

# The first records of the subfamily Beridinae (Diptera: Stratiomyidae) from Iran

S. Khaghaninia, F. Kazerani

Department of Plant Protection, Tabriz University, Iran

## Abstract

Based on collected specimens from Arasbaran Forests during 2013, four species belonging to 3 genera of the subfamily Beridinae (Diptera; Stratiomyidae) [*Actina chalybea* Meigen, 1804; *Beris schaposchnikowi* Pleske, 1926; *Beris clavipes* (Linnaeus, 1767) and *Chorisops nagatomii* Rozkošný, 1979] were recognised, which are recorded for the first time from Iran. A key to the studied species is provided, as well as diagnostic characters along with photos of the studied species; their geographical distributions are discussed.

## Introduction

Soldier flies of the subfamily Beridinae are small to moderate sized flies and have a worldwide distribution (Woodley, 2011). This subfamily includes more than 30 known species in the Palaearctic region (Woodley, 2011). Beridinae generally prefer rather shaded places in damp woods; few known larvae live in moss, leaf litter, and upper layers of soil (Rozkošný, 1983). Adults feed on nectar and pollen of flowers; in numerous species, males have been seen forming mating swarms (Rozkošný, 1998).

Beridinae is a sister group of other Stratiomyidae excluding Parhadrestitinae and Chiromyzinae, and can be morphologically distinguished from other subfamilies by the following characters: antennal flagellum cylindrical or spindle-shaped, consisting of 8 flagellomeres; scutellum usually with 4-6 spine-like marginal processes; if unarmed, then mid-tibia with an apical spur; all M veins arising from discal, dense microtrichia usually covering the entire wing membrane.

Nagatomi & Tanaka (1972) and Rozkošný (1979) revised 12 Japanese species of the genus *Beris* and the genus *Chorisops*, respectively. Rozkošný & Nartshuk (1980) provided a key to the Palearctic species of the genus *Beris*. Woodley (1981) revised this subfamily in the Nearctic region. Woodley (1987) studied the Afrotropical species of Beridinae. Yang & Nagatomi (1992) studied the Chinese species of the subfamily Beridinae. Woodley (1995) comprehensively revised the genera of this subfamily. Woodley (2001, 2011) provided a world catalogue of Stratiomyidae. Mason (2013) prepared a key to European species of the genus *Chorisops* Rondani, 1856.

As the fauna of the subfamily Beridinae in Iran remains unknown, the overall objective of this study was to investigate the Beridinae fauna in Arasbaran Forests.

## Materials and methods

This study was conducted in Arasbaran Forests during 2013. Arasbaran is a registered biosphere in East Azerbaijan province, northern Iran (Figure 1) and located at 38°40' 22.054" to 39° 08' 24.235" N; 46° 39' 21.023" to 47° 02' 20.125" E. This area has semi-arid steppes, rangelands and forests, rivers and springs with an altitude varying from 256 m to 2896 m, and covering an area of 78,560 hectares. It has been registered as a world heritage site by UNESCO since 1976. Specimens were collected using a sweep net. Collected specimens were killed in killing jars with cyanide. During collecting, the collection date, locality name and altitude were noted for every specimen. Some of the specimens were pinned with 00 and 000 mounted pins, dried, and put into collection boxes, and others were kept in 75% ethanol. All specimens are deposited in the Insect Museum of Tabriz University (IMTU). In order to identify specimens, reference was made to Rozkošný & Nartshuk (1980); Bei-Bienko (1988); Rozkošný (1998) and Mason (2013). The general distribution for each species was followed by Pape & Thompson (2011) and Woodley (2001).

## Results

A total of 4 species belonging to 3 genera of the subfamily Beridinae, *Actina chalybea* Meigen, 1804; *Beris schaposchnikowi* Pleske, 1926; *Beris clavipes* (Linnaeus, 1767) and *Chorisops nagatomii* Rozkošný, 1979, are identified. All studied species are newly recorded for the Iranian insect fauna.

Correspondence: Farzaneh Kazerani, Department of Plant Protection, Faculty of Agriculture, Tabriz University, Tabriz 51664, Iran.  
E-mail: f.kazerani2000@yahoo.com

Key words: Stratiomyidae, Beridinae, new records, Iran.

