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Nomenclatural changes in the higher classification of the family Tettigometridae (Hemiptera: Fulgoroidea) with description of a new tribe and new species and a review of the Iranian tettigometrid fauna

FARIBA MOZAFFARIAN¹, THIERRY BOURGOIN² & MICHAEL R. WILSON³

¹Insect Taxonomy Research Department, Iranian Research Institute of Plant Protection, Agricultural Research, Education and Extension Organization, P.O. Box 1454, 19395 Tehran, Iran. E-mail: mozaffarian@iripp.ir, faribamozaffarian@gmail.com

²Institut de Systématique, Évolution, Biodiversité, ISYEB-UMR 7205 MNHN-CNRS-UPMC-EPHE, Muséum national d'Histoire naturelle, Sorbonne Universités, 57 rue Cuvier, CP 50, F-75005 Paris, France. E-mail: thierry.bourgoin@mnhn.fr

³Department of Natural Sciences, Natural Museum of Wales, Cardiff, CF10 3NP, UK. E-mail: mike.wilson@museumwales.ac.uk

Abstract

The first part of this paper provides a historical review of the classification of the family Tettigometridae, including the description of a new tribe, *Plesiometrini* trib. nov. to accommodate three Afrotropical genera of the subfamily Tettigometrinae. The name *Nototettigometra* Muir 1924, is proposed to replace *Hilda* Kirkaldy 1900, homonym of *Hilda* Höernes & Auinger 1884, and corresponding new combinations are given, including *Nototettigometrinae* nom. subst. to replace *Hildinae* Fennah 1952. An identification key to suprageneric taxa of Tettigometridae including both male and female characters is provided. In the second part, 18 tettigometrid species are recorded from Iran. A new species, *Tettigometra* (*Tettigometra*) *parihana* sp. nov. is described. *Tettigometra* (*Metroplaca*) *longicornis* and *Tettigometra* (*Tettigometra*) *impressifrons* are reported as new records for the Iranian fauna. An identification key and distribution maps are provided for the Iran fauna.

Key words: Nototettigometrinae, *Plesiometrini*, *Nototettigometra*, *Tettigometra parihana* sp. nov., Iran, altitudinal distribution

Introduction

The family Tettigometridae is a small group within the Fulgoroidea, with fewer than 100 species, and representing less than 0.7% of the known planthopper taxonomic diversity (Bourgoin 2017). However, the taxon is widely distributed in Afrotropical, Palaearctic and Asian regions (Bourgoin 2017), but it remains absent from the Nearctics (Bourgoin 1988a, 1989). Species identification is difficult due to slight interspecific and wide intraspecific variation in the form of the head, body coloration and male genitalia (Holzinger *et al.* 2003) and taxonomy of the taxa remains problematic. Moreover, due to specific morphological characters, there have been debates and disagreements on the phylogenetic relationships with other planthopper families since Germar (1821) separated the family from all other planthoppers *versus* Latreille (1810) who included them in the ‘Fulgorellae’. However, most recent morphological analysis (Bourgoin 1987) and molecular phylogenies (Bourgoin *et al.* 1997, Yeh & Yang 1999, Yeh *et al.* 2005, Urban & Cryan 2007) now place Tettigometridae among the more recently diversified planthopper lineages.

In the first part of this paper we review the classification of the family as recently provided for some other families (Issidae: Wang *et al.* 2016, Dictyopharidae: Song *et al.* in press). This is in order to manage the homonymy of the well known Afrotropical tettigometrid genus *Hilda* Kirkaldy 1900 and also to accommodate the African Tettigometrinae genera into a separate taxonomic unit from the Palaearctic species already recognized in a separate tribe *Tettigometrini*. In the second part, we review the Iranian tettigometrid fauna (distributional data) with the description a new endemic species. Identification keys for both higher classification of the family and Iranian fauna are provided.

Material and methods

Tettigometridae of Iran deposited in Hayk Mirzayans Insect Museum, Iranian Research Institute of Plant Protection, Tehran, Iran (HMIM), National Museum of Wales, Cardiff, UK (NMWC), National Museum of Natural History, Paris (Dlabola collection) (MNHN) and Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (ZIN) were examined in this study. Two specimens were borrowed from National Museum, Prague, Czech Republic (NMPC). The specimens had been majorly collected by sweeping net and by light trapping. A new species was recognized among specimens of HMIM, 3 of which were deposited in ZIN as vouchers. Terminology for description of the male genitalia follows Bourgoin (1988b). Measurements were made by Vernier calipers. Metatibiotarsal formula ($n+(n)/n/n$) corresponds to the number of lateral tibial spines + (apical spines of metatibia by groups of spine)/of the first tarsomer/of the second tarsomer. Photos from dorsal and lateral view of all species were made using a Canon 650D Camera connected to an Olympus SZH stereomicroscope. An identification key was prepared using Xper2.2 (xpd 1.0) (Vignes & Lebbe 2009). Distribution maps for all species were made using ArcMap 9.3.

Results and discussion

1. Classification history of Tettigometridae

With the single genus *Tettigometra* Latreille, 1810, the family was first recognized as a separate familial unit from all others planthoppers ('Fulgorellae Latreille, 1807') within the Cicadariae Latreille 1802 (divisio 'Trimera') in the Rhyngota Homoptera by Germar (1818: 205) but only formally named 'Tettigometrae' in 1821 (Germar 1821: 6). As a separate group the family however, vanished later and the genus was variously placed either within the planthoppers ('Fulgorelles') following Latreille (1807), Germar (1818) or Guérin-Meneville (1834), or excluded from them, and within the 'Cicadellaires' following Spinola (1839: 155). A few years later, the family was again recognized forming the tribe Planigeni within the Cicadina Subtéricornes (= Fulgorelles Latreille) by Amyot & Audinet-Serville, 1843, a decision that was followed by Walker (1851). The taxon however, disappeared a second time and *Tettigometra* as a genus remained placed within the Issida group of the family Fulgorida by Stål (1866) for half a century, later separated in the tribe Tettigometrini in Issidae by Melichar (1903). It was definitively re-established as a family taxon by Kirkaldy (1907) in the Fulgoidea.

Schmidt (1912) first, divided the taxa into two tribes: Tettigometrini Germar, 1821 and Megaloplastinxini Schmidt, 1912. Subsequently, Baker (1924) up-graded them to subfamilies (Tettigometrinae Germar, 1821, Megaloplastinxinae Schmidt, 1912) and created a third one, Egropinae Baker, 1924. With an important taxonomic revision of the family, Fennah (1952) grouped all tettigometrid species into three subfamilies (Tettigometrinae, Egropinae and Hildinae Fennah, 1952). His classification was basically built according to the types of male genitalia, as already proposed by Muir (1923, 1924, 1930). Later, Ghauri (1964) and Bourgoin (1987) added respectively a fourth subfamily, Phalixinae Ghauri, 1964, and in the Egropinae, the tribe Cyranometrini Bourgoin, 1987. A graphical display of this history of the classification of the Tettigometridae is provided in figure 1.

2. Nomenclatural changes in Tettigometridae

Within Tettigometrinae the Palaearctic tribe Tettigometrini is monogenic with the type genus *Tettigometra* Latreille, 1804. The genus is however, the most diversified lineage of the family with about 50 species. The taxon was entirely revised by Lindberg (1948) and is currently divided to 8 subgenera (Emeljanov 1980): *Tettigometra*, *Eurychila* Signoret, 1866, *Hystrigonia* Emeljanov, 1980, *Macrometrina* Lindberg, 1948, *Metroplaca* Emeljanov, 1980, *Mimarada* Emeljanov, 1980, *Mitricephalus* Signoret, 1866, and *Stirometra* Emeljanov, 1980. All these Palaearctic tettigometrine form a very well characterized taxonomic unit with a uniform type of male genitalia. Three other Afrotropical monospecific genera (*Mesohilda* Fennah, 1952; *Parahilda* Knight, 1964 and *Plesiometra* Bourgoin, 1986) stand aside from the Palaearctic tribe Tettigometrini. They exhibit a very different type of male genitalia that allows separating them into a new tribe, Plesiometrini trib. nov.

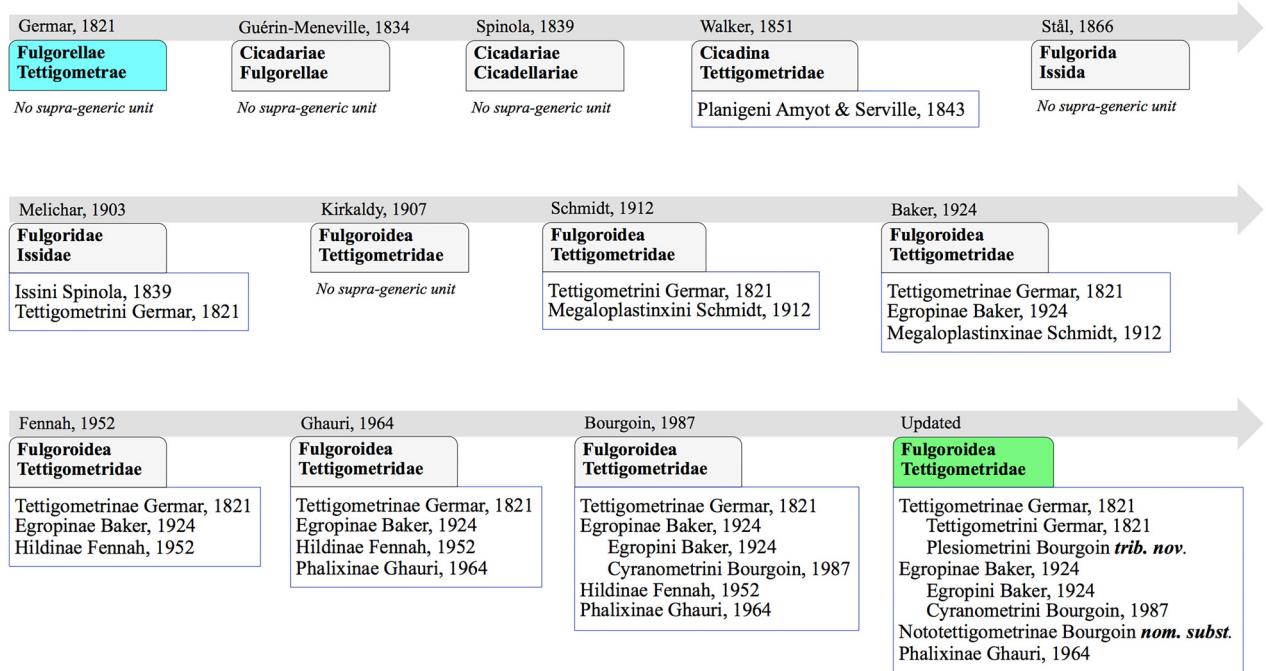


FIGURE 1. Classification history of family Tettigometridae.

2.1. New tribe Plesiometrini for three Afrotropical genera

Tettigometrinae Germar, 1821

Plesiometrini Bourgoin trib. nov.

Type genus: *Plesiometra* Bourgoin, 1986

Diagnosis. Afrotropical Plesiometrini differ from Palaearctic Tettigometrini by the male genitalia conformation showing a much longer aedeagus, tube-like, without inflatable membranous endosoma sac and by the presence of medio-ventral process of the pygofer. As in Palaearctic Tettigometrini female genitalia exhibit a sternal VII ovivalvula plate but also followed posteriorly by a second impair plate.

Description. Pygofer in ventral view well developed laterally with long lateral process-like developed arms; in lateral view an impair and medio-ventral process distinctly lower than the lateral arms. Male genitalia tube-like, long, without distal membranous endosoma. Gonostyli distally hook-like shaped and turned up-side; lamina gonostyli strongly developed, distally free and separated from the paired gonostyli. Female terminalia with sternite VII in three parts, the median part, ovivalvula, followed posteriorly by a supplementary impair plate (Bourgoin 1986, fig. 7).

Included taxa. Three monospecific genera: *Mesohilda* Fennah, 1952; *Parahilda* Knight, 1964 and *Plesiometra* Bourgoin, 1986 and the following species: *Mesohilda balteata* (Distant, 1907), *Parahilda capeneri* Knight, 1964 and *Plesiometra labefacta* Bourgoin, 1986.

Distribution. Western part of Southern Africa, from South Africa Northern provinces (Transvaal), to Namibia and Angola (Bourgoin 2017).

With the exception of Palaearctic Tettigometrini, all other suprageneric taxa are strongly differentiated and characteristic, and group one or few monospecific genera (Phalixinae, Cyranometrini, Plesiometrini trib. nov.) or with only few species (Egropinini). Only Hildinae exhibits some morphological disparity and diversity with the recognition of six different genera and 17 species (Bourgoin 2017).

