23 simple spines, 23–25 apically serrate spines, and chloride cells; posterior surface with a transverse basal row of short slender setae; posterodorsal surface with chloride cells; posteroven- tral surface with 28–30 short spines, four or five long, slender spines, eight or nine short, slender setae, and chloride cells. Mesotibia subcylindrical, straight (Figs. 18–19); anterior surface with a basal hydrophobic setose area of short slender setae; anterodorsal surface with 15–19 spines, and chloride cells; anteroven- tral surface with 21–23 simple spines, 23–25 apically serrate spines, and chloride cells; posterior surface with a transverse basal row of short slender setae; posterodorsal surface with chloride cells; posteroven- tral surface with 28–30 short spines, four or five long, slender spines, eight or nine short, slender setae, and chloride cells. Mesotibia subcylindrical, straight (Figs. 18–19); anterior surface with seven or eight spines, one prebasal campaniform sensillum, and chloride cells (not illustrated); anterodorsal surface with five spines (the prebasal longest); anteroventral surface with seven or eight spines; posterior surface with five spines, one prebasal campaniform sensillum, and 18 long, slender setae. One short, slender, falcate claw. Midlegs long and slender; L2/BL: 1.01; mesofemur longest, tibia longer than tarsus; FE:TI:TA= 1.00:0.48:0.42. Mesocoxa short, subconical; anterior and posterior surfaces with short, slender setae. Mesotrochanter short; anterior surface with four basal campaniform sensilla, and abundant short, slender setae; posterior surface with seven basal campaniform sensilla, and abundant short, slender setae. Mesofemur subcylindrical, straight; anterior surface with a basal hydrophobic setose area of short slender setae; anterodorsal surface with chloride cells; anteroventral surface with 21–23 simple spines, 23–25 apically serrate spines, and chloride cells; posterior surface with a transverse basal row of short slender setae; posterodorsal surface with chloride cells; posteroven- tral surface with 28–30 short spines, four or five long, slender spines, eight or nine short, slender setae, and chloride cells. Mesotibia subcylindrical, straight (Figs. 18–19); anterior surface with seven or eight spines, one prebasal campaniform sensillum, and chloride cells (not illustrated); anterodorsal surface with five spines (the prebasal longest); anteroventral surface with seven or eight spines; posterior surface with five spines, one prebasal campaniform sensillum, and 18 long, slender setae. One short, slender, falcate claw. Midlegs long and slender; L2/BL: 1.01; mesofemur longest, tibia longer than tarsus; FE:TI:TA= 1.00:0.48:0.42.
setae; posteroventral surface with 11 simple spines, and tibial comb represented by five apically serrate spines. Mesotarsus subcylindrical, straight (Figs. 18–19); anterodorsal surface with one long, slender, preapical seta and three spines; anteroventral surface with eight spines; posterior surface with six spines; posterodorsal surface with four or five spines, and 16–19 long, slender setae; and 16–19 long, slender setae; posteroventral surface with an apical spine. Two long, slender, falcate claws of different length. TA2/CL1: 0.85; TA2/CL2: 0.82. Hindlegs long, slender; L3/BL: 1.15; tarsus longest, tibia shorter than femur; FE:TI:TA = 0.74:0.67:1.00.

