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RESEARCH PAPER

Notes on Water Striders (Heteroptera: Gerridae) in Southwest Iran with a Description of a New Macropterous Form of *Metrocoris communis* (Distant, 1910)

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Abstract
In a sample collection trip across Fars Province, Iran, *Gerris thoracicus*, *G. costae*, *G. argentatus*, and *Metrocoris communis* were found and macropterous form of *M. communis* is described for the first time.

Keywords Heteroptera · Gerridae · Fauna · Fars Province · Iran

1 Introduction

Water striders (Hemiptera: Heteroptera: Gerridae), with 713 species in the world and 51 species in the Palearctic region (Lytle 2015), are common insects in aquatic habitats on the water surface film. According to the checklists, 6 genera and 18 species of the family Gerridae have been recorded for the Iranian fauna (Andersen 1993, 1995; Askari et al. 2009; Brown 1953; China 1938; Fent et al. 2011; Ghahari et al. 2013; Linnavuori 2009; Linnavuori and Hosseini 2000; Ostovan and Arefnia 2012). These numbers of species have only been reported as a result of very scattered case studies from Iran. *Metrocoris communis* (Distant, 1910), the only species of the genus *Metrocoris* Mayr, 1865, is recorded by den Boer (1965) for Iranian fauna (from Kerman) and recently by Ghahari et al. (2013) (from Hormozgan and Sistan and Baluchistan). Based on specimens from Arabia, Afghanistan, India and Iran, den Boer (1965) synonymized *M. omanensis* Brown, 1950 with *M. communis*. Chen and Nieser (1993b) re-described both apterous female and male of *M. communis*. Furthermore, some other wingless female and male specimens of the species have been recorded by Linnavuori (1994) from Iraq. As no description of macropterous form of *M. communis* was found in the literature, the long-winged form of the species is described in the current study.

2 Materials and methods

Almost all specimens have been collected partly during 2014–2015 throughout Fars Province between eastern longitude 50°36′ to 55°35′ and northern latitude 27°03′ to 31°40′. Some few additional specimens among the collected and deposited insects in Zoological Museum-Collection of Biology Department, Shiraz University (ZM-CBSU) from 1994 to 2002 were also studied. The sampling was carried out from gerrids' natural habitats, e.g., rivers, streams, ponds, pools, and a kind of man-made water resource, called Ab-anbar. In the south of Iran, Ab-anbar is a man-made structure to store rain water for future use.

Some of them had not been used for a long time and provided stagnant water for some insects, where we could find water striders and some other water bugs such as Notonectidae, Corixidae, and Veliidae. The specimens were preserved in 75% fresh ethanol a few hours after sampling. The insects were examined using Ziess Stemi SV11 stereo microscope, and their key characters were drawn using CorelDRAW Graphics Suite X7. Distribution maps of the species were prepared by MapInfo Professional version 7.0 (Fig. 1). The pictures were taken with Canon EOS 7D camera. The specimens were identified using references such as Andersen (1993, 1996), Poisson (1957), and Anufriev et al. (2001). Verification was done by Dr.

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Jakob Damgaard (Laboratory of Molecular Systematics, Botanical Garden and Museum, Copenhagen, Denmark). Quantitative morphometry of the long-winged form of *Metrocoris communis* was carried out following Chen and Nieser (1993a) with a calibrated eyepiece graticule. All specimens are deposited in ZM-CBSU.

The whole localities where samplings were carried out are listed below.