2.2. A new replacement name for genus *Hilda* and family Hildinae

In Hildinae, the genus name *Hilda* Kirkaldy 1900: 243, was proposed to replace the preoccupied name *Isthmia* Walker, 1851 *nec* Gray 1821, currently synonym of *Vertigo* Müller, 1773, a Vertiginidae Gastropoda (WoRMS 2017). Unfortunately the name proposed by Kirkaldy appears itself to be also pre-occupied by *Hilda* Hörnes & Auinger 1884, another mollusc genus of the family Buccidae, Gastropoda, and currently synonym of *Pisania* Bivona-Bernardi, 1832. According to ICZN code (Art. 23.3.5) *Hilda* Kirkaldy “must be replaced [*nomen substituto*] by the next oldest available name from among its synonyms including the names ... [of] subgenera within genera”. In 1924, Muir described a new genus from Peru, *Nototettigometra* Muir, 1924 that was put in synonymy with *Hilda* by Fennah (1952: 249), the single and type species of which, *N. breddini* Muir, 1924, itself synonymized with *Hilda patruelis* (Stål, 1855) later by Bourgoin (1989). In *Hilda* one subgenus was described, *Prodhilda* Bourgoin, 1988 (Bourgoin 1988c). However, *Hilda* Kirkaldy was also used by Fennah (1952) as the type genus erecting the subfamily Hildinae Fennah, 1952. According to ICZN code (Art. 39) “the name of this family group taxon is invalid as its type genus is a junior homonym [...] it must be replaced by the next oldest available name from among its synonyms... [or] by a new name [*nomen novum*] based on the valid name of the former type genus”, here therefore *Nototettigometra*. Accordingly, the following nomenclatural changes are proposed:

Tettigometridae Germar, 1821

Nototettigometrinae Bourgoin *nom. subst.*

Hildinae Fennah, 1952: 240 *nomem invalidum* replaced by Nototettigometrinae Bourgoin *nomen substituto* according to ICZN, article 39

Type genus: *Nototettigometra* Muir, 1924

Included genera: *Apohilda* Bourgoin, 1986, *Euphyonarthex* Schmidt, 1912, *Nototettigometra* Muir, 1924, *Hildadina* Bourgoin, 1986, *Megahilda* Fennah, 1959, *Raatzbrockmannia* Schmidt, 1924

Nototettigometra Muir, 1924 *nom. subst.*

Isthmia Walker, 1851: 732 [*nec* Gray, 1821] *nomen praeoccupatum* replaced by *Hilda* Kirkaldy, 1900 *nomen novum*, according to Kirkaldy (1900): 243

Nototettigometra Muir 1924: 219, syn. *Hilda* Kirkaldy, 1900 according to Fennah, 1952: 249

Hilda Kirkaldy, 1900: 243 [*nec* Hörnes & Auinger 1884] *nomen praeoccupatum* replaced by *Nototettigometra* Muir, 1924: 219 *nomen substituto*, according to ICZN, article 23.3.5.

Type species: *Isthmia undata* Walker, 1851:732 designated by Kirkaldy 1900: 243

Included taxa (new combinations):

- *Nototettigometra (Prodhilda)* (Bourgoin, 1988) **comb. nov.**
- *N. (P.) hodeberti* (Bourgoin, 1988) **comb. nov.**
- *N. (P.) proteacola* (Bourgoin & Pajor, 2000) **comb. nov.**
- *N. (N.) aurora* (Linnavuori, 1973) **comb. nov.**
- *N. (N.) cameroonensis* (Tamese & Dongmo, 2016) **comb. nov.**
- *N. (N.) ceres* (Linnavuori, 1973) **comb. nov.**
- *N. (N.) diana* (Linnavuori, 1973) **comb. nov.**
- *N. (N.) floreanna* (Bourgoin, 1993) **comb. nov.**
- *N. (N.) funesta* (Stål, 1854) **comb. nov.**
- *N. (N.) minerva* (Linnavuori, 1973) **comb. nov.**
- *N. (N.) olivacea* (Lallemand, 1929) **comb. nov.**
- *N. (N.) paolii* (Lallemand, 1930) **comb. nov.**

- *N. (N.) patruelis* (Stål, 1855) **comb. nov.**
- *N. (N.) patruelis elegantula* (Gerstaecker, 1892) **comb. nov.**
- *N. (N.) pulchra* (De Carlini, 1895) **comb. nov.**
- *N. (N.) rubrospersa* (Fennah, 1958) **comb. nov.**
- *N. (N.) speciosa* (Hesse, 1925) **comb. nov.**
- *N. (N.) undata* (Walker, 1851) **comb. nov.**
- *N. (N.) undata* var. *viridicollis* (Lallemand, 1929) **comb. nov.**
- *N. (N.) welwitschi* (Distant, 1917) **comb. nov.**

Note. The genus is Afrotropical only. Bourgoin (1989) concluded that the four Muir specimens used to described *N. breddini* Muir, 1930 (Muir 1930) were label errors and that, so far, Tettigometridae are definitively absent from the neotropics. The recent mention by Aléné *et al.* (2016) of *H. patruelis* recently been introduced in the USA is a misinterpretation of Wilson's paper (Wilson 2005), which just refer to a potential pest, but still not yet recorded as present in the United States.

2.3. Key to Tettigometridae subfamilies and tribes

1. In male sub-anal process overlooking male genitalia, gonostyli fused in an elongate boat-shaped lamina gonostyli plate with distinct dorso-basal lateral lobes (absent in *Apohilda* Bourgoin, 1986) on each side. In female, sternite VII with paired plates separated by a single median membranous fold, genitalia externally reduced to a median fold. Afrotropical taxa. (= ex Hildinae Fennah, 1952) Nototettigometrinae Bourgoin *nom. subst.*
- Male sub-anal process absent, gonostyli distinct, distally hook-shaped, and connected by a lamina gonostyli shorter than gonostyli. Female sternite VII with more than two plates, (a median ovivalvula), genitalia very reduced but small paired lobed processes visible 2
2. Male gonostyli with hooks turned latero-externally, lamina gonostyli broad, distally uni or bilobed 3
- Male gonostyli with hooks turned up-side, lamina gonostyli distally unilobed or concave Tettigometrinae Germar, 1821...5
3. Head with eyes narrower than pronotum. Male genitalia massive; medioventral process of pygofer short, half length of lateral lobes in ventral view; lamina gonostyli broad Egropinae Baker, 1924... 4
- Head with eyes broader than pronotum. Male genitalia hook-like; medioventral of pygofer almost as long as lateral lobes in ventral view. East Africa taxa (Uganda) Phalixinae Ghauri, 1964
4. Male genitalia without lateral processes; lamina gonostyli distally bilobed. Female with ovivalvula trapezoidal, anteriorly more than twice wider than lateral sternal VII plates. South East Asian taxa Egropini Baker 1924
- Male genitalia with a pair of lateral processes; lamina gonostyli distally unilobed. Female with ovivalvula slightly trapezoidal, anteriorly almost as wide as lateral sternal VII plates. West Africa taxa (Congo Basin) Cyranometrini Bourgoin, 1987
5. Pygofer with developed broad medioventral process. Male with lamina gonostyli developed, distally free; genitalia without periandrium, tube-like, long, without distal membranous endosoma. Female additional impair plate covering female genitalia opening. West South Afrotropical taxa Plesiometrini Bourgoin *trib. nov.*
- No medioventral process of pygofer or narrowly reduced. Male with lamina gonostyli narrow, laterally connected to gonostyli; genitalia with stirrup-shaped periandrium, not tube-like, with developed distal membranous endosoma. Female genitalia with ovivalvula but without additional impair plate. Palaearctic species Tettigometrini Germar, 1821

3. Tettigometridae of Iran

The earliest record of Tettigometridae species from Iran was given by Melichar (1902), who recorded *Tettigometra costulata* Fieber, 1865 from the southeast of the country. However, much of our current knowledge on tettigometrids in Iran were provided by the Czech entomologist Jiří Dlabola who collected and recorded many species during his fruitful collaborations with Hayk Mirzayans Insect Museum (HMIM) (Dlabola 1971, 1972, 1981 & 1984). He also described a new species, *T. demavenda* Dlabola, 1981. In 1995, seven species of Tettigometridae were listed by Mirzayans in the list of Auchenorrhyncha of Hayk Mirzayans Insect Museum (Mirzayans, 1995). Various faunistic data about Iranian tettigometrids were also provided by Barkhordari *et al.* (1981), Behdad (1988), Rajabi (1989), Karimzadeh Esfahani *et al.* (1998), Haghshenas & Khajeali (2000), Lashkari *et al.* (2009), Mozaffarian & Taghizadeh (2010), Moosavi Mahvelati & Modarres Awal (2011), Moosavi & Sadeghi Nameghi (2012) and Mozaffarian (2014). More recently, in their checklist of Fulgoromorpha of Iran, Mozaffarian & Wilson (2011) listed 14 species. According to the literature review and the examined material, a total of 18 Tettigometridae species are recording from Iran. One endemic new species is described.

3.1. description of a New *Tettigometra* species from Iran

Tettigometrinae Germar, 1821

Tettigometrini Germar, 1821

***Tettigometra (Tettigometra) parihana* Mozaffarian & Bourgoin sp. nov.**

Figures 2–6.

Type material. Holotype: 1♂, Fars province, Arsanjan, Aliabad-e Kamin, 1680m, 25.ix.1996, leg. Moghaddam/Barari/ Parchami (HMIM). Paratypes: 2♀♀. Same locality as holotype (HMIM), 3♀♀. Same locality as holotype (ZIN), 3♀♀. Fars province, Abadeh, Surmagh, 1750m, 25.ix. 1996, leg. Parchami/ Barari/ Moghaddam (HMIM).

Description. General colour of body yellow, rather greenish in some specimens, with greenish elytra and not shiny appearance (Fig. 2).

Head. Head in dorsal view wider than long. Vertex anteriorly with obtuse angle, prominent from an assumptive curve continuing the anterior margin of eyes (Fig. 3); the distance between the eyes at the base of vertex (a in fig. 3) nearly 1.5 times longer than the length of the vertex medially (b in fig. 3); the distance between the apex of the vertex and the level of anterior margin of eyes (c in fig. 3), nearly twice as the distance between the posterior edge of vertex to the level of anterior margin of eyes medially (d in fig. 3); vertex medially (b in fig. 3) longer than pronotum; profile of frons slightly concave in anterior half (Fig. 2b). Frons yellow, concolorous with clypeus and genae, slightly lighter near the junction with clypeus in some specimens. Rostrum yellow with orange medial groove and black apical segment, reaching to the level of the third trochanter. Eyes black; subocular calus well developed beyond the eyes posteriorly and posterolaterally, forming a semicircular posterior edge (Figs 2a and 3); in dorsal view calus slightly shorter than half of eye length; posterolateral corner of subocular calus nearly round in lateral view (Fig. 2b); no incision between subocular calus and pronotum (Fig. 2a); anteriolateral margin of eyes nearly continues after the edge of vertex with no notch (Figs 2a and 3).

Thorax. Pronotum yellow, nearly the same colour as vertex, both with concolourous pits scattered uniformly, width of pronotum in the widest part (f in fig. 3) nearly 3.5 times longer than the length medially (e in fig. 3); pronotum in lateral view elevates gradually higher than the level of vertex (Fig. 2b). Scutellum slightly convex (Fig. 2b), with nearly the same colour with dorsal surface of head and pronotum, in some specimens rather darker medially (Fig. 2a). Length of scutellum medially (g in fig. 3) nearly the same as the length of vertex and pronotum together (b+e in fig. 3).

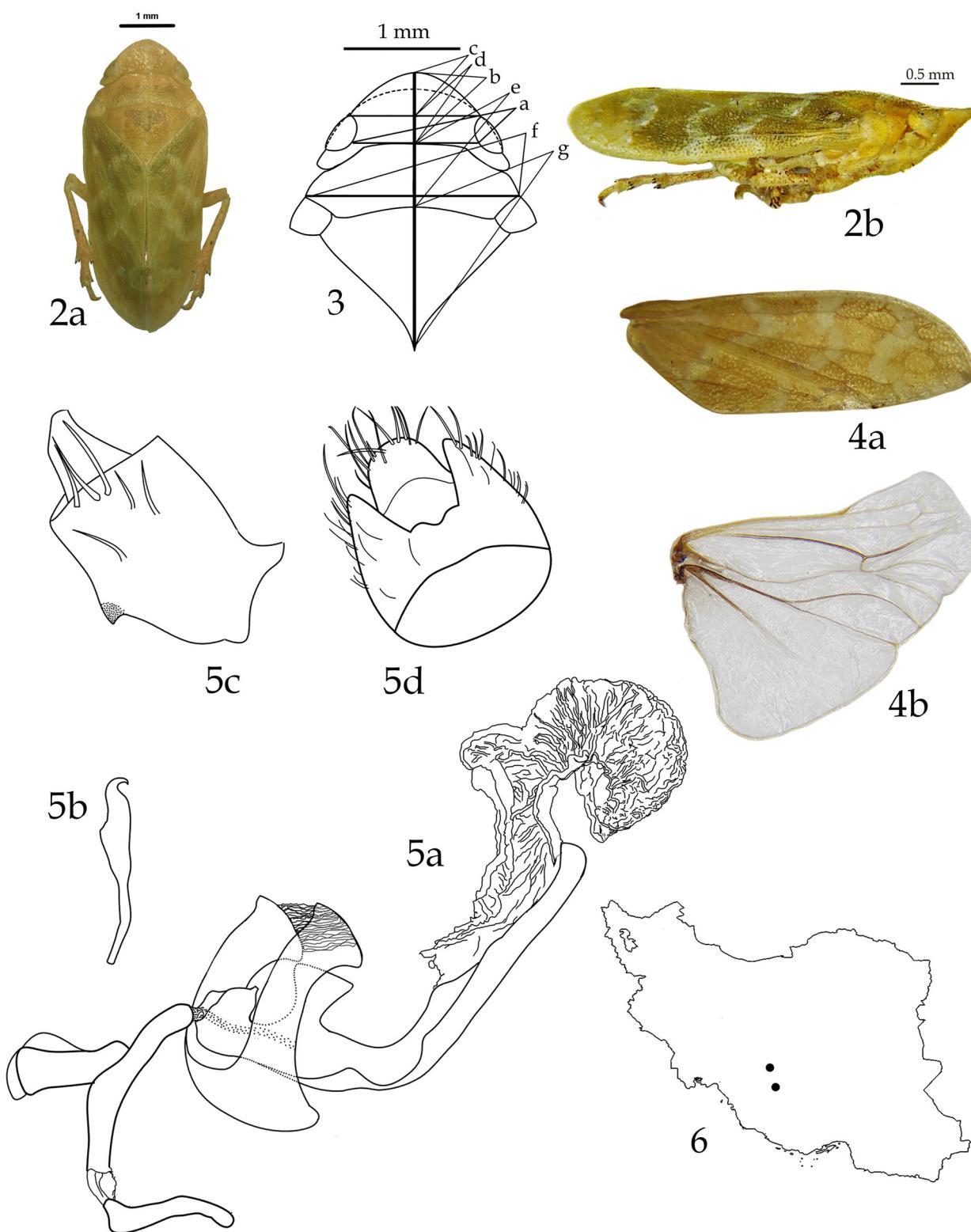
Wings. Wings. Tegula (Figs 2a and b) concolorous with dorsal surface of forebody . Tegmina (Figs 2a, b and 4a) covers the body completely; rooflike on the body with nearly parallel costal edges, greenish (brownish in some specimens) with light oblique and converging bands in dorsal view of the body. The light bands on the tegmina attitudes upward and again downward, producing a zigzag pattern on the wing. Venation reticulated apically, with $Pc+CP$ basally distinct, situate, $ScP+R$ long and straight, RP with 5 terminals, MP forking first after middle of tegmen, 5 terminals, CuA single, Pcu reaching A1 in the apical part of clavus in a very short indistinct $Pcu+A1$. Hindwings (Fig. 4b) hyaline and well developed, of typical tettigometrid venation pattern, two-lobed: RP and MP single, CuA with characteristic tettigometrid $CuA2$ bent connecting CuP , PCu anteriorly convex in its second half, A1 straight, A2 not reaching margin, vanishing at 2/3 of its length.

