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The mite fauna of Ekşisu Marshes in Erzincan (Turkey)

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Abstract: Reedbeds can be characterized as forming a transition between the aquatic and terrestrial ecosystems. They have distinctive animals adapted to living in aqueous conditions. Because of the lack of data on the mite fauna in marsh habitats of Turkey, this faunistic study was conducted in the Ekşisu Marshes, which resulted in collecting and determining 58 species and 36 genera belonging to 29 families. Of these, *Stigmaeus sphagneti* (Hull), *Neothrombium neglectum* (Bruyant), *Podothrombium macrocarpum* Berlese, *Johnstoniana eximia* (Berlese), *Calyptostomata velutinus* (Müller), *Heminothrus humicola* (Forsslund), *Astegistes pilosus* (Koch), *Achipteria coleoptrata* (Linnaeus), and *Lauritzenia elegans* (Kunst) are new records for the Turkish fauna. The diagnostic features and distributions throughout the world of the species that were determined as newly recorded for Turkey are given. This is also the first report of the families Calyptostomatidae and Neothrombidiidae from Turkey.

Key words: Mite, fauna, new records, Ekşisu Marshes, Erzincan, Turkey

1. Introduction

Turkey is one of the richest countries in terms of wetlands in Europe and the Middle East. The eastern Anatolian region has special importance for its wetlands, including marshy places, because of its high potential (Yilmaz and Demircioglu Yildiz, 2005). The Ekşisu Marshes are at a distance of 11 km in the east of Erzincan Province in eastern Anatolia (Figure), situated on the North Anatolian Fault (NAF) and having occurred as a result of the movements of the fault. The NAF is also important for hot and cold water springs appearing together, which feed the Ekşisu Marshes (Sunkar and Taşkıran, 2011).

Ekşisu consists of seasonal wet fields and agricultural fields that provide a very important habitat for birds and other rare species in the area. A total of 181 plants, 8 lepidopterans, 5 reptilians, 2 amphibians, 85 birds, and 7 mammalian species inhabit this area. *Sonchus erzincanicus* (Asteraceae), known as Erzincan milkwort, is a very rare endemic plant species growing in Erzincan, especially in this area (Kandemir et al., 2006a, 2006b). In addition to its natural richness, the important Urata archaeological site of Altıntepe lies just to the southeast of the wetland and dates back to the eighth and seventh centuries BC.

The mites (Acari) are small arthropods and an extremely diverse group of arachnids. They have successfully adapted to a wide range of habitats from the sea to freshwater, and they are present in all terrestrial habitats (Eisenbeis, 2006; Gulvik, 2007). The fauna of mites of marshy ecosystems in Turkey, including Ekşisu, has been poorly investigated (Özkan et al., 1993, 1995, 1996). In this research, the fauna of mites living in the Ekşisu Marshes in Turkey was investigated from February 2013 to March 2014. With the determination of mites in the research area, we aimed to contribute to the known number of animals of Turkey, and to investigate their biological diversity. In total, 58 species belonging to 36 genera and 29 families have been determined from the Ekşisu Marshes. Two mite families and 9 species were found to be new records for the Turkish fauna.

2. Materials and methods

Mite specimens were collected from the Ekşisu Marshes for a period of 14 months, between February 2013 and March 2014. Methods used for the collection, extraction, and preparation of the mite specimens were as discussed by Doğan and Ayyıldız (2003) and Doğan (2006). The mite specimens were examined and identified with the aid of a Leica DM 4000 B phase-contrast microscope. Identification of mites was done using the relevant literature (Summers and Schlinger, 1955; Summers, 1962; Gilyarov and

