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A new species of the centipede genus *Hessebius* Verhoeff, 1941 (Chilopoda: Lithobiomorpha: Lithobiidae) from Iran

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Subject Editor: Ehsan Rakhshani **ABSTRACT.** Hessebius iranicus **sp. nov.** is described based on 22 specimens from the eastern part of Mazandaran Province, Iran. This species belongs to the genus Hessebius Verhoeff, 1941, based on the structure of the female gonopods with a massive expansion and projection on the dorsolateral ridge. The new Iranian species differs from other congeners by the combination of the following characters: presence of both weak triangular projections on tergite 13 and accessory spines on the 15th legs, and by the number of spurs of female gonopods. It is the first species of Hessebius described from the Hyrcanian region of Iran.

Keywords: Chilopoda, Hyrcanian, lithobiids, western Asia, taxonomy

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INTRODUCTION

The genus *Hessebius* Verhoeff, 1941 comprises 21 species that spread from the Eastern Mediterranean Basin, Middle East, and central Asia through Eastern China (Verhoeff, 1941; Folkmanová, 1958; Folkmanová & Dobroruka, 1960; Zalesskaja, 1978; Ma et al., 2009, 2014, 2018; Pei et al., 2010, 2021; Volkova, 2016; Qiao et al., 2018, 2019; Dyachkov et al., 2022; Chao et al., 2025). The genus is characterised by the following traits: antennae with 17–22 articles (usually 20); up to 15 ocelli; forcipular coxosternal teeth 2+2; tergites without posterior triangular projections; legs 14 and 15 thicker than the anterior ones in females and both thicker in males; female gonopods with 2+2-5+5 spurs and a massive expansion and projection on the dorsolateral ridge of second article, a long claw sometimes with a stout lateral tooth at its base. These species prefer thermophilous habitats and find from near sea level to 2250 m in the eastern Mediterranean area and the Middle East and up to 4200 m in Mongolia, and 4700–4900 m in Tajikistan (Zapparoli & Edgecombe, 2011; Dyachkov, 2023).

Knowledge of the Lithobiomorpha of Iran is very poor, and data from this region is limited mainly to past papers and some limited recent studies. To date, only *H. barbipes* (Porat, 1893) has been reported from Iran (Zarei et al., 2020). Additionally, a sole female specimen of *Hessebius* sp. was recently recorded from Northern Iran (Mazandaran Province) (Dyachkov et al., 2023). The present study deals with the description of a new species of *Hessebius* from Iran.

MATERIAL AND METHODS

The specimens were collected by hand from Babolsar and Sari (20 and 2 specimens, respectively) cities, Mazandaran Province, and transferred to 96% ethanol. The material is deposited in ZCUMZ (abbreviations below) and examined under a stereo microscope Zeiss® 2000-C. The terminology follows Bonato et al.

(2010). The total body length is measured from the anterior margin of the cephalic plate to the rear edge of the postpedal segment. Length of tergites and sternites was measured from the middle of the front margin to the middle of the rear margin; width of tergites and sternites was measured on the widest part. Leg length excludes the pretarsus. All measurements are given in millimeters (mm). Leg spinulation (Plectrotaxy) data are given in a tabular form. Variations in plectrotaxy within a single specimen or between specimens are presented in parentheses. The number of coxal pores is given as a formula where a sequence of Arabic numerals means the number of pores from legs 12 to 15. The map (Fig. 1) was generated using SimpleMappr software (Shorthouse, 2010). Abbreviations: a – anterior, C – coxa, coll. – collector, D – dorsal, F – femur, m – median, P – prefemur, p – posterior, S/SS – sternite/ sternites, T/TT – tergite/tergites, Ti – tibia, Tim – intermediate tergite, Tr – trochanter, Ts/Tss – tarsus/tarsi, V – ventral, ZCUMZ – Zoological collection of University of Mazandaran.

RESULTS

Taxonomic hierarchy

Class Chilopoda Latreille, 1817

Order Lithobiomorpha Pocock, 1895

Family Lithobiidae Newport, 1844

Genus Hessebius Verhoeff, 1941

Type species. Hessebius kosswigi Verhoeff, 1941.

