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A re-evaluation of the genera *Aplonobia* Womersley and *Paraplonobia* Wainstein (Acari: Tetranychidae) with a description of a new species

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Original research

ABSTRACT

The genera *Aplonobia* and *Paraplonobia* are redefined due to confusion surrounding the classification of several morphologically intermediate species. Following our revision of these genera, their distinction is based on the form of the peritremes, which are anastomosing in *Aplonobia* and simple in *Paraplonobia*. As a result, the subgenus *Paraplonobia* (*Anaplonobia*) is treated as a synonym of *Aplonobia* and the subgenus *Parapolonobia* (*Brachynychus*) is moved to *Aplonobia*. A new species of *Aplonobia*, namely *Aplonobia aria* **sp. nov.**, is also described and illustrated based on females and a deutonymph collected from *Haloxylon ammodendron* (Amaranthaceae) in Southern Iran (Kerman Province). *Aplonobia tabukensis* (Kamran & Alatawi, 2016) is also recorded for the first time from Iran. *Paraplonobia* (*Anaplonobia*) *ambrosiae* (Tuttle, Baker & Abbatiello, 1976) [preoccupied by *Aplonobia ambrosiae* (Tuttle & Baker, 1968)] is renamed *Aplonobia neoambrosiae* **nom. nov.**

Keywords Amaranthaceae; *Anaplonobia*; *Haloxylon ammodendron*; spider mites; systematics
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Introduction

The Hystrichonychini are bryobiine spider mites with pad-like claws and empodia (Tetranychidae: Bryobiinae). Comprising 18 genera, the largest are *Aplonobia* Womersley, 1940, *Neopetrobia* Wainstein, 1956, and *Paraplonobia* Wainstein, 1960 (Migeon & Dorkeld 2022). Under the currently accepted classification (Smith Meyer 1974; Gutierrez 1985; Bolland *et al.* 1998), they differ from each other by somewhat minor differences: *Neopetrobia* has their f_1 setae displaced marginally, *Aplonobia* has dorsal setae set on strong tubercles, and *Paraplonobia* has smaller tubercles or none at all. As intermediate species exist, and the defining character states for the genera are subjective, the classification of species can be problematical, especially for *Aplonobia* and *Paraplonobia*.

Herein, we describe a new species of *Aplonobia*, classified into this genus after a reconsideration of genus definitions for *Aplonobia* and *Paraplonobia*. It is the first species of this genus recorded from the host plant *Haloxylon ammodendron* (C.A.Mey.) Bunge (Amaranthaceae).

Previously, within Iran, eight new species of Tetranychidae were described from Kerman (Khodayari *et al.* 2008; Mahdavi and Asadi, 2015; Mahdavi *et al.* 2013, 2018, 2021a,b; 2022a) and two species were recorded from *H. ammodendron* from Iran, namely *Augeriflechtmannia haloxyloni* Mahdavi, Latifi, Asadi & Auger, 2022 and *Aegyptobia carmania* Mahdavi & Asadi, 2023 (Mahdavi *et al.* 2022; Mahdavi & Asadi, 2023).

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Material and Methods

Our genus re-evaluation was based on a literature review dealing with the genera *Paraplonobia* and *Aplonobia*, including Kamran *et al.* (2016), who provided a useful overview of morphological variability in *Paraplonobia* as currently defined.

For the description of the new species, leaves and sheaths of *Haloxylon ammodendron* (Amaranthaceae) were collected in bags and brought to the laboratory. The dipping-washing-filtering method was used to remove the mites (Boller, 1984) and then was filtered through a sieve (400 Mesh), and the mites retained on the sieve were washed with 70% ethanol into a petri dish, then collected individually under a stereomicroscope and mounted in Hoyer's medium. Mites were identified with an Olympus® BX51 phase-contrast compound microscope. All measurements are given in micrometers (µm) as ranges; the measurements of the holotype are given in parentheses after the range of measurements for the paratypes. The drawings were made using a drawing tube attached to the microscope with 1000x and 1600x magnifications. The terminology and setal notations used for the description follow that of Lindquist *et al.* (1985). Body size was measured between dorsal setae v_2–h_1 for length and between sc_2–sc_2 for width (Saito *et al.* 1999). Distances between setae were measured as the distance from the inside edge of one setal base to the other (i.e., the minimum distance between two setal bases). Leg setal numbers are written as the total number of setae, including eupathidia, followed by the additional number of solenidia in parentheses. Depositories are cited using the following abbreviations:

SBUK — Collection of the Acarology Laboratory, Shahid Bahonar University of Kerman, Kerman, Iran.

ACASI — carological Collection, Acarological Society of Iran (ASI), Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Results and discussion

Taxonomic status of the genera *Aplonobia* and *Paraplonobia*

Aplonobia and *Paraplonobia* have a confused taxonomic history that is intertwined with the subgenera *Neopetrobia* (*Langella*) Wainstein, 1960*, Paraplonobia* (*Anaplonobia*) Wainstein, 1960 and *Paraplonobia* (*Brachynychus*) Mitrofanov & Strunkova, 1971, as discussed by Khanjani *et al.* (2017). Adding to confusion around genus concepts, the current classification differs markedly from the original definitions of Wainstein (1960). Originally, Wainstein (1960) divided *Aplonobia* into three subgenera: *Anaplonobia* Wainstein, with empodia shortened and bearing just one group of tenent hairs (versus a long empodium with multiple groups of tenent hairs in the other two subgenera); *Paraplonobia* Wainstein (with unbranched peritremes and short dorsal setae set on small tubercles or no tubercles at all); and *Aplonobia* s.str. (with anastomosing peritremes and dorsal setae long and on large tubercles). Smith Meyer (1974) recognized each of Wainstein's subgenera as separate genera and provided new diagnoses, but instead emphasized the size of the tubercles (large in *Aplonobia*, small or absent in *Anaplonobia* and *Paraplonobia*) over the form of the peritremes (simple or anastomosing in *Aplonobia*, anastomosing in *Anaplonobia*, simple in *Paraplonobia*). The form of the empodia was discarded as diagnostic character, with importance placed instead on the combination of small tubercles and anastomosing peritremes. Later, Gutierrez (1985) demoted *Brachynychus* and *Anaplonobia* back to subgenera, but under *Paraplonobia*, thus further underlining the importance of dorsal tubercles over the form of the peritremes. That is, *Aplonobia* was defined by having strong tubercles and *Paraplonobia*, including *Brachynychus* and *Anaplonobia* as subgenera, was defined by having small tubercles or none at all.

