

Mites of the genus *Anomaloppia* Subías (Acari: Oppiidae) from Alborz province, northern Iran, with one new species and a key to the known species

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In the course of a faunistic survey on oribatid mites in Alborz province, northern Iran, four species belonging to the genus *Anomaloppia* were collected: *A. iranica*, *A. mazandaranica*, *A. differens* and a hitherto unknown species which is named as *A. alborzi* **sp. n.** The new species is characterized by the rostral setae which are situated close to each other and by long sensilli, with a fusiform head and four long barbs and by smooth notogastral setae. *Anomaloppia differens* is recorded for the first time from Iran and a supplementary description is provided for this species on the basis of Iranian materials. An identification key to the species of *Anomaloppia* is given.

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1. Introduction

The oribatid mite genus *Anomaloppia*, belonging to subfamily Multioppiinae of the family Oppiidae Sellnick, 1937, was established by Subías (1978) with *A. canariensis* Subías, 1978, as the type species and has, until now, been represented by nine species that collectively have a semi-cosmopolitan distribution (Subías 2014).

Prior to this study, two species of this genus were recorded from Iran, both new for science: *A. iranica* Bayartogtokh & Akrami, 2000 from central and *A. mazandaranica* Akrami & Subías, 2007 from northern Iran. During 2012–13, in the course of a study on oribatid mites in Alborz province, northern Iran, four species belonging to the

genus *Anomaloppia* were collected: two above mentioned Iranian species, *A. differens* Mahunka & Topercer, 1983 and a hitherto unknown species which is named as *A. alborzi* **sp. n.** in this paper. We describe the new species and give a detailed redescription for *A. differens* and present an identification key to all known species of the genus.

2. Material and methods

Soil samples were taken under different plants in Alborz province. Mites were extracted from samples in Berlese-Tullgren funnels set over jars of 75% ethanol. Mites were extracted, cleared in lactophenol, and mounted in Hoyer's medium on

glass microscope slides. The slides were placed in an oven at 45°C for two weeks and then the specimens were examined using a light microscope (Zeiss Standard 20).

Figures were made using a drawing tube attached to a microscope. Body length was measured from the tip of the rostrum to the posterior edge of the notogaster, and body width refers to the maximum width of the notogaster in dorsal aspect. All body measurements are presented in micrometers (μm).

3. Species

3.1. *Anomaloppia iranica* Bayartogtokh & Akrami

Anomaloppia iranica Bayartogtokh & Akrami, 2000: 139, fig. 5.

Material examined. One female from Khouzankola, Chaloos road, soil under oriental plane trees, *Platanus orientalis* L., 35°55' N, 51°05' E, 2,000 m a.s.l., 16.VII.2012; one female from Barikan village, Taleghan, soil under cherry trees, *Prunus avium* L., 36°09' N, 50°44' E, 2,350 m a.s.l., 26.V.2013; five females and one male from Jaarou village, Eshtehard, soil under apple trees, *Malus domestica* Borkh, 35°70' N, 50°71' E, 1,420 m a.s.l., 28.X.2012, three females and three males from Sibestan village, Savojbolagh, soil under apple trees 36°02' N, 50°48' E, 2,147 m a.s.l., 8.VII.2012, two females from Fashand village, Savojbolagh, soil under apple trees, 36°00' N, 50°46' E, 1,262 m a.s.l., 19.V.2013, M. Keshavarz leg. All specimens are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, University of Tehran, Karaj, Iran.

Measurements. Body length 270–312, width of notogaster 136–188 ($n=16$).

3.2. *Anomaloppia mazandarunica* Akrami & Subías

Anomaloppia mazandarunica Akrami & Subías, 2007: 65, figs. 1–4.

Material examined. One female from Khouzankola, Chaloos road, soil under oriental plane

trees, 35°55' N, 51°05' E, 2,000 m a.s.l., 16.VII.2012; one female from Asara, Chaloos road, soil, 36°01' N, 51°10' E, 1,420 m a.s.l., 16.VII.2012; three females and one male from Jaarou village, Eshtehard, soil under apple trees, 35°70' N, 50°71' E, 1,420 m a.s.l., 28.X.2012, two females and two males from Sibestan village, Savojbolagh, soil under apple trees, 36°02' N, 50°48' E, 2,147 m a.s.l., 8.VII.2012, M. Keshavarz leg. All specimens are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, University of Tehran, Karaj, Iran.