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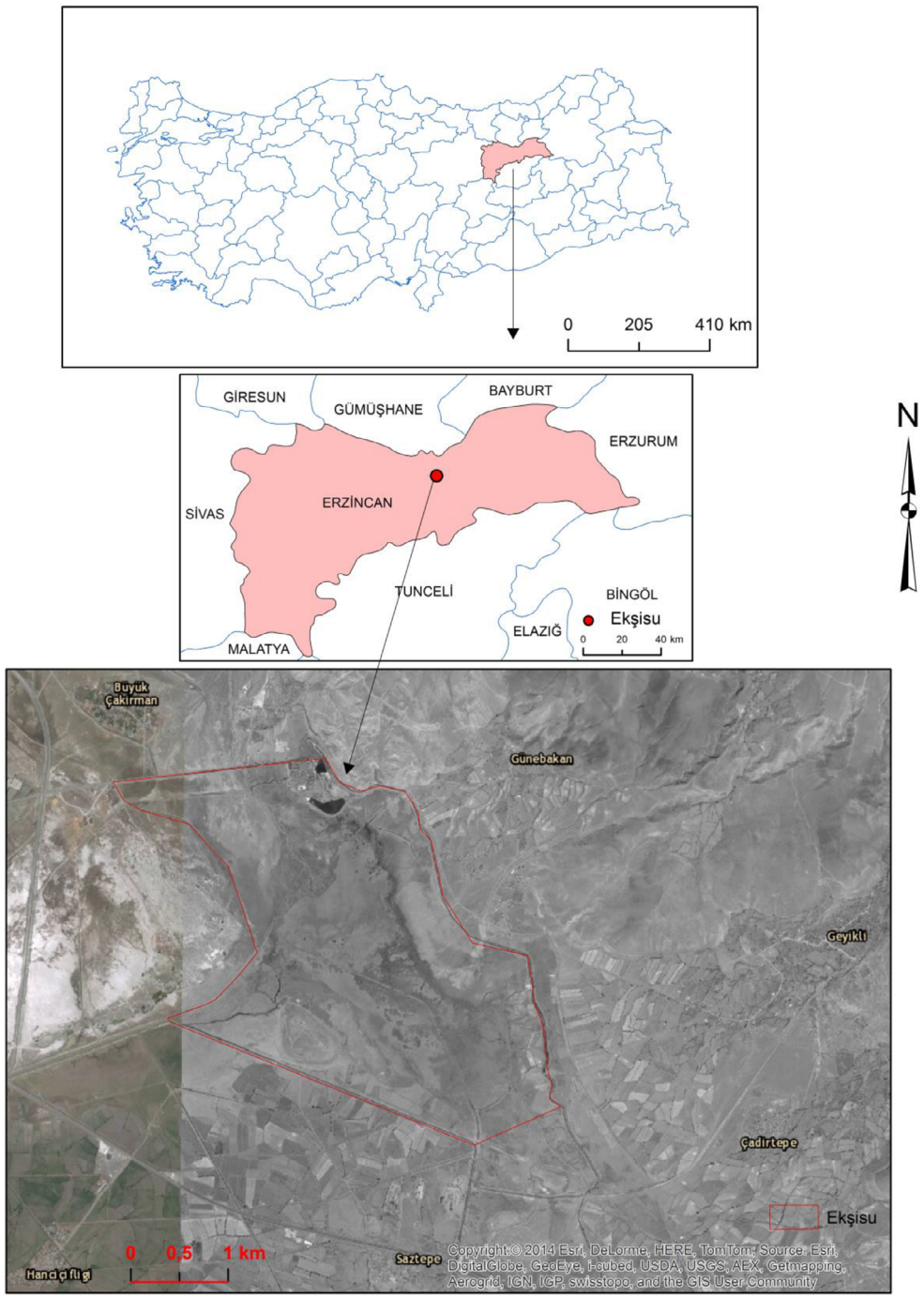


Figure. The map of Ekşisu Marshes.

Krivolutsky, 1975; Kunst, 1977; Kuznetsov, 1978; Ayyıldız, 1988a, 1988b, 1988c, 1988d; Ayyıldız and Özkan, 1988; Fan, 2000; Doğan and Ayyıldız, 2000, 2003; Doğan 2003, 2004, 2005, 2006, 2007, 2008; Fan et al., 2003; Mašán, 2003; Fan and Zhang, 2005; Weigmann, 2006). Materials examined were deposited in the Acarology Laboratories of Erzincan University and Erciyes University, Turkey.

