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### Morphometry and chaetotaxy of the nymphs of *Ectemnostega* (*Ectemnostegella*) *quechua* (Bachmann 1961) (Insecta: Hemiptera: Heteroptera: Corixidae)

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## Morphometry and chaetotaxy of the nymphs of *Ectemnostega* (*Ectemnostegella*) *quechua* (Bachmann 1961) (Insecta: Hemiptera: Heteroptera: Corixidae)

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The egg and the five nymphal instars of *Ectemnostega quechua* are described and illustrated for the first time. The eggs of *Ectemnostega* have a short stalk, and the shape, size and chorionic structure differ among groups of species. The nymphal characters most useful in identifying instars I–V of *Ectemnostega* are: body length; number of rostrum sulcations; number of setae on inner surface of protibiotarsus; spines and setae, and spines on posteroventral surface of mesofemur and mesotibia, respectively; setae on posterodorsal surface of mesotibia and mesotarsus; spines and setae on anteroventral surface and setae on posterior surface of metatibia; swimming hairs on anteroventral and posterodorsal surfaces of metatarsus; and the grade of development of wing pads. The nymphs of *E. quechua* can be easily distinguished from other species of *Ectemnostega* by the number of spines and setae on the posteroventral surface of mesofemur.

**Keywords:** Nepomorpha; Corixinae; taxonomy; immature stages; Neotropical Region

### Introduction

According to Bachmann (1981), five species of *Ectemnostega* Enderlein are present in Argentina, of which *Ectemnostega* (*Ectemnostegella*) *quechua* (Bachmann) is studied here. This species is distributed in mountainous areas of Peru, Bolivia and north-western Argentina (from Jujuy to Catamarca provinces) at over 3000 m above sea level (Roback and Nieser 1980; Bachmann 1981; Morrone et al. 2004). In Argentina, *E. quechua* lives in small lentic habitats exposed to the sun, with scanty vegetation, at 3400–4250 m above sea level (Bachmann 1981).

The Neotropical genus *Ectemnostega* comprises 12 species and is currently divided into two subgenera: *Ectemnostega* (one species) and *Ectemnostegella* Lundblad (11 species) (Hungerford 1948b; Bachmann 1960, 1979, 1981; Roback and Nieser 1980; Štys and Jansson 1988). Although the systematics of the adults of this genus is comparatively well known (Hungerford 1948b; Bachmann 1981), very few descriptions of the eggs and nymphs are available in the literature.

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Hungerford (1948a) described and illustrated the egg of *Ectemnostega* (*Ectemnostegella*) *peruana* (Jaczewski), and later Konopko and Melo (2009) and Konopko et al. (2010b) described the eggs of *Ectemnostega* (*Ectemnostegella*) *montana* (Lundblad) and *Ectemnostega* (*Ectemnostegella*) *stridulata* (Hungerford), respectively. Moreover, Konopko and Melo (2009) described in detail and illustrated all nymphal instars of *E. montana*, with emphasis on the morphometry and chaetotaxy of selected structures. Recently, Scheibler and Melo (2010) and Konopko et al. (2010b) described the nymphs of *Ectemnostega* (*Ectemnostega*) *quadrata* (Signoret) and *E. stridulata*, respectively. Unfortunately, the work of Scheibler and Melo (2010) did not emphasize the chaetotaxy, making comparisons difficult. With only three species of *Ectemnostega* known as nymphs and three species known as eggs, studies on the egg and nymphal morphology within the genus are still needed. Furthermore, morphometry and chaetotaxy provide a new source of nymphal characters useful to establish diagnostic features and putative homologies among species, and are therefore valuable for systematic and phylogenetic studies.

The main goals of this contribution are: (1) to describe and illustrate, for the first time, the egg and the five nymphal instars of *E. quechua*, with emphasis on the morphometry and chaetotaxy of selected structures; (2) to compare the egg of *E. quechua* with those of *E. montana*, *E. peruana* and *E. stridulata*, and the nymphs of *E. quechua* with those of *E. montana*, *E. quadrata* and *E. stridulata*; and (3) to establish the nymphal characters useful in identifying instars and species of *Ectemnostega*.

## Materials and methods

### Materials

Adults and nymphs of *E. quechua* have been collected in the field, fixed, and preserved in 96% ethanol. The eggs were obtained by dissection from females. Material is held in the collection of the Laboratorio de Entomología, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina (FCEN – UBA).

Examined material of *E. quechua*: ARGENTINA, Catamarca Province, Paso de San Francisco, 3925 m above sea level, 27°02'00" S, 68°04'11" W, 24 March 2001, M. Archangelsky coll. (FCEN – UBA) (10 dissected eggs; nymphs: instar I, four specimens; instar II, five specimens; instar III, six specimens; instar IV, seven specimens; instar V, 10 specimens). Additional examined material: *E. quadrata*, ARGENTINA, Chubut Province, Arroyo Pescado and Puente de Quichaura, December 2006, M. Archangelsky coll. (FCEN – UBA) (nymphs: instar I, two specimens; instars II–V, three specimens each); *E. montana*, ARGENTINA: Córdoba Province, Yacanto de Calamuchita, Arroyo Yacanto, 1200 m above sea level, 19 October 2008, S. A. Konopko coll. (FCEN – UBA) (nymphs: instars I–V, three specimens each).

### Methods

Adults found in association with the nymphs were identified as *E. quechua*, based on the work of Bachmann (1981). The taxonomic descriptions of the eggs and the nymphs were performed using a Leitz stereomicroscope (at magnifications up to 144 ×). For each nymph only differences with the subsequent nymph description are emphasized. Some nymphal specimens were cleared in lactic acid for several days, dissected, and

mounted on standard glass slides with polyvinyl-lacto-glycerol. Observation, drawings and further examination for the resolution of the chaetotaxy of antennal segments, legs, thorax and abdomen were made using an Olympus CX31 compound microscope (at magnifications up to 1000 ×), equipped with a drawing tube. Drawings were scanned and digitally edited.

### *Morphometric analysis*

Alcohol-preserved material was observed in a Petri dish with 96% ethanol. Nymphal structures to be measured were adjusted as parallel as possible to the plane of the objective, using a Leitz stereomicroscope equipped with a micrometric ocular. Paired structures of each individual were considered independently.

The following measurements and ratios have been taken: egg length (EL); egg width (EW); body length (BL); body width (BW); head length (HL); head width (HW); synthlipsis (S); width of an eye (eW); ocular index (OI); lengths of antennal segments I (A1L) and II (A2L); width of the antennal segment II (A2W); length of antenna (AL); length of pterothorax (PL); length of pro-, meso- and metafemur (FE1L, FE2L, FE3L, respectively); length of protibiotarsus, mesotibia and metatibia (TITA1L, TI2L, TI3L, respectively); length of mesotarsus and metatarsus (TA2L, TA3L, respectively); width of protibiotarsus, metatibia and metatarsus (TITA1W, TI3W, TA3W, respectively); length of the claw(s) of the pro-, meso- and metalegs (CLL1, CL1L2/CL2L2, CL1L3/CL2L3, respectively); length of pro-, meso- and metalegs (L1L, L2L, L3L, respectively); distance between the scent gland openings on segments III, IV and V (G3, G4, G5, respectively); and scent gland openings diameter in segments III, IV, V (D3, D4, D5, respectively). These measurements were used to calculate several ratios, which characterize body shape. The following material has been measured: instar I, two specimens; instars II–V, three specimens each (Table 1).

### *Chaetotaxy*

Terminology used in descriptions of the chaetotaxy of the legs follows Scudder (1966), Jansson (1969) and Konopko et al. (2010a,b). Chaetotaxy of the nymphs of *E. quechua* has been studied using the following material: instar I, one specimen; instars II–IV, two specimens each; instar V, three specimens. Figures 2(J,L), 3 and 4 (A–D) show the position of spines, setae and bristles on the legs. Interpretation of the chaetotaxy of legs follows the interpretation given in Konopko et al. (2010b). Only the number of setae in the dorsal row and inner surface of the protibiotarsus have been studied in the nymphs of *E. quadrata* and *E. montana*, respectively.

## Results

### *Ectemnostega (Ectemnostegella) quechua* (Bachmann 1961) (Figures 1–4; Tables 1, 2)

#### *Examined material*

ARGENTINA: Catamarca Province, Paso de San Francisco, 3925 m above sea level, 27°02'00" S, 68°04'11" W, 24 March 2001, M. Archangelsky coll. (FCEN – UBA) (10

Table 1. Measurements (in mm) of instars I–V of *Ectemnostega quechua*.