Hessebius iranicus Davoodi & Dyachkov sp. nov.

https://zoobank.org/urn:lsid:zoobank.org:act:785F5904-1CC9-4023-9E45-59E866E4F767

Figs 1-16 [Figs 10-11, 14-16: Holotype code 1H]

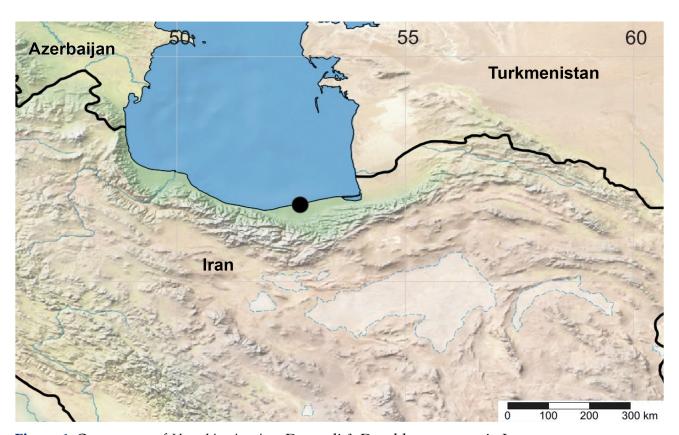


Figure 1. Occurrence of Hessebius iranicus Davoodi & Dyachkov sp. nov. in Iran.

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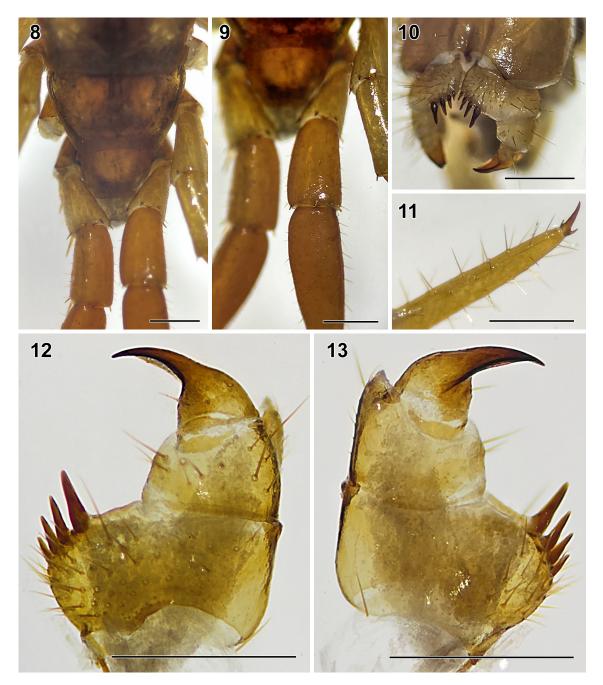
Figures 2–7. *Hessebius iranicus* Davoodi & Dyachkov **sp. nov.** (Paratypes). **2.** Dental margin of forcipular coxosternite, ventrally; **3.** Ocelli, laterally; **4.** Mandible, ventrally; **5.** Telopodite of 2nd maxillae, ventrally; **6.** Telopodites of 1st maxillae, ventrally; **7.** Postpedal segments of male, ventrally. Scale: 0.5 mm.

Type material. **Holotype** ♀ (ZCUMZ 1H), Iran, Babolsar city, Mazandaran province, N36°42'48.29" E52°41'9.37", under shrub of *Euonymus japonicus*, 22 m below sea level, 10 May 2023, coll. Parisa Davoodi; **Paratypes**: 17 ♀♀, 2 ♂♂ (ZCUMZ 2H), same data as holotype; 2 ♀♀ (ZCUMZ 3H), Iran, Mazandaran province, Sari city, Zare jungle park Sari, N36°33'14.4" E53°07'44.0".

Etymology. The name is derived from the country where the species was discovered.

Diagnosis. Body length 11.9–22 mm; antennae with 20–22 articles; 5 ocelli in a single broken row; Tömösváry's organ small; 2+2 teeth and spiniform porodonts at dental margin of forcipular coxosternite; tergite 13 with weak triangular projections; β legs 15 with prefemur, femur, and tibia thickened, both tarsi slender, femur and tibia flattened dorsally; ♀ legs 15 slightly thickened; legs 15 with both an anterior and posterior accessory spine; coxal pores 5–6, round; male gonopods 1-segmented, with 3 setae; female gonopods with 4–5 pin-shaped, sharp spurs and simple pointed claw, the second article with a massive distodorsal outgrowth (Table 3).

Description — **Holotype** ♀ (Figs 10–11, 14–16) Length, mm: body 19.6, cephalic plate 1.9, legs 14 and 15 ca 4.7 and 6, respectively; width, mm: cephalic plate 2, T1 and T3 1.6, T5 and T14 1.7, T7–8, T10 1.9, T12 2, Tim 1.4. Antennae: length 8.2 mm, extending back to anterior margin of T6; 20 elongate articles, length to width of terminal article ca 4:1. All articles covered with dense pale setae, except the two basal articles have fewer setae. Ocelli (Fig. 3): five in a single broken row, two anterior ocelli smaller than the following ones. Tömösváry's organ small, as large as the adjacent ocellus. Cephalic plate (Fig. 14): a little broader than T1, ratio ca 1:0.8, posterior margin slightly concave; moderately long setae sparsely scattered on all surfaces and along marginal ridge.



