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**Autor:** Weinberg, Medeea / Bächli, Gerhard

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## Four new species of Asilidae (Diptera) from Spain

MEDEEA WEINBERG<sup>1</sup> & GERHARD BÄCHLI<sup>2</sup>

The following species of Asilidae (Diptera) from the Monegros region, Zaragoza, Spain, are described as new to science: *Psilocurus blascoi*, *Cerdistus blascozumetai*, *Machimus blascoi*, and *Machimus javieri*.

Keywords: Asilidae, Spain, new species.

### INTRODUCTION

During the years 1989–1994, the *Juniperus thurifera* L. forest in the Monegros region, Zaragoza, Spain, was surveyed by Javier BLASCO-ZUMETA. Among the specimens of Asilidae collected (WEINBERG & BLASCO-ZUMETA, in press), four species of the genera *Psilocurus* LOEW, *Cerdistus* LOEW, and *Machimus* LOEW were found to be new to science. They are described in this paper and dedicated to Prof. Dr. Javier BLASCO-ZUMETA, Pina de Ebro, the restless fighter for the conservation of the *Juniperus thurifera* forest, who has collected there numerous plants and animals. His survey not only demonstrated the rich biodiversity of the area but also yielded a large number of species new to science.

Type locality for all new species is Retuerta de Pina, Los Monegros, Zaragoza, Spain. The species are named in honor of the collector. Specimens are deposited in the following collections: Natural History Museum «Grigore Antipa», București (NHMGA); Zoological Museum Zürich (ZMZ); private collection of Javier BLASCO-ZUMETA, Pina de Ebro (CBZ). Preparations of genitalia were made as detailed by WEINBERG & BÄCHLI (1993). Morphological terms were used as suggested by MCALPINE (1981), MAJER (1997), and MERZ & HAENNI (2000).

### RESULTS

#### Subfamily Laphystiinae

#### *Psilocurus* LOEW, 1874

There are eight species of *Psilocurus* known in the Nearctic and three in the Palearctic: *P. hypopygialis* PARAMONOV (1930) was described from Turkmenistan. Among several asilids collected in a dry sandy area in Iran, representing a mixture of Palearctic and Afrotropical species, OLDROYD (1958) described *P. translatus*, a species later reported also from Armenia (RICHTER, 1963) and the Caucasus (RICH-

<sup>1</sup> Natural History Museum «Grigore Antipa», Chaussee Kisselef 1, R-79744 București, Romania

<sup>2</sup> Zoological Museum, University of Zürich, Winterthurerstrasse 190, CH-8057 Zürich, Switzerland

TER, 1968). *P. negrus* LEHR (1974) was described from Turkmenistan. LEHR (1988) synonymized *P. hypopygialis* and *P. translatus*. However, according to the key of LEHR (1969), the following characters differentiate both nominal species: The specimens from Iran and the Caucasus region (= *P. translatus*) are black with a blue metallic shine and with discal setae on tergites 3 and 4, whereas the specimens from Turkmenistan (= *P. hypopygialis*) are blackish brown, with discal setae only on tergite 1.

The specimens from Spain belong to a new species close to *P. translatus* OLDROYD (as also interpreted by RICHTER, 1968), but differ by the metallic shine and the distribution of the discal setae. In addition, the hypopygium is not globular but more like that of *Laphystia* LOEW, 1847.

LEHR (1969) has characterized *Psilocurus* as follows: cell  $r_1$  open, facial gibbosity obvious and mystax with setae of different thickness, cells  $r_5$  open and  $m_3$  closed, etc., and *Laphystia* as follows: facial gibbosity missing, etc. The specimens from Spain share the characters of *Psilocurus*.

In all descriptions of Palearctic *Psilocurus* species, only OLDROYD (1958) gave an illustration (of the habitus).

### ***Psilocurus blascoi* n.sp.**

(Figs 1A, E, 2, 3)

Material: Holotype ♂, 7.V.1991, collected with color plates, pinned, dissected, genitalia stored in a microvial attached to the pin (NHMGA). Allotype ♀, same data and collecting method, pinned, dissected, genitalia stored in a microvial attached to the pin (NHMGA).

Paratypes: 1 ♂, 24.V.1991, collected with Malaise trap, pinned (NHMGA); 1 ♂, 7.VI.1991, collected with color plates situated between *Juniperus thurifera* and *Rosmarinus officinalis*, pinned (NHMGA); 1 ♂, 7.V.1991, same data and collecting method as holotype, pinned, dissected, genitalia stored in a microvial attached to the pin (ZMZ); 1 ♂, 7.VI.1991, collected with color plates situated between *Juniperus thurifera* and *Rosmarinus officinalis*, pinned (ZMZ); 2 ♂♂, 7.VI.1991, collected with color plates situated between *Juniperus thurifera* and *Rosmarinus officinalis*, pinned (CBZ).

Diagnosis ♂ ♀: Length 10 mm, black, metallic shine on the middle of the abdomen, with white microtrichia and setulae on the whole body. Most closely related to *P. translatus* OLDROYD, but differing in the shape of the genitalia.

#### **Description**

Head: Face and frons covered with silvery white microtrichia. Setulae white, ocellar and occipital setae strong, black. Antennae black, with mostly white and a few black setulae and setae on scape (Fig. 1E). Facial gibbosity prominent in lower half, mystax with long, silvery setulae, only in the middle with black setae. Proboscis and palpi black with white setulae.