At the time of Smith Meyer (1974), most described taxa seemed to fall reasonably neatly into their genera. However, new taxa have challenged the definitions of these genera, as the size of the tubercles is sometimes open to interpretation, as is apparent in the keys of Gutierrez

(1985). In these keys, *Aplonobia* have "some or all dorsal setae set on strong tubercles" and *Paraplonobia* have "dorsal setae not set on strong tubercles" which, at the very least, asks for a judgment on what defines a strong tubercle and whether any of the dorsal setae – which may be on tubercles of different sizes – would be regarded as "strong". Not surprisingly, species of *Paraplonobia* with tubercles can be difficult to classify. We also note that the type species of *Paraplonobia*, *Paraplonobia* (*Paraplonobia*) *echinopsili* Wainstein, 1960, is one of these intermediate species as it has its dorsal setae set on small tubercles.

Due to this confusion, we propose to define *Aplonobia* and *Paraplonobia* based on having anastomosing peritremes (*Aplonobia*) or simple peritremes (*Paraplonobia*). The presence of anastomosing peritremes is much less open to interpretation: although some peritremes anastomose less in certain species, whether or not a peritreme is anastomosing is more obvious. We define simple peritremes as those that are a single linear line of chambers. Simple peritremes may bend but they are never divided into a multi-chambered terminal structure. In their most basic form, an anastomosing peritreme in *Aplonobia* divides just once, as in the circular structure of *Aplonobia eurotiae* **comb. nov.** (Mitrofanov & Strunkova, 1975) and the two lines of closely appressed chambers in *Aplonobia* (*Brachynychus*) *cousiniae* **comb. nov.** (Mitrofanov & Strunkova, 1971) (Çobanoğlu *et al.* 2021). In the new species, the peritreme divides just two or three times (Fig. 3b). Most species have peritremes that terminate in a complex, bulbous, multi-chambered structure.

Thus, *Paraplonobia* is narrowed to exclude *Paraplonobia* (*Anaplonobia*) and *Paraplonobia* (*Brachynychus*), which are moved to *Aplonobia.* As the boundary between *Aplonobia* and *Paraplonobia* (*Anaplonobia*) was vague (i.e. based on the strength of dorsal tubercles) we consider *Anaplonobia* a junior synonym of *Aplonobia.* We also excluded the possibility of retaining *Anaplonobia* as a subgenus of *Aplonobia* sensu Wainstein (1960). Under his original concept, *Aplonobia* (*Anaplonobia*) has empodia with just one group of tenent hairs while *Aplonobia* (*Aplonobia)* has empodia with at least two groups of tenent hairs. This feature possesses diagnostic value but we perceive a grade between species. In Wainstein (1960), the subgenus *Anaplonobia* was based on *A. acharis* and *A. calame*. The type species, *A. calame*, is unique in having what appears to be one pair of tenent hairs (Pritchard & Baker 1955). In contrast, *A. acharis* is little different from several other taxa, except that Wainstein (1960) interpreted its five pairs of tenent hairs as one group as they are clustered at their tips. While a monotypic subgenus for *A. calame* is an option, we prefer to avoid this as another problem is the lack of empodial drawings in many descriptions (e.g., Tuttle & Baker 1968; Baker & Tuttle 1972; Tuttle *et al.* 1976). Thus, without a full revisionary work based on type specimens, the original concept of Wainstein (1960) is untenable.

Genus *Aplonobia* Womersley, 1940

Aplonobia Womersley, 1940:252; Pritchard & Baker, 1955:58; Wainstein, 1960: 139; Tuttle & Baker, 1968:47.
Type species — *Tetranycopsis histricina* Berlese.
Paraplonobia (*Anaplonobia*) (Wainstein, 1960) **syn. nov.**

Genus diagnosis

Peritreme anastomosing distally; body oval; prodorsum without lobes and with three pairs of setae, opisthosoma with 10 pairs of setae; setae f_1 and c_3 in normal position; claws and empodium pad-like each with tenent hairs; tarsus of leg I with 2 sets ofduplex setae; coxal setal formula usually 3-3-1-1, rarely 4-3-2-2 (subgenus *Brachynychus*); dorsal setae with/without tubercles (Table 1), tubercles sometimes large.

Remarks

Aplonobia is distinguished from *Paraplonobia* by the form of the peritreme (anastomosing in *Aplonobia vs.* simple in *Paraplonobia*)

Genus *Paraplonobia* Wainstein, 1960

Aplonobia (*Paraplonobia*) Wainstein, 1960: 140.
Paraplonobia: Tuttle and Baker 1968: 48, Smith Meyer 1974: 119, Chaudhri *et al.* 1974: 28, Gutierrez 1985: 75, Bolland *et al.* 1998: 7.
Type species — *Aplonobia* (*Paraplonobia*) *echinopsili* Wainstein, 1960 by original designation.

Genus diagnosis

Peritremes simple; body oval; prodorsum without lobes and with three pairs of setae, opisthosoma with 10 pairs of setae; setae f_1 and c_3 in normal position; claws and empodium pad-like each with tenent hairs; tarsus of leg I with 2 sets ofduplex setae; coxal setal formula usually 3-3-1-1. Dorsal setae with/without tubercles.

Note: Only two species with small tubercles (*P.* (*P.*) *echinopsili* Wainstein, 1960 and *P.* (*P.*) *penicillatus* Chaudhri, Akbar & Rasool, 1974).

Remarks

As noted above, the peritremes of *A. cousiniae* and *A. eurotiae* are considered anastomosing because they branch. However, previous authors have considered these peritremes differently. Interpretations of the peritreme of *A. cousiniae* have varied, being multi-chambered in Mitrofanov & Strunkova (1971), anastomosing in Meyer (1974) and simple in Meyer (1987). Here, we consider the termination of the peritreme anastomosing because it divides into two lines of chambers. For *A. eurotiae*, the original description shows two series of chambers along the peritrematal stem that divide distally and form a circle. The specimens examined by Çobanoğlu *et al.* (2021) may need re-evaluation as no chambers are shown, but their peritreme does branch distally before reconnecting to form a circle. Thus, in both Mitrofanov & Strunkova (1975) and Çobanoğlu *et al.* (2021), *A. eurotiae* has an anastomosing peritreme.

