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Article

Redescription of paratype female of *Prasadiseius achlora* (Prasad, 1972) (Acari: Otopheidomenidae)

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ABSTRACT
Prasadiseius achlora (Prasad, 1972) is redescribed based on photomicrographs of a paratype female specimen. Chaetotaxy of the idiosoma and genua and tibia is given, including corrections to the original description. Photomicrographs of the female's insemination system are provided showing that the species of *Prasadiseius* probably have a "laelapid-type" but do not show the sacculus as it is apparently not chitinized.

KEY WORDS: Chaetotaxy of genu and tibia; Katydiseiinae; setae r3 and Z5; sperm access system; sphingid mite.

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INTRODUCTION

The Otopheidomenidae are parasites of insects and mostly infest certain families of Hemiptera, Isoptera, Lepidoptera and Orthoptera in the tropical regions of the world, particularly the Neotropical and Oriental regions. At present, it includes 30 valid species that are placed in three subfamilies [Katydiseiinae Fain and Lukoschus, 1983; Otopheidomeninae Treat, 1955; and Treatiinae Wainstein, 1972] and nine genera (See list of species). All species are ectoparasites, mostly on the dorsal side of the posterior thorax and anterior abdomen, except for *Katydiseius nadchatrami* Fain and Lukoschus, 1983 which is an endoparasite in tracheae. Almost all species have been described from dead insects preserved in different museums except for *P. incanus* collected from live sphingids. The rate of infestation in such collections is reported to be 8% in Pyrrhocoridae (Treat 1965) and 1–3% in Sphingidae (Prasad 1976, 2013a, b).

The genus *Prasadiseius* Wainstein, 1972 comprises eight species that are found associated with the hawk moths (Lepidoptera: Sphingidae). When Wainstein (1972) established this genus, with the type species *P. pholusis* (Prasad, 1970b - from Bolivia and Honduras on *Pholus anchemolis, P. obliquus* and *Pholus* sp.), he included three other species: *P. cocytes* [(Prasad 1970a) - from Peru on *Cocytius duponchel*], *P. donahuei* [(Prasad 1970a) - from Peru on *Erinnyis obscura*] and *P. kayosiekeri* [(Prasad 1970b) - from Honduras, Panama Canal Zone and Peru on *Pachylia darceta, P. resumens* and *Triptogon lugubris*]. Since then, another four species were described from Sphingidae: *P. achlora* [(Prasad 1972) - from Uganda on *Antinephele achlora*, VP70-16], *P. aporodes* [(Prasad 1972) from Uganda on *Hippotion aporodes*], *P. indicus* [(Prasad 1973) from India on *Nephele* sp.] and *P. incanus* Prasad and Guanilo [*in* Prasad *et al.* 2011 from Peru on *Xylophanes fusimacula* and *X. undata*].

Prasad (2011) redescribed adults of *P. cocytes* collected from live sphingids in Peru in which he noted both setae *r3* and *r5* present. He reported these two setae present also in the deutonymphs (Prasad 2012) that were collected along with the above adults. But, in the original publication of this species (Prasad 1970a), he reported seta *r3* present and seta *r5* absent and in the original publication of *P. achlora* (Prasad 1972), he reported seta *r3* absent and seta *r5* present. Such discrepancies, and the lack of data on the chaetotaxy of genua and tibiae I-IV in many species of *Prasadiseius* prompted the author to re-examine the paratypes of *P. achlora* present in the author's collection after 45 years in 2017; 1 female was in excellent condition and re-examined. The results of this study are presented here, giving many details, voucher photos and chaetotaxy of genua and tibiae I-IV.

MATERIALS AND METHODS

Material examined – Paratype female #1 (Fig. 1, VP70-16) was examined using an Accu-Scope 3000 phase-contrast microscope (Accu-Scope, New York, USA) under 400×. The female was photographed in dorsal and ventral views (Figs. 2, 3) in low magnification (100×) and measured (Tables 1–3). Measurements were taken using the Micrometrics system. Leg lengths were measured from the midpoint of the base of coxa to the tip of the tarsus (pretarsus not included due to distortion or lack of clarity); Idiosoma and dorsal shield - Length in the middle and width at the widest point; and Distances between the setal pairs - From alveoli to alveoli; and Lengths of setae - From base to the tip. Photographs of the mite were taken using a Canon™ EOS 550D (Canon USA Inc., Melville, NY 11747, USA) camera after mounting on the microscope and saved in Photoshop CS5™ (Adobe Systems Inc., San Jose, CA 95110-2704, USA). The photographs were placed in the InDesign™ (Adobe Inc.) program to label the structures. The original magnification of the photos was 100-400× as mentioned in the explanation of the figures. As these were enlarged further in different magnifications to show the structures clearly and fit the page, exact magnifications are not given on the figures.

The line drawings of the right genua and tibiae I-IV were drawn in 400× by a pencil from the monitor on a transparent paper. Once the leg setae were drawn, a white sheet was placed on top of each transparent paper and leg segments with setae inked directly on this sheet. These were scanned in Photoshop and setae with segments labeled in Adobe InDesign.

RESULTS

Redescription of paratype female (Figs. 2–28, Tables 1–4)

DORSAL IDIOSOMA – Oval, with 12 pairs of setae of which 10 pairs on dorsal shield and 2 pairs on lateral integument. **Dorsal shield and setae –** Lateral incision and cleavage posterolateral to seta *j6*; with 10 pairs of setae of which 7 pairs in podonotal region (*j3, j5, j6, z2, z4, z5, s4*) and 3 pairs in opisthonotal region (*J2, J5, Z5*). All setae minute (4–13) and smooth except *Z5* being long (36–40) and finely serrate. Seta j4 absent. Measurements of setae as given in Table 1. **Dorsal integument and setae –** Seta *r3* lateral to and in between setae *z4* and *s4* and seta *r5* lateral to and in between setae *z5* and *j6,* both smooth and moderately long (23–26). **Pores, poroids, and sigilla on dorsal shield –** Only idm5 located lateral to seta *Z5* (Figs. 4, 7) and sigilla sg posterolateral to seta *j6* identified (Figs. 4, 6). **Distance measurements between setal pairs –** Transverse and vertical distance measurements of setal pairs as in Table 3. Setal pair *j5-j5* located very close to each other having minimum transverse distance (13) and *s4-s4* far apart from each other (171). Vertical distance least between *z2-z4* (64–66) and most between *j6-J2* (91).

VENTRAL IDIOSOMA – Tritosternum – Tritosternum with basal sclerite and laciniae totally absent (Fig. 8). **Sternal shield -** Lightly sclerotized and totally reticulate sternal shield longer than

wide (Fig. 8), each corner narrowly and triangularly extending lateral to *ST1, ST2* and *ST3* but difficult to observe and photograph even in 400×. All sternal setae long (38–50), *ST1* short of reaching base of *ST2* but *ST2* extending beyond base of *ST3.* Transverse distance much less between *ST1-ST1* (39) but more between *ST3-ST3* (53) and much more between *ST2-ST2* (64). Also, vertical distance much more between *ST1-ST2* (51–54) and much less between *ST2-ST3* (31–32). Oblique measurement between *ST1-ST3* (95–96). Often, tip of these setae difficult to see and measure correctly. **Metasternal plates –** Absent. Seta *ST4* and poroids iv3 also absent. **Genital shield –** Longer than wide, concave laterally and convex posteriorly, both corners round, posteriorly may appear roughly truncate due to its folding or folding of integument in that area, width measured posteriorly (87), *ST5* absent. **Anal shield –** Round anteriorly and laterally part of which may appear in dorsal position having pair of paraanal setae and part in ventral position having single postanal seta posterior to which cribrum seen, anus in terminal position surrounded by 2 tiny, triangular lateral shields and 1 triangular posterior shield to release defecation. **Peritreme –** Moderately long (128 including stigma), extending from anterior margin of coxa IV to posterior part of coxa II. **Sperm access system –** Not seen in this old female but seen as tubular structures stated in the original publication (Prasad 1972) and similar to 7 species of *Prasadiseius.*

Table 1. Measurements of different dorsal characters (µm) in a paratype female of *Prasadiseius achlora* (VP70-16).