3. Results

With this study, 58 mite species in 36 genera belonging to 29 families have been determined from the marshes (Table). Of these, *Stigmaeus sphagneti* (Hull), *Neothrombium neglectum* (Bruyant), *Podothrombium macrocarpum* Berlese, *Johnstoniana eximia* (Berlese), *Calyptostomata velutinus* (Müller), *Heminothrus humicola* (Forsslund),

Table. Mites determined from the research area.

Prostigmata		
Raphignathoidea		
Caligonellidae		4 species
Caligonella Berlese	*Neognathus* Willmann	
– *humilis* (Koch)	– *spectabilis* (Summers & Schlinger)	
Molothrognathus Summers & Schlinger	– *terrestris* (Summers & Schlinger)	
– *venusta* (Khaustov & Kuznetsov)		
Cryptognathidae		2 species
Favognathus Luxton		
– *cucurbita* (Berlese)		
– *kamili* Dönel & Doğan		
Neophyllobiidae		1 species
Neophyllobius Berlese		
– sp.		
Raphignathidae		1 species
Raphignathus Dugés		
– *gracilis* (Rack)		
Stigmaeidae		18 species
Cheylostigmaeus Willmann	*Stigmaeus* Koch	
– *urhani* Dönel & Doğan	– *additicius* Dönel & Doğan	
Eustigmaeus Berlese	– *devlethanensis* Akyol & Koç	
– *anauniensis* (Canestrini)	– *elongatus* Berlese	
– *erzincanensis* Doğan	– *kumalariensis* Akyol & Koç	
– *erciyesiensis* Doğan, Ayyildiz & Fan	– *planus* Kuznetsov	
– *ioanninensis* Kapaxidi & Papadoulis	– *pilatus* Kuznetsov	
– *sculptus* Doğan, Ayyildiz & Fan	– *sphagneti* (Hull)*	
– *segnis* (Koch)	*Storchia*	
Ledermuelleriopsis Willmann	– *ardabiliensis* Safasadati, Khanjani, Razmjou & Doğan	
– *ayyildizi* Doğan	– *robustus* (Berlese)	
– *plumosa* Willmann		
Calyptostomatoidea		
Calyptostomatidae		1 species
Calyptostomata Cambridge		
– *velutinus* (Müller)*		
Trombidioidea		
Johnstonianidae		1 species
Johnstoniana George		
– *eximia* (Berlese)*		
Microtrombidiidae		1 species
Empitrombium Southcott		
– *makolae* Sevsay & Karakurt		
Neothrombidiidae		1 species
Neothrombium Oudemans		
– *neglectum* (Bruyant)*		

Table. (Continued).

Podothrombiidae		2 species
Podothrombium Berlese		
– *filipes* (Koch)		
– *macrocarpum* Berlese*		
Trombidiidae		2 species
Allothrombium Berlese	*Dolichothrombium* Feider	
– *fuliginosum* (Hermann)	– *anatolia* Makol & Sevsay	
Hydryphantoidea		
Hydryphantidae		3 species
Hydryphantes Koch	*Thyopsis* Piersig	
– *crassipalpis* Koenike	– *cancellata* (Protz)	
Dacothyas Motas		
– sp.		
Lebertioidea		
Anisitsiellidae		1 species
Nilotonia Thor		
– *longipora* (Walter)		
Oribatida		
Epilohmannioidea		
Epilohmanniidae		1 species
Epilohmannia Berlese		
– *cylindrica* (Berlese)		
Phthiracaroidea		
Phthiracaridae		1 species
Phthiracarus Perty		
– sp.		
Crotonioidea		
Trhypochthoniidae		1 species
Trhypochthoniellus Willmann		
– *longisetus* (Berlese)		
Crotoniidae		1 species
Heminothrus Berlese		
– *humicola* (Forsslund)*		
Gymnodamaeoidea		
Gymnodamaeidae		1 species
Gymnodamaeus Kulczynski		
– sp.		
Damaeoidea		
Damaeidae		1 species
Damaeus Koch		
– sp.		
Gustavioidea		
Astegistidae		1 species

Table. (Continued).

