



<http://dx.doi.org/10.11646/zootaxa.3827.3.3>

<http://zoobank.org/urn:lsid:zoobank.org:pub:70168130-F212-4BE9-A115-A1CC424C165D>

Four new records and two new species of Phytoseiidae (Acari: Mesostigmata) from Turkey, with a key to the Turkish species

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Abstract

Four species of phytoseiid mites namely *Neoseiulus knappi* Zannou, Moraes, Ueckermann & Oliveira, *Typhlodromus* (*Typhlodromus*) *octogenipilus* Kreiter, Tixier & Duso, *Typhlodromus* (*T.*) *phialatus* Athias-Henriot, and *Typhloseiella isotricha* (Athias-Henriot) are recorded for the first time from Turkey. Two new species *Neoseiulus sekeroglu* Döker & Stathakis **n. sp.** and *Typhlodromus* (*Typhlodromus*) *antakyaensis* Stathakis & Döker **n. sp.** are described and illustrated. A key to the all known phytoseiid species for the Turkish fauna is also provided.

Key words: taxonomy, description, predatory mites, fauna, biological control

Introduction

Mites in the family Phytoseiidae (Acari: Mesostigmata) are of great importance in terms of regulating not only mite pest populations but also small soft bodied insects such as thrips and whiteflies (McMurtry & Croft 1997; McMurtry et al. 2013; Papadoulis et al. 2009). For augmentative biological control purpose, some phytoseiid species are currently available in international markets, but determination of the natural populations is essential in order to develop successful pest management programs locally.

Up to now, more than 2700 species of phytoseiid mites (including synonyms) are known for the world (Prasad 2012; Demite et al. 2014). However, only 63 species belonging to 17 genera have been recorded for the Turkish fauna (Şekeroglu & Kazak 1993; Moraes et al. 2004; Çakmak & Çobanoğlu 2006; Faraji et al. 2011; Döker et al. 2014).

This paper deals with four new records *Neoseiulus knappi* Zannou, Moraes, Ueckermann & Oliveira, *Typhlodromus* (*Typhlodromus*) *octogenipilus* Kreiter, Tixier & Duso, *Typhlodromus* (*T.*) *phialatus* Athias-Henriot, and *Typhloseiella isotricha* (Athias-Henriot). Additionally, two new species *Neoseiulus sekeroglu* Döker & Stathakis **n. sp.** and *Typhlodromus* (*Typhlodromus*) *antakyaensis* Stathakis & Döker **n. sp.** are described and illustrated. A key to identification of all species known from Turkey is also provided.

Material and methods

The specimens were collected from different plants using a camel hair brush and stored in 70% ethanol. The permanent slides were made using Hoyer's medium. A Zeiss Axioskop 2 plus drawing tube (camera lucida) was used for the illustrations. The taxonomic system is based on that proposed by Chant & McMurtry (2007). The setal nomenclature used follow Lindquist & Evans (1965) as adapted by Rowell et al. (1978). Other terminology follows Athias-Henriot (1975, 1977) for organotaxy, Evans (1963) and Evans & Till (1979) for the ventral pores and leg chaetotaxy, and Wainstein (1973) for the spermatheca, as proposed by Papadoulis et al. (2009). The dorsal and

