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Description of the third specimen of *Polydiscia squamata* Methlagl, 1928 (Acari: Prostigmata: Parasitengona: Tanaupodidae) known to science

ANDREAS WOHLTMANN

(With 4 figures)

Abstract

The third known specimen of *Polydiscia squamata* Methlagl, 1928 (Acari: Prostigmata: Parasitengona: Tanaupodidae) is described, additional details on chaetotaxy and morphology are given. Differences between *Polydiscia* species and the phylogenetic position of the genus are discussed in comparison with published data.

Keywords: Acari, Tanaupodidae, *Polydiscia squamata* Methlagl, redescription, phylogeny, Austria.

Introduction

Species of Parasitengona are conspicuous mites due to their often comparatively large size and bright red colouration. Although the heteromorphy of parasitic larvae and predatory postlarval instars results in numerous still unresolved taxonomical problems on species level, Parasitengona are quite well known on genus level, particularly in Europe.

Exceptional and mysterious is the genus *Polydiscia* Methlagl, 1928. For 75 years the genus was only known from two larvae of *P. squamata*, sampled free-living in a vacant lot near Vienna, Austria. The next and only further report of *Polydiscia* collected in the field comes from Spain in 2003; these specimens were recognized as a new species and named *P. deuterosminthurus* Baquero *et al*., 2003. Postlarval instars are still unknown for the genus, the host of the larva is known for *P. deuterosminthurus* only (Collembola: *Deuterosminthurus bisetosus* Baquero *et al*., 2003).

During preparation of a revision of European Johnstonianidae (Wohltmann *et al*., 2004), another larva of *P. squamata* was discovered in the collection of the Zoologisches Museum der Universität Hamburg (ZMH). According to the label the specimen was captured free-living in late May 1974 at Haiming, Oberinntal, Tirol (Austria) by H. Winkler, and provisionally determined as larval Johnstonianidae by G. Rack. The excellent condition of the slide allowed a detailed analysis of the larva, which will be redescribed and compared to published data.

