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A new species of *Isometopus* from Iran (Hemiptera: Heteroptera: Miridae: Isometopinae)

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Abstract. A new species, *Isometopus* (*Isometopus*) *linnavuorii* sp. nov., is described from Iran. Illustrations of male genitalia, scanning electron micrographs of male habitus and other selected characters of this new taxon are provided. The diagnosis of the new species is based on a comparison with other congeneric from the Middle East and Europe. The type specimens were deposited in the insect collection of the University of Guilan, Rasht, Iran. *Isometopus* (*Isometopus*) *kaznakovi* Kiritshenko, 1939 and *Isometopus* (*Isometopus*) *mirificus* Mulsant & Rey, 1879 are excluded from the fauna of Iran. The gender agreement is corrected in the name *Isometopus praetermissus* Akingbohungbe, 2012.

Key words. Heteroptera, Miridae, Isometopinae, new species, taxonomy, Guilan province, Iran, Palaearctic Region

Introduction

The subfamily Isometopinae is a group of generally small, strongly cryptic plant bugs with worldwide distribution (Kerzhner & Josifov 1999, Schuh 2013, Cassis & Schuh 2012). The members of this subfamily have paired ocelli between the compound eyes, which easily distinguishes them from other mirid subfamilies. The bugs appear to be generalist predators of soft-bodied insects, such as aphids and scale insects, inhabiting trunks, bark or branches of various broadleaved trees (Hesse 1947, Wheeler & Henry 1978).

Isometopinae currently comprise 5 tribes, 42 genera and 248 species (Linnavuori et al. 1998; Herczek & Popov 2012, 2014; Akingbohungbe 2012, 2013; Henry & Carpintero 2012; Schuh 2013; Namyatova & Cassis 2016, Yasunaga et al. 2013, 2016) of which 19 species are fossil taxa (Herczek 1993; Schuh 2013; Herczek & Popov 2012, 2014). The Isometopini and Myiommini are the most species-rich isometopine tribes worldwide, with 105 and 110 species, respectively. Among the tribe Isometopini, *Isometopus* Fieber, 1860 is the largest genus, comprising 72 species worldwide (Schuh 2013, Aukema et al. 2013). Thirty-eight species are recorded in the Palaearctic Region (Kerzhner & Josifov 1999, Aukema et al. 2013).

Akingbohungbe (1996) revised the subfamily known from Africa, Europe and the Middle East, noting that there were 89 species and one subspecies in that region. Among them, the known records of *Isometopus* in Europe and the Middle East comprise 9 species of the subgenus *Isometopus* s. str. and 4 species of the subgenus *Jehania* Distant, 1911.

According to Kim & Jung (2016), "the main morphological characters of this genus are as follows: generally oval body shape with densely golden pubescences and distinct punctures on the whole body dorsally, the head flattened anteriorly, the ocelli present on the vertex, the width of a compound eye approximately as wide as the vertex, and the antennae cylindrical in form".

The fauna of Iranian Miridae was recently studied by Linnavuori (1997a,b, 1998, 1999a,b, 2000a,b, 2004a,b, 2006, 2007, 2008, 2009, 2010), Linnavouri & Hosseini (1998, 1999, 2000), Hosseini (1997, 2013a,b,c; 2014a,b, 2015, 2016), Linnavuori & Modarres Awal (1999), Magnien & Matocq (2008), and Matocq & Pluot-Sigwalt (2012). An annotated catalog of the Iranian Miridae was compiled by Ghahari & Chérot (2014).

Two species of *Isometopus* were described from Iran: *I. sepherii* Linnavuori, Sarafrazi & Hosseini, 1998 from Guilan and *I. gharaati* Akingbohungbe, 2012 from Fars and West Azerbaijan. Other reported species from Iran, *Isometopus* (*Isometopus*) *kaznakovi* Kiritshenko, 1939 and *I.* (*I.*) *mirificus* Mulsant & Rey, 1879 cited in Aukema et al. (2013), represent a misinterpretation of Linnavuori et al. (1998), where those species were not recorded from Iran but were included only for comparison with *I. sepehrii*. In addition, the record of *I.* (*I.*) *intrusus* (Herrich-Schaeffer 1835) by Abd-Rabou & Ghahari (2006) is uncertain, due to the large number of taxonomic errors in that paper and also because it is unclear if any voucher specimens were deposited for further examination.