Metacoxa large, subconical (Fig. 21); anterior surface with abundant short and long, slender setae, medial to the segment, and with a prebasal set of short and stout spines on a bare area; anteroventral surface with some long, slender setae; posterior surface bare. Metatrochanter short (Fig. 21); anterior surface with abundant short and long, slender setae, medial to the segment, and with a prebasal set of short and stout spines on a bare area; anteroventral surface with some long, slender setae; posterior surface bare. Metatrochanter short (Fig. 21); anterior surface with abundant short, slender setae (two basal), and four basal campaniform sensilla; anteroventral surface with two long, slender setae; posterior surface with some short, slender setae, and seven basal campaniform sensilla. Metafemur slightly curved and flattened anteroposteriorly (Figs. 21–22); anterior surface with a basal hydrophobic setose area of short setae, reaching the basal half of the segment on the dorsal margin, and the apical fifth of the segment on ventral margin, with five or six short spines in three areas (upper, one; middle, three or four; lower, one), and with chloride cells (not illustrated); anterodorsal surface with two short spines; posterodorsal surface with two short, apical spines; posteroventral surface with two short spines and chloride cells (not illustrated); ventral surface with seven or eight long, slender, preapical setae. Metatarsus subcylindrical, straight, TI3 width/length: 0.21 (Figs. 21–22); anterodorsal surface with five short spines, and with chloride cells (not illustrated); anteroventral surface with nine to 11 short spines, and 26–27 long, slender setae, and chloride cells (not illustrated); posterodorsal surface with 27–29 spines, 10–12 short, slender setae, and 234–244 swimming hairs; posteroventral surface with 35–39 spines. Two short, slender, straight claws of different length. TA3/CL1: 5.85; TA3/CL2: 5.54.

Figures 15–20. S. (Aphelosigara) tucma. 15, profemur, nymphal instar III, anterior surface. 16–17, foreleg, anterior surface: 16, nymphal instar IV; 17, nymphal instar V. 18–19, midleg, nymphal instar III: 18, anterior surface; 19, posterior surface. 20, midleg, nymphal instar V, anterior surface. A: anterior; AD: anterodorsal; AV: anteroventral; BT: behind tibial comb; CL: claw; DR: dorsal row; IS: inner surface; LR: lower row; P: posterior; PD: posterodorsal; PV: posteroventral; TC: tibial comb; UR: upper row. Scale bars in mm: Fig. 15 = 0.30, Figs. 16–19 = 0.40, Fig. 20 = 0.80.
**Abdomen.** Ecdysial line visible on segments I–II. Posterior margins of the segments I and VIII straight and segments II–VII concave, dorsal and ventrally. G4/D4 and G5/D5: 9. Spiracles visible on segments I–VIII, small and rounded; located ventrolaterally near posterior margin (I) or located ventrally near anterior margin (II–VIII) of each segment; the one on the segment I is bigger than the others abdominal spiracles. Terga with few short, slender setae, and abundant chloride cells. Lateral spines of the abdominal segments (right side): I, zero; II–III, one short; IV, three short, one long; V, six short, two long; VI, seven short, two long; VII, eight short, six long; VIII, 10 short, seven long. Sternal with abundant short, slender setae. Unosternites without central spines.

**Fourth nymphal instar** (Figs. 5–6, 10, 16, 23–24; n = 5)
Similar to third instar except for the following features:

**Color.** Posterior margin of pro-, meso-, and metanotum, and metatarsus apically darker.

**Body.** Elongate, BL/BW: 1.86–1.97. Measurements that characterize the body shape are shown in Table 1.

**Head.** HL/HW: 0.45–0.48. S/eW: 0.92–1.09. OI: 1.05–1.22. HW/BL: 0.44–0.47. Rostrum with six transverse sulcations (N = 3). Antenna: AL/BL: 0.16–0.17; A1:A2 = 0.26–0.28:1.00; A2 width/length: 0.21–0.28; A1 dorsal surface with some short, slender setae; A2 dorsal surface with abundant short and long, slender setae, and flattened, long, apically serrate setae (Fig. 5); A2 ventral surface with seven short, stout spines, on the apical half of the segment, ventral margin with abundant short, slender setae (Fig. 6).

