Pakistan J. Zool., vol. 44(3), pp. 777-785, 2012.

Two New Species and a New Record of Oppioid Mites (Acari: Oribatida) from Turkey

Şule Baran,[1,] * Nusret Ayyıldız[2] and Aykut Kence[3]
[1] *Department of Biology, Arts and Science Faculty, Sakarya University, 54187 Sakarya, Turkey*
[2] *Department of Biology, Faculty of Science, Erciyes University, 38039 Kayseri, Turkey*
[3] *Department of Biology, Faculty of Arts and Science, Middle East Technical University, 06530 Ankara, Turkey*

Abstract.- Two new species *Oppiella (Perspicuoppia) ozkani* sp. n. and *Epimerella ankaraensis* sp. n. are recorded from Aegean region of Turkey (İzmir province) and pine forest in the province of Ankara in Turkey, respectively. The principal diagnostic features of the new species *Oppiella (Perspicuoppia) ozkani* sp. n. are shape of notogastral crista and humeral process and shape of costula. The new species *Epimerella ankaraensis* diferentiated from the other species of genus by entire rostrum. This is the first records of subgenus *Subiasella (Dividoppia)* of oppiid mites from Turkey. *Subiasella (Dividoppia) aperta* (Mahunka, 1987) recorded from Eastern Anatolian region of Turkey (Erzurum province) and redescribed.

Key words: Acari, oribatida, *Perspicuoppia*, *Dividoppia*, *Epimerella*, new species.

INTRODUCTION

Oribatid mites (Oribatida, Acari) are one of the major soil living decomposer microarthropods with approximately 10.000 described species (Schatz, 2002). Untill today 144 species belonging to 75 genera included in 43 family of oribatid mites were recorded from Turkey (Baran *et al*., 2010). This paper describes two new species belonging to families Oppiidae and Epimerellidae and a new record from Turkey.

Among the materials collected from Erzurum province a mite belonging to subgenus *Subiasella (Dividoppia)* is proposed here as a new record. Among the materials collected from İzmir province another mite belonging to subgenus *Oppiella (Perspicuoppia)* is proposed here as a new species. The subgenus *Oppiella (Perspicuoppia)* is well characterized by anterior margin of notogaster with two pairs of protuberances, notogastral cristae and humeral process (Subías and Arillo, 2001). Hitherto four known species belonging to this subgenus are present *Oppiella (Perspicuoppia*) *minidentata* (Subías, 1977), *Oppiella (Perspicuoppia) perspicua* (Mihelčič, 1956), *Oppiella (Perspicuoppia) rara* Ivany Vasiliu, 1997 and *Oppiella (Perspicuoppia) turcica* Toluk and Ayyıldız, 2009.

The genus *Epimerella* with *Oppia smirnovi* Kuliev 1962 as type-species was described from Talysh Azerbaijan SSR by Kulijev (1967) and initially placed in the family Oppiidae. Ayyıldız and Luxton (1989), however, differentiated *Epimerella* from the Oppiidae Sellnick, 1937 mainly by the presence of a medial cavity between epimera III and IV in addition to dorsosejugal suture protruding and pointed medially and based on these differences, established the family Epimerellidae with the genus *Epimerella* as the type genus. Epimerellidae is characterised by the following combination of characters: Dorsosejugal suture anterio-medially protruding and pointed. Notogastral setae very long, number 10-13 pairs (except setae *c2* much smaller than others). A medial cavity between epimera III and IV present. Rostrum entire or incised. Genital setae 5 pairs, aggenital (*ag*) setae 1 pairs, anal setae (*ad*) 2 pairs, adanal setae 3 pairs. Legs monodactylous.

Taxa of Epimerellidae are rare and comprise the following three genera and species: 1) *Epimerella* Kulijev, 1967; *E. smirnovi* (Kulijev, 1962) (Azarbaijan), *E. puzanovi* Gordeeva and Karppinen, 1988 (Ucrania), *E. distenta* Ayyıldız and Luxton, 1989 (Turkey), *E. rubeni* Khanbekjan and Gordeeva, 1991(Caúcaso), *E. Luxtoni* Toluk *et al*., 2008 (Turkey), *E. subiasi* Toluk *et al*., 2008

* Corresponding author: sbaran@sakarya.edu.tr
0030-9923/2012/0003-0777 $ 8.00/0

(Turkey); 2) *Enisella* Ayyıldız and Luxton, 1989; *Enisella turcica* Ayyıldız and Luxton, 1989 (Turkey) and 3) *Luxtonia* Mahunka, 2001; *Luxtonia hauseri* Mahunka, 2001 (Borneo) (Subías, 2009; Toluk *et al*., 2008).

Subiasella (Dividoppia) is proposed here as a new record. The subgenus *Subiasella (Dividoppia)* is included in subfamily Oxyoppiinae and well characterized by the medially incised rostrum, absence of costula, short crista, anteriorly strongly convex dorsosejugal sture and ten pairs of short notogastral setae (Mahunka, 1987). There are only one known species belonging to this subgenus *Subiasella (Dividoppia) aperta* (Mahunka, 1987) and represented by the holotype and two paratypes from Hungary. Previously only two species belonging to subfamily Oxyoppiinae, *Oxyoppia (Dzarogneta) baranae* and *Oxyoppia (Dzarogneta) ilicaensis* were known from Turkey (Baran and Ayyıldız, 2007; Toluk and Ayyıldız, 2008).

