



A taxonomic study on Damsel bugs (Hemiptera, Heteroptera, Nabidae, Nabinae) of Guilan province and adjacent areas in Iran, with an illustrated key to the genera and species

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ABSTRACT. Damsel bugs (Hemiptera, Nabidae) are predatory insects belonging to the order of Hemiptera. During the spring-summer of 2021–2022, nabid specimens were collected from Guilan province and adjacent areas. In this study, three species (four subspecies) belonging to two genera were collected and identified: *Himacerus mirmicoides* (O.Costa, 1834); *Nabis viridulus* Spinola, 1837; *Nabis pseudoferus pseudoferus* Remane, 1949 and *Nabis pseudoferus orientarius* Remane, 1962, furthermore, four species (four subspecies) belonging to two genera were examined from the insect collection of the Natural History Museum of the University of Guilan (UGNHM) including *Himacerus major* (A.Costa, 1842); *Nabis pseudoferus transcaspicus* Remane, 1962; *Nabis punctatus punctatus* A.Costa, 1847 and *Nabis capsiformis* Germar, 1838. In this paper, based on the morphological characteristics and genitalia of males, brief diagnostic descriptions, illustrated identification key and digital images of species habitus were provided to facilitate the identification of Nabidae of Guilan province and its adjacent areas.

Key words: Biocontrol, fauna, Iran, identification key, predator, male genitalia

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INTRODUCTION

Nabidae or damsel bugs are a small group of predatory insects that have a worldwide distribution. All members in this family are predators of adults and immatures of several groups of insects, e.g., leafhoppers, aphids, young caterpillars and lepidopteran eggs (Lattin, 1989). They live on trees, bushes, low herbaceous vegetation, grasses and shrubs or on the ground depending on the group (Lattin, 1989; Kerzhner, 1996). Important morphological characters to identify Nabidae include the moderate size of the body (rarely exceeding 10 mm), elongated head, labium flexible and usually curving, 4 segmented labium and antenna, antennal prepedicellite present, In most species, fossula spongiosa in protibiae and mesotibiae is present (Panizzi, 2015). This family currently includes 20 genera and 500 species (Faúndez & Carvajal, 2014), classified into two subfamilies, Nabinae A.Costa, 1853 and Prostemmatinae Reuter, 1890 (Kim et al., 2021). Prostemmatinae is a relatively small group, which has five genera with approximately 150 described species worldwide (Schuh & Slater, 1995; Cassis, 2016), in the Palaearctic region, 4 genera and approximately 30 species were reported (Lee et al. 2019). In contrast, the subfamily Nabinae is a larger group including 15 genera and approximately 350 species in four tribes worldwide, in

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the Palaearctic region a total of 6 genera and approximately 100 species were reported (Kerzhner, 1996). So far, 22 species belonging to 4 genera (*Alloeorhynchus* Fieber, 1860; *Prostemma* Laporte, 1832; *Nabis* Latreille, 1802 and *Himacerus* Wolff, 1811) from both subfamilies Prostematinae and Nabinae were listed from Iran (Hoberlandt, 1955; Seidenstücker, 1957, 1958; Remane, 1962; Kiritshenko, 1966; Baroughi, 1978; Kerzhner & Rieger, 1985; Kerzhner, 1981, 1987, 1996; Modarres Awal, 1987, 1997, 2008; Linnavuori & Hosseini, 2000; Heiss, 2002; Askari et al., 2009). Among them, 18 species belonging to those 4 genera were also reported from Guilan province and neighbouring areas (Linnavuori & Hosseini, 2000).

The Guilan province is located on the southern coast of the Caspian Sea. It consists of coastal and central plains, which are bordered by mountain ranges, the Talesh, Masuleh and Poshtehkuh mountains in the west and the Alborz mountains in the south. The mountain ranges are traversed by the Sefid Rud valley in central Guilan. This province has a unique climate (humid subtropical) and different vegetation in each of the following zones: coastal plain, central plain, forest zone, mountain meadows and dry hilly steppes. This remarkable situation has provided the province with a great variety of flora and fauna. Hence, the insect fauna in different parts of Guilan is diverse and abundant (Linnavuori & Hosseini, 2000). Since Nabidae have a significant role in maintaining biological balance and numerous species in Nabinae are important for the control of agricultural and forest pest populations (Kerzhner, 1996), they have attracted the attention of entomologists (Lattin, 1989). In addition, there have not been many studies on the Nabidae of Iran and especially of Guilan province, therefore this study aims to present the results of research on the fauna of Nabidae of Guilan province and adjacent areas.

MATERIAL AND METHODS

A faunal study on the family Nabidae was done in Guilan province and adjacent areas, during spring-summer 2021–2022. Specimens were collected by sweeping on vegetation; insects fallen into the net were collected by an aspirator, killed with ethyl acetate, then transferred into the 1.5 ml tubes, and labelled. Specimens were mounted on triangular cards from the right side of the body with water-soluble glue to preserve them in the collection. In order to prepare temporary slides with the genitalia of males, the last segment of the abdomen of males was separated by a fine entomological needle and then transferred into a container containing lactic acid. They were boiled in lactic acid for 3 minutes and then quickly transferred into cold alcohol. Different parts of the genitalia were separated by a fine needle and placed in special slides using glycerin. The specimens were examined using a stereomicroscope (GX-Microscope, Australia). Male specimens were identified based on morphological characters, including genitalia, using appropriate taxonomic keys (e.g., Péricart, 1987; Linnavuori & Hosseini, 2000; Novoselsky et al., 2014). Colour images of male specimens were captured using a Canon® EOS 200D camera attached to a Canon® EF 100mm f/2.8 USM Macro lens and a 65 mm extension tube. Colour images of parameres and phallus were captured using a Canon® 600D camera connected to a microscope (Leica® DM1000) under 10× and 20× magnifications, respectively. Photographs were subsequently edited in Adobe® Lightroom v. 6.1 software. Partially focused images were combined using Helicon Focus image stacking software Helicon Focus V8.1.0 stacking software (Kozub et al., 2022). The in-focus images were slightly edited and cropped using Adobe® Photoshop cc 2019. The examined specimens are kept in the insect collection of the Natural History Museum of the University of Guilan (UGNHM), Rasht, Iran. The terminology used for describing the morphological characters of the male genitalia follows Péricart (1987).