Figures 8–13. *Hessebius iranicus* Davoodi & Dyachkov **sp. nov.**. **8–9.** Rear body part of male, dorsally; **10.** Female gonopods, ventrally; **11.** Tarsus 2 of 15 legs, laterally; **12–13.** Female gonopod, laterally and mesally. Scale: 0.5 mm. (12–13: Paratype female; 10–11: Holotype, female).

Forcipular segment (Figs 2, 14): *T* partially covering *T1*; anterior margin of coxosternite almost straight, bearing 2+2 widely spaced teeth and spiniform porodonts, shoulders strongly sloping behind porodonts (Fig. 2); median diastema U-shaped, its width identical to the distance between the teeth of each pair. *TT* (Figs 15-16): smooth and sparsely setose, with rounded posterior corners, except weak triangular projections at *T13* (Fig. 15); long *TT* with concave posterior margins, short *TT* with almost straight posterior margins. *Tim* (Fig. 15) with strongly sinuate caudal margin, length to width ratio *ca* 1:1.4. *SS*: trapeziform and sparsely setose, setae most densely scattered along anterior margin of *SS* 1-6. *S15* subtrapeziform with short to long sparse setae. Posterior margin of *SS* 2-12 with short sutures. The first genital sternite (Fig. 10) well sclerotized, wider than long; 44 short to long setae scattered over the surface of genital sternite.

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Figures 14–16. *Hessebius iranicus* Davoodi & Dyachkov **sp. nov.** (holotype, female), dorsally. **14.** Cephalic plate and tergite 1; **15.** Rear body part; **16.** Sternites 4–8. Abbreviations: S5, S7, and S13: sternites 5, 7, and 13. Scale: 0.5 mm.

Legs: Tss 1–6 with shallow dorsal suture, *Tss* 7–15 with distinct articulation; short to long setae evenly scattered on all legs; anterior and posterior accessory spines present on legs 1–15 (Fig. 11). Legs plectrotaxy as in Table 1. Coxal pores circular, 6555.

Gonopods (Figs 10, 12–13): with 4+4 pin-shaped, acute spurs (external spurs larger than inner ones) and simple and sharp claw; the second article with a massive distodorsal outgrowth armed by six dorsal setae; 3rd article without dorsal setae.

Coloration (in 96% ethanol): brown yellow, forcipular tarsungula and posterior margins of *TT* darker.

Intraspecific variations (Female paratypes). Body length: 12–22 mm. Sides of labrum with well-expressed fringes of numerous thin bristles; a pair of setae projecting across the labral midpiece. Gnathal edge of mandible with numerous pulvilli, 5 pairs of well-developed teeth and numerous serrate aciculae

(Fig. 4). First maxillae: edge with numerous plumose bristles and simple setae (Fig. 6). Second maxillary telopodite (Fig. 5) with bristles, both simple and plumose, at tip. Usually with 5 ocelli (one specimen with 6) and 4+4 gonopodal spurs (three specimens have 5+5).

Male. Body length: 11.9–12.27 mm. Antennae with 20–22 articles. Legs plectrotaxy as in Table 2. Gonopods 1-segmented, flat, with 3 setae placed on gonopodal middle (Fig. 7). Legs 15 (Figs 8–9): *P*, *F*, and *Ti* thickened, both *Tss* slender (width of *Ti* to *Ts1* ratio *ca*. 2.5:1); *F* and *Ti* dorsally flattened; numerous short to long setae evenly scattered on all articles.

Table 1. *Hessebius iranicus* Davoodi & Dyachkov **sp. nov.** (holotype, female): leg plectrotaxy; letters in parentheses indicate variable spines.

			V					D		
Legs	С	Tr	P	F	Ti	С	Tr	P	F	Ti
1	-	-	mp	am	m	-	-	ap	a	a
2	-	-	mp	amp	am	-	-	ap	a(p)	a(p)
3-10	-	-	mp	amp	am	-	-	ap	ap	ap
11	-	-	(a)mp	amp	am	-	-	amp	ap	ap
12	-	-	amp	amp	am	-	-	amp	ap	ap
13-14	-	m	amp	amp	am	a	-	amp	ap	ap
15	-	m	amp	amp	ap	a	-	amp	p	-

Table 2. Hessebius iranicus Davoodi & Dyachkov **sp. nov.** (paratype, male): leg plectrotaxy; letters in parentheses indicate variable spines.