In the present paper, *Subiasella (Dividoppia) aperta* is redescribed, two new species *Oppiella (Perspicuoppia) ozkani* sp. nov**.** and *Epimerella ankaraensis* sp. nov. are newly described.

MATERIALS AND METHODS

Sampling and specimen preparation

Soil samples are transported to a laboratory and extracted using a Berlese funnel apparatus. Specimens were fixed and stored in 70% ethanol. Mounted in modified Hoyer's medium and 35% lactic acid. The drawings were made with the aid of a camera lucida attached to a compound microscope. Scanning electron microscope preparation procedure follows Behan-Pelletier and Walter (2007).

Terminology

Terminology used in this paper follows Balogh (1983) and Subías and Balogh (1989). All measurements are given in micrometers (µm). The following conventions of measurement are used: *Length of body*: measured from tip of rostrum to posterior edge of notogaster. *Width of notogaster*: refers to maximum notogastral width.

RESULTS

Oppiella (Perspicuoppia) ozkani, new species
(Figs. 1-3)

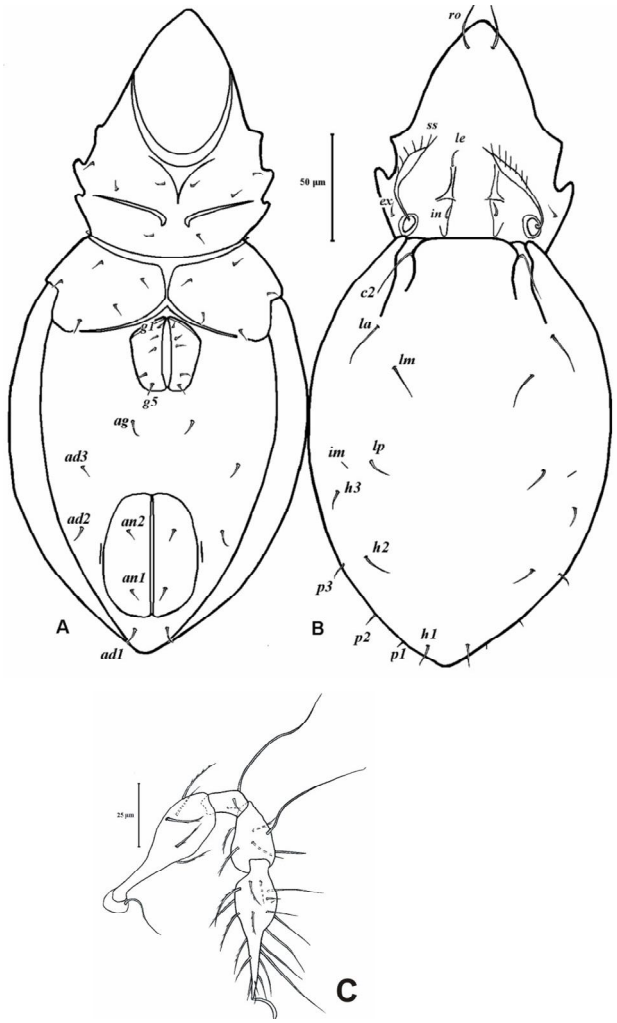

Fig. 1. *Oppiella (Perspicuoppia) ozkani* new species; A, ventral view; B, dorsal view; C, leg.

Material examined

Two specimens were studied, all of them from a single sample collected from İzmir, Turkey, 07. March. 2006. Holotype preserved in 70% ethanol and one paratype mounted on aluminum stubs and gold-coated for scanning electron

microscopy. All the material eximined deposited at the Acarology Laboratory of Atatürk University, Erzurum, Turkey.