Particulars	Female No. 1	Prasad (1972)
Dorsum		
Idiosoma length	548	450–490 (3 Females)
Idiosoma width	331	204–255 (3 Females)
Dorsal shield (DS) length	398	326–337 (3 Females)
Dorsal shield (DS) width	229	173–194 (3 Females)
Podonotal shield (PO) length	243	Not reported
Podonotal shield (PO) width	225	Not reported
Opisthonotal shield (OS) length	168	Not reported
Opisthonotal shield (OS) width	230	Not reported
Pair of setae on DS (PO + OS)	10 (7 + 3)	10 (7 + 3)
Pair of setae on integument	2 (*r3, r5*)	1 (*r5*)
Pair of setae on dorsal idiosoma	12 (7 + 3 + 2)	11 (7 + 3 + 1)
Length of setae		
j3	7–8	5–11 (3 Females)
j4	*j4* absent	*j4* absent
j5	5–6	5–11 (3 Females)
j6	6–7	5–11 (3 Females)
z2	12–13	5–11 (3 Females)
z4	11–12	5–11 (3 Females)
z5	6–7	5–11 (3 Females)
s4	9–10	5–11 (3 Females)
J2	8 (right absent)	5–11 (3 Females)
J5	4–5	5–11 (3 Females)
Z5	36–40	37–40 (3 Females)
r3	23	*r3* not reported
r5	26	18–20 (3 Females)

GNATHOSOMA – Measurements as given in Table 2. **Tectum** – Triangular, anteriorly round and smooth. **Chelicera -** Narrow anteriorly, wide in middle, having reduced and atrophied fixed digit distally where narrowly elongate movable digit present having 9–10 denticles posterior to a pointed and slightly curved tip (Figs. 13, 14). **Capitulum** – Posterior part of capitulum without capitular seta and having elongate capitular gutter (denticular rows with denticles in each row of capitular gutter not seen clearly) along with 3 usual pairs of hypostomal setae. **Corniculi** – Elongate, longer than salivary stylets, narrow and notched in middle at distal end and folded along entire length (Figs. 13,

15). **Salivary stylets** – Very narrow, much thinner and shorter than corniculi and pointed anteriorly. **Palps** – Apotele absent, trochanter without setae, femur with 4 setae (2 long dorsal, 1 slightly shorter ventral and 1 similar lateral setae, and genu with 5 setae (3 slightly shorter dorsal, 1 ventral and 1 lateral setae). Setation of tibia and tarsus difficult to determine.

Table 2. Measurements of different ventral, gnathosomal and leg characters (µm) in a paratype female of *Prasadiseius achlora* (VP70-16).

Particulars	Female No. 1	Prasad (1972)
Venter		
Tritosternum	Absent	Absent
Sternal shield length x width	Not measured	94–100 x 66–69
Setal pairs on sternal shield	3	3
Length of *ST1*	38–49	44–51
Length of *ST2*	49–50	46–51
Length of *ST3*	48–50	48–51
Length of *ST5*	*ST5* Absent	*ST5* Absent
Genital shield (Posteriorly)	Round	Truncate
Genital shield width	87	84–100
Anal shield length	Not measured	Not reported
Anal shield width	Not measured	68–73
JV1	Present	Present
JV4	Absent	Absent
JV5	Absent	Absent
Peritreme (PE) length	128	107–117
Peritreme extending to	*r3*	Not reported
Spermatheca	Not visible	Tubular
Gnathosoma		
Tectum margin (anterior),	Round, smooth	Round, smooth
Teeth on movable digit	9–10	8–10
Setae on palp (TR to GE)	0-4-5	0-4-5
Capitular seta	Absent	Not reported
Hypostomal setae (pairs)	3	Not reported
Legs: Length (CX-TA, no PRT)		
I	387	343–361
II	386	347–363
III	379	347–357
IV	463	416–425
Legs: Number of setae (CX to TI):		
I	Ge = 9, Ti = 8	2-5-11-9-8
II	Ge = 9, Ti = 7	2-5-9-9-7
III	Ge = 8, Ti = 7	2-5-6-8-7
IV	Ge = 8, Ti = 7	1-5-6-8-7

LEGS - Measurements of legs I-IV and details of setae on these as given in Table 2. Leg IV longest (463) and legs I-III of about same length (379-387). Pair of claws on each pretarsus tiny. Two heavy and stocky ventral setae (*av1* and *pv1*) present on tarsi II-IV. Each coxa I-III (Fig. 8) with normally present setae *av* and *pv* (appearing in posterior half of coxa I but *av* in anterior half and *pv* in posterior half of coxae II and III) and only *av* on coxa IV. Number of setae on legs I-IV (from coxa to tibia) as given by Prasad (1972): Leg I: 2-5-11-9-8, Leg II: 2-5-9-9-7, Leg III: 2-5-6-8-7 and Leg IV: 1-5-6-8-7. Chaetotaxy of genua I-IV and tibiae I-IV as in Table 4.

DISCUSSIONS

Dorsal shield, sexual dimorphism, and paedomorphosis in *Prasadiseius* – In the female of *P. achlora,* the dorsal shield is single, covered with a scale-like pattern, bi-laterally incised and cleaved

posterolateral to *j6* and anterior to *J2* near which roughly round sigilla sg, consisting of several small muscle scars, are present. These conditions are also present in the females of all species of *Prasadiseius*. Usually males are the same, but the male of *P. pholusis* expresses a paedomorphic condition, having 2 separate dorsal shields (anterior podonotal shield with 7 pairs of setae: *j3, j5, j6, z2, z4, z5,* and *s4* and small posterior dorsal shield with 2 pairs of setae: *J5* and *Z5*). This condition is often seen in the larva and protonymph of *Prasadiseius*. Other structures (single labrum, pair of internal malae around pharyngeal or oral opening) not seen.

Table 3. Measurements of distances between different setal pairs (μm) in a paratype female of *Prasadiseius achlora* (VP70-16).

Particulars	Female No. 1	Prasad (1972)
Distance measurements: D		
j3-j3 (Transverse)	72	Not reported
j4-j4 (Transverse)	Absent setae	Not reported
j5-j5 (Transverse)	13	Not reported
j6-j6 (Transverse)	52	Not reported
z2-z2 (Transverse)	103	Not reported
z4-z4 (Transverse)	135	Not reported
z5-z5 (Transverse)	65	Not reported
s4-s4 (Transverse)	171	Not reported
J2-J2 (Transverse), right absent	Not measured	Not reported
J5-J5 (Transverse)	36	Not reported
Z5-Z5 (Transverse)	70	Not reported
j3-j5 (Vertical)	68-73	Not reported
j6-J2 (Vertical)	91	Not reported
z2-z4 (Vertical)	64-66	Not reported
J2-J5 (Vertical))	81	Not reported
Distance measurements: V		
ST1-ST1 (Transverse)	39	Not reported
ST2-ST2 (Transverse)	64	Not reported
ST3-ST3 (Transverse)	53	Not reported
ST1-ST2 (Vertical)	51–54	Not reported
ST2-ST3 (Vertical)	31–32	Not reported
ST1-ST3 (Diagonal)	95–96	

Variation in location and morphology of setae in *Prasadiseius* – Species of *Prasadiseius* can show asymmetry in the presence of and position of dorsal setae. For instance, seta *j4* was absent on one side in *P. cocytes* (Prasad 2011) and seta *j5* may be located more anteriorly on one side. A similar condition is present in *P. achlora* (Figs. 4–6) in which seta *J2* is present on the left but absent on the right, and seta *j5* on the left is located anterior to right *j5*. Also of note is that the tip of seta *ST1* is bifurcate (Figs. 8, 12) which may be variation as it is present on one side only.