In the present study, a new species of *Isometopus* is described based on male specimens collected by light traps at Rasht, Iran. Illustration of male genitalia of the species, scanning electron micrographs of the male habitus and other diagnostic characters of this new taxon are provided.

Material and methods

Examined specimens were collected using light trap. Five dry mounted specimens were examined in this study using a Leica M165 C stereomicroscope. Scanning electron microscope (SEM) images were taken using a Hitachi TM3000 tabletop SEM.

For the examination of genitalia, specimens were softened in 70% ethanol and the male pygophore was removed under the stereomicroscope using sharp forceps, and then macerated in 10% KOH. Following KOH treatment, the pygophore was washed in distilled water and dissected in a drop of glycerol under the stereomicroscope. The dissected parameres and endosoma were studied and photographed using a Canon 600D digital camera attached to a HP 41 microscope. The genitalia were subsequently mounted in a microscopic slide using Hoyer's medium. Figures of parameres and head in frontal view were drawn and treated using Adobe illustrator CS6 ver. 16.0.0.

Measurements of specimens were made using an Infinity Analyze software version 6.2.0 (Lumenera corporation, Canada) based on scaled SEM photographs.

Habitus photographs were taken using a Visionary Digital imaging system (www.visionary-digital.com) comprised of a Canon 5D DSLR camera equipped with a Canon MP E-65mm 1–5× f/2.8 Macro lens. Partially focused images of specimens were combined using Helicon Focus software (http://www.heliconsoft.com). Images were edited using Adobe Photoshop CS3.

Taxonomy

Isometopus (*Isometopus*) *linnavuorii* sp. nov.

(Figs 1–5)

Type material. Holotype: ♂, **IRAN: Guilan:** Rasht (37°11′45″N, 49°38′25″E, 30 m), 27.–30.vii.2014, R. Hosseini lgt. Paratypes: 4 ♂♂, the same data as holotype. The holotype and 3 paratypes deposited in the Natural History Museum of the University of Guilan, Rasht, Iran; one paratype in the University of New South Wales, Sydney, Australia.

Diagnosis. The new species is recognized by the following combination of characters: body length 2.4–2.6 mm, eyes red or silver; ocelli contiguous to the eyes; head brown with black punctures; ocular index 0.9, antennal segments I 0.14–0.15× and II 0.80–0.85× longer than