Acknowledgements: we would like to thank the Talent Students Office of Tabriz University for financial support of this research. The authors extend their sincere thanks to Dr. Martin Hauser (California Department of Food and Agriculture), and Dr. Franco Mason (*Ministero Politiche Agricole e Forestali*, Italy) who kindly provided assistance with the identifications.

Received for publication: 12 January 2014.

Revision received: 26 February 2014.

Accepted for publication: 26 February 2014.

©Copyright S. Khaghaninia and F. Kazerani, 2014

Licensee PAGEPress, Italy

Journal of Entomological and Acarological Research 2014; 46:2239

doi:10.4081/jea.2014.2239

This article is distributed under the terms of the Creative Commons Attribution Noncommercial License (by-nc 3.0) which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

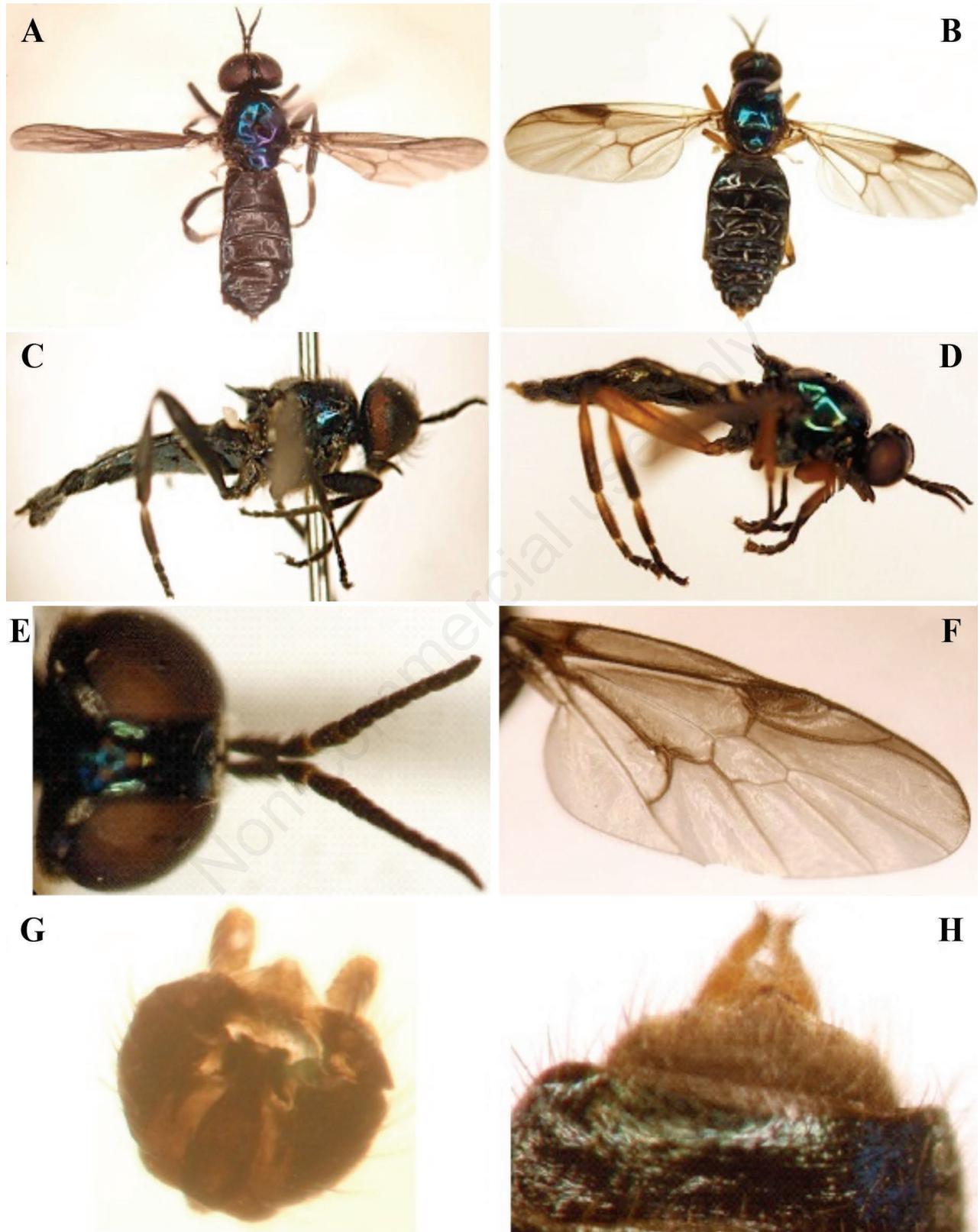


Figure 1. *Actina chalybea* Meigen, 1804; A) dorsal view of male, B) dorsal view of female; C) lateral view of male, D) lateral view of female, E) dorsal view of head (male), F) wing venation (male), G) male genitalia, H) female terminalia.