Measurements. Body length 297–314, width of notogaster 144–173 ($n=10$).

3.3. *Anomaloppia differens* Mahunka & Topercer (Fig. 1a–2b)

Anomaloppia differens Mahunka & Topercer, 1983: 229, figs. 1–3.

Material examined. Three males and one female from Morad Tappe village, Eshtehard, soil under cotton plant, *Gossypium hirsutum* L. (Malvaceae) 35°44' N, 50°18' E, 1,438 m a.s.l., 28.X.2012; one female from Jaarou village, Eshtehard, soil under apple trees, *Malus domestica* Borkh (Rosaceae), 35°70' N, 50°71' E, 1,420 m a.s.l., 28.X.2012, M. Keshavarz leg.

Measurements. Body length 289–310, width of notogaster 147–174 ($n=5$).

Supplementary description. Rostrum rounded at tip. Rostral setae (*ro*, 30–32) situated close to each other, thick, very long, extending for 2/3 of its length beyond tip of rostrum, diverging, densely barbed bilaterally. Lamellar (*le*, 18–23) and interlamellar (*in*, 18–24) setae about same size, nearly 1.5 times shorter than rostrals, thin, setiform, finely barbed unilaterally. Lamellar lines well developed, not reaching to insertion of lamellar setae. Translamellar line absent. Exobothridial setae (*ex*, 16) moderately long, thick, finely barbed. Exobothridial region ornamented with minute granules. Sensilli (*ss*, 53–60) long, fusiform-clavate, with eight medium long and four short barbs on the head and stalk respectively. Bothridia rounded with small openings. Three pairs of muscle sigillae situated between interlamellar setae, and several anterior to each bothridium.

