

## Review of the family Damaeolidae Grandjean, 1965 (Acari, Oribatida) with two new records from Turkey

Şule BARAN<sup>1,\*</sup>, Nusret AYYILDIZ<sup>2</sup>, Luis S. SUBIAS<sup>3</sup>

<sup>1</sup>Department of Biology, Faculty of Arts and Sciences, Sakarya University, 54187 Sakarya - TURKEY

<sup>2</sup>Department of Biology, Faculty of Science, Erciyes University, 38039 Kayseri - TURKEY

<sup>3</sup>Department of Zoology, Faculty of Biology, Complutense University, Madrid 28040 - SPAIN

Received: 18.02.2009

**Abstract:** A short review of the family Damaeolidae Grandjean, 1965 is provided with the first records of *Damaeolus asperatus* (Berlese, 1904) and *Damaeolus ornatissimus* Csiszár, 1962 from Turkey. Identification key to 11 known species of the family is given. Scanning electron microscopy photographs of the newly recorded species are also provided.

**Key words:** Acari, Oribatida, Damaeolidae, systematics, new records, Turkey

### Damaeolidae Grandjean, 1965 (Acari, Oribatida) familyasının incelenmesi ile Türkiye'den iki yeni kayıt

**Özet:** Türkiye için yeni kayıt olan *Damaeolus asperatus* (Berlese, 1904) ve *Damaeolus ornatissimus* Csiszár, 1962 türlerinin yeniden tanımları verilerek Damaeolidae Grandjean, 1965 familyasının değerlendirilmesi yapılmıştır. Bu familyaya ait bilinen 11 tür için teşhis anahtarı verilmiştir. Ayrıca, yeni kaydedilen türlere ait taramalı elektron mikroskopu fotoğrafları da sunulmuştur.

**Anahtar sözcükler:** Acari, Oribatida, Damaeolidae, sistematik, yeni kayıtlar, Türkiye

#### Introduction

Oribatid mites are one of the major acarine groups and occur in many types of habitats especially in soil (Balogh J. and Balogh P.1992). Hitherto 144 species belonging to 75 genera included in 43 family of oribatid mites had been recorded from Turkey (Özkan et al., 1988; Özkan et al., 1994; Erman et al., 2007).

The family Damaeolidae was erected by Grandjean (1965) with 2 genera *Damaeolus* Paoli, 1908 and *Fosseremus* Grandjean, 1954. Then the genera

*Gressittolus* Balogh, 1970 and *Caudamaeolus* P. Balogh, 1988 were included in this family by J. Balogh (1970) and P. Balogh (1988), respectively. The family has 4 genera and 11 known species and has a cosmopolite distribution except Antartica (Subías, 2008). To date, there is one record *Fosseremus quadripertitus* belonging to family Damaeolidae from Erzurum province of Turkey (Ayyıldız, 1988). The family Damaeolidae is thus represented by 3 species in Turkey, given in the present work.

\* E-mail: sbaran@sakarya.edu.tr

The redescription of the family and the related genera are given in the present paper. The species *Damaeolus ocellatus* Mahunka, 2000 was transferred to the genus *Gressittolus*. Two new species for the Turkish fauna, *Damaeolus asperatus* and *Damaeolus ornatisimus*, are also redescribed by scanning electron microscopy (SEM) investigation.

## Materials and methods

Mites were collected in soil and litter samples from Erzurum, Erzincan, and Sakarya provinces and extracted using a Berlese funnel apparatus. They were preserved in 70% ethanol. Mites were sorted from the samples under a stereomicroscope and mounted on slides in modified Hoyer's medium or 35% lactic acid.

The terminology used in this paper follows Grandjean (see Travé and Vachon 1975), Balogh (1983), and Subías and Balogh (1989). All measurements are given in micrometers ( $\mu\text{m}$ ). Examined materials are deposited in the Acarological Collection of the Zoological Museum, Erciyes University, Kayseri, Turkey.

## Results and discussion

### Family Damaeolidae Grandjean, 1965

#### Description

Lamellar setae near rostral setae. Prodorsum without lamellae or costulae. Eleven pairs of notogastral setae present. Fissures *im* absent. Pedotectum I very small or absent, pedotectum II absent. Epimeral setal formula 3:1:3:3. 6 pairs of genital setae, 3 pairs of aggenital setae, and 3 pairs of adanal setae present (one exception is the genus *Caudamaeolus* that has 8 pairs of notogastral setae, because the larval and nymphal scalp fixed on notogaster, and the number of aggenital setal formula different, which are difficult to see and represented only by 1 pair of alveoli).

