

## MORPHOLOGY OF JUVENILE STAGES OF *CONCHOGNETA TRAEGARDHI* (ACARI: ORIBATIDA: AUTOGNETIDAE) AND COMPARISON WITH THOSE OF *C. WILLMANNI*

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ABSTRACT: The morphology of juvenile stages of the oribatid mite *Conchogneta traegardhi* is studied for the first time. Moreover, immatures of this species are compared with those of *C. willmanni willmanni*, which occupy similar habitat.

KEY WORDS: morphology, juvenile stages, *Conchogneta traegardhi*, *Conchogneta willmanni willmanni*

### INTRODUCTION

The genus *Conchogneta* Grandjean 1963 (Acari, Oribatida, Autognetidae) currently includes 5 species and 2 subspecies (Subías 2004; Akrami 2008). The majority of its representatives have only local distributions. So far, specimens of *C. inundata* (Winkler, 1957) have been recorded only from the Czech Republic, *C. iranica* (Akrami, 2008) only from Iran, *C. vasiliorum* Mahunka, 2006 only from Romania, and *C. willmanni herzegowinensis* (Willmann, 1941) only from Bosnia and Herzegovina. Only two species are geographically widespread: *C. traegardhi* (Forsslund, 1947), recorded from the Palearctic and Canada, and *C. willmanni willmanni* (Dyrdowska, 1929) (= *Autogneta dalecarlica* Forsslund, 1947), from the Palearctic.

The morphology of immatures in *Conchogneta* has been studied only for *C. willmanni willmanni* (Grandjean, 1963). In the present paper we examine immatures of *C. traegardhi* and, on the basis of our new information and the aforementioned literature, we compare the juveniles of these two species. Because they have wide and overlapping geographical distribution, and often occupy the same habitats, this comparison should help distinguish these species in faunistic and ecological studies.

### MATERIALS AND METHODS

The available material included 102 juveniles of *C. traegardhi*: 31 larvae, 24 protonymphs, 11 deutonymphs and 36 tritonymphs. All were extracted by S.G. Ermilov from a clean culture under laboratory conditions. Methods of cultivation were presented earlier (Ermilov 2008). Adults of *C. traegardhi*, used in cultivation, have been collected in soil from the pine wood in the Nizhniy Novgorod Region (Russia) during spring and summer in 2007–2008. In the laboratory condition all adult specimens and juvenile stages ate only *Pleurococcus* sp.

The terminology used in the present paper follows that of Grandjean (see Trave and Vachon 1975 for references). Leg setation is given in parentheses, according to the sequence trochanter-femur-genu-tibia-tarsus. All formulas of legs solenidia are given in square brackets, according to the sequence genu-tibia-tarsus.

All body measurements are presented in micrometers.