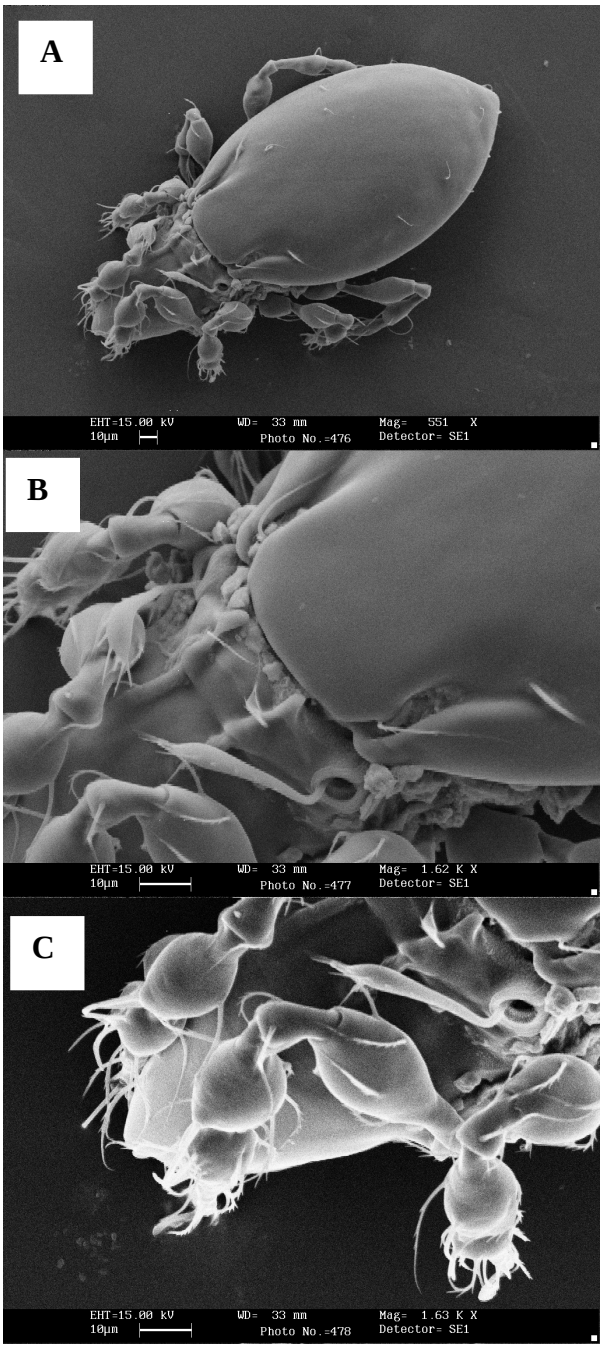

Fig. 2. SEM photographs of *Oppiella (Perspicuoppia) ozkani;* A, dorsal view; B, dorsal view of prodorsum and anterior margin of notogaster; C, dorsal view of prodorsum.

Description

Dimensions and color

Length of body: 260-296 µm and width of notogaster: 129-133 µm. The color is light brown.

Prodorsum (Figs. 1B, 2B, 2C)

Rostrum entire and rounded (Figs. 1B, 3C). A pair of elongated tubercles in the interbothridial region bearing interlamellar setae on their outer margin. Lamellar costulae linked with the interbothridial tubercles and at the corner directed to the bothridia (Figs. 1B, 2B). Lamellar setae arising on the distal tip of costulae. Rostral setae long and curved to each other. Sensillus uniform and unilaterally ciliate, having 7-8 branches (Figs. 1B, 2B). Lamelar setae closer to interlamelar setea than rostral setae.

Notogaster (Figs. 1B, 2A)

Oval shaped and elongated, posteriorly pointed. Anterior margin of notogaster has two pairs of protuberances; notogastral cristae and humeral process. Dorsosejugal sture straight medially, slighly arced laterally. Antero-laterally, the notogaster has a pair of humeral process, each separeted from the crista by a ditch. Both the humeral process and the crista rounded and prolonged in a posterior direction; humeral process prolonged until the setae *la*, and the crista prolonged to as half lengt of it. Setae *c2* originated on lateral sides of notogastral cristae. The notogaster has 10 pairs of fine, medium length, smooth setae (Figs. 1B, 2A). Notogastral setae pointed at the tip (Fig. 2D). The setae *c2* and *la* are longer than the others.

Ventral side (Fig. 1A)

The formula of the epimeral setae is the normal 3:1:3:3; the epimeral setae are smooth and short. Genital plates with five pairs of setae, short, slim and smooth. One pair of aggenital setae, all similar. Adenal setae *ad1* is postanal and adanal setae *ad3* is preanal. Lyrifisures *iad* in paraanal position.

Legs (Fig. 1C)

Typical for the genus, all legs monodactylous.

Etymology

The new species name is derived from Prof. Dr. Muhlis Özkan.

Remarks

The new species described is different from *Oppiella (P.) minidentata* (Subías, 1977) and *Oppiella (P.) perspicua* (Mihelčič, 1956) by (i) rounded cristae and humeral process; (ii) situation of setae *c2* (situated on lateral sides of cristae), (iii) shape of costulae.

The new species also differs from *Oppiella (P.) minidentata* by linked costulae and interbothridial tubercule. The new species differs from *Oppiella (Perspicuoppia) rara* Ivan and Vasiliu 1997 by (i) shape of costulae, (ii) rounded cristae and humeral process, (iii) type of sensillus, (iv) positions of cristae and humeral process with respect to each other.

