

## FOUR NEW SPECIES OF LIMONIIDAE (DIPTERA, NEMATOCERA) FROM THE INNER-WEST ANATOLIAN SUBREGION OF TURKEY

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### ABSTRACT

Four new species of Limoniidae (Diptera) are described from the Inner-West Anatolian subregion of Turkey (provinces of Afyonkarahisar, Kütahya and Uşak), and their male genitalia are illustrated for *Ellipteroides (Protogonomyia) murati* **sp. nov.**, *Molophilus* (s.str.) *aktashi* **sp. nov.**, *Molophilus* (s.str.) *hasbenli* **sp. nov.** and *Orimarga* (s.str.) *attautena* **sp. nov.** Characteristic features of the habitats of each species in the localities in which they were collected are given.

Key Words: crane flies, Tipuloidea, *Ellipteroides*, *Molophilus*, *Orimarga*

### RESUMEN

Cuatro nuevas especies de Limoniidae (Diptera) de la región centro-oeste de Anatolia en Turquía (provincias de Afyonkarahisar, Kütahya y Uşak), *Ellipteroides (Protogonomyia) murati* **sp. nov.**, *Molophilus* (s.str.) *aktashi* **sp. nov.**, *Molophilus* (s.str.) *hasbenli* **sp. nov.** y *Orimarga attautena* **sp. nov.** fueron descritas y la genitalia masculina ilustrada. Se proveen características de los hábitats de cada especie en las localidades donde fueron recolectadas.

Palabras Clave: moscas grúa, Tipuloidea, *Ellipteroides*, *Molophilus*, *Orimarga*

Members of Limoniidae are long-winged and stilt-legged, thin and delicate bodied crane flies of small to moderate size (usually between 2 mm and 11 mm) as compared to the Tipulidae. Generally their coloration varies between dull yellow to black (Oosterbroek 2006). One of the major groups of the crane flies (Tipuloidea), the family Limoniidae is among the largest families of Diptera includes 10,526 species and subspecies worldwide of which 1,630 species are known from the Palearctic region, and of the latter 727 are distributed in the Western Palearctic (Oosterbroek 2014).

As a result of previous studies on the Turkish fauna of Limoniidae in some regions of Turkey, such as the eastern Black Sea subregion (Koç et al. 2005; Starý & Oosterbroek 2008; Oosterbroek 2009), Muğla province (Koç 2004), Aydın province (Özgül et al. 2006), West Turkey (Parvu & Popescu-Mirceni 2006), Southeast Anatolia (Koç, 2008) and then the Inner-West Anatolian subregion (Özgül & Koç 2010; Özgül & Koç 2012), a total of 114 limoniid species have been determined from Turkey to date. The 4 new species described herein were also collected from the Inner-West Anatolian subregion.

### MATERIALS AND METHODS

This study is based on 27 male and 20 female specimens collected between 2009 and 2011 from

the provinces of Afyonkarahisar, Kütahya, and Uşak, located in the inner part of western Anatolia. The adults were collected from aquatic and semi-aquatic habitats by a sweep net (40 cm Ø). For illustrations, male genitalia were dissected and cleared according to Dieneske (1987). Habitat information of the 4 new species was given according to Pollet (2000). The illustrated morphological parts were stored in small capsules with glycerol. Terminology of morphological features generally follows that of McAlpine (1981). Classification follows Oosterbroek (2014). These specimens were preserved either in 70% mixture of alcohol and glycerin (3:1) solution or by pinning and drying and they were deposited in Collection of the Zoological Laboratory of the Department of Biology, Muğla University, Muğla, Turkey (ZMMU) and Collection of J. Starý, Olomouc, Czech Republic (JSO).