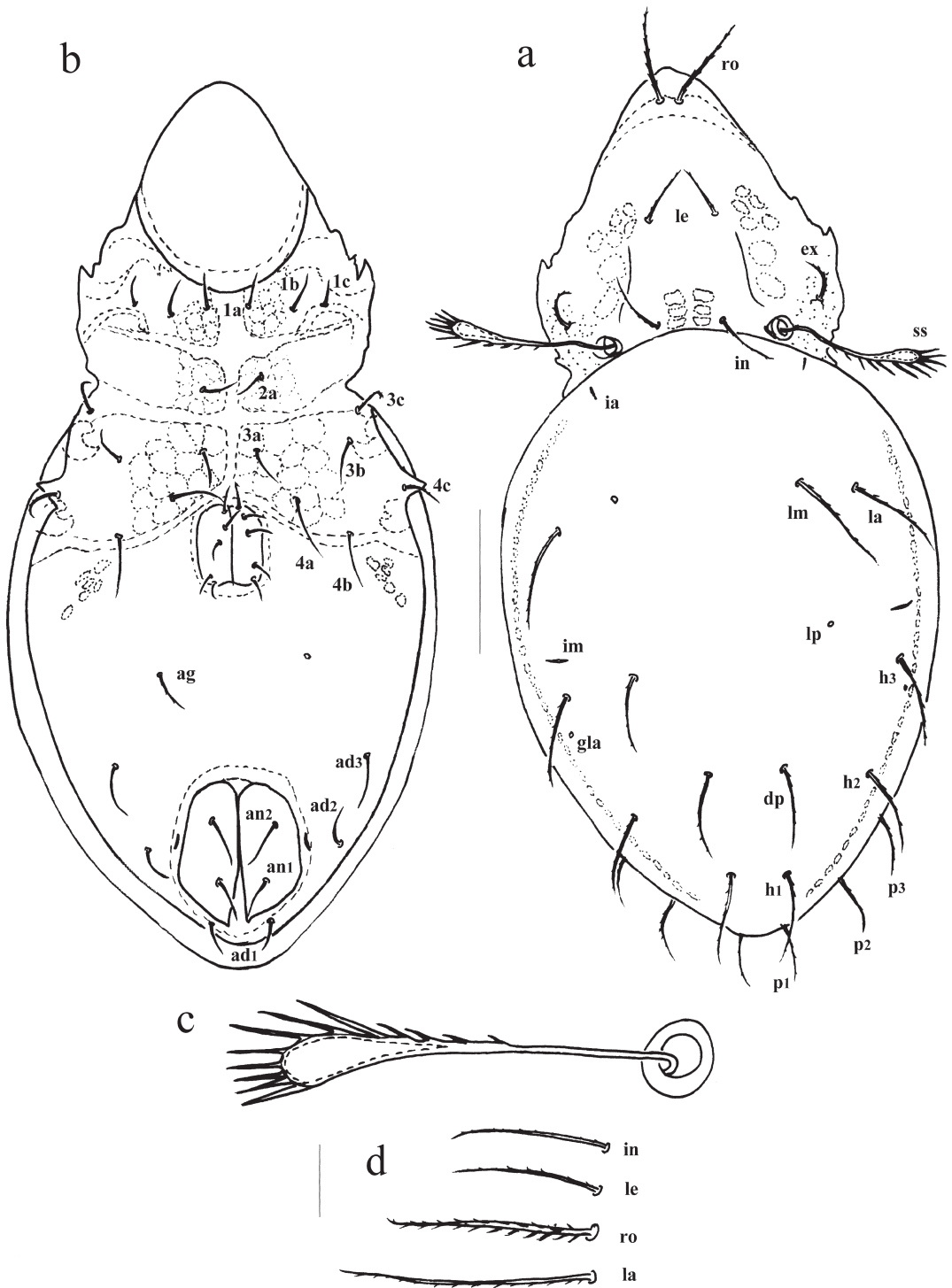


Fig. 1. *Anomaloppia differens* Mahunka & Topercer. – a. Dorsal view of body. – b. Ventral view of idiosoma. – c. Sensillus. – d. Prodorsal setae *in*, *le*, *ro* and notogastral seta *la*. Scale bars: a and b 50 μ m, c and d 10 μ m.

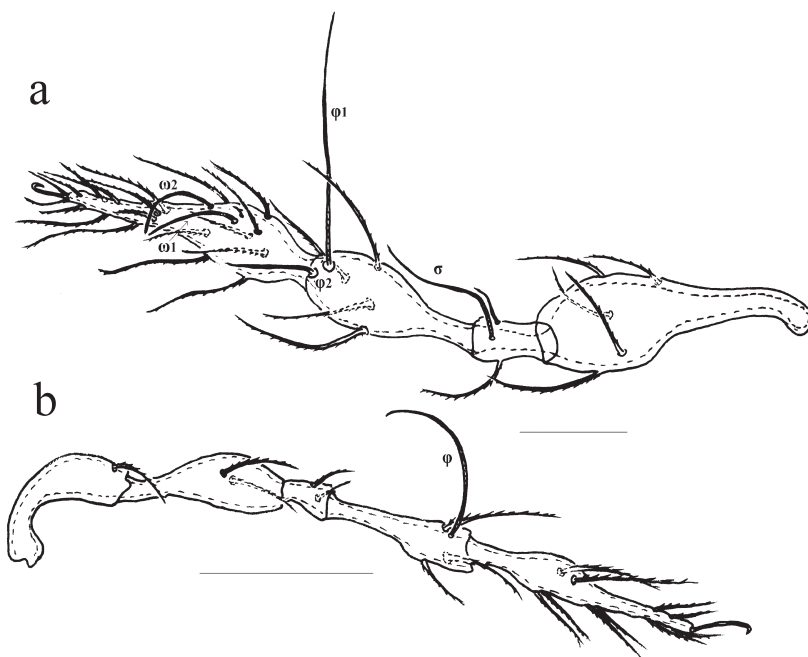


Fig. 2. *Anomaloppia differens* Mahunka & Topercer. – a. Leg I. – b. Leg IV. Scale bars: a 25 μ m, b 50 μ m.

Notogaster: Oval. Ten pairs of notogastral setae, long, thick and finely barbed unilaterally; setae c_2 absent, setae lm and la nearly situated in the same level. Lyrifissures ia , im and latero-opisthosomal gland (gla) openings well developed.