## Key to the studied species of the subfamily Beridinae

- i) Palpi absent or very small; male eyes contiguous;  $M_3$  absent (*Beris* Latreille): 2
  - Palpi well-developed, three-segmented; male eyes separated;  $M_3$  present: 3
- ii) Ground colour of abdomen orange to yellowish brown, with a dark brown preapical transverse stripe on each tergite (Figure 2A and B); male genitalia as in Figure 2G: *B. clavipes* (Linnaeus)
  - Ground colour of abdomen brown or black (Figure 3A and B); male genitalia as in Figure 3G: *B. schaposchnikowi* Pleske
- iii) Legs mainly black (in European species) (Figure 1C and D); male frons and face with long black hairs; wing-membrane entirely covered with dense microtrichia (*Actina* Meigen) (Figure 1F); epandrium very narrow, median process of synsternum poorly developed, covered with small spines on inner surface, parameres rather slender, longer than aedeagus (Figure 1G): *A. chalybea* Meigen
  - Legs predominantly yellow (Figure 4B); frons and face with only very short pale hairs; cells  $bm$  and  $Cu$  partly bare, with reduced wing microtrichia (Figure 4C) (*Chorisops* Rondani); abdomen with an extensive yellow pattern (Figure 4A); genitalia as Figure 4F: *C. nagatomii* Rozkošný

## List of studied species

### Genus *Actina* Meigen, 1804

#### *Actina chalybea* Meigen, 1804

**MATERIAL EXAMINED:** (15♀, 10♂): Chichekli (located in west part of Qaradagh forests), 38° 40' 58.68" N, 46° 31' 53.64" E, 2243 m, 4 Jun 2013; (6♀, 4♂): Aynali region (located in almost west of Qaradagh forests); 38° 50' 57.06" N, 46° 54' 35.46" E, 1613 m asl, 3 Jul 2013; leg. S. Khaghaninia.

**DISTRIBUTION:** Armenia, Austria, Azerbaijan, Bulgaria, Czech Republic, France, Georgia, Germany, Hungary, Italy, Poland, Romania, Russia, Slovakia, Spain, Switzerland, Ukraine, Yugoslavia.

**DIAGNOSTIC CHARACTERS:** A dark species with shining metallic thorax and entirely (males) or mainly (females) black legs (Figure 1B and C); antennae longer than frons in lateral view (Figure 1E).

**MALE:** eyes separated and densely haired, face subshining black, whitish pollinose along eye margin, frons and face with long black hairs; antennae black, scape densely hairy, about 1.5 times as long as pedicel (Figure 1E); scutellum with 4 spines; legs completely black (Figure 1C); wing: vein  $M_3$  usually vestigial (Figure 1F); halteres pale yellow; abdomen dark brown to black, subshining (Figure 1A); male genitalia: epandrium very narrow, median process of synsternum poorly developed as Figure 1G.

**FEMALE:** frons wider than in male, eyes with very short sparse hairs, frons and face with very short hairs; thoracic pile entirely pale yellow, short and adpressed on mesonotum; bases of all femora and tibia extensively yellow (Figure 1D); abdomen black, subshining (Figure 1B), female terminalia as in Figure 1H.

### Genus: *Beris* Latreille, 1802

#### *Beris clavipes* (Linnaeus, 1767)

**MATERIAL EXAMINED:** (20♀, 12♂): Mekidi valley (located almost in center of Qaradagh forests): 38° 50.864' E 46° 54.901' N, 1426 m, 14. Jul. 2013; (8♀, 10♂): Chichekli (located in west part of Qaradagh forests): 38° 30' 34.02" N, 46° 37' 23.46" E, 1689 m, 07 Jul 2013; leg. Khaghaninia.

**DISTRIBUTION:** Austria, Belgium, Bulgaria, Czech Republic,

Denmark, England, Estonia, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine, Wales.

