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The freshwater halacarid mite *Soldanellonyx chappuisi* Walter, 1917 (Acari: Halacaridae), character development from larva to adult and comparison with other halacarids

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(With 25 figures)

Abstract

The development of external characters of the freshwater halacarid mite *Soldanellonyx chappuisi* Walter, 1917 is outlined, the size, size relationship, number and position of setae and pores from the larva to adult illustrated. Apart from specific characters of this taxon, mainly an increase in the length of leg I, the development from instar to instar proved to be similar to that known in other halacarid species, in marine as well as in freshwater taxa. Though in the larva the number of idiosomal segments has not reached the final state, the number of dorsal idiosomatic setae and gland pores is complete. Marginally and ventrally the epimeral plates and genital plate increase in size and setae and acetabula are added in each instar. Shape and number of setae of the gnathosoma remain unchanged. The chaetotaxy of trochanters and tarsi is the same from the first (larva) to the last instar (female), on the other leg segments setae are added.

K e y w o r d s: Acari, Halacaroida, fresh water, *Soldanellonyx*, development, Germany, Greece.

Introduction

About 60 halacarid species of the marine prostigmatid mite family Halacaridae are found in fresh water. Some few of these species actually are marine but extend their range of distribution along the groundwater horizon, estuaries, deltas, and coastal ponds into fresh water, but most of the species belong to freshwater genera. These genera differ from marine ones in their delicate integumental plates and the external position of the genital acetabula. Moreover the dorsal and ventral plates lack markedly raised (thick) areolae, rosette pores or patchy ornamentation; in freshwater genera the surface of the plates is uniformly ornamented, reticulate or foveate, generally with tiny and evenly spread canaliculi which cross the integumental layers. Marine genera have a maximum of three pairs of genital acetabula, these are generally in a guarded position, inside the genital cavity which is closed by a pair of genital sclerites. Freshwater genera have external acetabula, they are situated on the external flank of the genital sclerites or on the genital plate, outside the genital sclerites.

Soldanellonyx is a freshwater genus. Characters of the adults are: idiosoma with reticulate dorsal and punctate ventral plates. Dorsum with five pairs of gland pores and five pairs of idiosomatic setae. Pair of adanal setae on anal plate. Anterior epimeral plate with three pairs of setae, posterior epimeral plate with one dorsal and two ventral setae. Female genital plate with three to five pairs of perigenital setae; genital acetabula in posterior part of genital plate. Gnathosomal base rectangular in ventral aspect, rostrum conical. Gnathosoma with two pairs of maxillary setae. Apex of rostrum with two pairs of tiny rostral setae. Palps four-segmented, dorsally attached to gnathosomal base and extending beyond rostrum. Second segment with two dorsal setae; third segment with ventral spine; fourth segment with three setae in basal whorl, apically with three setae and a spine. Genua of legs cylindrical, shorter than telofemora and tibiae. Tibiae with spiniform ventral setae. One or more of dorsal setae on telofemora and genua spur-like. Tarsi I to IV with 1,0,0,0 ventral setae. All tarsi with paired claws. Solenidia on tarsi I and II in dorsolateral position. Tines on claw I in umbrella-shaped arrangement. Tines on claws of following tarsi present though small.

The species pass through one larval and two nymphal stages until the adults leave the deutonymphal hull. Females seem to dominate in a given population; males have been mentioned (Sokolov 1952, Husmann & Teschner 1970, Imamura 1968). All adults studied by the author proved to be females (Bartsch 1975a, 2011, present material).

The genus is spread on all continents, except Antarctica which to date has not been studied in respect to its freshwater halacarid fauna, and there are records from oceanic islands (Falklands, Hawaiian Islands). Nine species are described, viz *S. akiyoshiensis* Imamura, 1959, *S. chappuisi* Walter, 1917, *S. lohmannelloides* (Sokolov & Jankovskaja, 1970), *S. miyakoensis* Imamura, 1957, *S. monardi* Walter, 1917, *S. morimotoi* Imamura, 1970, *S. papillosus* Imamura, 1957, *S. visurgis* Viets, 1959, and *S. marlieri* Bader, 1968. The last mentioned species is expected to belong to the genus *Limnohalacarus* Walter, 1917 (Bartsch 2009b). Two species, described under the names *Hamohalacarus subterraneus* Walter, 1931 and *Stygohalacarus scuplensis* Viets, 1934, may have to be included in the genus *Soldanellonyx* (Bartsch 1989, 2006b, 2009b).