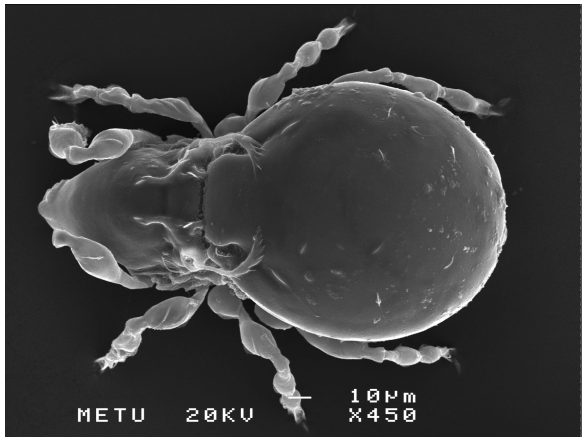

Fig. 3. SEM photographs of *Oppiella (Oppiella) nova.*

Genus *Oppiella* has two subgenus; *Oppiella* and *Perspicuoppia*. Both of them have two pairs of protuberances on their anterior marigin of notogasters; notogastral cristae and humeral process (Figs. 2A, 2B, 3). In *Oppiella* this crista and humeral process adjacent and so there is only one pair of decurrent line on the anterior margin of notogaster (Fig. 3). But in *Perspicuoppia* there is a ditch between these two protuberances and so two pairs of decurrent line; one is from cristae the other is from humeral process (Fig. 2B). The new species also similar to *Oppiella nova* by the shape of cristae and humeral process but differs from it by the presence of a ditch between these two protuberances.

KEY TO TURKISH SPECIES OF *OPPIELLA*

1. Notogastral cristae with a pair of decurrent line .... *Oppiella (Oppiella)nova* (Qudemans, 1902)
- Notogastral cristae with two pairs of decurrent line .....
2 Rostrum with nose-like projection, anterior margin with two pairs of round humeral processes ....*Oppiella (Perspicuoppia) turcica* ..... Toluk and Ayyıldız, 2009
- Rostrum without nose-like projection, anterior margin with one pairs of round humeral processes .... *Oppiella (Perspicuoppia)ozkani* sp. nov.

Epimerella ankaraensis, new species

(Figs. 4-5)

Material examined

Three specimens were studied, all of them from a single sample collected from campus of Middle East Technical University, Turkey, 19 March, 2007. The holotype and 2 paratypes are stored in 70% ethanol, 2 paratypes are mounted on aluminum stubs and gold-coated for scanning electron microscopy. Holotype and paratypes are deposited at the Acarology Laboratory of Atatürk University, Erzurum, Turkey.

Description

Dimensions and color

Length of body: 300-330 µm and width of notogaster: 110-135 µm (n=5). The dark brown or brown.

Prodorsum (Figs. 4A, 5B and 5C)

Rostrum entire nasiform and projecting medially (Figs. 5B, 5C). Rostral setae *ro* situated closely together and finely ciliated (Fig. 5B). Lamellar setae *le* inserted mediodorsally on prodorsum, closer to interlamellar setae *in* than to rostral setae, longest prodorsal setae. Costula short, extending anteriorly from base of bothridium towards lamellar setae but not reaching lamellar setae, strongly arcuate. Exobothridial setae *ex* longer and stronger than the rostral setae, equal in length to interlamellar setae. Sensillus long, curved, head fusiform, unilaterally ciliated with 7-10 cilia (Figs. 4A, 5C).

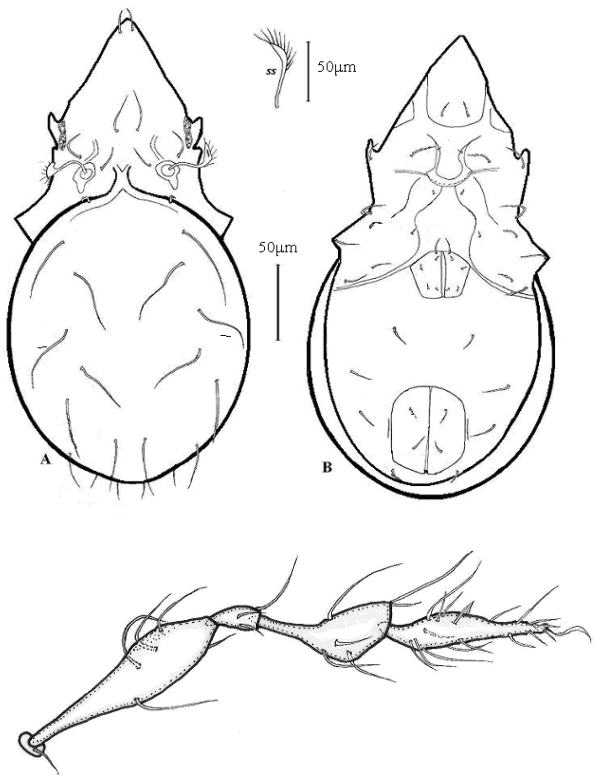

Fig. 4. *Epimerella ankaraensis* new species; A, dorsal view; B, ventral view; C, leg.

Notogaster (Figs. 4A, 5A, 5D, 5E)

Projecting anterio-medially as it is typical in all of the species of family (Figs. 4A, 5F). Ten pairs of notogastral setae present. Setae *lm* situated posteriorly with respect to setae *la*. Setae *c2* much shorter than others, fine smooth and curved backward (Figs. 4A, 5D). The other notogastral setae very long, tapered and barbed at apical half (Fig. 5E). Setae *la* and *lp* arranged in a longitudional line whereas setae *lm* originated medially not on the same line. Setae *lm* nearer to setae *la* than setae *lp* (the distance between setae *la* and *lm* equal to ¼ of length of setae *lm*, and the distance between setae *lm* and *lp* equal to ½ of length of setae *lm*) (Figs. 4A, 5D). Lyrifisures *im* situated laterally on notogaster, posterior to setae *lp, ia* not observable.