RESULTS

Six species (one is subdivided into three subspecies) belonging to two genera were identified from Guilan province and adjacent areas, based either on freshly collected material or on specimens preserved in the insect collection of the Natural History Museum of the University of Guilan (UGNHM).

*Taxonomic hierarchy***Order Hemiptera Linnaeus, 1758****Suborder Heteroptera Latreille, 1810****Family Nabidae A.Costa, 1853****Subfamily Nabinae A.Costa, 1853****Tribe Nabini A.Costa, 1853****Genus *Himacerus* Wolff, 1811*****Himacerus (Aptus) mirmicoides* (O.Costa, 1834) (Figs 2A, 2B, 5A, 6E)**

Material examined. Iran, Guilan, Ardeh (37°32'12.7"N, 48°49'55.7"E), 20.VII.2022, 6 Nymphs; Roshandeh (37°31'04.3"N, 48°52'17.9"E), 20.VII.2022, 2 Nymphs, 1 ♂; Gilvan-Masal (37°18'24.1"N, 48°59'11.4"E), 20.VI.2022, 2 Nymphs, 3 ♂♂, 3 ♀♀; Dasht-e Veyl (36°49'56.8"N, 49°36'38.9"E), 20.IX.2021, 2 ♂♂, 3 ♀♀; Hendekhale (37°23'01.3"N, 49°26'38.8"E), 25.V.2022, 2 ♂♂; Darreh Dasht (36°48'07.7"N, 49°38'18.1"E), 18.VI.2022, 20 Nymphs, 2 ♂♂; Ardabil, Anaviz (37°40'46.6"N, 48°28'34.7"E), 23.VII.2022, 4 Nymphs, 1 ♂, 2 ♀♀; Majolan (37°14'30.2"N, 48°50'56.7"E), 27.VII.2022, 1 Nymph, leg.: R. Hosseini & A. Gholami.

Distribution in Iran. Ardabil (Modarres Awal, 1987, 1997); East Azerbaijan (Kerzhner & Rieger, 1985); Golestan (Kerzhner, 1963, 1981, 1987); Guilan (Kerzhner, 1987; Linnavuori & Hosseini, 2000); Mazandaran (Kerzhner & Rieger, 1985; Kerzhner, 1987; Linnavuori & Hosseini, 2000).

General distribution. European, extending to North Africa and the Middle East (Kerzhner, 1996).

Diagnosis. Brachypterous (Figs 2A–2B). Length 6–7.6 mm. Yellowish brown or reddish. Antennae are yellow and shorter than body, apical part of the second segment is dark brown. Middle of scutellum, dorsum of abdomen and venter black. Fore and middle legs with 2 rows of short spines in the inner part, femora with transverse brown stripes, tibiae have at least one black ring near the base and darkened on upper part. Hemelytra with irregular tinged pattern. Apex of paramere tridentate (Fig. 5A). Endosome of the phallus has small sclerites and does not have spines (Fig. 6E). Measurements in Table 1.

Habitats. It was collected on grass under trees, on *Alcea setosa* (Malvaceae) (Fig. 1A), *Oenothera speciosa* (Onagraceae) (Fig. 1B), *Urtica* sp. (Urticaceae), *Euphorbia* sp. (Euphorbiaceae) and *Alnus glutinosa* (Betulaceae).

***Himacerus (Anaptus) major* (A. Costa, 1842) (Figs 2C, 5F, 6I).**

Material examined. Iran, Guilan, Darreh Dasht (36°48'07.7"N, 49°38'18.1"E), 27.V–20.VI.1995, 1 ♂, leg.: R.E.Linnavuori & R.Hosseini (UGNHM, Linnavuori & Hosseini, 2000).

Distribution in Iran. Guilan (Linnavuori & Hosseini, 2000).

General distribution. Holo-Mediterranean, introduced into Canada and the USA (Kerzhner, 1996; Kerzhner & Henry, 2008).

Diagnosis. Macropterous (Fig. 2C) Length 7.6 mm. Head with a black median band. Antennae are yellow and shorter than body, apical part of the second segment is slightly brown. Pronotum brownish yellow with black median and lateral bands. Middle of scutellum, dorsum of abdomen and venter black, sometimes ventral part of abdomen has two longitudinal brown stripes. Legs are mostly yellowish, profemora ventrally and metafemora apically brownish or black, on the inner part of profemora and mesofemora with dense setae and black bristles between them, on the inner part of protibiae and mesotibiae with two rows of black spines. Hemelytra almost dark brown without irregular tinged pattern. Parameres are T-shaped (Fig. 5F). Endosome of the phallus has sclerite plates (Fig. 6I). Measurements in Table 1.

Genus *Nabis* Latreille, 1802***Nabis (Aspilaspis) viridulus* Spinola, 1837 (Figs 3A, 3B, 5E, 6C–6D)**

Material examined. Iran, Guilan, Gangeh, (36°50'42.0"N, 49°27'39.6"E), 14.VII.2021, 2 nymphs, 1 ♂, 4 ♀♀; Pa Rudbar (36°36'45.3"N, 49°44'05.8"E), 10.IV.2022, 3 ♂♂, 1 ♀; Manjil-Lowshan (36°40'48.0"N, 49°25'51.6"E), 14.VII.2021, 4 Nymphs, 2 ♂♂, 2 ♀♀; near Tutkabon (36°54'47.0"N, 49°31'22.7"E), 19.V.2022, 3 Nymphs, 1 ♀; Ardabil, Givi-Khalkhal (37°41'06.7"N, 48°22'58.8"E), 14.IX.2021, 1 nymph, 4 ♂♂, 2 ♀♀, Leg.: R.Hosseini & A.Gholami.