	with calyx elongate; movable digit of chelicera with one tooth	<i>N. tiliarum</i> (Oudemans)
-	Ventrianal shield with about equal length and width, with pre-anal solenostomes; peritreme extending to level with j1 or j3 setae; spermatheca with calyx cup-shaped; movable digit of chelicera smooth	<i>N. aceri</i> (Collyer)
49.	Seta S5 present	Subgenus <i>Anthoseius</i> De Leon ... 50
-	Seta S5 absent	Subgenus <i>Typhlodromus</i> Scheuten ... 61
50.	Ventrianal shield with only three pairs of pre-anal setae	<i>T. invectus</i> Chant
-	Ventrianal shield with four pairs of pre-anal setae	51
51.	Macroseta of basitarsus IV shorter than the distance between its base and the dorsal slit organ	52
-	Macroseta of basitarsus IV longer than the distance between its base and the dorsal slit organ	54
52.	Macroseta of basitarsus IV knobbed apically; dorsal shield reticulated and heavily sclerotised; movable digit of chelicera with three teeth	<i>T. bakeri</i> (Garman)
-	Macroseta of basitarsus IV with pointed tip; dorsal shield reticulated but not heavily sclerotised; movable digit of chelicera with one tooth	53
53.	Dorsal shield with five pairs of large solenostomes; peritreme extending beyond level of j1 setae.	<i>T. rhenanus</i> (Oudemans)
-	Dorsal shield with three pairs of large solenostomes; peritreme extending to level of j3 or between z2 and j3 setae	<i>T. recki</i> Wainstein
54.	Seta Z5 knobbed apically	<i>T. rapidus</i> Wainstein & Arutunjan
-	Seta Z5 pointed apically	55
55.	Dorsal shield with four pairs of large solenostomes	<i>T. rarus</i> Wainstein
-	Dorsal shield with three or five pairs of large solenostomes	56
56.	Dorsal shield with three pairs of large solenostomes	57
-	Dorsal shield with five pairs of large solenostomes	58
57.	Peritreme long, extending to level of j3 setae; ventrianal shield with a pair of pre-anal solenostomes	<i>T. inopinatus</i> (Wainstein)
-	Peritreme shorter, extending to level between z4 and s4 setae; ventrianal shield without pre-anal solenostomes	<i>T. kazachstanicus</i> Wainstein
58.	Movable digit of chelicera smooth; peritreme short extending at most to level of z3 setae.	<i>T. bagdasarjani</i> Wainstein & Arutunjan
-	Movable digit of chelicera with one or two teeth; peritreme longer, extending to level of j3 or j1 setae	59
59.	Movable digit of chelicera with one tooth; calyx of spermatheca narrower and longer, length 4–5 times its width	<i>T. tamaricis</i> (Kolodochka)
-	Movable digit of chelicera with two teeth; calyx of spermatheca short, length at most double its width	60
60.	Seta JV5 longer than Z5; setae Z4 and Z5 slightly serrate	<i>T. foenilis</i> Oudemans
-	Seta JV5 and Z5 subequal in length; setae Z4 or/and Z5 smooth.	<i>T. involutus</i> Livshitz & Kuznetsov
61.	Genu II with eight setae	62
-	Genu II with seven setae	65
62.	Dorsal shield with 3 pairs of solenostomes.	63
-	Dorsal shield with 4 pairs of solenostomes.	64
63.	Seta Z4 as long as distance between its insertion and that of Z5; calyx of spermatheca elongate, with short neck.	<i>T. pyri</i> Scheuten
-	Seta Z4 shorter than distance between its insertion and that of Z5; calyx of spermatheca cup-shaped distally with long neck	<i>T. tubifer</i> Wainstein
64.	Atrium of spermatheca incorporated with calyx	<i>T. antakyaensis</i> Stathakis & Döker n. sp.
-	Atrium of spermatheca not incorporated with calyx	<i>T. octogenipilus</i> Kreiter, Tixier & Duso
65.	Peritreme short extending anteriorly to level between z4 and s4	<i>T. andrei</i> Karg
-	Peritreme longer, extending at least level of setae z3	66
66.	Calyx of spermatheca longer; tubular	<i>T. athiasae</i> Porath & Swirski
-	Calyx of spermatheca shorter; not tubular	67
67.	Calyx of spermatheca with neck long	<i>T. cotoneastri</i> Wainstein
-	Calyx of spermatheca without neck	68
68.	Macroseta on basitarsus IV short, half length of seta Z5; peritreme extending to level between z2 and z3	<i>T. tiliae</i> Oudemans
-	Macroseta on basitarsus IV longer, at least 3/4 length of seta Z5; peritreme extending at least to level of z2	<i>T. phialatus</i> Athias-Henriot

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