

An annotated catalogue of the Iranian Anthocoridae (Hemiptera: Heteroptera: Cimicomorpha)

Hassan GHAHARI¹⁾, Diego Leonardo CARPINTERO²⁾ and Hadi OSTOVAN³⁾

¹⁾ Department of Agriculture, Islamic Azad University, Shahre Rey Branch, Tehran, Iran;
e-mail: h_ghahhari@yahoo.com

²⁾ División Entomología, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”,
Av. Ángel Gallardo 470 (1405), Ciudad Autónoma de Buenos Aires, Argentina;
e-mail: dcarpint@macn.gov.ar (corresponding author)

³⁾ Department of Entomology, Fars Science and Research Branch, Islamic Azad University, Marvdasht, Iran;
e-mail: ostovan2001@yahoo.com

Abstract. A total of 47 anthocorid species (Heteroptera: Anthocoridae) from 10 genera, including *Amphiareus* Distant, 1904, *Anthocoris* Fallén, 1814, *Buchananiella* Reuter, 1884, *Cardiastethus* Fieber, 1860, *Dufouriellus* Kirkaldy, 1906, *Elatophilus* Reuter, 1884, *Lyctocoris* Hahn, 1836, *Orius* Wolff, 1811, *Temnostethus* Fieber, 1860, and *Xylocoris* Dufour, 1831, are catalogued from Iran. The following five species are new for Iran: *Elatophilus (Euhadrocerus) hebraicus* Péricart, 1967, *Buchananiella continua* (White, 1880), *Cardiastethus fasciiventris* (Garbiglietti, 1869), *Orius (Heterorius) strigicollis* (Poppius, 1915), and *Orius (Dimorphella) tantillus* (Motschulsky, 1863). *Buchananiella pseudococci* (Wagner, 1951), comb. nov., is transferred from the genus *Cardiastethus*.

Keywords. Hemiptera, Heteroptera, Anthocoridae, new combination, faunistics, Iran, Palaearctic Region

Introduction

The minute pirate bugs (Heteroptera: Anthocoridae *sensu lato*) are small in size (1.5–5 mm) and modest in the number of species, with approximately 450 species world-wide (PÉRICART 1972), although SCHUH & SLATER (1995) suggested a slightly lower number (they mentioned 50 Lasiochilidae, nearly 250 Anthocoridae and an unspecified number of Lyctocoridae). The diversity of this family is better known in the Northern Hemisphere than in the Southern Hemisphere. HENRY (1988) listed 23 genera and 89 species for America north of Mexico and HERRING (1976) provided a key for all American genera. CARPINTERO (2002) listed 37 genera

ctive potential. In the latter genus, at least the cosmopolitan species *Lytocoris campestris* (Fabricius, 1794) is known also as a facultative blood sucking ectoparasite on birds, rodents and eventually humans (e.g., ŠTYS & DANIEL 1958).

However, the Anthocoridae are in general important predators of phytophagous mites and mite eggs, insect eggs and various soft-bodied insects. These beneficial insects may be found on a number of important crops including most fruit trees, corn, cotton, soybeans, alfalfa, and grape vine. In orchards they can play a role as predators of the European red mite (*Panonychus ulmi* (C. L. Koch, 1836)), two-spotted mite (*Tetranychus urticae* C. L. Koch, 1836), thrips *Frankliniella occidentalis* Pergande, 1895 and *Thrips tabaci* (Lindemann, 1888), and most aphids. This is particularly significant and economically important to pest managers and integrated control programs. The Anthocoridae feed occasionally on other predators and may also occasionally fall prey to general predators such as spiders and lacewing larvae, but this is a minor problem that does affect their role in pest management programs (e.g., HERRING 1966, 1967; PÉRICART 1971, 1972; RIUDAVETS 1995; SCHUH & SLATER 1995; CARPINTERO 2002).

The Iranian fauna of the Anthocoridae has been little studied. PÉRICART (1996) listed 13 species from Iran. The most important studies on the Iranian Anthocoridae were conducted by OSTOVAN (1998), LINNAVUORI & MODARRES (1998), LINNAVUORI & HOSSEINI (2000), OSTOVAN & NIAKAN (2000), HEISS (2002), GHAHARI et al. (2004), LINNAVUORI (2004a,b), ERFAN & OSTOVAN (2005), OSTOVAN & MIRHELLI (2005), ABD-RABOU & GHAHARI (2006), GHAHARI & OSTOVAN (2006), MIRAB-BALOU et al. (2007, 2008), GHAHARI et al. (2008) and FALAMARZI et al. (2009). This paper provides a catalogue of all anthocorid species known from Iran.

Material and methods

The specimens were collected from various cultivated plants and weeds in different locations of Iran. In addition, all literature data on Iranian Anthocoridae were revised. All specimens were identified by the authors.

To collect and identify specimens of *Orius*, the following technique was used: plants or parts of plants were placed in transparent plastic bags. The predators were collected from these bags and stored in vials containing 70% alcohol. Their identification was based on patterns of the wings, body and male and female genitalia that are the most reliable structures for taxonomic identification (KELTON 1963, HERRING 1966, PÉRICART 1972). In males, entire abdomen was removed, macerated in 10% KOH, and boiled in a water bath for approximately 20 minutes. Afterwards it was transferred to distilled water, the genitalia dissected, placed in clove oil for 15 minutes and subsequently mounted on slides with Hoyers solution and sealed with varnish. Female genitalia were prepared following the methodology given by Luciana Tavella (Università degli Studi di Torino, Italy; pers. comm.), who recommends the genital pore (abdominal sternite VIII) as a reliable structure for female identification. Abdominal sternite VIII can be mounted on a slide and observed with a clearing solution.

The system, nomenclature, synonymy, and distribution follow mainly PÉRICART (1996). Exact references are given for later additions and changes. The distribution in Iran is listed according to provinces (Fig. 1) (HANGAY et al. 2005).