(1) 28°42′50.28″N, 52°36′59.04″E, 1168 m, 25.iv.2012, Z. Shamsoddini. (2) 30°06′14.04″N, 51°27′26.10″E, 904 m, 15.vi.2012, Z. Shamsoddini. (3) 30°20′19.14″N, 52°09′51.00″E, 1776 m, 16.x.2012, S. Moghadam. (4) 29°33′15.9″N, 52°44′22.9″E, 1471 m, 05.v.2013, S. Moghadam. (5) 30°13′51.72″N, 53°12′45.90″E, 1856 m, 05.v.2013, S. Moghadam. (6) 28°33′0.6″N, 55°08′57″E, 01.v.2014, S. Sadeghi. (7) 30°00′29.54″N, 52°18′12.36″E, 1677 m, 06.v.2014, M. Dashan, F. Ghorbanizadeh. (8) 29°57′46.80″N, 52°24′8.40″E, 1553 m, 06.v.2014, M. Dashan, F. Ghorbanizadeh. (9) 28°19′29.22″N, 53°3′8.28″E, 628 m, 07.v.2014, pool, Z. Khazaei. (10) 28°27′13.68″N, 53°09′21.42″E, 07.v.2014, river, Z. Khazaei. (11) 29°29′32.10″N, 52°10′59.52″E, 08.v.2014, stream, S. Sadeghi, Z. Khazaei. (12) 28°43′36.60″N, 52°55′15.60″E, 1200 m, 24.v.2014, M.S. Tahami, M. Dashan, H. Darvishnia. (13) 29°8′25.92″N, 53°58′55.50″E, 1655 m, 31.v.2014, Ab-anbar, Z. Khazaei. (14) 28°58′21.24″N, 54°23′26.40″E, 1424 m, 31.v.2014, river, Z. Khazaei. (15) 28°43′16.80″N, 52°37′34.20″E, 1232 m, 05.vi.2014, river, F. Ghorbanizadeh. (16) 29°0′19.08″N, 53°4′49.86″E, 1395 m, 18.vi.2014, stream, Z. Khazaei. (17) 28°46′27.60″N, 53°24′26.76″E, 1243 m, 18.vi.2014, pond, Z. Khazaei, M. Dashan. (18) 28°59′1.92″N, 53°12′21.36″E, 1378 m, 18.vi.2014, stream, Z. Khazaei, M. Dashan. (19) 30°35′03.5″N, 52°09′49.6″E, 2130 m, 09.vii.2014, pond, Z. Khazaei, H. Darvishnia. (20) 30°09′06.9″N, 52°16′16.3″E, 2333 m, 09.vii.2014, stream, Z. Khazaei, H. Darvishnia. (21) 30°28′19.20″N, 53°10′28.80″E, 2123 m, 09.vii.2014, pond, Z. Khazaei, H. Darvishnia. (22) 30°28′36.42″N, 53°12′43.38″E, 2166 m, 09.vii.2014, stream, Z. Khazaei, H. Darvishnia. (23) 30°17′14.88″N, 53°13′9.18″E, 1941 m, 09.vii.2014, river, Z. Khazaei, H. Darvishnia. (24) 30°12′43.6″N, 52°03′50.9″E, 2204 m, 16.vii.2014, river, Z. Khazaei. (25) 30°15′10.6″N, 52°03′58.8″E, 2340 m, 16.vii.2014, stream, Z. Khazaei. (26) 30°13′39.7″N, 52°00′32.6″E, 2166 m, 16.vii.2014, stream, Z. Khazaei. (27) 30°11′13.9″N, 52°02′20.7″E, 2002 m, 16.vii.2014, stream, Z. Khazaei. (28) 29°49′06.1″N, 52°18′21.3″E, 2090 m, 16.vii.2014, stream, Z. Khazaei, M.S. Tahami. (29) 29°59′54.54″N, 53°01′14.46″E, 1656 m, 