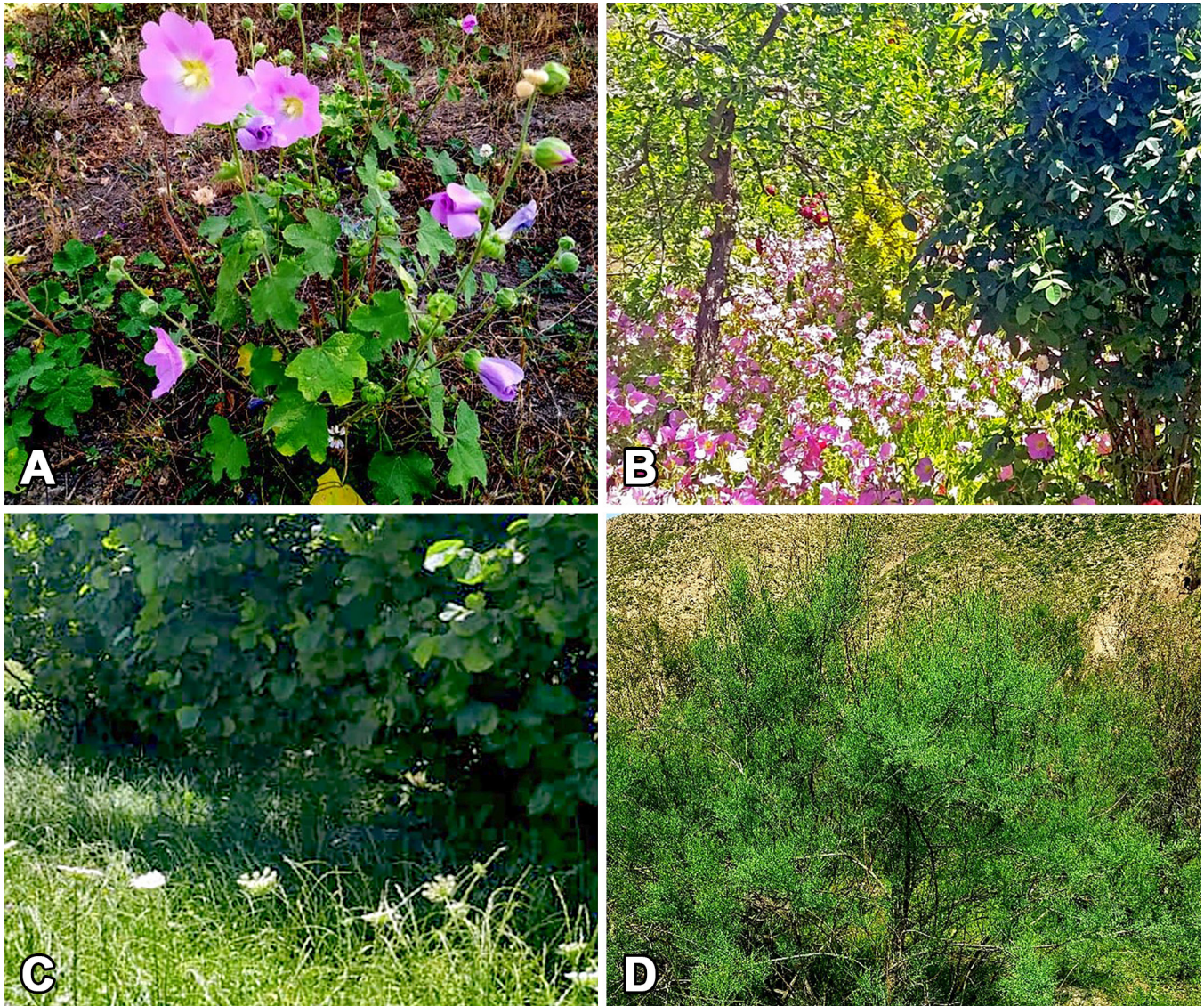


Figure 1. Habitats and host plants of *Himacerus mirmicoides* (O.Costa, 1834). **A.** *Alcea setosa* (Malvaceae); **B.** *Oenothera speciosa* (Onagraceae); **C.** Habitat of *Nabis (Nabis) pseudoferus pseudoferus* Remane, 1949 and *Nabis (Nabis) pseudoferus orientarius* Remane, 1962; **D.** Habitat and host plant of *Nabis viridulus* Spinola, 1837, *Tamarix* sp. (Tamaricaceae).

Distribution in Iran. Esfahan, Fars (Kerzhner, 1987); Golestan (Kerzhner, 1987; Heiss, 2002); Guilan (Linnavuori & Hosseini, 2000); Kerman (the record from Anbarabad (Seidenstücker, 1958 as *Nabis viridis*) may belong, at least partly, to *N. pallidus* or *N. indicus* (Kerzhner, 1987)); Khorasan (Seidenstücker, 1957 - as *Aspilaspis viridis* from Birdjand; Kerzhner, 1987; Linnavuori & Modarres Awal, 1998); Khuzestan (Kerzhner, 1987); Markazi (Modarres Awal, 1997); Mazandaran (Heiss, 2002); Sistan va Baluchestan (Seidenstücker, 1957 - as *Aspilaspis viridis* from Iranshahr, Sangun and Kuh-e Taftan; [the record from Zahedan (Kiritshenko, 1966) belongs to *N. pallidus*], and West Azerbaijan (Kerzhner, 1987).

General distribution. Holo-Mediterranean, extending to Sahel (Senegal, Sudan) and Central Asia (Tajikistan, Uzbekistan) (Kerzhner, 1996).

Diagnosis. Macropterous. Length 6.5–7.2 mm. Mostly Green (Fig. 3A), sometimes with reddish tinge (Fig. 3B). Antennae yellow-green and shorter than body. Legs yellow-green. Profemora often with transverse brown stripes. Profemora and mesofemora with pale, hair-like bristles, or spine-like brown bristles only on mesofemora, rarely one or two dark bristles on profemora without brown tubercles at

bases. Hemelytra yellowish green, mesorium often with brownish or reddish subapical spot. Paramere narrowish and relatively straight (Fig. 5E). Phallus with gracile basal hook, area near the three apical hooks not spiny (Figs 6C–6D). Measurements in Table 1.

Habitats. This species was collected on *Tamarix* sp. (Tamaricaceae) (Fig. 1D) and or grass under trees.