Results

A total of 47 anthocorid species from 10 genera (*Amphiareus* Distant, 1904, *Anthocoris* Fallén, 1814, *Buchananiella* Reuter, 1884, *Cardiastethus* Fieber, 1860, *Dufouriellus* Kirkaldy, 1906, *Elatophilus* Reuter, 1884, *Lyctocoris* Hahn, 1836, *Orius* Wolff, 1811, *Temnostethus* Fieber, 1860, and *Xylocoris* Dufour, 1831) classified in four anthocorine tribes (Anthocorini, Cardiastethini, Oriini, and Xylocorini) and two subfamilies (Anthocorinae and Lyctocorinae) have been recorded in Iran. These include five species new for Iran: *Elatophilus* (*Euhadrocerus*) *hebraicus* Péricart, 1967, *Buchananiella continua* (White, 1880), *Cardiastethus fasciiventris* (Garbiglietti, 1869), *Orius* (*Heterorius*) *strigicollis* (Poppius, 1915), and *Orius* (*Dimorphella*) *tantillus* (Motschulsky, 1863).

Family ANTHOCORIDAE Fieber, 1836

Subfamily Anthocorinae Fieber, 1836

Tribe Anthocorini Fieber, 1836

Genus *Anthocoris* Fallén, 1814

Anthocoris angularis Reuter, 1884

Distribution in Iran. Tehran (GHAHARI et al. 2004).

General distribution. Azerbaijan (doubtful record), Kazakhstan, Kirgizia, Mongolia, Tadjikistan, Uzbekistan (PÉRICART 1996).

Anthocoris butleri Le Quesne, 1954

Distribution in Iran. Mazandaran (ABD-RABOU & GHAHARI 2006).

General distribution. Western and central Europe (PÉRICART 1996).

Anthocoris confusus Reuter, 1884

Distribution in Iran. Golestan (GHAHARI & OSTOVAN 2006), Guilan (LINNAVUORI & HOSSEINI 2000), Hamedan (MIRAB-BALOU et al. 2007, 2008, as *A. confusus* and *A. confuses*, respectively), Mazandaran (ABD-RABOU & GHAHARI 2006).

General distribution. Holarctic (PÉRICART 1996, HENRY 1988).

Anthocoris flavipes Reuter, 1884

Distribution in Iran. Golestan (GHAHARI & OSTOVAN 2006), Kerman (GHAHARI et al. 2004), Mazandaran (GHAHARI et al. 2004, GHAHARI & OSTOVAN 2006).

General distribution. Kazakhstan (Asian part), Armenia (doubtful record), China (Western Plateau), Kirgizia, Tadjikistan, Indian Tibet (PÉRICART 1996).

Anthocoris gallarumulmi (De Geer, 1773)

Distribution in Iran. Golestan (ABD-RABOU & GHAHARI 2006), Khorasan (MODARRES AWAL 1997), Semnan (MODARRES AWAL 1997, ABD-RABOU & GHAHARI 2006).

General distribution. Widely distributed in Europe, Morocco (doubtful record), Turkey, Georgia, Armenia, Azerbaijan (PÉRICART 1996).

Anthocoris guentheri Péricart, 2007

Distribution in Iran. Khorasan (PÉRICART 2007).

General distribution. Endemic to Iran.

Anthocoris limbatus Fieber, 1836

Distribution in Iran. Isfahan (GHAHARI et al. 2004).

General distribution. Widespread in Europe (from Great Britain to Russia) and northern parts of Palaearctic Asia (PÉRICART 1996).

Anthocoris minki minki Dohrn, 1860

Distribution in Iran. Ardabil (MODARRES AWAL 1987), East Azarbaijan (MODARRES AWAL 1997), Fars (OSTOVAN & NIAKAN 2000), Golestan (GHAHARI & OSTOVAN 2006), Mazandaran (ABD-RABOU & GHAHARI 2006, GHAHARI et al. 2008).

General distribution. Widespread in Europe (from Great Britain to Russia), North Africa (Morocco, Tunisia), and Palaearctic Asia (Central Asia, Asian part of Turkey) (PÉRICART 1996).

Anthocoris minki pistaciae Wagner, 1957

Distribution in Iran. Ardabil (LINNAVUORI & HOSSEINI 2000), Fars (FALAMARZI et al. 2009), Kerman (MODARRES AWAL 1997), Khorasan (LINNAVUORI & MODARRES AWAL 1998), Sistan & Baluchestan (MODARRES AWAL 1997).

General distribution. Eastern Europe (Greece, Ukraine, and South European Territory of Russia), North Africa (Algeria, Morocco, Tunisia) and Central Asia (PÉRICART 1996).

Anthocoris nemoralis (Fabricius, 1794)

Distribution in Iran. Ardabil (LINNAVUORI & HOSSEINI 2000), East Azarbaijan (HASSANZADEH et al. 2009a,b), Fars (MODARRES AWAL 1997, OSTOVAN & NIAKAN 2000), Golestan (GHAHARI & OSTOVAN 2006), Guilan (LINNAVUORI & HOSSEINI 2000), Isfahan (MODARRES AWAL 1997), Khorasan (HEISS 2002), Markazi (MODARRES AWAL 1997), Mazandaran (GHAHARI et al. 2008), Tehran (MODARRES AWAL 1997), Zanjan (ABD-RABOU & GHAHARI 2006).

General distribution. Widespread in Europe (from Great Britain to Russia), North Africa (Algeria, Egypt, Libya, Morocco, Tunisia), and Central Asia. Introduced to North America (PÉRICART 1996, HENRY 1988).

Anthocoris nemorum (Linnaeus, 1761)

Distribution in Iran. East Azarbaijan (HASSANZADEH et al. 2009a,b), Fars (MODARRES AWAL 1997, OSTOVAN & NIAKAN 2000), Golestan (GHAHARI & OSTOVAN 2006), Guilan (LINNAVUORI & HOSSEINI 2000, ABD-RABOU & GHAHARI 2006), Hamedan (MODARRES AWAL 1997), Isfahan

(MODARRES AWAL 1997), Markazi (MODARRES AWAL 1997), Kermanshah (MODARRES AWAL 1997), Kordestan (MODARRES AWAL 1997), Mazandaran (GHAHARI et al. 2008), Semnan (MODARRES AWAL 1997), Tehran (MODARRES AWAL 1997), West Azarbaijan (MODARRES AWAL 1997), Yazd (MODARRES AWAL 1997), Zanjan (MODARRES AWAL 1997, ASKARI et al. 2009).

General distribution. Widespread in Europe (from Great Britain to Russia) and Palaeartic Asia (from Iran to China) (PÉRICART 1996).