**DIAGNOSTIC CHARACTERS:** wings smoky blackish in both sexes; abdomen orange, with dark preapical lines; hind tibiae yellow, at most darkened at extreme distal tips.

**MALE:** eyes contiguous, with short but dense hairs; antennae long and slender, flagellum longer than two basal segments combined (Figure 2E); thorax shining black, covered with mainly erect black hairs; scutellum with 6 spine-like, hairy processes; legs: all femora yellow; tibiae yellow, fore and mid-tibiae darkened on distal half, hind tibiae darkened only at tip, Tarsi black, hind basitarsus swollen, longer than the other tarsal segments (Figure 2C); wings extensively blackish infuscated, vein  $M_3$  absent (Figure 2F), halteres yellowish-brown, darkened at base; abdomen ochre-yellow, the first segment often blackish on both sides, dark preapical transverse lines distinct on tergites (Figure 2A); male genitalia: median process of synsternum high (Figure 2G).

**FEMALE:** frons wide, flagellum of antenna often longer than in male; hind tibiae entirely yellow, hind basitarsus long but not swollen as in male (Figure 2D); halteres yellow; abdomen ochre-yellow, including base, the black preapical lines distinct (Figure 2B); female terminalia as in Figure 2H.

#### *Beris schaposchnikowi* Pleske, 1926

**MATERIAL EXAMINED:** (7♀, 1♂): Chichekli (located in west part of Qaradagh forests), 38° 40' 58.68" N, 46° 31' 53.64" E, 2243 m, 4 Jun 2013; leg. S. Khaghaninia.

**DISTRIBUTION:** Russia, Georgia, Azerbaijan.

**DIAGNOSTIC CHARACTERS:** Body pile pale yellow, legs mainly yellow; abdominal tergites 2-5 virtually without pollen.

**MALE:** antennae inserted just below middle of head profile (Figure 3E); eyes contiguous with short and dense hairs; thorax shining black, metallic green on mesonotum, edges of humeri yellowish and postalar-calli brownish; scutellum with 6 spines; legs mainly pale yellow, but fore and hind coxa black; fore and mid-tarsi darkened from tips of basitarsus onwards; hind tarsus brown, hind basitarsus long and swollen (Figure 3C); wings slightly yellowish with brown pterostigma (Figure 3F); halteres entirely yellow; abdomen black (Figure 3A); male genitalia as in Figure 3G.

**FEMALE:** eyes with very short but relatively dense pale hairs; frons and face black, subshining, with dense but short, yellowish hairs; thorax shining black with pile pale yellow, metallic green reflections on mesonotum and scutellum; legs yellow, darkened only on fore coxae and all tarsi, but hind basitarsus yellow (Figure 3D); wings almost hyaline, all veins pale yellow, only pterostigma dark brown (Figure 3B); abdomen shining brown, only 1<sup>st</sup> tergite and the narrow anterior margin of tergite 2 greyish dusted, other tergites virtually without any pollen (Figure 3B); female terminalia as in Figure 3H.

### Genus *Chorisops* Rondani, 1856

#### *Chorisops nagatomii* Rozkošný, 1979

**MATERIAL EXAMINED:** (1♀): Oskulu region (located in near center of Qaradagh forests); 38° 51' 48.78" N, 46° 50' 45.54" E, 1667 m, 02 Aug 2009; leg. Khaghaninia.

**DISTRIBUTION:** England, Austria, Switzerland, Britain, France, Czech Republic, Germany, Ireland, Italy, Romania, Slovakia, Switzerland, Netherlands, Ukraine.

**DIAGNOSTIC CHARACTERS:** pterostigma usually pale, yellow (Figure 4C); abdominal tergites mainly yellow (Figure 4A), two basal segments also with dorsal yellow patches; wing with bare area in cell  $Cu$  extending beyond cubital fork; male synsternum without median