Astegistes Hull	
– *pilosus* (Koch)*	
Oppioidea	
Oppiidae	1 species
Ramusella Hammer	
– *fasciata* (Paoli)	
Tectocepheoidea	
Tectocepheidae	2 species
Tectocepheus Berlese	
– *minor* Berlese	
– *velatus* (Michael)	
Licneremaeoidea	
Passalozetidae	1 species
Passalozetes Grandjean	
– *africanus* Grandjean	
Achipterioidea	
Achipteriidae	1 species
Achipteria Berlese	
– *coleoptrata* (Linnaeus)*	
Oripodoidea	
Oribatulidae	2 species
Oribatula Berlese	
– *glabra* (Michael)	
– *undulata* Berlese	
Scheloribatidae	1 species
Scheloribates Berlese	
– sp.	
Haplozetidae	1 species
Lauritzenia Hammer	
– *elegans* (Kunst)*	
Galumnoidea	
Galumnidae	1 species
Galumna Heyden	
– sp.	
Mesostigmata	
Eviphidoidea	
Macrochelidae	3 species
Macrocheles Latreille	
– *glaber* (Müller)	
– *scutatus* (Berlese)	
– sp.	

*: New for Turkey.

Astegistes pilosus (Koch), *Achipteria coleoptrata* (Linnaeus), and *Lauritzenia elegans* (Kunst) are new records for the Turkish fauna. Additionally, the families Calyptostomatidae and Neothrombidiidae are recorded from Turkey for the first time.

New records for Turkey

Order Prostigmata

Superfamily Raphignathoidea

Family Stigmaeidae

Genus *Stigmaeus* Koch

Species *Stigmaeus sphagneti* (Hull)

This species can be distinguished by: eyes present, central shield with 3 pairs of setae, setae d_2 located on marginal shields and setae e_2 located on lateral zonal shields, intercalary shield divided, with setae f_1, suranal shield entire, with 2 pairs of setae, dorsal setae barbed on distal half, dorsum completely covered with reticulate patterns, formed by polygonal cells, setal formula of femora 6–5–3–2, and genua 4(κ)–4(κ)–1–1.

Material examined – One female from litter and soil under *Juncus heldreichianus*, Saztepe mound, 39°43′5.68″N, 39°36′43.40″E, 1150 m, 30 March 2013; 10 females from the same habitat, 39°43′12.54″N, 39°36′40.71″E, 1150 m, 13 April 2013; 1 female from the same habitat, 39°43′45″N, 39°37′25″E, 1150 m, 31 December 2013; 1 female from the same habitat, 39°43′44″N, 39°37′28″E, 1150 m, 31 January 2014.

Distribution – Alberta and Cape Breton Island (Canada), Iran, Romania, Slovakia, Tyne (UK), USA (Hull, 1918; Summers, 1962; Oswald and Minty, 1970; Lafontaine et al., 1987; Kalúz, 1998, 2008; Walter and Latonas, 2011; Santamaría et al., 2012; Beyzavi et al., 2013), and Turkey (this paper).

Superfamily Calyptostomatoidea

Family Calyptostomatidae

Genus *Calyptostoma* Cambridge

Species *Calyptostoma velutinus* (Müller)

Color bright orange to brownish. Scutum reduced to sensillary area carrying only 1 pair of sensilla. Two pairs of red eyes, laterally. Palp 4-segmented, chelicera elongate, styliform, consisting of small digitus and cheliceral base. Cuticular folds form scale-like patterns on the idiosoma.

Material examined – One adult from fertile litter, southeast of Saztepe mound, 39°43′53.4″N, 39°37′02.8″E, 1150 m, 16 June 2013; 18 adults and 13 deutonymphs from meadow and moss on sulfurous water, 39°44′14″N, 39°36′48″E, 1150 m, 31 December 2013.

Distribution – Albania, Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Great Britain, Greece, Hungary, Italy, Japan, Norway, Poland, Portugal (Madeira), Romania, Russia, Slovenia, Switzerland, Sweden, the Netherlands (Mąkol and Wohltmann, 2012), and Turkey (this paper). At this time, the family Calyptostomatidae has not been previously recorded from Turkey.