***Anthocoris pilosus* (Jakovlev, 1877)**

Distribution in Iran. Ardabil (LINNAVUORI & HOSSEINI 2000), Fars (ERFAN & OSTOVAN 2005, FALAMARZI et al. 2009), Guilan (LINNAVUORI & HOSSEINI 2000), Khorasan (LINNAVUORI & MODARRES AWAL 1998), Mazandaran (HEISS 2002), Semnan (JAKOVLEV (1877): Shahrud (holotype, as *Tetraphleps pilosus*); KIRITSHENKO (1949)), Tehran (LINDBERG 1938).

General distribution. Widespread in Europe and Palaeartic Asia (PÉRICART 1996).

***Anthocoris poissoni* Kiritschenko, 1952**

Distribution in Iran. West Azarbaijan (GHAHARI et al. 2004).

General distribution. Kirgizia and Tadzhikistan (PÉRICART 1996).

***Anthocoris simillimus* Poppius, 1909**

Distribution in Iran. Guilan (GHAHARI et al. 2004).

General distribution. Kirgizia and Tadzhikistan (PÉRICART 1996).

***Anthocoris visci* Douglas, 1889**

Distribution in Iran. Kordestan (ABD-RABOU & GHAHARI 2006).

General distribution. Europe and Asian part of Turkey (PÉRICART 1996).

Genus *Dufouriellus* Kirkaldy, 1906

***Dufouriellus ater* (Dufour, 1833)**

Distribution in Iran. Fars (FALAMARZI et al. 2009).

General distribution. Widely distributed in the Palaeartic, Nearctic, and southern Neotropical Regions (HENRY 1988, PÉRICART 1996, CARPINTERO 2002, CAROINTERO & DELLAPÉ 2008).

Comment. The generic placement of *Dufouriellus* was revised recently by CARPINTERO & DELLAPÉ (2008).

Genus *Elatophilus* Reuter, 1884

Subgenus *Elatophilus* Reuter, 1884

***Elatophilus nigricornis* (Zetterstedt, 1838)**

Distribution in Iran. Kordestan (ABD-RABOU & GHAHARI 2006).

General distribution. Widespread in Europe (from Great Britain to Russia), Turkey, Cyprus, and Israel (PÉRICART 1996).

Subgenus *Euhadrocerus* Reuter, 1884

***Elatophilus hebraicus* Péricart, 1967**

Material examined. EAST AZERBAIJAN: Arasbaran, 780 m a.s.l., August 2004, 1 ♂, M. Havaskary leg., D. L. Carpintero det. **New record for Iran.**

General distribution. Cyprus, Israel (PÉRICART 1996).

Genus *Temnostethus* Fieber, 1860

Subgenus *Ectemnus* Fieber, 1860

***Temnostethus reduvinus parilis* (Horváth, 1891)**

Distribution in Iran. Ardabil (LINNAVUORI & HOSSEINI 2001), Khorasan (LINNAVUORI & MODARRES AWAL 1998), Fars (FALAMARZI et al. 2009).

General distribution. Armenia, Azerbaijan, Iran (PÉRICART 1996).

Subgenus *Montandoniella* Puton, 1888

***Temnostethus dacicus* (Puton, 1888)**

Distribution in Iran. Fars (ERFAN & OSTOVAN 2005).

General distribution. Central and eastern Europe, Turkey, Georgia, Armenia, Azerbaijan (PÉRICART 1996).

Subgenus *Temnostethus* Fieber, 1860

***Temnostethus gracilis* Horváth, 1907**

Distribution in Iran. Guilan (LINNAVUORI & HOSSEINI 2000).

General distribution. Eurosiberian, also found in Canada (PÉRICART 1996, HENRY 1988).

***Temnostethus longirostris* (Horváth, 1907)**

Distribution in Iran. Fars (ERFAN & OSTOVAN 2005).

General distribution. Central and eastern Europe, Turkey (PÉRICART 1996).

Tribe Cardiaethini Carayon, 1972

Dufouriellini Van Duzee, 1916: 35 (partim). Type genus: *Dufouriellus* Kirkaldy, 1906.

Cardiaethini Carayon, 1972: 338. Type genus: *Cardiaethus* Fieber, 1860. Synonymized by ŠTYS (1975: 161); restored by CARPINTERO & DELLAPÉ (2008: 506).

Genus *Amphiareus* Distant, 1904

***Amphiareus obscuriceps* (Poppius, 1909)**

Distribution in Iran. Iran (PÉRICART 1996, no exact locality mentioned). Guilan (LINNAVUORI & HOSSEINI 2000).

General distribution. Eastern Asia, Nepal, Kazakhstan, Kirgizia, Iran, Georgia, recently spreading as alien species in Europe and North America (PÉRICART 1996, YAMADA & HIROWATARI 2003, RABITSCH 2008, HENRY et al. 2008).

Genus *Buchananiella* Reuter, 1884

***Buchananiella continua* (White, 1880)**

Material examined. MAZANDARAN: Amol, 198 m a.s.l., October 2003, 2 ♂♂ 3 ♀♀, H. Sakenin leg., D. L. Carpintero det. **New record for Iran.**

General distribution. Mediterranean, tropical Africa, tropical America, and Australia (PÉRICART 1996, CASSIS & GROSS 1995, CARPINTERO 2002).

***Buchananiella pseudococci pseudococci* (Wagner, 1951) comb. nov.**

Distribution in Iran. Bushehr (LINNAVUORI 2004a).

General distribution. Egypt, Iran, India (YAMADA et al. 2008). The subspecies *B. pseudococci occidentalis* Carayon, 1957 is distributed in tropical Africa, Madagascar, and Réunion (PÉRICART 1996).

Comments. This species is transferred to *Buchananiella* because of the shape of male genitalia, which is typical of *Buchananiella* and differs from that of the members of *Cardiastethus* (see PÉRICART 1972).

Genus *Cardiastethus* Fieber, 1860

***Cardiastethus fasciventris* (Garbiglietti, 1869)**

Material examined. MAZANDARAN: Savadkooh, 550 m a.s.l., September 2004, 1 ♂ 2 ♀♀, M. Tabari leg., D. L. Carpintero det. **New record for Iran.**

General distribution. Widespread in Europe and North Africa (PÉRICART 1996).

***Cardiastethus nazarenus* Reuter, 1884**

Distribution in Iran. Guilan (LINNAVUORI & HOSSEINI 2000), Mazandaran (HEISS 2002).

General distribution. Mediterranean (PÉRICART 1996).

Tribe Oriini Carayon, 1958

Genus *Orius* Wolff, 1811

Subgenus *Dimorphella* Reuter, 1884

***Orius agilis* (Flor, 1860)**

Distribution in Iran. Khorasan (GHAHARI et al. 2004).