21.viii.2014, river, Z. Khazaei, M.S. Tahami. (30) 29°48′12.84″N, 53°28′25.74″E, 1573 m, 21.viii.2014, river, Z. Khazaei, M.S. Tahami. (31) 29°00′46.56″N, 52°33′51.66″E, 1491 m, 22.viii.2014, stream, Z. Khazaei, M.S. Tahami. (32) 28°41′03.78″N, 52°40′53.22″E, 1195 m, 22.viii.2014, stream, Z. Khazaei, M.S. Tahami. (33) 28°43′15.96″N, 52°37′33.78″E, 22.vii.2014, river, Z. Khazaei, M.S. Tahami. (34) 29°04′20.22″N, 52°39′16.62″E, 1771 m, 22.viii.2014, stream, Z. Khazaei, M.S. Tahami. (35) 31°23′27.78″N, 52°25′18.54″E, 2050 m, 01.ix.2014, stream, Z. Khazaei. (36) 30°30′38.04″N, 53°07′49.98″E, 2136 m, 01.ix.2014, river, Z. Khazaei. (37) 30°23′12.78″N, 53°29′16.32″E, 2348 m, 02.ix.2014, stream, Z. Khazaei. (38) 30°26′55.98″N, 53°38′55.92″E, 2183 m, 02.ix.2014, stream, Z. Khazaei. (39) 28°53′42.48″N, 52°22′40.62″E, 1479 m, 24.ix.2014, river, Z. Khazaei. (40) 30°22′46.38″N, 51°47′17.22″E, 2102 m, 25.ix.2014, river, Z. Khazaei. (41) 29°47′39.00″N, 51°34′35.22″E, 875 m, 02.x.2014, river, Z. Khazaei. (42) 29°18′54.90″N, 51°52′04.56″E, 675 m, 02.x.2014, river, Z. Khazaei. (43) 30°19′04.32″N, 52°15′22.14″E, 1610 m, 25.x.2014, river, Z. Khazaei. (44) 28°59′01.98″N, 53°12′18.96″E, 1295 m, 19.iv.2015, stream, Z. Khazaei. (45) 27°43′56.64″N, 53°34′6.66″E, 554 m, 21.iv.2015, pool, Z. Khazaei. (46) 27°45′18.90″N, 53°33′40.20″E, 610 m, 21.iv.2015, stream, Z. Khazaei. (47) 27°25′40.92″N, 53°15′42.84″E, 426 m, 22.iv.2015, Ab-anbar, Z. Khazaei, Soleimanipoor. (48) 27°32′47.22″N, 52°52′48.66″E, 432 m, 23.iv.2015, pond, Z. Khazaei. (49) 27°31′30.66″N, 52°51′51.18″E, 488 m, 23.iv.2015, reservoir, Z. Khazaei. (50) 28°41′31.1″N, 52°27′43″E, 864 m, 25.iv.2015, river, H. Darvishnia. (51) 29°49′01.02″N, 51°38′48.00″E, 862 m, 26.iv.2015, pond, Z. Khazaei. (52) 30°02′43.56″N, 51°33′31.68″E, 945 m, 26.iv.2015, river, Z. Khazaei. (53) 30°05′03.36″N, 51°32′07.26″E, 914 m, 26.iv.2015, stream, Z. Khazaei. (54) 30°19′04.32″N, 52°15′22.14″E, 1610 m, 15.v.2015, A. Khajehpanah, M. Razbanian. (55) 28°47′14.10″N, 54°22′18.42″E, 1152 m, 21.vi.2015, stream, Z. Khazaei. (56) 28°47′48.48″N, 54°18′06.06″E, 1165 m, 21.vi.2015, canal of qanat, Z. Khazaei. (57) Fars, Jahrom, Cimakan, Cimakan Rd. (Ab-garm), 3.iii.2001, K. Elmi.