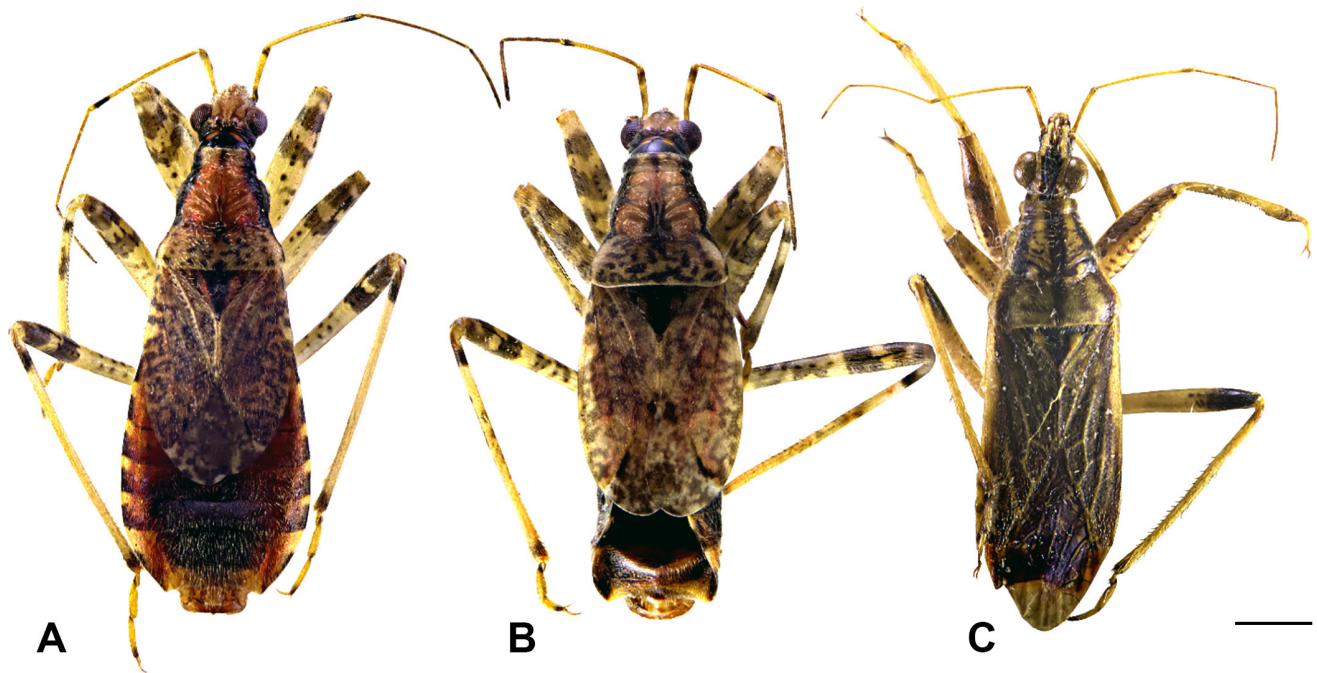


Figure 2. General habitus of the males. **A–B.** *Himacerus mirmicoides*; **C.** *Himacerus major*. Scale= 1mm.

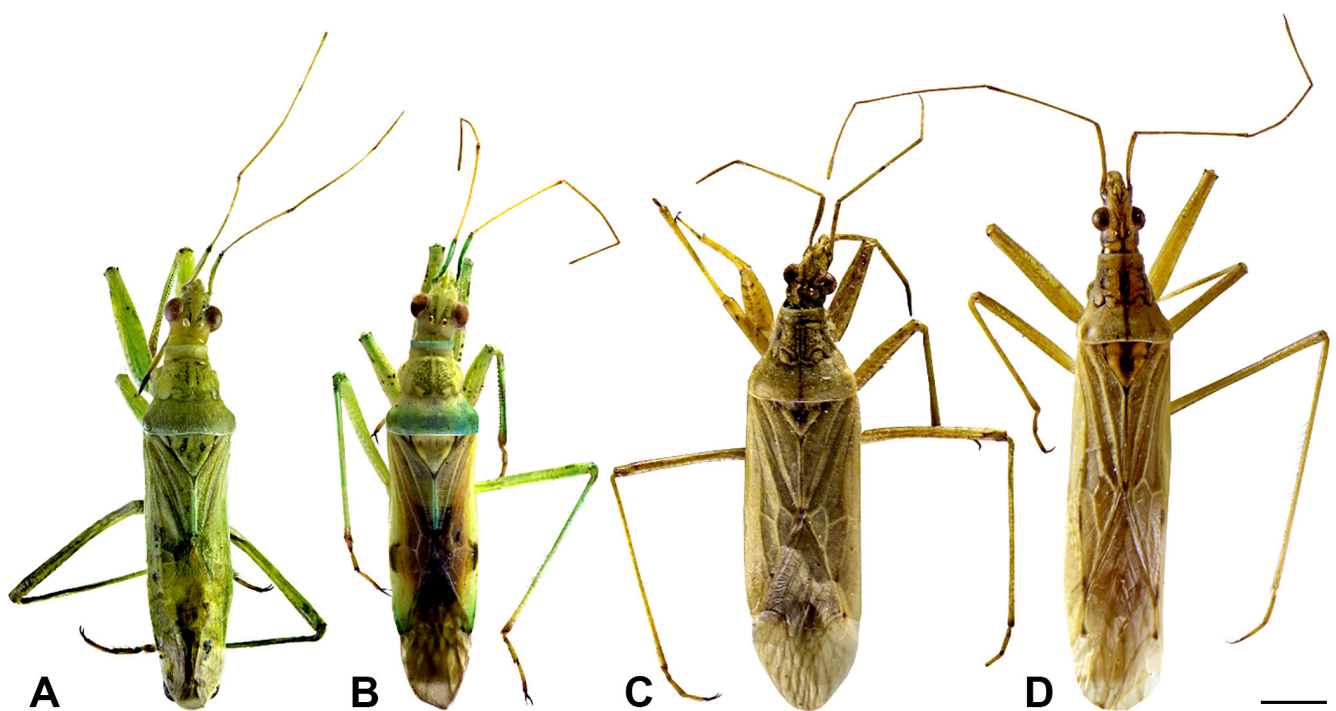


Figure 3. General habitus of the male specimens. **A–B.** *Nabis viridulus*; **C.** *Nabis punctatus*; **D.** *Nabis capsiformis*. Scale= 1mm.

***Nabis (Nabis) pseudoferus pseudoferus* Remane, 1949 (Figs 4B, 5B, 6A)**

Material examined. Iran, Guilan, Pirkooch (36°50'23.0"N, 50°01'11.7"E), 16.VII.2022, 3 ♂♂, 2 ♀♀, leg.: R.Hosseini.

Distribution in Iran. East Azerbaijan and West Azerbaijan (Kerzhner, 1987).

Diagnosis. Macropterous (Fig. 4B). Length 6.2–7.8 mm. Yellowish brown. Antennae yellow and shorter than body. Pronotum with black median and lateral bands. Middle of scutellum black. Black indistinct patterns on legs, sometimes profemora with developed transverse stripes but not contiguous. Six spots on the corium. Base of paramere short, inner margin strongly curved and distinctly constricted basally, disk broad and not curved on outer side, apical margin of disk slightly deflexed (Fig. 5B). Phallus with one long hook (Fig. 6A). Measurements in Table 1.