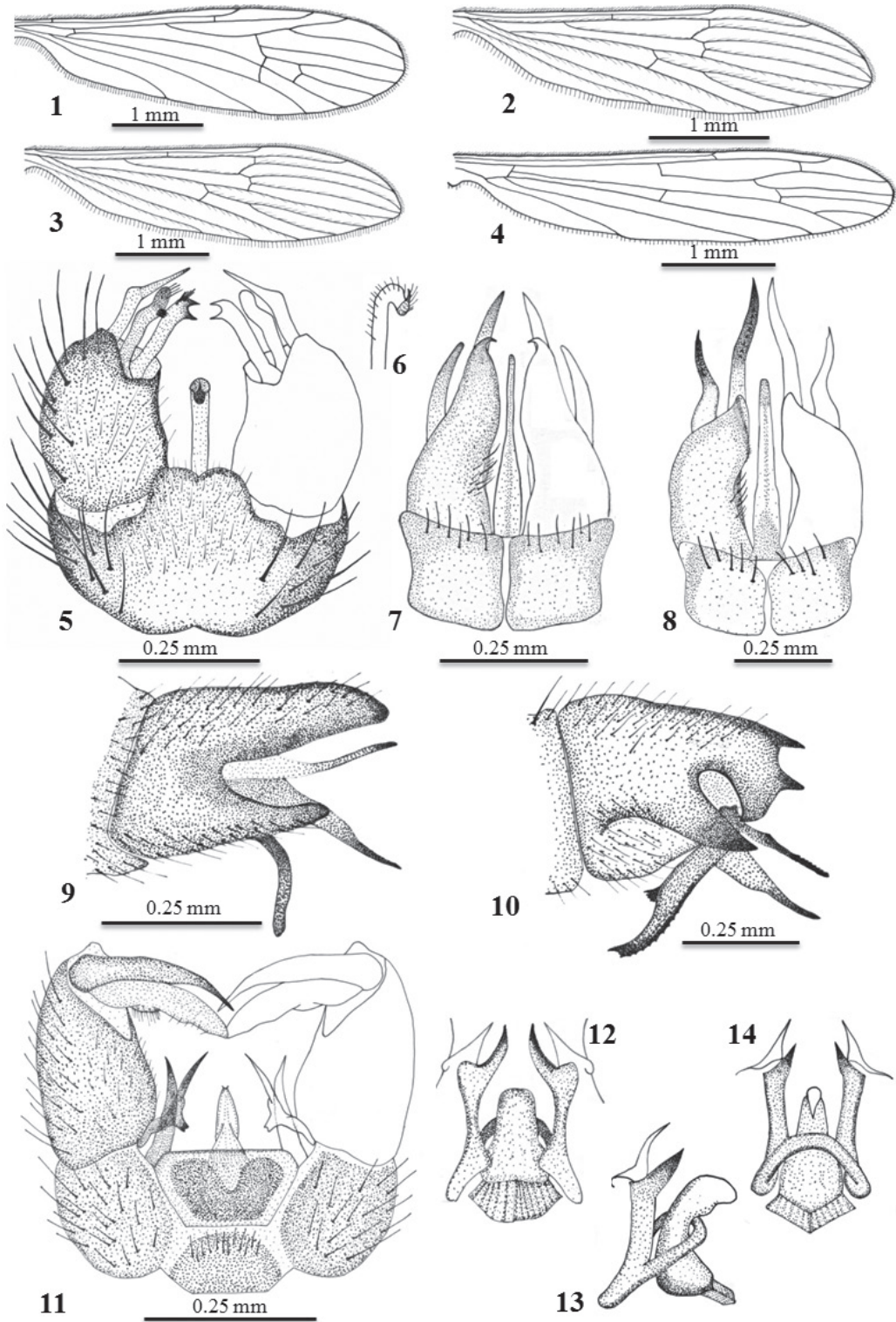
### SYSTEMATICS

Family Limoniidae

Subfamily Chioneinae

*Ellipteroides (Protogonomyia) murati* **sp. nov.**  
(Figs. 1, 5 and 6)