Epimeral region: With numerous muscle sigillae. Apodemes I , II , Sj and IV well developed. Epimeral setae mostly long, $4a$ and $4b$ the longest, all smooth, only $3c$ and $4c$ distinctly barbed, epimeral setal formula (I–IV) 3-1-3-3. Discidia well developed, projected laterally. Genitoanal plates with five pairs of genital (g_1 – g_5) setae, three on anterior half and two on posterior half, one pair of aggenital (ag), two pairs of anal (an_1 – an_2) and three pairs of adanal (ad_1 – ad_3) setae, all smooth, only ag finely barbed, ad_3 situated in preanal position. Genitoanal region smooth, with few small sigillae situated posterolaterally of each epimeral seta $4b$. Fissures iad paraanal, adjacent to anal plates.

Legs: Setation normal for the family, tarsi monodactylos. Formula of setation, including famulus: I (1-5-2-4-20), II (1-5-2-4-12), III (2-3-1-3-11), IV (1-2-2-3-10), formula of solenidia I (1-2-2), II (1-1-2), III (1-1-0), IV (0-1-0). Structure and setation of legs I and IV as shown in Fig 2.

3.4. *Anomaloppia alborzi* sp. n. (Fig. 3a–d)

Material examined. Holotype (female): Jaarou village, Eshtehard, Alborz province, Iran, soil under apple trees, 35°70' N, 50°69' E, 1,425 m a.s.l., 8.IV.2013, M. Keshavarz leg.

Paratype (female): Morad Tappe village, Eshtehard, Alborz province, Iran, soil under cotton plant, 35°44' N, 50°18' E, 1,438 m a.s.l., 28.X.2012, M. Keshavarz leg.

The holotype is deposited in the Acarological collection, Department of Plant Protection, Shiraz University, Shiraz, Iran, and the paratype in the Acarological collection, Jalal Afshar Zoological Museum, University of Tehran, Karaj, Iran.

Diagnosis. Body size 274–293 \times 147–164 with typical characters of *Anomaloppia*. Rostral setae as long as lamellar and interlamellar setae, thick, barbed bilaterally. Sensilli long, with a fusiform head and four long barbs and barbulate stalk. Ten pairs of long notogastral setae, conspicuously thin, smooth and flagelliform.

Description. Measurements: Holotype: body length 293, width of notogaster 164; paratype: body length 274, width of notogaster 147.

Prodorsum (Fig. 3a, c, d): Rostrum evenly rounded. Rostral setae (21) thick, situated close to each other, densely barbed bilaterally. Lamellar