Our re-evaluation of *Aplonobia* and *Paraplonobia* creates a homonym: *Paraplonobia* (*Anaplonobia*) *ambrosiae* (Tuttle, Baker & Abbatiello, 1976) [preoccupied by *Aplonobia ambrosiae* (Tuttle & Baker, 1968)] is renamed *Aplonobia neoambrosiae* **nom. nov.**

Key to the genera and subgenera of *Paraplonobia/Aplonobia* and near genera

The following key begins at couplet 12 of Bolland *et al.* (1998, p. 7) and includes *Geogiobia*, which was re-instated as a genus by Zhovnerchuk & Auger (2019).

1. Many coxal (11-9-9-9) and ventral setae, 1 species ..... *Tauriobia* Livshitz & Mitrofanov, 1967
— Coxal setae formula not exceeding 4-3-2-2 2

2. Setae c_3 moved in lateral position, posterior to c_2 setae, forming an almost longitudinal arrangement with c_2 and e_2 setae, 8 species ..... *Georgiobia* Wainstein, 1960
— Setae c_3 in normal position 3

3. Peritremes termination simple, 10 species ..... *Paraplonobia* Wainstein, 1960
— Peritreme termination anastomosing, 53 species ..... *Aplonobia* Womersley, 1940 – 4

4. Coxal setae formula not exceeding 3-3-1-1, 52 species ..... *Aplonobia* (*Aplonobia*) Wainstein, 1960
— Coxal setae formula 4-3-2-2, 1 species ..... *Aplonobia* (*Brachynychus*) Mitrofanov & Strunkova, 1971

Table 1 Species of the genera of *Aplonobia* and *Paraplonobia*, their host plants, and the country of the original description .