Legs. Legs yellow concolourous with ventral surface of the body with orange granulation in some specimens (Figd 2a and b). Tibial and tarsal spines dark brown; Metatibial apical spines located on two rows, 5 or 6 spines in the first row, 1 or 3 spines in the second row. Spines of apex of first tarsomere (7 or 8) located in a single row. Metabiotarsal formula 6 + (5+1, 3)/7-8/ 2.

Abdomen. Abdomen with brownish tergites and yellow sternites; male pygofer yellow.

Male Terminalia (Figs 5a–d). Basal support of connective short bent at 90° with corpus connectivi. Tectiform structure long with crista developed. Brachi connectivi a little shorter than corpus. Periandrium stirrup-shaped, surrounding a tubular aedeagus bearing in its first half a characteristic dorsal quadrangular tooth, elevated and wider apically than basally; second half elongated bearing apically the membranous endosoma sac. *Ductus ejaculatorius* running between the two brachi connectivi, connecting with ductus seminis at its entrance into aedeagus and ending up to the phallotrem at the end of the endomosa (Fig. 5a). Gonstyli paired and symmetrical (Fig.

5b), elongate, hook-shaped apically, broaden in the middle third of the length and narrowed at the basal third. Anal tube (Figs 5c and d) rectangular laterally with a ventral tooth in the middle.



FIGURES 2–6. *Tettigometra parihana* sp. nov.: 2a, b. Dorsal and lateral views of habitus. 3. Dorsal view of head and thorax. 4a, b. Forewing and hindwing. 5. Male genitalia: 5a. Aedeagus, endosome sac, periandrium, ductus ejaculatorii, connective and crista. 5b. Gonostylus. 5c. Lateral view of anal tube. 5d. Dorsal view of anal tube. 6. Distribution of the species in Iran.

Female genitalia much reduced of typical Palaearctic tettigometrine type : three sternal VII plates with the medial one, ovivalvula, slightly overlapping sternite VIII. External female genitalia reduced to simple medial membranous fold between strongly reduced gonocoxite-gonapophyses VIII lobiform processes. Gonaphyses IX closing posteriorly the fold in a small rounded impair process.

Diagnosis. The new species is very similar externally to some variants of *T. sulphurea* with green yellow colour and complete tegmina. However, the light oblique bands on the tegmina, rather similar to the Hildinae pattern in some afrotropical species, can be seen only on the tegmina of the new species. Subocular plate is more developed posteriorly and the genitalia is clearly distinct: the aedeagus dorsal tooth is elevated and pointed in *T. sulphurea* while it is distinctly quadrangular with a flat dorsal margin in *T. parihana* sp. n.

Body size. ♀♀: 10.0–14.0 mm, average: 11.73 mm, ♂: 10.00 mm.

Etymology. The name of the new species “*parihana*” is comprised of “*pari*” which refers to exquisite, winged fairy-like spirits ranking between angels and evil spirits in Persian culture and “*han*” meant queen in Middle Persian (300 BC–800 AD).

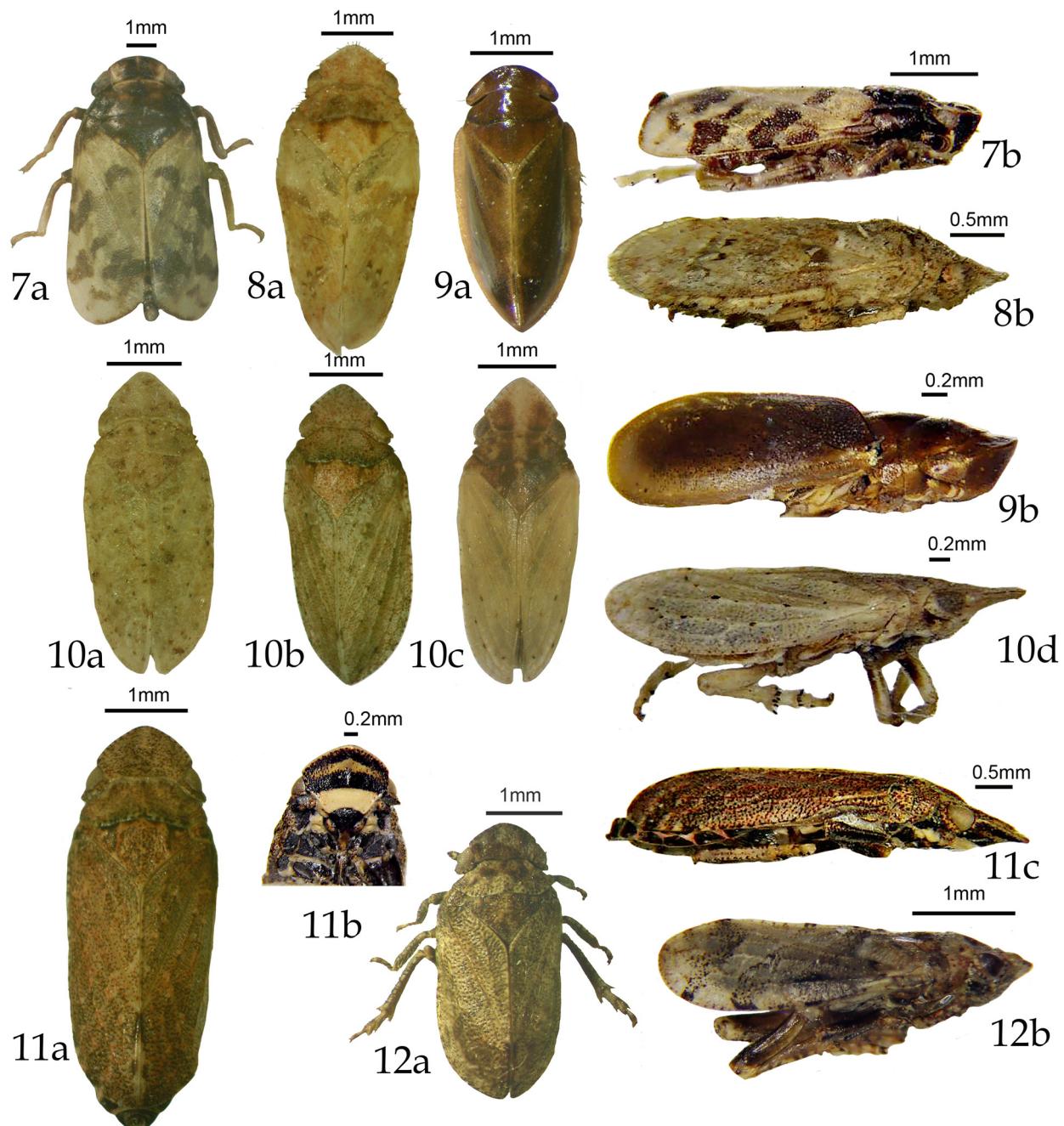
Distribution. The new species was collected from two locations in Fars province in southwest of Iran (Fig. 6), in south of Zagros Mountain (Dry Zagros). This area is part of Zagros mountain chain corresponding to an endemic zone for Fulgoromorpha (Mozaffarian, 2013) and the new species belong to a zone of relatively high altitude (1680m).

3.2. Identification key to the species of family Tettigometridae in Iran

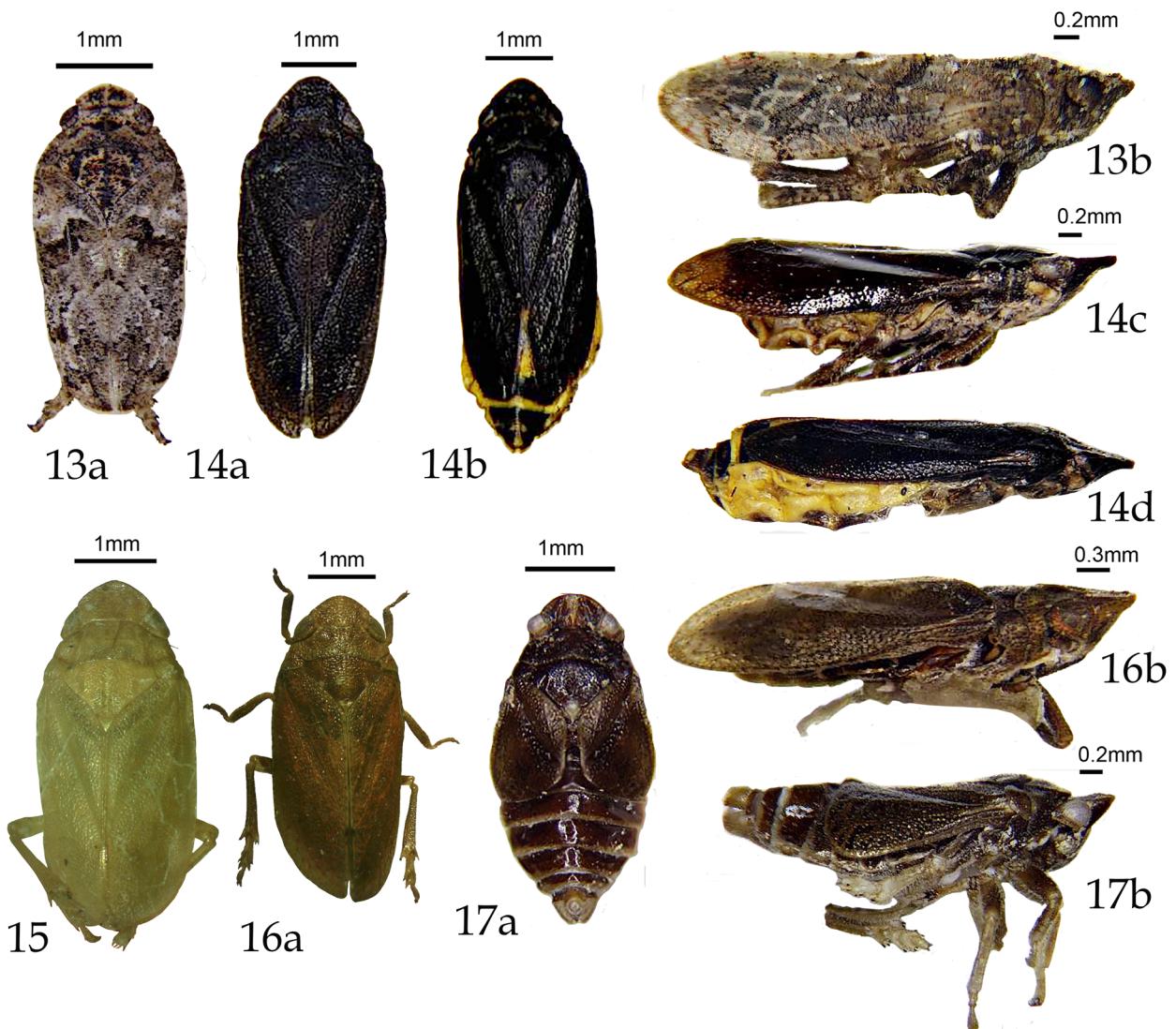
(Figs 7–39)