Challenging Otopheidomenidae – Species of this family either have a "phytoseiid-type" or "tubular type" sperm access system. The latter type is likely to be the "laelapid-type" in which a single sacculus is present, but as noted below, standard taxonomic studies under light microscopy have not yet detected a sacculus. As shown in Evans (1992), in the phytoseiid-type, a thread-like tubular "major duct" emerges from a "solenostome" posterior of coxa III on left and right side of body and each enters in an enlarged chitinized tubular "calyx" and then to a round "vesicle" for temporarily storing spermatophores. On other hand, in the laelapid-type, a single "sacculus" (or a less-well defined structure, the syncytium) is present in middle of opisthosoma in which the "tubulus annulatus" enters from left and right side of body. The minor duct, atrium, calyx and paired vesicles of the phytoseiid-type are absent in the laelapid-type and some other structures are present.

Table 4. Chaetotaxy of genua and tibiae I-IV of *Prasadiseius achlora* (VP70-16).

Character	Chaetotaxy
Genu I	2-2/1+2/1-1 or *al1+al2-ad1+ad2/av1-pd1+pd2/pv1-pl1* = 9
Tibia I	1-2/1+2/1-1 or *al1-ad1+ad2/av1-pd1+pd2/pv1-pl1* = 8
Genu II	2-2/1+2/1-1 or *al1+al2-ad1+ad2/av1-pd1+pd2/pv1-pl1* = 9
Tibia II	1-1/1+2/1-1 or *al1-ad1/av1-pd1+pd2/pv1-pl1* = 7
Genu III	1-2/1+2/1-1 or *al1-ad1+ad2/av1-pd1+pd2/pv1-pl1* = 8
Tibia III	1-1/1+2/1-1 or *al1-ad1/av1-pd1+pd2/pv1-pl1* = 7
Genu IV	1-2/1+2/1-1 or *al1-ad1+ad2/av1-pd1+pd2/pv1-pl1* = 8
Tibia IV	1-1/1+2/1-1 or *al1-ad1/av1-pd1+pd2/pv1-pl1* = 7

Although the sperm-access system was not visible in the present study, it has been seen before, partially, in this and all other species of *Prasadiseius* (Prasad, 1970a, b, 1972, 1973). All that can be seen are paired tubular structures arising on each side of body from a solenostome posterior of coxa III and extending towards the middle of the opisthosoma. At high magnification, each tube has a central lumen in middle of a thin walled tube which is narrow proximally and widens distally in middle of the opisthosoma (Figs. 29-33). The lateral walls may fold over along the length (Fig. 31). Although the sacculus was not seen, this does not mean it is not present, but it instead may be an unchitinized syncytium as present in the *Varroa destructor* (Varroidae) and *Hattena cometis* (Ameroseiidae) (Alberti and Hänel 1986; Di Palma *et al.* 2013).

Lindquist, Krantz, and Walter (2009: 151, 164) treated the Otopheidomenidae as one of the four families of the Phytoseioidea (i.e. Blattisociidae, Otopheidomenidae, Phytoseiidae and Podocinidae). The phytoseiid-type sperm access sperm access system is the main character of the Phytoseioidea, and although there was no specific diagnosis for Otopheidomenidae, they followed Zhang (1995) in defining it by the following features: (1) Fixed cheliceral digit absent or reduced or less than 1/4 th length of slender, pointed movable digit; (2) Tritosternum commonly absent or reduced to a basal remnant; (3) Anal opening terminal or occasionally subterminal, usually in anal shield; and (4) Parasites of insects. However, they also suggested that the Otopheidomenidae could be diphyletic because members of subfamilies Katydiseiinae and Otopheidomeninae did not appear to have phytoseiid-type spermathecal system. The observations presented here for *Prasadiseius* support this hypothesis, although somewhat weakly, as only tubuli are visible.

Within the Otopheidomenidae, *Prasadiseius* is well-defined and its monophyly is supported by the following features: (1) Ectoparasites of Sphingidae, (2) Female with single dorsal shield having short bilateral incision between setae *j6-J2* anterior to sigilla sg, (3) Hypotrichous dorsal idiosoma (with 12-14 pairs including *r3* and r5) and hypotrichous ventral idiosoma [with 7 pairs of setae, including 3 pairs sternal, 1 pair genital, 3 circumanal setae (counted as 2 pairs), and 1 pair opisthosomal between genital and anal shields), (4) Tectum round and smooth anteriorly; (5) Capitular setae and palpal apotele absent, (6) Palp trochanter without seta, femur with 4 and genu with 5 setae; (7) Fixed digit very much reduced and movable digit narrowly elongate having several teeth (7-14), (8) Tritosternum absent, (9) Three pairs of sternal setae either on shield or on integument, (10) Anal shield with terminal anus, (11) Tubular type sperm access system, and (12) Hypotrichy of leg segments. The strength of these characters lead this author to believe that the genus *Prasadiseius* could represent a higher taxon as a tribe within the Otopheidomeninae.

Finally, the species of Katydiseiinae and Treatiinae comprise enigmatic species that do not fall in the typical diagnostic features of Otopheidomenidae as established by Treat (1956), which apply to the Otopheidomeninae as currently defined. The Treatiinae may instead be more closely related to the Phytoseiidae, as species in this group have sometimes been treated. On the other hand, the three species of Katydiseiinae are more enigmatic, and could either be seen as the sister-group to the Otopheidomeninae, a taxon with different non-phytoseioid sister-group relationships, a polyphyletic group or not belonging to Otopheidomenidae *sensu* Treat (1955). A detailed taxonomic study is

needed to resolve these problems.

List of 30 species of Otopheidomenidae of the world known till December 31, 2017 (Subfamilies, genera and species in alphabetical order).

Subfamily Katydiseiinae Fain & Lukoschus, 1983: 174.

1. *Eickwortius termes* Zhang, 1995: 244 - Kenya.
2. *Katydiseius nadchatrami* Fain and Lukoschus, 1983: 174 - Malaysia.
3. *Orthopteroseius sinicus* Mo, 1996: 201 - China.

Subfamily Otopheidomeninae Chant, 1965: 353.

1. *Noctuiseius batoridgi* Prasad, 1987: 245 - Philippines.
2. *Noctuiseius treati* Prasad, 1968: 441 - Oahu Island, Easter Island (USA).
3. *Otopheidomenis ascalaphae* Syed and Goff, 1983: 316 - Oahu Island (USA).
4. *Otopheidomenis zalelestes* Treat, 1955: 556 - AL, FL, GA, MS, NJ, NY (USA).
5. *Prasadiseius achlora* (Prasad, 1972: 346) - Uganda.
6. *Prasadiseius aporodes* (Prasad, 1972: 348) - Uganda.
7. *Prasadiseius cocytes* (Prasad, 1970a: 29) - Brazil, Colombia, Ecuador, Guatemala, Malaysia, Mexico, Peru.
8. *Prasadiseius donahuei* (Prasad, 1970a: 31) - Cuba, Guatemala, Mexico, Peru, USA, Venezuela.
9. *Prasadiseius incanus* Prasad and Guanilo *in* Prasad, Guanilo, Grados, and Prasad, 2011: 109 - Peru.
10. *Prasadiseius indicus* (Prasad, 1973: 194) - India.
11. *Prasadiseius kayosiekeri* (Prasad, 1970b: 1211) - Brazil, Guatemala, Honduras, Panama Canal Zone, Peru.
12. *Prasadiseius pholusis* (Prasad, 1970b: 1213) - Bolivia, Ecuador, Guatemala, Honduras.

Subfamily Treatiinae Wainstein, 1972: 453.