### *Caudamaeolus* P. Balogh, 1988

#### Description

Lamellar setae near rostral setae. Sensillus long with distal half fusiform with a long apical flagellum. Notogaster with larval and nymphal scalps and ending in 2 pairs of apophyses with 2 pairs of setae;

the other 6 pairs of notogastral setae shorter; also 1 pair of rosette-like protuberances in the lateral part of notogaster; dorsosejugal suture arched. Epimeral setal formula as usual (3:1:3:3). Setal formula in the anogenital region 6:1:2:3.

#### Monotypic

*Caudamaeolus petalus* P. Balogh, 1988- Type species

### *Fosseremus* Grandjean, 1954

#### Description

Lamellar setae near rostral setae. Sensillus fusiform. Notogastral setae setiform and sheathed in cerotegumental capsule. Notogaster with 4 semicircular depressions; dorsosejugal suture arcuate. Epimeral setal formula as usual (3:1:3:3). Setal formula in the anogenital region 6:3:2:3.

#### Three species:

*Fosseremus americanus* (Jacot, 1938)

*Fosseremus laciniatus* (Berlese, 1905) - Type species

*Fosseremus sculpturatus* Mahunka, 1982

### *Gressittolus* Balogh, 1970

#### Description

Lamellar setae near rostral setae. Sensillus fusiform with or without an apical flagellum. Notogastral setae short and blade shaped, situated marginally except *lm*; dorsosejugal suture slightly arched. Epimeral setal formula as usual (3:1:3:3). Setal formula in the anogenital region 6:3:2:3. Genital plate protruding anteriorly. Some laths on the anal plates present. Notogaster margined with a polygonate pattern on the central portion.

#### Two species

*Gressittolus marginatus* Balogh, 1970- Type species

*Gressittolus ocellatus* (Mahunka, 2000) comb. nov.

#### Notes

The species *Gressittolus ocellatus* (Mahunka, 2000) was described in the genus *Damaeolus* by Mahunka (2000). However due to the short and blade shaped notogastral setae, medially arising only 1 pair of notogastral setae (*lm*), elongated genital plate, central notogaster portion with uneven, polygonal chitinous

structure, and notogastral margins with irregular and rugulose structure, this species belongs to the genus *Gressittolus* Balogh, 1970 being very similar to *Gressittolus marginatus* Balogh, 1970.

***Damaeolus Paoli, 1908***

**Description**

Lamellar setae near rostral setae. Sensillus fusiform with an apical flagellum. Notogastral setae long flagelliform or setiform. Notogaster without 4 semicircular depression; dorsosejugal suture straight or arched. Epimeral setal formula as usual (3:1:3:3). Setal formula in the anogenital region 6:3:2:3.

Five species:

*Damaeolus asperatus* (Berlese, 1904) - Type species

*Damaeolus bregetovae* Csiszár, 1962

*Damaeolus cellulatus* Subías, Ruiz and Kahwash, 1990

*Damaeolus magnus* Mahunka, 1979

*Damaeolus ornatissimus* Csiszár, 1962

***Damaeolus ornatissimus* Csiszár, 1962 (Figures 1-5)**

**Material Examined**

The examined material collected from Karayazı, Geyikli, Erzurum, Turkey, 39°42' N, 42°09' E, 8 June 2000 (3 specimens) (specimen numbers EUZM-25001, EUZM-25002, and EUZM-25003), from moss on rock and Soğuksu village, Hendek, Sakarya, Turkey, 40°88' N, 30°61' E, 09 May 2007 (7 specimens)

(specimen numbers EUZM-5401, EUZM-5402, EUZM-5403, EUZM-5404, EUZM-5405, EUZM-5406, and EUZM-5407)

**Measurements**

Length of body 260-275 µm, width of body 138-145 µm.

**Prodorsum** (Figures 1, 2 and 4). Rostrum broadly rounded, but pointed at the tip (Figure 4). Lamellar and rostral setae close to each other and their lengths nearly equal. Interlamellar setae close to each other and dilated basally. Rostral and lamellar setae long, interlamellar ones short.