Three *Soldanellonyx* species are known to belong to the European fauna, *S. chappuisi*, *S. monardi*, and *S. visurgis*. Most individuals of *S. chappuisi* are larger than the other *Soldanellonyx* species, the length of the idiosoma is 312-452 µm, that of *S. monardi* 267-378 µm, and of *S. visurgis* 252-351 µm. The legs of *S. monardi* are almost equal in length, legs I of *S. chappuisi* and *S. visurgis* are distinctly larger than legs II. Differences between *S. chappuisi* and *S. visurgis* are, spines and spurs of leg I are ending bluntly in *S. chappuisi*, they are slender and tapering in *S. visurgis*, the basal spur and spine on the second and third palpal segments, respectively, are close to the segment's middle in *S. chappuisi*, in a more basal position in *S. visurgis*, and the tines on claws II to IV are short in *S. chappuisi* but long and distinct in *S. visurgis*.

Soldanellonyx chappuisi is wide-spread on the northern hemisphere, records are from North America (Canada, US), from Europe (northern Sweden to Italy, Spain to Bulgaria) and Asia (Kyrgyzstan, Korea and Japan) (Bartsch

2011). The species is an inhabitant of the depth of lakes, the groundwater, caves, springs, sand filters of waterworks, and the hyporhithral zone, records are from the lowlands to 2000 m altitude.

Descriptions of *S. chappuisi* are given by Walter (1917) and Bartsch (1975a, 1989, 2006b, 2011). The setae on the legs are of different size and shape, there are slender dorsal setae, short, delicately spinose spurs and strong ventral spines. Premising that the shape (within a given range of variation) and the position amongst the setae in general is stable, the different shape makes it easy to follow which of the setae has been added in a given instar.