3 Results

Totally, 455 adult female and male specimens were collected from 57 localities, including three *Gerris* Fabricius, 1794 species and one *Metrocoris* Mayr, 1865 species, which were identified as *G.* (*Gerris*) *argentatus* Schummel, 1832; *G.* (*G.*) *thoracicus* Schummel, 1832; *G.* (*G.*) *costae* (Herrich-Schäffer, 1850); and *M. communis* (Distant, 1910). Two species, *G. lateralis* Schummel, 1832 and *Aquarius paludum paludum* (Fabricius, 1794), were reported by China (1938) and Ostovan and Arefnia (2012), respectively, from the same area, but were not found during our samplings.

Abbreviations: macr.: macropterous, micr.: micropterous, apt,.: apterous.

3.1 *Gerris* (*Gerris*) *argentatus* Schummel, 1832

Material examined (Fig. 1a): (10) 1♀ macr. (17) 1♀ macr. (30) 3♂7♀ micr. (36) 2♂12♀ micr.

Comment. Pale stripe pleurally on pronotum developed both anteriorly and posteriorly interrupted in some specimens and continuous in others. Body length in males 6 and in females 6.5–7.5 mm.

3.2 *Gerris* (*Gerris*) *thoracicus* Schummel, 1832

Material examined (Fig. 1b): (1) 1♂. (3) 1♀. (4) 1♂. (5) 1♀. (6) 1♂1♀. (7) 5♂9♀. (8) 1♀. (9) 1♂1♀. (10) 7♂8♀. (11) 14♂9♀. (12) 2♂4♀. (14) 3♂2♀. (16) 3♂2♀. (19) 2♀. (20) 9♂4♀. (21) 1♂4♀. (27) 1♂1♀. (31) 1♀. (32) 2♂6♀. (33) 1♂2♀. (34) 1♀. (37) 4♀. (39) 1♀. (43) 1♀. (45) 1♂1♀. (46) 1♂2♀. (47) 1♀. (48) 2♀. (51) 7♂4♀. (53) 4♂3♀. (54) 2♂1♀.

Comments Pale sub-marginal stripe interrupted and present on both anterior and posterior lobes; ventral sclerite Y-shaped, but in some material apices of the sclerite overlap each other (Fig. 2a); in some individuals of