Cerotegumental granulation of prodorsum polygonal in center. Sensillus fusiform with an apical flagellum.

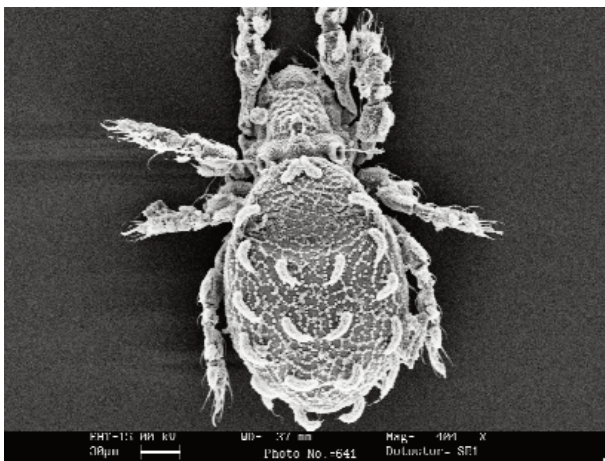


Figure 1. *Damaeolus ornatissimus*, dorsal view of adult (SEM photograph).

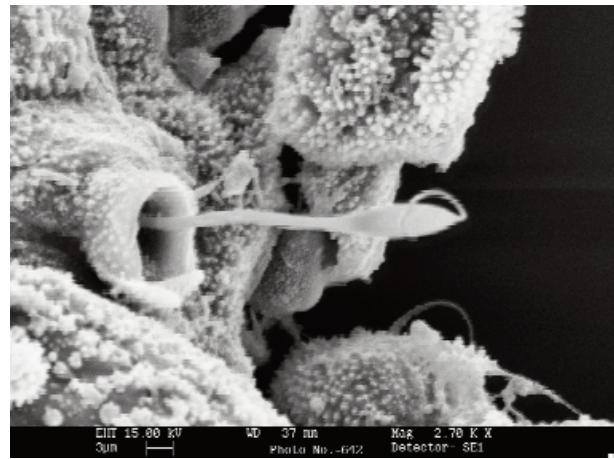


Figure 2. *Damaeolus ornatissimus*, sensillus (SEM photograph).



Figure 3. *Damaeolus ornatissimus*, notogastral setae (SEM photograph).



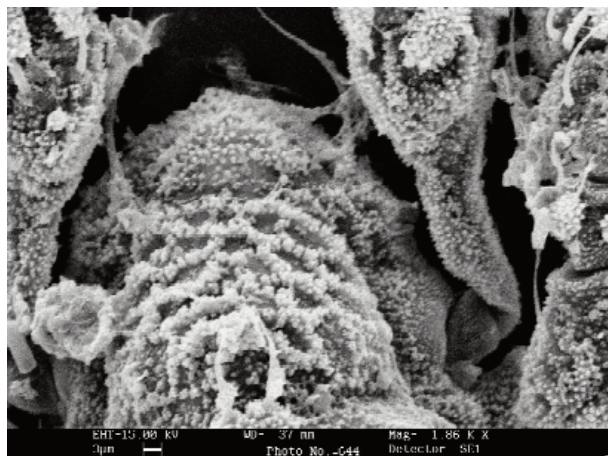


Figure 4. *Damaeolus ornatissimus*, rostral region (SEM photograph).

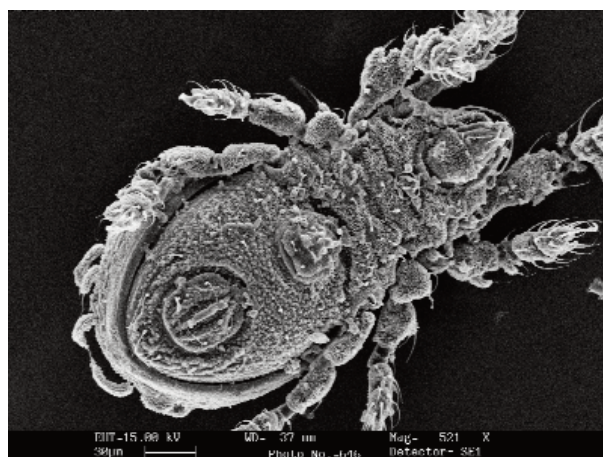


Figure 5. *Damaeolus ornatissimus*, ventral view of adult (SEM photograph).