Species	Host plant	Country
Genus *Aplonobia* Womersley (peritreme anastomosing distally)		
***Aplonobia* (*Aplonobia*) Wainstein, 1960 (Coxal setal formula not exceeding 3-3-1-1)**		
A. (*A.*) *abbatielloi* Baker & Tuttle, 1994	*Ambrosia dumosa*	USA
A. (*A.*) *alkalisalinae* Tan & Lu, 1996	*Bassia scoparia* , *Kalidium foliatum* , *Salsola*	China
A. (*A.*) *ambrosiae* (Tuttle & Baker, 1968)	*Ambrosia confertiflora*	USA
A. (*A.*) *anisa* Pritchard & Baker, 1955	*Artemisia*	USA
A. (*A.*) *aria* Mahdavi & Asadi **sp. nov.**	*Haloxylon ammodendron*	Iran
A. (*A.*) *aughrabiensis* Smith Meyer, 1987	*Passerina corymbosa*	South Africa
A. (*A.*) *carinati* Smith Meyer, 1987	*Dysphania carinata*	South Africa
A. (*A.*) *carthaeae* Stathakis, Vretto & Panou, 2022	*Ballota acetabulosa*	Greece
A. (*A.*) *citri* Smith Meyer, 1974	*Citrus sinensis*	South Africa
A. (*A.*) *crispipilis* Auger & Flechtmann, 2009	*Limoniastrum guyonianum, Limonium, Salsola*	Tunisia
A. (*A.*) *deina* Pritchard & Baker, 1955	*Balsamorhiza sagittata*	USA
A. (*A.*) *digitata* Smith Meyer, 1974	*Mastersiella digitata*	South Africa
A. (*A.*) *dyssodiae* (Tuttle & Baker, 1968)	*Dyssodia papposa*	USA
A. (*A.*) *haplopappi* (Tuttle & Baker, 1968)	*Xanthisma gracile*	USA
A. (*A.*) *histricina* (Berlese, 1910)	Unknown	Australia
A. (*A.*) *honiballi* Smith Meyer, 1974	*Citrus sinensis*	South Africa
A. (*A.*) *hyderabadiensis* (Chaudhri, Akbar & Rasool, 1974)	Unknown	Pakistan
A. (*A.*) *inflata* Smith Meyer, 1987	*Berkheya bipinnatifida, Indigofera, Sida rhombifolia*	South Africa
A. (*A.*) *karadagi* (Mitrofanov, 1975)	*Eryngium campestre*	Ukraine
A. (*A.*) *pentziae* Smith Meyer, 1987	*Oncosiphon grandiflorus, Oncosiphon suffruticosus, Osteospermum calendulaceum*	South Africa
A. (*A.*) *pongolana* (Smith Meyer, 1974)	Grass and soil	South Africa
A. (*A.*) *potentillae* (Tuttle & Baker, 1968)	*Potentilla hippiana*	USA
A. (*A.*) *punctata* Smith Meyer, 1974	*Buddleja saligna*	South Africa
A. (*A.*) *sisianensis* (Bagdasarian, 1959)	*Achillea*	Armenia
A. (*A.*) *sphaeralceae* (Tuttle & Baker, 1968)	*Ambrosia deltoidea, Sphaeralcea ambigua*	USA
***Aplonobia* – new and reinstated combinations from *Paraplonobia* Wainstein, 1960**		
A. (*A.*) *acharis* Pritchard & Baker, 1955 **reinst. comb.**	*Hemizonia* , *Holocarpha virgata*	USA
A. (*A.*) *algarrobicola* (Gonzalez, 1977) **comb. nov.**	*Prosopis chilensis*	Chile
A. (*A.*) *allionia* (Baker & Tuttle, 1972) **comb. nov.**	*Allionia incarnata*	USA
A. (*A.*) *arabica* (Mirza & Alatawi, 2016) **comb. nov.**	*Prosopis juliflora*	Saudi Arabia
A. (*A.*) *artemisia* (Baker & Tuttle, 1972) **comb. nov.**	*Artemisia ludoviciana*	USA
A. (*A.*) *berberis* (Baker & Tuttle, 1972) **comb. nov.**	*Berberis haematocarpa*	USA
A. (*A.*) *boutelouae* (Tuttle & Baker, 1968) **comb. nov.**	*Bouteloua curtipendula*	USA
A. (*A.*) *brickellia* (Baker & Tuttle, 1972) **comb. nov.**	*Brickellia californica, Heterotheca subaxillaris, Hymenothrix wislizeni*	USA
A. (*A.*) *calame* Pritchard & Baker, 1955 **reinst. comb.**	Asteraceae sp.	USA
A. (*A.*) *candicans* (Smith Meyer, 1974) **comb. nov.**	*Melolobium, Melolobium candicans*	South Africa
A. (*A.*) *coldeniae* Tuttle & Baker, 1964 **reinst. comb.**	*Tiquilia palmeri*	USA
A. (*A.*) *concolor* (Chaudhri, Akbar & Rasool, 1974) **comb. nov.**	*Pennisetum*	Pakistan
A. (*A.*) *contiguus* (Chaudhri, Akbar & Rasool, 1974) **comb. nov.**	*Cynodon dactylon*	Pakistan
A. (*A.*) *cyperi* Flechtmann & Gomez-Moya, 2021 **comb. nov.**	*Cyperus* sp.	Brazil
A. (*A.*) *daryaensis* (Chaudhri, Akbar & Rasool, 1974) **comb. nov.**	*Panicum*	Pakistan
A. (*A.*) *euphorbiae* Tuttle & Baker, 1964 **reinst. comb.**	*Euphorbia albomarginata, Polygonum argyrocoleon*	USA
A. (*A.*) *eurotiae* (Mitrofanov & Strunkova, 1975) **comb. nov.**	*Kraschenninnikovia* sp.	Uzbekistan
A. (*A.*) *glebulenta* (Smith Meyer, 1974) **comb. nov.**	grass and soil	South Africa
A. (*A.*) *haloxylonia* (Alatawi & Mizra, 2016) **comb. nov.**	*Haloxylon salicornicum*	Saudi Arabia
A. (*A.*) *harteni* (Smith Meyer, 1996) **comb. nov.**	Unknown	Yemen
A. (*A.*) *inornate* (Smith Meyer, 1987) **comb. nov.**	*Justicia nuttii*	South Africa
A. (*A.*) *juliflorae* Tuttle & Baker, 1968 **reinst. comb.**	*Prosopis juliflora*	USA
A. (*A.*) *neoambrosiae* (Tuttle, Baker & Abbatiello, 1976) **reinst. comb.**	*Ambrosia*	Mexico
A. (*A.*) *prosopis* Tuttle & Baker, 1964 **reinst. comb.**	*Prosopis juliflora*	USA
A. (*A.*) *tabukensis* (Kamran & Alatawi, 2016) **comb. nov.**	*Haloxylon salicornicum*	Saudi Arabia
A. (*A.*) *theroni* (Smith Meyer, 1974) **comb. nov.**	Grass and soil	South Africa
A. (*A.*) *tshipensis* (Smith Meyer, 1974) **comb. nov.**	Grass, *Tshipise*	South Africa
***Aplonobia* (*Brachynychus*) Mitrofanov & Strunkova, 1971 comb. nov. (Coxal setae formula 4-3-2-2)**		
A. (*B.*) *cousiniae* Mitrofanov & Strunkova, 1971 **comb. nov.**	*Cousinia rubiginosa*	Tajikistan
Genus *Paraplonobia* Wainstein (Peritreme simple distally – Coxal setae formula 2-2-1-1)		
P. boutelouae Baker & Tuttle, 1972	*Bouteloua aristidoides*	USA
P. dactyloni Smiley & Baker, 1995	*Cynodon dactylon* , *Hilaria*	Yemen
P. echinopsili Wainstein, 1960	*Bassia hyssopifolia*	Kazakhstan
P. edenvillensis Smith Meyer, 1974	*Poaceae* sp.	South Africa
P. flechtmanni Khanjani, Khanjani & Seeman, 2017	*Rhaponticum repens*	Iran
P. herniariae (Bagdasarian, 1954)	*Herniaria incana*	Armenia
P. hilariae Tuttle & Baker, 1968	*Hilaria rigida*	USA
P. myops (Pritchard & Baker, 1955)	*A sparagus* , *Asparagus officinalis*	USA
P. penicillatus Chaudhri, Akbar & Rasool, 1974	*Atriplex crassifolia* , *Bassia indica*	Pakistan
P. tridens Tuttle & Baker, 1968	*Celtis laevigata* , *Dasyochloa pulchellum*	USA

Family Tetranychidae Donnadieu, 1875

Tribe Hystrichonychini Pritchard & Baker, 1955

Genus *Aplonobia* Womersley, 1940

Aplonobia Womersley, 1940:252; Pritchard & Baker, 1955:58; Wainstein, 1960: 139; Tuttle & Baker, 1968:47.
Type species — *Tetranycopsis histricina* Berlese.

Aplonobia aria sp. nov.

Zoobank: D55BEB8A-A80C-4D9D-AB87-0CCCAC6F081F

(Figs. 1–4)

Type material

Female (Holotype), 20 females, 1 deutonymph paratypes ex. *Haloxylon ammodendron* (Amaranthaceae), Kerman-Kerman Province, Iran, 30°14′N 57°13′E, altitude 1835 m; 03 June 2022, coll. S. M. Mahdavi.

Type deposition — Holotype, 19 females and juveniles deposited at SBUK, one female paratype deposited at ACASI.

Diagnosis

Dorsal body setae slender, tapering and pilose, longer than distances between consecutive setae and set on small tubercles; setal bases of e_1 and f_1 closer together than other dorsocentral setae; prodorsum medially with weak longitudinal striae bearing small lobes, longitudinal striae laterally; opisthosoma with transverse striae between dorsocentral setae and longitudinal to oblique striae between dorsolateral setae; stylophore with a small mediocephalic emargination; peritreme anastomosing, branching into 2–3 additional chambers; leg I shorter than body length; setation of legs I–IV lacking many setae: coxae 2-2-1-1; trochanters 0-0-1-1; femora 3-3-2-2; genua 4-4-2-2; tibiae 8+(1)-3-3-3; tarsi 6+2dupl.-7+1dupl.-7-7; empodia with two rows of four tenent hairs.

Description

Female — (n=20; measurement of holotype in parentheses; Figs. 1–4 except 3d). Length of body (excluding gnathosoma) 341–395 (367), v_2–h_1 317–358 (323); width 265–301 (270), sc_2–sc_2 169–190 (169).