Ventral region (Figs. 4B, 5F, 5G)

Composition of epimeral region unusual. Epimera I has a postero-medially deep, semi-circular cavity distinguishable in SEM photograph Figure 5G. A narrow horse shoe shaped band surround the semi-circular cavity is distinguishable by compound microscope. A wide medial cavity between epimera III and IV present, distance at widest point of cavity equal in width to anterior margin of genital plates (Figs. 4B, 5G). Epimeral surfaces II and III+IV elevated. Epimeral setal formula 3-1-3-3. Epimeral setae long, strongly barbed except seta *1a* minute, smooth, hardly discernable, setae *2a* and *3a* also short, but much thicker than *1a* and easily discernable. Anogenital formula 5-1-2-3. Genital setae shortest of anogenital setae, except seta *g5* slightly longer than remainder of genital setae, directed anteriorly. Aggenital and adanal setae long, barbed. Adanal seta ad_3 inserted preanally, seta ad_1 postanally. Lyrifissure *iad* in adanal position (Fig. 4B).

Legs (Fig. 4C)

Typical for the genus, all legs monodactylous.

Etymology

The new species name is derived from the city, Ankara, in which it was found.

Remarks

Epimerellidae and its mostly similar genera are distinguished from other oppiid mites on the basis of relatively few characters. Previously genus *Epimerella* was characterised by incised rostrum but here we described the *Epimerella* with entire or incised rostrum.

The new species closely resembles one particular member of the largest genus *Epimerella puzanovi* Gordeeva and Karppinen, 1988, but differs from it by the following features: in the new species; (i) rostrum entire; (ii) Costulae do not reach to lamellar setae and strongly arcuate; (iii) Lamellar setae is the longest prodorsal setae; (iv) Setae *la* and *lp* arranged in a longitudional line whereas setae *lm* originated medially not on the same line; (v) Setae *lm* nearer to setae *la* than setae *lp*; (vi) Exobothridial setae longer and stronger than the rostral one, and as long as the interlamellar one; (vii) All ventral setae ciliated; (viii) Setae g_1 longer than the other genital setae.