**Thorax.** Mesonotum with short, slender setae on the anterior four fifths of the segment; short, lanceolate setae of the posterior margin of the setose area of the mesonotum more extended medially than on previous instar, but not reaching the posterior margin of the segment (Fig. 10). PL/BL: 0.28–0.31. The meso- and metathoracic wing pads...
covering the anterior third of the urotergites I and II, respectively.
Forelegs L1/BL: 0.34–0.37; FE1/TITA1: 0.72–0.79. Procoxa anterior and posterior surfaces with abundant short and long, slender setae.
Protrochanter anterior and posterior surfaces with five and seven basil campaniform sensilla, respectively. Profemur anterior surface with eight to nine spines (three short, slender, simple; two long, stout, flattened, apically serrate; three or four simple, stout: two or three short and one long); anteroventral surface with two short, apical spines, and without the two short, slender setae (Fig. 16). Protibiotarsus TITA1 width/length: 0.24–0.28; anterior surface with eight or nine long setae in dorsal, 45–46 setae in upper, 19–20 long setae in lower rows, tibial comb of four (3+1) spines, and two short spines behind the tibial comb; inner surface with 45–47 long, slender setae (Fig. 16). Midlegs L2/BL: 0.86–0.90; FE: TI:TA = 1.00:0.45:0.47:0.36–0.40. Mesocoxa anterior and posterior surfaces with abundant short and long, slender setae. Mesotrochanter anterior surface with five basal campaniform sensilla. Mesofemur anterodorsal surface with 22 spines; anteroventral surface with 30 simple spines, and 33–36 apically serrate spines; posteroventral surface with 48–57 short spines, three long, slender spines, and 20–23 short, slender setae. Mesotibia anterior surface with seven to nine spines; anteroventral surface with eight or nine spines; posterior surface with 27–29 long, slender setae; posteroventral surface with 14–15 apically serrate spines, four to five simple spines, and tibial comb of five to six spines (four or five simple, one or two apically serrate). Mesotarsus anteroventral surface with seven or eight spines; posterior surface with five spines; posterodorsal surface with 29–35 long, slender setae. TA2/CL1: 0.81–0.82; TA2/CL2: 0.78–0.79. Hindlegs L3/BL: 0.94–0.99; FE: TI: TA = 0.72–0.76:0.69–0.71:1.00. Metatrophanter anterior surface with five basal campaniform sensilla (Fig. 23).
Metafemur anterior surface with nine or 10 short spines in three areas (upper, one; middle, three; lower, five or six). Metatibia T13 width/length: 0.22–0.28 (Figs. 23–24); anterodorsal surface with five or six short spines; anteroventral surface with 11–16 short spines, and 35–40 long, slender setae; posterior surface with three or four short spines, and 28–33 long, slender setae; posterodorsal surface with 15–16 spines, and seven or eight short, slender setae; posteroventral surface with 21–26 spines, and tibial comb of six simple spines. Metatarsus T13 width/length: 0.15–0.17; anterior surface with five or six short spines on the basal two third of the segment; anteroventral surface with 29–32 short spines, and 321–328 swimming hairs; posterodorsal surface with 36–38 spines, 10–11 short, slender setae, and 391–396 swimming hairs; posteroventral surface with 48 spines. TA3/CL3: 7.65–8.07; TA3/CL2: 7.25–7.65.
Abdomen. G4/D4: 5 and G5/D5: 5–6. Lateral spines of the abdominal segments (right side): I, zero; II–III, one short; IV, four to five short, two long; V, seven to eight short, four long; VI, six short, five to six long; VII, 22 short, five long; VIII, 11–12 short, eight to nine long.
Fifth nymphal instar (Figs. 7–8, 11–14, 17, 20; n = 5)
Similar to fourth instar except for the following features:

**Color.** Posterior margins of the metathoracic wing pads and abdominal sternites I and II medially, and claws of the midlegs apically darker.

**Body.** BL/BL: 2.01–2.07. Measurements that characterize the body shape are shown in Table 1.

**Head.** HL/HW: 0.47–0.50. S/eW: 0.74–0.85. OI: 0.83–1.02. HW/BL: 0.42–0.45; with more chloride cells in frontal view than in previous instar. Rostrum with seven transverse sulcations (N = 3). Antenna AL/BL: 0.15; A1:A2 = 0.27–0.35:1.00; A2 width/length: 0.18–0.25; A1 ventral surface with some short, slender setae (Fig. 8); A2 ventral surface with 14–15 short, stout spines on the apical half of the segment (Figs. 7–8).