Habitats. This species was collected on grass under the hazelnut trees (Fig. 1C).

***Nabis (Nabis) pseudoferus transcaspicus* Remane, 1962 (Figs 4C, 6F)**

Material examined. Iran, Guilan, Lounak (37°00'14"N, 49°51'50"E), 20.VII.1996, 1 ♂, 3 ♀♀, leg.: R.E.Linnavuori & R.Hosseini (UGNHM, Linnavuori & Hosseini, 2000).

Distribution in Iran. Ardabil (Modarres Awal, 1987; Linnavuori & Hosseini, 2000); East Azerbaijan (Modarres Awal, 1997); Golestan (Kerzhner, 1963, 1981, 1987); Khorasan (Kerzhner, 1987; Linnavuori & Modarres Awal, 1998; Heiss, 2002; Modarres Awal, 2008); Semnan (Remane, 1962; Kerzhner, 1963, 1981, 1987); Tehran (Linnavuori & Hosseini, 2000); Guilan (Linnavuori & Hosseini, 2000); Mazandaran (Kerzhner, 1987; Heiss, 2002).

Comment. Transitional populations, intermediate between *Nabis (Nabis) pseudoferus transcaspicus* Remane, 1962 and *Nabis (Nabis) pseudoferus orientarius* Remane, 1962 occur in Guilan and Mazandaran provinces (Kerzhner, 1987). Linnavuori & Hosseini (2000) pointed out that the shape of spicula vary between *orientarius* and *transcaspicus* in material from Guilan province.

General distribution. Turkmenistan and Iran (Kerzhner, 1996).

Diagnosis. Length 7.5 mm (Fig. 4C) Diagnostic characters mostly the same as previous subspecies. Phallus with one short and one long hook (Fig. 6F). Measurements in Table 1.

***Nabis (Nabis) pseudoferus orientarius* Remane, 1962 (Figs 4A, 5C, 6B)**

Material examined. Iran, Ardabil, Givi (37°40'21.7"N, 48°20'14.9"E), 23.VII.2022, 3 ♂♂, 8 ♀♀; Guilan, Pirkooch (36°50'23.0"N, 50°01'11.7"E), 16.VII.2022, 1 Nymph, 1 ♂, 5 ♀♀, leg.: R. Hosseini.

Distribution in Iran. East Azerbaijan (Remane, 1962; Kerzhner, 1987), Esfahan (Kerzhner, 1987), Fars (Kiritshenko, 1966; Kerzhner, 1963, 1981, 1987), Guilan (Linnavuori & Hosseini, 2000), Kerman (Kiritshenko, 1966, Kerzhner, 1987), Tehran (Remane, 1962; Kerzhner, 1963, 1981, 1987), Zanzan (Askari et al., 2009).

Diagnosis. Length 6.5–7.8 mm (Fig. 4A). Diagnostic characters mostly the same as previous subspecies. Base of paramere almost cylindrical and not constricted, disk broad and almost curved on outer side, apical end of disk deflexed (Fig. 5C). Phallus with two long hooks (Fig. 6B). Measurements in Table 1.

Habitats. This species was collected on grass under the hazelnut trees (Fig. 1C).

***Nabis (Nabis) punctatus punctatus* A. Costa, 1847 (Figs 3C, 5D, 6G)**

Material examined. Iran, Guilan, Ganjeh (36°50'42.0"N, 49°27'39.6"E), 14.V-13.VI.1995, 1 ♂, leg.: R.E.Linnavuori & R.Hosseini. (UGNHM, Linnavuori & Hosseini, 2000).

Distribution in Iran. Alborz (Lindberg, 1938 misidentified as *N. ferus* - see Kerzhner, 1988), East Azerbaijan, Esfahan, Fars, Golestan (Kerzhner, 1987); Guilan (Kerzhner, 1987; Linnavuori & Hosseini, 2000); Kerman, Kohgiluyeh va Buyer Ahmad (Kerzhner, 1987); Khorasan (Kerzhner, 1987, Linnavuori & Modarres Awal, 1998); Markazi, Mazandaran, Qazvin, Semnan (Kerzhner, 1987); Tehran (Hoberlandt, 1959 misidentified as *N. sareptanus* - see Kerzhner, 1987); West Azerbaijan (Kerzhner, 1987); The record from Lahijan (Guilan province) is based on a single female, whose identity was considered as uncertain already in the original paper (Wagner, 1961).