1. *Hemipteroseius adleri* Costa, 1968: 1 - Israel, Lithuania, Poland.
2. *Hemipteroseius ageneius* Treat, 1965: 7 - Antigua, Cuba, Guadeloupe, Haiti, Martinique, Mona, Puerto Rico, Culebra.
3. *Hemipteroseius antilleus* Treat, 1965: 3 - Cuba, Haiti, Jamaica.
4. *Hemipteroseius dysderci* (Evans, 1963: 609) - Trinidad [= *Entomoseius dysderci*].
5. *Hemipteroseius indicus* (Krantz and Khot, 1962: 536) - Democratic Republic of Congo, India, Israel [Syn.: *Hemipteroseius vikrami* Menon, *in* Menon, Joshi, Mohammad and Ramamurthy, 2011: 54 - India; per Prasad, 2017].
6. *Hemipteroseius parvulus* Treat, 1965: 6 - Haiti, Puerto Rico.
7. *Hemipteroseius sabbaticus* Treat, 1965: 12 - Panama. [*Hemipteroseius vikrami* Menon, *in* Menon, Joshi, Mohammad, and Ramamurthy, 2011: 54 - India] Syn.: *Hemipteroseius indicus* (Krantz and Khot, 1962: 536).
8. *Hemipteroseius womersleyi* Evans, 1963: 612 - Nigeria.
9. *Nabiseius arabicus* Negm and Alatawi, 2013: 185 - Saudi Arabia.
10. *Nabiseius duplicisetus* Chant and Lindquist, 1965: 516 - Chile.
11. *Nabiseius melinae* Halliday, 1994: 347 - Australia.
12. *Nabiseius rivnayae* Amitai and Swirski, 1980: 5 - Israel.
13. *Treatia dieuches* Ramsay, 1973: 3 - Tanzania.
14. *Treatia indicus* Ghai and Gupta, 1984: 171 – India, re-instated. syn.: *Treatia ghaiguptaorum* Zhang, 1995: 242, ERROR, new name for homonym *Treatia indica* Ghai and Gupta, 1984: 171 with *Treatia indica* Krantz and Khot, 1962: 536 which now has been transferred to *Hemipteroseius* as *H. indicus*].
15. *Treatia phytoseioides* (Baker and Johnston) [= *Laelaptonyssus phytoseioides* Baker and Johnston, 1959: 275–277, USA; Single female holotype collected on Hemiptera in Oakland, FL, USA, on September 8, 1958].

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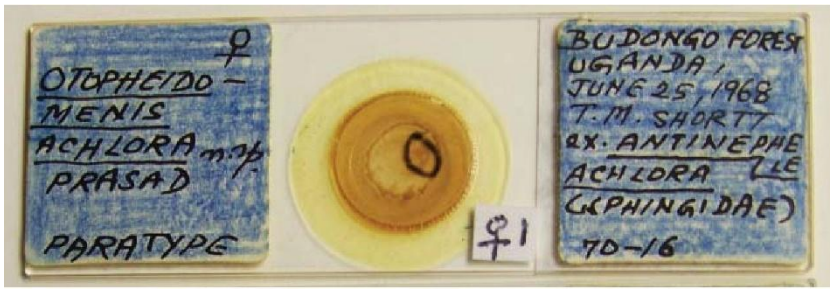


Figure 1. *Prasadiseius achlora* – Slide with paratype female #1 mounted in Hoyer's medium in 1970, re-examined, and photographed in December 2017 [VP70-16, 100×].

Figures 2–3. *Prasadiseius achlora* – 1. Entire female in dorsal view; 2. Same female in ventral view – both in low magnifications. Female is mounted dorsal side up. Thus, left side legs and setae are called left even if seen in ventral view showing sternal and genital shields [Paratype female #1, VP70-16, 100×].