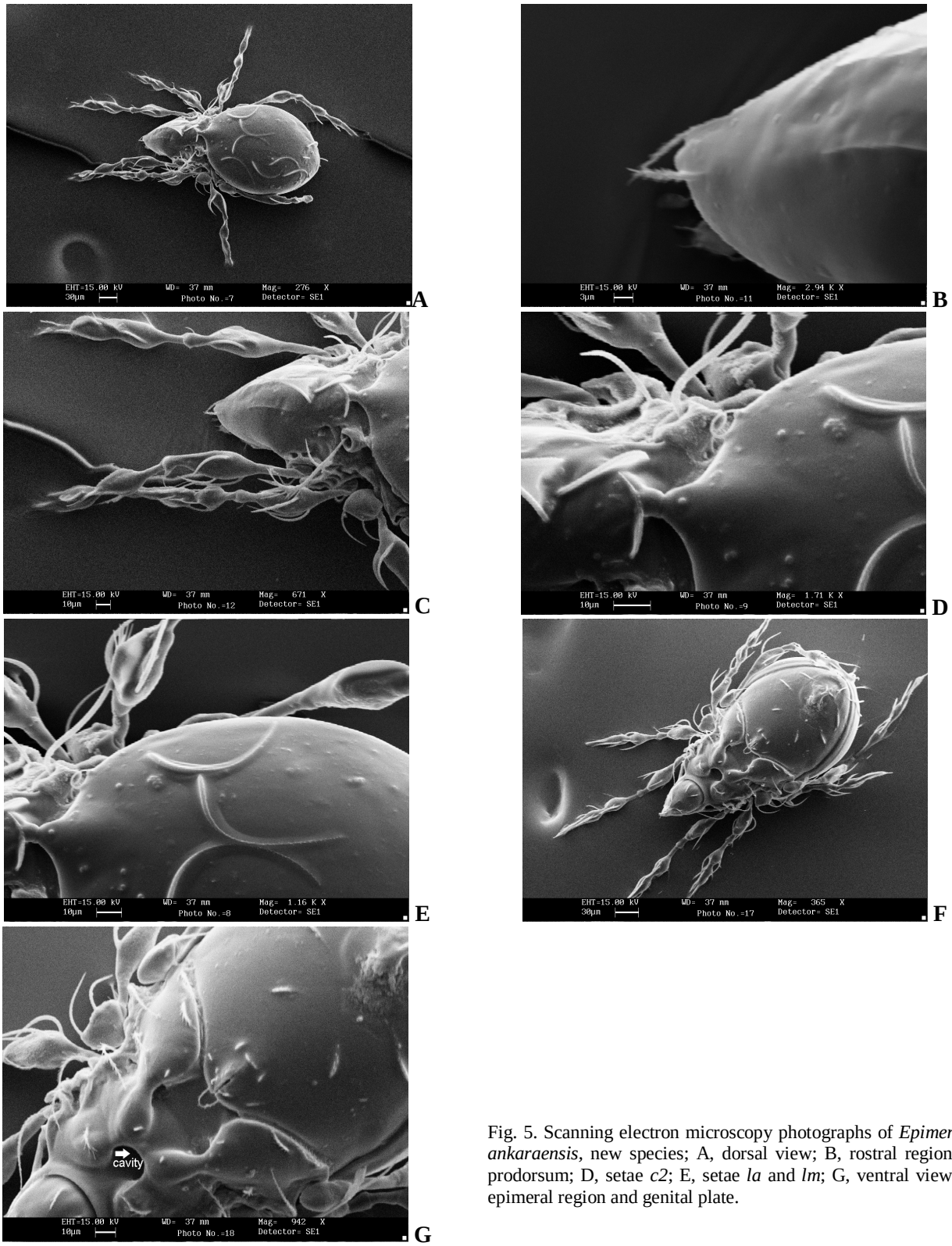

Fig. 5. Scanning electron microscopy photographs of *Epimerella ankaraensis*, new species; A, dorsal view; B, rostral region; C, prodorsum; D, setae *c2*; E, setae *la* and *lm*; G, ventral view; G, epimeral region and genital plate.

In the description of *Epimerella puzanovi* it is stated that "the rostrum is tripartitate, its teeth closely adjoined" (Gordeeva and Karppinen, 1988), but this was not shown in the Figure.

KEY TO TURKISH SPECIES OF *EPIMERELLA*

1- Rostrum entire ..... *Epimerella ankaraensis* sp. nov.
- Rostrum with two separeted tooth.....2
2- Epimera I meeting medially .... *Epimerella luxtoni* Toluk *et al*. (2008)
- Epimera I separated from each other medially 3
3- Setae *in* reaching beyond insetion point of seta *le* .... *Epimerella subiasi* Toluk *et al*. (2008)
- Setae *in* not reaching beyond insetion point of seta *le* .. .... *Epimerella distenta* Ayyıldız and Luxton, 1989

Subiasella (Dividoppia) aperta (Mahunka, 1987) (Figs. 6-7)

Material examined

Nine specimens were studied, all of them from a single sample collected from Kiremitlik bastion, Atatürk forest, Erzurum, Turkey, 19. May. 2001, soil under *Verbascum* sp.. Seven specimens preserved in 70% ethanol and other 2 other one mounted on aluminum stubs and gold-coated for scanning electron microscopy. All the material eximined deposited at the Acarology Laboratory of Atatürk University, Erzurum, Turkey.

Description

Dimensions and color

Length of body 242-260 µm and Width of notogaster: 115-124 µm. The color is light brown.

Prodorsum (Figs. 6B, 7B, 7C)

Rostrum incised medially, without sharp teeth (Fig. 7C). Rostral setae (*ro*) arising far from each other and not curved to each other. Lamelar (*le*), interlamelar setae (*in*) and exobothridial setae (*ex*) are similar, small, thin and smooth. Lamelar setae closer to interlamelar setea than rostral setae. Lamelar line slightly concaved, translamelar line hardly visible (Fig. 7C). Sensillus (*ss*) clavate, unilaterally ciliated and has a thick stalk. Sensillus has 21-23 cilia; with medium sized 12-13 cilia on its head and 9-10 short cilia on its stalk (Fig. 7B). Bothridial tubercules are elongated and "9" shaped, they are almost touching to notogatral humeral process (Fig. 7C).

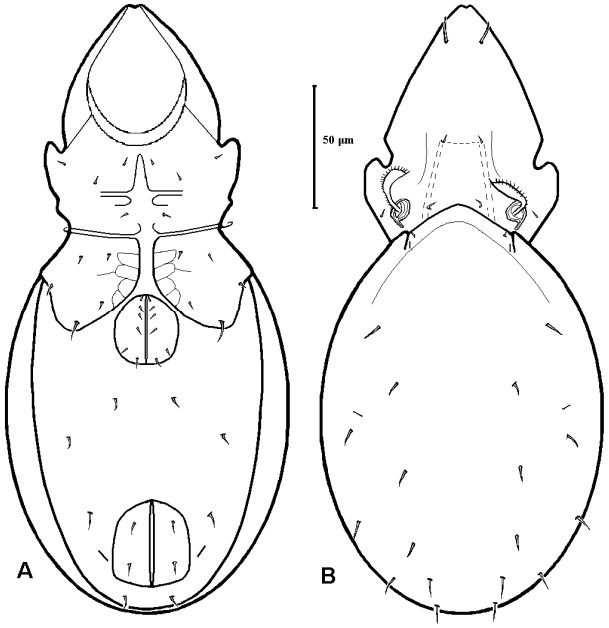

Fig. 6. *Subiasella (Dividoppia) aperta*; A, Ventral view; B, Dorsal view.

Notogaster (Figs. 6B, 7A, 7C)

Anterior margin strongly arched with well developed, protruding humeral process. The *c2* setae are fine and smaller than the other nine pairs of notogastral setae, which are short but not thin. Humeral process almost touching to posterior end of bothridial tubercule. Surface of notogaster has rare granulation on its aterio-medial region (Fig. 7C). Lyrifissure *ia* visible and longitudinal. Lyrifisure *im* well developed.