Dorsum – (Fig. 1a). Prodorsum medially with weak longitudinal striae bearing small lobes, longitudinal striae laterally; opisthosoma with transverse striae between dorsocentral setae, longitudinal to oblique between dorsolateral setae and arched in caudal part; dorsal body setae slender, tapering and pilose (Fig. 1b), dorsocentral setae a little longer than distances between consecutive setae and e_2, f_2; dorsal setae set on small tubercles (Fig. 2), c_1–c_3 and h_1 tubercles without punctations, other opisthosomal setae surrounded by punctations; setal bases of e_1 and f_1 closer together than other dorsocentral setae; dorsal seta c_3 more or less in line with c_1 and c_2, not longitudinally aligned with c_2, d_2, e_2 and f_2. Lengths of setae: v_2 40–45 (42), sc_1 45–59 (58), sc_2 39–47 (46), c_1 52–65 (65), c_2 48–55 (50), c_3 37–48 (43), d_1 50–64 (59), d_2 48–69 (55), e_1 52–64 (60), e_2 60–77 (73), f_1 70–80 (80), f_2 57–68 (59), h_1 41–49 (47). Distances between dorsal setae: v_2–v_2 45–48 (45), sc_1–sc_1 124–131 (124), sc_2–sc_2 169–190 (169), c_1–c_1 87–93 (88), c_2–c_2 158–174 (158), c_3–c_3 235–266 (235), d_1–d_1 80–95 (83), d_2–d_2 160–185 (160), e_1–e_1 31–35 (31), e_2–e_2 119–137 (123), f_1–f_1 26–29 (29), f_2–f_2 82–87 (84), h_1–h_1 41–49 (41).

Venter – striae between setae (*4a*) transverse, anterior of agential setae (*ag*) and posterior of setae *3a* longitudinal (Fig. 3a). Lengths of setae: *1a* 34–36 (34), *3a* 40–44 (42), *4a* 53–55 (53), *ag* 70–75 (72), g_1 99–101 (100), g_2 100–102 (100), ps_1 11–12 (11), ps_2 11–12 (11), ps_2 11–12 (11), h_2 13–14 (13), h_3 10–13 (12); distances between setae *1a*–*1a* 34–37 (34), *3a*–*3a*

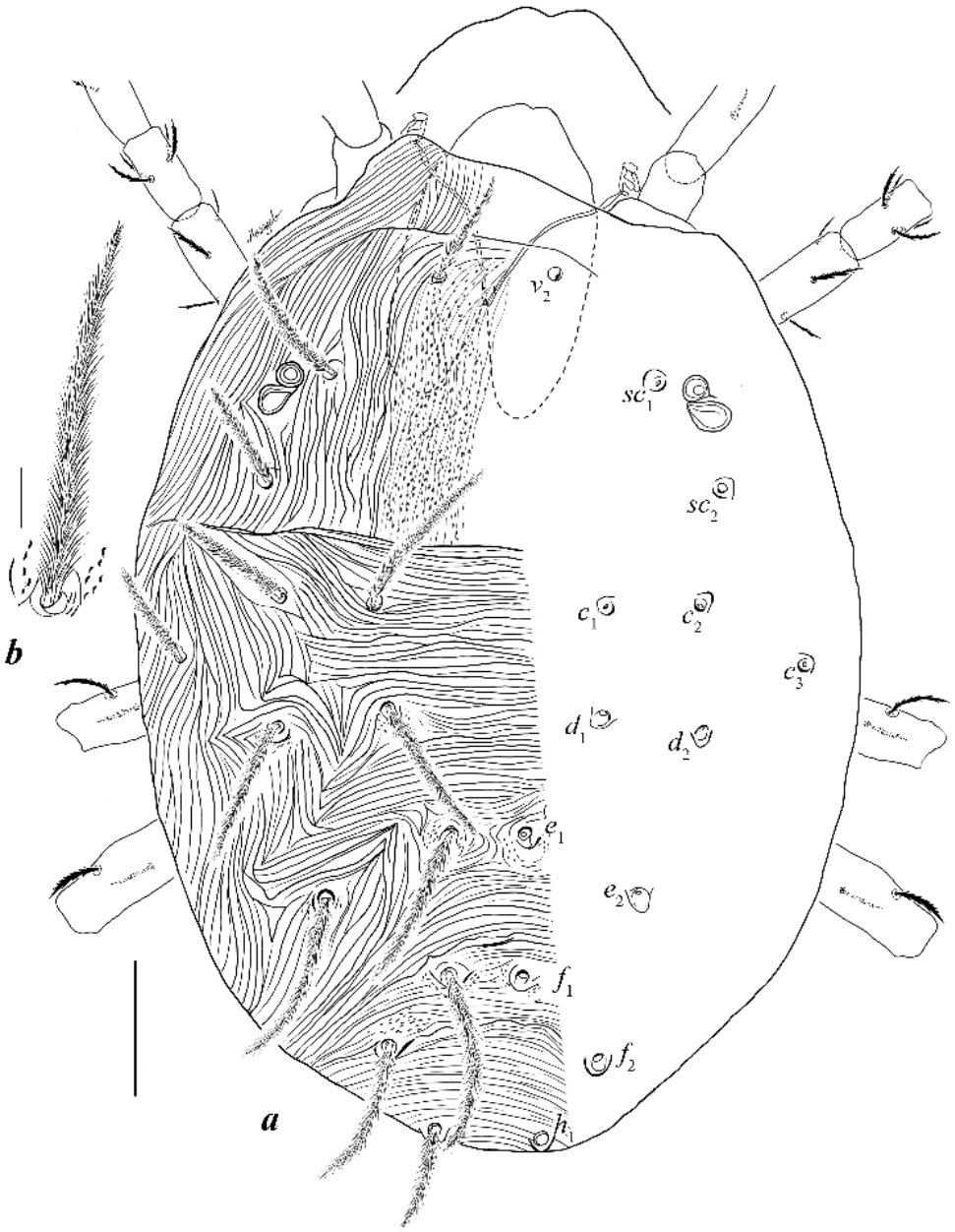


Figure 1 *Aplonobia aria* **sp. nov.** Female. a – Dorsum; b – Dorsal seta. Scale bars = 50 µm (a), 10 µm (b).