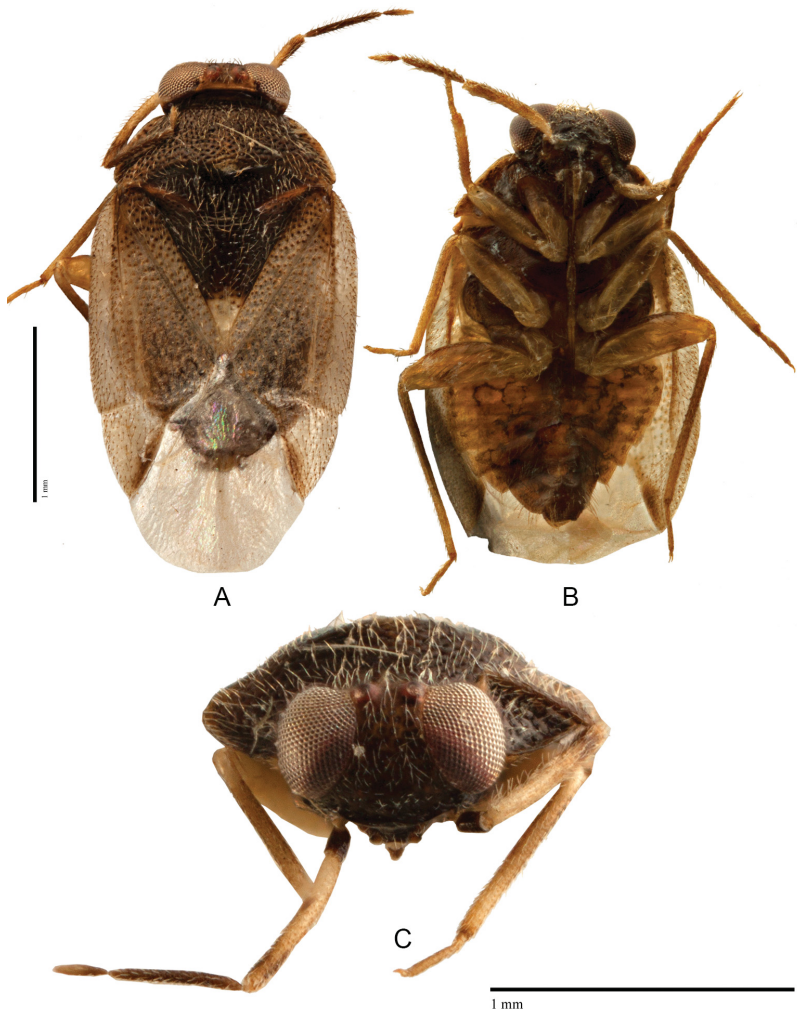

Fig. 1. Habitus photographs of *Isometopus linnavuorii* sp. nov: A – dorsal view, B – ventral view; C – frontal view.

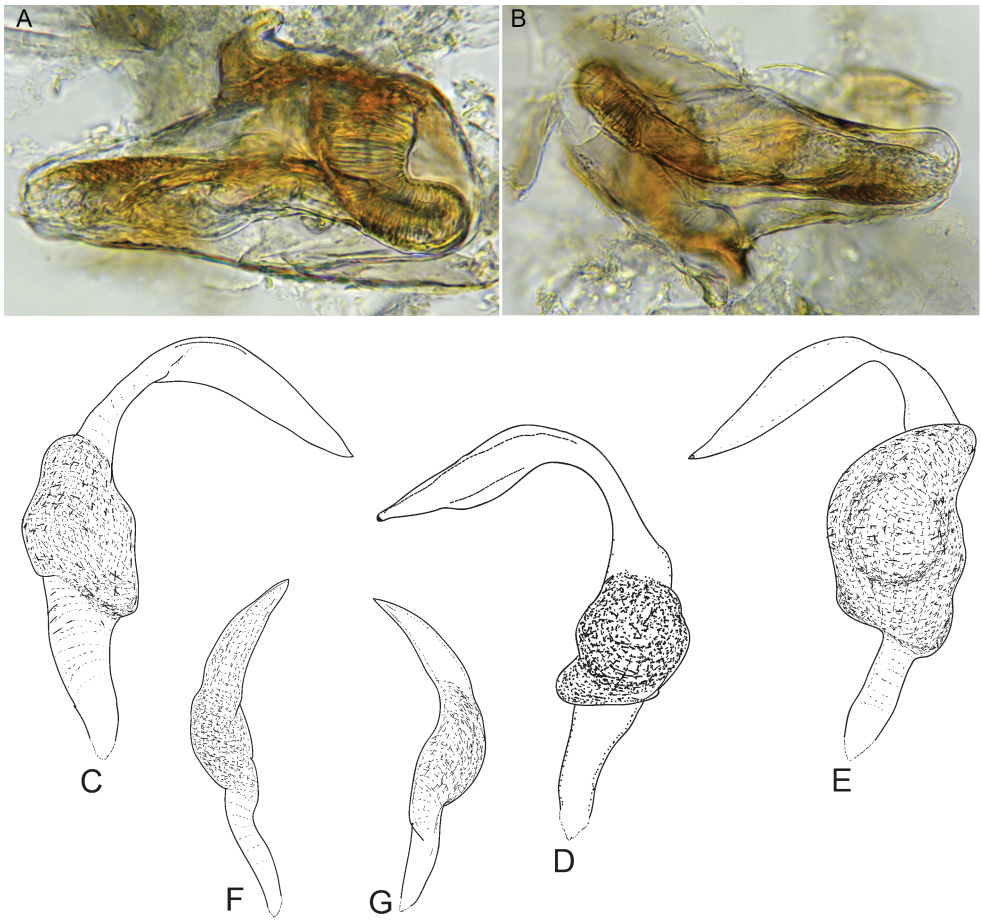

Fig. 2. Male genitalia of *Isometopus linnavuorii* sp. nov.: A, B – endosoma (A – lateral view, B – ventral view); C–E – left paramere, different views; F, G – right paramere, two different views.