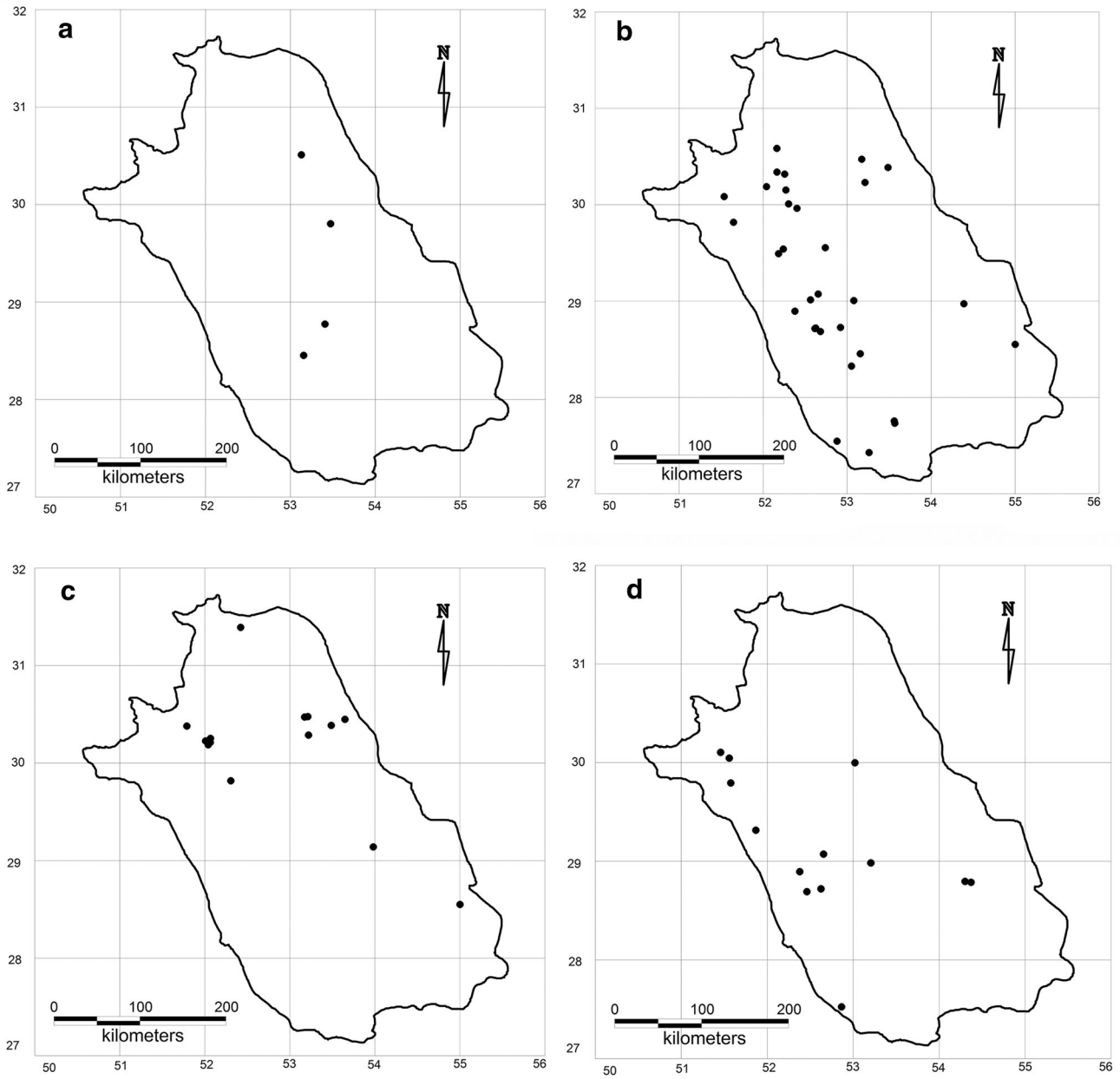

Fig. 1 Localities of collected materials. **a** *Gerris argentatus*, **b** *G. thoracicus*, **c** *G. costae*, **d** *Metrocoris communis* (apt.)

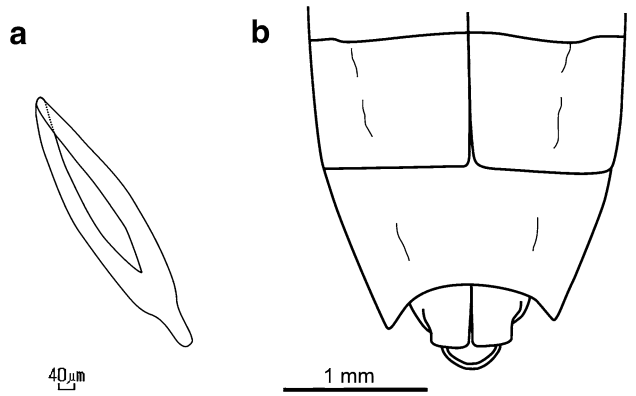

Fig. 2 *Gerris* cf. *thoracicus*, **a** ventral sclerite, dorsal view, **b** pregenital and genital segments, ventral view

different populations, the lateral sides are indented nearly in the middle (Fig. 2b); all samples were macropterous.

As described by Andersen (1993), the eighth segment in female *G. thoracicus* is trapezoid and ventral sclerite in male Y-shaped, but we found some individuals in some populations of the species with different traits. Ventral sclerites were Y-shaped, but the apices overlapped each other (Fig. 2a), and sometimes one beside the other as well. An indentation on lateral margins of gonocoxae, nearly in the middle, was observed in some females (Fig. 2b). Therefore, we called the individuals with the different traits *Gerris* cf. *thoracicus*.

3.3 *Gerris* (*Gerris*) *costae* (Herrich-Schäffer, 1850)

Material examined (Fig. 1c): (6) 1♂. (13) 5♂6♀. (20) 1♂. (21) 3♂2♀. (22) 1♂4♀. (23) 3♂6♀. (24) 5♂10♀. (25) 6♂1♀. (26) 3♂2♀. (27). (28) 2♂4♀. (35) 2♂1♀. (37) 13♂7♀. (38) 7♂1♀. (40) 14♂15♀.