Diagnosis



Figs. 1-14. Diagnostic characters of the 4 new species of Limoniidae. 1-4. Wings, 5-14. Male terminalia (5,7,8,11,12: dorsal view; 6,9,10,13: lateral view; 14: ventral view); aedeagus: 6; aedeagal complex:12-14. 1, 5, 6. *El-lipteroides* (*Protogonomyia*) *murati* **sp. nov.**, 2, 7, 9. *Molophilus* (s.str.) *aktashi* **sp. nov.**, 3, 8, 10. *M.* (s.str.) *hasbenli* **sp. nov.** and 4, 11-14. *Orimarga* (s.str.) *attautena* **sp. nov.**

General body coloration yellowish dark brown. Antenna long, reaching base of the wing, if bent backwards. Head blackish brown; thorax brown and abdomen dark brown. Wing normal in length. Crossvein m-cu close to the base of discal cell. The basal half of femur yellowish brown, the remaining dark brown. Gonostylus with 3 parts. The dorsal gonostylus sharp-ended and the ventral gonostylus bifurcated at the tip. Aedeagus long and upturned. Female cerci very short and reduced. Body length 5.5-7 mm, wing length 5-6 mm, antenna length 1.7-1.9 mm.

#### Male

Head. Frons and nape blackish-brown; cheeks and rostrum yellow; palp brown except for the yellow last segment. Antenna 16-segmented; scapus, pedicellus and the first 4 flagellar segments oval and brown, others cylindrical and varying between brown to yellow. All flagellar segments with long spine-like setae, frons and vertex with long, black and spine-like setae.

Prothorax light brown; mesonotum brown with 3 brown-black longitudinal stripes, the median line bearing a lighter median streak. Scutum and scutellum brown. Pleura below wing base and between spiracles patterned with a brown spot, yellow colored except for the spot and brown lower half of the sternopleura; stem of the halter dull yellow, knob beige.

Wing membrane with yellowish tone, brown veined.  $Sc_2$  is 3 times longer than  $Sc_3$ .  $Sc_1$  is connected to radius slightly beyond  $Rs$  median; 3 branches of  $Rs$  reaching wing margin.  $R_2$  absent. Discal cell on distal half of the wing.  $M_1$  and  $M_2$  fused. Crossvein m-cu at the base of discal cell (Fig. 1). Coxa and trochanter light brown, femur and tibia yellow at the basal half, yellow to brown in the other half. Tarsus brown, tarsal claws without secondary teeth.

Coloration of abdomen, including hypopygium, varying between brown and dark brown; while anterior of tergite 1, lateral appendages and posterior margins of segments yellow. Segment 9 dorsally robust and forward projected, ventrally incurved as of letter "M". Gonocoxite dome-shaped, distal half with 3-lobed gonostylus. Ventral gonostylus spatula-shaped, distally with 2 strong and equal-sized spines; median gonostylus short and light-colored, upturned, enlarged to form a tubercle, at the distal end with numerous thin setae and furthermore on distal inner margin with few short spines; dorsal gonostylus naked, long, hook-shaped, upturned and with a pointed tip (Fig. 5). Aedeagus rod-shaped, on distal half thin haired and towards the end beak-like curved upwards (Figs. 5 and 6).

#### Female

Similar to male in general morphology and coloration. Cercus and hypovalve reduced and

modified as in all *Ellipteroides* (*Protogonomyia*) species.

#### Remarks

*Ellipteroides* (*Protogonomyia*) *murati* **sp. nov.** is closely related to *Ellipteroides* (*Protogonomyia*) *adrastea* Stary & Mendl, 1984, from which it differs by varying between dark brown and yellow coloration of abdomen, ventrally incurved distal ending of tergite 9. The clearest differences between *E. (P.) murati* **sp. nov.** and *E. (P.) adrastea* Stary & Mendl, 1984, are in the male genitalia, especially the structure and chaetotaxy of the ventral gonostylus. In *E. (P.) murati* **sp. nov.**, this gonostylus is spatula-shaped and without setae.