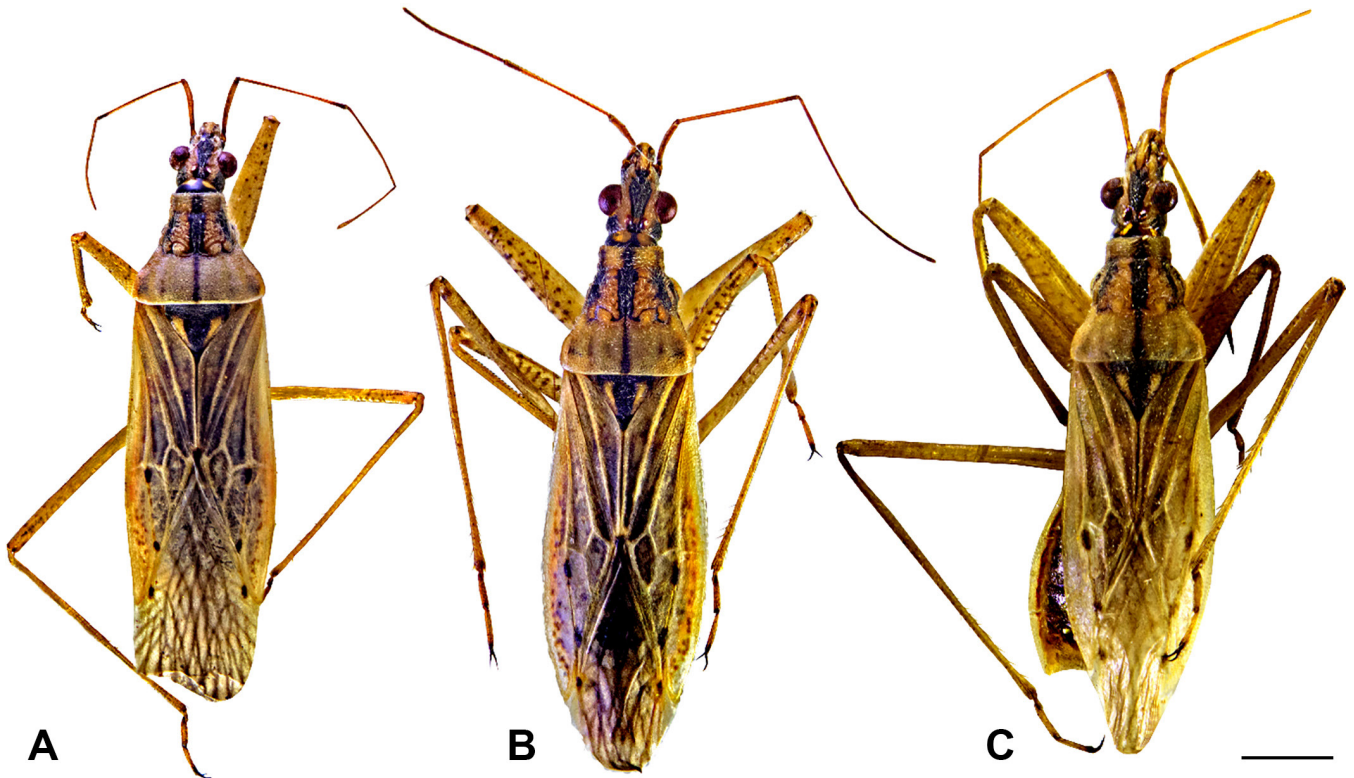


Figure 4. General habitus of the male specimens. **A.** *Nabis pseudoferus orientarius*; **B.** *Nabis pseudoferus pseudoferus*; **C.** *Nabis pseudoferus transcaspicus*. Scale = 1mm.

General distribution. Europe, extending to north-west Africa and Central Asia (Kerzhner, 1996).

Diagnosis. Macropterous (Fig. 3C). Length 7.7 mm. Light brown. Antennae yellow and shorter than body. Profemora and mesofemora have brown spots. Hemelytra as long as abdomen, membrane long, apically rounded. Apical part of paramere broadly blade-like, elongate and narrowish with shallowly and regularly curved outer margin (Fig. 5D). Phallus with two hooks (Fig. 6G). Measurements in Table 1.

Nabis (Tropiconabis) capsiformis Germar, 1838 (Figs 3D, 5G, 6H)

Material examined. Iran, Guilan, Deylaman-Barasar (36°47'54.0"N, 49°45'22.9"E), 23.VII.1996, 2 ♂♂, 3 ♀♀, leg.: R.E. Linnavuori & R.Hosseini (UGNHM, Linnavuori & Hosseini, 2000); Kolor road (37°25'48.0"N, 48°41'24.0"E), 5.VII.2021, 1 ♀, leg.: R.Hosseini.

Distribution in Iran. Ardabil (Linnavuori & Hosseini, 2000); Bushehr (Kerzhner, 1987); East Azerbaijan (Baroughi, 1978; Modarres Awal, 1997); Fars, Golestan (Kerzhner, 1987); Guilan (Linnavuori & Hosseini, 2000); Hormozgan (Kerzhner, 1987; Linnavuori, 2004); Ilam (Kerzhner, 1987); Kerman (Seidenstücker, 1958; Wagner, 1961; Kiritshenko, 1966; Kerzhner, 1987); Khorasan (Seidenstücker, 1957; Linnavuori & Modarres Awal, 1998; Heiss, 2002, Modarres Awal, 2008); Khuzestan (Seidenstücker, 1958; Kerzhner, 1987); Kohgiluyeh va BuyerAhmad, Kordestan, Lurestan (Kerzhner, 1987); Markazi (Modarres Awal, 1997); Sistan va Baluchestan (Hoberlandt, 1955; Seidenstücker, 1957; Kiritshenko, 1966; Kerzhner, 1987); Tehran, and West Azerbaijan (Kerzhner, 1987).

General distribution. Cosmotropical (Kerzhner, 1996; Kerzhner & Henry, 2008).

Diagnosis. Macropterous (Figs 3D). Length 7–7.5 mm with gracile body. Yellowish light brown. Antennae yellow and shorter than body. Sometimes has a brown longitudinal stripe on dorsum of head, pronotum and scutellum. Hemelytra is distinctly longer than abdomen. Disc of paramere semicircular (Fig. 5G). Phallus with two hooks (Fig. 6H). Measurements in Table 1.

