Acta Aquatica Turcica
E-ISSN: 2651-5474 15(3), 318-324 (2019) DOI: https://doi.org/10.22392/actaquatr.515607

Contribution to the Knowledge of Freshwater Halacarid Mites (Acari: Halacaridae) from Turkey

Furkan DURUCAN[1*], Yunus Ömer BOYACI[2]

[1]Işıklar Caddesi No 16, 17 TR-07100 Antalya, Turkey
[2]Isparta University of Applied Sciences, Faculty of Eğirdir Fisheries, Isparta, Turkey

*Corresponding Author: f_durucan@hotmail.com

Research Article

Received 21 January 2019; Accepted 14 February 2019; Release date 15 September 2019.

How to Cite: Durucan, F., & Boyacı, Y.Ö. (2019). Contribution to the knowledge of freshwater halacarid mites (Acari: Halacaridae) from Turkey. *Acta Aquatica Turcica*, *15*(3), 318-324. https://doi.org/10.22392/actaquatr.515607

Abstract

Based on freshwater halacarid mites collected from four different provinces (Antalya, Denizli, Isparta and Muğla) of Turkey, two species of the genera *Halacarellus* and *Porohalacarus* are reported and illustrated in the present study. *Halacarellus hyrcanus* (Viets, 1928) was only recorded from Muğla, while *Porohalacarus alpinus* (Thor, 1910) is recorded from Isparta, Denizli and Antalya. *H. hyrcanus* is reported for the first time from Turkey in this study. Additionally, comparisons of the idiosoma lengths and localities of the two species are presented here.

Keywords: Halacaridae, Acari, *Halacarellus hyrcanus*, *Porohalacarus alpinus*.

Türkiye'nin Tatlısu Halacarid Kenelerine (Acari: Halacaridae) Katkılar

Özet

Bu çalışmada, Türkiye'nin 4 farklı ilinden (Antalya, Denizli, Isparta ve Muğla) toplanan örnekler üzerinden *Halacarellus hyrcanus* (Viets, 1928) ve *Porohalacarus alpinus* (Thor, 1910) türleri bildirilmiştir. *H. hyrcanus* sadece Muğla İli'nden kaydedilirken, *P. alpinus* türü Antalya, Denizli ve Isparta'dan kaydedilmiştir. *H. hyrcanus* türü Türkiye faunası için yeni kayıttır. Ayrıca, her iki türün vücut uzunlukları ve lokalite bilgileri de bu çalışmada sunulmuştur.

Anahtar kelimeler: Halacaridae, Acari, *Halacarellus hyrcanus*, *Porohalacarus alpinus*.

INTRODUCTION

Halacarid mites are relatively small benthic organisms, the adult body length is less than 1 mm and unable to swim. Although the majority are marine, some are found in freshwater streams, lakes and ponds. While the first marine halacarid mite recorded in 1758 by Baster, the first freshwater halacarid mite was described in 1879 by Kramer. Until now, the family Halacaridae includes more than 1000 marine and approximately 60 freshwater species all over the world (Bartsch, 2006, 2009; Durucan, 2018). In this study, illustrations of deutonymph and female of *P. alpinus*, and female, male of *H. hyrcanus* are given with their worldwide distributions and comparisons. The present materials from four different provinces (Antalya, Denizli, Isparta and Muğla) of Turkey adds new record of freshwater halacarid mites of Turkey.

MATERIAL and METHODS

Samples were collected by hand at localities in Turkey. Mites were extracted by washing the substrates. The meiofauna retained in the set of sieves (63µm, 500 µm, 1 mm) was sorted under binocular microscope (Nikon SMZ 10A). In the laboratory, mite specimens were cleared in lactic acid and mounted in Hoyers medium. Figures were drawn with the aid of a camera lucida (Nikon Eclipse E400). The specimens were kept in the first author's personal collection in Antalya. All measurements are given as micrometers (µm).