70–86 (73), *4a–4a* 52–55 (55), *ag* 13–14 (14), g_1 7–9 (7), g_2 25–28 (26), h_2–h_2 11–15 (12), h_3–h_3 22–24 (23). Coxal setae smooth, except *2c* barbed.

Spermatheca – Elongate vesicle, bulb-shaped structure at distal end (Fig. 3c).

Gnathosoma – Peritreme anastomosing distally, branching into 2–3 additional chambers (Fig. 3b); stylophore with a small mediocephalic emargination; palpal setation typical, spinneret (*suζ*) about 3 times as long as broad (Fig. 4g).

Legs – (Figs. 4a–f). Setation of legs I–IV: coxae 2(*1b*, *1c*)–2(*2b*, *2c*)–1(*3b*)–1(*4b*); trochanters 0-0-1(*v′*)-1(*v′*); femora 3(*d*, *bv″*, *l′*)-3(*d*, *bv″*, *l′*)-2(*d*, *ev′*)-2(*d*, *ev′*); genua 4(*d*, *v′*, *v″*, *l′*)-4(*d*, *v′*, *v″*, *l′*)-2(*d*, *l′*)-2(*d*, *l′*); tibiae 9(*db*, *v′*, *v″*, *l′*, *l″*, *l′1*, *l″1*, *v′1*, *φ*)-3(*d*, *v′*, *v″*)-3(*d*, *v′*, *v″*)-3(*d*, *v′*, *v″*); tarsi 6(*p′ζ*, *p″ζ*, *u′*, *u″*, *pv″*, *v′1*+2dupl.(*ft′*, *ω′*, *ft″*, *ω″*))-7(*p′ζ*, *p″ζ*, *u′*, *u″*, *pv″*,

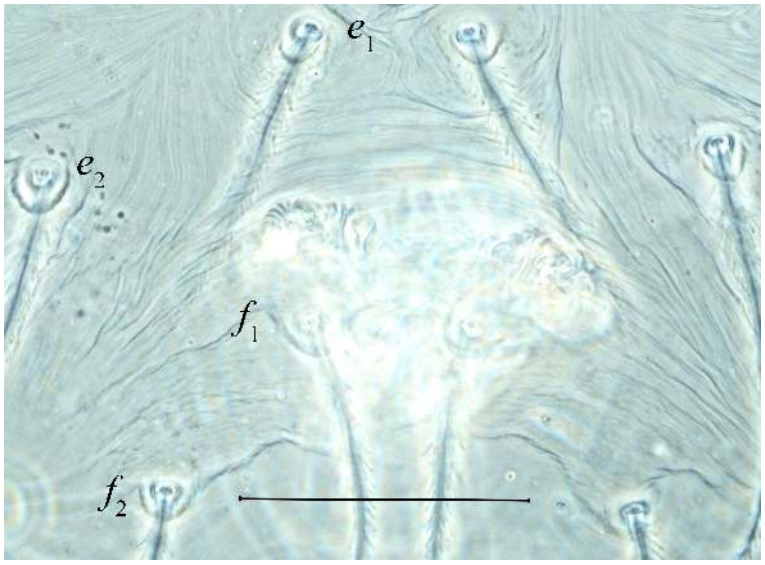


Figure 2 *Aplonobia aria* **sp. nov.** Female. Dorsum some areas between setae d_1–e_1. Scale bars =50 µm.

v'1, *ft'*+1dupl.(*ft''*, *ω''*))-7(*ft'*, *tc'*, *tc''*, *u'*, *u''*, *pv''*, *v'1*)-7(*ft'*, *tc'*, *tc''*, *u'*, *u''*, *pv''*, *v'1*); tarsi II–IV without solenidia; coxal setae smooth, except *2c* barbed; claws and empodia I–IV pad-like, empodia with two rows of four tenent hairs (Fig. 4f). Lengths of legs (from trochanter to tarsus): I 237–250 (248), II 174–190 (186), III 178–200 (193), IV 201–230 (218).

Deutonymph — (n=1; Fig. 3d). Length of body (excluding gnathosoma) 342, v_2–h_1 292; width 250, sc_2–sc_2 151.

Dorsum – Prodorsal striation pattern close to that of female; dorsal setae similar to female but narrower, only caudal part *e*, *f* and *h* with small tubercles. Lengths of setae: v_2 35, sc_1 31, sc_2 31, c_1 36, c_2 36, c_3 35, d_1 33, d_2 42–61, e_1 49, e_2 54, f_1 51, f_2 52, h_1 41. Distances between dorsal setae: v_2–v_2 40, sc_1–sc_1 102, sc_2–sc_2 151, c_1–c_1 70, c_2–c_2 133, c_3–c_3 229, d_1–d_1 71, d_2–d_2 139, e_1–e_1 23, e_2–e_2 99, f_1–f_1 23, f_2–f_2 66, h_1–h_1 28.

Venter – (Fig. 3d). Striation pattern similar to that of female; aggenital area with one pair each of aggenital setae (*ag*) and genital setae (g_1). Lengths of intercoxal setae: *1a* 33, *3a* 25, *4a* 18, *ag* 18, g_1 13, h_2 10, h_3 10; distances between intercoxal setae *1a–1a* 32, *3a–3a* 73, *4a–4a* 59, *ag–ag* 14, h_2–h_2 10, h_3–h_3 20.

Gnathosoma – Palp and peritreme similar to female but stylophore completely rounded.