General distribution. Eurosiberian, reaching from central Europe to Russian Far East and north China (PÉRICART 1996).

***Orius albidipennis* (Reuter, 1884)**

Distribution in Iran. Fars (MODARRES AWAL 1997, OSTOVAN 1998, OSTOVAN & NIAKAN 2000, GANJI 2007, FALAMARZI et al. 2009), Golestan (GHAHARI & OSTOVAN 2006), Guilan (LINNAVUORI & HOSSEINI 2000), Hormozgan (LINNAVUORI 2004a), Isfahan (MODARRES AWAL 1997, GHAHARI & HATAMI 2000), Khorasan (HADDAD SABZEVAR 2007), Khuzestan (AFSHARI et al.

2000), Mazandaran (GHAHARI et al. 2008), Semnan (NIKNAM 2000), Sistan & Baluchestan (ABD-RABOU & GHAHARI 2006).

General distribution. Spain, Africa (southwards to Nigeria), Near East, Arabian Peninsula, Iraq, Iran, Central Asia, and Pakistan (PÉRICART 1996).

Orius tantillus (Motschulsky, 1863)

Material examined. KERMAN: Jiroft, 725 m a.s.l., April 2003, 2 ♂♂, H. Ghahari leg., D. L. Carpintero det. **New record for Iran.**

General distribution. Oriental Region, southern China, Taiwan, Japan, Australia, Micronesia; widely distributed over the Indo-Pacific Region (GHAURI 1972, CASSIS & GROSS 1995, YASUNAGA 1997b, PÉRICART 1996).

Comment. YASUNAGA (1997b) treated *O. tantillus* as a member of *Dimorphella*.

Subgenus *Heterorius* Wagner, 1952

Orius bulgaconus Ghauri, 1972

Distribution in Iran. Fars (OSTOVAN & NIAKAN 2000, OSTOVAN & MIRHELLI 2005), Khorasan (HADDAD SABZEVAR 2007), Mazandaran (GHAHARI et al. 2008), Semnan (NIKNAM 2000).

General distribution. Pakistan (GHAURI 1972), Iran.

Orius horvathi (Reuter, 1884)

Distribution in Iran. Ardabil (LINNAVUORI & HOSSEINI 2000), Chaharmahal & Bakhtiari (ESFANDIARI 2000), Fars (MODARRES AWAL 1997, OSTOVAN & NIAKAN 2000, OSTOVAN & MIRHELLI 2005, GANJI 2007, FALAMARZI et al. 2009), Guilan (LINNAVUORI & HOSSEINI 2000), Kerman (MODARRES AWAL 1997), Khorasan (LINNAVUORI & MODARRES AWAL 1998, HADDAD SABZEVAR 2007), Kuhkolyeh & Boyerahmad (ABD-RABOU & GHAHARI 2006), Mazandaran (GHAHARI et al. 2008), Semnan (NIKNAM 2000).

General distribution. Widespread in Europe (from France to Russia), Morocco, and Palearctic Asia (from Turkey to China) (PÉRICART 1996).

Orius laticollis discolor (Reuter, 1884)

Distribution in Iran. Fars (FALAMARZI et al. 2009), Guilan (LINNAVUORI & HOSSEINI 2000), Khorasan (LINNAVUORI & MODARRES AWAL 1998), Tehran (BABMORAD et al. 2000).

General distribution. Spain, Romania, eastern Europe, north-west Africa, Israel, Armenia, Azerbaijan, Central Asia (PÉRICART 1996).

Orius majusculus (Reuter, 1879)

Distribution in Iran. Guilan (LINNAVUORI & HOSSEINI 2000), Kermanshah (ABD-RABOU & GHAHARI 2006).

General distribution. Palearctic Region, recently introduced to Canada (PÉRICART 1996, HENRY 2008).

***Orius minutus* (Linnaeus, 1758)**

Distribution in Iran. Fars (MODARRES AWAL 1997, OSTOVAN 1998, OSTOVAN & NIAKAN 2000, OSTOVAN & MIRHELLI 2005), Guilan (LINNAVUORI & HOSSEINI 2000), Hamedan (MODARRES AWAL 1997; MIRAB-BALOU et al. 2007, 2008), Isfahan (MODARRES AWAL 1997, ABD-RABOU & GHAHARI 2006), Kermanshah (MODARRES AWAL 1997), Khorasan (SHOJAI et al. 1996, MODARRES AWAL 1997), Kordestan (MODARRES AWAL 1997), Markazi (MODARRES AWAL 1997), Mazandaran (GHAHARI & OSTOVAN 2006), Semnan (MODARRES AWAL 1997, NIKNAM 2000), Tehran (MODARRES AWAL 1997), West Azarbaijan (MODARRES AWAL 1997).

General distribution. Widespread in Europe and Palaearctic Asia, introduced to North America (PÉRICART 1996, HENRY 1988).

***Orius strigicollis* (Poppius, 1915)**

Material examined. EAST AZARBAIJAN: Arasbaran, 790 m a.s.l., August 2004, 1 ♂, M. Havaskary leg., D. L. Carpintero det. **New record for Iran.**

General distribution. Southern China, Taiwan, Japan (PÉRICART 1996, YASUNAGA 1997a).

Comments. PÉRICART (1996) did not attribute this species to one of the subgenera. YASUNAGA (1997a) accommodated *O. strigicollis* in the subgenus *Heterorius*.

***Orius vicinus* (Ribaut, 1923)**

Distribution in Iran. Fars (ERFAN & OSTOVAN 2005, FALAMARZI et al. 2009), Guilan (LINNAVUORI & HOSSEINI 2000), Isfahan (ABD-RABOU & GHAHARI 2006), Khorasan (LINNAVUORI & MODARRES AWAL 1998; HADDAD SABZEVAR 2007), Mazandaran (GHAHARI et al. 2008), Tehran (ESFANDIARI 2000).

General distribution. Widespread in Europe (from France to Russia) and Palaearctic Asia (from Turkey to north China) (PÉRICART 1996).

Subgenus *Orius* Wolff, 1811

***Orius laevigatus laevigatus* (Fieber, 1860)**

Distribution in Iran. Fars (OSTOVAN & NIAKAN 2000, OSTOVAN & MIRHELLI 2005, FALAMARZI et al. 2009), Khorasan (LINNAVUORI & MODARRES AWAL 1998).