Family Johnstonianidae

Genus *Johnstoniana* George

Species *Johnstoniana eximia* (Berlese)

Scutum triangular with anterior naso, bears anterior and posterior sensilla and additionally 10–14 nonspecialized setae placed laterally to posterior sensilla. The remaining part of dorsal idiosoma without prominent sclerites, covered with numerous smooth, spine-like, backwards-curved setae set on flat plates. Palp trochanter without fenestra. Palp tarsus with 1 solenidion, 5 or 6 eupathidia, and about 20 nonspecialized setae.

Material examined – One adult from meadow on lowland bog, 39°43′53.4″N, 39°37′02.8″E, 1150 m, 16 June 2013.

Distribution – Austria, Germany, Italy, Poland, Romania, Switzerland (Berlese, 1910; Schweizer, 1951; Feider, 1955; Wohltmann et al., 1994; Gabryś and Mąkol, 1994), and Turkey (this paper).

Family Neothrombiidae

Genus *Neothrombium* Oudemans

Species *Neothrombium neglectum* (Bruyant)

Palp tibia with ctenidium placed dorsomedially, behind the odontus and formed of 5 or 6 spine-like setae. Aspidosoma with naso. Sensillary area bears 2 sensilla: each seta covered with barbs evenly distributed along the stem. Margins of sensillary area form a circle, which is open anteriorly. Accessory posterior process of crista absent. Dorsal opisthosomal setae bifurcate at about one-third of their length from base, covered with setules. Tarsus I longer than tibia I.

Material examined – One deutonymph from litter with diverse humidity and vegetation, Saztepe mound, 39°43′07.3″N, 39°36′44.5″E, 1150 m, 16 June 2013; 2 females from meadow on lowland bog, 39°43′53.4″N, 39°37′02.8″E, 1150 m, 16 June 2013.

Distribution – Austria, Bulgaria, France, Germany, Italy, Poland, Romania, China (Oudemans, 1912; Kneissl, 1915; Feider, 1945, 1955; Willmann, 1950; Fan, 1984; Haitlinger, 1998), and Turkey (this paper). In this study, the family Neothrombiidae has also been recorded for the first time from Turkey.

Family Podothrombiidae

Genus *Podothrombium* Berlese

Species *Podothrombium macrocarpum* Berlese

Dorsal opisthosomal setae only slightly curved or straight, with several barbs; the most distally placed setulae do not reach the tip of setal stem. Spine-like setae forming the comb on palp tibia elongated, with splinters on both sides. In dorsal comb, behind the odontus, 3–6 spine-like setae; in ventral one, 4–7 spines.

Material examined – One deutonymph and adult from moss and sod under rock, Saztepe mound, 39°43′11″N, 39°36′23″E, 1170 m, 25 October, 2013; 1 deutonymph from cowpat near sulfurous water, 39°43′59.7″N, 39°37′15.3″E, 1150 m, 25 October 2013; 1 deutonymph from moss near

sulfurous water, 39°44′00″N, 39°37′15″E, 1150 m, 19 November 2013.

Distribution – Austria, France, Germany, Hungary, Iceland, Italy, Poland, Romania, Spain, Switzerland, the Netherlands (Berlese, 1910; Oudemans, 1928; Vitzthum, 1929; Sellnick, 1931; Feider, 1948; André, 1949; Willmann, 1951; Mihelčič, 1958; Schweizer and Bader, 1963; Gabryś and Mąkol, 1994; Mąkol, 2005), and Turkey (this paper).

Order Oribatida

Superfamily Crotonioidea

Family Crotoniidae

Genus *Heminothrus* Berlese

Species *Heminothrus humicola* (Forsslund)

Sensillum longer than all other setae on the prodorsum; notogastral sides nearly parallel; medial longitudinal ridges more strongly expressed than the lateral ridges on the notogaster; posterior marginal setae markedly curved, pubescent; the remaining notogastral setae ensiform; legs monodactyl.

Material examined – One specimen from grassy soil, near sulfurous water, 39°43′59.4″N, 39°37′14.8″E, 1150 m, 4 July 2013.