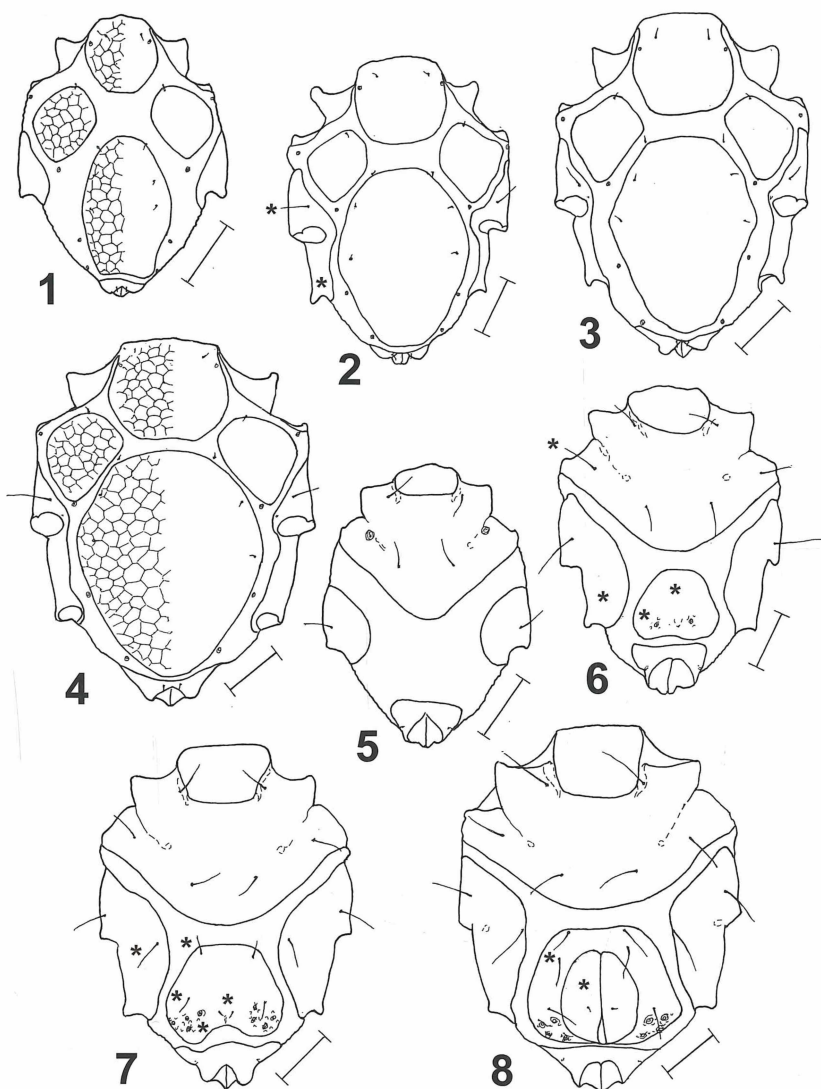
Material and methods

The specimens studied are from northern Germany (Wesergebirge, Bückeberge, near Obernkirchen, Hühnerbachquelle, 52°15' N, 9°09' E, coll. I. Bartsch) and Greece (mainland, Etolia-Akarnania region, Serekas Mountain, Megalo Spilio, 38°46' N, 20°57' E, 1000 m; Peloponnesos, north slope of Taygetos Mountain, Varvara Spilia, 36°57' N, 22°22' E, 1490 m; Killini Mountains, Ziria Mountain, Hermou (Hermes) Spilaio, 37°56' N, 22°26' E, 1685 m, all coll. P. M. Giachino). Ten individuals of each instar (larva, protonymph, deutonymph, female) were used for detailed microscopical examination, and ten legs of each instar to count the number of setae. Voucher specimens of each instar, collected in the Megalo Spilio, are deposited in the Zoological Museum, Hamburg. The drawings were prepared on the basis of cleared and mounted specimens.

Abbreviations used in the descriptions are: *AD*, anterior dorsal plate; *AE*, anterior epimeral plate; *DN*, deutonymph; *ds-1* to *ds-6*, first to sixth pair of dorsal setae of idiosoma, numbered from anterior to posterior; *GP*, genital plate; *OC*, ocular plate(s); *P-2* to *P-4*, second to fourth palpal segment; *pas*, parambulacral seta(e); *PD*, posterior dorsal plate; *PE*, posterior epimeral plate(s); *pgs*, perigenital setae; *PN*, protonymph; *sgs*, subgenital setae. The legs are numbered I to IV, the leg segments 1 to 6 are trochanter, basifemur, telofemur, genu, tibia, and tarsus. Rare numbers of setae or acetabula are in parentheses. The setation formula of the legs presents the number of setae from trochanter to tarsus. The number of setae on the tarsi includes the solenidion and parambulacral setae. The position of a seta is given in a decimal system with reference to the length of the relevant structure, from the proximal to distal end.

Characters and development from larva to adults

Idiosoma: Length of larval idiosoma 174-210 µm, width 125-153 µm, length of *PN* 207-272 µm, width 157-192 µm, length of *DN* 277-362 µm, width 194-284 µm, length of female 312-452 µm, width 214-300 µm. Larva with incomplete number of segments, posterior epimeral plates short, only including coxae of leg III. Larval *AD* rectangular, *OC* small and round and *PD* short and slender (Fig. 1). Dorsal plates with coarse, reticulate ornamentation. Pair of *ds-1* on *AD*, *ds-2* anterior to or in margin of *OC*, *ds-3* anterior to *PD*, *ds-4* and *ds-5* on *PD*, *ds-6* on anal plate. Pairs of *glp-1* in margin of *AD*, *glp-2* to *glp-5* within striated integument, lateral and posterior to *OC* and, in posterior part of idiosoma, lateral to *PD*. In following stages size of *AD* slightly, that of *PD* markedly increased (Figs 2-4). Ornamentation of plates similar in all stages. Pair of *ds-2* of female generally outside *OC*. No change in number and arrangement of dorsal setae and gland pores.



Figs 1-8. *Soldanellonyx chappuisi* Walter: 1. idiosoma, dorsal, larva; 2. idiosoma, dorsal, protonymph; 3. idiosoma, dorsal, deutonymph; 4. idiosoma, dorsal, female; 5. idiosoma, ventral, larva; 6. idiosoma, ventral, protonymph; 7. idiosoma, ventral, deutonymph; 8. idiosoma, ventral, female. (Scale = 50 μ m). New elements (plates, setae, acetabula) marked with an asterisk. Ornamentation of dorsal plates not illustrated in PN and DN.

Larval *AE* with two pairs of setae and pair of epimeral pores (Fig. 5). In protonymph a pair of setae added in area representing coxa II (Fig. 6); epimeral pores vestigial or absent. No change in number of setae in following stages. Larval *PE* short, with a single pair of ventral setae. In *PN* a segment including coxa IV added and a pair of dorsal setae (Fig. 2). Deutonymphal *PE* with two pairs of ventral setae (Fig. 7). No further change in outline and number of setae from *DN* to adult (Fig. 8). Genital plate in larva lacking but present in *PN* and increasing in size in each of following instars. *GP* of *PN* with one to two pairs of genital acetabula, that of *DN* with three to four pairs of acetabula, rarely with one or two or up to five pairs. Deutonymphal *GP* with two pairs of *pgs*, rarely a single pair, and one, rarely two *sgs* in either half of plate. Genital plate of female with four to eight (eleven) pairs of acetabula and three to five (six) pairs *pgs*. Female with pair of large genital sclerites, each plate with one to four (five) *sgs*.