### RESULTS AND DISCUSSION

#### Juvenile morphology of *Conchogneta traegardhi*

##### Larva

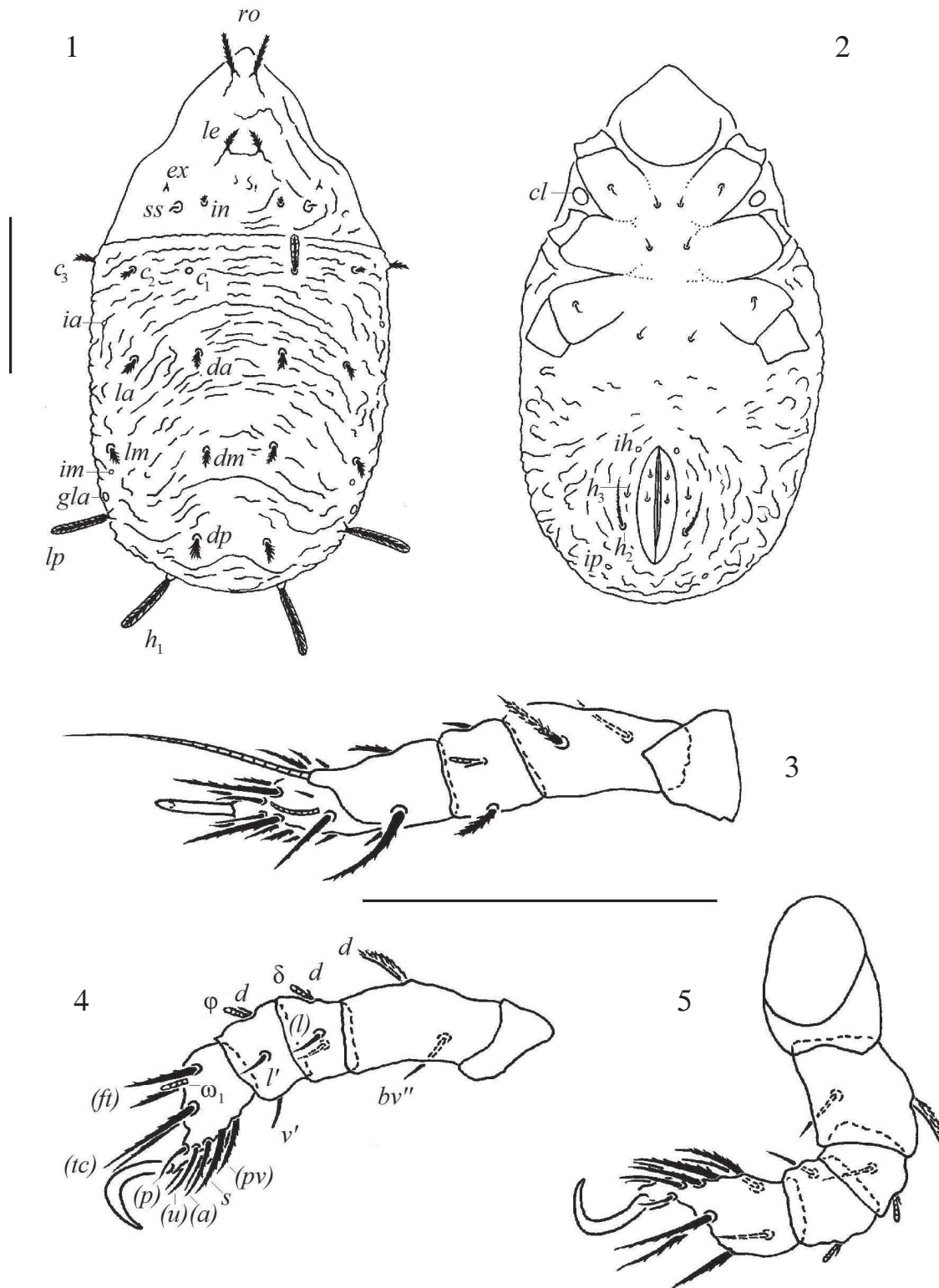
Figs. 1–5

Body oval, weakly sclerotized, white-coloured. Body length 172–188, body width 86–102.

**Prodorsum** (Fig. 1). Triangular form, rostrum rounded. Surface of plate with longitudinal and transverse folds. Four pairs of setae. Rostral (*ro*, 12) and lamellar (*le*, 6) setae straight, barbed, set on small apophyses. Interlamellar setae (*in*, 2) small, barbed. Exobothridial setae (*ex*, 2) small, thorn like, set on small apophyses. Small, rudimentary sensilli (*ss*) with a weak distal swelling. Bothridia developed.

**Gastronotal region** (Fig. 1). Covered with folded cuticle. With 12 pairs of gastronotal setae of which only 10 visible in dorsal aspect. All setae barbed; *c*<sub>1</sub>, *lp* and *h*<sub>1</sub> the longest, in the shape of long, ensiform leaves, hardly expanded distally, their central shaft straight, with longer lateral barbs. Some setae sit on apophyses. Lyrifissures *ia* visible between setae *c*<sub>2</sub> and *la*; lyrifissures *im* and openings of opisthonotal glands (*gla*) located between setae *lm* and *lp*.

**Anogenital region** (Fig. 2). Covered with folded cuticle. Two pairs of pseudanal setae located near anal valves. Setae *h*<sub>2</sub> long and barbed, setae *h*<sub>3</sub> small. Lyrifissures *ip* and *ih* visible.