width of head, antennal segment II 0.5× longer than posterior width of pronotum. Pronotum 2.75–3.00× wider than long. Height of gena very short, 0.16× as high as eye (Figs 3d,e); head in frontal view 1.6× wider than high, pronotum dark brown, mesoscutum black, punctate, laterally brown, distinctly carinate; scutellum black with disk slightly raised, apex white; hemelytra whitish translucent, abdomen visible through hemelytra.

Description. Male. ***Colouration.*** *Head* brown with dense black punctures, eyes red or silver; ocelli hyaline, surrounded by red annuli; posterior margin of vertex light brown; frontal

part of head between antennifers black or dark brown, antennifer distinctly whitish; gena dark brown or black, maxillary plate brown; clypeus dark brown; labium generally brown with sparse whitish setae; antennal segment I dark brown or black, antennal segment II pale brown, distal end dark brown, segments III and IV dark brown. *Thorax:* pronotum dark brown, with dense black punctures, lateral margins narrowly pale brown and posterolateral angles with pale brown marking; posterior margin of pronotum in the middle with a white marking; mesoscutum black, laterally brown. *Scutellum* black, apex whitish. *Thoracic pleuron*: propleuron light brown with dark punctures, mesepisternum and metepisternum brown, metathoracic scent gland evaporative area brown, peritreme light brown. *Hemelytra* stramineous, translucent, abdomen visible through them, R+M pale brown, cuneus translucent, internally with a pale brown marking, membrane bright hyaline. *Legs* generally pale brown; femora generally dark brown. *Ventral side* of body uniformly brown.

Structure, vestiture and texture. Body elongated, oval. Head densely punctate, eyes glabrous, immediately above the anterior margin of pronotum; ocelli distinctly raised, touching inner margin of eyes; region immediately above the antennifer and lower part of frons ridged; gena short, antennal segment I with a few setae, II–IV covered densely with whitish setae; head covered with whitish setae; labium surpassing metacoxae, reaching abdominal segments III to IV. *Thorax:* pronotum punctate, covered by long, whitish, hair-like setae, collar distinct, calli obsolete, posterior margin broadly bisinuate; propleuron punctate; evaporative area large, triangular shaped, almost same size of metepisternum, peritreme tongue shaped, reaching posterior margin of metepisternum (Fig. 4b). Mesoscutum exposed, punctate. Scutellum punctate, densely covered with long whitish setae, anterior margin of scutellum tumidly rasied, posteriorly acuminate. *Hemelytra:* clavus, anterior part of corium and embolium along to the clavus punctate, cuneus impunctate, cell membrane indistinct, hemelytra covered with golden setae, ventral side of body with whitish setae.

Male genitalia: pygophore covered with long hair-like setae, left paramere hook-shaped, sensory lobe tumid, apophysis tapered (Figs 2c–d), right paramere simple (Figs 2f–g), weakly arcuate, endosoma as in Figs 2a–b.

Measurements (in mm). Body length 2.2–2.5, width 1.29–1.32; lengths of antennal segments: I – 0.1, II – 0.54–0.57, III – 0.34–0.39, IV – 0.13–0.17; ocellar width 0.06–0.09; interocellar width (in dorsal view) 0.06–0.09; width across eyes (in dorsal view) 0.65–0.69; interocular width 0.2; width of eye 0.22; ocular index 0.9; width of head across eyes (in frontal view) 0.64, height of head in frontal view 0.4, width between antennal annuli 0.25; height of eyes from frontal view 0.31; height of gena 0.03 mm; width of pronotum on posterior margin 1.1; length of pronotum in the middle 0.35–0.40; width of anterior part of pronotum 0.45 mm; antennal segment I 0.14–0.15× as long as diatone; antennal segment II 0.80–0.85× as long as diatone; antennal segment II 0.5× as long as basal width of pronotum; pronotum basally 2.75–3.00 times as broad as long as in middle; length of cuneus 0.4; length of labium 1.05; length of scutellum 0.67; width of scutellum at anterior margin 0.74.