RESULTS

Family Halacaridae Murray, 1877
Genus *Halacarellus* Viets, 1927
Halacarellus hyrcanus (Viets, 1928) (Figure 1)

Material examined

1♀, 1♂, Kargı Stream, Fethiye, Muğla, 15 May 2016, Coll. Y. Ö. Boyacı.

Morphology and notes

Dorsal and ventral plates large. Setae ds-1 on AD, ds-2 to ds-4 (striated in integument), ds-5 on PD and ds-6 on anal plate. AE with 3 pairs of ventral setae. PE with 1 dorsal seta and 2 ventral setae. Anterior portion of GA broadly rounded. Female GA with 2 pairs of pgs and sgs. Genital acetabula external (Figure 1). Male with almost 100 pgs around GO (Figure 1). Gnathosoma 1.6 times longer than wide. Both pairs of maxillary setae on rostrum. Palps 4 segmented. Total palp lenght is 150 µm. P-2 with dorsal seta; P-3 with medial spur; P-4 with three setae (Figure 1). Leg-I chaetotaxy (from trochanter to tarsus): 1, 2, 8, 6, 10, 8; Leg I longer than leg II (Figure 1). The morphological characteristics of the our specimens reported here accord with the previously descriptions (Bartsch 1998, 2018; Viets 1928). The present finding constitutes first record of this species from Turkey. See Table 1 for measurements.