General distribution. Europe, western Asia to Pakistan (PÉRICART 1996).

***Orius niger* (Wolff, 1811)**

Distribution in Iran. Ardabil (LINNAVUORI & HOSSEINI 2000), East Azarbaijan (MODARRES AWAL 1987, 1997; SADEGHI et al. 2009), Fars (OSTOVAN 1998, OSTOVAN & NIAKAN 2000, GANJI 2007, FALAMARZI et al. 2009), Guilan (LINNAVUORI & HOSSEINI 2000), Hamedan (EGHBALIAN et al. 2008), Isfahan (MODARRES AWAL 1987, 1997), Kerman (KIRITSHENKO 1966, as *O. niger* var. *ullrichi*), Khorasan (LINNAVUORI & MODARRES AWAL 1998, HADDAD SABZEVAR 2007), Mazandaran (GHAHARI et al. 2008), Semnan (NIKNAM 2000, ABD-RABOU & GHAHARI 2006), West Azarbaijan (MODARRES AWAL 1987, 1997).

General distribution. Widespread in Europe (from Great Britain to Russia), North Africa (Algeria, Egypt, Libya, Morocco, Tunisia), and Palaearctic Asia (from Turkey to India and China) (PÉRICART 1996).

***Orius pallidicornis* (Reuter, 1884)**

Distribution in Iran. Fars (OSTOVAN 1998, OSTOVAN & MIRHELLI 2005, GANJI 2007), Golestan (GHAHARI & OSTOVAN 2006), Mazandaran (GHAHARI & OSTOVAN 2006), Semnan (ABD-RABOU & GHAHARI 2006).

General distribution. South Europe (Spain, France, Italy, Croatia, Greece), North Africa (Madeira, Morocco, Tunisia, Libya), and Near East (Israel, Iraq, Turkey) (PÉRICART 1996).

***Orius perpunctatus* (Reuter, 1884)**

Distribution in Iran. Fars (ERFAN & OSTOVAN 2005).

General distribution. Widespread in Neotropics (CARPINTERO 2002).

Tribe Xylocorini Carayon, 1972

Genus *Xylocoris* Dufour, 1831

Subgenus *Arrostelus* Kirkaldy, 1906

***Xylocoris flavipes* (Reuter, 1875)**

Distribution in Iran. Hormozgan (LINNAVUORI 2004b), Khuzestan (MOHAGERY et al. 1998).

General distribution. Cosmotropical, predator of common pests of stored grain, occasionally introduced to storages in Europe (PÉRICART 1996, HENRY 1988, CASSIS & GROSS 1995, CARPINTERO 2002).

Subgenus *Proxylocoris* Carayon, 1972

***Xylocoris confusus* Carayon, 1972**

Distribution in Iran. Bushehr (LINNAVUORI 2004a).

General distribution. North Africa (extending to the Sudanese subregion of Africa), Saudi Arabia, Yemen, and Kuwait (GHAURI 1985, PÉRICART 1996).

***Xylocoris galactinus* (Fieber, 1836)**

Distribution in Iran. Guilan (LINNAVUORI & HOSSEINI 2000).

General distribution. Holarctic (PÉRICART 1996, HENRY 1988).

Subgenus *Xylocoris* Dufour, 1831

***Xylocoris cursitans* (Fallén, 1807)**

Distribution in Iran. Iran (PÉRICART 1996; no exact locality mentioned).

General distribution. Holarctic (PÉRICART 1996, HENRY 1988).

***Xylocoris obliquus* A. Costa, 1853**

Distribution in Iran. 'S Persia' [= southern Iran] (REUTER 1884); Kerman (SEIDENSTÜCKER 1958, as *X. obliquus orientalis*).

General distribution. Mediterranean and Eastern Europe, North Africa, Near East, Transcaucasia, and Central Asia (PÉRICART 1996).

Subfamily Lyctocorinae Reuter, 1884

Tribe Lyctocorini Reuter, 1884

Genus *Lyctocoris* Hahn, 1836

Subgenus *Lyctocoris* Hahn, 1836

***Lyctocoris campestris* (Fabricius, 1794)**

Distribution in Iran. Khuzestan (MODARRES AWAL 1997), Tehran (LINDBERG 1938).

General distribution. Cosmopolitan. Introduced to the Nearctic, Neotropical, Afrotropical, Oriental, Australian, and Pacific Region (PÉRICART 1996, HENRY 1988, CASSIS & GROSS 1995, CARPINTERO 2002).

Discussion

The results of this study indicate that the fauna of Anthocoridae in Iran is diverse. Iran is a large country with complex geography (Fig. 1) and varying climate and we expect that additional species remain to be discovered during future studies of this important insect group in Iran.

During the last 25 years, various studies were devoted to clarify the taxonomy of Anthocoridae *sensu lato* (see SCHUH & SLATER 1995). As a result the family has been divided into three families: Anthocoridae, Lasiochilidae and Lyctocoridae. Although we agree with the methodology used in the papers, we do not agree with the list of characters used included in the analysis and with polarization of some states. During the last 10 years, one of us discovered a series of new characters useful to clarify the phylogenetic position of some doubtfully placed taxa (CARPINTERO & DELLAPÉ 2006, 2008). For these reasons, we follow the traditional concept of a single family Anthocoridae *sensu lato* divided into three subfamilies. We believe that a new phylogenetic analysis using a more complete list of characters will bring more light to the relationships among members of this controversial group in the future.

Acknowledgements

The authors are indebted to Petr Kment (National Museum, Praha, Czech Republic) for editing the manuscript and help with literature on Heteroptera. We also thank the late Izyaslav M. Kerzhner (Russian Academy of Sciences, St. Petersburg, Russia), David R. Horton (USDA-ARS, USA), Kazutaka Yamada (Tokushima Prefectural Museum, Japan), Pierre Moulet (Museum Requien, Avignon, France) and Rauno Linnavuori (Raisio, Finland) for invaluable helps in progress of the project. We are indebted to H. Sakenin (Ghaemshahr Islamic Azad University, Iran), M. Tabari (Iran Rice Research Institute, Mazandaran, Iran) and M. Havaskary (Tehran Science & Research Branch, Iran) for the loan of many interesting specimens. The research was supported by Shahre Rey Islamic Azad University and Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET.