- | | | |
|-----|---|----|
| 1. | Vertex medially shorter than pronotum | 2 |
| - | Vertex medially longer than pronotum | 4 |
| = | Vertex medially nearly as long as pronotum | 15 |
| 2. | Profile of frons convex in whole length | 3 |
| - | Profile of frons concave in anterior half and convex in the posterior half (Fig. 13b) | |
| | <i>Tettigometra (Striometra) costulata</i> Fieber, 1865 | |
| 3. | Hemelytra with different colour from forebody (Fig. 7a), lateral edges of hemelytra converging anteriorly and not extending upwards | |
| - | <i>Tettigometra (Eurychila) pantherina</i> Horváth, 1891 | |
| - | Hemelytra nearly concolorous with forebody (Fig. 9a), lateral edges of hemelytra parallel and upward extending | |
| | <i>Tettigometra (Metroplaca) longicornis</i> Signoret, 1866 | |
| 4. | Clypeus and lora darker than other parts of the face | 5 |
| - | Clypeus and lora not darker than other parts of the face | 10 |
| 5. | Scutellum with a pair of dark longitudinal bands on the lateral of the middle line | 6 |
| - | Scutellum without a pair of dark longitudinal bands on the lateral of the middle line | 8 |
| 6. | Profile of frons concave nearly in whole length | 7 |
| - | Profile of frons concave in anterior half | |
| | <i>Tettigometra (Mitricephalus) eremi</i> Lindberg, 1948 | |
| 7. | Frons with alternate black and light bands ventrally (Fig. 11b) | |
| - | <i>Tettigometra (Mitricephalus) macrocephalus</i> Fieber, 1865 | |
| - | Frons without alternate black and light bands ventrally | |
| | <i>Tettigometra (Mitricephalus) sordida</i> Fieber, 1865 | |
| 8. | Profile of frons concave in anterior half | 9 |
| - | Profile of frons nearly straight | |
| | <i>Tettigometra (Tettigometra) depressa</i> Fieber, 1865 | |
| 9. | A notch present between the anterior margin of eyes and the lateral edge of vertex | |
| | <i>Tettigometra (Tettigometra) varia</i> Fieber, 1865 | |
| - | No notch between the anterior margin of eyes and the lateral edge of vertex | |
| | <i>Tettigometra (Tettigometra) angulata</i> Lindberg, 1948 | |
| 10. | Coarse hairs present on frons | |
| - | <i>Tettigometra (Hystrigonia) hexaspina</i> Kolenati, 1857 | |
| - | Coarse hairs absent on frons | 11 |
| 11. | Posterior corner of subocular plates in lateral view acute and nearly sharp | 12 |
| - | Posteriolateral corner of subocular plates in lateral view obviously wide and nearly round | 13 |
| 12. | General colour of hemelytra blackish or dark brownish | |
| - | <i>Tettigometra (Tettigometra) angulata</i> Lindberg, 1848 | |
| - | General color of hemelytra light greenish or yellowish | |
| | <i>Tettigometra (Tettigometra) pseudovitellina</i> Mitjaev, 1971 | |
| 13. | Level of pronotum and mesonotum in lateral view nearly at the same level of vertex | |
| - | <i>Tettigometra (Tettigometra) vitellina</i> Fieber, 1865 | |
| - | Level of pronotum and mesonotum in lateral view higher than the level of vertex | 14 |
| 14. | Tegmina with obvious light, parallel and zigzag pattern | |
| | <i>Tettigometra (Tettigometra) parihana</i> Mozaffarian et Bourgoin sp. nov. | |
| - | Tegmina not as above | |
| | <i>Tettigometra (Tettigometra) sulphurea</i> Mulsant et Rey, 1855 | |
| 15. | A deep pit on frons present | |
| | <i>Tettigometra (Tettigometra) impressifrons</i> Mulsant et Rey, 1855 | |

- A deep pit on frons absent 16
- 16. Profile of frons convex in whole length *Tettigometra (Tettigometra) virescens* (Panzer, 1799)
- Profile of frons concave nearly in whole length or nearly straight in anterior half 17
- 17. Frons in ventral view with alternate black and light bands *Tettigometra (Tettigometra) sororcula* Horváth, 1897
- Frons in ventral view without alternate black and light bands *Tettigometra (Tettigometra) demavenda* Dlabola, 1981



FIGURES 7–12. Dorsal and lateral views of : 7a, b. *Tettigometra pantherina*; 8a, b. *Tettigometra hexaspina*; 9a, b. *Tettigometra longicornis*; 10a–d. *Tettigometra eremi*; 11 a–c. *Tettigometra macrocephala*; 12a, b. *Tettigometra sordida*.



FIGURES 13–17. Dorsal and lateral views of: 13a, b. *Tettigometra costulata*; 14 a–d. *Tettigometra angulata*; 15. *Tettigometra demavenda*; 16a, b. *Tettigometra depressa*; 17a, b. *Tettigometra impressifrons*.

3.3. Review of Tettigometridae recorded from Iran

Tettigometra (Eurychila) pantherina Horváth, 1891 (Figs 7a–b and 24)

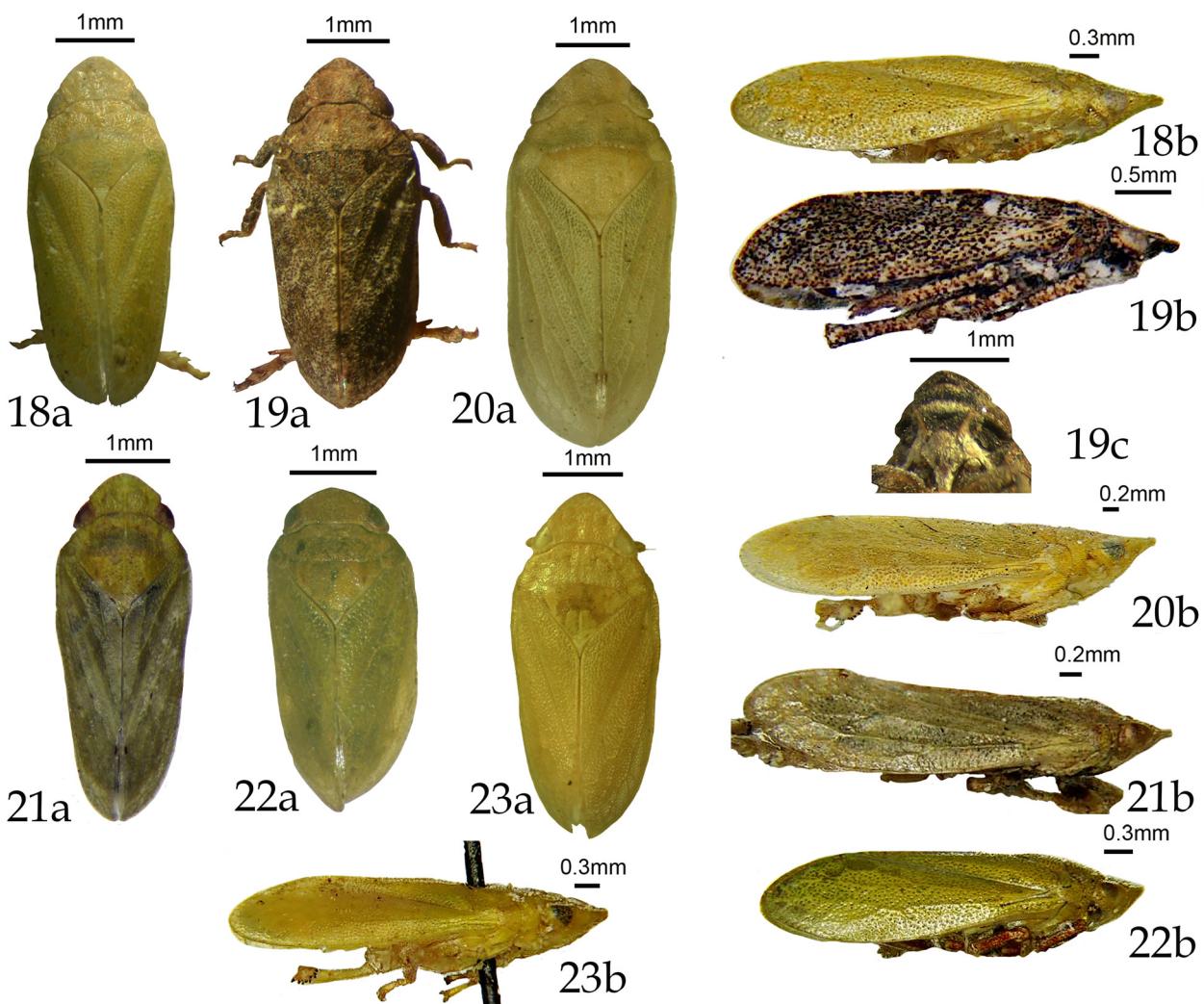
Tettigometra pantherina Horváth, 1891: 81.

Eurychila pantherina (Horváth): Dlabola (1981, 1984), Mirzayans (1995), Mozaffarian & Wilson (2011), Mozaffarian (2014).

Material examined. Ardabil province: Meshkinshahr, $38^{\circ} 23'N$ $47^{\circ} 40'E$, v.1977, leg. Kh.B, 1 specimen (HMIM); Fars province: 10 Km S. Dehbid, 2000m, 15.vi.2000, leg. Badii/ Sarafrazi/Linnavuori, 1 specimen (HMIM); Kerman province: 21-23.III.1928, leg. V. Kusnezov, 1 specimen (ZIN); Khuzestan province: Minu Island, $30^{\circ} 20'N$, $48^{\circ} 13'E$, 29.iv.1976, leg. Pazuki/ Abaii, 1 specimen (HMIM).

Distribution and habitat. The species was recorded from Transcaucasus, Iran, Afghanistan and Central Asia (Mozaffarian & Wilson 2011). According to the publication and the above examined material, the species is distributed from northwest to south and southeast of Iran (Figure 24) indicating the probable southern borders of the distribution of the species with the lowest latitude. In addition, according to the collecting data with a rather high recorded elevation for the species (2400 m by Dlabola (1984) and 2000 m in the current study) it is expected

that the species should be found in the mountains of north and east of Iran as well. The only record in northwest of Iran (Fig. 24) may be connected with the southern records through Zagros mountain in the west of the country, but probably not through the central parts, which contain two big deserts (Dasht-e Lut and Dasht-e Kavir) with low altitude.



FIGURES 18–23. Dorsal and lateral views of: 18a–c. *Tettigometra pseudovitellina*; 19a, b. *Tettigometra sororcula*; 20a, b. *Tettigometra sulphurea*; 21a, b. *Tettigometra varia*; 22a, b. *Tettigometra virescens*; 23a, b. *Tettigometra vitellina*.

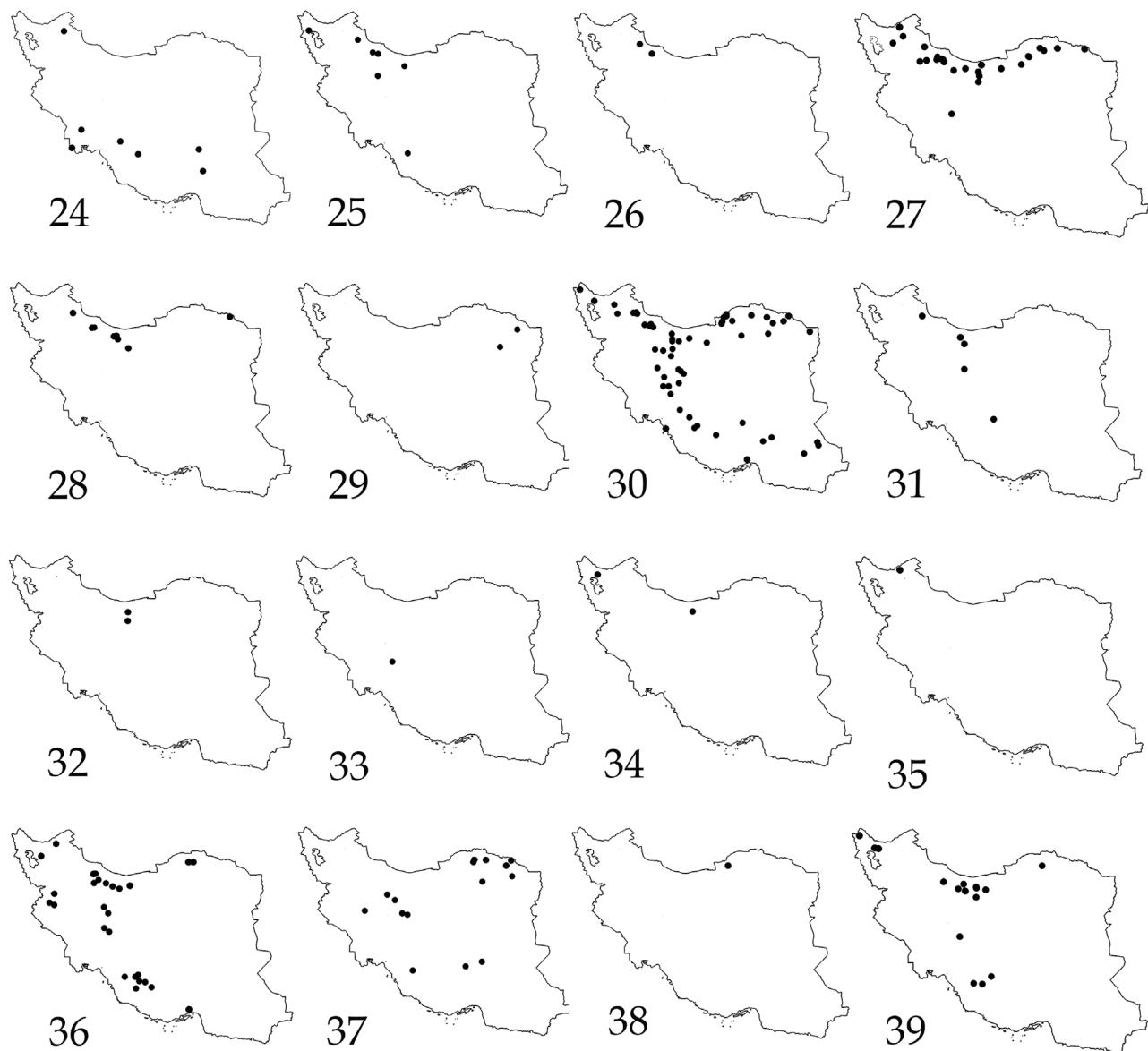
Tettigometra (Hystrigonia) hexaspina Kolenati, 1857 (Figs 8a–b and 25)

Tettigometra hexaspina Kolenati 1857: 428

T. hexaspina Kolenati: Dlabola (1984), Mozaffarian & Wilson (2011), Mozaffarian (2014).

Material examined. Ardabil province: 10 km W. Givi, 8.vii.2002, leg. R. & S. Linnauori, 1 specimen (NMWC), 5–20 km E. Givi, 8–9.viii.2002, leg. R. Linnauori, 3 specimens (NMWC); Gilan province: Jirandeh, 6–8.vii.1996, leg. R. Linnauori, 1 specimen (NMWC), Tonekabon-Rudbad, 29.v–28.vi.1995, leg. R. Linnauori, 2 specimens (NMWC); Markazi province: 5 km Gharghabad, 1570 m, 35° 6'N 49° 46'E, 15.viii.2006, leg. Mozaffarian, 1 specimen (HMIM); Tehran province: Latian Dam, 1711 m, 35° 48'N 51° 40'E, 6.viii.2006, leg. Mozaffarian, 1 specimen (HMIM).