**Thorax.** Mesonotum with a T-shaped area of short, lanceolate setae (Fig. 12) on posterior margin, reaching the anterior margin of metanotum medially (Fig. 11). PL/BL: 0.27. Posterior margins of the meso- and metathoracic wing pads with flattened, apically serrate setae (Figs. 11, 14), and long, lanceolate setae (Fig. 13), respectively. Meso- and metathoracic wing pads reaching the anterior margin and covering the anterior half of the urotergite III (Fig. 11), respectively. Forelegs L1/BL: 0.31–0.33; FE1/TITA1: 0.72–0.78. Protrochanter anterior and posterior surfaces with six and nine basal campaniform sensilla, respectively. Profemur anterior surface with 12–13 spines (five short, slender, simple; two long, stout, flattened, apically serrate; five or six simple, stout: four or five short and one long (Fig. 17). Protibiotarsus TITA1 width/length: 0.22–0.31; anterior surface with 48–56 setae in upper, 22–23 long setae in lower rows, tibial comb represented by five spines; inner surface with 75–78 long, slender setae (Fig. 17). Midlegs L2/BL: 0.82–0.88; FE: TI: TA = 1.00:0.45:0.46:0.33–0.34. Mesotrochanter anterior and posterior surfaces with six and nine basal campaniform sensilla, respectively. Mesofemur anterodorsal surface with 28 spines;
anteverentral surface with 26–31 simple spines, and 49–51 apically serrate spines; posteroventral surface with 70–73 short spines, and 32–36 short, slender setae. Mesotibia anterior surface with eight to ten spines (Fig. 20); anteverentral surface with 12–14 spines (Fig. 20); posterior surface with 37–41 long, slender setae; posteroventral surface with 37–42 apically serrate spines, nine to 11 simple spines, and tibial comb represented by five to seven simple spines. Mesotarsus anterior surface with four or five spines; posteroventral surface with 48–53 long, slender setae. TA2/CL1: 0.70–0.78; TA2/CL2: 0.69–0.74. Hindlegs L3/BL: 0.94–0.95; FE:TI:TA = 0.67–0.74:0.67–0.69:1.00. Metatrochanter anterior and posterior surfaces with six and nine basal campaniform sensilla, respectively. Metafemur anterior surface with 11–13 short spines in three areas (upper, one; middle, three or four; lower, seven or eight); ventral surface with seven to 11 long, slender, apical setae. Metatibia TI3 width/length: 0.18–0.24; anteroventral surface with 37–41 long, slender setae; posteroventral surface with 45–48 spines. TA3/CL1: 8.95–9.78; TA3/CL2: 8.54–9.24.

Abdomen. G4/D4: 4–5, G5/D5: 5. Lateral spines on the abdominal segments (right side): I, zero; II–III, one short; IV, four to five short, two long, V, five to six short, four to five long; VI, five to seven short, three to four long; VI, 21–23 short, seven to eight long; VIII, nine to 11 short, six to seven long.