Measure	Instar I	Instar II	Instar III	Instar IV	Instar V
BL	1.34 – 1.36	1.81 – 1.86	2.46 – 2.50	3.60 – 3.62	4.89 – 5.16
BW	1.09 – 1.12	1.41 – 1.44	1.66 – 1.69	2.03 – 2.06	2.48 – 2.60
HL	0.21 – 0.22	0.39 – 0.42	0.48 – 0.51	0.54 – 0.59	0.78 – 0.98
HW	0.77 – 0.79	1.07 – 1.09	1.26 – 1.29	1.66 – 1.69	2.03 – 2.11
S	0.45 – 0.47	0.55 – 0.57	0.69	0.64 – 0.74	0.74 – 0.87
eW	0.18	0.32 – 0.35	0.37 – 0.40	0.60 – 0.62	0.74 – 0.79
A1L	0.07	0.06 – 0.07	0.10 – 0.11	0.13 – 0.14	0.15 – 0.17
A2L	0.10	0.21	0.30 – 0.31	0.39 – 0.40	0.40 – 0.60
A2W	0.06	0.06	0.10 – 0.11	0.11 – 0.12	0.11 – 0.15
AL	0.17	0.27 – 0.28	0.40 – 0.42	0.52	0.54 – 0.77
PL	0.36 – 0.37	0.50	0.69 – 0.71	0.94 – 1.02	1.34 – 1.59
FE1L	0.30	0.40 – 0.42	0.50 – 0.54	0.67 – 0.69	0.84 – 0.89
TITA1L	0.40 – 0.41	0.52	0.67	0.87 – 0.89	1.12 – 1.19
TITA1W	0.14	0.14 – 0.16	0.22	0.20 – 0.22	0.27 – 0.35
CLL1	0.12	0.16 – 0.17	0.18 – 0.21	0.21 – 0.24	0.30 – 0.35
L1L	0.69 – 0.70	0.92 – 0.94	1.18 – 1.22	1.54 – 1.56	1.96 – 2.03
FE2L	0.65 – 0.66	0.99	1.31 – 1.34	1.74 – 1.81	2.36 – 2.41
TI2L	0.31 – 0.32	0.46 – 0.47	0.64 – 0.65	0.87 – 0.89	1.09 – 1.17
TA2L	0.36 – 0.37	0.47	0.61 – 0.62	0.76 – 0.77	0.97 – 0.99
CL1L2	0.43	0.51 – 0.52	0.67	0.84 – 0.87	1.07 – 1.09
CL2L2	0.44	0.52 – 0.53	0.69	0.84 – 0.89	1.09 – 1.12
L2L	1.33 – 1.34	1.91 – 1.92	2.58 – 2.60	3.37 – 3.47	4.41 – 4.54
FE3L	0.50	0.71 – 0.72	0.89 – 0.92	1.12 – 1.19	1.49 – 1.51
TI3L	0.45 – 0.46	0.61	0.79 – 0.82	1.04 – 1.07	1.31 – 1.41
TI3W	0.12 – 0.13	0.16	0.20	0.22 – 0.25	0.30 – 0.32
TA3L	0.71 – 0.72	0.99	1.24	1.59	2.06 – 2.18
TA3W	0.09 – 0.10	0.11 – 0.12	0.17 – 0.20	0.22	0.30 – 0.35
CL1L3	0.18 – 0.20	0.20 – 0.22	0.21 – 0.23	0.22 – 0.23	0.25
CL2L3	0.19 – 0.21	0.21 – 0.23	0.22 – 0.24	0.23 – 0.24	0.26
L3L	1.66 – 1.67	2.32 – 2.33	2.95 – 2.98	3.74 – 3.84	4.86 – 5.11
G3	0.06	0.06	0.05 – 0.06	–	–
G4	0.12	0.12	0.11 – 0.12	0.12	0.11 – 0.12
G5	0.10	0.11	0.10 – 0.11	0.11 – 0.12	0.11
D3	0.01	0.01	0.01	–	–
D4	0.01	0.01	0.01	0.01	0.02
D5	0.01	0.01	0.01	0.01	0.02

Notes: L, length; W, width. See Materials and methods for additional abbreviations.

dissected eggs; nymphs: instar I, four specimens; instar II, five specimens; instar III, six specimens; instar IV, seven specimens; instar V, 10 specimens).

#### Egg (Figure 1A)

For morphometry,  $n = 10$ .

Eggs were dissected from three gravid females, each containing 11–13 eggs.

EL: 0.81–0.88 mm. EW: 0.54–0.59 mm. Shape elongate oval, EL/EW: 1.44–1.59, flattened at one side, with a very short stalk (Figure 1A). Colour yellow, micropylar

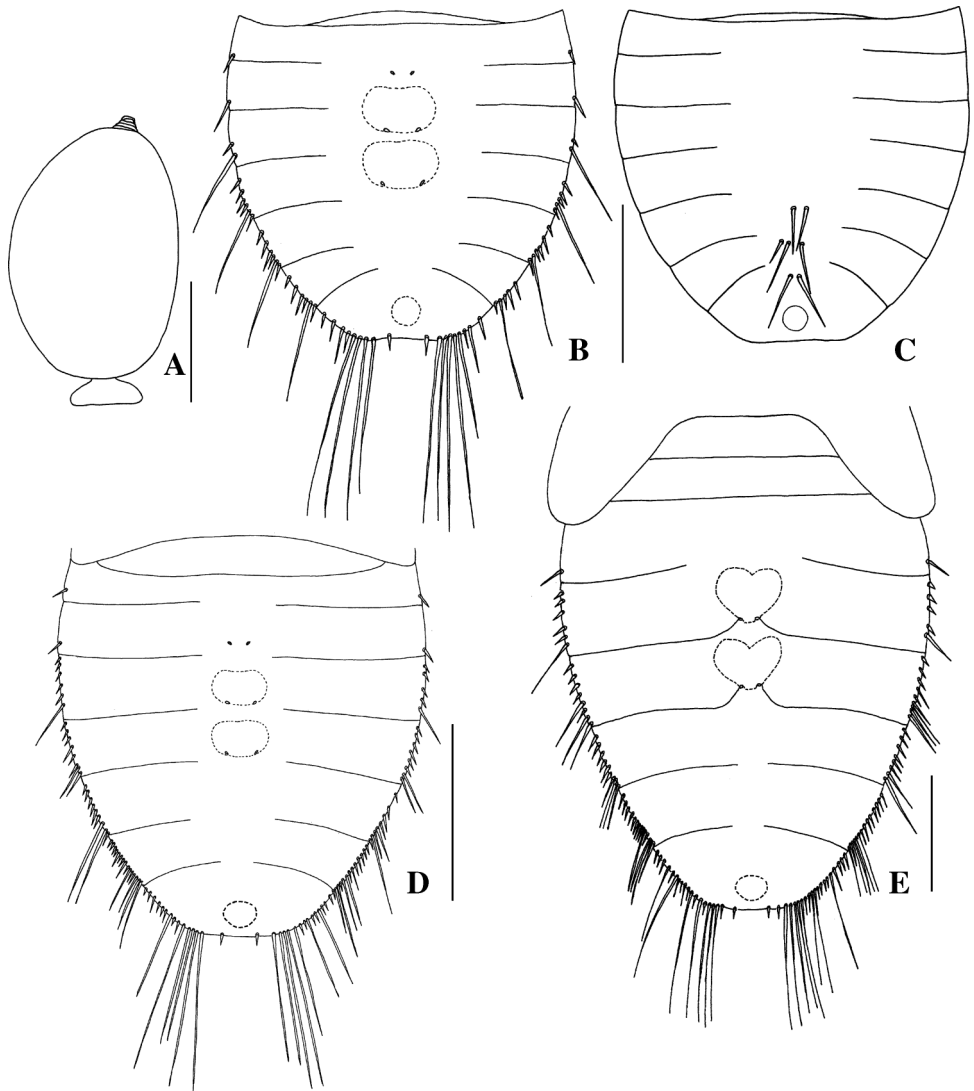


Figure 1. *Ectemnostega quechua*. (A) Egg. (B,C) abdomen, instar I: (B) dorsal view; (C) ventral view. (D,E) Abdomen, dorsal view: (D) instar III; (E) instar V. Scale bars: (A) 0.40 mm, (B,C) 0.50 mm, (D,E) 0.80 mm.

process and stalk transparent. Surface ornamented by irregular interlocking hexagons with rounded structures.

*First instar* (Figures 1B,C, 2A,J, 3A,B, 4A,B)

For morphometry,  $n = 2$ ; for chaetotaxy,  $n = 1$ .