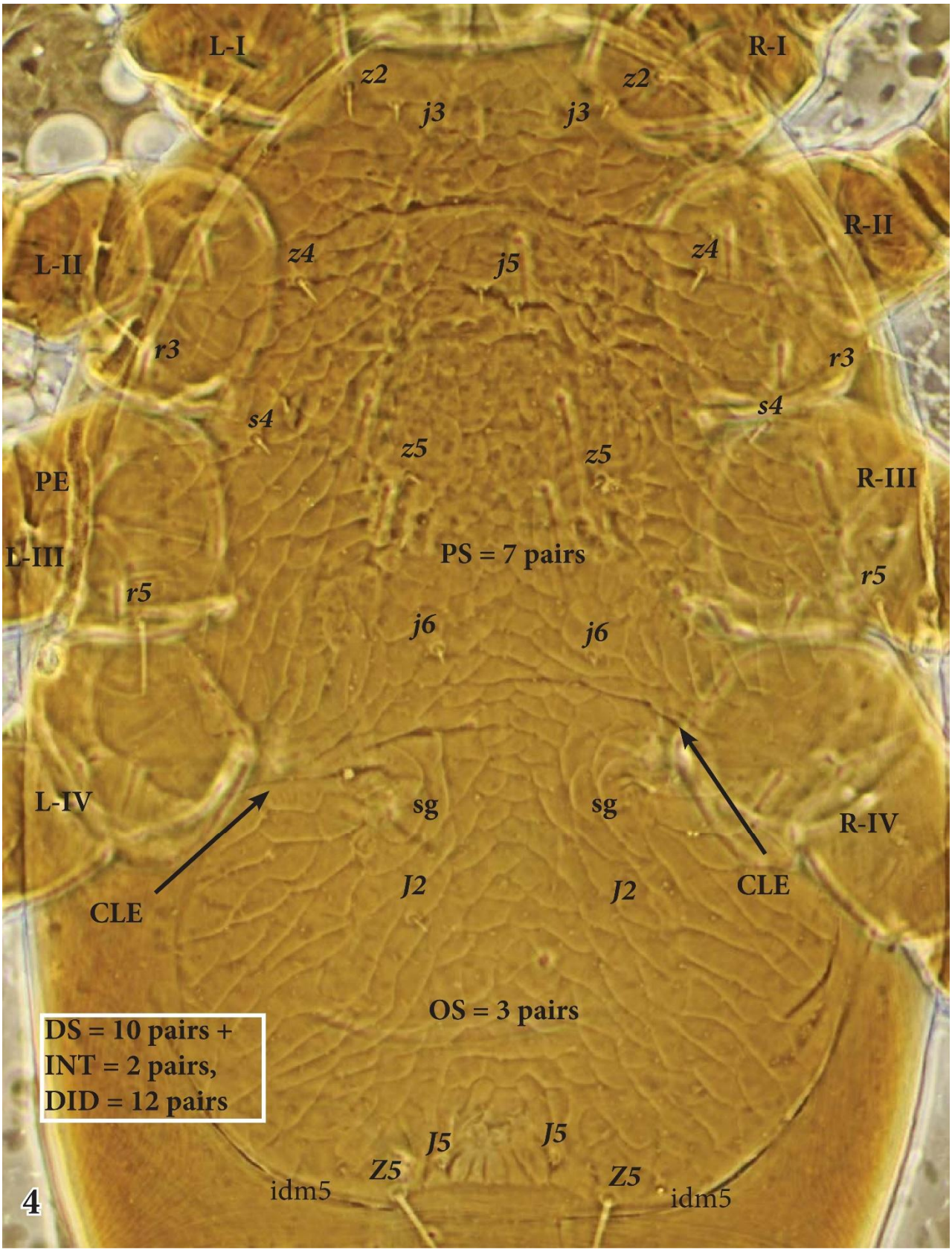
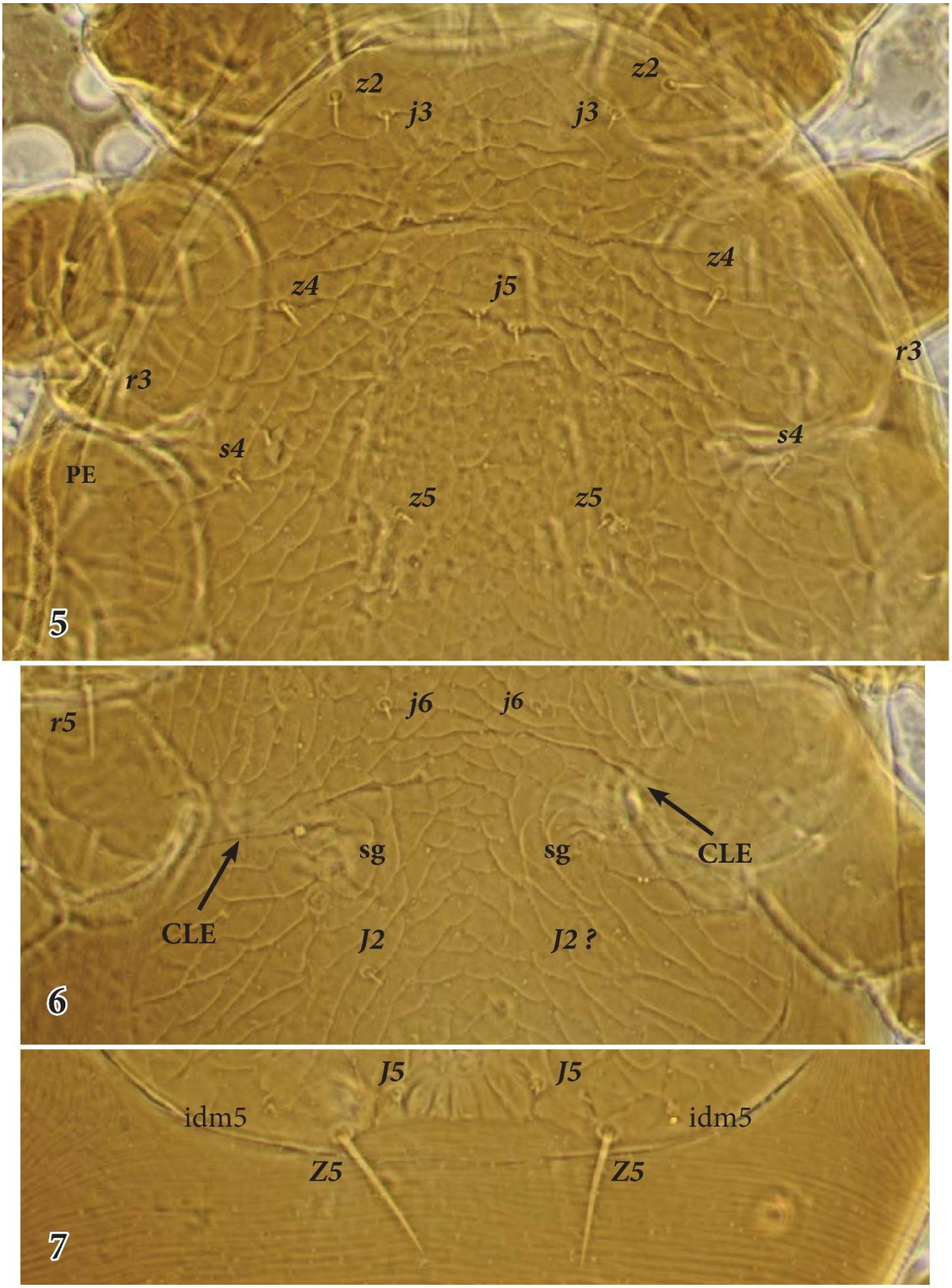
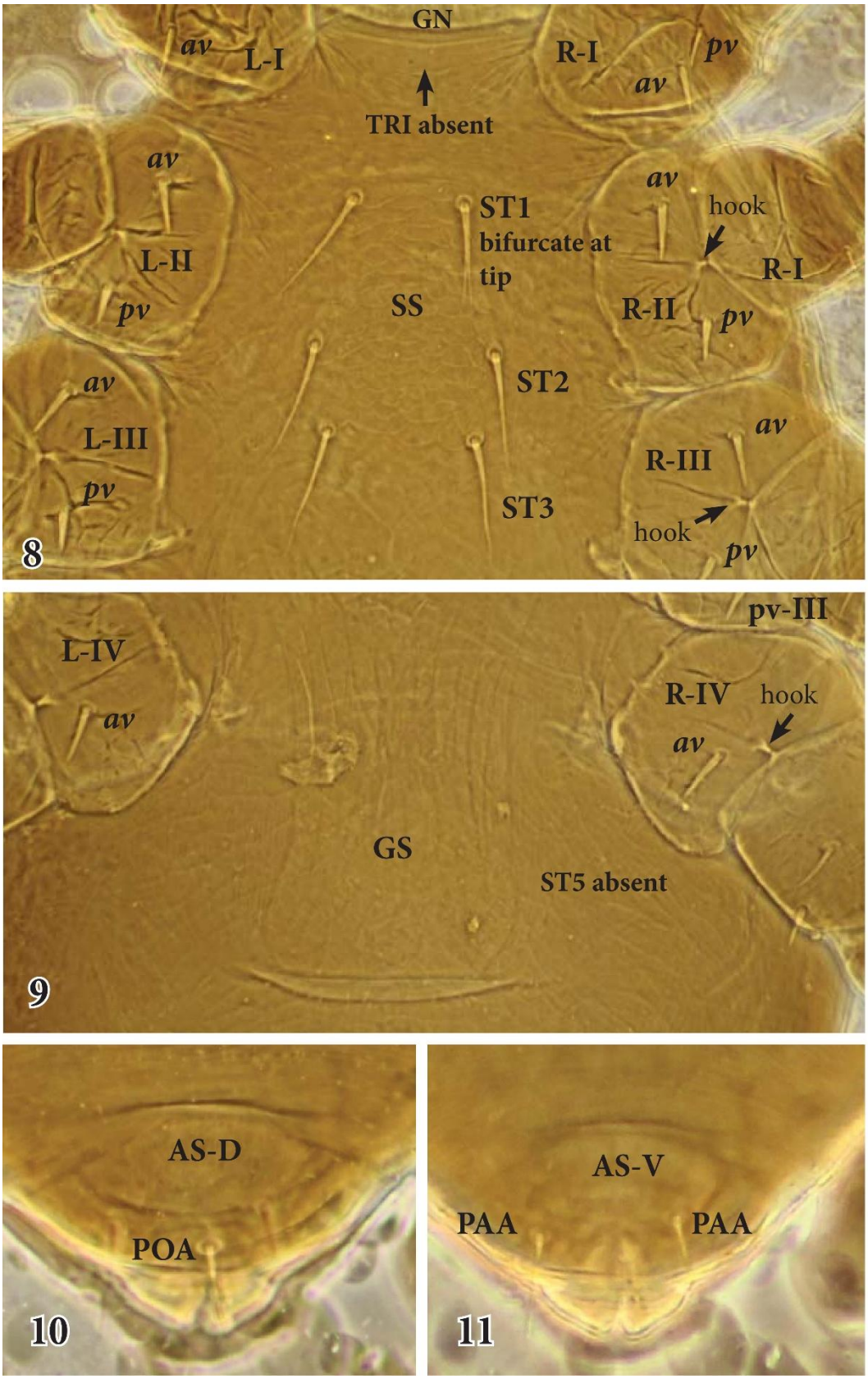