G n a t h o s o m a : Larval gnathosoma with two pairs of maxillary setae and two pairs of rostral setae (Fig. 9). Rostral sulcus almost extending to basal pair of setae. Pair of palps four-segmented, no seta on *P-1*, two spur-like dorsal setae on *P-2*, a large ventral spine on *P-3*, three slender setae in basal whorl, three setae and a spine in distal part of *P-4*. In larva basal spur on *P-2* at 0.4, distal spur at 0.8. No change in number of setae from larva to female, but slight change in position of spurs on *P-2* due to increased length of *P-2* (Fig. 10). In female basal spur on *P-2* at 0.5, distal spur at 0.9.

L e g s : Larva with three pairs of legs, fourth pair of legs added in *PN*. Five-segmented legs of larva with trochanter, femur, genu, tibia, and tarsus. In protonymph legs I to III six-segmented, femur divided into basifemur and telofemur, leg IV five-segmented. In *DN* and females all legs six-segmented.

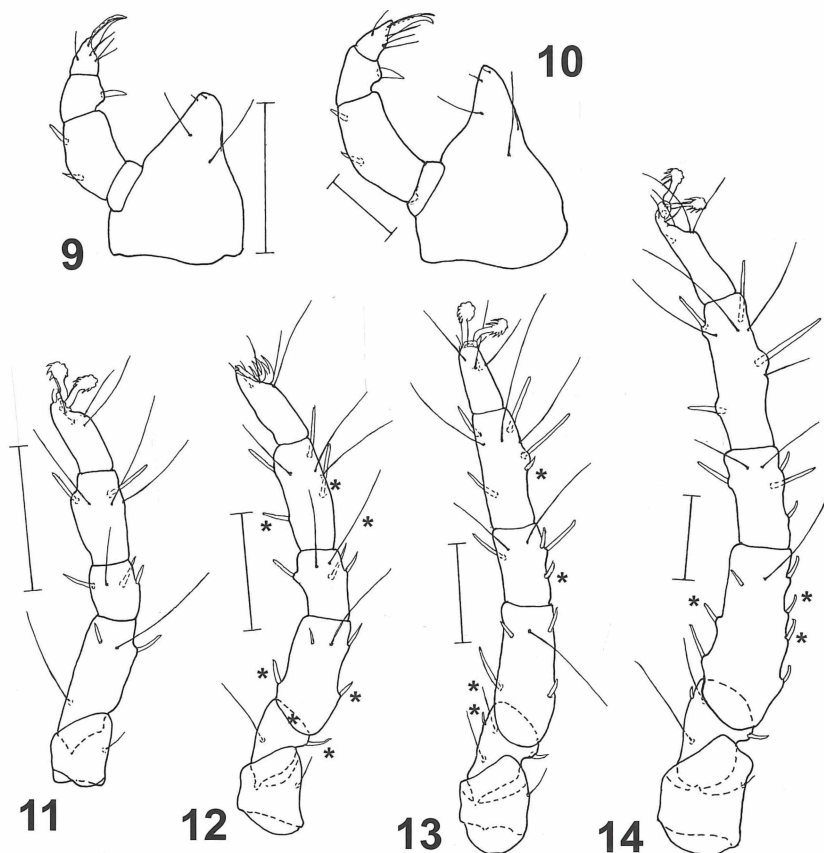
Larval leg I slightly longer than leg II and about as long as leg III; ratio leg I to legs II and III, 1:0.9:1.0 (dorsal length from trochanter to tip of tarsus). Genu I and tibia I 1.2-1.3 and 1.9-2.0 times longer than high (lateral aspect). Leg I 0.6-0.7 times of length of idiosoma. In following instars leg I increasing in length when compared with the other legs. Approximate ratio of protonymphal legs I to II and III, 1:0.8-0.9:0.9, of deutonymphal legs, 1:0.8:0.8-0.9 and of female legs, 1:0.7:0.7-0.8. Telofemur, genu and tibia I of *PN* 2.0, 1.5 and 2.4 times longer than high, respectively, in *DN* these segments 2.0-2.2, 1.7-1.8, 2.5 and in female 2.5, 2.1 and 2.9 times longer than high. Leg I of *PN* 0.7 times of length of idiosoma, leg I of *DN* 0.9 times and that of female almost as long as idiosoma (0.9-1.0 times).