Distribution and habitat. Eastern Europe, Turkey, Caucasus and Iran. Distribution of species in Iran is in the western part of the country (Fig. 25). Accordingly its distribution in Iran corresponds to its eastern and southern limits. The species has been found from 1300 m (Dlabola 1984) to 1711 m altitude (1570 m–1711 m in the current study). Therefore it is expected that the only record in southwest of the country is connected to the northern records through other parts of Zagros mountain in the west of Iran. The species was recorded as a pest to *Papaver somniferum* L. (Papaveraceae) in Serbia (Gradojevic 1931).



FIGURES 24–39. Distribution maps in Iran: 24. *Tettigometra pantherina* 25. *Tettigometra hexaspina* 26. *Tettigometra longicornis* 27. *Tettigometra eremi* 28. *Tettigometra macrocephala* 29. *Tettigometra sordida* 30. *Tettigometra costulata* 31. *Tettigometra angulata* 32. *Tettigometra demavenda* 33. *Tettigometra impressifrons* 34. *Tettigometra pseudovitellina* 35. *Tettigometra sororcula* 36. *Tettigometra sulphurea* 37. *Tettigometra varia* 38. *Tettigometra virescens* 39. *Tettigometra vitellina*.

***Tettigometra (Metroplaca) longicornis* Signoret, 1866**
(Figs 9a–b and 26)

Tettigometra longicornis Signoret, 1866: 159

Material examined. Ardabil province: Majareh, 21–22.vii.1996, leg. R. Linnavuori, 1 specimen (NMWC); Gilan province: Rostamabad, Salansar, 6–8.v.2001, leg. R. & S. Linnavuori, 1 specimen (NMWC). This is the first record of the species from Iran.

Distribution and habitat. Dlabola (1981) recognized the species as an arboreal-pontomediteranean faunal element, found in steppes of Anatoly. According to Nast (1972), the species is distributed in Northern Africa, Western, Southern, Central and Eastern Europe, Caucasus, Turkey, Central Asia and Afghanistan. These records in northwestern Iran (Fig. 26) are the first ones for the country. However, due to the distribution of the species from north of Africa to central Asia and Afghanistan, it may be present also in central north and northeast of Iran.

***Tettigometra (Mitricephalus) eremi* Lindberg, 1948**

(Figs 10a–d and 27)

Tettigometra eremi Lindberg, 1948: 27

T. eremi Lindberg, 1948: Nast (1972) [listed], Dlabola (1972, 1981), Mirzayans (1995).

Material examined. Ardabil province: Majareh-Khalkhal, 22.vii.1996, leg. R. Linnavuori, 3 specimens (NMWC), Majareh-Khalkhal, 22.vii.1996, leg. R. Linnavuori, 1 specimen (NMWC), Majareh, 21–22.vii.1996, 9.viii.1998 leg. R. Linnavuori, 23 specimens (NMWC); Azarbaiejan-e Sharghi province: Heris, Tazehkand, 2078m, 38° 16' 4.6"N 47° 12' 14.9"E, 17.vi.2008, leg. Mozaffarian, 10 specimens (HMIM), Tabriz, Kalibar, 1863 m, 38° 52' 13.5"E 46° 58' 14.5"E, 2.ix.2007, leg. Mozaffarian, 2 specimens (HMIM), Tabriz, Matnagh, North slope of Sahand mt., 16.vi.2008, leg. Mozaffarian, 20 specimens (HMIM); Esfahan province: Khansar, Golestankuh, 2582m, 33° 10' 06"N 50° 23' 52.1"E, 20.vii.2010, leg. Mozaffarian, 1 specimen (HMIM); Gilan province: Damashk, Barehsar, 27.vii.2002, leg. R. & S. Linnavuori, 1 specimen (NMWC), Damashk, Barehsar, 27.vii.2002, leg. R. & S. Linnavuori, 2 specimens (NMWC); Gilan province: Darreh Dasht, 10.vii.1996, leg. R. Linnavuori, 3 specimens (NMWC), Darreh Dasht, 27.v., 20.vi.1995, leg. R. Linnavuori, 8 specimens (NMWC), Deilaman, 16–20.vii.1996, leg. R. Linnavuori, 3 specimens (NMWC), Deilaman, Barasar, 23.vii.1996, leg. R. Linnavuori, 2 specimens (NMWC), Deylaman, Barasar, 23.vii.1996, leg. R. Linnavuori, 1 specimen (NMWC), Manjil, 15–17.ix.2000, leg. R. Linnavuori, 2 specimens (NMWC), Manjil, 26.vi.1996, leg. R. Linnavuori, 3 specimens (NMWC), Rostamabad-Salansar, 24.vii.1996, leg. R. Linnavuori, 6 specimens (NMWC), Rostamabad-Salansar, 8–10.ix.2000, 6–8.v.2001, leg. R. & S. Linnavuori, 16 specimens (NMWC), Salansar, 23.viii.1998, R. Linnavuori, 2 specimens (NMWC); Golestan province: Farsian, 16.vii.2003, leg. R. & S. Linnavuori, 1 specimen (NMWC), Golestan National Park, Sulgerd, 1150m, 2021.VII.1996, leg. Ebrahimi/ V. Nazari, 1 specimen (HMIM), Tilabad, 11.vii.2006, leg. R. & S. Linnavuori, 4 specimens (NMWC); Khorasan-e Razavi province: Darrgaz, 15.vi.1994, leg. R. Linnavuori, 7 specimens (NMWC); Khorasan-e Shomali province: Golestan National Park, 150 km West Bojnurd, 14.vii.1994, leg. R. Linnavuori, 1 specimen (NMWC); Mazandaran province: Kandovan, 11.viii.1970, leg. Safavi/ Haschemi, 3 specimens (HMIM); Semnan province: 25–30 km N. Shahroud, 4.vii.2004, leg. R. & S. Linnavuori, 1 specimen (NMWC), Vavasar, 1635m, 36° 8' 8.3"N 53° 37' 50.89"E, 9.viii.2009, leg. Serri, 1 specimen (HMIM); Zanjan province: 20–35 km E. Zanjan, 13.vii.2004, leg. R. & S. Linnavuori, 2 specimens (NMWC), 20–35km E. Zanjan, 13.vii.2004, leg. R. & S. Linnavuori, 1 specimen (NMWC), Zanjan-Gilvan Rd., Khanchai, 2335 m, 36° 41'N 48° 44"E, 11.vii.2006, leg. Mozaffarian, 18 specimens (HMIM).

Distribution and habitat. The distribution type of the species is reported as an eremian Iranoturanian (Dlabola 1981). In addition to Iran, the species is recorded from northwestern to northern and northeastern countries of Iran (Ukraine, Transcaucasia, Turkey, Afghanistan and Central Asia (Mozaffarian & Wilson 2011)). Consequently, its distribution in Iran (Northwest to northeast in fig. 27) appears to be logically in the continuation of the recorded distribution range. However the elevation of the records in Iran is extremely variable as Dlabola (1981) recorded it from 400 m to 3850 m. Examined material are within this limit (1150 m to 2582 m). If some high ability of the species to adapt to various elevations and the consequent climate variations should be hypothesised, existence of cryptic species might also explain these observations. Indeed specimens of *T. eremi* shows a very high color variation (Figs 10a–d). Dlabola (1972) recorded the species as a Turanoeremial faunal element which is found in steppes, semi-deserts, steppes and forest steppes. Some of the examined specimens were collected in *Quercus* woodland and near pastures and mountain close to wheat and alphalpa fields, on *Euphorbia*, *Mentha* and *Artemisia*. The species has also been recorded in semi-steppes areas with *Artemisia* and *Euphorbia*,

steppes and fields, grassy mountain vegetation, and forest vegetation near the Caspian Sea on *Juniperus* and from mountain vegetation (Dlabola 1981).

***Tettigometra (Mitricephalus) macrocephala* (Fieber, 1865)**

(Figs 11a–c and 28)

Tettigometra macrocephalus Fieber, 1865: 569.

Mitricephalus macrocephalus (Fieber, 1865): Dlabola (1981), Mozaffarian & Wilson (2011).

Material examined. Alborz province: Karaj, Kalha, 36° 5'N 51° 8'E, 2000m, 26.viii.1996, leg. Badii/ Sarafrazi/ Barari, 1 specimen (HMIM), nr Gachsar, 17.vii.2002, R. & S. Linnavuori, 1 specimen, (NMWC); Ardabil province: 5–20km E. Givi, 8–9, vii.2002, leg. R Linnavuori, 1 specimen (NMWC); Gilan province: Jirandeh, 6–8.viii.1996, leg. R. Linnavuori, 2 specimens (NMWC), Sangrud, 29–30.viii.2003, leg. R Linnavuori, 1 specimen (NMWC); Khorasan-e Razavi province: 70 km West Dargaz, 14.vi.1994, leg. R. Linnavuori, 1 specimen (NMWC).

Distribution and habitat. Dlabola (1981) mentioned this species as an arboreal-pontomediterranean faunal element which is found in mountains from central Europe to western Siberia. The species has also been recorded from other parts of Europe, Turkey, Iran, Afghanistan, Central and Northern Asia (Mozaffarian & Wilson, 2010), in forest steppes, in steppes with *Astragalus*, woodland margins, on grasses and mostly in vineyards (Dlabola, 1981, Nickel, 2003). The species is distributed in northern parts of Iran (Fig. 28). Apart from Iran, its distribution in the countries in west, northwest, north and northeast of Iran, suggests the probable existence of the species in eastern part of Alborz Mountain too from northwest to northeast (Fig. 28). Therefore, the only record in the northeast of Iran would be connected to the other known records in western part of Alborz mountain. Nickel (2003) gave the elevation of 150 to 500 m for the records of this species in Germany, however, it is reported here from 2000 m, being in agreement with Dlabola (1981) records from 2000-2545m. Hence Iranian specimens appear to be adapted to the high elevation in Alborz mountain.

***Tettigometra (Mitricephalus) sordida* Fieber, 1865**

(Figs 12a–b and 29)

Tettigometra sordida Fieber, 1865: 571

T. sordida Fieber: Nast (1972), Mozaffarian & Wilson (2011), Moosavi & Sadeghi Nameghi (2012).

Material examined. Khorasan-e Razavi province: Khalilabad, 25.v.2016 (HMIM)

Distribution and habitat. Nast (1972) mentioned the distribution of the species in the countries in Western and Eastern Europe, central and northern Asia, in the northeast of Iran (Fig. 29). This distribution appears to be the continuation of the extralimital distribution of the species in central Asia. The records of this species in Iran probably indicate the south border of the distribution of the taxon with lowest latitude. Dlabola (1981) recognized the species as an arboreal-pontomediterranean faunal element.

***Tettigometra (Stirometra) costulata* Fieber, 1865**

(Figs 13a–b and 30)

Tettigometra costulata Fieber, 1865: 572

T. costulata Fieber: Melichar (1902), Dlabola (1971, 1972, 1981), Nast (1972) [listed], Behdad (1988), Rajabi (1989), Mirzayans (1995), Abaii (2000), Lashkari *et al.* (2009), Mozaffarian and Taghizadeh (2010), Mozaffarian & Wilson (2011), Mozaffarian (2014).