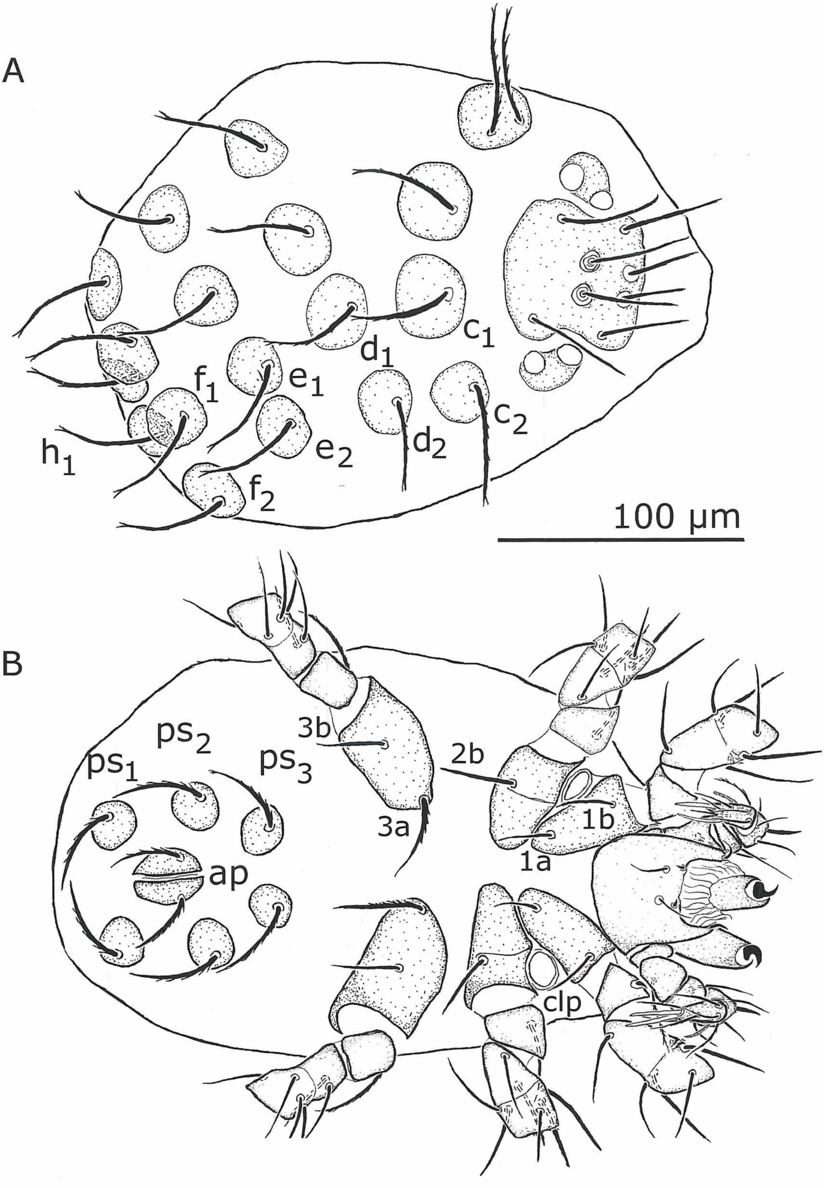

Fig. 1. Habitus of *Polydiscia squamata* Methlagl: **A** – dorsal view; *c, d, e, f, h*: setae of dorsal rows. Legs and gnathosoma not shown; **B** – ventral view; *1a, b, 2a, 3a, b* = setae on coxa I-III; *ap* = anal pore with sclerites, *clp* = Claparédes organ; *ps1-3* = pseudoanal setae. Legs omitted beyond femur. All to the same scale (ZMH specimen No. A 38/74).

Material and methods

Material used for taxonomic investigations was a single specimen (accession number A 38/74) deposited at the ZMH, Hamburg, Germany. Drawings and measurements were carried out using an Olympus BH-2 light microscope with differential interference phase-contrast and camera lucida. All lengths are given in µm. The terminology follows Grandjean (1947) and application of his system to Parasitengona made by Zhang (1998) and other authors (Southcott 1986; M¹ kol & Wohltmann 2000).

Results

Polydiscia squamata Methlagl, 1928

(Figs 1-4)

Description

Postlarval instars: unknown.
Larva. Colour in life unknown.
Standard measurements listed in Table 1.

Dorsum of idiosoma (Fig. 1a) with roughly quadrangular prodorsal sclerite (scutum) bearing one pair of trichobothria and additionally three pairs of non-specialized setae (Fig. 2). Sensillae of trichobothria smooth, non-specialized setae also smooth. Anterior seta (*AM*) shorter and probably homologous to the anterior trichobothrium of other Parasitengona, mid (*AL*) and posterior (*PL*) seta longer and of about the same size as sensillum. Laterally on each side of prodorsum a pair of eyes (diameter 10), each pair on a common ocular plate (27 x 17). Posterior to scutum 19 setulose setae (length 40-50 µm) with bifid tips, arranged in rows (C row: c_{1-2}, D row: d_{1-2}, E row: e_{1-2}, F row: f_{1-2}, H row: h_1), each seta placed on an ovoid sclerite (diameter around 30). C_2 sclerite on left side carries two setae.
Venter (Fig. 1b): Coxa I with seta *1b* (length 25 µm) and seta *1a* (17-21); supracoxal seta absent. Coxa II with seta *2b* (28-30), between coxae I-II the Claparède's organ. Coxa III with seta *3b* (27) and seta *3a* (35-40). All setae on coxae with few setules. Posterior to coxa III anal pore, flanked by a pair of sclerites (29 x 11) each carrying a setulose seta. Around the anal opening three pairs of setulose anal setae each inserted on a sclerite.
Gnathosoma (Fig. 3) with spine-like, small oral (3) and adoral (6) setae; hypostomal setae (16) smooth, supracoxal setae absent on palp. Palp trochanter without setae, palp femur dorsally with one distally setulose seta (30), palp genu dorsally with one smooth seta (25). Palp tibia with three smooth setae (16-20) and distally the setiform, smooth odontus. Palp tarsus with a single solenidion ω (14) two prominent distal eupathidia ζ (20) and 6 non-specialized setulose setae (16-24). Velum simple; cheliceral blade smooth without teeth.

Legs (Fig. 4). Leg segmentation formula 7-7-7; femura of legs I-III completely divided into basi- and telofemur. Pretarsus I-III each with two claws plus median claw-like empodium. Lateral claws deeply incised,

Table 1. Standard data of *Polydiscia* spp.
(Data from *P. squamata* (ZMH specimen No. A 38/74) compared to type data from Vercammen-Grandjean, 1972 and type data of *P. deuterosminthurus* (Baquero *et al.*, 2003). All data im µm).