Number of setae on each segment in each developmental stage summarized in Tables 1-4. Trochanters I and II of larva each with a seta in medial position, trochanter III laterally with a short seta or spur. Number and position of setae the same in following instars. Trochanter IV without a seta, in *PN* as well as in following stages (Figs 23-25).

Basifemora and telofemora I and II still fused in larva (Figs 11, 15); area of basifemora with long ventral seta. In *PN* a dorsal spur added to basifemur I (Fig. 12) and a dorsal, rarely also a small ventral spur to basifemur II. Basifemora I of *DN* and female each with two long setae and two spurs (Figs 13 and 14), basifemora II each with single seta and two spurs (Figs 17 and 18).

Larval basifemur III with ventral spine (Fig. 19), in *PN* a dorsal spur added (Fig. 20). Area representing protonymphal basifemur IV without setae (Fig. 23), deutonymphal and female basifemur IV with a dorsal and ventral spur (Figs 24 and 25).

In larva area equalling telofemur I with three dorsal setae, i.e. a long, slender seta and two short spurs. In *PN* a dorsal spur and ventral spine added (Fig. 12). Increase in length of telofemur mainly in the basal part, in the following stages also in the middle part. *DN* (Fig. 13) either with three dorsal spurs, as in *PN*, or with four dorsal spurs. In female telofemur I distinctly longer than in *DN* and another ventral and one or two dorsal spurs added (Fig. 14). Chaetotaxy of telofemur II the same in larva and *PN*, viz



Figs 9-14. *Soldanellonyx chappuisi* Walter: **9.** gnathosoma, lateral, larva; **10.** gnathosoma, lateral, female; **11.** leg I, dorsolateral, larva; **12.** leg I, dorsolateral, protonymph; **13.** leg I, dorsal, deutonymph; **14.** leg I, dorsolateral, female. (Scale = 50 μ m). New elements (setae or division of a leg segment) marked with an asterisk.

Table 1. *Soldanellonyx chappuisi* Walter: larva, leg segments and number of setae (number of cases of a given variant in brackets).

Leg	I	II	III
segment			
1	1(10)	1(10)	1(10)
2+3	1(10)+3(10)	1(10)+3(10)	0(2),1(8)+2(10)
4	4(10)	4(10)	3(10)
5	5(10)	5(10)	5(10)
6	7(10)	6(10)	6(10)

Table 2. *Soldanellonyx chappuisi* Walter: protonymph, leg segments and number of setae (number of cases of a given variant in brackets). *IV-2 and IV-3 still fused, figures given are those within areas representing IV-2 and IV-3.

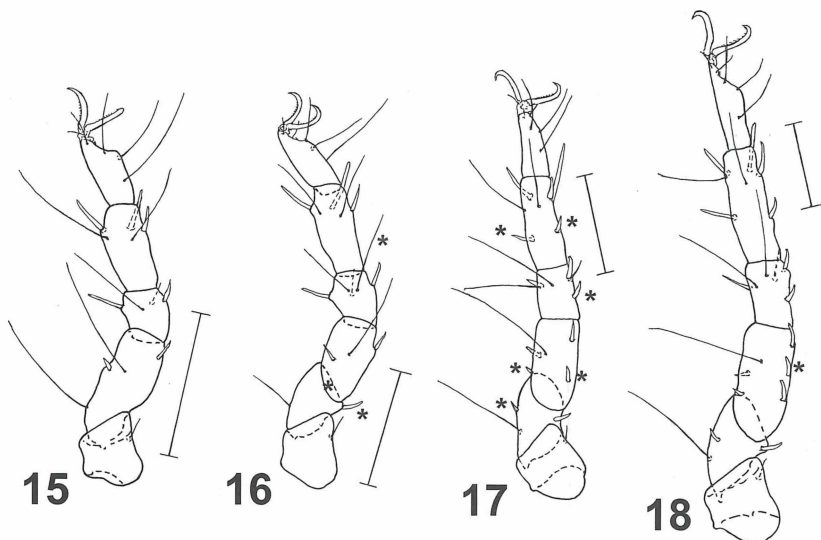
Leg	I	II	III	IV
segment				
1	1(10)	1(10)	1(10)	0(10)
2	2(9),3(1)	2(7),3(3)	2(10)	0(10)*
3	4(1),5(9)	2(1),3(9)	2(10)	1(2),2(8)*
4	4(1),5(9)	4(2),5(8)	3(10)	3(10)
5	7(10)	5(10)	5(10)	5(10)
6	7(10)	6(10)	6(10)	5(10)

Table 3. *Soldanellonyx chappuisi* Walter: deutonymph, leg segments and number of setae (number of cases of a given variant in brackets).