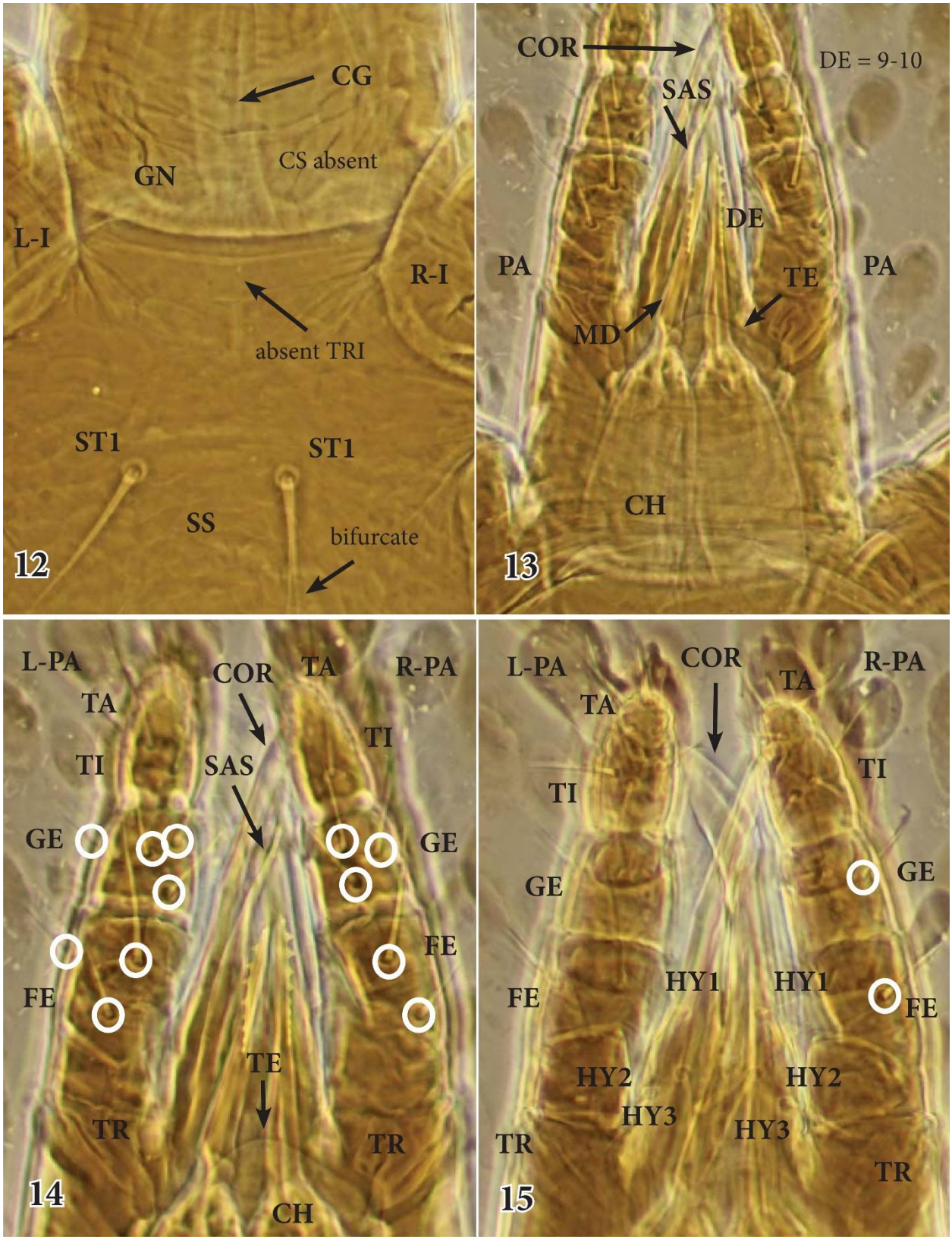
Figure 4. *Prasadiseius achlora* (dorsal) – Dorsal idiosoma (DID) with 12 pairs of setae of which l0 pairs on laterally cleaved (CLE) dorsal shield (DS) and 2 pairs on integument (INT). Peritreme (PE) extending slightly anterior to seta *r3*. Most sigilla present but barely seen. A tiny pore (idm5) with a minute seta-like structure present [Paratype female #1, VP70-16, 200×].



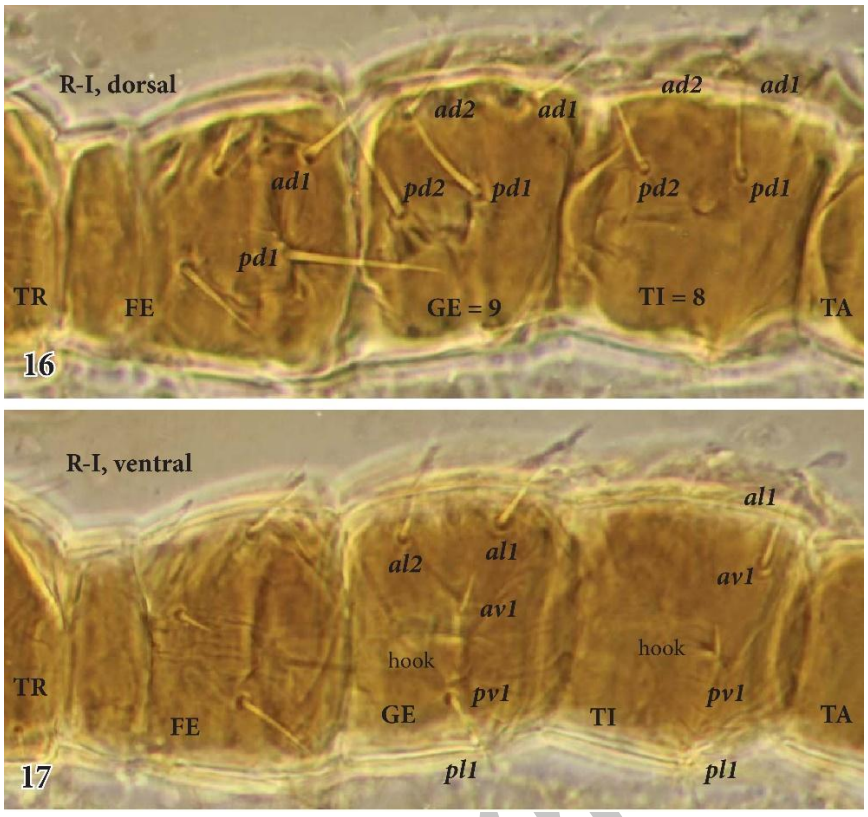
Figures 5-7. *Prasadiseius achlora* (dorsal) – Parts of enlarged dorsal shield (5. anterior, 6. middle, 7. posterior) having scale-like pattern and respective setae. Lateral cleavage of dorsal shield (CLE) just anterolateral to sigilla (sg) seen. Left peritreme extending anterior to *r3*. Seta *r5* on left and *r3* on right along with many barely seen sigilla. A tiny pore (idm5) with a minute seta-like structure present [Paratype female #1, VP70-16, 400×].



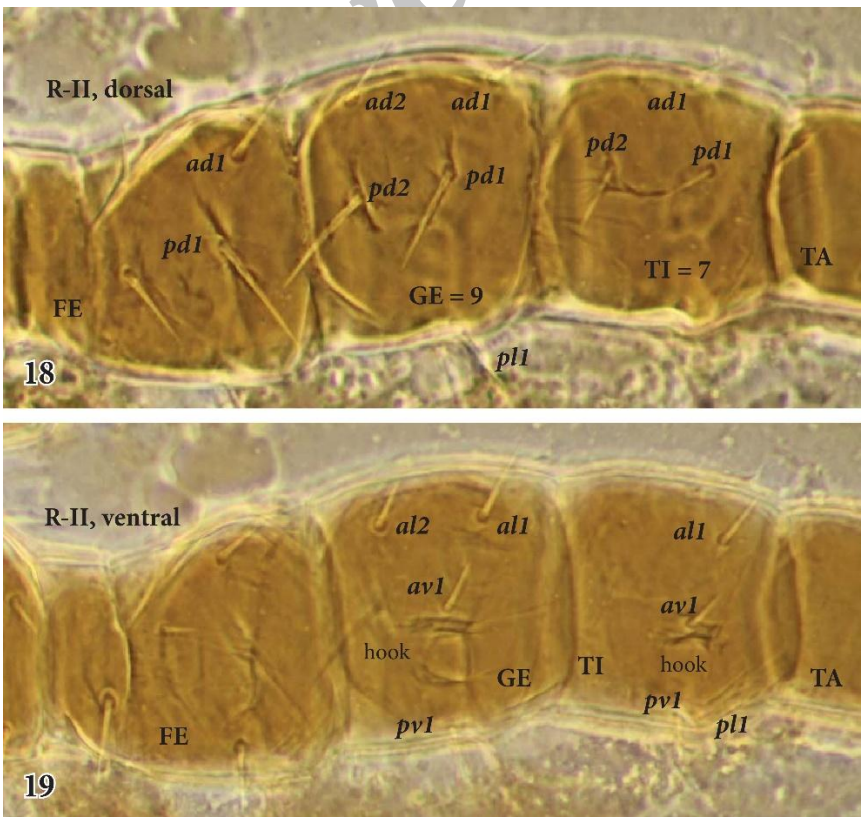
Figures 8-11. *Prasadiseius achlora* (Ventral) – 8. Absent tritosternum (TRI) and sternal shield (SS) with 3 pairs of ST1-ST3 on it; 9. Genital shield (GS) and absent *ST5;* 10. Anal shield (AS) in dorsal view with terminal anus and postanal seta (POA); 11. Same anal shield in ventral view with terminal anus and paraanal setae (PAA). Setae and ventral hook in middle of each coxa also seen [Paratype female #1, VP70-16, 400×].