Comment. Pale sub-marginal stripe continuous, sometimes interrupted (Fig. 3); all samples were macropterous.

3.4 *Metrocoris communis* (Distant, 1910)

Material examined (Fig. 1d): (2) 7♂6♀ apt. (14) 5♂7♀ apt. (15) 7♂7♀ apt. 2♀ macr. (18) 10♂6♀ apt. (29) 4♂9♀ apt. (33) 8♂3♀ apt. 2♀ macr. (34) 10♂7♀ apt. (39) 5♂4♀ apt. (41) 1♀ macr. (42) 3♂4♀apt. (44) 10♂6♀ apt. (49) 1♂1♀ apt. (50) 4♂3♀ apt. 2♀ macr. (52) 5♂7♀ apt. (55) 6♂6♀ apt. (56) 1♀ apt. (57) 2♀ apt. 1♂ macr.

Description of macropterous *Metrocoris communis* (Figs. 4, 5)

Material examined: localities 15, 33, 41, 50, 57.

Size (all measurements are based on millimeter): Interocular width 0.52–0.58 (♀), 0.63 (♂); eye width 0.42–0.52 (♀), 0.42 (♂); posterior eye width 0.42–0.47 (♀), 0.53 (♂); head width 1.53–1.68 (♀), 1.68 (♂); body width across

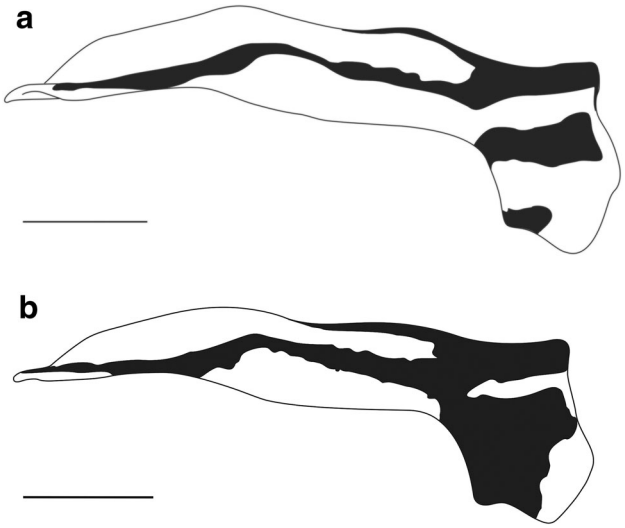

Fig. 3 Lateral view of pronotum in *Gerris costae*. Continuous (**a**) and interrupted (**b**) pale sub-marginal stripe, Scale 1 mm

acetabula 2.89–3.42 (♀), 3.32 (♂); length of hind trochanter 0.53–0.63 (♀), 0.79 (♂); pronotum: median length 3.6–3.8 (♀), 3.58 (♂); humeral width 2.4–2.7 (♀), 2.53 (♂), length of lateral margin 1–1.2 (♀), 1.26 (♂), length of lateral margin from humerus to apex 2.5–3 (♀), 2.74 (♂); width of segment 8 in male 0.79.

The description of macropterous female: Pronotal coloration pattern with a horizontal dark band at the base of pronotum, as long as distance between the eyes, with a pair of short dark stripes on its apices; a median longitudinal dark stripe not reaching distal end of pronotal disc and connecting to the middle of the horizontal band at the base; a pair of sub-lateral dark stripes at either side of median stripe; a pair of dark stripes at the lateral margins of pronotum (Fig. 5a). In some individuals, caudal end of sub-lateral stripes are conjoined to apical end of median stripe (Fig. 5b). Fore femur approximately slender, with a dark narrow mark on the upper surface, a wider dark mark on the external surface, a short mark on internal face of distal half and a dark ring on caudal end, seven visible long hairs at the underside; length of middle and hind femora subequal. The second to seventh abdominal segments ventrally light beige, first tergite brownish, second to sixth terga light beige, a brownish line at the base of second tergite, seventh segment laterally notched, posterior half of segment 7 w-shaped. Seventh sternite more protruding than eighth and ninth segments. A tuft of hairs on the each corner of segment 7, sometimes on the fifth and sixth paraterga and -sternites. Also, eighth tergite light beige and proctiger brownish.