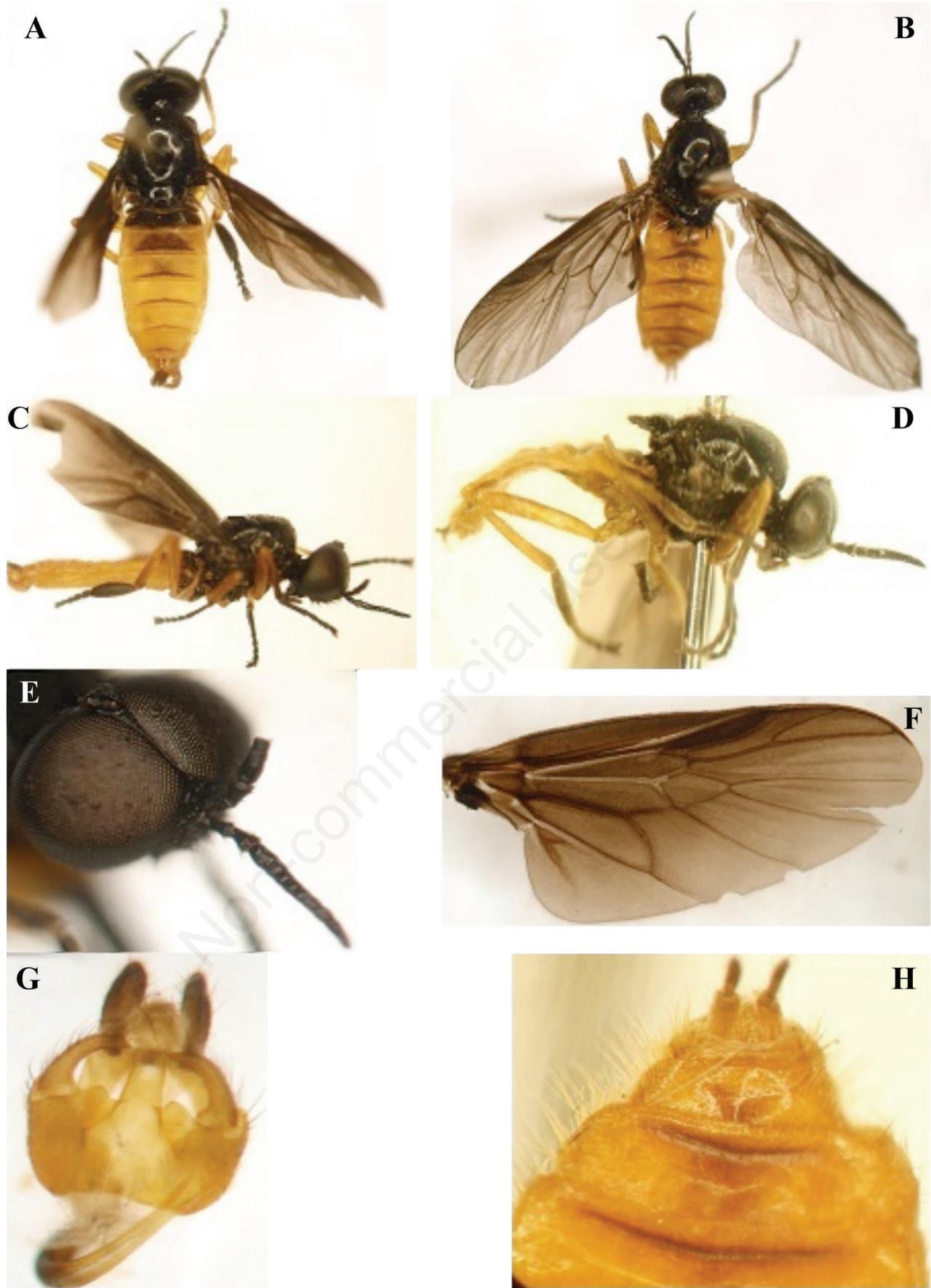


Figure 2. *Beris clavipes* (Linnaeus, 1767); A) dorsal view of male, B) dorsal view of female, C) lateral view of male, D) lateral view of female, E) dorsal view of head, F) wing venation, G) male genitalia, H) female terminalia.