Female. Unknown

Differential diagnosis. The new species belongs to the nominotypical subgenus *Isometopus*. It is close to *I. vanharteni*, and in spite of similarity to this and other *Isometopus* species known

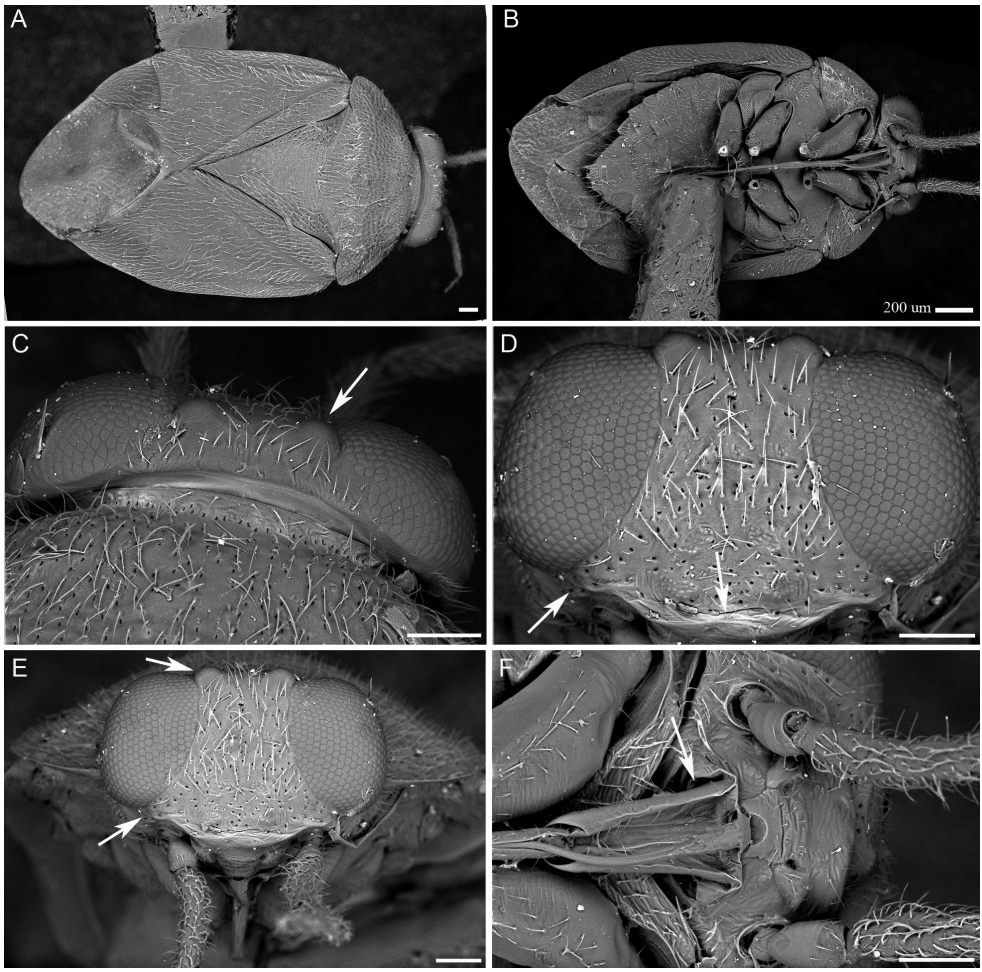

Fig. 3. Scanning electron micrographs of *Isometopus linnavuorii* sp. nov.: A – body in dorsal view; B – body in ventral view; C –head in dorsal view; D, E – head in frontal view; F – head in fronto-ventral view. Scales = 100 μm unless otherwise marked.

from the Middle East and Europe, the new taxon can be readily separated from all other species by using the revised key to the species of *Isometopus* based on Akingbohungbe (2012).