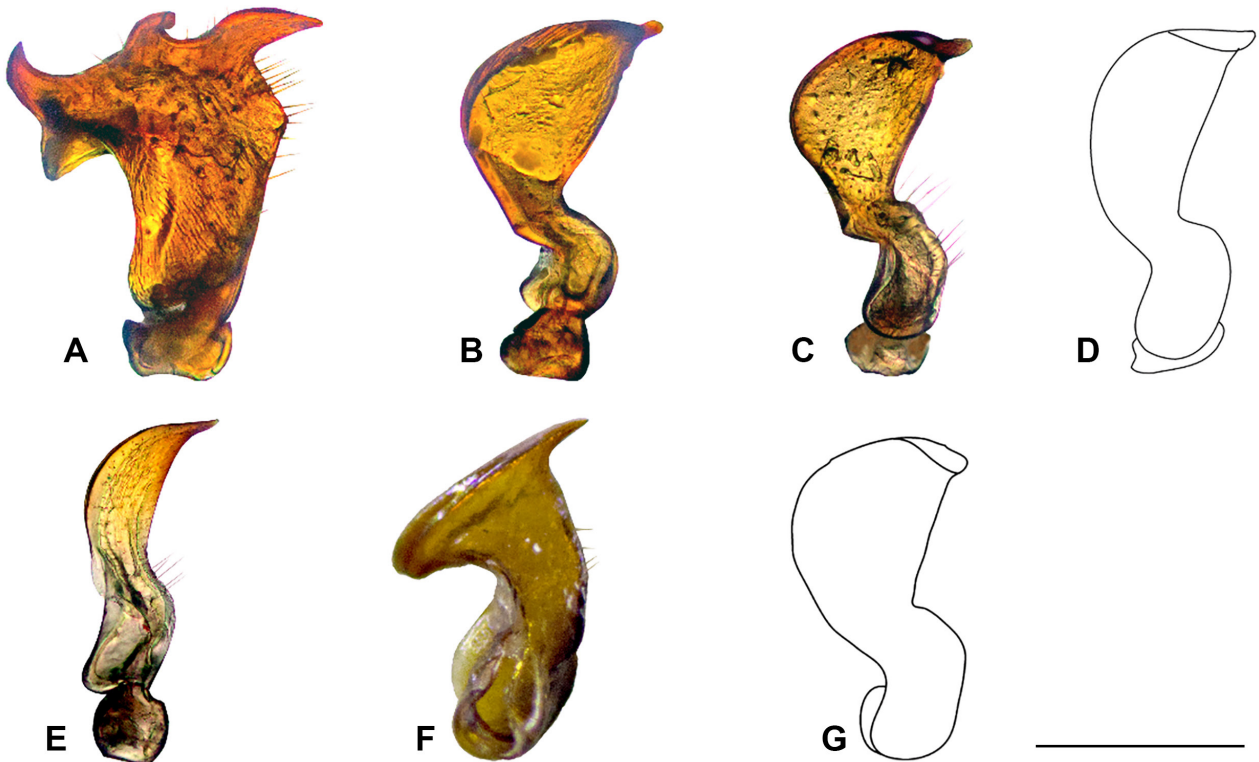


Figure 5. Paramere. **A.** *Himacerus mirmicoides*; **B.** *Nabis pseudoferus pseudoferus*; **C.** *Nabis pseudoferus orientarius*; **D.** *Nabis punctatus*; **E.** *Nabis viridulus*; **F.** *Himacerus major*; **G.** *Nabis capsiformis*. Scale= 1mm. (D. & G. redrawn after Kerzhner, 1981).

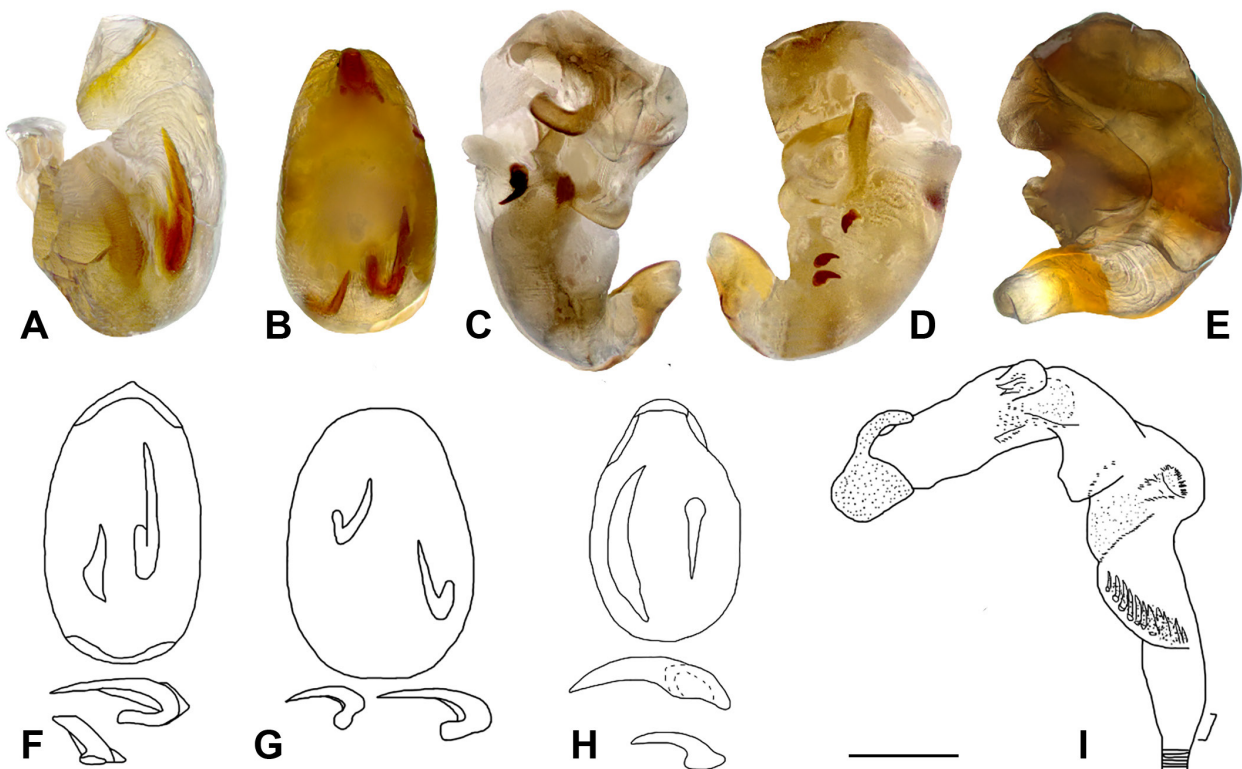


Figure 6. Phallus. **A.** *Nabis pseudoferus pseudoferus*; **B.** *Nabis pseudoferus orientarius*; **C-D.** *Nabis viridulus*; **E.** *Himacerus mirmicoides*; **F.** *Nabis pseudoferus transcaspicus*; **G.** *Nabis punctatus*; **H.** *Nabis capsiformis*; **I.** *Himacerus major*. Scale= 0.5mm. (F-I. redrawn after Kerzhner, 1981).

Table 1. Measurements of the morphometric characters (in mm) for the studied damsel bugs.

Characters	<i>N. viridulus</i> (n= 5 ♂♂)	<i>N. pseudoferus pseudoferus</i> (n= 3 ♂♂)	<i>N. pseudoferus orientarius</i> (n= 3 ♂♂)	<i>N. pseudoferus transcaspicus</i> (n= 1 ♂)	<i>N. capsiformis</i> (n= 2 ♂♂)	<i>N. punctatus</i> (n= 1 ♂)	<i>H. major</i> (n=1 ♂)	<i>H. mirnicoides</i> (n= 5 ♂♂)
Width of the head (across the eyes)	0.8	0.8	0.8	0.8	0.6	0.8	1	0.9
Length of head (dorsal view)	1.1	1.1	1.1	1.3	1.2	1.3	1.4	1.2
Vertex	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
Width of the eye (dorsal view)	0.2	0.2	0.2	0.2	0.1	0.2	0.3	0.2
Width of abdomen	1.5	1.8	1.9	1.8	1.2	1.8	2.4	2.3
Length of Abdomen	3.1	3.2	3.3	3.4	3.9	4	3.8	3.4
Width of prothorax	1	0.9	0.9	1	0.7	0.9	1.1	1
Length of prothorax	0.9	0.8	0.8	0.9	0.6	0.7	0.9	0.8
Width of scutellum	0.9	0.8	0.8	0.9	0.7	0.9	0.9	0.6
Length of scutellum	0.8	0.6	0.6	0.7	0.6	0.8	0.8	0.5
Length of Antenna	3.1	4	3.2	3	3.2	3.6	3.1	3.1

Key to the genera and species of Nabinae in Guilan (male specimens).