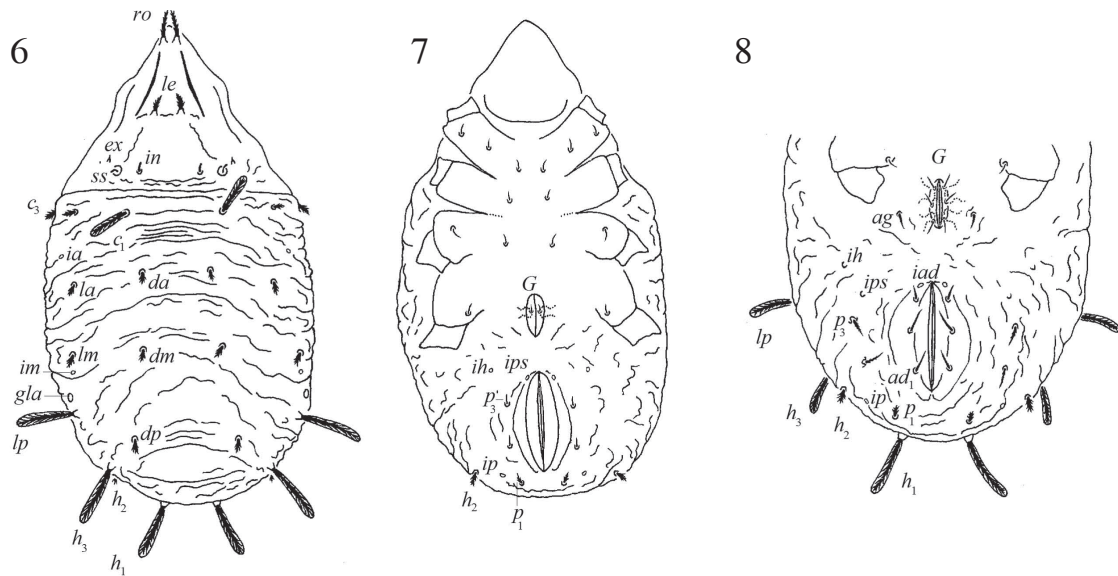


Figs. 1-5. *Conchogeta traegardhi*, larva: 1 — dorsal view; 2 — ventral view; 3-5 — legs I-III, respectively. Scale bar 50  $\mu$ m.

**Epimeral region** (Fig. 2). Covered with smooth cuticle. Epimeral formula: 3-1-2; setae small. Claparede's organ (*cl*) visible. Third pair of setae on first epimere are protective scales over Claparede's organ.

All setae and body measurements of larva given in table 1.

**Legs** (Figs. 3-5). Tarsus with 1 claw. Long, thin solenidium on tibia I set on apophyse. Tibia II, III and genu I-III with double groups of small seta and longer, expanded on the top solenidium. Formulas of setae and solenidia legs: I (0-2-3-3-16) [1-1-1], II (0-2-3-3-13) [1-1-1], III (0-2-2-2-13) [1-1-0].



Figs. 6–8. *Conchogneta traegardhi*, 6 — protonymph, dorsal view; 7 — protonymph, ventral view; 8 — deutonymph, anogenital region. Scale bar 50  $\mu$ m.

### Nymphs

The morphology of nymphs (protonymph, deutonymph and tritonymph) in most aspects is similar to that of the larva: colour of body white, folds remain on cuticle.

The basic morphological changes, characteristic for each of the nymphs, are noted below. All setae and body measurements of the nymphs are presented in table 1.

#### Protonymph: basic morphological changes

Figs. 6, 7

Body length: 229–250, body width: 114–123.

Length of prodorsal setae similar to those of larva. Interlamellar setae appear in the form of small thorn (Fig. 6).

With 15 pairs of gastronotal setae. Setae  $p_1$ – $p_3$  appear:  $p_1$  barbed,  $p_2$  and  $p_3$  smooth. Setae  $c_1$ ,  $lp$ ,  $h_1$  and  $h_3$  longer than other setae, expanded distally. Setae  $h_2$  short, setae  $h_3$  long and barbed unlike in larva (Figs. 6, 7).

Lyrifissure *ips* appears. Genital valves (*G*) with 1 pair of small setae. Epimeral formula: 3–1–2–1. Claparede's organ absent (Fig. 7).

Formulas of legs setae and solenidia: I (0–2–3–3–16) [1–1–2], II (0–2–3–3–13) [1–1–1], III (0–2–2–2–13) [1–1–0], IV (0–0–0–0–7) [0–0–0].

#### Deutonymph: basic morphological changes

Fig. 8

Body length: 270–282, body width: 127–143. Prodorsal setae with only slightly increased length:

*ro* 12–16, *le* 8–12 and *in* 2–4. Length of exobothridial setae unchanged.

With 15 pairs of gastronotal setae; most distally expanded or with long, lateral barbs in mid-region. All setae *p* become barbed. Three pairs of straight, adanal setae ( $ad_1$ – $ad_3$ ), lyrifissures *iad* and 1 pair of small aggenital (*ag*) setae added. Three pairs of genital setae.