*Colour*. Ground colour brown, with dark markings. Head brown, with dark markings, except ecdysial line and ventral and lateral surfaces testaceous. Eyes reddish brown. Rostrum brown. Antennae testaceous, with pale setae. Pro-, meso- and metanotum

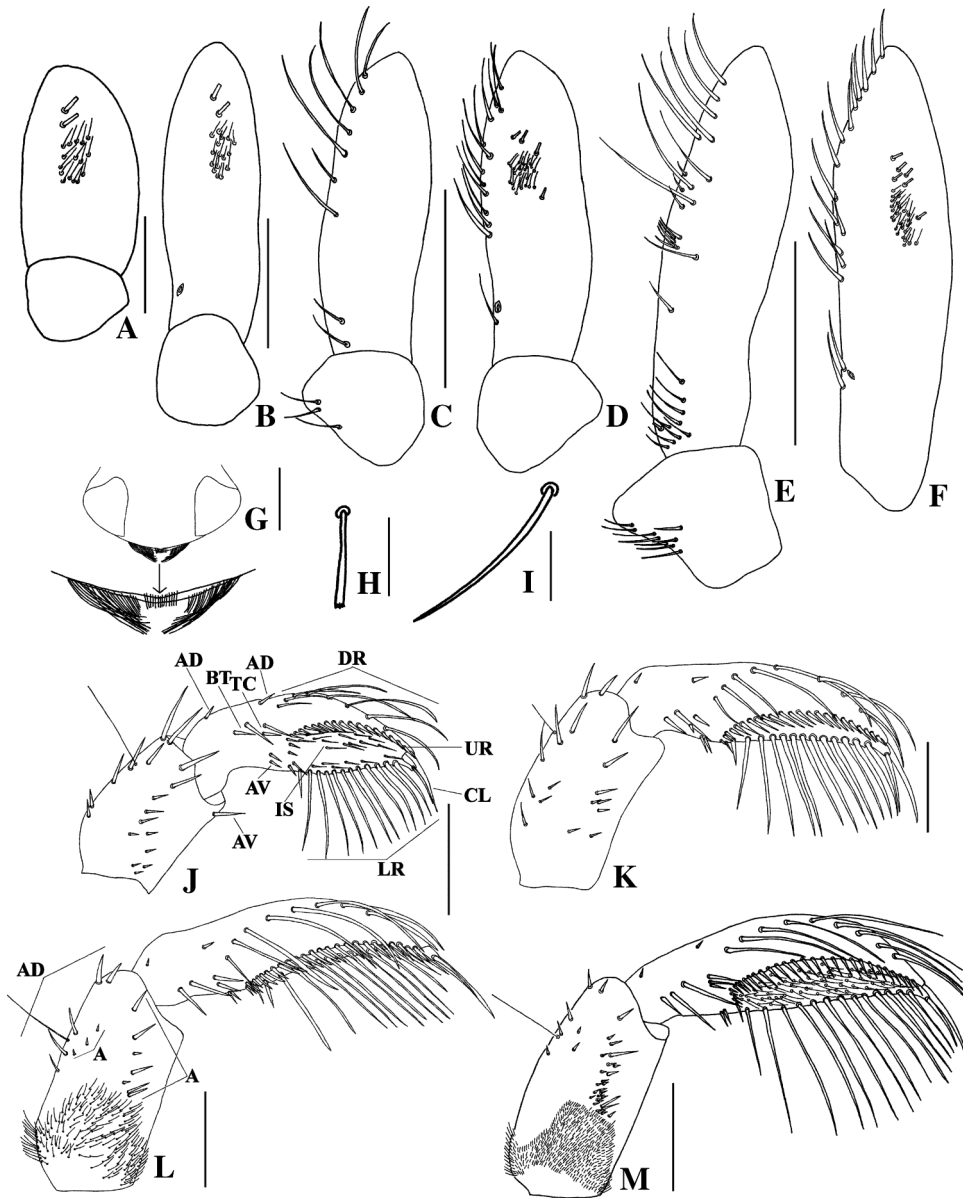


Figure 2. *Ectemnostega quechua*. (A–E) Antenna: (A) ventral view, instar I; (B) ventral view, instar II; (C) dorsal view, instar III; (D) ventral view, instar III; (E) dorsal view, instar IV. (F) Antennite 2, ventral view, instar IV. (G) Dorsal view of head (in part), instar III. (H) Short, apically serrate seta medially on posterior margin of head, instar III. (I) Long, slender seta laterally on posterior margin of head, instar III. (J–M) Proleg, anterior surface: (J) instar I; (K) instar II; (L) instar III; (M) instar V. Abbreviations: A, anterior; AD, anterodorsal; AV, anteroventral; BT, behind tibial comb; CL, claw; DR, dorsal row; IS, inner surface; LR, lower row; TC, tibial comb; UR, upper row. Scale bars (in mm): (A) 0.05, (B,I) 0.10, (C–F,J–L) 0.20, (G) 0.50, (H) 0.03, (M) 0.40.

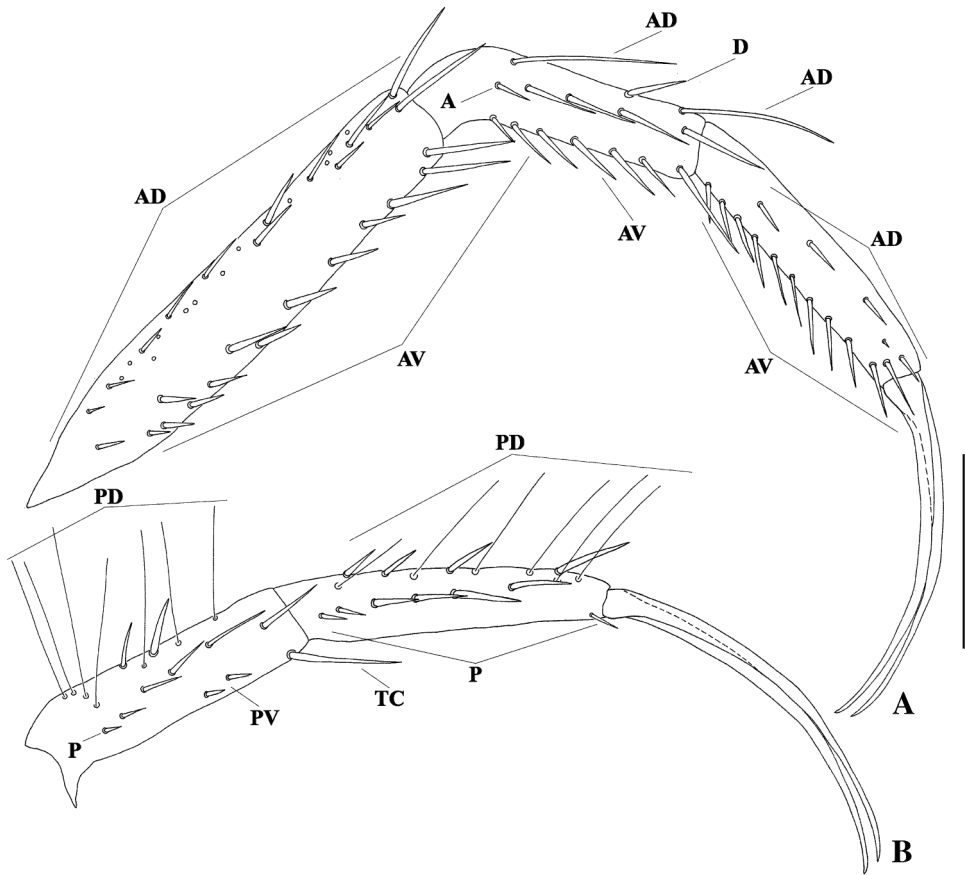


Figure 3. *Ectemnostega quechua*. Mesoleg, instar I: (A) anterior surface; (B) posterior surface. Abbreviations: A, anterior; AD, anterodorsal; AV, anteroventral; D, dorsal; P, posterior; PD, posterodorsal; PV, posteroventral; TC, tibial comb. Scale bars: 0.20 mm.

brown, with paired dark markings on anterior margin of each segment. Thoracic pleurae and sterna testaceous. Legs testaceous, except mesotibia basally, mesotarsus apically, claws of the mesolegs apically, metafemur apically, metatibia basally and apically, metatarsus apically and claws of the metalegs darker. Abdominal terga brown with dark markings; scent glands reddish brown on segments IV and V; abdominal sternites testaceous, except last segment with rounded, central, dark area. Connexiva brown, with dark markings on posterior margin of each segment.

*Body*. Suboval, BL/BW: 1.22–1.23. Measurements that characterize the body shape are shown in Table 1.