Legs – Setation of legs I–IV: coxae 2(*1b*, *1c*)-2(*2b*, *2c*)-1(*3b*)-1(*4b*); trochanters 0-0-0-0; femora 3(*d*, *bv''*, *l'*)-3(*d*, *bv''*, *l'*)-2(*d*, *ev'*)-2(*d*, *ev'*); genua 2(*d*, *l'*)-2(*d*, *l'*)-1(*d*)-1(*d*); tibiae 7(*db*, *v'*, *v''*, *l'*, *l''*, *l'1*, *φ*)-3(*d*, *v'*, *v''*)-3(*d*, *v'*, *v''*)-3(*d*, *v'*, *v''*); tarsi 5(*p'ζ*, *p''ζ*, *u'*, *u''*, *pv''*+2dupl.(*ft'*, *ω'*, *ft''*, *ω''*))-6(*p'ζ*, *p''ζ*, *u'*, *u''*, *pv''*, *ft'*+1dupl.(*ft''*, *ω''*))-6(*ft'*, *tc'*, *tc''*, *u'*, *u''*, *pv''*)-6(*ft'*, *tc'*, *tc''*, *u'*, *u''*, *pv''*). Setation for legs I–IV differs from adult female by seta (*v'*) absent on trochanters III-IV, setae (*v'*, *v''*) absent on genua I-II, seta (*l'*) absent on genua III-IV, setae (*v'1*, *l''1*) absent on tibiae I and seta (*v'1*) absent on tarsi I–IV. Lengths of legs (from trochanter to tarsus): I 178, II 136, III 132, IV 136.

Male — Unknown

Remarks

Aplonobia aria **sp. nov.** is close to *Aplonobia calame* Pritchard & Baker, 1955 **reinst. comb**. which shares slender pilose dorsal setae that are mostly longer than the distances between consecutive setae and set on small tubercles and a prodorsal region formed by small lobes.

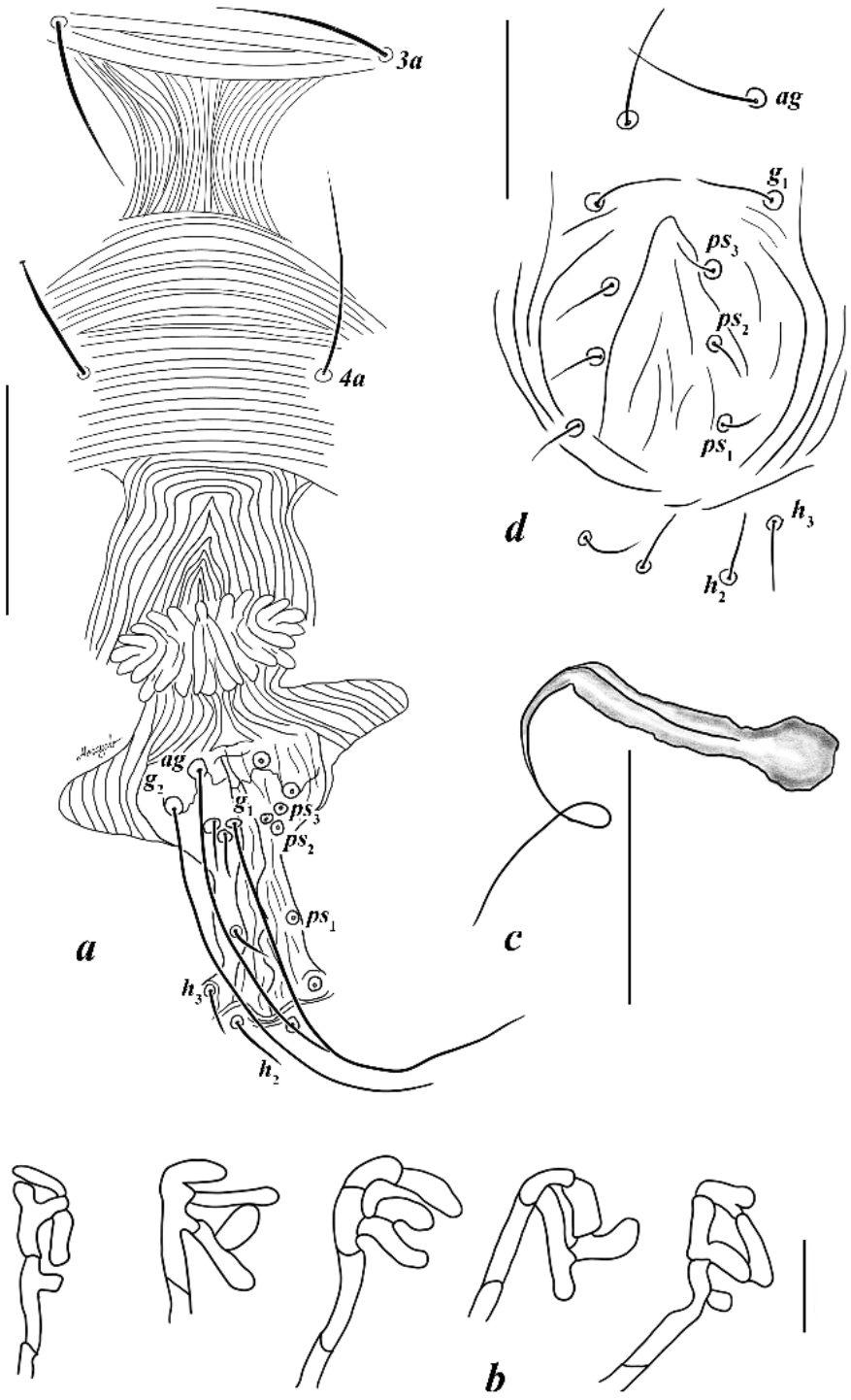


Figure 3 *Aplonobia aria* **sp. nov.** Female. a – Ventral posterior of setae *3a*; b – End of peritreme variation; c – End of spermatheca. Deutonymph; d – genital area. Scale bars =50 µm (a), 10 µm (b), 20 µm (c), 10 µm (d).

However, the new species differs from *A. calame* by leg setation tibia I [8+(1) in *A. aria* vs. 13+(1) in *A. calame*], leg setation tarsi III–IV (without solenidia in *A. aria vs.* with solenidia *A. calame*), the form of the peritreme (few anastomosing chambers in *A. aria* vs. many