*Notogaster* (Figures 1 and 3). Dorsosejugal suture arched. Eleven pairs of notogastral setae present; all in the same length, curved, not flagellate (some of examined specimens have flagellate *p1* and *p2* setae; Figure 1) and sheathed in cerotegumental capsule, composed of granules, detached in some species. Cerotegumental granule of notogaster arranged in polygonal shape. Setae *c1* directed anteriorly and the others directed posteriorly. A semicircular depression present anteromedially.

*Venter* (Figure 5). Epimeral surface finely granulated. Epimeral borders and apodems weakly developed. Epimeral setal formula: 3:1:3:3 as usual. All epimeral setae very thin and fine. The surface of ventral plate granulated. All setae in the anogenital region simple, their formula: 6:3:2:3. Adanal setae longer than the remaining ones. Distance between anal and genital plates slightly greater than length of genital plate.

*Legs*. Legs are densely covered with fine granulation. Typical for the genus, all legs monodactylous.

#### Notes

The body dimensions of *Damaeolus ornatissimus* were given as length of body 296-325 µm, width of body 156-175 µm by Csiszar and Jeleva (1962). They were given as length of body 250-260 µm, width of body 120-130 µm by Perez-Íñigo (1997). According to our data, the dimensions are as follows: length of body 260-275 µm, width of body 138-145 µm. In this

respect, the dimensions of the specimens found in Turkey are in accordance with previously given dimensions. While all the notogastral setae described as never flagelliform by Csiszar and Jeleva (1962) in some of our investigated specimens setae *p1* and *p2* has an apical flagellum (Figure 1).

A semicircular anteromedial depression that was not mentioned previously is present in our samples. The other morphological features of our specimens resemble those of previously known specimens.

#### Distribution

Southern Europe, the Caucasus, and western Asia

#### *Damaeolus asperatus* (Berlese, 1904) (Figures 6-9)

#### Material Examined

Kiremitlik bastion, Atatürk forest, litter and composted soil, Erzurum, Turkey, 39°81'N, 41°91'E, 19 May 2001 (2 specimens) (specimen numbers EUZM-25004 and EUZM-25005), under a pine tree and Ahmediye, Erzincan, Turkey, 39°88'N, 39°33'E, 28 April 2001 (5 specimens) (specimen numbers EUZM-2401, EUZM-2402, and EUZM-2403, 2404, and 2405), from grassy soil.

#### Measurements

Length 285-305 µm, width 143-157 µm.

*Prodorsum* (Figures 6, 7 and 9). Rostrum broadly rounded. Lamellar and rostral setae close to each other and their lengths nearly equal. Interlamellar

setae close to each other and dilated basally. Rostral and lamellar setae long, interlamellar ones short.

Cerotegumental granulation of prodorsum irregular. Sensillus fusiform with an apical flagellum.

*Notogaster* (Figures 6 and 8). Dorsosejugal suture arched. Eleven pairs of notogastral setae present; all of them thin and flagellate and sheathed in cerotegumental capsule, composed of granules, detached in some species. Cerotegumental granule of notogaster arranged irregularly. Setae *c1* directed anteriorly. A semicircular depression present anteromedially.

*Venter*. Epimeral surface granulated. Epimeral borders and apodems weakly developed. Epimeral

setal formula: 3:1:3:3 as usual. All epimeral setae thin. The surface of ventral plate granulated. All setae in the anogenital region simple, their formula: 6:3:2:3. Adanal setae longer and flagellate. Distance between anal and genital plates as great as length of genital plate.

*Legs*. Legs are densely covered with fine granulation. Typical for the genus, all legs monodactylous.

#### Notes

The body dimensions of *Damaeolus asperatus* have been given as length of body 263 µm, width of body 142 µm by Csizsar and Jeleva (1962). According to our data, the dimensions are as follows: length of body

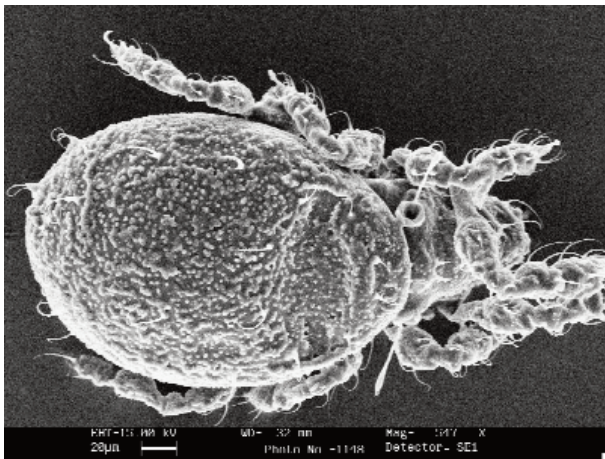


Figure 6. *Damaeolus asperatus*, dorsal view of adult (SEM photograph).