Epimeral formula 3–1–2–2. Formulas of legs setae and solenidia: I (0–4–3–3–16) [1–2–2], II (0–4–3–4–13) [1–1–2], III (1–3–2–3–13) [1–1–0], IV (0–2–2–2–12) [0–1–0].

#### Tritonymph: basic morphological changes

Figs. 9, 10

Body length: 282–365, body width: 143–166.

Length of prodorsal setae increased: *ro* 16–20, *le* 8–12, *in* 2–4. Length of setae *ex* constant (2).

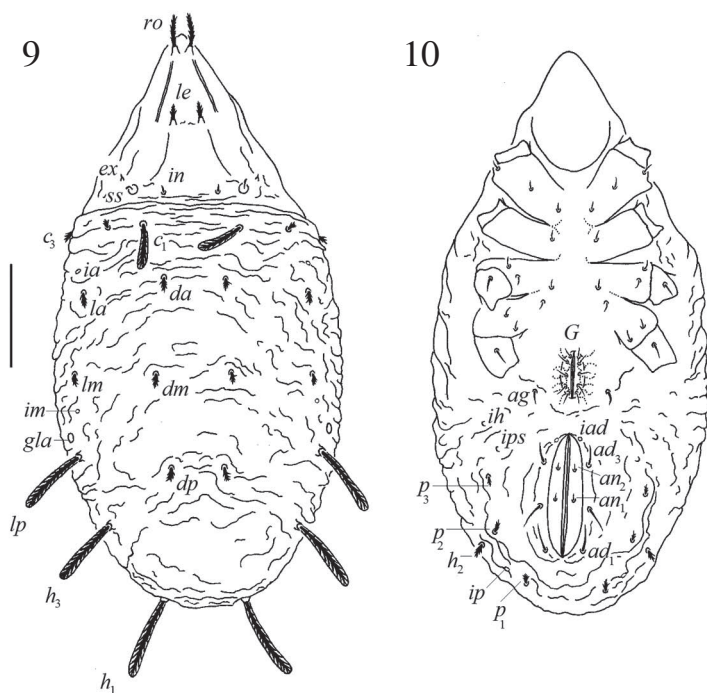
With 15 pairs of gastronotal setae.

Anal valves with 2 pairs of setae ( $an_1$ ,  $an_2$ ); 3 pairs of adanal setae. Genital valves with 5 pairs of setae; 1 pair of aggenital setae. Epimeral formula: 3–1–3–3.

Formulas of setae and solenidia legs: I (1–4–4–4–18) [1–2–2], II (1–4–4–5–15) [1–1–2], III (2–3–3–4–15) [1–1–0], IV (1–2–3–4–12) [0–1–0]. Changes in legs setation and solenidia of juvenile stages given in table 2.

#### Differentiation of immatures of *Conchogneta traegardhi* and *C. willmanni willmanni*

Our results concerning *C. traegardhi* and data from Grandjean (1963) on *C. willmanni willmanni*



Figs. 9–10. *Conchogneta traegardhi*, tritonymph: 1 — dorsal view; 2 — ventral view. Scale bar 50  $\mu$ m.

Table 1.  
Body measurements and setation of *Conchogneta traegardhi* during development

Character	Larva	Protonymph	Deutonymph	Tritonymph	Adult
Body length	172–188	229–250	270–282	282–365	348–381
Body width	86–102	114–123	127–143	143–166	182–199
Length of rostral setae	12	12	12–16	16–20	28–32
Length of lamellar setae	6	6	8–12	8–12	32–41
Length of interlamellar setae	2	2	2–4	2–4	20
Length of sensilli	Rudimentary	Rudimentary	Rudimentary	Rudimentary	82–94
Length of exobothridial setae	2	2	2	2	8–12
Epimeral setation*	3–1–2	3–1–2–1	3–1–2–2	3–1–3–3	3–1–3–3
Number of notogaster setae*	12	15	15	15	10
Number of genital setae*	0	1	3	5	6
Number of aggenital setae*	0	0	1	1	1
Number of adanal setae*	0	0	3	3	3
Number of anal setae*	0	0	0	2	2