Ventral side (Figs. 6A, 7D)

Formula of epimeral setae is the normal, 3:1:3:3; epimeral setae are smooth and short, with the exception of the setae *4b* (Figs. 6A, 7D). Genital plates with six pairs of genital setae; anal plates with two pairs of anal setae. Inner surface of epimeres ornamented by polygonal reticulation. Anal plate is oval and bigger than genital one. Setae *ad3* originating far from each other and from *ad2*. Setae *ad1* in postanal and setae *ad3* in preanal position. Lyrifisures *iad* in direct apoanal position.

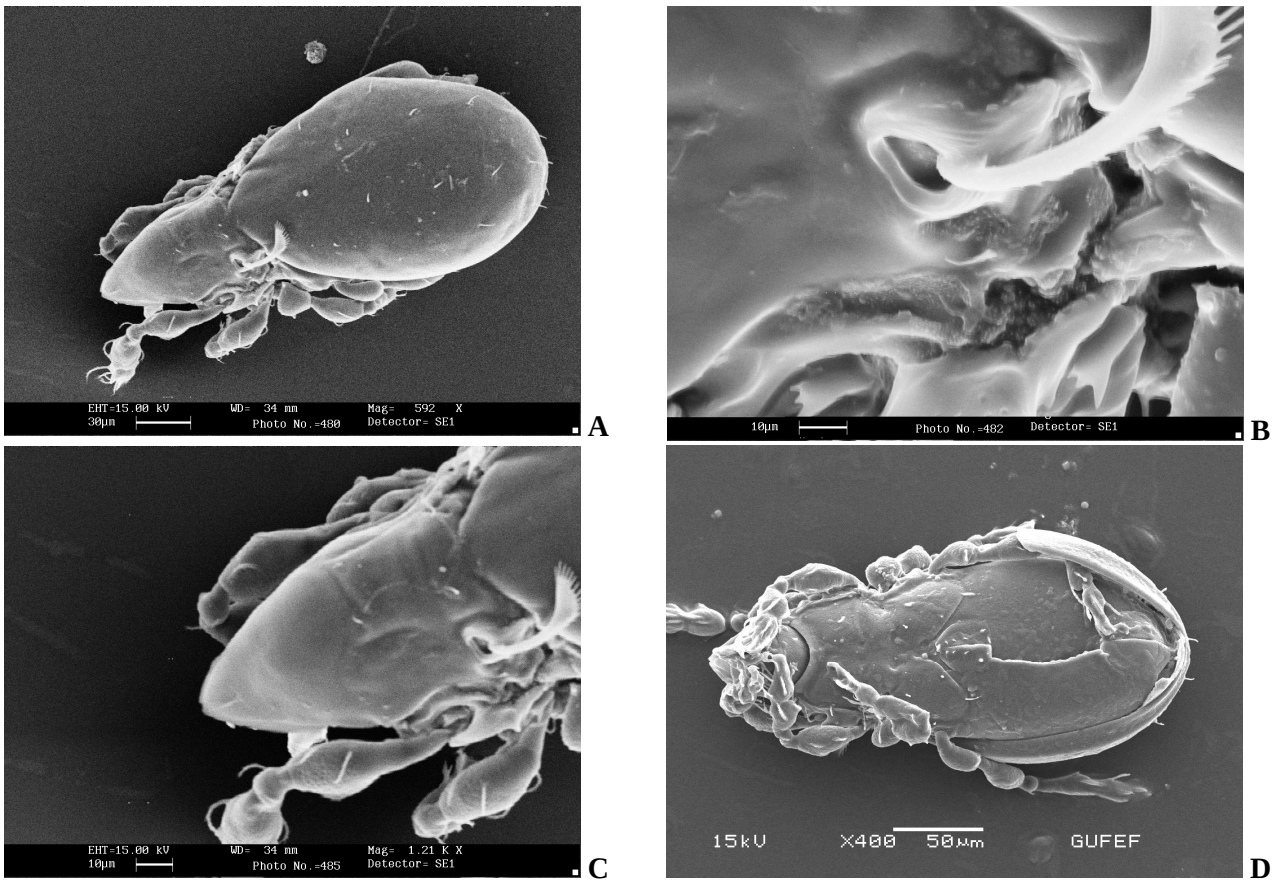

Fig. 7. SEM photographs of *Subiasella (Dividoppia) aperta;* A, dorsal view; B, sensillus and bothridium; C, dorsal view of prodorsum; D, ventral view.

Remarks

We think this is the same species with *Subiasella (Dividoppia) aperta*. Because in light microscopy investigation cilia of sensillus stalk, lamellar line and translamellar line very hardly visible. But in SEM investigation they are easyly visible. So by SEM study some of unclear chracters of this species also described.

The other morphological features of our specimens resemble those of previously known specimens.

ACKNOWLEDGEMENTS

We wish to express our sincere thanks to Dr. Sándor Mahunka from the Hungarian Natural History Museum for reading the manuscript and valuable advice given. We also thank Dr. Luis S. Subías for providing some of the references. This study was partly supported by the Scientific and Technological Research Council of Turkey (TUBITAK), Project no 105T552 (TBAG-HD/115).