Etymology. The species is named in honour of Dr. Rauno E. Linnavuori, a good friend and colleague who introduced mirid bugs to me for the first time.

Collection circumstances. Collected by light trap near *Populus* sp. trees.

Distribution. Iran (Guilan province).

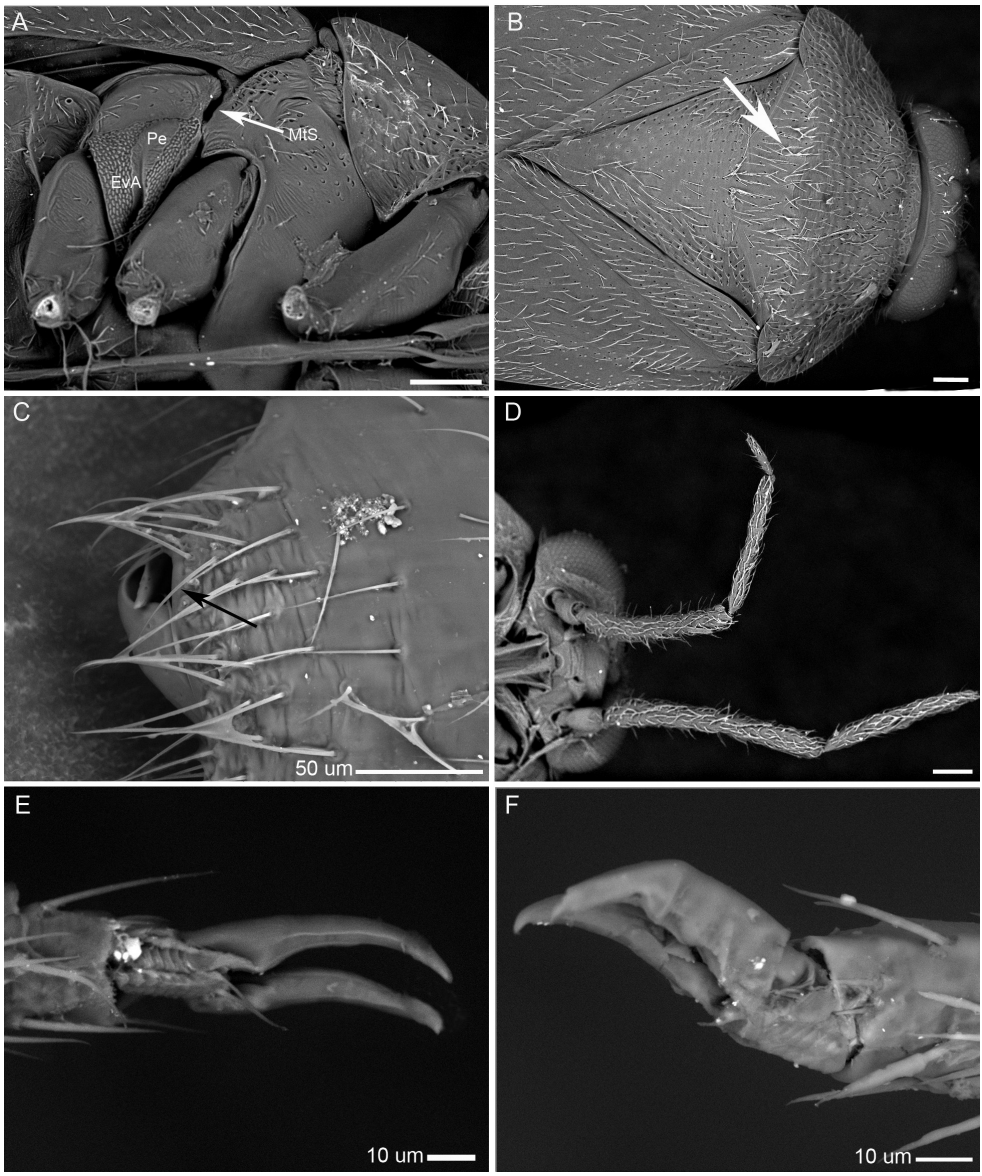

Fig. 4. Scanning electron micrographs of *Isometopus linnavuorii* sp. nov.: A – prothorax, mesothorax and metathorax in lateral view; B – head, pronotum and scutellum in dorsal view; C – pygophore, dorsolateral view; D – antenna; E, F – tarsal claws. Abbreviations: EvA – evaporative area; Mts – metathoracic spiracle; Pe – peritreme. Scales = 100 μm unless otherwise marked.