Material examined. Alborz province: Karaj, 30.ix.1974, 17,27.vii.1971, 9.x.1975, leg. Sabzevari, 9 specimens (HMIM), Taleghan, Lanbaran, 1850m, 29.viii.1996, leg. Badii/ Barari/ Sarafrazi, 2 specimens (HMIM), Malard, 30.v.1971, leg. Sabzevari, 1 specimen (HMIM); Ardabil province: 10 Km W. Khalkhal, 8–9.vii.2002, leg. R. & S. Linnavuori, 2 specimens (NMWC), Firouzabad, 9.viii.2002, leg. R. & S. Linnavuori, 1 specimen (NMWC);

Azarbaiejan-e Sharghi province: Khalkhal-Givi, 22.vii–4.viii.1996, leg. R. Linnavuori, 1 specimen (NMWC), Khalkhal, 30.vii.1996, leg. R. Linnavuori, 1 specimen (NMWC), Saray, 14–15.vii.2004, leg. R. & S. Linnavuori, 1 specimen (NMWC); Bushehr province: nr Bandar-e Genaveh, 23–24.iv.2007, leg. R. & S. Linnavuori, 1 specimen (NMWC); Chahar mahal va Bakhtiari province: Ben, Gerdab, inside city, 2064m, 32° 32'N 50° 44'E, 20.vi.2009, leg. Mozaffarian, 1 specimen (HMIM); Chaharmahal va Bakhtiari province: Ardel, Gahru, Tang-e Zevezdegan, 2347m, 31° 59'N 50° 51'E, 23.VI.2009, leg. Mozaffarian, 1 specimen (HMIM); Esfahan province: Kashan, Ghohrud, Junian, 2000 m, 12–13.vi.1984, leg. Pazuki/ Hashemi, 1 specimen (HMIM), Kashan, Tahagh, 2000m, 14–15.vi.1984, leg. Pazuki/ Hashemi, 6 specimens (HMIM); Khansar, Golestanlu, 33° 10'N 50° 24'E, 2587m, 20.vii.2010, leg. Mozaffarian, 1 specimen (HMIM); Ghamsar, Ghazaan, 2224m, 14.vi.2011, leg. Mozaffarian, 1 specimen (HMIM); Natanz, Abyaneh, 2253m, 15.vi.2011, leg. Mozaffarian, 1 specimen (HMIM); Fars province: Estahban, 10–11.vi.1996, leg. R. Linnavuori, 1 specimen (NMWC), Shiraz, 29°37'N 52°31'E, 11.vi.2007, leg. Farashiani, 1 specimen (HMIM), Tang-e Bostanak, 8–9.vi.1996, leg. R. Linnavuori, 1 specimen (NMWC), Tang-e Bostanak, 8–9.vi.1996, leg. R. Linnavuori, 1 specimen (NMWC), Zargan, Bamoo Nat. Park, 13–14.vi.1996, leg. R. Linnavuori, 2 specimens (NMWC), Zargan, Bamoo National Park, 13–14.vi.1996, leg. R. Linnavuori, 6 specimens (NMWC), Ghom province: Ghom, 34°38'N 50°53'E, 1.viii., 10.x.1974, leg. Farzaneh, 2 specimens (HMIM); Gilan province: Ganjeh, 14.v.–13.vi.1996, leg. R. Linnavuori, 5 specimens (NMWC), Irandeh, 6–8.vii.1996, leg. R. Linnavuori, 1 specimen (NMWC), Manjil, 22.ix.1998, leg. R. Linnavuori, 1 specimen (NMWC), Tonekabon–Rudbad, 26.5–viii.7.1996, leg. R. Linnavuori, 3 specimens (NMWC), Tonekabon–Rudbad, 6–12.vi.2002, leg. R. Linnavuori, 1 specimen (NMWC), Tonekabon–Rudbar, 29.v–28.vi.1995, leg. R. Linnavuori, 1 specimen (NMWC), Sangrud, 20.ix.1998, leg. R. Linnavuori, 1 specimen (NMWC) Golestan province: Agh Ghala, 3–4 m, 37° 4'N 54° 28'E, 37°1'N 54°26'E, 29.v.2003, leg. Leg. Lashkari, 5 specimens (HMIM); Alagol, 12–13.vii.2003, leg. R. & S. Linnavuori, 2 specimens (NMWC), Incheborun, 22.vii.2005, leg. R. & S. Linnavuori, 1 specimen (NMWC), nr. Azadshahr, 11–12.vii.2006, leg. R. Linnavuori, 1 specimen (NMWC); Hormozgan province: Geno mountain, Baghe-Tang, 470m, 7–8.v.1977, leg. Pazuki, 1 specimen (HMIM); Kerman province: Jiroft, Esfandagheh Rd., 1685m, 28°41'46.3"N 57°19'30.2"E, 29.iv.2012, leg. Mozaffarian, 1 specimen (HMIM), Jiroft, Mohamadabad, 3–4.v.1973, leg. Borumand, 1 specimen (HMIM); Kerman province: Sarcheshmeh, 19.v.1996, leg. R. Linnavuori, 1 specimen (NMWC); Khorasan-e Razavi province: Dargaz, 15.vi.1994, leg. R. Linnavuori, 10 specimens (NMWC), Khalkanlu, 30 K. E. Ghuchan, 7.vi.1994, leg. R. Linnavuori, 14 specimens (NMWC), Khargh, 70 km SW Quchan, 8–9.vi.1994, leg. R. Linnavuori, 1 specimen (NMWC), nr. Sabzevar, 3.vi.1994, leg. R. Linnavuori, 8 specimens (NMWC), Shourlokh, 35 km SW. Sarakhs, 30.iv.1994, leg. R. Linnavuori, 1 specimen (NMWC); Khorasan-e Shomali province: Nodeh, 30–40km ESE Bojnurd, 11.vii.1994, leg. R. Linnavuori, 1 specimen (NMWC); Kohkiluyeh va Boyerahmad, 2 specimens (HMIM), Kuhgol Fal., 3022m, 30° 52'N 51° 31'E, 15.vi.2009, leg. Mozaffarian, 1 specimen (HMIM); Markazi province: 5 km Gharhabad, 1570 m, 35° 6'N 49° 46'E, 15.viii.2006, leg. Mozaffarian, 1 specimen (HMIM), Saveh, 17.vi.1999, leg. Mozaffarian, 1 specimen (HMIM), Saveh, 25.vi.1982, 21.x.1998, leg. Farzaneh, 3 specimens (HMIM), Markazi province: Varcheh, nr. Arak, 3–4.vi.2005, leg. R. & S. Linnavuori, 8 specimens (NMWC); Semnan province: 20 Km SW. Biarjomand, 13–14.v.1996, leg. R. Linnavuori, 2 specimens (NMWC), Semnan, 16–17.vii.2005, leg. R. Linnavuori, 1 specimen (NMWC), Semnan, 23.vii.2004, leg. R. & S. Linnavuori, 2 specimens (NMWC); Sistan va Baluchestan province: Khash-Sardya Rd., Hajiabad, 1538m, 28°23'3" N 61°11'11.7"E, 23.iv.2012, leg. Mozaffarian, 2 specimen (HMIM), Tehran, Evin, 16.viii.1972, 17.vi.1971, 25–27.vii.1971, leg. Sabzevari, 13 specimens (HMIM); Zanjan province: Mamalan, 4–6.vi.2002, leg. R. Linnavuori, 1 specimen (NMWC), nr. Mamalan, 12–14.v.2001, leg. R. Linnavuori, 1 specimen (NMWC).

Distribution and habitat. North Africa, Southern Europe, Yugoslavia, Transcaucasia, Northern parts of Western Asia, Iran, Afghanistan, Central Asia (Mozaffarian & Wilson, 2011). The species has a rather general distribution in Iran (Fig. 30), being in accordance with the rather wide range of distribution of the species in Palaearctic, from north Africa to central Asia. Dlabola (1981, 1971) mentioned this species as an arboreal–pontomediterranean and transeremian faunal element. The species has been recorded from steppes in mountains, on broad leaf plants such as *Acer*, *Quercus*, in vineyards and gardens with *Citrus*, palm and pomegranate and on *Tamarix* from 220 m to 2000 m elevation in Iran (Dlabola 1981) and from 4 m to 3022 m elevation in this study. The wide range of the recorded elevation for this species, along with its wide geographic distribution in various latitudes are remarkable. Possible occurrence of cryptic species among the populations of this taxon or its high ability for adapting to very different environmental biotopes need to be investigated more thoroughly. The species is

also reported as a ‘pest’ on *Quercus* in Northern and Western Iran (Abaii 2000) but no record was found to confirm any economic damage caused by this species.

***Tettigometra (Tettigometra) angulata* Lindberg, 1948**

(Figs 14a–d and 31)

Tettigometra angulata Lindberg, 1948: 19

T. angulata Lindberg: Dlabola (1972) [listed], Nast (1972) [listed], Mirzayans (1995), Mozaffarian & Wilson (2011).

Material examined. Alborz province: Karaj, Azadbar, 70 km W. Karaj, 2410 m, 10.vii.1995, leg. R. Linnavuori, 1 specimen (NMWC); Azarbayjan-e Sahrghi: Majareh-Khalkhal, 22.vii.1996, leg. R. Linnavuori, 1 specimen (NMWC); Esfahan province: Kashan, 33°59'N 51°26'E, 25.v.1970, leg. Abaii, 1 specimen (HMIM); Fars province: 10 km S. Dehbid, 2000 m, 14.vi.1996, leg. R. Linnavuori, 1 specimen (NMWC); Kerman province: Rafsanjan, 30°24'N 55°58'E, 17.iv.1971, leg. Safavi/ Zairi, 2 specimens (HMIM); Kohkiluyeh va Boirahmad province: 2 specimen (HMIM).

Distribution and habitat. Transcaucasia, Turkey, Israel, Iran, Afghanistan and Central Asia (Mozaffarian & Wilson 2011). Distribution in Iran is from northwest to south (Fig. 31). The known distribution of the species in Iran appears to be in the continuation of the distributional area of the species in the west of Palaearctic. However, it remains absent in east parts of Iran, not connecting Central Asia and Afghanistan populations known for this species. Dlabola mentioned this species as arboreal-pontomediterranean (Dlabola 1981) and arboreal-Caspian faunal element that is found in semi deserts and steppes (Dlabola 1972). The elevation for the examined specimens ranges between 2000 m and 2410 m.

***Tettigometra (Tettigometra) demavenda* Dlabola, 1981**

(Figs 15 and 32)

Tettigometra demavenda Dlabola, 1981: 170

T. demavenda Dlabola: Dlabola (1981), Mozaffarian & Wilson (2011), Mozaffarian (2013).

Material examined. Mazandaran province: Gazanak, Hazarchal, 1400m, 20–21.vii.1970, 1 specimen (NMPC).

Distribution and habitat. The species is considered endemic as it has been recorded only from Iran (Fig. 32), in steppes in mountain areas, with elevation 1400–2400 m (Dlabola 1981).

***Tettigometra (Tettigometra) depressa* Fieber, 1865**

(Figs 16a–b)

Tettigometra depressa Fieber, 1865: 563

T. depressa Fieber, 1865: Nast (1972) [listed], Mozaffarian & Wilson (2011) [listed].

Material examined. The record of this species is included here because it was listed by Nast (1972), however with no locality record. There was no Iranian specimen of this species in available museum collections. The examined specimens used for the identification key and the figures in this study belong to MNHN (Paris) and was not originally collected from Iran.

Distribution and habitat. Dlabola (1981) mentioned the species as an arboreal-pontomediterranean faunal element which is distributed from west Mediterranean to west Siberia. Distribution in Iran is unknown.

***Tettigometra (Tettigometra) impressifrons* Mulsant et Rey, 1855**

(Figs 17a–b and 33)

Tettigometra impressifrons Mulsant et Rey, 1855: 211

Material examined. Chahar Mahal-e Bakhtiari province: Shahr-e Kord, leg. Esfandiari, 4 specimens (HMIM). The species is recorded for the first time from Iran.

Distribution. Northern Africa, Western and Southern Europe and Western Asia. According to the examined material, the species is distributed in the western part of Iran (Fig. 33). The only record of this species in Iran might indicate the eastern border of its distribution.

***Tettigometra (Tettigometra) pseudovitellina* Mitjaev, 1971**

(Figs 18a–b and 34)

Tettigometra pseudovitellina Mitjaev, 1971: 75

T. pseudovitellina Mitjaev: Dlabora (1981), Mozaffarian & Wilson (2011), Moosavi Mahvelati & Modarres Awal (2011), Mozaffarian (2014).

Material examined. Azarbayjan-e gharbi Province: maku, 19-20.vi.1970, 2 specimens (NMPC); Tehran province: Tehran, Evin, 16.viii.1971, leg. Sabzevari, 1 specimen (MNHN). The species was described by Mitjaev (1971) very briefly in the body of an identification key with three figures. Two specimens were borrowed from NMHN and NMPC for this study and both of them were already identified by Dlabora. However, there appear to be some differences between those specimens and the illustrations in the original description. Hence, the identification of many similar specimens in HMIM and NMWC needs to be confirmed by comparing with the type specimen of *T. pseudovitellina*.

Distribution and habitat. Kazakhstan (Nast 1972). In dry fields and semi-deserts with Alhagi (Dlabora 1981). Recorded distribution in Iran is in the north of the country, on southern slopes of Alborz Mountain (Fig. 34). The long distance between the Iranian records and also with type locality in central Asia, highlights the necessity of the revision of the taxa.

***Tettigometra (Tettigometra) sororcula* Horváth, 1897**

(Figs 19a–c and 35)

Tettigometra sororcula Horváth 1897a: 90

T. sororcula Horváth: Dlabora 1994, Mozaffarian & Wilson (2011).

Material examined. Azerbaiejan-e Sharhi province: Kalibar, 38°51'47.5"N, 46°58'35"E, 1793m, 2.ix.2007, leg. Mozaffarian, 1 specimen (HMIM).

Distribution. Western, southern and eastern Europe, western Asia and Iran (Dlabora 1994). The species has already been recorded from Iran but without locality mentioned. We report here the only available locality for this species (Northwest of the country, fig. 35). It has been found at 1793 m altitude. Distribution of this species in the west of Iran appears to be in the continuation of the distribution of this species in Europe and western Asia.

***Tettigometra (Tettigometra) sulphurea* Mulsant et Rey, 1855**

(Figs 20a–b and 36)

Tettigometra sulphurea Mulsant et Rey, 1855: 209

T. sulphurea Mulsant & Rey: Mirzayans *et al.* (1976), Dlabora (1981), Mirzayans (1995), Mozaffarian & Wilson (2011), Mozaffarian (2014).