Key to the last three nymphal instars of the species of Sigara from Argentina

1. Mesothoracic wing pads reaching the posterior margin of pterothorax; metathoracic wing pads reaching the anterior margin of urotergite II (Fig. 9) **nymphal instar III** … 2
   - Mesothoracic wing pads surpassing the posterior margin of pterothorax; metathoracic wing pads surpassing the anterior margin of urotergite II (Figs. 10–11) … 4
2. Metaxyphus longer than wide and apically truncate … **S. tucma**
   - Metaxyphus wider than long and apically rounded … 3
3. Hydrophobic setose area on anterior surface of the profemur covering the basal half of the segment; urosternite V with two long central spines (Konopko 2013b: Figs. 1D, 2C) **S. santiagensis**
   - Hydrophobic setose area on anterior surface of the profemur covering more than the basal half of the segment (Konopko 2012: Fig. 15); urosternite V without central spines … **S. schadei**
4. Meso- and metathoracic wing pads not reaching the posterior margin of urotergite II (Fig. 10) **nymphal instar IV** … 5
   - Meso- and metathoracic wing pads surpassing the posterior margin of urotergite II (Fig. 11) **nymphal instar V** … 7
5. Posteroventral surface of the metafemur with two spines (Fig. 22) … **S. tucma**
   - Posteroventral surface of the metafemur with four to five spines (Konopko 2013b: Fig. 3D) … 6
6. Hydrophobic setose area on anterior surface of the metafemur covering the basal half of the segment (Konopko 2012: Fig. 21) … **S. schadei**
   - Hydrophobic setose area on anterior surface of the metafemur covering more than the basal half of the segment (Konopko 2013b: Fig. 3C) … **S. santiagensis**
7. Hydrophobic setose area on posterior surface of the profemur covering the basal half of the segment … **S. santiagensis**
   - Hydrophobic setose area on posterior surface of the profemur covering more than the basal half of the segment … 8
8. Posteroventral surface of the metafemur with two spines (Fig. 22) … **S. tucma**
   - Posteroventral surface of the metafemur with six to 10 spines (Konopko 2012: Fig. 24) … **S. schadei**

**Discussion**

The eggs of Sigara have a very short basal stalk according to Poisson (1933), Hungerford (1948a,b), Fernando (1965), Bachmann (1981), and Konopko (2012, 2013b), based on the following species: Sigara (Allosigara) decorata, S. (Aphelosigara) tucma, S. (Phaeosigara) paludata, S. (Sigara) striata, S. (S) stagnalis, S. (Subsigara) distincta, S. (Tropocorixa) schadei, S. (T) meridionalis, S. (T) irrorata, S. (T) pruthiana, S. (T) santiagensis, and S. (Vermicorixa) alternata. The short basal stalk is also present in the eggs of other genera of Corixidae as Arcotocorixa Wallengren, Calliocorixa White, Cenocorixa Hungerford, Centrocorixa Lundblad, Corisella Lundblad, Corixa Geoffroy, Dysocorixa Hungerford, Ectemnostega Enderlein, Gryptocorixa Hungerford, Hesperocorixa Kirkaldy, Krizosacorixa Hungerford, Neosigara Lundblad, Orocorixa Nieser & Padilla-Gil, Palmacorixa Abbott, Pseudocorixa Jaczewski, Rhamphocorixa Abbott, Sinocorixa Horvath, Trichocorixa Kirkaldy, and Xenocorixa Hungerford (Hungerford 1948a,b; Cobben 1968; Padilla-Gil and Nieser 1994; Konopko and Mazzuco 2011; Konopko 2012, 2013a,b); and in Micronectidae, in the eggs of the subgenus of Tenagobia Bergroth: Uncertagobia Nieser and Tenagobia (Cobben 1968; Bachmann 1979, 1981, 1983; Konopko et al. 2010a). The eggs of S. decorata (EL: 0.96 mm; EW: 0.86 mm) and S. meridionalis (EL: 0.86 mm; EW: 0.72 mm) are bigger than the ones of S. alternata (EL: 0.55 mm; EW: 0.35 mm), S. distincta (EL: 0.68 mm; EW: 0.60 mm), S. irrorata (EL: 0.75 mm; EW: 0.50 mm), S. paludata (EL: 0.65 mm; EW: 0.50 mm), S. santiagensis (EL: 0.71–0.77 mm; EW: 0.50–0.57 mm), S. schadei (EL: 0.72–0.77 mm; EW: 0.57–0.62 mm) and S. tucma (EL: 0.58–0.63 mm; EW: 0.49–0.54 mm) (Hungerford 1948a,b; Konopko 2012, 2013b). The shape of the egg of S. tucma described in this work is similar to the one studied by Bachmann (1981). The ratio length/width is smaller in S. decorata (1.12) and S. distincta (1.13) than in the other species (S. alternata: 1.57; S. irrorata: 1.50; S. meridionalis: 1.19; S. paludata: 1.30; S. santiagensis: 1.31–1.47; S. schadei: 1.18–1.29; and S. tucma: 1.16–1.24) (Hungerford 1948a,b; Konopko 2012, 2013b). The ratio length/width of the eggs of the genus Neosigara (N. murilloi Hungerford, 1.24; N. colombiensis Lundblad, 1.20; N. aristera Nieser & Padilla, 1.28; N. sterea Nieser & Padilla, 1.20) are similar to the ones of S. tucma (1.16–1.24), S. meridionalis (1.19), S. schadei (1.18–1.29), and S. paludata (1.30) (Hungerford 1948a; Konopko 2012; Padilla-Gil and Nieser 1994). The ratio length/width of the egg of S. tucma studied in this work is different (1.16–1.24) from the one published by Bachmann (1981; 1.40). The chorionic surface of the eggs of S. tucma and S. santiagensis are similar as they are ornamented by smooth hexagons, and they can be distinguished from the ones of S. schadei as they have protruberances delimiting small areas on them (Konopko 2012, 2013b). According to Hungerford (1948a,b) the eggs of S. alternata, S. decorata, and S. distincta are not sculptured, whereas the ones of S. irrorata, S. meridionalis, and S. paludata have a minutely wrinkled surface.