General morphology of ovipositor and membranous valves similar to those of *Ellipteroides* (*Protogonomyia*) *adrastea* Stary & Mendl, 1984, from which it differs by female cercus longer than tergite 10, distally thinner and upturned, and with blunt tip.

#### Type Material

HOLOTYPE (male): Kütahya, Tavşanlı, Tavşanlı-Harmancık road 10. km, (N 39° 38' E 29° 17'), 902 m, 24-VII-2009. PARATYPES: (10 ♂♂, 10 ♀♀) same data as for holotype; 1 ♂, 1 ♀ paratypes (JSO) and 18 paratypes (ZMMU).

#### Distribution

Turkey (Kütahya).

#### Etymology

This species is named in honor of Prof. Dr. Murat BARLAS, a specialist on aquatic and semi-aquatic insects.

#### Habitat

Fenlands, humid grassland, humid coniferous woodland.

*Molophilus* (*Molophilus*) *aktashi* **sp. nov.**  
(Figs. 2, 7 and 9)

#### Diagnosis

General body coloration yellowish dark brown. If bent backwards, antenna, of moderate length, not reaching to the wing base. Head dark brown; thorax yellowish brown and abdomen dark brown. Wing normal in length. Discal cell absent. The basal half of femur yellowish brown, the remaining brownish black. Male terminalia with outer gonostylus sharp-ended and distal half of

outer gonostylus thin unlike its base. Aedeagus slim and longer than outer gonostylus. Cerci of female ovipositor of medium length and width within the genus, upturned and pointed at tip. Body length 3.5-4.5 mm, wing length 4-5 mm, antenna length 1-1.5 mm.

#### Male

Head brownish-black. Rostrum, antennae and palpi grayish brown, last segments of the palpi darker. Antenna with 14 oval flagellar segments, with setae shorter than the segment itself.

Thorax yellowish-brown. Wing blackish-brown, except for the base and around spiracle 1. Mesonotum with 4 distinct brownish-black stripes and a light median band. Scutum and scutellum brownish-black. Coxa and trochanter yellow-brown, as in the tibia and basal half of the femur, distal half of which ranging between dark brown to black. Tarsal segments black-brown. Metatarsus length more or less equal to the total length of remaining tarsal segments.

Wing membrane with yellow tone; brown veined;  $Sc_2$  at the level of  $R_s$  middle;  $Sc_1$  long,  $Sc_1$  and  $R_5$  extending beyond  $R_s$  furcation, both at the same line. Discal cell absent (Fig. 2).

Abdomen dark brown, at posterior margins of segments with narrow yellow rings. Hypopygium yellow brown, sternite 9 short, more or less straight at the posterior margin, tergite 9 length of  $\frac{1}{3}$  of the gonocoxite. Lateral aspect of gonocoxite, a broadly rounded lateral lobe on dorsal and ventral parts tapering towards the shortened and finger-like blunt tip. Inner and outer gonostylus dark pigmented at the tip. Inner gonostylus blunt-ended and strongly bent at its distal  $\frac{2}{3}$ . Outer gonostylus enlarged on its basal half, while on the distal half becoming thinner with pointed tip. Aedeagus slender and elongated (Figs. 7 and 9).

#### Female

Similar to male in general morphology and coloration. However, body length, wing length and length of antenna of female is shorter than that of male.

#### Remarks

In general appearance, *Molophilus (Molophilus) aktashi* **sp. nov.** is practically identical with *Molophilus* (s. str.) *medius* de Meijere, 1918. However, the new species can be distinguished from *M. (s. str.) medius* de Meijere, 1918 by having darker general coloration. The clearest differences between the new species and *M. (s. str.) medius* de Meijere, 1918 are in male genitalia, especially the structure of the inner gonostylus

and the outer gonostylus. In the new species, the inner gonostylus is blunt-ended. The outer gonostylus is straight-ended and enlarged on its basal half in *M. (s. str.) aktashi* **sp. nov.**

#### Type Material

**HOLOTYPE** (male): Turkey: Kütahya, Simav, Kızılcık Village, (N 39° 16' E 28° 39'), 1161 m, 16-VII-2011. **PARATYPES** (1 ♂, 1 ♀): 1 /, same data as for holotype (ZMMU). 1 ♂, Kütahya, *Domanıç*, Kocayayla Village, Kocayayla Pass, (N 39° 52' E 29° 39'), 1265 m, 24-VII-2009 (JSO).