References

- ABD-RABOU S. & GHAHARI H. 2006: Predators of whiteflies (Homoptera: Aleyrodidae) in Iran. *Trends in Entomology* **5**: 41–46.
- AFSHARI A., MOSSADEGH M. S. & KAMALI K. 2000: Spider mites, predators and their average feeding on *Tetranychus turkestanii* U. & N. in Khuzestan province. P. 320. In: *Proceedings of 14th Iranian Plant Protection Congress, Tehran University, 5–8 September*. Tehran.
- ASKARI O., POURABAD R. F. & KHAGANINIA S. 2009: Faunistic study of Heteroptera of Zanjanround region in Zanjan Province of Iran. *Munis Entomology & Zoology* **4**: 560–563.
- BABMORAD M., BAGHERI-ZENOUS E. & YARMAND H. 2000: Identification of predaceous insects of *Monostera unicostata* in Karaj. P. 290. In: *Proceeding of 14th Iranian Plant Protection Congress*. Tehran.
- BACHELER J. S. & BARANOWSKI R. M. 1975: Paratriphelps laeviusculus, a phytophagous anthocorid new to the United States (Hemiptera: Anthocoridae). *Florida Entomologist* **58**: 157–163.
- BU W.-J. & ZHENG L.-Y. 2001: *Hemiptera. Lasiochilidae, Lyctocoridae, Anthocoridae. Fauna Sinica. Insecta. Vol. 24*. Science Press, Beijing, 267 pp (in Chinese, English summary).
- CARAYON J. 1961: Quelques remarques sur les Hemipteres-Heteropteres: leur importance comme insectes auxiliaires et les possibilites de leur utilisation dans la lutte biologique. *Entomophaga* **6**: 133–144.
- CARAYON J. 1972: Caractères systématiques et classification des Anthocoridae (Hemipt.). *Annales de la Société Entomologique de France (N.S.)* **8**: 309–349.
- CARPINTERO D. L. 2002: Catalogue of the Neotropical Anthocoridae (Heteroptera). *Revista de la Sociedad Entomológica Argentina* **61**: 25–44.
- CARPINTERO D. L. & DELLAPÉ P. M. 2006: Pehuencoris: new genus of Cardiaesthethini (Heteroptera: Anthocoridae) from southern Argentina and Chile (Patagonia). *Zoological Science* **23**: 1039–1042.
- CARPINTERO D. L. & DELLAPÉ P. M. 2008: Rajburicoris, a new genus of Cardiaesthethini, and discussion of the systematic position of Dufouriellus (Hemiptera: Heteroptera: Anthocoridae). *Acta Entomologica Musei Nationalis Pragae* **48**: 503–509.
- CASSIS G. & GROSS G. F. 1995: Hemiptera: Heteroptera (Coleorrhyncha to Cimicomorpha). In: HOUSTON W. W. K. & MAYNARD G. W. (eds.): *Zoological Catalogue of Australia. Vol. 27.3A*. CSIRO, Melbourne, xv + 506 pp.
- EGHBALIAN A. H., KHANJANI M. & POURMIRZA A. A. 2008: Study on natural enemies of brown mite, *Bryobia rubriculcus* Scheuten (Acari: Tetranychidae) in plum and cherry orchards in Hamedan province. P. 37. In: *Proceedings of 18th Iranian Plant Protection Congress*.
- EMAMI M. S. 2006: Biology of *Anthocoris nemoralis* Fab. (Het.: Anthocoridae), a predatory of *Psylla pyricola*. P. 248. In: *Proceedings of 17th Iranian Plant Protection Congress, 2–5 September*. Tehran University.
- ERFAN D. & OSTOVAN H. 2005: Species diversity of flower bugs (Family: Anthocoridae) in Shiraz region. *Journal of Agricultural Sciences* **11**: 81–95 (in Persian, English summary).
- ESFANDIARI H. 2000: *Investigation on the natural enemies and biology of Sphaerolectanium prunastri Fonsc. on almonds in Shahrekord*. M.Sc. thesis of Tehran Islamic Azad University, Science & Research Branch, 80 pp. [p. 55] (unpublished).
- FALAMARZI Sh., ASADI Gh. & HOSSEINI R. 2009: Species inventory, preys and host plants of Anthocoridae sensu lato (Hemiptera: Heteroptera) in Shiraz and its environs (Ira, Fars Province). *Acta Entomologica Musei Nationalis Pragae* **49**: 33–42.
- GANJI F. 2007: *Species diversity of the flower bug genus Orius in North of Fars province and biology of O. niger aegyptiacus Wagner*. M.Sc. thesis of Islamic Azad University, Tehran Science & Research Branch, 82 pp. (unpublished).
- GHAHARI H., CHÉROT F., OSTOVAN H. & SAKENIN H. 2008: Heteroptera from rice fields and surrounding grasslands of northern Iran (Insecta), with special emphasis on predator species. *Journal of the Entomological Research Society* **10**: 13–25.
- GHAHARI H. & HATAMI B. 2000: Study on natural enemies of whiteflies (Homoptera: Aleyrodidae) in Isfahan province. *Journal of the Entomological Society of Iran* **20**: 1–24.
- GHAHARI H., KERZKNER I. M. [sic!], SAKENIN H., HUANG J. 2004: Report of eight predator bug species (Insecta: Heteroptera) for Iran. P. 150. In: *Proceedings of 16th Iranian Plant Protection Congress, 28 Aug. – 1 Sept*. Tabriz University.
- GHAHARI H. & OSTOVAN H. 2006: Predator arthropods fauna of whiteflies (Homoptera: Aleyrodidae) in Mazan-