The last three nymphal instars of S. tucma can be easily recognized by (Table 2): the body and head lengths; the body, head, and eye widths; the number of transverse sulcations of the rostrum; the number of campaniform sensilla on anterior and posterior surfaces of the protocoxae; the number of setae on the inner surface of the protobothriotarsus (Figs. 16–17); number of spines on the tibial comb of the protobothriotarsus and metatibia (Figs. 16–17, 22, 24); the number of campaniform sensilla on anterior surface of the meso- and metatrochanters (Figs. 21, 23); the number of spines on anteroventral surface of the mesofemur; the number of long, slender setae on posterior and posterodorsal surfaces...
of the mesotibia and mesotarsus, respectively (Fig. 19); the number of long setae on the anteroventral and posterior surfaces and the number of spines on the posterodorsal surface of the metatibia (Figs. 21–24); the number of spines and swimming hairs on anteroventral and posterodorsal surfaces of the metatarsus (Figs. 21–22); and the grade of development of the wing pads (Figs. 9–11).

The last three nymphal instars of S. tucma, S. santiagiensis, and S. schadei can be separated from each other based on: the hydrophobic setose area on anterior surface of the profemur covering the basal half of the segment (S. santiagiensis and S. tucma) or more than the basal half (S. schadei); the hydrophobic setose area on posterior surface of the profemur covering the basal half of the segment (S. santiagiensis) or more than the basal half (S. schadei and S. tucma); the hydrophobic setose area on the anterior surface of the metafemur covering the basal half of the segment (S. schadei and S. tucma) or more than the basal half (S. santiagiensis); the number of spines on posteroventral surfaces of the metafemur (III: S. tucma, two, S. santiagiensis, four to five, S. schadei, seven to eight; IV: S. tucma, two, S. santiagiensis, five, S. schadei, four; V: S. tucma, two, S. santiagiensis, four, S. schadei, six to 10); the number of swimming hairs on anteroventral surface of the metatarsus (III: S. tucma, 173–177, S. santiagiensis, 106–108, S. schadei, 198–200; IV: S. tucma, 321–328, S. santiagiensis, 260–265, S. schadei, 210–214; V: S. tucma, 540–550, S. santiagiensis, 344–348, S. schadei, 260–265); the shape of the metaxyphus (longer than wide and apically truncate in S. tucma, and wider than long and apically rounded in S. santiagiensis and S. schadei); and the presence or absence of central spines on the urosternite V in nymphs III (two long spines in S. santiagiensis, and without spines in S. schadei and S. tucma) (Konopko 2012, 2013b).

The chaetotaxy of the mesonotum, metafemur, and metatibia distin-

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