- 1 Connexivum and the rest of venter not separated from each other. Abdominal sterna with small, shiny spots near outer edge (Genus *Himacerus*) 2
 - Connexivum clearly separated from the rest of venter by a longitudinal furrow. Abdominal sterna without shiny spots (Genus *Nabis*) 3
- 2 Body mostly yellowish brown or reddish. Head and pronotum without black median stripe. Mostly brachypterous, hemelytra with irregular tinged pattern. Femora with transverse brownish stripes. Apex of paramere tridentate (Fig. 5A). *Himacerus mirnicoides* (O.Costa, 1834)
 - Body not yellowish brown or reddish. Head and pronotum with black median stripe. Macropterous, hemelytra almost dark brown without irregular tinged pattern. Profemora ventrally and metafemora apically brownish or black, Apex of paramere not tridentate (Fig. 5F). *Himacerus major* (A. Costa, 1842)
- 3 Body green, sometimes with reddish or brownish pattern. Head, pronotum and scutellum without brownish longitudinal median line. Paramere narrowish and relatively straight (Fig. 5E). *Nabis viridulus* Spinola, 1837
 - Body yellowish or grayish without above-mentioned pattern. Head, pronotum and scutellum with brownish longitudinal median line. Apical portion of paramere distinctly wider than previous species. 4
- 4 Gracile species (Table 1) with long legs. Hemelytra longer than abdomen. *Nabis capsiformis* Germar, 1838
 - Robust species (Table 1) with shorter legs. Hemelytra as long as abdomen or shorter. 5
- 5 Corium with six small black spots. Apical part of paramere short and broad, outer margin strongly curved and distinctly constricted basally (Figs 5B, 5C). *Nabis pseudoferus**
 - Corium without six small black spots. Apical part of paramere broadly blade-like, elongate and narrowish with shallowly and regularly curved outer margin (Fig. 5D). *Nabis punctatus punctatus* A. Costa, 1847

Remarks. *Nabis pseudoferus* includes three subspecies: *Nabis (Nabis) pseudoferus pseudoferus* Remane, 1949, *Nabis (Nabis) pseudoferus transcaspicus* Remane, 1962 and *Nabis (Nabis) pseudoferus orientarius* Remane, 1962.

DISCUSSION

Damsel bugs, as predatory insects, do not have specific host plants, hence they are found on plants where their prey live. They are generally found on trees, bushes, low herbaceous vegetation, grasses, shrubs and even on the ground (Lattin, 1989; Kerzhner, 1996). In the current study, these bugs were mostly collected on the following plants *Tamarix* sp., *Alcea setosa*, *Oenothera speciosa*, *Urtica* sp., *Euphorbia* spp., *Alnus glutinosa* and in the mixture of plants under the trees which were infested by aphids, leafhoppers, nymph of mirids and lepidopteran larvae. A review of the literature shows that insect body size in different populations could be affected by different influencing factors such as latitude or altitudinal clines (Chown & Gaston, 2010; Kivelä et al., 2011). Results of character measurement in our research indicated that the body sizes of some collected species are smaller compared to those of the same species mentioned in other studies (e.g., Péricart, 1987; Linnavuori & Hosseini, 2000). These differences could depend on the above-mentioned factors. At the moment, only subfamily Nabinae is present in Guilan province and *Nabis* is the most abundant genus in the province. In addition, *Himacerus (Aptus) maracandicus* (Reuter, 1890), which had been reported by Kerzhner from Guilan province (Kerzhner, 1963, 1981, 1987), was not found in this research.

In conclusion, the results of this paper could be considered as a preliminary study on Nabidae of Guilan province and adjacent areas. Therefore, in the future complementary studies are needed to collect more samples from other localities to obtain more information in order to have a wider and better view about the distribution and activity of these beneficial insects in the region.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution in the paper as follows: R.H.: Collecting and identification of specimens, preparation of the manuscript; A.G.: Collecting the specimens, preparation of slides, taking the photographs and preparation of the manuscript. Both authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the insect collection of the Natural History Museum of the University of Guilan (UGNHM), Rasht, Iran and are available from the curator, upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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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مطالعه‌ی تاکسونومیک سن‌های زیرخانواده Nabinae (Hemiptera, Heteroptera, Nabidae) استان گیلان و مناطق مجاور در ایران، به انضمام کلید مصور جنس‌ها و گونه‌ها

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چکیده: سن‌های خانواده ناییده حشرات شکارگر متعلق به راسته‌ی Hemiptera هستند. در طول بهار و تابستان ۱۴۰۰-۱۴۰۱، نمونه‌هایی از این سن‌ها از استان گیلان و مناطق مجاور جمع‌آوری شدند. در این مطالعه سه گونه (چهار زیرگونه) متعلق به دو جنس جمع‌آوری و شناسایی شدند: *Himacerus mirmicoides* (O.Costa, 1834)، *Nabis pseudoferus pseudoferus* Remane, 1949، *Nabis viridulus* Spinola, 1837، *orientarius* Remane, 1962، علاوه بر این، چهار زیرگونه متعلق به دو جنس از مجموعه حشرات موزه تاریخ طبیعی دانشگاه گیلان (UGNHM) شامل: *Himacerus major* (A.Costa, 1842)، *Nabis pseudoferus pseudoferus* Remane, 1962، *Nabis capsiformis* Germar، و *Nabis punctatus punctatus* A.Costa, 1847، *transcaspicus* Remane, 1962 نیز بررسی و معرفی شدند. در این مقاله، بر اساس ویژگی‌های ریخت‌شناسی و اندام تناسلی افراد نر، توصیفات مختصر تشخیصی، کلید شناسایی مصور و تصاویر دیجیتالی از گونه‌ها به منظور تسهیل در شناسایی سن‌های Nabidae استان گیلان و مناطق مجاور آن ارائه شد.

واژگان کلیدی: کنترل زیستی، فون، ایران، کلید شناسایی، شکارگر، اندام تناسلی نر