- daran and Golestan Provinces and their feeding efficiency. *Journal of Agriculture and Natural Resources Science* **12**: 171–180 (in Persian with English summary).
- GHAURI M. S. K. 1972: The identity of *Orius tantillus* (Motschulsky) and notes on Oriental Anthocoridae (Hemiptera, Heteroptera). *Journal of Natural History* **6**: 409–421.
- GHAURI M. S. K. 1985: New Anthocoridae from Kuwait and Ethiopia (Heteroptera). *Reichenbachia* **23**: 81–86.
- HADDAD SABZEVAR E. 2007: *Biodiversity of Anthocoridae (Heteroptera) in environs of Sabzevar*. M.Sc. thesis of Entomology, Islamic Azad University, Arak Science & Research Branch, 56 pp. (unpublished).
- HANGAY G., NADAI L. & SZEKELY K. 2005: Report on Hungarian entomological expeditions to Iran. *Folia Historico Naturalia Musei Matraensis* **29**: 7–18.
- HASSANZADEH M., POURABAD R. F. & SHAYESTEH N. 2009a: An investigation on some Heteroptera in Marand region (Iran). *Munis Entomology & Zoology* **4**: 19–24.
- HASSANZADEH M., POURABAD R. F., GHARAAT M. A. & BEYKPOR A. R. 2009b: A study on the Heteroptera fauna of Shend Abad region and environ (Iran). *Munis Entomology & Zoology* **4**: 527–530.
- HEISS E. 2002: Beitrag zur Kenntnis der Wanzenfauna (Heteroptera) Irans, I. Pp. 87–97. In: GUTLEB B. & WIESER Ch. (eds): *Ergebnisse einer Zoologischen Exkursion in den Nordiran, 2001*. Arthropoda (Lepidoptera, Trichoptera, Neuroptera, Heteroptera, Coleoptera, Opiliones, Araneae, Decapoda) und Vertebrata (Amphibia, Reptilia, Aves, Mammalia). *Carinthia II* **192/112** (2001): 33–140.
- HENRY T. J. 1988: Family Anthocoridae. Pp. 12–28. In: HENRY T. J. & FROESCHNER R. C. (eds.): *Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States*. E. J. Brill, Leiden – New York – København – Köln, xix + 958 pp.
- HENRY T. J. 2008: First North American records for the Palaearctic *Orius majusculus* (Reuter) (Hemiptera: Heteroptera: Anthocoridae). *Proceedings of the Entomological Society of Washington* **110**: 953–959.
- HENRY T. J., WHEELER A. G. Jr. & STEINER W. E. Jr. 2008: First North American records of *Amphiareus obscuriceps* (Poppius) (Hemiptera: Heteroptera: Anthocoridae), with a discussion of dead-leaf microhabitats. *Proceedings of the Entomological Society of Washington* **110**: 402–416.
- HERRING J. L. 1966: The genus *Orius* of the Western Hemisphere (Hemiptera: Anthocoridae). *Annals of the Entomological Society of America* **59**: 1093–1109.
- HERRING J. L. 1967: Heteroptera: Anthocoridae. *Insects of Micronesia* **7**: 392–414.
- HERRING J. L. 1976: Keys to genera of Anthocoridae of America North of Mexico, with description of a new genus (Hemiptera: Heteroptera). *Florida Entomologist* **59**: 143–150.
- JAKOVLEV V. E. 1877: Poluzhestkokrylya (Hemiptera Heteroptera) severnoy Persii. [True bugs (Hemiptera Heteroptera) of northern Iran]. *Trudy Russkago Entomologicheskago Obshchestva* **10**: 67–98 (in Russian).
- KELTON L. A. 1963: Synopsis of the genus *Orius* Wolff in America north of Mexico (Heteroptera: Anthocoridae). *Canadian Entomologist* **95**: 631–636.
- KIRITSHENKO A. N. 1949: Nastoyashchie poluzhestkokrylye (Hemiptera-Heteroptera) sobranye akad. E. N. Pavlovskim v 1942 g. v Irane. [True bugs (Hemiptera-Heteroptera) collected by academician E. N. Pavlovsky in Iran in 1942]. *Trudy Zoologicheskogo Instituta Akademii Nauk SSSR* **8**: 879–887 (in Russian).
- KIRITSHENKO A. N. 1966: Nastoyashchie poluzhestkokrylye (Hemiptera – Heteroptera), sobranye D. M. Shteynbergom v 1955 g. v Irane. (Hemiptera-Heteroptera collected by D. M. Steinberg in Iran in 1955). *Entomologicheskoe Obozrenie* **65**: 798–805 (in Russian, English title).
- LINDBERG H. 1938: Einige Heteropterenfunde aus Nord-Persien. Beschreibung einer neuen Art, *Eurydema persicum*. *Notulae Entomologicae* **18**: 88–91.
- LINNAVUORI R. E. 2004a: Heteroptera of the Hormozgan province in Iran. II. Nepomorpha, Gerromorpha, Leptopodomorpha, Cimicomorpha (Nabidae, Anthocoridae, Miridae). *Acta Universitatis Carolinae Biologica* **48**: 85–98.
- LINNAVUORI R. E. 2004b: Heteroptera of the Hormozgan province in Iran. III. Cimicomorpha (Anthocoridae, Cantacaderidae, Tingidae), Pentatomomorpha. *Acta Universitatis Carolinae Biologica* **48**: 273–286.
- LINNAVUORI R. E. & MODARRES AWAL M. 1998: Studies on the Heteroptera of the Khorasan province in N.E. Iran. I. Nepomorpha, Gerromorpha, Leptopodomorpha, Cimicomorpha (Nabidae and Anthocoridae), and Pentatomomorpha (Coreoidea). *Entomologica Fennica* **9**: 237–241.