Leg	I	II	III	IV
segment				
1	1(10)	1(10)	1(10)	0(10)
2	4(10)	3(10)	2(10)	2(10)
3	5(3),6(7)	3(2),5(8)	3(4),4(6)	2(10)
4	5(1),6(9)	5(3),6(7)	3(10)	3(10)
5	7(1),8(9)	6(1),7(9)	5(1),6(9)	6(1),7(9)
6	7(10)	6(10)	6(10)	5(10)

Table 4. *Soldanellonyx chappuisi* Walter: female, leg segments and number of setae (number of cases of a given variant in brackets).

Leg	I	II	III	IV
segment				
1	1(10)	1(10)	1(10)	0(10)
2	4(10)	3(10)	2(10)	1(2),2(8)
3	7(1),8(8),9(1)	5(1),6(9)	3(7),4(3)	3(5),4(5)
4	6(10)	6(10)	3(10)	3(10)
5	8(10)	6(1),7(9)	5(2),6(8)	7(8),8(2)
6	7(10)	6(10)	6(10)	5(8),6(2)

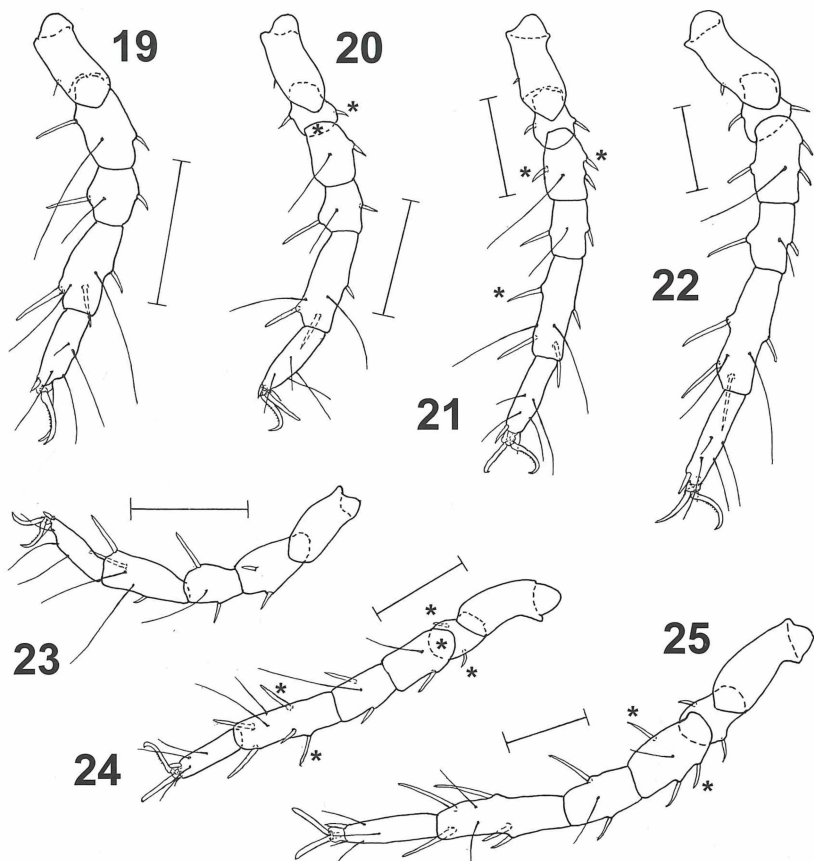


Figs 15-18. *Soldanellonyx chappuisi* Walter: **15.** leg II, dorsolateral, larva; **16.** leg II, dorsolateral, protonymph; **17.** leg II, dorsal, deutonymph; **18.** leg II, dorsolateral, female. (Scale = 50 μ m). New elements (setae or division of a leg segment) marked with an asterisk.

one long seta and two spurs. In *DN* a dorsal and ventral spur added in basal part, rarely another dorsal spur. Female, in general, with three dorsal spurs. Larval and protonymphal telofemur III with one long seta and a dorsal spur, in *DN* a spur added both ventrally and dorsally. No further change in chaetotaxy of telofemur III from *DN* to female. Distal part of protonymphal femur (equalling telofemur IV) with two setae, either one spur-like, one seta-like or both spur-like (Fig. 23). Deutonymphal telofemur IV, as in *PN*, with either a slender seta and a spur (Fig. 24) or with two spurs. On female telofemur IV a dorsal spur and a ventral spine added.