	V					D				
Legs	С	Tr	P	F	Ti	С	Tr	P	F	Ti
1	-	-	mp	am	m	-	-	ap	a	a
2	-	-	mp	amp	am	-	-	ap	a(p)	a(p)
3–10	-	-	mp	amp	am	-	-	ap	ap	ap
11	-	-	(a)mp	amp	am	-	-	amp	ap	ap
12	-	-	amp	amp	am	-	-	amp	ap	ap
13	-	m	amp	amp	am		-	amp	ap	ap
14	-	m	amp	amp	am	(a)	-	amp	p	p
15	-	m	amp	amp	a	(a)	-	amp	p	-

Table 3. Differences between *Hessebius multicalcaratus* Folkmanová, 1958, *H. perelae* Zalesskaja, 1978, *H. scythodes* Volkova, 2016, *H. zalesskajae* Farzalieva, 2017, and *H. iranicus* **sp.nov.**

CI. (Species								
Characters	H. multicalcaratus	H. perelae	H. scythodes	H. zalesskajae	H. iranicus sp. nov.				
Body size (mm)	9–21	22-24	14-16	14-19	12-22				
Weak triangular projections on T13	absent	absent	absent	absent	present				
Dorsal sulci/sutures on male legs 14–15	present	present	present	present	absent				
Female gonopodal claw	bidentate	simple	bidentate	bidentate	simple				
Accessory spines of legs 15	absent	absent	absent	present	present				
Sources	Folkmanová, 1958; Zalesskaja, 1978; Dyachkov, 2019	Zalesskaja, 1978; Dyachkov, 2019	Volkova, 2016	Farzalieva, 2017	present study				

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DISCUSSION

The new species, *Hessebius iranicus* **sp. nov.**, is the second species of *Hessebius* reported from Iran besides *H. barbipes* (Porat 1893). While *H. iranicus* **sp. nov.** has been found in the northern part of Iran, *H. barbipes* has been reported from Fars, Bushehr, Khuzestan, and Markazi Provinces (Zarei et al., 2020). The new species shares more morphological similarities with *H. perelae* Zalesskaja, 1978 and *H. multicalcaratus* Folkmanová, 1958, and *H. zalesskajae* Farzalieva, 2017 than with other species. *Hessebiuss iranicus* **sp. nov.** is distinguished from these species by the presence of weak triangular projections on tergite 13 (present versus absent) and dorsal sulci on male 14th and 15th legs (absent versus present). A full list of the differences between *Hessebius* species with 4–5 female gonopodal spurs is given in Table 3.

The Hyrcanian Region, stretching around 1,000 km along the southern coast of the Caspian Sea, includes Hyrcanian Forests that form a green arc of forest, separated from the Caucasus to the west and from semi-desert areas to the east, non-forested rangelands above the timberline, as well as formerly forested lowland areas. The narrow coastal plains along the Caspian Sea are heavily degraded and almost entirely converted into cultivated lands; however, the forest ecosystems have so far been preserved at higher altitudes on both slopes of the Tallish and the Alborz Mountains (UNESCO, 2023). The new species is found in humid habitats of the narrow coastal plains along the Caspian Sea (Babolsar and Sari city). The Hyrcanian region, acting as a center of cryptic and endemic diversities, is regarded as an ancient ecosystem that has provided refuge for many species (Saberi-Pirooz et al., 2021). It is generally considered that climatic stability during the Pleistocene has played a significant role in shaping the current rich Hyrcanian fauna (Saberi-Pirooz et al., 2021). Chilopoda of the Hyrcanian ecoregion are still insufficiently studied, that are limited mainly to old papers and some recent studies. The research on centipede communities of forest habitats could be useful for biodiversity and conservation issues in this area.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: P. Davoodi: Collecting, preparing, and examining the specimens, identification, drafting, and revising the manuscript; Yu.V. Dyachko: Taxonomic work and identification of specimens, drafting and revising the manuscript. The authors read and approved the final version of the manuscript.

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This research received no specific grant from any funding agencies.

AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Zoological Collection of the University of Mazandaran and are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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معرفی یک گونه جدید از جنس Verhoeff, 1941 (Chilopoda: Lithobiomorpha: Lithobiidae) Hessebius Verhoeff, از ایران

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چکیده: گونه جدید .Hessebius iranicus sp. nov. بر اساس ۲۲ نمونه از شرق استان مازندران توصیف شد. این گونه بر اساس ساختار گونوپود جنس ماده که دارای یک توسعه یافتگی و بیرونزدگی در لبه پشتی-جانبی است، در جنس Hessebius Verhoeff, 1941 طبقهبندی می شود. گونه جدید ایرانی از دیگر گونههای این جنس بر اساس صفات زیر قابل تمایز است: وجود بیرون زدگی کوچک در ترجیت سیزدهم، وجود خارهای اضافی در پای پانزدهم و تعداد خارهای گونوپود در جنس ماده. این مورد، اولین گونه توصیف شده از جنس Hessebius از منطقه هیرکانی در ایران محسوب می شود.

واژگان کلیدی: صدپایان، هیرکانی، لیتوبیدها، غرب آسیا، تاکسونومی