\* in pairs

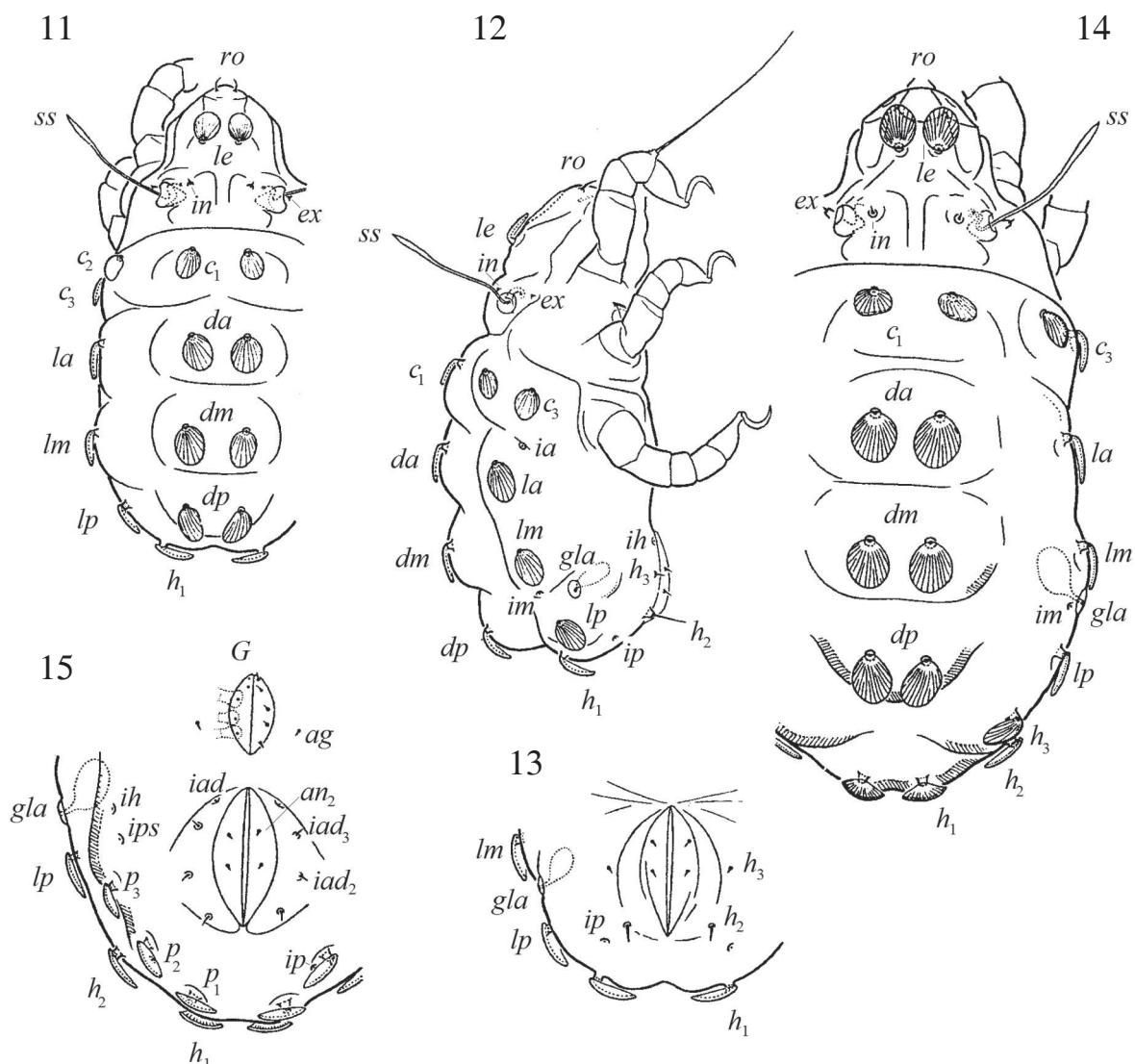
allow us to compare their juvenile stages and note distinguishing features and similarities.

**Distinctions.** The basic distinctive features in morphology of juveniles of *C. traegardhi* and *C. willmanni willmanni* are established in a structure of cuticle and setae of a body.

**Body covering.** The cuticle (particularly of the notogaster and anogenital region) of *C. traegardhi* juveniles has numerous transverse folds (Figs. 1, 2, 6–10). *Conchogneta willmanni willmanni* juveniles have rather smooth cuticle, with folds present mostly on the dorsal surface of the

gastronotal region, between rows setae (Figs. 11, 14).