Genu I of larva with two ventral spiniform setae, one slender dorsal seta and a dorsal spur. *PN* with a second slender dorsal seta (Fig. 12) and most of *DN* with a second dorsal spur. Female with two ventral spines, two slender dorsal setae and two spurs. Genu II of larva with four setae, i.e. a spiniform and a short, slender ventral seta, a long dorsal seta, and a dorsal spur. In *PN* a slender dorsal seta added (Fig. 16). Most of *DN* and all females with two dorsal spurs. Larval genu III with three setae, a spine, a spur and a slender seta. No setae added in the following instars. Same arrangement of setae on protonymphal, deutonymphal and female genu IV.

Larval tibia I with pair of ventral spines and three slender dorsal setae, in *PN* a basal pair of ventral spines added, in most *DN* a short seta or spur situated near the basal spine. Female with four ventral spines, three long dorsal setae and one medial seta or spur. Tibiae II, III and IV of *PN* each with pair of ventral spines, two slender dorsal setae and a dorsal spur. On deutonymphal tibia II a ventral spine and a dorsal spur added, on tibia III a



Figs 19-25. *Soldanellonyx chappuisi* Walter: **19.** leg III, dorsolateral, larva; **20.** leg III, dorsolateral, protonymph; **21.** leg III, dorsolateral, deutonymph; **22.** leg III, dorsolateral, female; **23.** leg IV, dorsolateral, protonymph; **24.** leg IV, dorsal, deutonymph; **25.** leg IV, dorsal, female. (Scale = 50 μ m). New elements (setae or division of leg segments) marked with an asterisk.

ventral spine and on tibia IV two ventral spines. Chaetotaxy of female tibiae the same as that of *DN*.

Tarsus I of all instars with three dorsal setae, a dorsolateral solenidion, a short ventral seta and a pair of *pas* singlets. Tarsus II with three dorsal setae, a dorsolateral solenidion, a pair of *pas* singlets but no ventral setae. Tarsus III with three dorsal setae, a dorsolateral solenidion, apically with medial spur and lateral seta. On tarsus IV solenidion in general lacking (one female with dorsolateral solenidion), else setation similar to that of tarsus III. Apart from a few anomalies, number and arrangement of tarsal setae the same in all instars.

Discussion

Halacarid mites run through one larval and one to three nymphal instars till they moult to the adult. Adults and juveniles share the habitat and larvae and nymphs do not differ markedly from adults in their external characters, though of course, the juvenile instars are smaller, the number of segments and setae is incomplete and they lack the genital organs and sex-related characters. The external characters of juveniles have been outlined now and then when describing halacarid mites, more detailed studies of the development of characters from larva to adults have been done on the basis of populations of the freshwater halacarid *Porolohmannella violacea* (Kramer, 1879) and species of the marine genera *Copidognathus* Trouessart, 1888, *Isobactrus* Newell, 1947, *Rhombognathides* Viets, 1927, *Metarhombognathus* Newell, 1947, and *Rhombognathus* Trouessart, 1888 (Bartsch 1998, 2003, 2007). In all halacarid species studied, in detail or rather cursory, the general character development is similar though there exist typical generic and specific differences.

Add of segments are distinct on the venter whereas in almost all halacarid species the number of dorsal setae and gland pores is the same in all instars. Differences between the larva and following instars are the increased length of the posterior epimeral plates and, in general, the enlargement of the dorsal plates. *Soldanellonyx chappuisi* follows this common rule. Exceptions are, adults of *Metarhombognathus* have distinctly smaller dorsal plates than deutonymphs, and adults of several species of the genus *Anomalohalacarus* Newell, 1949 have a longitudinally divided *PD* whereas it is uniform in the juveniles (Bartsch 1998, 2003). Unique in larvae of *Metarhombognathus* is that the pair of *ds-6* is represented by its pores but the setae seem to be absent.