*Head*. Short, subrectangular, HL/HW: 0.27–0.28; anterior margin rounded; Y-shaped ecdysial line visible; with trichobothria and long stout and short slender setae in frontal view. S/eW: 2.50–2.61. OI: 2.81–2.92. HW/BL: 0.56–0.59. *Rostrum*: short, with three transverse sulcations ( $n = 1$ ). *Antenna*: AL/BL: 0.12–0.13; two-segmented;



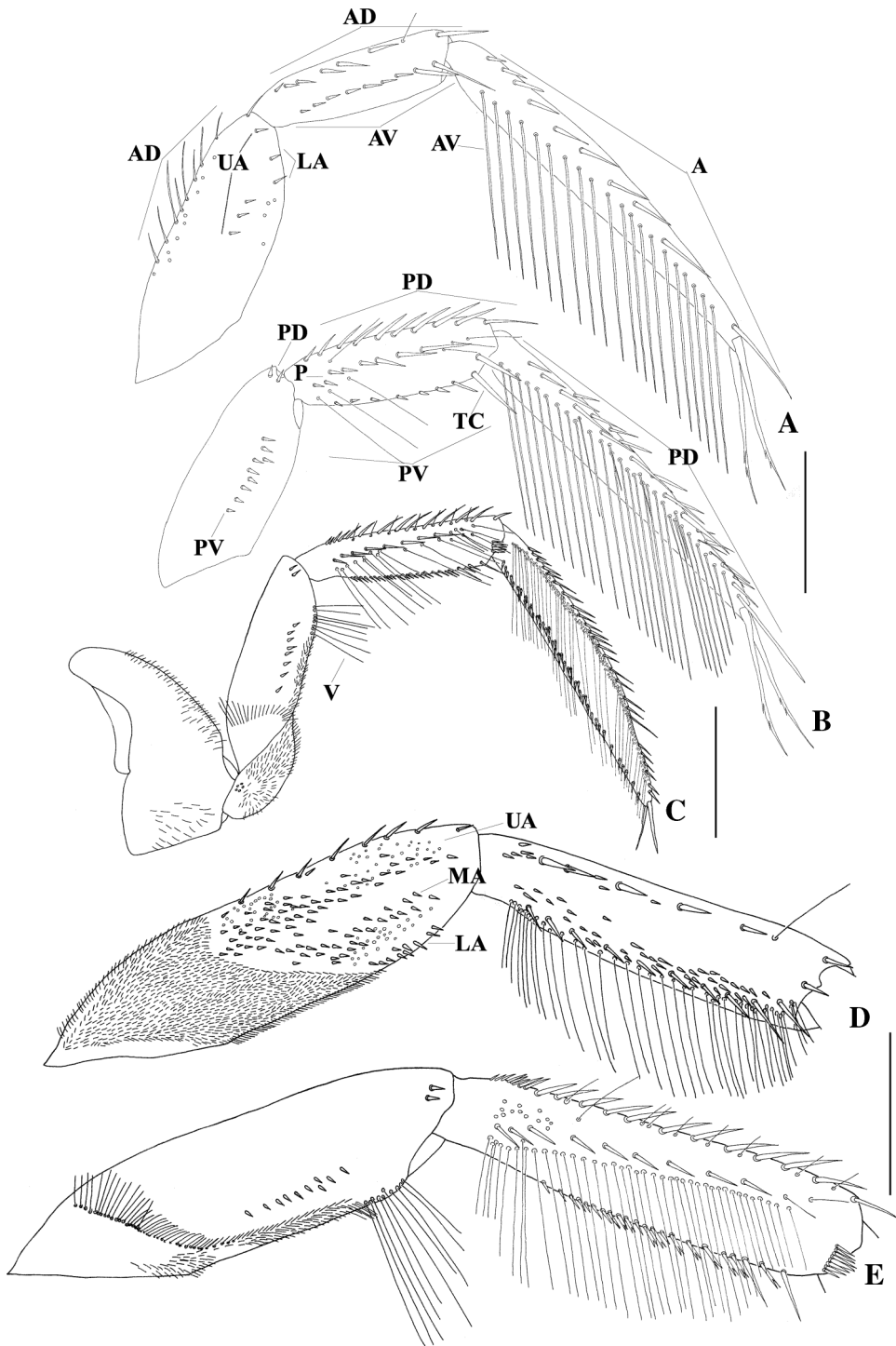


Figure 4. *Ectemnostega quechua*. (A,B) Metaleg, instar I: (A) anterior surface; (B) posterior surface. (C) Metaleg, posterior surface, instar III. (D,E) Metaleg, instar V: (D) anterior surface; (E) posterior surface. Abbreviations: A, anterior; AD, anterodorsal; AV, anteroventral; LA, lower area; MA, middle area; P, posterior; PD, posterodorsal; PV, posteroventral; TC, tibial comb; UA, upper area; V, ventral. Scale bars: (A,B) 0.30 mm, (C-E) 0.50 mm.

Table 2. Summary of characters differentiating instars I–V of *Ectemnostega*.

Characters	<i>Ectemnostega quechua</i>					<i>Ectemnostega stritulata</i>					<i>Ectemnostega montana</i>				
	Instar I	Instar II	Instar III	Instar IV	Instar V	Instar I	Instar II	Instar III	Instar IV	Instar V	Instar I	Instar II	Instar III	Instar IV	Instar V
Measurements (in mm) and ratios															
BL	1.34–1.36	1.81–1.86	2.46–2.50	3.60–3.62	4.89–5.16	1.12	1.59–1.69	2.31–2.50	3.17–3.30	4.59–4.71	1.25–1.35	1.80	2.40–2.50	3.35–3.50	5.20–5.50
BW	1.09–1.12	1.41–1.44	1.66–1.69	2.03–2.06	2.48–2.60	0.94	1.24–1.29	1.49–1.56	1.86–1.98	2.31–2.53	0.88–1.05	1.30	1.35–1.55	2.00–2.10	2.50–3.00
HL	0.21–0.22	0.39–0.42	0.48–0.51	0.54–0.59	0.78–0.98	0.19	0.38–0.42	0.46–0.48	0.50–0.52	0.69–0.73	0.20–0.23	0.40	0.50	0.55–0.60	0.80–1.00
HW	0.77–0.79	1.07–1.09	1.26–1.29	1.66–1.69	2.03–2.11	0.70	0.94–1.07	1.19–1.26	1.51–1.69	2.01–2.11	0.75–0.80	1.05	1.40–1.45	1.80–1.85	2.40–2.50
eW	0.18	0.32–0.35	0.37–0.40	0.60–0.62	0.74–0.79	0.18	0.29–0.30	0.40–0.43	0.53–0.54	0.64–0.66	0.18–0.20	0.30	0.40–0.45	0.60–0.70	0.90–1.00
OI	2.81–2.92	2.00–2.19	2.33–2.43	1.27–1.58	1.15–1.40	2.35	1.20–1.58	1.88–2.32	1.42–1.59	1.46–1.59	2.00–2.28	1.23	1.22–2.00	1.13–1.36	1.00–1.33
Structures															
Rostrum, no. of sulcations	3	4	5	6	7	3	4	5	6	7	3	4	6	8	10
Chaetotaxy: number of setae (st), spines (sp), swimming hairs (sh) and campaniform sensilla (cs), short (S) / long (L); presence / absence															
FE1, A, sp	9 S, 2 L	8 S, 2 L	8 S, 2 L	15 S, 5 L	22 S, 5 L	9	9	18	21	32	9	9	14	25	37–39
T1TA, IS, st	20	24–26	30–32	45–48	60–64	14	35	40	48	66	19–22	28–30	40–44	68–70	79–83
FE2, AD, sp/st	6 S, 8 L	29–30 S, 10 L sp	33 S, 16 L sp	54 S, 68–70 S, 16 L sp	10 sp	23 sp	23 sp	32 sp	43 sp	42 sp	11 sp	22 sp	12 sp / 17 st	25 sp / 15 st	23 sp / 29 st
FE2, PV, sp/st	2–3 S, 7 L	23–24 S, 6 L sp	31 S, 8 L	62 S, 7 L	89 S, 7 L	15 sp	24 sp	44 sp	78 sp	105 sp	3 sp	21 sp	48 sp / 7–8 st	68 sp / 7–8 st	123 sp / 7–8 st
T12, AV, sp	7	7	10	11–12	15–17	6	6	9	13	11–14	7	7	11	15	14
T12, PD, st	7	15	17	31	42	7	15	20	30	48	5	14	21	30	50
T12, PV, sp	2 S	9–10 S	12 S	22 S, 1 L	42 S, 1 L	2	9	12	22	32	2	7	14	27	46
T12, TC, sp	1	3	4	4	4	1	3	4	5	4–5	1	4	5	6	7
TA2, PD, st	6	13–15	20–22	29–30	48–52	8	17	23	31	57	7	13	29	35	60
CX3, A, set of sp	absent	absent	present	present	absent	absent	absent	present	present	present	absent	absent	present	present	present
TR3, A, cs	3	3	4	5	6	3	3	3	5	5	3	3	4	5	6
FE3, A, sp	6	6	31	59	91	10	12	23	42	50	11	11	18–21	23	23–26
T13, AD, sp	7	8	7	12	14	5	5	6	8	11	9	10	15	19	24
T13, AV, sp/st	9 sp	11 sp	13 sp / 18 st	22 sp / 32 st	47 sp / 41 st	9 sp	12 sp	13 sp / 14 st	18 sp / 26 st	30 sp / 32 st	10 sp	14 sp	15 sp / 28 st	25 sp / 40 st	42 sp / 50 st