Distribution – The Alps and other mountain ranges in central and western Europe (Subías et al., 2012), and Turkey (this paper).

Superfamily Gustavioidea

Family Astegistidae

Genus *Astegistes* Hull

Species *Astegistes pilosus* (Koch)

Rostrum rounded in front, laterally with 3–4 teeth; rostral and lamellar setae with medium long; sensilla clavate; lamellar cuspides long, diverging; notogaster with 6 pairs of setae, the remaining setae much shorter; genital plates with 6 pairs of setae.

Material examined – Two specimens from moss and soil, near sulfurous water, 39°43′59.4″N, 39°37′14.8″E, 1150 m, 4 July 2013; 25 specimens from moss, near sulfurous water, 39°43′14″N, 39°36′48″E, 1150 m, 31 January 2014; 22 specimens from moss and grass, near sulfurous water, 39°44′14″N, 39°36′48″E, 1150 m, 25 February 2014.

Distribution – Palearctic: Europe (less common in the south) and southeastern Palearctic (Subías et al., 2012), Turkey (this paper).

Superfamily Achipterioidea

Family Achipteriidae

Genus *Achipteria* Berlese

Species *Achipteria coleoptrata* (Linnaeus)

Sacculonotic, oxypterous, synlamellate mites; anterior margin of lamellar cuspides slanted, furnished with 1 lateral tooth; interlamellar setae long, projecting considerably beyond base of cuspidium; sensilla slender and fusiform; pedotectum I round.

Material examined – Two specimens from litter and grassy soil near *Juncus heldreichianus*, Saztepe mound, 39°43′18.25″N, 39°36′38.86″E, 1150 m, 13 April 2013.

Distribution – Holarctic (Palearctic and northern Nearctic), India (Sikkim), Saint Helena (Subías et al., 2012), and Turkey (this paper).

Superfamily Oripodoidea

Family Haplozetidae

Genus *Lauritzenia* Hammer

Species *Lauritzenia elegans* (Kunst)

Interlamellar setae do not reach the end of the lamella; rostrum not granulated; sensillum long, fusiform, covered with fine hair; sacculi relatively short; notogastral setae fine, 30 μm in length; genital plates with 4 pairs of setae; fissurae *iad* postanal in position.

Material examined – One specimen from grassy soil near *Juncus heldreichianus*, Saztepe mound, 39°43′5.67″N, 39°36′43.04″E, 1150 m, 30 March 2013; 4 specimens from litter and grassy soil near *J. heldreichianus*, Saztepe mound, 39°43′18.25″N, 39°36′38.86″E, 1150 m, 13 April 2013; 1 specimen from litter under *J. heldreichianus*, near Saztepe mound, 39°43′07.3″N, 39°36′44.5″E, 1150 m, 13 May 2013; 2 specimens from grassy soil, 39°43′45″N, 39°37′25″E, 1140 m, 31 December 2013; 1 specimen from dung, near Saztepe mound, 39°43′44″N, 39°37′28″E, 1150 m, 31 January 2014.

Distribution – Southern Holarctic (central Europe and southeastern USA) (Subías et al., 2012), and Turkey (this paper).

4. Discussion

Some wetlands in the world are more special and unique than others. Ekşisu is one of these areas, and it has not been thoroughly explored yet. This special area is a wetland that is nourished by sodium carbonate and sulfurous water resources reaching the surface from fault cracks. Sandy and alluvial soils with a very high physiological depth are rather common in this place. The Erzincan Plain, where Ekşisu is located, has the highest temperature level in the East Anatolian Region, with an average of 10.060 °C annually (Kandemir et al., 2006a). In this study, it was found that the studied area of Ekşisu has high mite diversity, with mites living in different habitats. It can be considered as a key biodiversity area consisting of natural richness. However, a large part of Ekşisu has been destroyed as a result of anthropogenic activities. This marshland is used recreationally; the rangeland is drained; the reedbeds are filled and burned in order to create agricultural lands. The remaining area is still under the threat of destruction, and so the conservation of this valuable natural area and determination of all its biological diversity is essential.

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