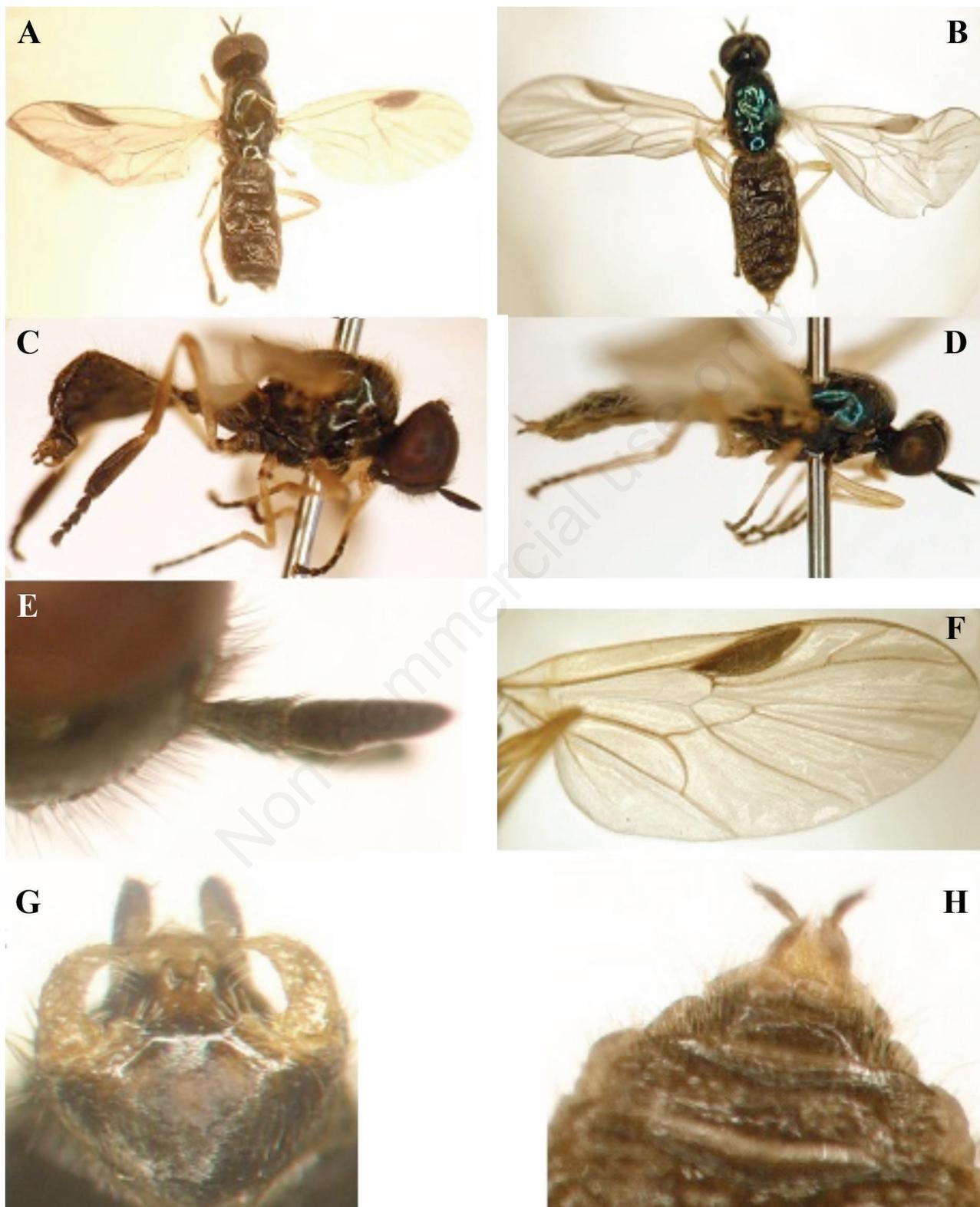


Figure 3. *Beris schaposchnikowi* Pleske, 1926; A) dorsal view of male, B) dorsal view of female, C) lateral view of male, D) lateral view of female, E) dorsal view of head, F) wing venation, G) male genitalia, H) female terminalia.

process (Figure 4F).

MALE: face entirely whitish pollinose; antennae about as long as head in lateral view, black inner part of pedicel and first segments of flagellomere yellow, inserted slightly above middle of head, last flagellomere cylindrical (Figure 4D); thorax dark, metallic green to shining violet with yellowish pile; humeri, postalarcalli and scutellar spines contrasting yellow (Figure 4E); Legs mainly yellow including coxae, hind femur thickened in apical half and darkened except basal part, hind tibia brown, except for base, elongate-conical, gradually thickened towards apex, all tarsi brown, only posterior basitarsus yellowish basally to varying degrees (Figure 4B); wings hyaline with pale brown veins and pale pterostigma, vein M<sub>3</sub>

reduced (Figure 4C); halteres pale yellow; abdomen subshining brown in ground-colour, tergites 3-6 with extensive yellow median patches that only leave the lateral margins brown, narrow preapical transverse lines distinct at tergites 3-6, posterior margins of tergite 6 darkened (Figure 4A); male genitalia as in Figure 4F.