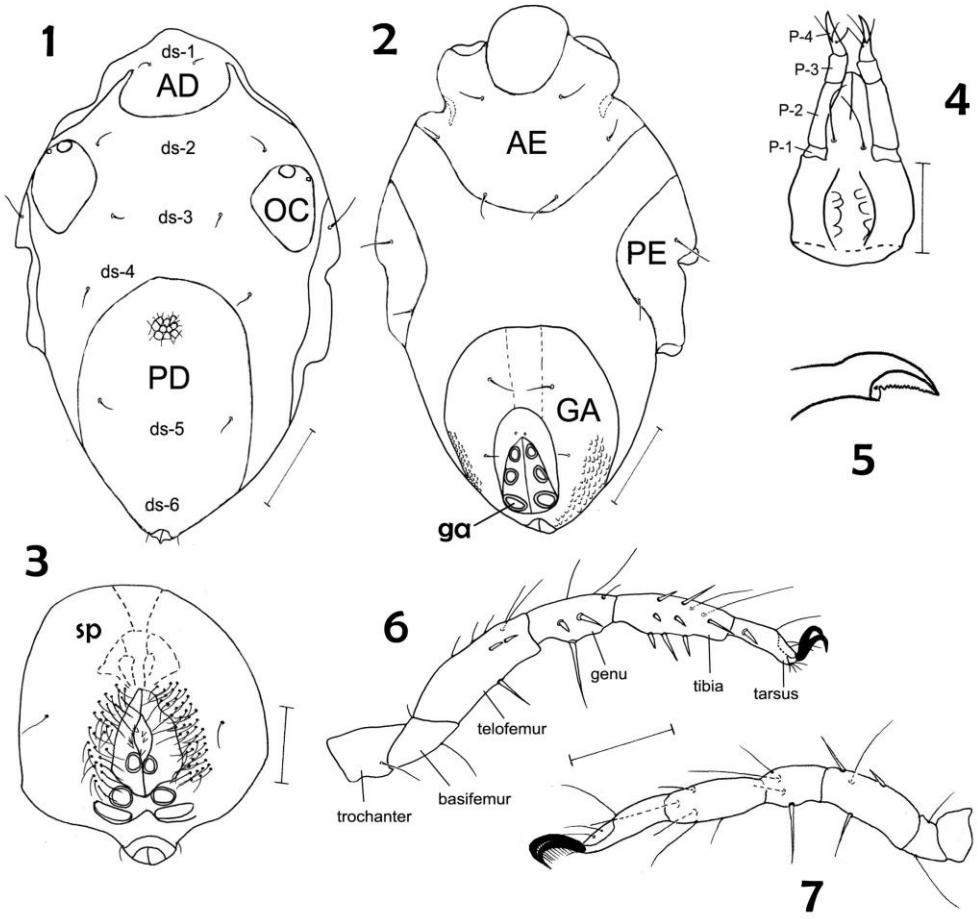

Figure 1. *H. hyrcanus* (Viets, 1928) **1** idiosoma, dorsal, ♀ **2** idiosoma, ventral, ♀ **3** GA, ♂ **4** gnathosoma, ventral, ♀ **5** chelicera, ♀ **6** leg I, lateral, ♀ **7** leg II, medial, ♀ **(AD** anterior dorsal plate **AE** anterior epimeral plate **ds-1 to ds-6** dorsal setae numbered in sequence from anterior to posterior **GA** genitoanal plate **ga** genital acetabula **OC** ocular plate **P-1 to P-4** palps from 1-4 **PD** posterior dorsal plate **PE** posterior epimeral plate **sp** spermatopositor) Scale bars: 100 µm.

Distribution

H. hyrcanus was found for the first time from Caspian Sea, Bakü-Azerbaijan by Viets (1928) and afterwards recorded from Rhine (France, Germany, Netherlands), Bulgaria (Lake Varna), Romania (Danube delta, Sfintul Gheorghe, Plavisevita, Sulina) (Bartsch, 1998; 2004; 2009) *Present record*: Kargı Stream, Fethiye (Muğla, Turkey) (Table 2).

Genus *Porohalacarus* Thor, 1922
Porohalacarus alpinus (Thor, 1910) (Figure 2-3)

Material examined

4 ♀♀, from *Cladophora* sp. on stone 50 cm depth (25 September 2016) (37°53'0.5202"N; 30°51'59.565"E) at coastal part of Lake Eğirdir, Isparta; 6 ♀♀, from macrophytes which in 1-2 m depth (30 October 2014) (38°15'48.0"N; 29°55'17.0"E) at Lake Işıklı, Denizli; 34 ♀♀ and 3 DN, from macrophytes which in 30-50 cm depth (27 August 2018) (36°51'35.2872"N;30°43'48.9468"E) at Mehmet Manavoğlu Park, Antalya. Coll. F. Durucan.

Morphology and notes

Dorsal and ventral plates large. Dark spots of eye pigment underneath AD and OC. The characteristics features of *P. alpinus* are dorsal plates reticulated, anterior margin of AD and PD truncated, female GA has five pairs of pgs; each of genital sclerit with four genital acetabula (Figure 1). The first author also observed four females with an everted ovopositor (Figure 1).

Gnathosoma 1.6 times longer than wide. Both pairs of maxillary setae on rostrum. Palps 4 segmented. Total palp lenght is 87 µm. P-2 with dorsal seta; P-3 with medial spur; P-4 with 3 setae (Figure 1). Leg-I chaetotaxy (from trochanter to tarsus): 1, 2, 4, 5, 6, 8. Legs slender, tibia I ventrally with four bristles (Figure 2). The same author also has found three deutonymphs at Mehmet Manavoğlu Park, Antalya. The deutonymph specimens similar to the adult one. Dorsal and ventral plates smaller than adults. GA of the specimens have four pairs of genital acetabula (Figure 3). See Table 1 for measurements.

P. alpinus differs from *P. gallicus* by the following features: (1) OC as long as or longer than AD in *P. gallicus*, while OC distinctively shorter than AD in *P. alpinus* (2) ventral plates fused to a ventral shield in *P. gallicus* while ventral plates are separated in *P. alpinus* (Bartsch, 2006).

The morphological characteristics and idiosoma size of our specimens accord with the original description. Table 2 summarizes worldwide literature data on idiosoma size of the species.This is the first halacarid record from Lake Işıklı, Denizli, Turkey and constitutes the second record of this species from Sinop, Turkey, by Bartsch (2004) but the species not illustrated.