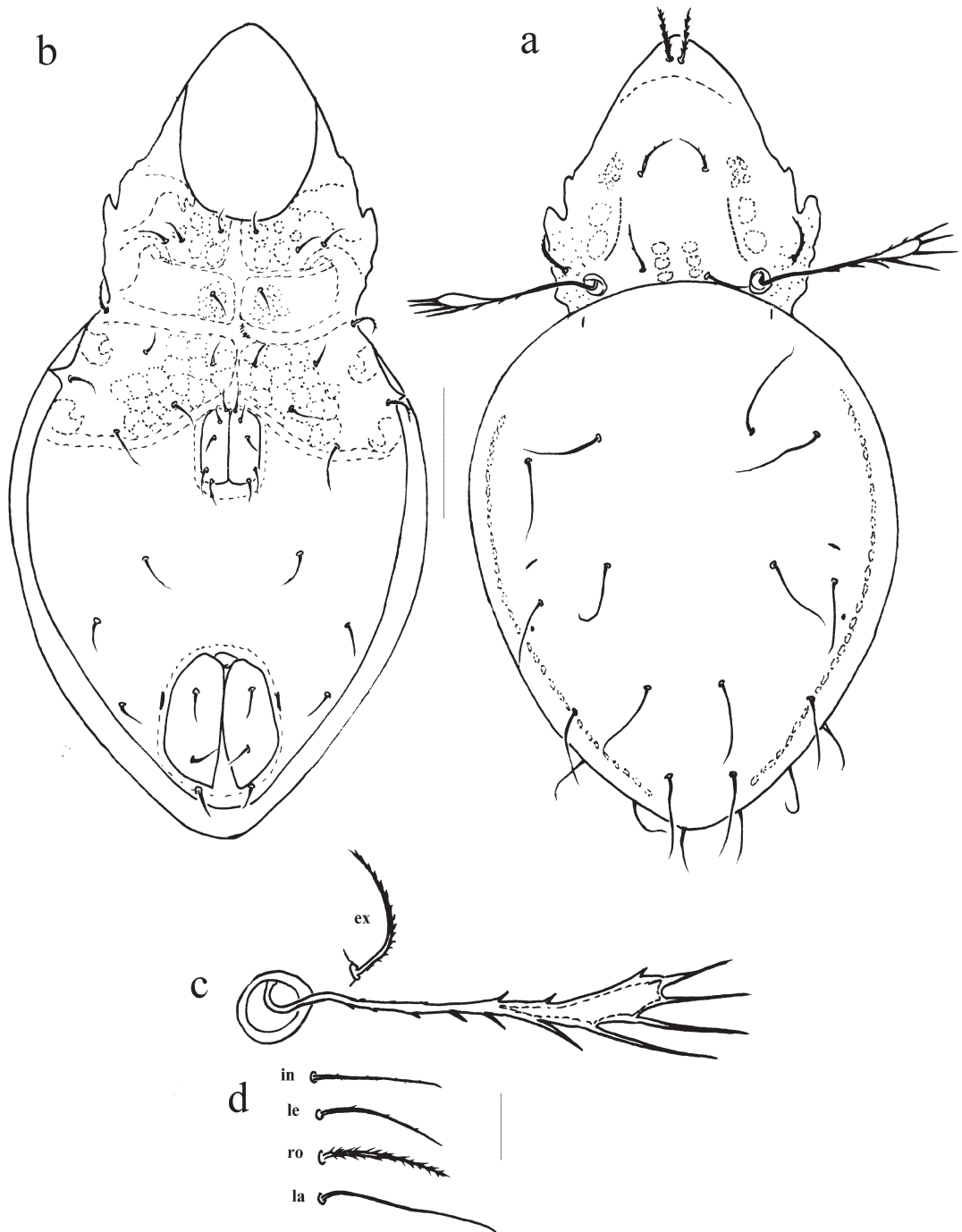


Fig. 3. *Anomaloppia alborzi* sp. n. – a. Dorsal view of body. – b. Ventral view of idiosoma. – c. Sensillus and exobothridial seta. – d. Prodorsal setae *in*, *le*, *ro* and notogastral seta *la*. Scale bars: a and b 50 μ m, c and d 10 μ m.

and interlamellar setae about same length as rostral setae, thin, nearly smooth with very fine, sparse barbs. Exobothridial setae about same length as other prodorsal setae, thick, densely barbed throughout their length. Lamellar lines poorly developed, not reaching to the insertions of lamellar setae. Translamellar line absent. Exobothridial region granulate. Sensilli (67–69) with long barbate stalk and fusiform head with four long barbs. Bothridia rounded, with small openings. Three pairs of muscle sigillae situated between the interlamellar setae and some anterior to each bothridium.

Notogaster (Fig. 3a, d): Notogaster oval, anterior notogastral margin convex. Ten pairs of notogastral setae thin, smooth, nearly long and whip-shape, setae *lm* and *la* nearly situated in the same level. Lyrifissures *ia* and *im* and latero-opisthosomal gland openings well developed.

Ventral region (Fig. 3b): Epimeral region with a few muscle sigillae. Apodemes *I*, *II*, *Sj* and *IV* well developed. Epimeral setal formula (I–IV) 3-1-3-3, epimeral setae mostly short, thin and smooth, only *3c* and *4c* finely barbed. Genitoanal plates with five pairs of genital setae (three arranged on anterior half and another two on posterior half of the plates), one pair of aggenital, two pairs of anal and three pairs of adanal setae, all smooth. Genitoanal region smooth. Fissures *iad* para-anal and adjacent to anal plates.

Legs: Structure and setation similar to previous species (Fig. 2).

Etymology. The specific name “*alborzi*” refers to the region of the type locality of the species, Alborz province of Iran.