Key to the species of *Isometopus* known in Europe and the Middle East

(based on males, modified from Akingbohungbe 2012).

1 Apical frontal margin finely carinate or marginate, more or less confluent with clypeus and mandibular plate, which are broadly visible in front. Hemelytra mostly glassy hyaline or at least with broad glassy hyaline bands. Subgenus ***Jehania*** Distant, 1910. 2
– Apical frontal margin strongly carinate, distinctly raised over base of clypeus and mandibular plate which are either strongly deflexed or depressed; if not, hemelytra distinctly opaque and frons ivory-white with contrasting dark punctures. Subgenus ***Isometopus*** Fieber, 1860. 4
2 Ocellar width equal to interocellar width, frons rugose-punctuate. ..... ***I.* (*J.*) *yemenensis*** Akingbohungbe, 2003
– Interocellar width at least 1.6× as broad as each ocellus; frons practically impunctate. 3
3 Ocelli whitish translucent, interocellar width about 3.3× ocellar width; mesoscutum punctate; rostrum largely yellow-brown, reaching seventh abdominal sternite. ..... ***I.* (*J.*) *carinifrons*** Akingbohungbe, 2006
– Ocelli together with surrounding annuli dark-red, interocellar width about 1.6× ocellar width; mesoscutum impunctate; rostrum largely dark reddish-brown to black, reaching fourth abdominal sternite. ..... ***I.* (*J.*) *gharaati*** Akingbohungbe, 2012
4 Interocellar width equal to ocellar width. 5
– Interocellar width at least 1.3× as broad as ocellus. 7
5 Head in frontal view about 1.3× as broad as high; cuneus pale yellow with apical mesal dark brown band. ..... ***I.* (*I.*) *longirostris*** Akingbohungbe, 1996
– Head in frontal view >1.3× as broad as high, cuneus not as above. 6
6 Head in front view about 1.5× as broad as high; antennal segment III dark-red with pale basal and apical extremities; cuneus unicolourous reddish-brown. ..... ***I.* (*I.*) *vanharteni*** Akingbohungbe, 2006
– Head in frontal view about 1.6× as broad as high, cuneus translucent, internally with a pale brown marking. ..... ***I.* (*I.*) *linnavourii* sp. nov.**
7 Interocellar width more than 2× as broad as ocellus. 8
– Interocellar width less than 2× as broad as ocellus. 10
8 Head in front about 1.5× as broad as high; frons at level of ventral margin of eyes with ivory-white transverse stripes separated by distinct punctate grooves. ..... ***I.* (*I.*) *taeniaticeps*** Puton, 1898
– Head in front less than 1.5× as broad as high; frons devoid of distinct ivory-white transverse stripes as indicated above. 9
9 Head from dorsal view rather strongly appressed, over 5× as broad as long; pronotum more than 3× as broad as long. ..... ***I.* (*I.*) *intrusus*** (Herrich-Schaeffer, 1835)
– Head in dorsal view less strongly appressed, about 4× as broad as long or less; pronotum less than 3× as broad as long. ..... ***I.* (*I.*) *diversiceps*** Linnavuori, 1962
10 Head in front 1.2× as broad as high; dorsum largely pale testaceous to ivory-white with broad blue-black blotches and bands. ..... ***I.* (*I.*) *mirificus*** Mulsant & Rey, 1879
– Head in front at least 1.3× as broad as high; dorsum either piceous to blackish or deep yellow to golden suffused with reddish. 11