#### Distribution

Turkey (Kütahya).

#### Etymology

This species named in the memory of Prof. Dr. Metin AKTAŞ (1955-2012), the chief editor of the "Journal of the Entomological Research Society" and a former member of Gazi University, Department of Biology.

#### Habitat

Fenlands, humid grassland, dry coniferous woodland.

*Molophilus (Molophilus) hasbenli* **sp. nov.** (Figs. 3, 8 and 10)

#### Diagnosis

General body coloration brownish black. Antenna, medium length, not reaching to the wing base, if bent backwards, Head and thorax brownish black. Abdomen dark brown. Wing normal in length. Discal cell absent. The distal part of femur yellowish brown, the remaining brownish black. Male terminalia with outer gonostylus serrate at its distal margin. Aedeagus proximally broad and sharp-ended in the distal. Cercus of female ovipositor of medium length and width within the genus, upturned and pointed at tip. Body length 2-3 mm, wing length 3-3.5 mm, antenna length 0.7-1 mm.

#### Male

Head black, rostrum and palpi blackish brown, 14 oval flagellar segmented antennae ranging from brown to dark brown. Thorax brownish-black, mesonotum black striped, pleura ranging from yellowish-brown to blackish-brown. Coxa brown; basal  $\frac{1}{3}$  of the trochanter and femur yellowish-brown, other  $\frac{2}{3}$  of the femur blackish-brown. Tibia yellowish-brown except for the

blackish brown distal, while tarsus ranging between yellowish- brown to blackish-brown.

Wing membrane with yellow tone; brown veined; Sc<sub>2</sub> at the level of Rs middle; Sc<sub>1</sub> long, Sc<sub>1</sub> and R<sub>2</sub> extending beyond Rs furcation, both at the same line. Discal cell absent (Fig. 3). Stem of the halter beige, knob black.

Abdomen blackish-brown, darker on the tergite endings. Sternite 8 pointed conical at the end, about half the length of hypopygium; tergite 9 shorter than 1/3 of gonocoxite, with crescent shaped indentation at the caudal margin. Gonocoxite dorsally with two striking pointed, dark pigmented at the end and broad beak-like appendages. Outer gonostylus reduced dorsal margin saw-toothed, elongated; inner gonostylus relatively strong, broadened at the base, distally dagger-like, dorsally saw-toothed, ventrally with a few rows of medially chitinized setae. Aedeagus basally enlarged and distally pointed (Figs. 8 and 10).

Female

Unknown.

Remarks

The male genitalia of *Molophilus* (s. str.) *tjederi* Stary, 1968 and *M.* (s. str.) *hasbenli* **sp. nov.** are very similar, and the males are best separated by reference to structures of at the base broadened inner gonostylus with ventrally a few rows of medially chitinized setae; reduced and flattened outer gonostylus and basally broadened, distally pointed aedeagus in *M.* (s. str.) *hasbenli* **sp. nov.**

Type Material

HOLOTYPE (male): Turkey: Uşak, *Ulubey*, Avgan Village, Avgan Canyon (N 38° 23' E 29° 24'), 634 m, 14-VII-2011 (ZMMU); PARATYPES (5 ♂♂): 1 ♀, Kütahya, *Tavşanlı*, Kargılıköy (N 39° 32' E 29° 13') 733 m, 15-VII-2010. 1 ♂, Uşak, *Es-kigüney* Village, Dikence (N 38° 50' E 29° 23') 1057 m, 01-VII-2010. 2 ♂♂, *Banaz*, Hatiplar Village (N 38° 46' E 29° 46') 958 m, 30-VI-2010, (ZMMU). 1 ♂, Uşak, *Ulubey*, Avgan Village, Avgan Canyon (N 38° 22' E 29° 21'), 585 m, 09-VI-2009 (JSO).