	P. squamata A 38/74	***P. squamata*** Vercammen-Grandjean, 1972	***P. deuterosminthurus*** Baquero *et al.*, 2003
Palptarsus	21	18	16 (fused with tibia)
odontus	18		18-24
Palptibia	10		-
Palpgenu	11		13
Palpfemur	12		10
Palptrochanter	6		18
Scutum length	58	66-67	58-60
Scutum width	60		
Psens	42	66-68	39-44
PSens-PSens	15	15-18	15
AM	31	54-58	25-29
AM-AM	12	14	8-11
AL	42	38-40	39-42
AL-AL	46	39-48	42-46
PL	46	44-50	44-48
PL-PL	43	46	37-42
pa	202	252-268	207-245
Tarsus **I**	65	64-66	67-70
Tibia I	40		
Genu I	28		
Telofemur I	16		
Basifemur I	28		
Trochanter I	25		
Coxa I	42		
pm	182	232-258	215-219
Tarsus **II**	54	63-64	56-57
Tibia II	37		
Genu II	24		
Telofemur II	21		
Basifemur II	25		
Trochanter II	21		
Coxa II	43		
pp	197	258-274	245-259
Tarsus **III**	60	58-60	57-59
Tibia III	41		
Genu III	32		
Telofemur III	19		
Basifemur III	16		
Trochanter III	29		
Coxa III	48		

bifid (Fig. 4). Chaetotaxy of legs given in Table 2. Each subterminal eupathidium (ζ) on tarsus I and II with companion seta (*z*). 'Pretarsal' eupathidium on legs I and II rarely visible.

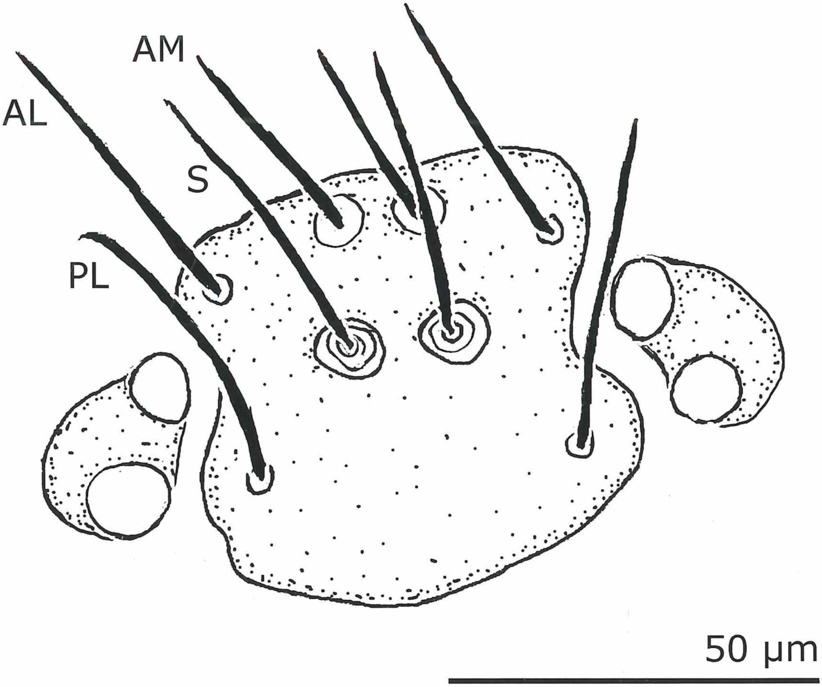

Fig. 2. Scutum and lateral eyes of *Polydiscia squamata* Methlagl (*AM, AL, PL* = normal setae on scutum; *S* = sensillum of trichobothrium. ZMH specimen No. A 38/74).