Distribution

P. alpinus was described (only one female) for the first time in Norway from littoral macrophytes by Thor (1910) and afterwards recorded from Europe (from Finland and Iceland to Italy), Black Sea (Turkey) North Africa, North America (United States and Canada), Australia and New Zealand (Bartsch, 2009); Madagascar (Bartsch, 2018) Present study records: Mehmet Manavoğlu Park (Antalya, Turkey), Lake Eğirdir (Isparta, Turkey) and Lake Işıklı (Denizli, Turkey).

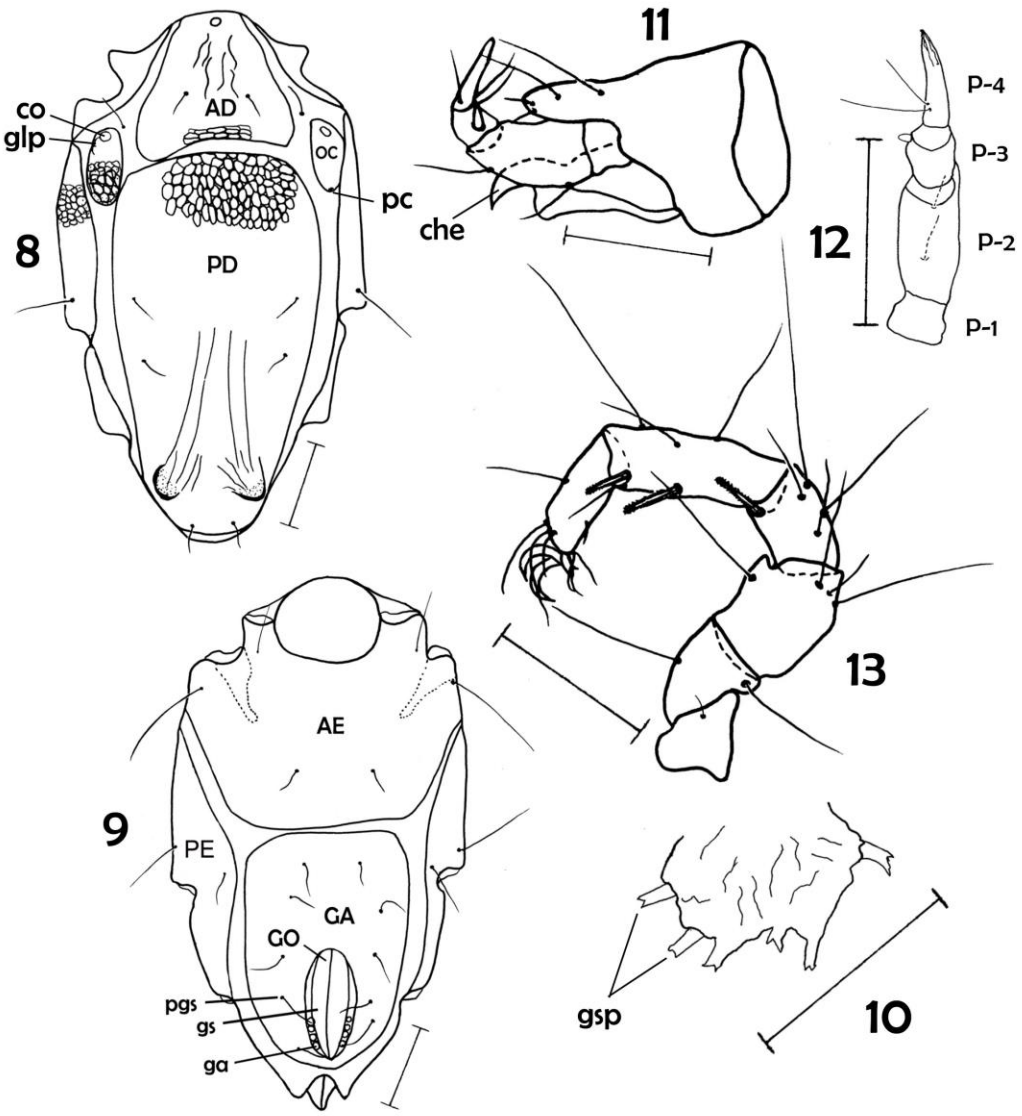

Figure 2. *P. alpinus* (Thor, 1910) female: **8** idiosoma, dorsal **9** idiosoma, ventral **10** everted ovopositor **11** gnathosoma, lateral **12** palp,ventro-lateral **13** leg I, lateral **(AD** anterior dorsal plate **che** chelicera **co** cornea **AE** anterior epimeral plate **GA** genitoanal plate **ga** genital acetabula **glp** gland pore **GO** genital opening **gs** genital sclerite **gsp** genital spine **OC** ocular plate **P-1 to P-4** palps from 1-4 **pc** pore canaliculus **PD** posterior dorsal plate **PE** posterior epimeral plate **pgs** perigenital setae**)** Scale bars: 50 µm.

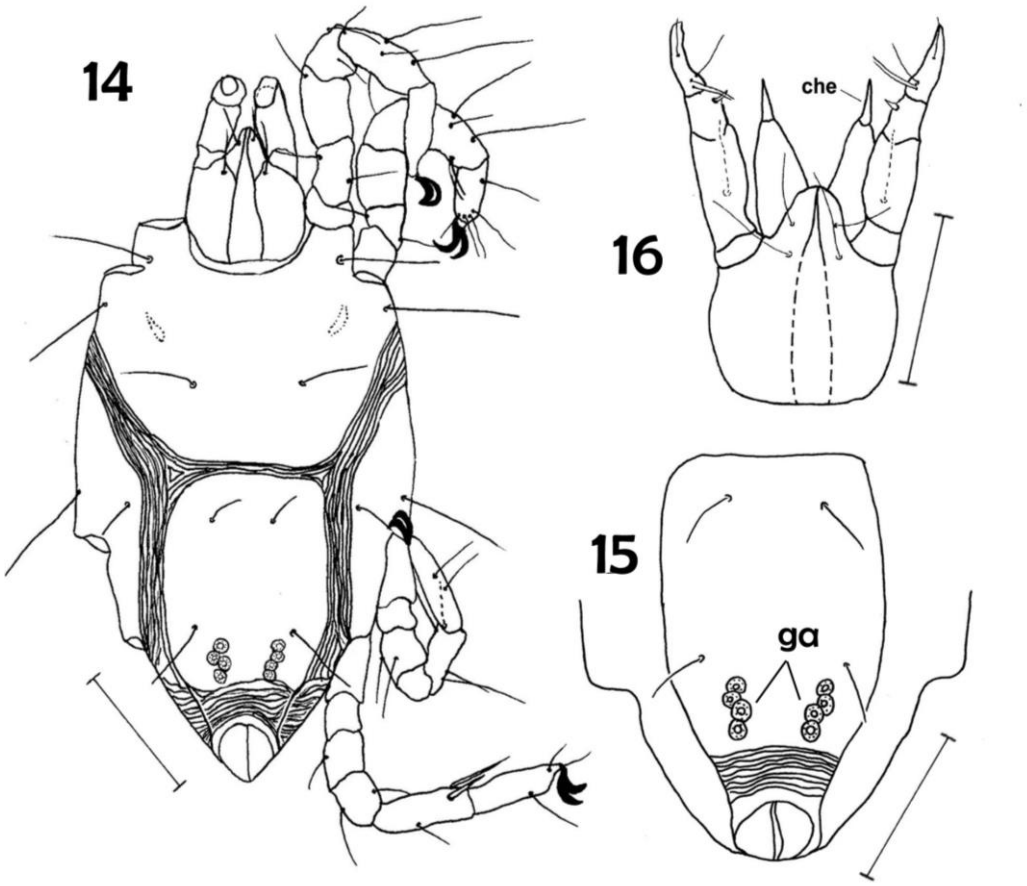

Figure 3. *P. alpinus* (Thor, 1910), DN: **14** Idiosoma with gnathosoma, ventral **15** deutonymph GA **16** gnathosoma, ventral (**che** chelicera **ga** genital acetabula) Scale bars: 50 µm.