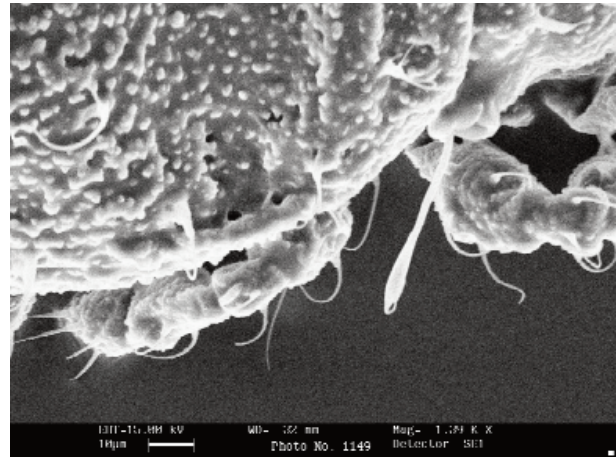


Figure 7. *Damaeolus asperatus*, sensillus (SEM photograph).

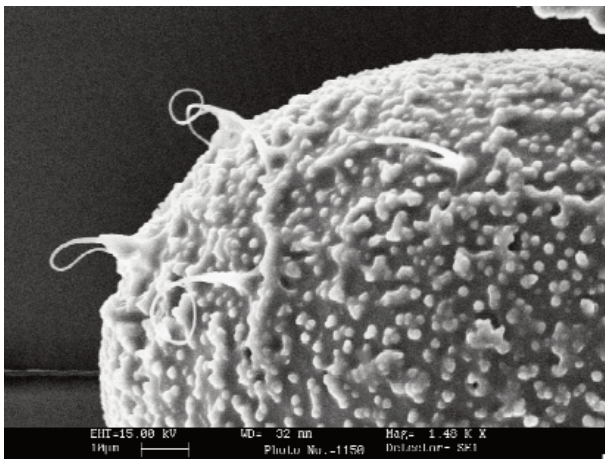


Figure 8. *Damaeolus asperatus*, notogastral setae (SEM photograph).

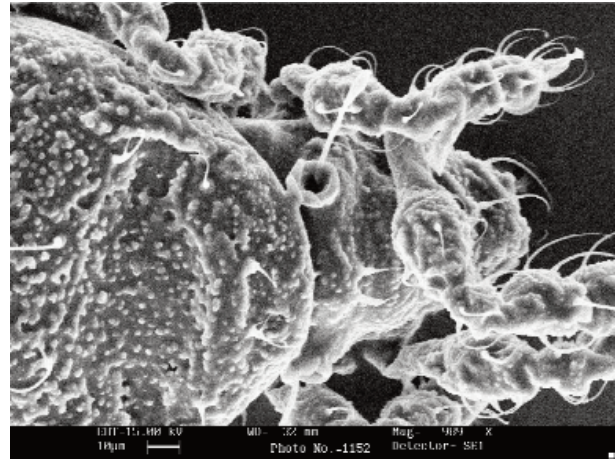


Figure 9. *Damaeolus asperatus*, prodorsal region (SEM photograph).



285-305 µm, width 143-157 µm. In this respect, the dimensions of the specimens found in Turkey are greater than the previously given dimensions.