## Discussion and conclusions

Woodley (1995) studied the relationships of the 33 genera of

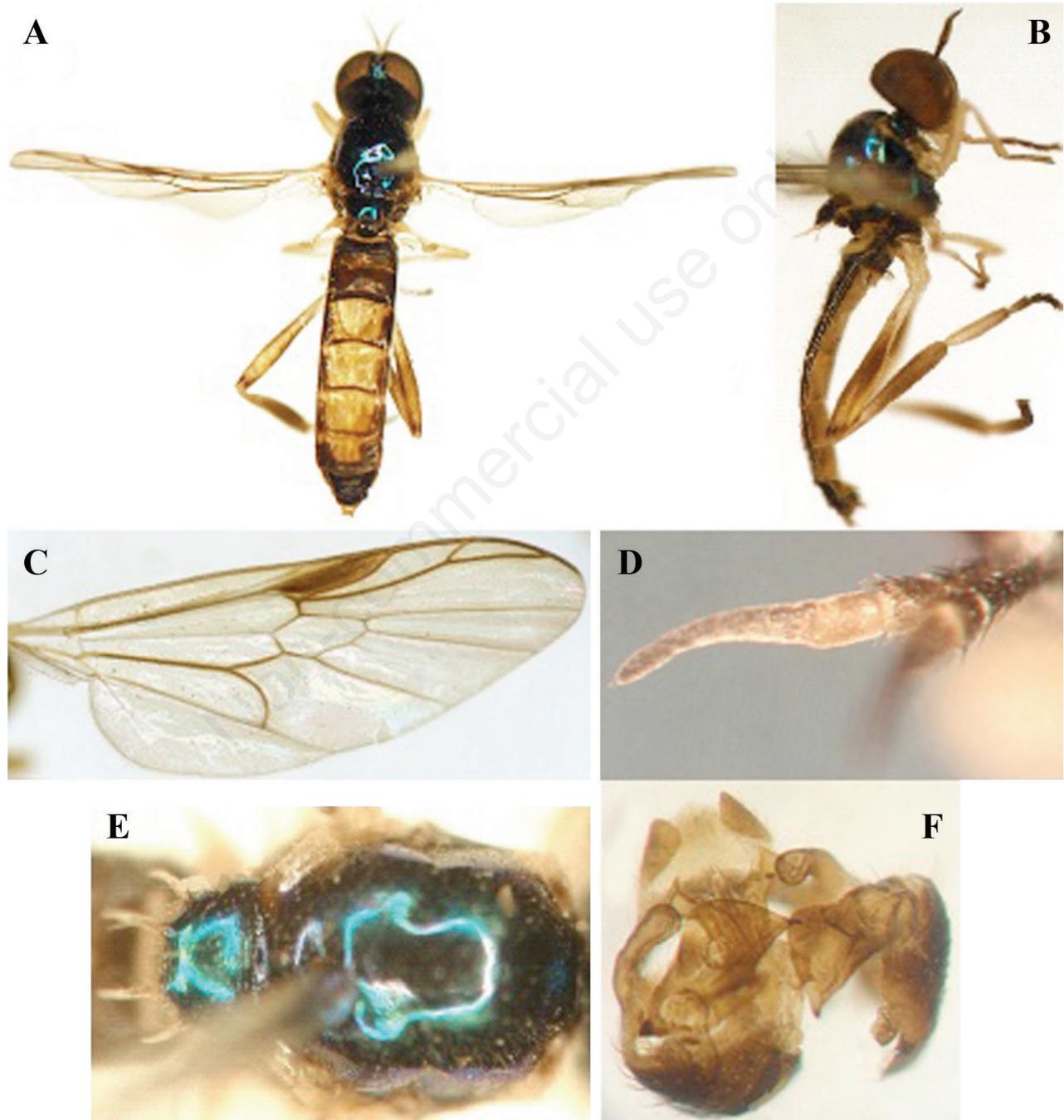


Figure 4. *Chorisops nagatomii* Rozkošný, 1979 (male); A) dorsal view, B) lateral view, C) wing venation, D) antenna, E) dorsal view of mesonotum and scutellum, F) male genitalia.