On the ventral side, the genital plate is added in the *PN* and increased in size in the *DN* and female. The protonymphal *GP* starts with one to two pairs of external acetabula, on the plate of the *DN* there are one to five, and in the female three to eleven acetabula in either half. Protonymphs of marine genera have a single pair of internal acetabula, adults one to three pairs. The genital plate of the protonymphal *S. chappuisi*, as that of marine halacarid species, bears no perigenital setae. In the deutonymph of *S. chappuisi* two pairs of *pgs* are most commonly found. Two pairs are also present in the majority of halacarid deutonymphs. Exceptions are deutonymphs of the marine genera *Acaromantis* Trouessart & Neumann, 1893, *Agaua* Lohmann, 1889 and *Simognathus* Trouessart, 1889 (not all species) which have a single pair of *pgs* (Chang & Chatterjee 2006, Bartsch 1977, 2009a, 2010) and species with three nymphal stages, viz. representatives of *Isobactrus* and *Rhombognathus* (Bartsch 1975b, 2003). In the species of the two latter genera the last nymphal stage, the tritonymph, bears two pairs of *pgs*. The larva lacks a genital plate and acetabula, instead the *AE* of the larva bears a pair of epimeral pores, pores which are expected to be osmoregulatorily active areas (Bartsch 1974). All halacarid larva seem to have either epimeral pores or epimeral vesicles. In the majority of genera with epimeral pores, as in *Soldanellonyx*, the larval pores become vestigial and disappear in the following instars. In species with epimeral vesicles, these are present in both larvae, nymphs and adults.

Whereas the number and position of the dorsal idiosomatic setae is the same from larva to adult, setae are added to the epimeral plates. Halacarid larvae start with two pairs of setae on the *AE* (or area representing the *AE*), a third pair is added in the *PN*. In general, no more setae are added in the following nymphs and adults, except for a few genera, e.g. *Lohmannella* Trouessart, 1901, with four pairs of setae, and *Acanthohalacarus* Bartsch, 2001, with five pairs in the adults (Bartsch 2001, 2006a). Larvae have a single pair of setae on their short *PE*; the *PE* of the *PN* includes the coxae of leg IV. The dorsal seta, anterior to insertion of leg III, is present in most protonymphs; in the freshwater mite *Porolohmannella violacea* and in a few marine *Isobactrus* species that pair of setae appears in the deutonymph (Bartsch 2003, 2007).

In *Soldanellonyx chappuisi* there is a change in the length of leg I, the telofemora, genua and tibiae of adults are distinctly longer than in the larva, relative to the length of the following legs. Leg I of the larva is distinctly shorter than the idiosoma, that of the female almost as long as the idiosoma. In the long-legged *Porolohmannella violacea* each instar has longer legs, palps and rostrum than the previous one (Bartsch 2007). As in most halacarid mites, both the larval trochanters and tarsi have the final number of dorsal and ventral setae. In *S. chappuisi* the number of eupathid parambulacral setae on tarsi I and II is the same in all instars, as well as the *pas* on tarsi III and IV. In marine halacarids with an increased number of *pas*, the final number is reached in the adults, e.g. in *Acanthohalacarus*, *Halacarus frontiporus* Newell, 1947, and several species of *Thalassarachna* Packard, 1871 (Newell 1947, Bartsch 2001 and unpublished data). On the other leg segments setae are added.

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Zusammenfassung

Anhand von Larven, Nymphen und Adulten von *Soldanellonyx chappuisi* Walter, 1917 wurde die Entwicklung äußerer Merkmale während der Ontogenese verfolgt, Änderungen in der Größe und hinsichtlich der Zahl und Lage von Borsten und Poren dargestellt. Abgesehen einiger art-typischer Merkmalsänderungen, so die Verlängerung des ersten Beinpaares, ist die Entwicklung der ähnlich, die von anderen Halacariden bekannt ist, sowohl von Arten des Süßwassers als auch von den des Meeres. Obwohl bei den Larven die Anzahl der Körpersegmente noch unvollständig ist, ist bereits in diesem Stadium die vollständige Zahl der dorsalen Platten, Körperhaare und Drüsenporen ausgebildet. Dagegen wird auf der Ventralseite eine weitere Coxalplatte und die Genitalplatte eingeschoben, die Zahl der Haare nimmt zu. Bereits das Gnathosoma der Larve weist die endgültige Form auf. Bei den Beinen bleibt die Behaarung der Trochanteren und Tarsen unverändert, bei anderen Segmenten hat die Zahl der Haare oft nach einer Häutung zugenommen.

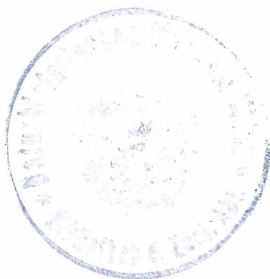
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