(Continued)

Table 2. (Continued)

Characters	<i>Ectemnostega quechua</i>										<i>Ectemnostega stridulata</i>										<i>Ectemnostega montana</i>									
	Instar I	Instar II	Instar III	Instar IV	Instar V	Instar I	Instar II	Instar III	Instar IV	Instar V	Instar I	Instar II	Instar III	Instar IV	Instar V	Instar I	Instar II	Instar III	Instar IV	Instar V	Instar I	Instar II	Instar III	Instar IV	Instar V					
TI3, P, sp / Sst / Lst	8 sp / 6	9 sp / 11	8 sp / 16-19	9 sp / 30	9 sp / 42	7 sp / 6	8 sp / 10	8 sp / 16	8 sp / 3	8 sp / 3	8 sp / 7	8 sp / 15	8 sp / 28	8 sp / 46-47	7 sp / 7	8 sp / 10-11	8 sp / 15	8 sp / 28	8 sp / 46-47	7 sp / 7	8 sp / 10-11	8 sp / 15	8 sp / 28	8 sp / 46-47						
TI3, TC, sp	2	3	5	7	8	2	2	4	6	8	2	2	3-4	5	2	3-4	5	7	8	2	3-4	5	7	8						
TA3, AV, sp / sh	20 sh	22 sp / 37-38	25 sp / 115-120	26 sp / 198-204	34 sp / 280-285	20 sh	19 sp / 40	24 sp / 114 sh	25 sp / 231 sh	23 sp / 420 sh	23-25 sh	26 sp / 189 sh	29 sp / 318 sh	30 sp / 450 sh	23-25 sh	26 sp / 189 sh	29 sp / 318 sh	30 sp / 450 sh	23-25 sh	26 sp / 189 sh	29 sp / 318 sh	30 sp / 450 sh	30 sp / 450 sh							
TA3, PD, sp / sh	20 sp / 25-27	20 sp / 64-66	25-28 sp / 178-180	29-31 sp / 280-284	33 sp / 450-458	15 sp / 28 sh	15 sp / 57 sh	22 sp / 157 sh	24 sp / 280 sh	32 sp / 630 sh	18-20 sp / 30-31	18-20 sp / 65-71	36 sp / 416 sh	36 sp / 606 sh	18-20 sp / 30-31	18-20 sp / 65-71	253 sh	36 sp / 416 sh	36 sp / 606 sh	18-20 sp / 30-31	18-20 sp / 65-71	253 sh	36 sp / 416 sh	36 sp / 606 sh						
US IV, C sp	0	0	0	0	0	3 Ssp	3 Ssp	2 Ssp	0	0	2 Ssp / 2	0	0	0	2 Ssp / 2	0	0	0	0	2 Ssp / 2	0	0	0	0						
US V, C sp	0	0	0	0	0	4 Ssp	5 Ssp	2 Ssp	0	0	3 Ssp / 2	3 Ssp / 2	0	0	3 Ssp / 2	3 Ssp / 2	0	0	0	3 Ssp / 2	3 Ssp / 2	0	0	0						
US VI, C sp	2 Lsp	2 Lsp	2 Lsp	0	0	2 Ssp / 2	2 Ssp / 2	2 Lsp	0	0	2 Ssp / 2	2 Ssp / 2	0	0	2 Ssp / 2	2 Ssp / 2	2 Lsp	0	0	2 Ssp / 2	2 Ssp / 2	2 Lsp	0	0						
US VII, C sp	2 Lsp / 1 Ssp	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	2 Lsp	0	0						
US VIII, C sp	2 Lsp	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	2 Lsp	0	0	2 Lsp	2 Lsp	2 Lsp	0	0						

Notes: A, anterior surface; AD, anterodorsal surface; AV, anteroventral surface; C, central; CX3, metacoxa; IS, inner surface; P, posterior surface; PD, posterodorsal surface; PV, posteroventral surface; TC, tibial comb; TR3, metatrochanter; US, urostermite. Information sources: *E. montana* (Konopko and Melo 2009), and *E. stridulata* (Konopko *et al.* 2010b). See the Material and methods for additional abbreviations.

segment II longer than segment I, A1:A2= 0.73–0.78:1.00; A1 subconical; A2 subcylindrical; A2 width/length: 0.61–0.63. A1 and A2 dorsal surface and A1 ventral surface bare; A2 ventral surface with a set of short, slender spines and two short, stiff spines on apical half (Figure 2A).

*Thorax. Pronotum:* visible, subrectangular and short, with anterior margin slightly concave, lateral margins convex, and posterior margin straight at middle. *Mesonotum:* posterior margin convex at middle. *Metanotum:* posterior margin straight at middle. Ecdysial line visible on pro-, meso- and metanotum. Thoracic terga with few short, slender setae; meso- and metanotum with one lateral spine on both sides each. PL/BL: 0.27. *Pro-, meso- and metasternum:* posterior margin concave at middle. Thoracic sterna with few short, slender setae. Meso- and metathoracic spiracles small and rounded, located ventrally, near posterior margin of each segment. Meso- and metathoracic wing pads absent. *Prolegs:* (Figure 2J) short, L1/BL: 0.52; femur shorter than protibiotarsus, FE1/TITA: 0.73–0.75. *Procoxa:* short, subconical; anterior surface with two short, slender basal setae; anterodorsal and anteroventral surfaces with chloride cells; posterior surface with few short, slender setae. *Protrochanter:* short; anterior surface with some short slender setae, two short basal setae and three basal campaniform sensilla; posteroventral surface with three slender spines. *Profemur:* (Figure 2J) short, stout and subrectangular; anterior surface with 11 (nine short, two long) spines; anterodorsal surface with one long slender seta in the apical half of the segment, seven spines (the two apical ones longest), and chloride cells (not illustrated); anteroventral surface with one long slender apical spine; posterodorsal surface with one short slender apical spine. *Protibiotarsus:* (Figure 2J) elongate, TITA width/length: 0.34–0.35; anterior surface with eight long setae in dorsal, 22 setae in upper and 13 bristles in lower row, tibial comb represented by two spines (one short and one long), and two spines (one short and one long) present behind the tibial comb; anterodorsal surface with two short spines in the basal half; anteroventral surface with two short spines; inner surface with 20 slender setae; posterior surface with some long, slender setae. One short, slender and falcate claw. *Mesolegs:* (Figure 3A,B) long and slender; L2/BL: 0.97–1.00; femur longest, tarsus longer than tibia; FE : TI : TA = 1.00 : 0.46–0.48 : 0.54–0.56. *Mesocoxa:* short, subconical; anterodorsal surface with chloride cells; anteroventral surface with two spines; posterior surface bare. *Mesotrochanter:* short; anterior surface with three basal campaniform sensilla and two short basal setae; posterior surface with two basal campaniform sensilla; posteroventral surface with two spines. *Mesofemur:* (Figure 3A) subcylindrical; anterodorsal surface with 14 (six short, eight long) spines and chloride cells; anteroventral surface with 13 (ten short, three long) spines and chloride cells (not illustrated); posterodorsal surface with one long apical spine; posteroventral surface with nine or ten spines (seven long and two or three short). *Mesotibia:* (Figure 3A,B) subcylindrical, straight; anterior surface with a row of five spines (four long and one short); anterodorsal surface with two long, slender spines (one prebasal and one preapical); anteroventral surface with seven spines (the apical one longest); posterior surface with six spines; posterodorsal surface with seven long slender setae and two short spines; posteroventral surface with two short spines and tibial comb represented by only one long slender spine; dorsal surface with one short spine on the apical half. *Mesotarsus:* (Figure 3) subcylindrical, straight; anterodorsal surface

with five spines (four long and one short); anteroventral surface with 11 spines; posterior surface with seven spines; posterodorsal surface with six long slender setae, and four spines. Two long, slender, falcate claws of different length. TA2/CL1: 0.83–0.85; TA2/CL2: 0.81–0.83. *Metalegs*: (Figure 4A,B) long, slender; L3/BL: 1.22–1.25; tarsus longest, tibia shorter than femur; FE : TI : TA = 0.69–0.70 : 0.62–0.64 : 1.00. *Metacoxa*: large, subconical; anterodorsal surface with chloride cells; posterior surface bare. *Metatrochanter*: short; anterior surface with three basal campaniform sensilla; posterior surface with three basal campaniform sensilla; posteroventral surface with two spines. *Metafemur*: (Figure 4A,B) slightly curved and flattened anteroposteriorly; anterior surface with six short spines in two areas (upper, four; lower, two); anterodorsal surface with nine spines, and chloride cells; anteroventral surface with chloride cells; posterodorsal surface with two short apical spines; posteroventral surface with nine short spines. *Metatibia*: (Figure 4A,B) subcylindrical, straight, TI3 width/length: 0.26–0.29; anterodorsal surface with seven spines (the apical one longest) and one long slender seta in the apical third; anteroventral surface with nine spines (the two apical ones longest); posterior surface with eight spines and six long slender setae (three prebasal and three preapical); posterodorsal surface with 10 spines and one long slender seta; posteroventral surface with seven spines and tibial comb of two long spines. *Metatarsus*: (Figure 4A,B) slightly curved and flattened anteroposteriorly; TA3 width/length: 0.12–0.14; anterior surface with 10 spines (the apical one longest); anteroventral surface with 20 swimming hairs; posterodorsal surface with 20 spines (the apical one longest), 25–27 swimming hairs and six long, slender setae; posteroventral surface with 19–20 spines (not illustrated). Two long, slender straight claws of different length. TA3/CL1: 3.56–4.01; TA3/CL2: 3.40–3.80.