Table 1. Measurements (µm) of *H. hyrcanus* and *P. alpinus*

Length/Width	*Halacarellus hyrcanus* (Viets, 1928)		*Porohalacarus alpinus* (Thor, 1910)	
	♀	♂	DN	♀
Idiosoma	575/400	550/375	235-240/135-137	255-312/160-186
Gnathosoma	200/110	162/75	55/50	85/60
AD	100/137	125/170	63/66	75/100
OC	100/75	125/100	37/25	50/23
PD	300/225	300/250	162/87	225/125
AE	137/287	150/250	75/125	89/175
PE	200/100	250/100	112/25	162/37
GA	237/225	250/225	77/65	135/100
GO	125/75	110/90	-	63/35
Total palp	150	125	70	87
Leg I	550	412	155	225

Table 2. List of globally recorded *H. hyrcanus* and *P. alpinus* with additional informations (*****, gnathosoma included **n**, number of specimens **DN**, deutonymph **L**, larva **PN**, protonymph)

Species	Reference	Location	Length of idiosoma (µm)
P. alpinus	Thor, 1910	Norway	♀: 350*/200 (n=1)
	Walter, 1919	Lake Davos-Switzerland	?: 345/215 (n=1)
	Sokolov, 1952	Russia	♀: 320/200
	Bartsch, 1973	Hohwachter Bucht-Germany	♀: 343/265 DN: 267-280 PN: 205-209
	Morselli & Mari, 1979	Parco della Repubblica, Modena-Italy	♀: 268-308/185-216 (n=7) DN:162, 234, 276, 318 (n=4) PN:142, 208, 240, 273 (n=4)
	Mari & Morselli, 1985	Tuscan-Emilian Apennines-Italy	♀: 290-300/176-203 (n=10)
	Benfatti et al., 1992	Lake Bolsena, Viterbo-Italy	♀: 314/180, 315/174 (n=2)
	Bartsch, 2018	North and Southern Madagascar	♀: 280-318 (n=10) ♂: 286 (n=1) DN: 240-263 (n=6) PN: 186-210 (n=6) L:140-185 (n=6)
	Present study	Lake Eğirdir, Isparta-Turkey Lake Işıklı, Denizli-Turkey Mehmet Manavoğlu Park, Antalya-Turkey	♀: 250-287/162-175 (n=4) ♀: 255-312/160-186 (n=6) ♀: 250-300/135-188 (n=34) DN: 210-232/130-135 (n=3)
H. hyrcanus	Viets, 1928	Caspian Sea, Bakü, Azerbaijan	♀: 495 ♂: 455
	Bartsch, 1998	Lake Varna, Bulgaria	♀: 478-527 ♂: 447-459 DN: 402-459
	Present study	Kargı Stream, Fethiye, Muğla-Turkey	♀: 575 ♂: 550

DISCUSSION

In Turkey, the first records of freshwater halacarids (*Copidognathus tectiporus* and *Porohalacarus alpinus*) were given by Bartsch (2004). Later, Durucan (2018) recorded and illustrated all life stages of *C. tectiporus* from Lake Eğirdir (Isparta, Turkey).

H. hyrcanus is for the first time recorded from Turkey (Kargı Stream, Muğla) in this study. Further studies aimed to improve our knowledge of Turkish freshwater halacarid mites should focus on unstudied areas and habitats in Turkey.

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