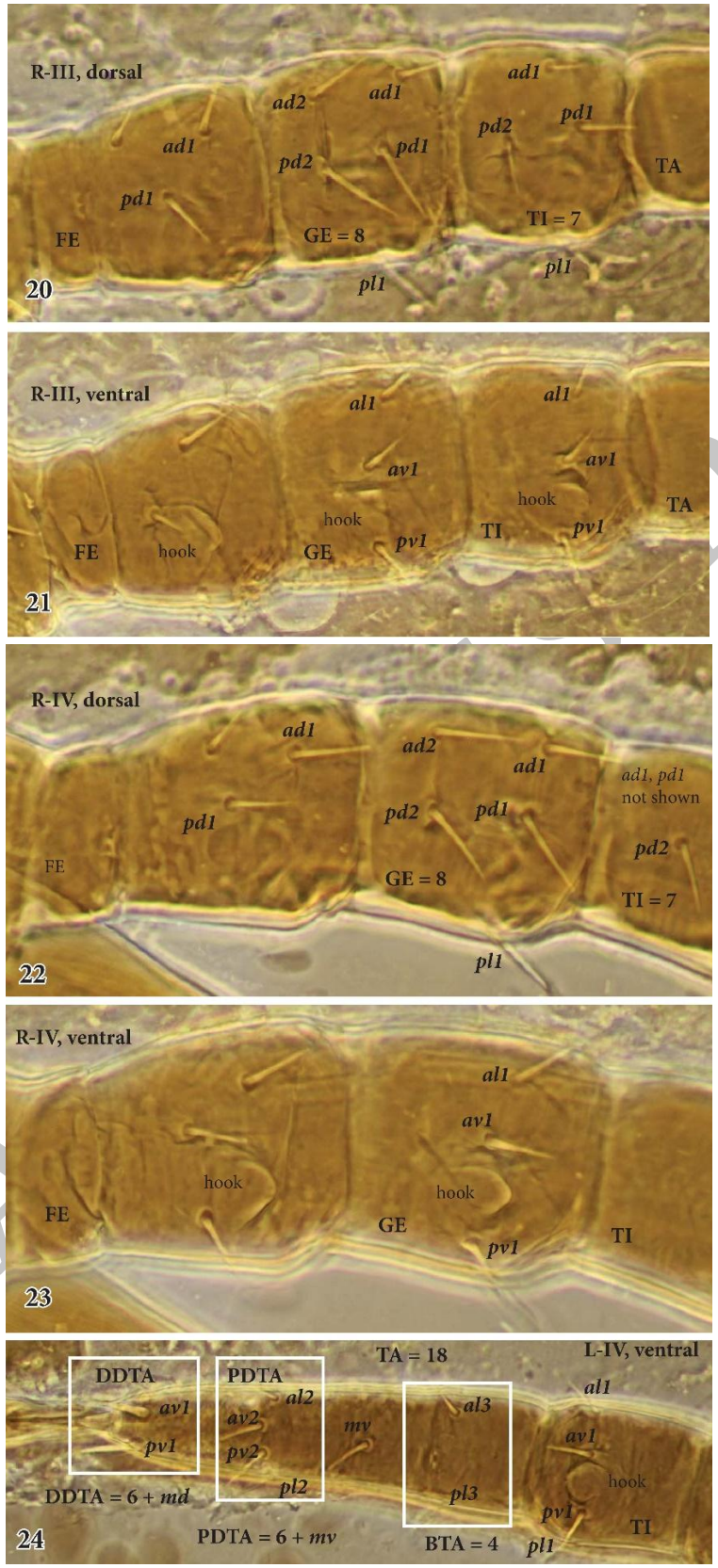
Figures 12-15. *Prasadiseius achlora* (Ventral) – Gnathosoma (GN) in dorsal and ventral views with round tectum (TE), chelicerae (CH) having 9–10 denticles on movable digit (MD), elongate and distally notched corniculi (COR), long and pointed salivary stylets (SAS), hypostomal setae HY1-HY3, barely visible capitular gutter (CG), absent capitular seta (CS), palps (PA), and absent tritosternum [Paratype female #1,VP70-16, 400×].



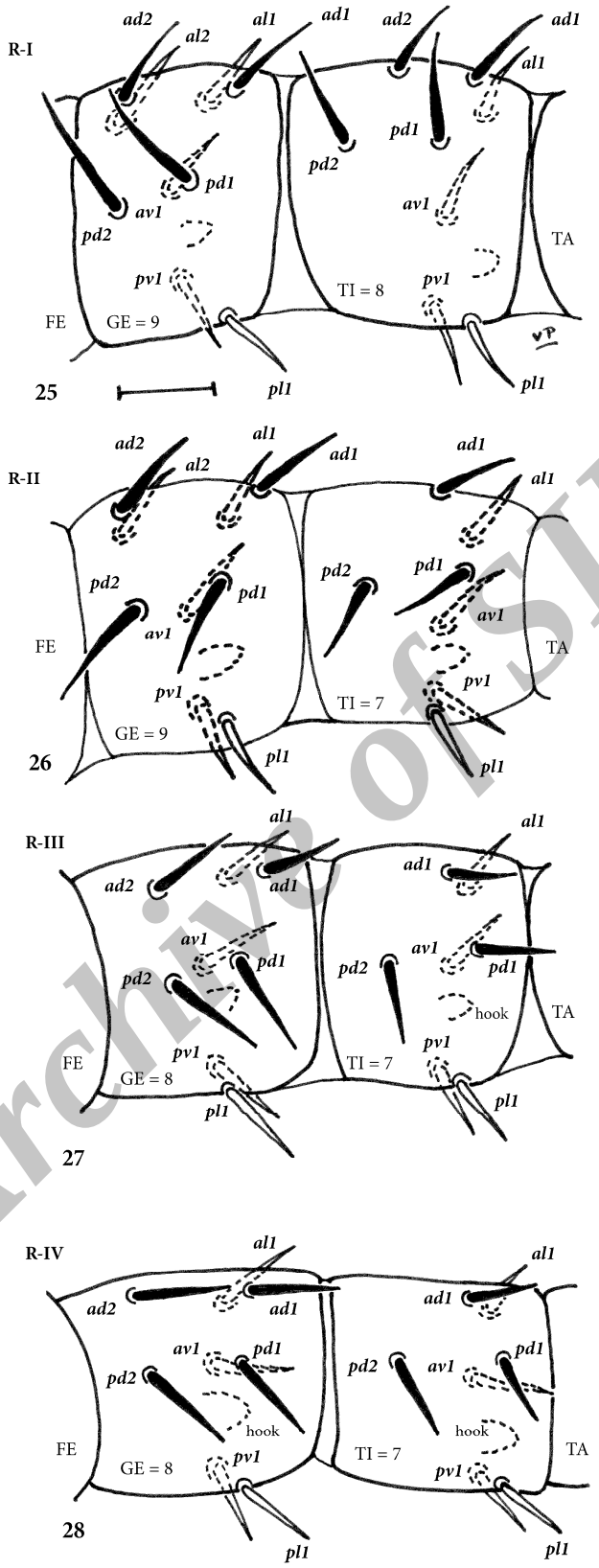
Figures 16–17. *Prasadiseius achlora* (Right leg I) – 16. Dorsal and 17. Ventral views showing setae on genu (GE = 9) and tibia (TI = 8). A triangular and distally pointed ventral hook in middle of each genu and tibia also seen [Paratype female #1, VP70-16, 400×].