Discussion

The Hamburg specimen of *P. squamata* largely fits the description of Vercammen-Grandjean (1972) as well as that of *P. deuterosminthurus* (Baquero *et al*., 2003), who also investigated the type of *P. squamata* and corrected some misinterpretations (i.e., branched instead of nude setae on coxae I-III, four instead of two solenidia on tibia I, 25 instead of 21 non-specialized setae on tarsus I, presence of a companion seta on tarsus I). The presence of two instead of one seta on the left sclerite *C2* obviously constitutes an aberrant condition in the Hamburg specimen. Other differences concern tiny structures which may have been overlooked (i.e., presence of three pairs of gnathosomal setae). Measurements recorded for sensillae (*AM, S*) differ between *P. squamata* (see Vercammen-Grandjean 1972) on the one hand and both *P. deuterosminthurus* (see Baquero *et al*. 2003) and the Hamburg specimen (Table 1) on the other hand. However, sensillae are broken in the specimen of *P. squamata* observed by Vercammen-Grandjean (see Baquero *et al*. 2003) and it is impossible to evaluate his data. Considering the small number of individuals (each three in *P. squamata* and in *P. deuterosminthurus*) hitherto measured, differences in other quantitative data are debatable, including those listed by Baquero *et al*. (2003) in order to separate *P. deuterosminthurus* from *P. squamata*, and may be attributable to variability within species. Therefore, and given that Winkler's specimen was collected in the same geographical area where Methlagl sampled the larvae, the Hamburg specimen obviously belongs to *P. squamata*. The number of solenidia on genu I constitutes the only qualitative character separating *P. squamata* (2) from *P. deuterosminthurus* (3). With regard to differences found in larvae of other parasitengone species of a particular genus, this nevertheless justifies a hypothesis on separate species.

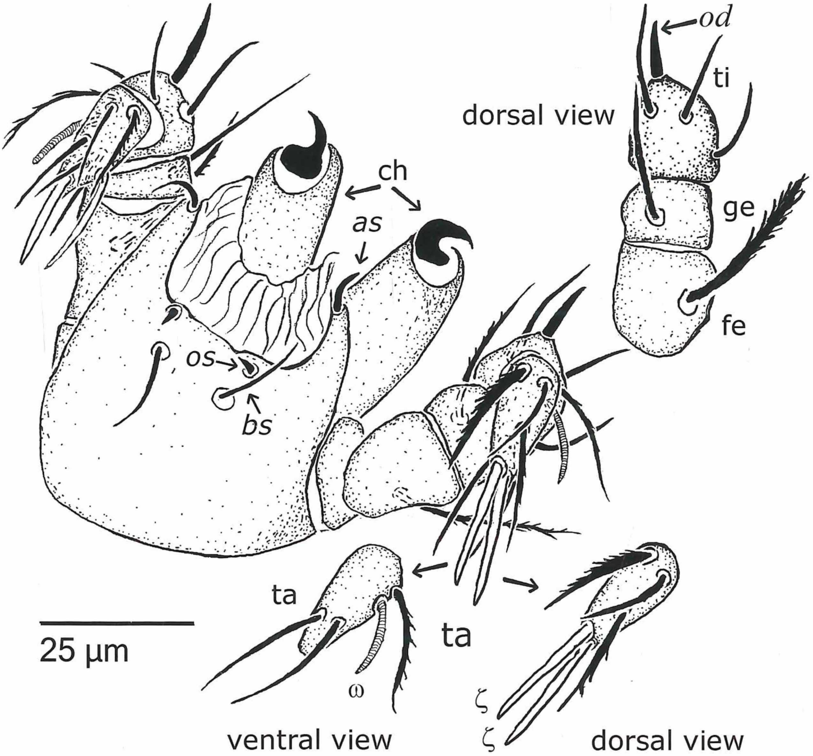

Fig. 3. Gnathosoma of *Polydiscia squamata* Methlagl (ventral view. *as* = adoral setae, *bs* = hypostomal setae, *od* = odontus = palp tibial claw, *os* = oral setae; *ch* = chelicera; *ta* = palp tarsus, *ti* = palp tibia, *ge* = palp genu, *fe* = palp femur; *ù* = solenidium, *æ*= eupathidium. All to the same scale ZMH specimen No. A 38/74).