Distribution

Turkey (Uşak, Kütahya).

Etymology

The new species is named in honor of Prof. Dr. Abdullah HASBENLİ, a specialist on the Diptera and Coleoptera.

Habitat

Fenlands, humid grassland, dry coniferous woodland.

Family Limoniidae

Subfamily Limoniinae

*Orimarga* (s.str.) *attautena* **sp. nov.** (Figs. 4, 11-14)

Diagnosis

General body coloration dark grayish brown, somewhat shiny. Antenna long, reaching to about base of wing, if bent backwards. Head and thorax dusty gray and brighter than abdomen. Wing rather narrow and short. Discal cell absent. Legs normal in length and thickness. Femur significantly expanded in distal end. Abdomen with narrow rust-red colored band laterally. Male terminalia with outer gonostylus sharp-ended; inner gonostylus with inner basal bulge. Paramere prolonged; slightly dagger-like and curved outwards. Female terminalia with more or less long cercus. Body length 8-8.5 mm, wing length 4.5-5.5 mm, antenna length 0.9-1.2 mm.

Male

Head gray-black. Antenna and palpi grayish-brown. Antenna 16-segmented. Flagellar segments oval and very short haired.

Thorax grayish-black. Mesonotal stripes not conspicuous, except for a narrow dark median line continuing on scutum. Coxae grayish brown. Legs stilt-like. Trochanter and proximal half of the femur brown, by the distal half of the femur legs ranging between brown and brownish black. Metatarsus very long, almost 1.5 x long as all other segments.

Wing narrow and reduced, hyalinous and brown veined. Sc<sub>2</sub> close to Sc<sub>1</sub>, distal to the base of Rs. R<sub>2</sub> on basal half of R<sub>3</sub>. Discal cell absent. Cross-vein m-cu at the center of the wing (Fig. 4). Halter organ whitish, beige to the distal of the knob.

Abdomen elongated cylindrical, shiny brownish-black with grayish pruinose; lateral margins of the tergites rusty red. Inner and outer gonostyli of the same length: outer gonostylus dark brown, strong hook-like; inner gonostylus lappet-like, to the interior with a small setae tubercle (Fig. 11). Aedeagus shortened and slightly broad and parameres long, dagger like bent outwards (Fig. 12, 13, 14).

Female

Resembles the male in general appearance. Cercus nearly equal to the length of tergite 10 and curved upwards. Genital frame narrow.

## Remarks

*Orimarga* (s.str.) *attautena* **sp. nov.** resembles *O.* (s.str.) *attenuata* (Walker, 1848) and *O.* (s. str.) *juvenilis* (Zetterstedt, 1851) in many aspects. But it has some different features. The clearest differences between the new species and the other 2 species are in the shape of parameres and ventral view of the aedeagus. *O.* (s.s tr.) *attautena* **sp. nov.** can be distinguished from *O.* (s.str.) *attenuata* (Walker, 1848) with laterally crescent-shaped aedeagus and *O.* (s. str.) *juvenilis* (Zetterstedt, 1851) with laterally aliform-shaped expanded aedeagus by the structure of the aedeagus. In *O.* (s. str.) *attautena* **sp. nov.**, the aedeagus is laterally “C” shaped.

## Type Material

**HOLOTYPE** (male): Turkey, Kütahya, Küçükler-Murat Mountain 21.km (N 38° 56' E 29° 36'), 1466 m, 10-VI-2009 (ZMMU). **PARATYPES** (7 ♂♂, 9 ♀♀): 6 ♂♂, 9 ♀♀, same data as for holotype (ZMMU). 1 ♂, same data as for holotype (JSO). 2 ♂♂, Afyonkarahisar, Sandıklı, Sorkun, Akdağ 15. km (N 38° 20' E 30° 01'), 1467 m, 25-V-2010 (ZMMU).