**Distinctions in structure of prodorsal setae.** Juvenile stages of *C. traegardhi* have small, rudimentary sensilli. Rostral and lamellar setae straight and barbed, setae *ro* longer than *le*. Interlamellar setae densely barbed (Figs. 1, 6, 9). In contrast, *C. willmanni willmanni* possesses long and well developed sensilli in all stages, rostral setae straight and thin, lamellar setae in the form of wide leaves, setae *le* longer than *ro*, and interlamellar setae in the form of thorns (Figs. 11, 12, 14).



Figs. 11–15. *Conchogneta willmanni willmanni*, larva: 11 — dorsal view, 12 — lateral view, from Grandjean (1963),  $\times 500$ ; 13 — anogenital region; from Grandjean (1963),  $\times 660$ ; tritonymph: 14 — dorsal view, 15 — anogenital region, from Grandjean (1963),  $\times 500$ .

**Distinctions in structure of gastronotal setae.** Most setae in *C. traegardhi* are barbed. Setae  $c_1$ ,  $la$ ,  $h_1$  (and  $h_3$  beginning in protonymph) are longer than other setae, in the form of long, ensiform leaves. *Conchogneta willmanni willmanni* has all setae in the form of wide leaves (except  $h_2$  and  $h_3$  in larva) (Figs. 11–15).

**Similarity.** The basic similar features in morphology of the juveniles relate to body setation. Juvenile stages of both species possess identical setation of gastronotal, genital, aggenital, adanal, anal and epimeral setae (Table 1). Moreover, setae of legs and solenidia does not differ (Table 2).

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#### REFERENCES

- Akrami, M. 2008. A new species Autognetidae Grandjean, 1960 (Acari: Oribatida) from Iran. *Journal of the Acarological Society of Japan*, 17: 17–21.
- Ermilov, S.G. 2008. *Laboratornoe kul'tivirovanie oribatidnykh kleshchey nadsemeystva Crotonioidea (Acari, Oribatida) s tsel'yu izucheniya ikh razvitiya* [The laboratory cultivation of oribatid mites from superfamily Crotonioidea (Acari, Oribatida) with the purpose of studying of their development]. Nizhniy Novgorod, 54 pp. [In Russian]
- Grandjean, F. 1963. Les Autognetidae (Oribates). Deuxieme partie. *Acarologia*, 5: 653–689.
- Subías, L.S. 2004. Listado sistematico, sinonimico y biogeografico de los acaros oribatidos (Acari-formes, Oribatida) del mundo (1758–2002). *Graellsia*, 60. Numero extraordinario: 3–305. Listado sistematico, sinonimico y biogeografico de los acaros oribatidos (Acari-formes, Oribatida) del

Table 2  
Legs setation of *Conchogneta traegardhi* during development

	Trochanter	Femur	Genu	Tibia	Tarsus
Leg I					
Larva	–	d, bv''	d, (l), $\delta$	(l), v', $\varphi_1$	(ft), (tc), (p), (u), (a), s, (pv), (pl), e, $\omega_1$
Protonymph	–	–	–	–	$\omega_2$
Deutonymph	–	(l)	–	$\varphi_2$	–
Tritonymph	v'	–	v'	v''	(it)
Adult	–	v''	d lost	–	–
Leg II					
Larva	–	d, bv''	d, (l), $\delta$	d, l', v', $\varphi$	(ft), (tc), (p), (u), (a), s, (pv), $\omega_1$
Protonymph	–	–	–	–	–
Deutonymph	–	(l)	–	l''	$\omega_2$
Tritonymph	v'	–	v'	v''	(it)
Adult	–	v''	d lost	d lost	–
Leg III					
Larva	–	d, v'	d, l', $\delta$	d, v', $\varphi$	(ft), (tc), (p), (u), (a), s, (pv)
Protonymph	–	–	–	–	–
Deutonymph	v'	l'	–	l'	–
Tritonymph	l'	–	v'	l''	(it)
Adult	–	–	d lost	d lost	–
Leg IV					
Protonymph	–	–	–	–	ft, (p), (u), (pv)
Deutonymph	–	d, v'	d, l'	d, v', $\varphi$	(tc), (a), s
Tritonymph	v'	–	v'	(l)	–
Adult	–	–	–	d lost	–

mundo (excepto fosiles). Actualizado en junio de 2006, en abril de 2007 y en mayo de 2008) <http://www.ucm.es/info/zoo/Artropodos/Catalogo.pdf>

Trave, J. and Vachon, M. 1975. Francois Grandjean 1882–1975 (Notice biographique et bibliographique). *Acarologia*, 17: 1–19.