*Abdomen*. Ecdysial line visible on segments I and II (not illustrated). Posterior margin of each segment concave dorsally and ventrally. Segment III, only the two scent gland openings are distinct; segments IV and V, the bean-shaped scent glands and their openings are distinct (Figure 1B). G3/D3: 6, G4/D4: 12, G5/D5: 10. Spiracles small and rounded, located ventrally near posterior (II–VIII) or anterior (I) margins. Terga with few slender setae, both short and long, and chloride cells. Lateral spines of the abdominal segments on right/left sides: I, 0/0; II–III, 1/1 short; IV, 1/1 short, 1/1 long; V, 4/5 short, 1/1 long; VI, 5/5 short, 1/1 long; VII, 4/5 short, 1/1 long; VIII, 4/5 short, 5/4 long (Figure 1B). Sterna with few slender setae, both short and long, and chloride cells. Central spines of urosternites: I–V: 0; VI, VIII: 2 long; VII: 3 (2 long, 1 short) (Figure 1C).

#### *Second instar* (Figure 2B,K)

For morphometry,  $n = 3$ ; for chaetotaxy  $n = 2$ .

Similar to first instar except for the following features.

*Colour*. Paired dark markings on pro-, meso- and metanotum with a medial pale area.

*Body*. BL/BW: 1.28–1.32. Measurements that characterize the body shape are shown in Table 1.

*Head.* HL/HW: 0.36–0.39; with chloride cells in frontal view. S/eW: 1.57–1.77. OI: 2.00–2.19. HW/BL: 0.58–0.60. *Rostrum:* with four transverse sulcations ( $n = 2$ ). *Antenna:* AL/BL: 0.15; A1:A2 = 0.31–0.32:1.00; A2 more elongate than in previous instar; A2 width/length: 0.28–0.29; A2 ventral surface with one basal campaniform sensillum (Figure 2B).

*Thorax. Metanotum:* with chloride cells on both sides of the segment. PL/BL: 0.27–0.28. Mesothoracic wing pads present, with length a little more than half of pterothorax along midline; metathoracic wing pads absent. *Prolegs:* (Figure 2K), L1/BL: 0.50–0.51; FE1/TITA: 0.75–0.79. *Procoxa:* anterodorsal and anteroventral surfaces without chloride cells. *Profemur:* (Figure 2K) anterior surface with 10 (eight short, two long) spines; anterodorsal surface with seven spines (all of similar length); anteroventral surface without apical spine. *Protibiotarsus:* (Figure 2K) TITA width/length: 0.26–0.30; anterior surface with 24–25 setae in upper row and 14–15 bristles in lower row; inner surface with 24–26 slender setae (not illustrated). *Mesolegs:* L2/BL: 1.03–1.06; FE : TI : TA = 1.00 : 0.46–0.47 : 0.47. *Mesocoxa:* anterior surface with slender setae, both short and long; anterodorsal surface without chloride cells; posterior surface with some slender setae, both short and long. *Mesofemur:* anterodorsal surface with 39–40 (29–30 short, 10 long) spines; anteroventral surface with 14–15 (five or six short, nine long) spines; posteroventral surface with 29–30 (23–24 short, six long) spines; ventral surface with nine short spines. *Mesotibia:* anterior surface with a row of six spines; posterodorsal surface with 15 long slender setae; posteroventral surface with nine or ten short spines, and tibial comb of three spines. *Mesotarsus:* anterodorsal surface with four or five spines; anteroventral surface with nine or ten spines; posterodorsal surface with 13–15 long slender setae. TA2/CL1: 0.89–0.90; TA2/CL2: 0.87–0.89. *Metalegs:* L3/BL: 1.25–1.29; FE : TI : TA = 0.72–0.73 : 0.62 : 1.00. *Metacoxa:* anterodorsal surface without chloride cells; anterior and posterior surfaces with some short setae. *Metafemur:* anterodorsal surface with 10 spines. *Metatibia:* TI3 width/length: 0.26; anterodorsal surface with eight spines; anteroventral surface with 11 spines; posterior surface with nine spines and 11 long slender setae; posteroventral surface with nine spines and tibial comb of three spines. *Metatarsus:* TA3 width/length: 0.11–0.12; anterior surface with 12 spines; anteroventral surface with 22 spines and 37–38 swimming hairs; posterodorsal surface with 10 long slender setae and 64–66 swimming hairs; posteroventral surface with 22–24 spines. TA3/CL1: 4.50–4.95; TA3/CL2: 4.30–4.71.

*Abdomen.* G3/D3: 8, G4/D4: 12.50, G5/D5: 12. Terga with abundant chloride cells. Lateral spines of the abdominal segments on right/left sides: IV, 3/3 short, 1/1 long; V, 6/6 short, 1/1 long; VI, 7/7 short, 1/1 long; VII, 4/5 short, 2/2 long; VIII, 5/6 short, 5/5 long. Sterna with abundant chloride cells. Central spines of urosternites: VI–VIII, 2 long.

*Third instar* (Figures 1D, 2C,D,G–I,L, 4C)

For morphometry,  $n = 3$ ; for chaetotaxy,  $n = 2$ .

Similar to second instar except for the following features.

*Body.* Elongate, BL/BW: 1.48–1.49. Measurements that characterize the body shape are shown in Table 1.

*Head.* HL/HW: 0.38–0.40; posterior margin laterally with long slender setae and medially with short apically serrate setae (Figure 2G–I). S/eW: 1.75–1.87. OI: 2.33–2.43. HW/BL: 0.51–0.52. *Rostrum:* with five transverse sulcations ( $n = 2$ ). *Antenna:* AL/BL: 0.16–0.17; A1 : A2 = 0.33–0.35 : 1.00; A1 with a lateral protuberance; A2 width/length: 0.32–0.37; A1 dorsal surface with short slender setae (Figure 2C); A2 dorsal surface with slender setae, both short and long (Figure 2C); A2 ventral surface with four short, stiff spines on apical half, and ventral margin with long slender setae (Figure 2D).

*Thorax. Pronotum:* totally hidden by head; posterior half with short slender setae; posterior margin with long slender setae (not exposed). Meso- and metathoracic wing pads present. Meso-, metathoracic wing pads and anterior half of mesonotum with abundant short slender setae; metanotum with short slender setae abundant, but more scattered than on mesonotum; posterior margin of setose area of mesonotum and internal margins of wing pads with short and long lanceolate setae, respectively; posterior and external margins of wing pads with long slender setae. PL/BL: 0.28. *Pro-, meso- and metapleura:* with short slender setae. Meso- and metathoracic spiracles elongate; metathoracic spiracles smaller than mesothoracic ones and larger than abdominal ones. Mesothoracic wing pads reaching posterior one-fifth of pterothorax; metathoracic wing pads almost reaching posterior margin of urotergite I. *Prolegs:* (Figure 2L) L1/BL: 0.48–0.49; FE1/TITA: 0.75–0.81. *Procoxa and protrochanter:* anterior and posterior surfaces with abundant short slender setae. *Profemur:* (Figure 2L) anterior surface with a basal hydrophobic setose area covering less than the basal half of the segment; anterodorsal surface with five spines; posterior surface with a basal hydrophobic setose area covering less than the basal half of the segment. *Protibiotarsus:* (Figure 2L) TITA width/length: 0.32; anterior surface with 26–28 setae in upper row and 16–17 bristles in lower row; inner surface with 30–32 slender setae (not illustrated). *Mesolegs:* tibia longer than tarsus, FE : TI : TA = 1.00 : 0.48–0.50 : 0.46–0.47. *Mesotrochanter:* anterior surface with four basal campaniform sensilla and abundant slender setae, both short and long; posterior surface with abundant slender setae, both short and long. *Mesofemur:* anterior surface with basal hydrophobic setose area of short slender setae; anterodorsal surface with 45–47 (33 short, 12–14 long) spines; anteroventral surface with 27–30 (14–16 short, 13–14 long) spines; posterior surface with a transverse basal row of short slender setae; posteroventral surface with seven long slender setae, and 39 (31 short, eight long) spines; ventral surface with 22 short spines (17 double). *Mesotibia:* anteroventral surface with 10 spines; posterodorsal surface with 17 long slender setae; posteroventral surface with 12 short spines, and tibial comb of four spines. *Mesotarsus:* anteroventral surface with 13–14 spines; posterodorsal surface with 20–22 long slender setae. TA2/CL1: 0.92–0.93; TA2/CL2: 0.96. *Metalegs:* (Figure 4C) L3/BL: 1.18–1.21; FE : TI : TA = 0.72–0.74 : 0.64–0.66 : 1.00. *Metacoxa:* anterior surface with abundant short setae and with a basal central set of short and stout spines on glabrous area; anteroventral surface with some long slender setae on glabrous area. *Metatrochanter:*