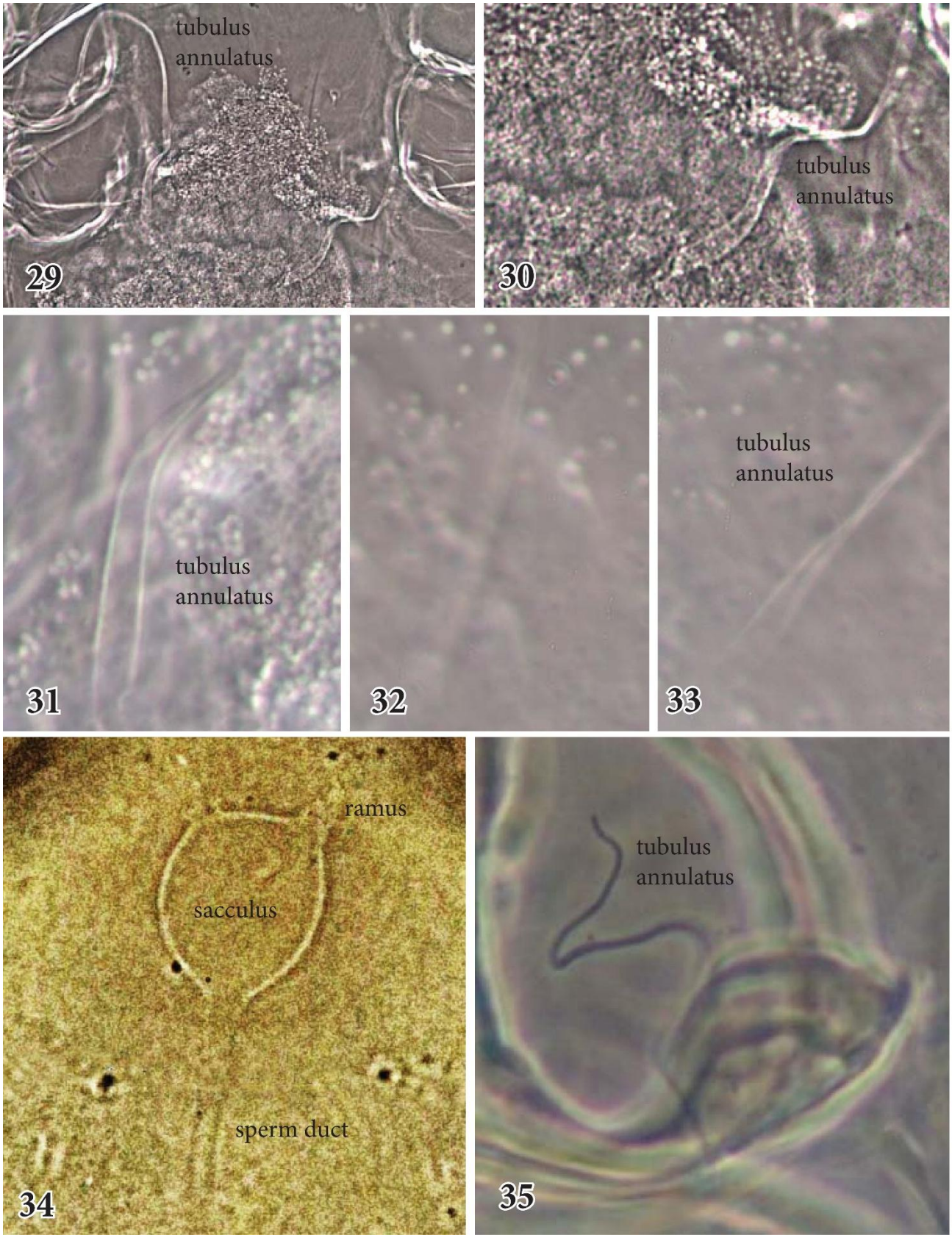
Figures 18–19. *Prasadiseius achlora* (Right leg II) – 18. Dorsal and 19. Ventral views showing setae on genu (GE = 9) and tibia (TI = 7). A triangular and distally pointed ventral hook in middle of each femur, genu, and tibia also seen [Paratype female #1, VP70-16, 400×].



Figures 20–24. *Prasadiseius achlora* – 20. Dorsal and 21. Ventral views (Right leg III) showing setae on genu (GE = 8) and tibia (TI = 7). A triangular and distally pointed ventral hook in middle of each femur, genu, and tibia is also seen; 22. Dorsal and 23. Ventral views (Right leg IV) with setae on genu (GE = 8) and tibia (TI = 7); 24. Tarsus of left leg IV in ventral view with pair of heavy setae *av1* and *pv1* at ventral tip. A triangular and distally pointed ventral hook in middle of each femur, genu, and tibia also seen (BTA = Basitarsus, DDTA = Distal distitarsus, PDTA = Proximal distitarsus [Paratype female #1, VP70-16, 400×].



Figures 25–28. *Prasadiseius achlora* (Right legs) – 25. Genu I with 9 setae (Ge = 9) and tibia I with 8 setae (Ti = 8); 26. Genu II with 9 setae (Ge = 9) and tibia II with 7 setae (Ti = 7); 27. Genu III with 8 setae (*Ge* = 8) and tibia III with 7 setae (Ti = 7); 28. Same number of setae present on genu IV (GE = 8) and tibia IV (TI = 7). A triangular and distally pointed ventral hook present slightly posterior to middle of each segment and therefore all *ad* and *pd* setae seen in anterior half of segment [Paratype female #1,VP70-16, bar = 20 µm, all figures 24–27].



Figures 29–36. Sperm access system in females of some mites. Otopheidomenidae: 29–31. *Prasadiseius cocytes* (VP09-22); 32 and 33. *P. incanus* (VP10-33); Ascidae: 34. *Arctoseius babenkoi* (Makarova, 2000); Ameroseiidae: 35. *Neocypholaelaps* sp. (OSU) [Figs. 29, 30, and 35 = 400×; 31-33 = 1000×].

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بازتوصیف پاراتایپ مادهٔ *Prasadiseius achlora* (Prasad, 1972) (Acari: Otopheidomenidae)

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چکیده

گونهٔ *Prasadiseius achlora* (Prasad, 1972) بر اساس مایکروگرافهای تصویری نمونه پاراتایپ ماده بازتوصیف شد. کتوتاکسی ایدیوزوما و زانوها و ساق‌ها شامل تصحیحاتی در توصیف نخستین ارایه می‌شود. مایکروگرافهای تصویری تهیه شده از سامانهٔ تلقیح ماده نشان می‌دهد که گونه‌های *Prasadiseius* به احتمال «لاپید-تایپ» هستند اما کیسهٔ ذخیره دیده نمی‌شود که به ظاهر کیتینی نشده است.

واژگان کلیدی: کتوتاکسی زانو و ساق؛ Katydiseiinae ؛ موهای r3 و Z5؛ *Messor* ؛ سامانهٔ دریافت اسپرم؛ کنهٔ اسفینجید.

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