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

*Distribution*

Palearctic region

**Key to the known species of Damaeolidae**

- 1- Notogaster with 2 pairs of posterior apophyses each bearing a seta .....  
.....*Caudamaeolus petalus* P. Balogh, 1988
- Notogaster without posterior apophyses ...2
- 2- Notogaster with 4 semicircular depressions 3
- Notogaster without 4 semicircular depressions .....4
- 3- Sculpture on prodorsum, notogaster and anal plates present .....  
.....*Fosseremus sculpturatus* Mahunka, 1982
- Sculpture on prodorsum, notogaster and anal plates absent .....  
.....*Fosseremus laciniatus* (Berlese, 1905)  
( .....*Fosseremus americanus* (Jacot, 1938))
- 4- Notogastral setae short, blade shaped and only one pair of notogastral setae (*lm*) arising medially .....5

- Notogastral setae long flagelliform or setiform .....6
- 5- Sensillus with apical flagellum .....  
.....*Gressittolus ocellatus* (Mahunka, 2000)
- Sensillus without apical flagellum .....  
.....*Gressittolus marginatus* Balogh, 1970
- 6- Notogastral setae long flagelliform .....7
- Notogastral setae setiform and sheathed in cerotegumental capsule .....  
.....*Damaeolus ornatissimus* Csiszár, 1962
- 7- Dorsosejugal suture straight .....8
- Dorsosejugal suture arched .....9
- 8- Rostrum rounded .....  
.....*Damaeolus bregetovae* Csiszár, 1962
- Rostrum straight .....  
.....*Damaeolus magnus* Mahunka, 1979
- 9- Cellular sculpture on notogaster present ....  
*Damaeolus cellulatus* Subías, Ruiz & Kahwash, 1990
- Polygonal cerotegument on notogaster present .....  
.....*Damaeolus asperatus* (Berlese, 1904)

*Notes*

*Fosseremus americanus* was described as *Damaeolus laciniatus americanus* by Jacot (1938) without any drawing, but it is not sufficient to recognize it, and that is the reason we consider this species as *sp. inq.* Type material of this species was deposited at the United States National Museum.

**References**

Ayyıldız, N. 1988. Erzurum ovası oribatid akarları (Acari: Oribatida) üzerine sistematik araştırmalar. II. Yüksek oribatidler. DOĞA TU Zool. Der. 12(2): 131-144.

Balogh, J. 1970. New Oribatids (Acari) from New Guinea. II. Acta Zool. Acad. Sci. Hung. 16: 291-344.

Balogh, P. 1988. Oribatid mites from Ecuador (Acari). Acta Zool. Acad. Sci. Hung. 34(4): 321-338.

Balogh, J. 1983. A partial revision of the Oppiidae Grandjean, 1954 (Acari: Oribatei). Acta Zool. Acad. Sci. Hung. 29: 1-79.

Balogh, J. and Balogh, P. 1992. The Oribatid Mites Genera of the World, vol. 1. L. Nagy (Ed.). Hungarian Natural History Museum, 263pp, Budapest.

Csiszár, J. and Jeleva, M. 1962. Oribatid mites (Acari) from Bulgarian soils. Acta Zool. Acad. Sci. Hung. 8 (3-4): 273-301.

Erman, O. Özkan, M. Ayyıldız, N. and Doğan, S. 2007 Checklist of the mites (Arachnida: Acari) of Turkey. Second Supplement. Zootaxa 1532: 1-21.

Grandjean, F. 1965. Complement a mon travail de 1953 sur la classification des Oribates. Acarologia 7: 713-734.

Jacot, A. P. 1938. Some new western North Carolina moss-mites. Proceedings of the Entomological Society of Washington 40: 10-15.

Mahunka, S. 2000. Oribatid(s) mites (Acari: Oribatida) from Madagascar IV: new *Nothrus* and *Damaeolus* species. Folia ent. Hung. 61: 21-25.

- Özkan, M. Ayyıldız, N. and Soysal, Z. 1988. Türkiye akar faunası. DOĞA TU Zool. Derg. 12(1): 75-85.
- Özkan, M. Ayyıldız, N. and Erman, O. 1994. Check list of the Acari of Turkey. First supplement. EURAAC News Letter 7(1): 4-12.
- Perez-Íñigo, C. 1997. Acari, Oribatei, Gymnonota I. En: *Fauna Ibérica*, vol. 9. Ramos, M. A. et al. (Eds.). Museo Nacional de Ciencias Naturales, CSIC. 374 pp, Madrid.
- Subías, L.S. 2008. 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, 1951 (Acari: Oribatei). Acta Zool. Acad. Sci. Hung. 35: 355-412.
- Travé, J. and Vachon, M. 1975. François Grandjean 1882-1975 (notice biographique). Acarologia 17: 1-19.