anterior surface with four basal campaniform sensilla and with abundant short slender setae; anteroventral surface with two to three long slender spines; posterior surface with five basal campaniform sensilla and with abundant short slender setae. *Metafemur*: (Figure 4C) anterior surface with 31 short spines in two areas (upper, 19; lower, 12), and a basal hydrophobic setose area reaching apical third of segment on ventral margin; anterodorsal surface with 8–10 spines; posterior surface with transverse basal row of long slender setae (Figure 4C); posteroventral surface with 8–10 short spines; ventral surface with seven to eight long slender setae in apical third of the segment. *Metatibia*: (Figure 4C) TI3 width/length: 0.24–0.25; anterodorsal surface with seven spines; anteroventral surface with 13 spines and 18 long slender setae; posterior surface with eight spines and 16–19 long slender setae; posterodorsal surface with 14 spines and seven short slender setae; posteroventral surface with 20–25 spines (eight double), and tibial comb of five spines. *Metatarsus*: TA3 width/length: 0.14–0.16; anterior surface with 15 spines; anteroventral surface with 25 spines and 115–120 swimming hairs; posterodorsal surface with 25–28 spines and 178–180 swimming hairs (not all illustrated) (Figure 4C); posteroventral surface with 46–47 spines. TA3/CL1: 0.76–0.78; TA3/CL2: 1.10–1.16.

*Abdomen*. Scent gland openings of segment III more reduced than in previous instar. G3/D3: 4–5, G4/D4: 9–10, G5/D5: 7. Spiracles of segment I larger than rest of spiracles; spiracles of segments II–VIII located ventrally near anterior margin of each segment. Terga with abundant short, slender setae and more chloride cells than in previous instar. Lateral spines of the abdominal segments on right/left sides: IV, 4/5 short, 1/1 long; V, 6/6 short, 2/2 long; VI, 7/7 short, 1/2 long; VII, 9/11 short, 4/4 long; VIII, 8/9 short, 7/6 long (Figure 1D). Sterna with abundant short, slender setae, without chloride cells.

#### *Fourth instar* (Figure 2E,F)

For morphometry,  $n = 3$ ; for chaetotaxy,  $n = 2$ .

Similar to third instar except for the following features.

*Body*. BL/BW: 1.76–1.77. Measurements that characterize the body shape are shown in Table 1.

*Head*. HL/HW: 0.33–0.35. S/eW: 1.04–1.25. OI: 1.27–1.58. HW/BL: 0.46–0.47. *Rostrum*: with six transverse sulcations ( $n = 2$ ). *Antenna*: AL/BL: 0.14–0.15; A1 : A2 = 0.33–0.36 : 1.00; A2 width/length: 0.28–0.31; A2 dorsal surface with abundant slender setae, both short and long (Figure 2E); A2 ventral surface with six short, stiff spines on apical half (Figure 2F).

*Thorax*. *Mesonotum*: short lanceolate setae on posterior margin of setose area more extended medially than in previous instar. PL/BL: 0.26–0.28. Mesothoracic wing pads almost reaching and metathoracic wing pads reaching the posterior margin of urotergite I. *Prolegs*: L1/BL: 0.43; FE1/TITA: 0.75–0.80. *Protrochanter*: anterior surface with five basal campaniform sensilla. *Profemur*: anterior surface with 20 (15 short, five long) spines; posteroventral surface with seven short spines. *Protibiotarsus*: TITA width/length: 0.22–0.25; anterior surface with eight to nine long setae in



dorsal, 28–30 setae in upper and 15–16 bristles in lower rows; inner surface with 45–48 slender setae. *Mesolegs*: L2/BL: 0.94–0.96; FE : TI : TA = 1.00 : 0.48–0.50 : 0.42–0.44. *Mesocoxa*: anterior and posterior surfaces with abundant setae, both short and long. *Mesotrochanter*: anterior surface with five basal campaniform sensilla. *Mesofemur*: anterodorsal surface with 70–72 (54 short, 16–18 long) spines and without chloride cells; anteroventral surface with 34–37 (19–21 short, 15–16 long) spines and without chloride cells; posteroventral surface with 13 long slender setae, and 69 (62 short, seven long) spines; ventral surface with 28 spines (10 double). *Mesotibia*: anteroventral surface with 11–12 spines; posterodorsal surface with 31 long slender setae; posteroventral surface with 23 (22 short, one long) spines. *Mesotarsus*: anteroventral surface with 17–19 spines; posterodorsal surface with 29–30 long slender setae. TA2/CL1: 0.89–0.93; TA2/CL2: 0.97. *Metalegs*: L3/BL: 1.04–1.07; FE : TI : TA = 0.70–0.75 : 0.66–0.67 : 1.00. *Metatrochanter*: anterior surface with five basal campaniform sensilla; posterior surface with seven basal campaniform sensilla. *Metafemur*: anterior surface with 59 short spines in three areas (upper, 35; middle, 17; lower, 7); anterodorsal and anteroventral surfaces without chloride cells; ventral surface with nine long slender setae in apical third of the segment. *Metatibia*: TI3 width/length: 0.21–0.23; anterodorsal surface with 12 spines; anteroventral surface with 22 spines, and 32 long slender setae; posterior surface with nine spines and 30 long slender setae; posterodorsal surface with 16 spines and six short slender setae; posteroventral surface with 21 spines (15 double), and tibial comb of seven spines. *Metatarsus*: TA3 width/length: 0.14; anteroventral surface with 26 spines and 198–204 swimming hairs; posterodorsal surface with 29–31 spines and 280–284 swimming hairs; posteroventral surface with 49–50 spines. TA3/CL1: 0.75–0.76; TA3/CL2: 1.07–1.12.

*Abdomen*. Scent gland openings of segment III not distinct. G4/D4: 10, G5/D5: 9–10. Lateral spines of abdominal segments on right/left sides: IV, 5/5 short, 1/1 long; V, 5/5 short, 4/4 long; VI, 6/6 short, 4/4 long; VII, 13/10 short, 5/4 long; VIII, 9/10 short, 7/6 long. Urosternites I–VIII without central spines.

*Fifth instar* (Figures 1E, 2M, 4D,E)

For morphometry,  $n = 3$ ; for chaetotaxy,  $n = 3$ .

Similar to fourth instar except for the following features.

*Colour*. Posterior margin of head darker. Rostrum with base and apex darker. Posterior margin of mesonotum darker. Metathoracic wing pads with internal and posterior margins darker. Thoracic pleurae brown with dark markings.

*Body*. More elongate than previous instar. BL/BW: 1.97–2.03. Measurements that characterize body shape are shown in Table 1.

*Head*. HL/HW: 0.38–0.46; with more chloride cells in frontal view than in previous instar. S/eW: 0.94–1.13. OI: 1.15–1.40. HW/BL: 0.40–0.43. *Rostrum*: with seven transverse sulcations ( $n = 3$ ). *Antenna*: AL/BL: 0.11–0.15; A1 : A2 = 0.29–0.38 : 1.00; A2 width/length: 0.25–0.28; A1 ventral surface with one basal campaniform sensillum;

A2 ventral surface with 10 short, stiff spines on apical half, and ventral margin with abundant long slender setae.