Material examined. Alborz province: Karaj, 15.x.1974, leg. Sabzevari, 1 specimen (HMIM); Azerbajian-e Sharhi province: Tabriz, Osku, Kandovan, 37°54'N 46°05'E, 1.x.1975, leg. Sadeghzadeh, 8 specimen (HMIM), Ahar-Kalibar Rd., 15 km Kalibar, 1582 m., 38°45'N 47°6'E, 2.ix.2007, leg. Mozaffarian, 1 specimen (HMIM); Esfahan province: Chadegan, Zayandehrood river, 2065m., 32°43'N 50°44'E, 20.vi.2009, leg. Mozaffarian, 1 specimen (HMIM), Daran, 32°58'N 50°24'E, 30.vi.1970, leg. Safavi / Haschemi, 1 specimen (HMIM), Ghom-Esfahan, 29.vi.1970, leg. Safavi / Haschemi, 1 specimen (HMIM); Fars province: 16 km N. Shiraz, 14.vi.2002, leg. R. Linnavuori, 1 specimen (NMWC), Fasa, Mianjangal, 18-19.vi.2006, leg. R. Linnavuori, 1 specimen (NMWC),

Firuzabad, 15–16.vi.2006, leg. R. Linnavuori, 1 specimen (NMWC), Gavkoshak, 29°38'N 51°48'E, 27.vi.1975, leg. Abaii, 1 specimen (HMIM), Maharl, 14–15.vi.2003, leg. R. & S. Linnavuori, 2 specimens (NMWC), Maharl, 1718.vi.2002, leg. R. Linnavuori, 3 specimens (NMWC), Mianjangal, 18–19.6.2006, leg. R. Linnavuori, 1 specimen (NMWC), Sarvestan, 10.vi.1996, leg. R. Linnavuori, 1 specimen (NMWC), Zargan, Bamoo Nat. Park, 13–14.vi.1996, leg. R. Linnavuori, 1 specimen (NMWC); Ghazvin province: Takestan, Band-e Delavar, 5.vii.2006, leg. Mozaffarian / Nematian, 1 specimen (HMIM); Ghom province: Salafchegan, Dizjan, 1550m., 29.vii.1997, leg. Barari/ Mofidi, 1 specimen (HMIM); Gilan province: Sangrud, 19–20.viii.2002, leg. R. & S. Linnavuori, 2 specimens (NMWC), Sangrud, 20.ix.2007, leg. R. Linnavuori, 4 specimens (NMWC), Sangrud, 21.ix.2000, leg. R. Linnavuori, 6 specimens (NMWC), Sangrud, 4.viii.1998, 19–20.viii.2002, leg. R. Linnavuori, 5 specimen (NMWC), Sangrud, Jirandeh, 25.vi. 1996, leg. R. Linnavuori, 1 specimen (NMWC); Golestan province: Golestan National Park, Sulgerd, 1150m., 20–21.vii.1996, leg. Ebrahimi/ V. Nazari, 1 specimen (HMIM); Hormozgan province: Bandar-Abbas, Geno Mountain, Bagh-e Tang, 410m, 27°24'N 56°12'E, 7–8.v.1977, leg. Pazuki, 1 specimen (HMIM); Kermanshah province: 30 Km Kermanshah-Sanandaj Rd., Cham-e Luch, 2.vii.1975, leg. Nuri, 1 specimen (HMIM), Ravansar, 18.ix.1976, leg. Nuri, 1 specimen (HMIM); Khorasan-e Shomali province: Zard, 100 km WNW Bojnurd, 13.7.1994, leg. R. Linnavuori, 4 specimen (NMWC); Kordestan province: 15Km Sanandaj, 13.vii.1975, 2 specimens (HMIM); Markazi province: 30km. Delijan, 33°59'N 50°40'E, 29.VI.1970, leg. Safavi/ Haschemi, 1 specimen (HMIM); Tehran province: Evin, 12–13.vii.1974, 3 specimens (HMIM).

Distribution and habitat. Southern, Western and Eastern Europe, North parts of Western Asia, Iran, Afghanistan and Central Asia (Mozaffarian & Wilson 2011). The distribution of the species in Iran (Fig. 36) appears to be in the continuation of its distribution from western European countries to, north and northeast of Iran. Dlabola (1981) recognized this species as an arboreal-pontomediterranean faunal element which can be found in forest steppes and steppes with *Alhagi*, *Artemisia*, *Populus alba* and *Salix*. The examined specimens has also been attracted to a light trap and found on alfalfa and sunflower fields, vineyards and near water with *Typha*, *Mentha* sp. and *Salix*. The examined specimens were collected from 410 m to 2650 m elevation which is a noticeable range. The wide distribution range of the species together with the noticeable morphological variation of the species might suggest hight ability of adapting to various environmental conditions including different elevations. However, the possibility of the existence of cryptic species may be another explanation.

***Tettigometra (Tettigometra) varia* Fieber, 1865**

(Figs 21a–b and 37)

Tettigometra varia Fieber, 1865: 565

T. varia Fieber: Dlabola (1981), Mirzayans (1995), Mozaffarian & Wilson (2011).

Material examined. Esfahan province: Ghamsar, Ghazaan, 14.vi.11, leg. Mozaffarian, 1 specimen (HMIM), Taragh, Keshe, 1768m, 17.vi.11, leg. Mozaffarian, 1 specimen (HMIM); Fars province: Khanezenyan, 13–14.vi.2003, leg. R. Linnavuori, 1 specimen (NMWC); Ghom province: Ghom, 34°38'N 50°53'E, 7.xi.1975, leg. Sabzevari, 1 specimen (HMIM); Kerman province: Kerman, 22–23.v.1996, leg. R. Linnavuori, 2 specimens (NMWC), Sarcheshmeh, 2225m, 19.v.1996, leg. R. Linnavuori, 3 specimens (NMWC); Khorasan-e Razavi province: 70 km West Dargaz, 14.vi.1994, leg. R. Linnavuori, 6 specimens (NMWC), Khalkanlu, 30 K. E. Ghuchan, 7.vi.1994, leg. R. Linnavuori, 2 specimens (NMWC), Parvand, 70 km W Sabzevar, 31.1.vi.1994, leg. R. Linnavuori (NMWC), Zoshk, 24.v.1994, leg. R. Linnavuori, 4 specimens (NMWC); Khorasan-e Shomali province: Golestan Park, 150 km West Bojnurd, 14.vii.1994, leg. R. Linnavuori, 1 specimen (NMWC), Zard, 100 km WNW Bojnurd, 13.vii.1994, leg. R. Linnavuori, 6 specimens (NMWC); Lorestan province: Borujerd, 4–5.vi.2005, leg. R. Linnavuori, 1 specimen (NMWC); Markazi province: Saveh, 8–9.vi.2003, leg. R. Linnavuori, 1 specimen (NMWC).

Distribution and habitat. Eastern Europe, Jordan, Afghanistan and Central Asia (Mozaffarian & Wilson 2011). Recorded distribution in Iran along with the label data of the examined material shows the distribution of the species in Northeast, west and south of Iran (Fig. 37) which can be considered as the continuation of its distributional area. Dlabola (1981) mentioned this species as an arboreal-pontomediterranean faunal element. The species is found in steppe woods with *Juniperus* (Dlabola 1981, Holzinger *et al.* 2003) and has been found in the elevation of 1000 m to 2225 m.

***Tettigometra (Tettigometra) virescens* (Panzer, 1799)**

(Figs 22a–b and 38)

Fulgora virescens Panzer, 1799: 12

T. virescens (Panzer): Lashkari *et al.* (2009).

Material examined. There wasn't any Iranian specimen of this species available in this study. The examined material used for figures belonged to MNHN and was collected from other parts of the world.

Distribution and habitat. According to Nast (1972) the species is distributed in the countries in Northern Africa, Western, Southern and Eastern Europe, and Western Asia. The recorded distribution in Iran is in Northeast (Fig. 38). The species is found in woody margins and in xerothermic places on low vegetation with *Pinus* and *Juniperus* (Nickel 2003). Lashkari *et al.* (2009) recorded the species in the elevation of 2300m in Northeast of Iran.

***Tettigometra (Tettigometra) vitellina* Fieber, 1865**

(Figs 23a–b and 39)

Tettigometra vitellina Fieber, 1865: 566

T. vitellina Fieber: Barkhordari *et al.* (1981), Dlabola (1981), Mirzayans (1995), Mirzayans *et al.* (1976), Nast (1972), Mozaffarian and Taghizadeh (2010), Mozaffarian and Wilson (2011), Mozaffarian (2014).

Material examined. Alborz province: Karaj, 17.vii.1971, 30.ix.1974, leg. Sabzevari, 2 specimens (HMIM); Esfahan province: Esfahan, 3 specimens (HMIM); Fars province: Saadat Shahr, 2.vii.1970, leg. Safavi/ Haschemi, 2 specimens (HMIM), Dasht-e arjan, 20.viii.1970, leg. Safavi / Haschemi, 1 specimen (HMIM); Tehran province: Evin, 16.viii.1971, leg. Sabzevari, 1 specimen (HMIM).

Distribution and habitat. Yugoslavia, Transcaucasia, Northern parts of Western Asia, Afghanistan and Central Asia (Mozaffarian & Wilson 2011). Distribution in Iran is as Fig. 39, which appears to be the continuation of the extralimitted distribution of the species. The published data (Dlabola 1981) showed the present of this species in steppes, semisteppes, mountains, near snow areas, fields with alphalpa, near salt marshes, in swamps with dense grassy cover, places with *Tamarix*, *Alhagi*, *Juniperus*, at the elevation of 1000–3850 m in Iran. The species is also attracted to light.

Conclusions

Tettigometridae accumulate many interesting contrasting macropatterns starting with a small species diversity but a widely distributed taxa from Northern Europe to South African Cape, in Afrotropical, Palearctic and Asia regions, remaining absent from the Nearctics and Australian regions (Bourgoin, 1988a, 1989, 2017). Both these wide longitudinal and latitudinal profiles are also completed with an unexpected large altitudinal distribution from the level of sea to over 3850 m for *T. vitellina* as reported here in Iran—and even higher for some other species in Tibet (unpublished). Particularly in Iran, several species seem distributed at such a large range of altitude that they must carry an exceptional ability to be able to adapt to the different habitats that successively occurs from the sea level to the high mountain. These adaptations to very different climatic conditions must also be linked to diet constraints allowing them to feed on various plants occurring at these different altitudes. This is why we hypothesise that several of the species mentioned here—as well as for most Afrotropical Nototettigometrinae taxa—as currently mainly recognized from male genitalia characters only (most of them on continuous and non-discrete characters difficult to address with certainty), represent groups of cryptic species with more restricted distribution, that molecular investigations may be used to examine in the future.