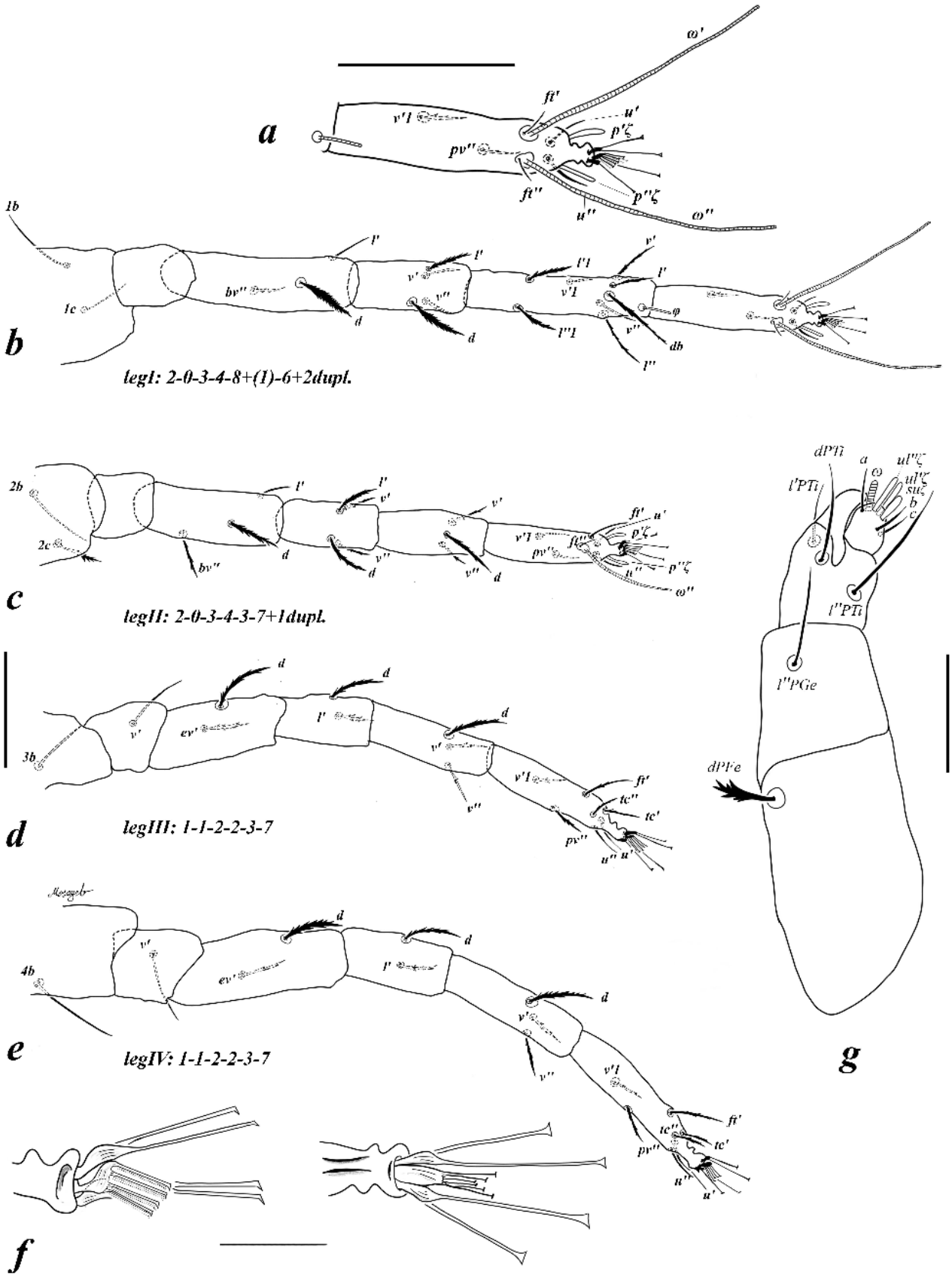


Figure 4 *Aplonobia aria* **sp. nov.** Female. a – Tarsus leg I; b – Leg I; c – Leg II; d – Leg III. e – Leg IV; f – Empodium IV lateral left; g – dorsal right. Scale bars = 50 µm (a–e), 10 µm (f), 20 µm (g).

chambers, forming a club, in *A. calame*); the number of empodial hairs (four pairs tenent hairs vs. two hairs, not formed as tenent hairs); the anterior stylophore (with a small mediocephalic emargination in *A. aria* vs. rounded in *A. calame*); length of leg I as compared to body length (shorter than body length in *A. aria* vs. as long as in *A. calame*).

According to Kamran's key (i.e. couplet 28) in Kamran *et al.* (2016), *Aplonobia aria* **sp. nov.** is close to *Aplonobia tshipensis* (Smith Meyer, 1974) **comb. nov.** which was first described as *Anaplonobia tshipensis* Smith Meyer, 1974. The species differ by the form of the dorsal body setae (densely pilose in *A. aria* vs. weakly barbed in *A. tshipensis*); numerous differences in leg setation [*A. tshipensis*: femora 9-6-4-4; genua 5-5-4-4; tibiae 13(1)-8-6-7; tarsi 16(1)+2dupl.-13+1dupl.-12(1)-12(1)]; the anterior stylophore (small mediocephalic emargination in *A. aria* vs. deeply incised in *A. tshipensis*).

The leg chaetotaxy of *Aplonobia aria* **sp. nov.** also deserves comment as it has remarkably few leg setae, expressing fewer than all other species of *Aplonobia* and *Paraplonobia.* These losses are also apparent in the deutonymph, with numerous setae also absent in this life stage.

Etymology

This species is named after Aria, an old Persian "satrapy" – a system of government used in ancient Persia that was established by the Achaemenid Empire during the 6th century BC.

New record of *Aplonobia tabukensis* (Kamran & Alatawi) comb. nov. for the first time from Iran

Aplonobia tabukensis (Kamran & Alatawi, 2016), 44, Saudi Arabia ex. *Haloxylon salicornicum.* This species was collected for the first time from *Haloxylon ammodendron* (Amaranthaceae), Qalehganj, Kerman province, 27°31′N, 57°52′E, 20 Sep. 2018, coll. S. M. Mahdavi.

Depository: SBUK-No. Tet 32.

Notes — In Kamran *et al.* (2016) there is an inconsistency between their table, figures and text in terms of leg chaetotaxy as it seems all setae on tarsus I-II were not included in the table. Setation of legs I–IV of our samples completely match their drawing as follows: coxa 2-2-1-1; trochanter 1-1-1-1; femora 8-6-3-3; genua 4-5-3-3; tibiae 13(+1)-9-8-8; tarsi 14+2dupl.-11+1dupl.-11+1dupl.-11+1dupl., tarsi I with 12 tactile setae, two sets of duplex setae and two eupathidia; tarsi II with 9 tactile setae, one set of duplex setae and two eupathidia.

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