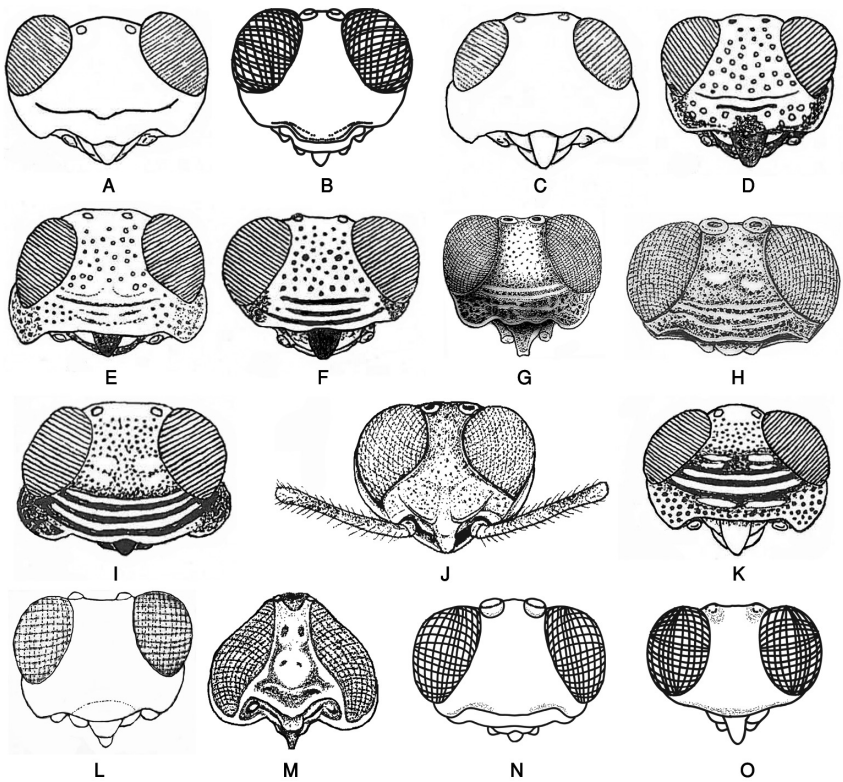

Fig. 5. Head in frontal view. A – *Isometopus diversiceps* Linnavuori, 1962; B – *I. gharaati* Akingbohungbe, 2012; C – *I. intrusus* (Herrich-Schaeffer, 1835); D – *I. mirificus* Mulsant & Rey, 1879; E, F – *I. kaznakovi* Kiritshenko, 1939 (female and male); G, H – *I. praetermissus* Akingbohungbe, 2012 (G – female, H – male); I – *I. quadrifasciatus* Wagner, 1973; J – *I. quadrivittatus* Akingbohungbe, 2003; K – *I. taeniaticeps* Puton, 1898; L – *I. sepehrii* Linnavuori, Sarafrazi & Hosseini 1998; M – *I. yemenensis* Akingbohungbe, 2003; N – *I. vanharteni* Akingbohungbe 2006; O – *I. linnavuorii* sp. nov. Figs A, C, D, E, F, K, I after Wagner (1973); L after Linnavuori et al. (1998); J and M after Akingbohungbe (2003); N after Akingbohungbe (2006) and Figs B, G, H after Akingbohungbe (2012).

11 Dorsum deep yellow to golden suffused with reddish; head in front about 1.32× as broad as high. ..... ***I.* (*I.*) *peregrinus*** Akingbohungbe, 1996
– Dorsum piceous to blackish; head in front about 1.48× as broad as high. 12
12 Membrane of hemelytra densely covered with microsetae, biareolate; gena relatively low, less than 0.1× as high as eye. ..... ***I.* (*I.*) *nigritulus*** Akingbohungbe, 1996
– Membrane of hemelytra glabrous, uniareolate; gena relatively higher, 0.2× as high as eye. ..... ***I.* (*I.*) *praetermissus*** Akingbohungbe, 2012*

* The specific epithet is the Latin adjective praetermissus (-a, -um), meaning permitted, neglected or overlooked. Because the generic name Isometopus is masculine, the gender agreement must be corrected as I. praetermissus (see Article of 31.2 of ICZN 1999).

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