Some characters used for identifying the only macropterous male sample found were: fore femura incrassate, lower surface without indentation or

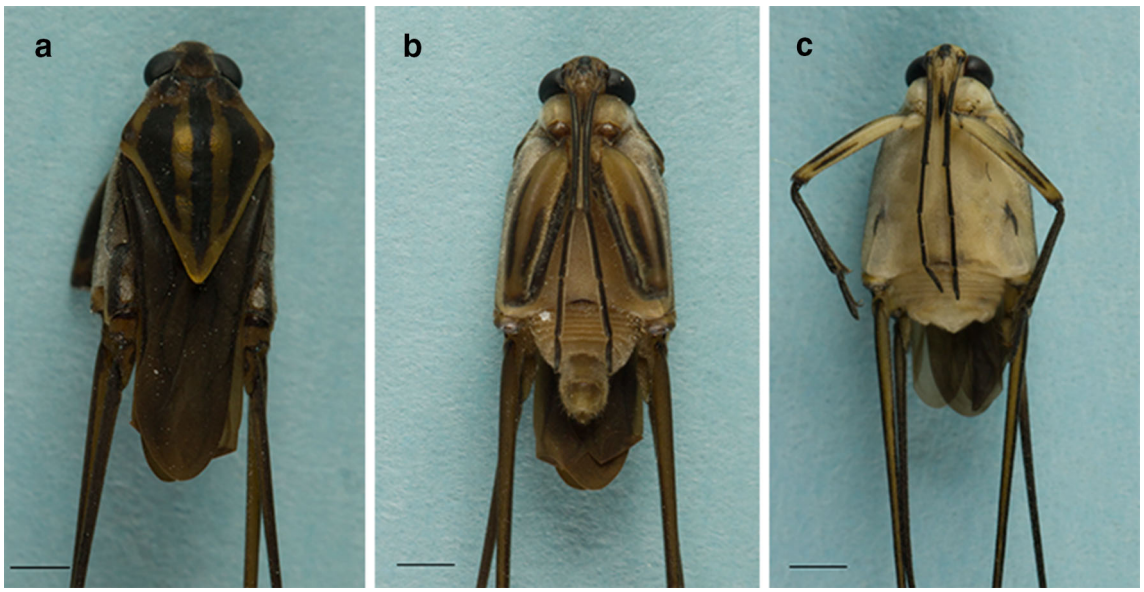

Fig. 4 Macropterous *Metrocoris communis*, male **a** dorsal view, **b** ventral view, **c** female, ventral view, Scale 1 mm

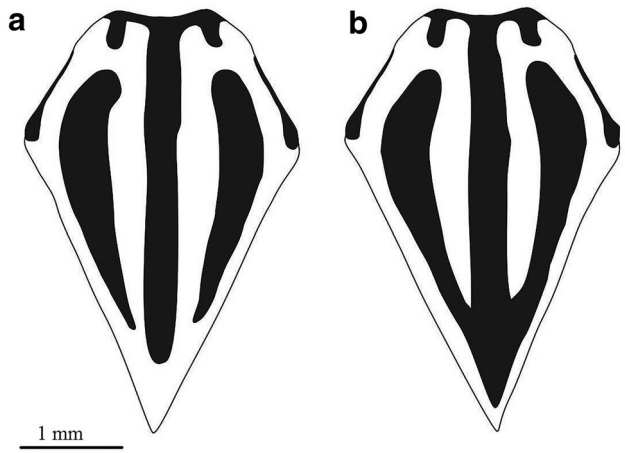

Fig. 5 Coloration pattern of pronotum of macropterous *Metrocoris communis* (female)

constriction and with a small apical tooth (ratio length/width 3.57); fore tibia with a sub-basal tooth-like elevation; the sub-lateral stripes of pronotum do not conjoin to the median stripe, the first of the above-mentioned pronotal coloration patterns (Figs. 4a, 5a); eighth tergite with sub-parallel sides. Since there was only one male sample available, it was not possible to compare some characters such as male endosoma.