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References

- Abaii, M. (2000) *Pests of forest trees and shrubs of Iran*. Ministry of Agriculture, Agricultural Research, Education & Extension Organization, Tehran, 178 pp.
- Aléné, D.C., Voula, V.A., Tadu, Z. & Djitéo-Lordon, C. (2016) First record and some aspects of the bio-ecology of *Hilda patruelis* Stål (Hemiptera: Tettigometridae) on *Vernonia amygdalina* Delile (Asteraceae) in Southern Cameroon. *Entomology and Applied Science Letters*, 3 (5), 114–121.
- Amyot, C.J.B. & Audinet-Serville, J.G. (1843) Deuxième partie. Homoptères. Homoptera Latr. *Histoire Naturelle des insects*, Hémiptères, 1843, 1–676.
- Baker, C.F. (1924) Remarks on the Tettigometridae. *Philippine Journal of Science, Manila*, 24, 91–99.
- Barkhordari, M., Samet, Kh. & Farzaneh, A. (1981) Etude préliminaire sur la faune des *Tamarix*. *Journal of Entomological Society of Iran*, 6 (1 & 2), 3–8.
- Behdad, E. (1988) *Pests and diseases of forest trees and shrubs and ornamental plants of Iran*. Neshat Publisher, Esfahan, 824 pp.
- Bourgoin, T. (1986) Etude des Tettigometridae Africains. I. Notes sur le genre *Euphyonarthex* et description de trois nouveaux genres (Hemiptera, Fulgoromorpha). *Nouvelle Revue d'Entomologie*, 3 (3), 293–301.
- Bourgoin, T. (1987) Etude des Tettigometridae Africains. II. un remarquable nouveau genre représentant une nouvelle tribu. Etude de la monophylie de la famille (Hemiptera, Fulgoromorpha). *Nouvelle Revue d'Entomologie*, 4 (4), 393–405.
- Bourgoin, T. (1988a) The world distribution of Tettigometridae (Fulgoroidea): Some questions. *Tymbal*, 11, 15–16.
- Bourgoin, T. (1988b) A new interpretation of the homologies in the Hemiptera male genitalia, illustrated by the Tettigometridae (Hemiptera Fulgoromorpha). *6th Auchenorrhyncha Meeting Proceedings*, Turin, Italie, 1987, 113–120.
- Bourgoin, T. (1988c) Etude des Tettigometridae africains. III. Description d'un nouveau sous-genre et d'une nouvelle espèce d'*Hilda*, et notes sur *Apohilda juno* (Linnauvori) [Hem. Fulgoromorpha]. *Bulletin de la Société Entomologique de France*, 93, 33–37 [33].
- Bourgoin, T. (1989) Les Tettigometridae néotropicaux: des erreurs d'étiquetage (Hem. Fulgoromorpha). *Nouvelle Revue d'Entomologie*, 6 (1), 98.
- Bourgoin, T. (2017) FLOW (Fulgoromorpha Lists on The Web): A world knowledge base dedicated to Fulgoromorpha. Version 8. Available from: <http://www.hemiptera-databases.org/flow> (accessed 2 September 2017)
- Bourgoin, T., Steffen-Campbell, J.D. & Campbell, B.C. (1997) Molecular phylogeny of Fulgoromorpha (Insecta, Hemiptera, Archaeorrhyncha) The Enigmatic Tettigometridae: Evolutionary affiliations and historical biogeography. *Cladistics*, 13, 207–224.
<https://doi.org/10.1111/j.1096-0031.1997.tb00316.x>
- Dlabola, J. (1971) Taxonomische und chorologische Ergänzungen der Zikadenfauna von Anatolien, Iran, Afghanistan und Pakistan (Homoptera: Auchenorrhyncha). *Acta entomologica Bohemoslovaca*, 68 (6), 377–396.
- Dlabola, J. (1972) Beiträge zur Kenntnis der Fauna Afghanistans. Homoptera Auchenorrhyncha. *Acta Musei Moraviae Scientiae Biologicae*, 16–17, 189–248.
- Dlabola, J. (1984) Neue Zikadenarten von dem Mediterraneum-Raum und Iran mit weiteren Beiträgen zur iranischen Fauna (Hom, Auchenorrhyncha). *Acta Musei Nationalis Pragae*, 40, 21–63.
- Dlabola, J. (1994) Ergänzungen zur iranischen, israelischen und benachbarten Zikadenfaunen mit Beschreibungen 30 neuer Taxone (Homoptera, Auchenorrhyncha). *Acta Musei Nationalis Pragae*, 49B (1993), 1–4, 41–110.
- Dlabola, J. & Jankovic, L. (1981) Drei neue Erythria-Arten und einige Ergänzungen der jugoslawischen Zikadenfauna. *Bulletin de l'Academie Serbe des Sciences et des Arts Classe des Sciences Mathématiques et Naturelles Sciences Naturelles*, 75 (21), 67–79.
- Emeljanov, A.F. (1980) An attempt of subgeneric division of the genus *Tettigometra* Latr. *Vestnik Zoologii*, 2, 51–55.
- Fennah, R.G. (1952) On the classification of the Tettigometridae (Homoptera: Fulgoroidea). *The Transactions of the Royal Entomological Society of London*, 103 (7), 239–255.
<https://doi.org/10.1111/j.1365-2311.1952.tb01066.x>
- Fieber, F.X. (1865) Synopse der europ. Arten *Tettigometra*. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien*, 15, 561–572.
- Germar, E.F. (1818) Bemerkungen über einige Gattungen der Cicadarien. *Magazin der Entomologie, Halle*, 3, 177–227.
- Germar, E.F. (1821) Bemerkungen über einige Gattungen der Cicadarien. *Magazin der Entomologie, Halle*, 4, 1–106.
- Ghauri, M.S.K. (1964) The male genitalia of *Phalix titan* Fennah (Homoptera : Tettigometridae). *Proceedings of the Royal Entomological Society of London (B)*, 33 (3–4), 53–55.
<https://doi.org/10.1111/j.1365-3113.1964.tb01609.x>
- Gradojević, M. (1931) Contribution to the knowledge of the pests of the southern Serbian poppy, *Tettigometra hexaspina* Klti. Hemiptera - Homoptera -Tettigometridae *Glasnik Jugoslovenskog entomološkog društva*, V, 97–102. [1930, in Serbian]

- Guérin-Méneville, F.E. (1834) Essai d'un nouvel arrangement des Hémiptères de la section des Homoptères, et révision de la tribu des Fulgorelles. In: *Voyage aux Indes Orientales, par le Nord de l'Europe (...) pendant les années 1825–1829*. C. M. Bélanger, Arthur Bertrand Libr>Edit., Paris, pp. 445–480.
- Haghshenas, A. & Khajeali, J. (2000) Leafhoppers (Homoptera: Auchenorrhyncha) fauna of potato fields in Chagar Mahal and Bakhtiari province. *Fourteenth Iranian Plant Protection Congress (Isfahan)*, Isfahan, 2000, 249.
- Holzinger, W.E., Kammerlander, I. & Nickel, H. (2003) *The Auchenorrhyncha of central Europe, Fulgoromorpha, Cicadomorpha excl. Cicadellidae*. Koninklijke Brill, Leiden/Boston, 673 pp.
- Horváth, G. (1891) Hemipteres recueillis dans l'Armenie Russe avec la description d'espèces et variétés nouvelles. *Revue d'Entomologie. Publiee par la Societe Francaise d'Entomologie*, 10, 68–81.
- Horváth, G. (1897) Description d'Hemipteres nouveaux et notes diverses. *Revue d'Entomologie*, 16, 81–97.
- Karimzadeh Esfahani, J., Kharrazi Pakdel, A. & Kheyri, M. (1998) Leafhopper (Homoptera: Auchenorrhyncha) fauna of sugarbeet fields in Isfahan province. *Thirteenth Iranian Plant Protection Congress*, Karaj, 1998, 69.
- Kirkaldy, G.W. (1900) Bibliographical and nomenclatorial notes on the Rhynchota. No. 1. *The Entomologist*, 33, 238–243. <https://doi.org/10.5962/bhl.part.3888>
- Kirkaldy, G.W. (1907) Leafhoppers supplement. (Hemiptera). Bulletin. Hawaiian Sugar Planters' Association Experiment Station. Division of Entomology. *Honolulu* 3, 1–186.
- Kolenati, F. (1857) Homoptera Latreille. Leach. Gulaerostria Zetterstedt. in Meletemata Entomologica. *Bulletin de la Société Impériale des Naturalistes de Moscou*, 30, 399–429.
- Lashkari, M., Nouri Ganbalani, G., Mozaffarian, F., Ghorbani, Kh. & Fathi, A. (2009) Faunistic study of planthoppers infraorder Fulgoromorpha (Hem. Auchenorrhyncha) in different climatic regions of Gorgan, Iran. *Journal of Entomological Research*, 1 (2), 119–133.
- Latreille, P.A. (1807) *Genera Crustaceorum et Insectorum. Secundum ordinem naturalem in Familias disposita, iconibus exemplisque plurimis explicata. Tome 3*. A. Koenig, Parisii et Argentorati, 258pp.
- Latreille, P.A. (1810) *Considérations générales sur l'ordre naturel des animaux composant les classes des crustacés, des arachnides, et des insectes; avec un tableau méthodique de leurs genres, disposés en familles*. Chez F. Schoell, Paris, 444 pp.
- Lindberg, H. (1948) Materialien zu einer Monographie der Gattung *Tettigometra* (Hom. Cicad.). *Notulae entomologicae*, 28, 1–40.
- Melichar, L. (1902) Homopteren aus West-China, Persien und dem Sud-Ussuri-Gebiete, St. Petersburg *Museum Zool Annals*, 7, 76–146.
- Melichar, L. (1903) *Homopteren-Fauna von Ceylon*. Dames, F.L. Berlin, 248 pp.
- Mirzayans, H. (1995) *Insects of Iran. The list of Homoptera: Auchenorrhyncha in the Insect Collection of plant Pests & Diseases Research Institute*. Ministry of Agriculture, Agricultural Research, Tehran, 63 pp.
- Mirzayans, A., Borumand, H., Zairi, M. & Rajabi, G. (1976) Insect fauna from province of Fars (Iran) (1). *Journal of Entomological Society of Iran*, 3 (1 & 2), 109–135.
- Mitjaev, I.D. (1971) *Leafhoppers of Kazakhstan (Homoptera -Cicadinea)*. Science of Kazakh SSR, Alma Ata, 211 pp.
- Moosavi, N. & Sadeghi Nameghi, H. (2012) Biodiversity of Auchenorrhyncha in sugar beet fields of Mashhad region and new records for Khorasan Razavi province. *Journal of Sugar Beet*, 28 (1), 7–12.
- Moosavi Mahvelati, N. & Modarres Awal, M. (2011) Faunistic study of Auchenorrhyncha in sugar beet fields of Mashhad and Chenaran. *Journal of Plant Protection*, 25 (3), 34.
- Mozaffarian, F. (2013) A preliminary study on the distribution patterns of endemic species of Fulgoromorpha (Hemiptera, Auchenorrhyncha) in Iran. *Zookeys*, 319, 231–248. <https://doi.org/10.3897/zookeys.319.4159>
- Mozaffarian, F. (2014) Fauna of planthoppers superfamily Fulgoroidea (Hem.: Auchenorrhyncha) in the northwestern Iran. *Journal of Field Crop Entomology*, 4 (1), 1–16.
- Mozaffarian, F. & Taghizadeh, M. (2010) The first report of three leafhoppers & planthoppers from central parts (Tehran, Semnan, Ghom, Ghazvin and Makazi provinces) of Iran. *Nineteenth Iranian Plant Protection Congress*, Tehran, 2010, 129.
- Mozaffarian, F. & Wilson, M.R. (2011) An annotated checklist of the planthoppers of Iran (Hemiptera, Auchenorrhyncha, Fulgoromorpha) with distribution data. *Zookeys*, 145, 1–57. <https://doi.org/10.3897/zookeys.145.1846>
- Muir, F.A.G. (1923) On the classification of the Fulgoroidea (Homoptera). *Proceedings of the Hawaiian Entomological Society*, 5, 205–247.
- Muir, F.A.G. (1924) An Americal Tettigometrid (Homoptera). *Annals of the Entomological Society of America*, 17, 219–222. <https://doi.org/10.1093/aesa/17.2.219>
- Muir, F.A.G. (1930) On the classification of the Fulgoroidea. *Annals & magazine of natural history*, 10 (6), 461–478. <https://doi.org/10.1080/00222933008673237>
- Mulsant, M.E. & Rey, C. (1855) Description de quelques Hémipt. res-Homopt. res nouveaux ou peu connus. *Annales de la Société Linnéenne de Lyon*, 2 (2), 197–249, 426.
- Nast, J. (1972) *Palaearctic Auchenorrhyncha (Homoptera) An annotated check list*. Polish Scientific Publishers, Warsaw, 550 pp.

- Nickel, H. (2003) *The leafhoppers and planthoppers of Germany (Hemiptera, Auchenorrhyncha): patterns and strategies in a highly diverse group of phytophagous insects*. Pensoft Publishers, Sofia-Moscow and Goecke & Evers, Keltern, 460 pp.
- Panzer, G.W.F. (1799) [Fulgora virescens, Fulgora obliqua, Cicada costata, Cicada cruentata, Cicada haemorrhœa, Cicada aethiops, Cicada thoracica, Cicada leporina]. Faunae Insectorum Germanicae initia: oder Deutschlands Insecten, 61, 12–19.
- Rajabi, G. (1989) *Insects attacking Rosaceous fruit trees in Iran. Vol. 3. Homoptera*. Ministry of Agriculture, Tehran, 256 pp.
- Schmidt, E. (1912) Zwei neue Tettigometriden-Gattungen aus der heissen Zone. (Hemiptera-Homoptera). *Deutsche entomologische Zeitschrift*, 1912, 459–462.
- Signoret, V. (1866) Revue du groupe des Tettigométrides Homoptères-Fulgorelles. *Annales de la Société Entomologique de France, Paris*, Series 4, 6, 139–160.
- Song, Z.S., Bartlett, C., O'Brien, L., Liang, A.P., Bourgoin, T. (2018) Morphological phylogeny of Dictyopharidae (Hemiptera: Fulgoromorpha), *Systematic Entomology*. [in press]
- Spinola, M. (1839) Essai sur les Fulgorelles, sous-tribu de la tribu des Cicadaires, ordre des Rhyngotes. *Annales de la Société Entomologique de France. Paris*, 8, 133–337.
- Stål, C. (1866) Hemiptera Homoptera Latr. *Hemiptera Africana*, 4, 1–276.
- Urban, J.M. & Cryan, J.R. (2007) Evolution of the planthoppers (Insecta: Hemiptera: Fulgoidea). *Molecular Phylogenetics and Evolution*, 42, 556–572.
<https://doi.org/10.1016/j.ympev.2006.08.009>
- Vignes, R. & Lebbe, J. (2009) Xper2. Version 2.2 (xpd 1.0). Homepage (free download). Available from: <http://www.infosyslab.fr/lis/?q=en/resources/software/xper2> (accessed 24 January 2018)
- Walker, F. (1851) *List of the specimens of Homopterous insects in the collection of the British Museum. Vol. 3*. British Museum, London, 271 pp.
- Wang, M., Zhang, Y.L. & Bourgoin, T. (2016) Planthopper family Issidae (Insecta: Hemiptera: Fulgoromorpha): linking molecular phylogeny with classification. *Molecular Phylogenetics and Evolution*, 105, 224–234.
<https://doi.org/10.1016/j.ympev>
- Wilson, S.W. (2005) Keys to the families of Fulgoromorpha with emphasis on planthoppers of potential economic importance in the southeastern United States of America (Hemiptera: Auchenorrhyncha). *Florida Entomologist*, 88 (4), 464–481.
[https://doi.org/10.1653/0015-4040\(2005\)88\[464:KTTFOF\]2.0.CO;2](https://doi.org/10.1653/0015-4040(2005)88[464:KTTFOF]2.0.CO;2)
- WoRMS (2017) WoRMS Editorial Board. World Register of Marine Species. VLIZ. Available from: <http://www.marinespecies.org> (accessed 31 August 2017)
- Yeh, W.B. & Yang, C.T. (1999) Fulgoromorpha phylogeny based on 28S rDNA nucleotide sequence. *Chinese Journal of Entomology*, 11, 87–111.
- Yeh, W.B., Yang, C.T. & Hui, C.F. (2005) A molecular phylogeny of planthoppers (Hemiptera: Fulgoidea) inferred from mitochondrial 16S rDNA sequences. *Zoological Studies*, 44 (4), 519–535.