## Distribution

Turkey (Afyonkarahisar, Kütahya).

## Etymology

The name *attautena* is an anagram of *attenuata*, to be treated as a noun in apposition.

## Habitat

Fenlands, humid coniferous woodland, humid grassland.

## ACKNOWLEDGMENTS

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## REFERENCES CITED

- DIENSK, J. W. 1987. An Illustrated Key to the Genera and Subgenera of the Western Palaearctic Limoniidae (Insecta: Diptera), Including a Description of the External Morphology. Stutgarter. Beitr. Naturk. (A) 409: 1-52.
- KOÇ, H. 2004. Faunistic and ecological investigation of Tipulidae and Limoniidae families in Muğla province. Muğla Sıtkı Koçman Univ. Publ. 55 (Presidency Publ. 35): 1-18, 1-154.
- KOÇ, H. 2008. Additions to the Limoniidae species in Turkey (Insecta, Diptera). III. Intl. J. Dipterol. Res. 19: 3-5.
- KOÇ, H., ÖZGÜL, O., AND AKTAŞ, M. 2005: Contributions to Pediciidae and Limoniidae of Turkey (Diptera). Studia Dipterologica 11(2): 615-618.
- MCALPINE, J. F. 1981. Chapter 2: Morphology and terminology: Adults, pp. 9-63 In J. F. McAlpine, B. V. Peterson, G. E. Shewell, H. J. Teskey, J. R. Vockeroth and D. M. Wood [eds.], Manual of Nearctic Diptera. Monograph 27: (1). Res. Branch, Agric. Canada, Ottawa.
- OOSTERBROEK, P. 2006. The European families of the Diptera, identification, diagnosis, biology, KNNV-Uitgeverij, Utrecht. 205 pp.
- OOSTERBROEK, P. 2009. New distributional records for Palaearctic Limoniidae and Tipulidae (Diptera: Craneflies), mainly from the collection of the Zoological Museum, Amsterdam. Zoosymposia 3: 179-197.
- OOSTERBROEK, P. 2014. Catalogue of the Craneflies of the World (Insecta, Diptera, Nematocera, Tipuloidea). <http://nlbif.eti.uva.nl/ccw/index.php> (Accessed 17-I-2014).
- ÖZGÜL, O., AND KOÇ, H. 2010. New records from Inner West Anatolia to the Turkish Limoniidae (Insecta, Diptera) fauna. J. Entomol. Res. Soc. 12(3): 45-49.
- ÖZGÜL, O., AND KOÇ, H. 2012: Contributions to the Limoniidae (Insecta, Diptera) fauna from the inner west Anatolia. Turkish J. Entomol. 36(6): 745-751.
- ÖZGÜL, O., KOÇ, H., AND STARÝ J. 2006. Additions to the Limoniidae species in Turkey (Insecta, Diptera) II. Intl. J. Dipterol. Res. 17(3): 209-213.
- PARVU, C., AND POPESCU-MIRCENI, R. 2006. Faunistic data on some dipteran families (Insecta: Diptera) from West Turkey (Results of Taurus Expedition 2005). Travaux du Mus. Natl. d'Histoire Nat. Gri-gore Antipa 49: 283-295.
- POLLET, M. 2000. Een gedocumenteerde Rode Lijst van de slankpootvliegen van Vlaanderen. Mededelingen van het Instituut voor Natuurbehoud 8. Brussel, Pp: 190.
- STARÝ, J., AND OOSTERBROEK, P. 2008. New records of West Palaearctic Limoniidae, Pediciidae and Cylindrotomidae (Diptera) from the collections of the Zoological Museum, Amsterdam. Zootaxa 1922: 1-20.