- LINNAVUORI R. E. & HOSSEINI R. 2000: *Heteroptera of Guilan with remarks on species of the adjacent areas. Part 1*. Guilan University Publication, Rasht, 94 pp.
- MIRAB-BALOU M., KHANJANI M. & ZOLFAGHARI M. 2007: The preliminary study of true bugs (Hemiptera: Heteroptera) fauna in the alfalfa field of Hamedan province (Western Iran). *Pakistan Entomologist* **29**: 5–8.
- MIRAB-BALOU M., RASOULIAN Gh. R., KHANJANI M. & SABAH Q. 2008: Study on taxonomy of phytophagous bugs of the family Miridae and introducing insects natural enemies of the alfalfa tarnished plant bug in Hamedan alfalfa farms (West of Iran). *Pakistan Entomologist* **30**: 55–60.
- MODARRES AWAL M. 1987: Collecting and determining of the fauna of Heteroptera in Ardabil area and Research Station of University of Tabriz in Moghan. *Journal of the Entomological Society of Iran* **9**: 15–28.
- MODARRES AWAL M. 1997: Anthocoridae (Heteroptera). Pp. 69–70. In: *List of agricultural pests and their natural enemies in Iran*. Ferdowsi University Press, 429 pp.
- MOHAJERY A., FATHIZADEH A. & TABIBNEJAD A. 1998: Useful and destructive insects associated with date-palms and dates at Khuzestan province. P. 166. In: *Proceeding of 13th Iranian Plant Protection Congress, September 1998*.
- NIKNAM M. 2000: *Identification of Orius spp. (Heteroptera: Anthocoridae) and biology of dominant species in Semnan province*. M.Sc. thesis of Entomology, Islamic Azad University, Tehran Science & Research Branch, 86 pp. (unpublished).
- OSTOVAN H. 1998: Some species of the flower bug genus Orius Wolff (Hemiptera: Anthocoridae) from Iran. *Journal of the Agricultural Sciences* **4**: 5–10 (in Persian with English summary).
- OSTOVAN H. & NIAKAN J. 2000: Some bugs of the subfamily Anthocorinae (Hemiptera: Anthocoridae) collected in Fars province, Iran. *Journal of the Agricultural Sciences* **5**: 5–14 (in Persian with English summary).
- OSTOVAN H. & MIRHELLIA. 2005: Flower bugs of the genus Orius Wolff (Heteroptera: Anthocoridae) from Iran and feeding rate of predatory bug Orius albidipennis (Reuter) under laboratory condition. *IOBC/wpr Bulletin* **28(1)**: 195–196.
- PÉRICART J. 1971: Observations diverses et nouvelles synonymies concernant les Anthocoridae et Microphysidae paléarctiques. *Bulletin de la Société Linnéenne de Lyon* **40**: 93–114.
- PÉRICART J. 1972: *Hémiptères Anthocoridae, Cimicidae, Microphysidae de l'Ouest-Paléarctique. Faune de l'Europe et du bassin Méditerranéen. Vol. 7*. Fédération Française des Sociétés de Sciences Naturelles, Paris, 402 pp.
- PÉRICART J. 1996: Family Anthocoridae Fieber, 1836 – flower bugs, minute pirate bugs. Pp. 108–140. In: AUKEMA B. & RIEGER Ch. (eds.): *Catalogue of the Heteroptera of the Palaearctic Region. Vol. 2. Cimicomorpha I*. The Netherlands Entomological Society, Amsterdam, xiv + 361 pp.
- PÉRICART J. 2007: A new species of Anthocoris from Iran: Anthocoris guentheri n. sp. (Heteroptera: Anthocoridae). Pp. 109–111. In: RENKER C. (ed.): *Festschrift zum 70. Geburtstag von Hannes Günther. Mainzer Naturwissenschaftliche Archiv, Beiheft* **31**: 1–339.
- RABITSCH W. 2008: Alien true bugs of Europe (Insecta: Hemiptera: Heteroptera). *Zootaxa* **1827**: 1–44.
- REUTER O. M. 1884: Monographia Anthocoridarum orbis terrestris. *Acta Societatis Scientiarum Fennicae* **14**: 555–758.
- RIUDAUVETS J. 1995: Predator of Frankliniella occidentalis (Perg.) and Thrips tabaci Lind.: a review. *Wageningen Agricultural University Papers* **95**: 43–87.
- SADEGHI R., POURABAD R. F., KAZEMI M. H. & HASSANZADEH M. 2009: Introduction of some Heteroptera of Qurigol (Iran). *Munis Entomology & Zoology* **4**: 498–500.
- SLAS-AGUILAR J. & EHLER L. E. 1977: Feeding habits of Orius tricolor. *Annals of the Entomological Society of America* **70**: 60–62.
- SCHUH R. T. 1986: The influence of cladistics on heteropteran classification. *Annual Review of Entomology* **31**: 67–93.
- SCHUH R. T. & SLATER J. A. 1995: *True bugs of the World (Hemiptera: Heteroptera). Classification and Natural History*. Cornell University Press, Ithaca, 337 pp.
- SCHUH R. T., WEIRAUCH Ch. & WHEELER W. C. 2009: Phylogenetic relationships within the Cimicomorpha (Hemiptera: Heteroptera): a total-evidence analysis. *Systematic Entomology* **34**: 15–48.
- SEIDENSTÜCKER G. 1958: Heteropteren aus Iran 1956, I. Hemiptera – Heteroptera (ohne Familie Miridae). *Stuttgarter Beiträge zur Naturkunde* **11**: 1–5.

- SHOJAI M., OSTOVAN H., KHODAMAN A., HOSSEINI M. & DANIALI M. 1996: The occurrence of *Orius minutus* (L.) in apple orchards Mashhad. *Journal of the Agricultural Sciences* **2**: 5–20 (in Persian with English summary).
- ŠTYS P. 1975: Suprageneric nomenclature of Anthocoridae (Heteroptera). *Acta Universitatis Carolinae Biologica* **1973**: 159–162.
- ŠTYS P. & DANIEL M. 1958: *Lycotocoris campestris* (F.) (Heteroptera, Anthocoridae) jako fakultativní ektoparazit člověka. (*Lycotocoris campestris* (F.) (Heteroptera, Anthocoridae) as human facultative ectoparasite). *Časopis Československé Společnosti Entomologické* **54**: 88–97 (in Czech, English and Russian summaries).
- VAN DUZEE E. P. 1916: *Check list of the Hemiptera (excepting the Aphididae, Aleurodidae and Coccidae) of America North of Mexico*. New York Entomological Society, New York, i–xi + 1–111 pp.
- WAGNER E. 1951: Neue Wanzenarten aus Aegypten (Hemiptera-Heteroptera). *Bulletin de la Société Fouad Ier d'Entomologie* **1973**: 141–144.
- WAGNER E. 1968: Contribution a la faune de l'Iran. 7. Hémiptères Hétéroptères (pro parte). *Annales de la Société Entomologique de France (N. S.)* **4**: 437–453.
- YAMADA K., BINDU K. & NASSER M. 2008: Taxonomic and biological notes on *Cardiastethus affinis* and *C. pseudococci pseudococci* (Hemiptera: Heteroptera: Anthocoridae) in India. *Zootaxa* **1910**: 59–68.
- YAMADA K. & HIROWATARI T. 2003: Japanese species of the genus *Amphiareus* Distant (Heteroptera: Anthocoridae), with descriptions of two new species. *Entomological Science* **6**: 289–300.
- YASUNAGA T. 1997a: The flower bug genus *Orius* Wolff (Heteroptera: Anthocoridae) from Japan and Taiwan, Part II. *Applied Entomology and Zoology* **32**: 379–386.
- YASUNAGA T. 1997b: The flower bug genus *Orius* Wolff (Heteroptera: Anthocoridae) from Japan and Taiwan, Part III. *Applied Entomology and Zoology* **32**: 387–394.