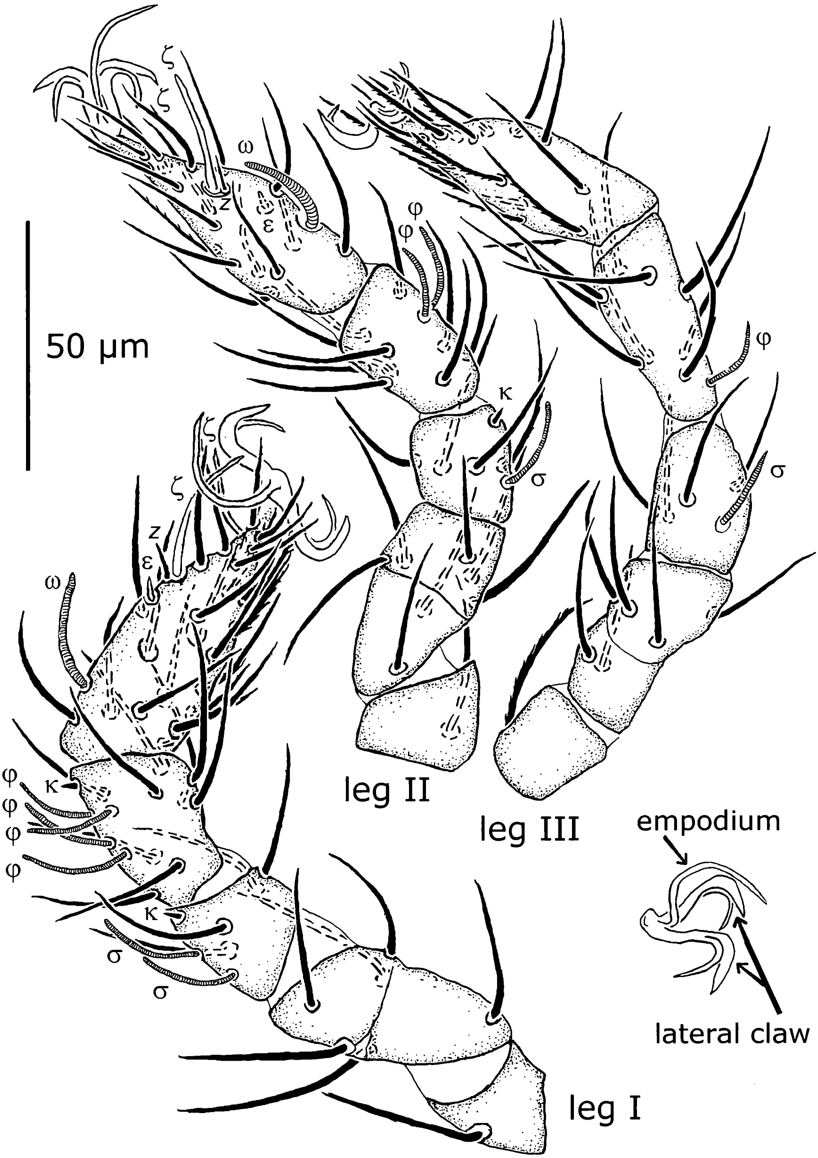

Fig. 4. Legs of *Polydiscia squamata* Methlagl (ZMH specimen No. A 38/74). Specialized setae as explained in table 2, detail shows pretarsus. All to the same scale.

Table 2. Setation of legs and palp of *Polydiscia* spp. (N = normal setae, ù , ö, ó = solenidia, å = famulus, æ= eupathidium, *z* = companion setae, ê = microseta; V.-G. = Vercammen-Grandjean; * = Corrections made by Baquero *et al.* (2003) after checking the types of *P. squamata* listed in brackets).