REFERENCES

AYYILDIZ, N. AND LUXTON, M., 1989. Epimerellidae (Acari, Oribatida) a new mite family. *J. nat. Hist.*, **23**: 1381 – 1386.

BALOGH, J., 1983. A partial revision of the Oppiidae Grandjean, 1954 (Acari: Oribatei). *Acta Zool. Acad. Scient. Hungaricae*, **29**: 1-79.

BARAN, Ş., AYYILDIZ, N. AND SUBÍAS, L.S., 2010. Review of the Family Damaeolidae Grandjean, 1965 (Acari, Oribatida) with two new records from Turkey. *Turkish J. Zool.*, **34**: 343-349.

BARAN, Ş. AND AYYILDIZ, N., 2007. Two new species of soil mites (Acari, Oribatida, Oppiidae and

Machuellidae) from Turkey. *Zootaxa,* **1445**: 57–64.

BEHAN-PELLETERIER, V. AND WALTER, D., 2007. *Phyllermus* n. gen., from leaves of deciduous trees in eastern Australia (Oribatida: Licneremaeoidea). *Zootaxa*, **1386**: 1-17.

GORDEEVA, E.V. AND KARPPINEN, E., 1988. New oribatid mites of the family Oppiidae Grandjean, 1954 (Acarina, Oribatei) from Crimea and Caucasus. *Annl. ent. Fenn.,* **54**: 59-64.

KHANBEKIAN, V.R. AND GORDEEVA, E.W., 1991. New genus *Fineoppia khosrovica* gen nov., sp. nov. and two new species *Medioppia trilobata* sp. nov and *Epimerella rubeni* sp. nov. of family Oppiidae Grandjean, 1954, in armenia (Acariformes, Oribatei). *Dokl. Akad. Haykap.,* **92**: 86-92.

KULIJEV, K.A., 1962. Fifteen new representatives of the oribatid mites (acariformesi Oribatei) from the genera *Oppia* and *Ceratozetes*. *Trud. Azerbaidzhanskogo nauchnois-sledovatelskogo vet. Inst.,* **13**: 250-268.

KULIJEV, K.A., 1967. Dva novykh roda oribatidntkh kleshchei iz Azerbaidzhana. *Dokl. Akad. Nauk Azerbaidzhanskoi* SSR, **23**: 85-91.

MAHUNKA, S., 1987. A survey of the Oribatids of the Kiskunság National Park (Acari: Oribatida). - In: *The fauna of the Kiskunság National Park. II* (ed. S. Mahunka), Akadémiai Kiadó, Budapest, pp. 346-397.

MAHUNKA, S., 2001. Oribatids from Brunei III (Acari: Oribatida). *Rev. suis. Zool.,* **108**: 317-349.

MIHELCIC, F., 1956. Oribatiden Südeuropas V. *ZooI. Anz.*, **157**: 154-179.

SCHATZ, H., 2002. Die oribatidenliteratur und die beschriebenen oribatidenarten (1758-2001) eine analyse. *Abhandl. Berich. Naturkundemus. Görlitz,* **74**: 37-45.

SUBÍAS, L.S., 1977. *Taxonomía y Ecología de los Oribátidos Saxícolas y Arborícolas de la Sierra de Guadarrama (Acarida, Oribatida)*. Trabajo nº 24 Cátedra de Artrópodos, Departamento de Zoología, Facultad de Biología, Universidad Complutense de Madrid. pp. 379.

SUBÍAS, L.S., 2009. *Listado sistematico, sinonimico y biogeografico de los acaros oribatidos (Acariformes: Oribatida) del Mundo (Excepto fosiles). http://www.ucm.es/info/zoo/Artropodos/Catalogo.pdf*

SUBÍAS, L.S. AND BALOGH, P., 1989. Identification keys to the genera of Oppiidae Grandjean, 1954 (Acari: Oribatei). *Acta Zool. Acad. Scient. Hung.,* **35**: 355-412.

SUBÍAS, L.S. AND ARILLO, A., 2001. Acari, Oribatei, Gymnonota II. In: *Fauna Ibérica*, vol. 15 (eds. M. A. Ramos, J. A. Tercedor, X. B. Ros, J. G. Noguera, A. G. Sierra, E. M. Mayol, F. M. Piera, J. S. Marino, and J. T. González). Museo Nacional de Ciencias Naturales. CSIC. Madrid, pp. 289.

TOLUK, A. AND AYYILDIZ, N., 2008. New and unrecorded oppioid mites (Acari: Oribatida) from Yozgat Pine Grove National Park, Turkey. *Acarologia,* **48**: 209-223.

TOLUK, A., AYYILDIZ, N. AND BARAN, Ş., 2008. Two new species of Epimerella Kulijev, 1967 (Acari, Oribatida, Epimerellidae) from Turkey. *J. nat. Hist.,* **42**: 2537-2546.

TOLUK, A. AND AYYILDIZ, N., 2009. Three new species of Oppiidae from Turkey (Acari: Oribatida). *Zootaxa* **1988**: 33-47.

(Received 29 July 2010, revised 8 April 2012)