Remarks. Among the known species of the genus *Anomaloppia*, the following species, *A. differens* Mahunka & Topercer, 1983, *A. ozkani* Ayyildiz, 1989, *A. iranica* Bayartogtokh & Akrami, 2000 and *A. mazandaranica* Akrami & Subias, 2007 have rostral setae straight, divergent and with their insertions close together. Iranian species, *A. iranica*, and Turkish species, *A. ozkani*, resemble the new species in the more closely spaced rostral setae and smooth notogastral setae. However, *A. iranica* is distinguishable from the new species by the thin rostral setae that are barbed unilaterally; shorter interlamellar setae; sensilli moderately long, more clavate with 11–12 short barbs, and shorter solenidia σ and ϕ 1

of legs I. *Anomaloppia ozkani* can also be differentiated from *A. alborzi* sp. n. by the long rostral setae that are barbed unilaterally; sensilli moderately long, with 11–12 short barbs close to each other, and shorter notogastral setae. The structure and setation of the legs of *A. ozkani* are unknown.

4. Key to the known species of *Anomaloppia* Subias, 1978

1. Rostral setae situated close to each other, hence distance between insertions less than half their length 2
 - Rostral setae situated far to each other, hence distance between insertions more than half their length 7
2. Rostral setae conspicuously longer than lamellar setae (about 1.5 times length of lamellars, extending for 2/3 of its length beyond the tip of rostrum) 3
 - Rostral setae nearly as long as or slightly longer or shorter than lamellar setae (extending for 1/3 of its length beyond the tip of rostrum) 4
3. Notogastral setae smooth (300 × 150)
 - A. ozkani* Ayyildiz, 1989 (Turkey)
 - Notogastral setae ciliate (275–292 × 141–146)
 - A. differens* Mahunka & Topercer, 1983 (southeast-central Europe)
4. Notogastral setae smooth 5
 - Notogastral setae ciliate (275–310 × 142–160)
 - A. mazandaranica* Akrami & Subias, 2007 (Iran)
5. Lamellar lines absent, rostral setae strongly curved inward, lamellar setae longer than rostrals (380 × 220)
 - A. manifera* (Hammer, 1955) (Alaska & Palearctic region)
 - Lamellar lines developed, rostral setae straight, diverging, lamellar setae as long as rostrals 6
6. Sensilli clavate with 11–12 short barbs and short, nearly smooth stalk (288–300 × 138–144)
 - A. iranica* Bayartogtokh & Akrami, 2000 (Iran)
 - Sensilli fusiform with four long barbs and long ciliate stalk *A. alborzi* sp. n.

7. Sensilli pectinate with very long barbs, notogastral setae c_2 developed, but minute (232–240 × 120–124)
A. peregovitsi (Mahunka, 1986)
 (Tanzania)
- Sensilli fusiform or clavate, notogastral setae c_2 not developed 8
8. Sensilli clavate with a rounded head and 10 radiating barbs (220)
A. dispariseta (Hammer, 1958)
 (southern Neotropical region
 and Subantarctic)
- Sensilli fusiform, ciliate unilaterally 9
9. Notogastral setae long, reaching insertion of next row, discidia hooked, distinctly curved backward (222–235 × 121–125)
A. madeirensis Arillo & Subías, 1990
 (Madeira)
- Notogastral setae short, not reaching insertion of next row, discidia normal, projected laterally 10
10. Rostrum widened, rostral setae conspicuously longer than notogastral setae, sensilli with short stalk and barbs (250 × 138)
A. canariensis Subías, 1978
 (Canary Islands)
- Rostrum narrow, rostral setae about equal in length to notogastral setae, sensilli with long stalk and barbs (294–336 × 136–147)
A. chitinofincta (Kulijev, 1962)
 (southern Palaearctic region)

5. Discussion

In his catalogue, Subías (2014) synonymized *A. ozkani* and *A. iranica* without any discussion. In our opinion, this synonymy is doubtful, due to the longer rostral setae, shorter notogastral setae (es-

pecially rows *h* and *p*) and fusiform sensilli with pointed head in *A. ozkani* (versus clavate with rounded head in *A. iranica*). There are some features such as distance between rostral setae, length of rostral setae, length and shape (smooth, ciliate) of notogastral setae, shape of sensilli and presence or absence of lamellar and translamellar lines that differentiate the species in this genus. In conclusion, the above key can be used to identify adults of all known species of *Anomaloppia*.

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