Beridinae based on 22 adult morphological characters, using a parsimony analysis and as a result of this analysis, the subfamily was divided into the *Beris* and *Actina* groups. Among the studied species in this study, the species of the genus *Beris* are grouped in the *Beris* group and the species of the genera *Actina* and *Chorisops* are situated in the *Actina* group.

All studied species were collected from forest areas. Rozkošný (1998) stated that *A. chalybea* is common in open lowland deciduous forest and *B. clavipes* was found in wet moss near a spring, adults are rather frequent on the leaves of shrubs and low foliage near springs and streams; also, *C. nagatomii* was found in refuse washed up in a muddy stream.

Rozkošný (1998) noted that *B. schaposchnikowi* is probably restricted to the Caucasian region and our records extend the range of distribution of this species in the region.

Fauna of the subfamily Beridinae in adjacent countries like Turkey has been poorly studied (Üstüner & Hasbenli, 2003; Üstüner & Hasbenli, 2011). Comparing these studies with the results of the present study, it can be concluded that fauna of this subfamily in the Arasbaran Forests is relatively rich, and further studies are necessary in these forests and other forests in northern Iran.

## References

- BEI-BIENKO, G., 1988 - Keys to the insects of the European part of the USSR (Vol. V). Diptera and Siphonaptera (Part II). - Smithsonian Institution Libraries and the National Science Foundation, Washington DC: 987 pp.
- MASON F., 2013 - Updated Italian checklist of Soldier Flies (Diptera, Stratiomyidae). - ZooKeys. 336: 61-78.
- NAGATOMI A., TANAKA A., 1972 - The Japanese *Beris* (Diptera, Stratiomyidae). - Mem. Fac. Agric. Kagoshima Univ. 8: 87-113.
- PAPE T., THOMPSON F.C., 2011 - Systema Dipteriorum. Version 2.0. Available from: <http://www.diptera.org> Accessed: 20 Jul 2013.
- ROZKOŠNÝ R., 1979 - Revision of the Palaearctic species of *Chorisops*, including the descriptions of a new species (Diptera, Stratiomyidae). - Acta Ent. Bohem. 76: 127-136.
- ROZKOŠNÝ R., NARTSHUK E.P., 1980 - Two new species of *Beris*, with a key to the Palaearctic species of the genus (Diptera, Stratiomyidae). - Acta Ent. Bohem. 77: 408-418.
- ROZKOŠNÝ R., 1983 - A biosystematic study of the European Stratiomyidae (Diptera), Introduction, Beridinae, Sarginae and Stratiomyinae (vol. 1). - Series Entomologica, Hague: 401 pp.
- ROZKOŠNÝ R., 1998 - Family Stratiomyidae. Manual of Palaearctic Diptera (Chapter 24). - Science Herald, Budapest: 387-411.
- ÜSTÜNER T., HASBENLI A., 2003 - First record of the Subfamily Beridinae (Diptera: Stratiomyidae) from Turkey. - Studia Dipterologica. 10: 186-188.
- ÜSTÜNER T., HASBENLI A., 2011 - The first record for two species of the soldier flies (Diptera: Stratiomyidae) from Turkey. - J. Agr. Sci. Tec. 1: 231-237.
- WOODLEY N.E., 1981 - A revision of the Nearctic Beridinae (Diptera: Stratiomyidae). - Bull. Mus. Comp. Zool. 149: 319-367.
- WOODLEY N.E., 1987 - The Afrotropical Beridinae (Diptera: Stratiomyidae). - Ann. Natal. Mus. 28: 119-131.
- WOODLEY N.E., 1995 - The genera of Beridinae (Diptera: Stratiomyidae). - Mem. Proc. Entomol. Soc. Wash. 16: 1-231.
- WOODLEY N.E., 2001 - A world catalog of the Stratiomyidae (Insecta: Diptera). - North American Dipterists' Society, Washington, DC: 475 pp.
- WOODLEY N.E., 2011 - A world catalog of the Stratiomyidae (Insecta: Diptera): a supplement with revisionary notes and errata. In: THOMPSON F.C., BRAKE I., LONSDALE O. (Eds.), Contributions to the biosystematic database of world Diptera. III ed. - MYIA, Sofia-Moscow: 485-521.
- YANG D., NAGATOMI A., 1992 - A study on the Chinese Beridinae (Diptera: Stratiomyidae). - S. Pac. Stud. 12: 129-178.