*Thorax. Mesonotum:* short lanceolate setae on posterior margin of setose area reaching anterior margin of metanotum medially. Posterior margin of meso- and metathoracic wing pads with long lanceolate setae. PL/BL: 0.27–0.31. Mesothoracic wing pads reaching posterior margin of urotergite II; metathoracic wing pads reaching anterior third of urotergite III. *Prolegs:* (Figure 2M) L1/BL: 0.38–0.41; FE1/TITA: 0.71–0.80. *Profemur:* (Figure 2M) anterior surface with 27 (22 short, five long) spines; posteroventral surface with 28–30 short spines. *Protibiotarsus:* (Figure 2M) TITA width/length: 0.23–0.31; anterior surface with nine long setae in dorsal, 29–32 setae in upper row, tibial comb represented by three spines (one short and two long), and three spines (one short and two long) behind the tibial comb; inner surface with 60–64 slender setae. *Mesolegs:* L2/BL: 0.86–0.93; FE : TI : TA = 1.00 : 0.46–0.48 : 0.40–0.41. *Mesotrochanter:* anterior surface with eight basal campaniform sensilla. *Mesofemur:* anterodorsal surface with 84–86 (68–70 short, 16 long) spines; anteroventral surface with 38–41 (27–30 short, 11 long) spines; posteroventral surface with 25 long slender setae and 96 (89 short, seven long) spines; ventral surface with 26 spines (15 double). *Mesotibia:* anterior surface with a row of eight spines; anteroventral surface with 15–17 spines; posterodorsal surface with 42 long slender setae; posteroventral surface with 43 (42 short, one long) spines, and three long slender setae in basal third of the segment. *Mesotarsus:* anteroventral surface with 15–16 spines; posterodorsal surface with 48–52 long slender setae. TA2/CL2: 0.98. *Metalegs:* (Figure 4D,E) L3/BL: 0.95–1.01; FE : TI : TA = 0.69–0.72 : 0.64–0.65 : 1.00. *Metatrochanter:* anterior surface with six basal campaniform sensilla; posterior surface with nine basal campaniform sensilla. *Metafemur:* (Figure 4D,E) anterior surface with 91 short spines in three areas (upper, 53; middle, 28; lower, 10); anterodorsal surface with nine spines; posteroventral surface with 10 short spines; ventral surface with 10 long slender setae in the apical third of segment (as in Figure 4E, not illustrated in Figure 4D). *Metatibia:* (Figure 4D,E) TI3 width/length: 0.23; anterodorsal surface with 14 spines; anteroventral surface with 47 spines and 41 long slender setae; posterior surface with nine spines and 42 long slender setae; posterodorsal surface with 20 spines and nine short slender setae; posteroventral surface with 22 spines (10 double), and tibial comb of eight spines. *Metatarsus:* TA3 width/length: 0.14–0.16; anteroventral surface with 34 spines and 280–285 swimming hairs; posterodorsal surface with 33 spines and 450–458 swimming hairs. TA3/CL1: 0.72–0.75; TA3/CL2: 1.07–1.13.

*Abdomen.* Scent glands of segments IV–V heart-shaped (Figure 1E). G4/D4 and G5/D5: 6. Lateral spines of abdominal segments on right/left sides: IV, 4/5 short, 1/1 long; V, 5/5 short, 4/3 long; VI, 6/6 short, 2/4 long; VII, 9/10 short, 5/4 long; VIII, 12/12 short, 8/7 long (Figure 1E).

## Discussion

The eggs of *Ectemnostega* (based on *E. montana*, *E. peruana*, *E. quechua* and *E. stridulata*) have a very short basal stalk (Hungerford 1948a; Konopko and Melo 2009; Konopko et al. 2010b). This characteristic is also present in the eggs of other genera of

Corixidae represented in Argentina, such as *Centrocorisa* Lundblad, *Sigara* Fabricius, and *Trichocorixa* Kirkaldy (Hungerford 1948a,b; Cobben 1968); and in the eggs of *Tenagobia* Bergroth (Micronectidae) belonging to the subgenera *Incertagobia* Nieser and *Tenagobia* (Cobben 1968; Bachmann 1979, 1981, 1983; Konopko et al. 2010a). Two types of egg shape are found in *Ectemnostega*: an elongate oval one, as in *E. peruana* (Hungerford 1948a), *E. quechua* and *E. stridulata* (Konopko et al. 2010b); and a subspherical one, as in *E. montana* (Konopko and Melo 2009). The eggs of *E. quechua* (EL: 0.81–0.88 mm; EW: 0.54–0.59 mm) and *E. stridulata* (EL: 0.79–0.87 mm; EW: 0.47–0.57 mm) are similar in size (Konopko et al., 2010b), and smaller than those of *E. montana* (EL: 0.93–1.03 mm; EW: 0.73–0.78 mm) (Konopko and Melo 2009) and *E. peruana* (EL: 1.15 mm; EW: 0.58 mm) (Hungerford 1948a). The length/width ratio distinguishes the eggs of *E. montana* (1.27–1.34, Konopko and Melo 2009) and *E. peruana* (1.98, Hungerford 1948a), and is similar in *E. quechua* (1.44–1.59) and *E. stridulata* (1.43–1.75, Konopko et al. 2010b). The eggs of *E. montana*, *E. quechua* and *E. stridulata* (Konopko and Melo 2009; Konopko et al. 2010b) share the presence of a surface ornamented by irregular interlocking hexagons with (*E. quechua* and *E. stridulata*) or without (*E. montana*) rounded structures. Hungerford (1948a) stated that the eggs of *E. peruana* are not sculptured.

The presence of abdominal scent glands on terga IV–V in the nymphs of *Ectemnostega* (based on *E. montana*, *E. quadrata*, *E. quechua* and *E. stridulata*) is shared with other genera of Corixidae represented in Argentina, like *Centrocorisa*, *Heterocorixa* White, *Sigara* and *Trichocorixa*, and differs from *Tenagobia* (Micronectidae), with scent glands on terga III–V (Konopko and Melo 2009; Konopko et al. 2010a, b; Scheibler and Melo 2010).

The spines on the ventral and posteroventral surfaces of profemur are clearly more abundant in nymphs of instar V of *E. quechua*, *E. montana* and *E. stridulata* (subgenus *Ectemnostegella*, 28–64 spines), than in those of *E. quadrata* (subgenus *Ectemnostega*, 18–20 spines) (Konopko and Melo 2009; Konopko et al. 2010b; Scheibler and Melo 2010). The number of long slender setae in the dorsal row of the tibiotarsus is similar in the nymphs of *E. quechua* (instars I–III, eight setae; instar IV, eight or nine; instar V, nine), *E. montana* (instars I–V, seven to nine), *E. stridulata* (instars I–III, seven; instar IV, eight; instar V, seven or eight) (Konopko and Melo 2009; Konopko et al. 2010b), and *E. quadrata* (instars I–V, eight). This character distinguishes them from the nymphs of *Tenagobia fuscata* (Stål) (instars III–V, three), *T. incerta* Lundblad (instar III–IV, six; instar V, six or seven), and *T. shadei* Lundblad (instars III and V, five) (Micronectidae) (Konopko et al. 2010a).

The main characters separating the nymphs of the genus *Ectemnostega* are summarized in Table 2. The nymphal characters most useful in identifying instars I–V of *Ectemnostega* (based on *E. montana*, *E. quechua* and *E. stridulata*) are: body and head lengths; body, head and eye widths; number of transverse sulcations of the rostrum; number of spines on the anterior surface of profemur (except nymphs II and III of *E. quechua*, and I–II of *E. stridulata* and *E. montana*) and anterodorsal surface of metatibia (except nymphs I–III of *E. quechua* and *E. stridulata*, and nymphs I and II of *E. montana*); setae on inner surface of protibiotarsus and posterodorsal surface of mesotibia and mesotarsus; spines and setae on the anterodorsal (except nymphs IV and V of *E. stridulata*) and posteroventral surfaces of mesofemur; spines on posteroventral surface of the mesotibia; spines and setae on the anteroventral surface and setae on the posterior surface of the metatibia; spines of the metatibial comb (except

nymphs I and II of *E. stridulata*); swimming hairs on anteroventral and posterodorsal surfaces of metatarsus; chaetotaxy of the pterothorax; and grade of development of the wing pads. Also, the nymphs of *E. montana*, *E. quechua* and *E. stridulata* can be separated based on the presence (instars III–V) or the absence (instars I and II) of the central set of short stout spines on the anterior surface of the metacoxa.

The nymphs of *E. montana*, *E. quechua* and *E. stridulata* can be separated from each other based on (Table 2): width of an eye (only nymphs V); ocular index (only nymphs I); number of spines on the anterior surface of the profemur (except nymphs I and II of the three species, and nymphs IV of *E. quechua* and *E. stridulata*) and metafemur (except nymphs I–III of *E. stridulata* and *E. montana*); setae of the inner surface of the protibiotarsus (except nymphs I and II of *E. quechua* and *E. montana*, nymphs III of *E. stridulata* and *E. montana*, and nymphs IV and V of *E. quechua* and *E. stridulata*); spines and setae on the anterodorsal (except nymphs I and II of *E. stridulata* and *E. montana*) and posteroventral surfaces of the mesofemur and on the anteroventral surface of the metatibia (except nymphs I of the three species and nymphs II of *E. quechua* and *E. stridulata*); spines on the anterodorsal surface of the metatibia (except nymphs III of *E. quechua* and *E. stridulata*); spines and swimming hairs on the anteroventral (except nymphs I and III of *E. quechua* and *E. stridulata*) and posterodorsal surfaces of the metatarsus (except nymphs I and II of *E. quechua* and *E. montana*); central spines on the urosternites IV (only nymphs I) and V (only nymphs I and II). The presence of central spines on the urosternites IV and VI clearly distinguishes nymphs II and III of *E. stridulata* and I and II of *E. quechua*, respectively.

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