	P. squamata A 38/74	***P. squamata*** V.-G. 1972 *	***P. deuterosminthurus*** Baquero et al 2003
Palptarsus	6 N, 1 ω, 2 ζ	6 N, 1 ω, 2 ζ	6 N, 1 ω, 2 ζ
Palptibia	3 N	3 N	3 N
Palpgenu	1 N	1 N	1 N
Palpfemur	1 N	1 N	1 N
Palptrochanter	0 N	0 N	0 N
Tarsus **I**	23-25 N, 1 ω, 1 ε, 2 ζ, 1 *z*	21 (25) N, 1 ω, 1 ε, 2 ζ, (1 *z*)	25 N, 1 ω, 1 ε, 2 ζ, 1 *z*
Tibia I	9 N, 4 φ, 1 κ	9 N, 2 (4) φ, 1 κ	9 N, 4 φ, 1 κ
Genu I	4 N, 2 σ, 1 κ	4 N, 2 σ, 1 κ	4 N, 3 σ, 1 κ
Telofemur I	5 N	5 N	5 N
Basifemur I	1 N	1 N	1 N
Trochanter I	1 N	1 N	1 N
Coxa I	2 N	2 N	2 N
Tarsus **II**	21 N, 1 ω, 1 ε, 2 ζ, 1 *z*	21 N, 1 ω, 1 ε, 2 ζ	21 N, 1 ω, 1 ε, 2 ζ, 1 *z*
Tibia II	9 N, 2 φ	9 N, 2 φ	9 N, 2 φ
Genu II	4 N, 1 σ, 1 κ	4 N, 1 σ, 1 κ	4 N, 1 σ, 1 κ
Telofemur II	5 N	5 N	5 N
Basifemur II	2 N	2 N	2 N
Trochanter II	1 N	1 N	1 N
Coxa II	1 N	1 N	1 N
Tarsus **III**	19-20 N	20 N	20 N
Tibia III	9 N, 1 φ	9 N	9 N, 1 φ
Genu III	4 N, 1 σ	4 N, 1 σ	4 N, 1 σ
Telofemur III	4 N	4 N	4 N
Basifemur III	2 N	2 N	2 N
Trochanter III	1 N	1 N	1 N
Coxa III	2 N	2 N	2 N

Some other characters of *Polydiscia* need clarification. Although the insertion of *AM* setae on the scutum is broader than insertions of *AL* and *PL* setae, no anterior trichobothrium could be detected in the Hamburg specimen. Thus it remains doubtful whether *AM* setae are really modified as sensillae in *Polydiscia* as proposed by Vercammen-Grandjean (1972) and Baquero *et al.* (2003). The anal sclerite was drawn as undivided sclerite by Vercammen-Grandjean (1972), and in a similar way for *P. deuterosminthurus* (Baquero *et al.* 2003). It is clearly divided into a pair of lateral sclerites in the Hamburg specimen. Moreover, I agree with the interpretation of Vercammen-Grandjean concerning the setation of palp tibia and the arrangement of the palp tarsus. The odontus (= palptibial claw of other authors) is considered as modified setae and is certainly not a homologous structure to the pretarsal claws of walking legs. In *Polydiscia*, the odontus is rather weak and resembles a thickened seta. The observation of a fused palp tibia-tarsus in *P. deuterosminthurus* (Baquero *et al.* 2003) would constitute a further character separating this species from *P. squamata*. However, Baquero *et al.* (2003) provided no drawing of the character and the SEM figure of the gnathosoma (Fig 3 in Baquero *et al.*, 2003) indicates a separation of palp tarsus and palp tibia in *P. deuterosminthurus* as is known for *P. squamata*, and other Parasitengona as well.

The phylogenetic position of *Polydiscia* is under discussion. Newell (1957) suggested its inclusion within the Johnstonianidae. Vercammen-Grandjean (1972) firstly supported this position and suggested the status of a new subfamily Polydiscinae, but then (1973) transferred *Polydiscia* to Trombellidae. Later, Southcott (1987) redirected *Polydiscia* into the Johnstonianidae. However, all these decisions were based on a tentative feeling about the direction of evolution. In a phylogenetic analysis, Welbourn (1991) restricted Johnstonianidae to Johnstonianinae and Charadracarinae and transferred (among others) *Polydiscia* to Tanaupodidae. If this hypothesis is correct, it seems rather likely that *Polydiscia* constitutes the larva of *Rhinothrombium* Berlese, 1910, which is the only other Tanaupodidae in biotope types inhabited by *Polydiscia* and which is solely known from postlarval instars. The restriction of Johnstonianidae is supported by a recent revision of the family (Wohltmann *et al.*, 2004); however, the phylogenetic position of *Polydiscia* remains vague and not well supported by apomorphies. In a phylogenetic re-analysis, the monophyly of Tanaupodidae could not be supported (Wohltmann, in press), and *Polydiscia* appeared as the most basally deviated branch within the terrestrial Parasitengona. However, this position is also not well supported by apomorphies. Thus, the phylogenetic position of *Polydiscia*, and of Tanaupodidae in general, remains a problem that deserves further research.

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Author's address:

Dr. habil. A. WOHLTMANN, Institut für Ökologie und Evolutionsbiologie, Universität Bremen, Fachbereich 2, Postfach 33 04 40, D-28334 Bremen, Germany (e-mail: wohltman@uni-bremen.de).

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