Habitat: Long-winged specimens have been collected from the same localities as wingless individuals. The specimens (except in location 57) were found in shallow part of rivers with less than 30 cm depth and slow flowing water. The macropterous male (location 57) was collected from a part of the river with fast water flow.

4 Discussion

In this study, some female *G. thoracicus* had an indention in the lateral margins of the gonocoxae. Overlapping apices of Y-shaped ventral sclerite were observed in some males as well. On the one hand, *G. thoracicus* is a well-known species over its distributional range and distinct traits are not expected. On the other hand, Damgaard (2008) showed that the populations of *G. thoracicus* have low genetic differentiations due to the good flight ability of the most macropterous individuals. Accordingly, it is suggested that the distinct populations must have no morphological differences or low genetic distance. The question, therefore, remains unanswered: Are these differences intra- or inter-population (at the species level) variations? There are two ways to examine the cause(s) of the observed morphological differences. First, future molecular studies may clarify the possible genetic distances of the populations and phylogenetic relationships among these taxa. If considerable genetic distances exist through the examinations, they will lead us toward this hypothesis: besides the morphological differentiations, the populations can be distinct taxa. Second, the possibility that this species might produce more than one generation with morphological differences during the summer must not be ignored. In other words, the observed differences in individuals can be associated with separate non-diapause generations like some other gerrids. Therefore, a comparative study of seasonal sampling of the species in this part of Iran as well as other areas may reveal the reason(s) for some differences of the features among the generations of the species.

In comparison to current descriptions of European water strider populations, some characteristics showed few differences as presented below. Andersen (1996) noted in his identification key that pale sub-marginal stripe is usually only present on the pronotal lobe. Damgaard and Cognato (2005) introduced the interrupted state of this character as a diagnostic characteristic in subgenus *Gerris*. In our three collected species of the subgenus, the sub-marginal stripe was interrupted in *Gerris thoracicus*, while most of the specimens of *G. costae* showed continuous state of the character, except a few specimens which had interrupted form of the stripe. These characteristics were compared with the *G. costae* from Syria and Turkey deposited in Zoologische Staatssammlung Munchen (ZSM), Munich, Germany. Their specimens also had only continuous pale sub-marginal stripes. In addition, *G. argentatus* had both states. Therefore, it could be concluded that the interrupted pale sub-marginal stripe is not a diagnostic character for distinguishing the subgenus and both forms are common in *Gerris* s.str.

The pronotal coloration patterns of long-winged *Metrocoris communis* are different from those reported for other species of *Metrocoris* by Chen and Nieser (1993a). In *M. communis*, the color pattern on abdominal segments in long-winged individuals was different from those in wingless ones. The main characters used for identifying the long-winged individuals, however, were the same as those used for wingless ones. In comparison to *M. commuoides*, the closest species to *M. communis*, the pronotum apex is pointed as in *M. commuoides*, the lateral dark stripe between the anterior angle and humerus is narrower than the one in *M. commuoides*, apices of median stripe and sub-lateral stripes are not conjoined and also conjoint together at the caudal ends, the basic horizontal stripe is just as wide as the distance between the eyes (with two small dark stripes at the ends), while it is wider in other patterns. Consequently, the coloration patterns of pronotum do not add a distinctive feature for identifying the two species. The two species are separated by the shape of parameres and the outer margin of the male fore tibia, as Chen and Nieser (1993b) stated.

This work was not aimed at more studies on the wing pattern of the species or to judge whether the wing pattern of the species was affected by environmental factors such as temperature. Further studies and large volume of environmental information, therefore, are required for that topic.

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