Thorax with white microtrichia and setulae, strong setae black; dorsally shining black, with black-grey microtrichia leaving two shining black bands along the brown median stripe from the postpronotal callus to the front of the scutellum, between them there is a smaller, shining black triangle based toward the scutellum. Scutellum with 10–14 black or white marginal setae.

Pleura covered with silvery microtrichia, leaving two shining black patches, one between fore and mid coxae, and a smaller one between mid and hind coxae.

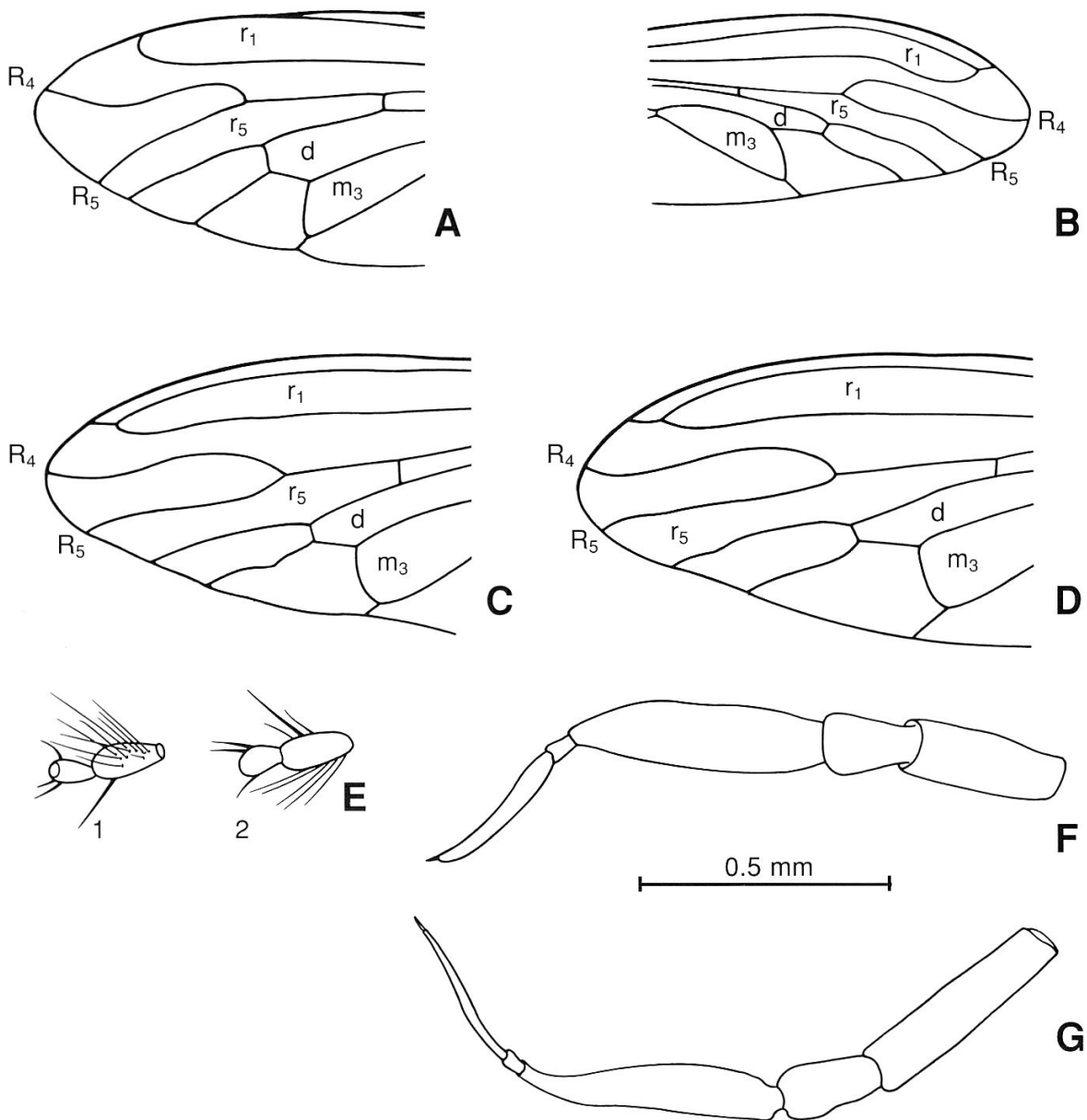


Fig. 1. Wing tips: A, *Psilocurus blascoi* n. sp.; B, *Cerdistus blascozumetai* n. sp.; C, *Machimus blascoi* n. sp.; D, *Machimus javieri* n. sp. – Antennae: E, *Psilocurus blascoi* n. sp., scape and pedicel, 1. frontal view, 2. posterior view; F, *Machimus blascoi* n. sp.; G, *Machimus javieri* n. sp.

Legs black, with reddish color at bases of femora and tibiae; forelegs and midlegs with white setae, hindlegs with strong black ones.

Wings (Fig. 1A) short, transparent, veins brown; length 5 mm, in relation to the body length, the wings are disproportionally short. Halteres yellow.

Abdomen with microtrichia, shining black medially; the black tergites have brown-yellow lateral margins, with gray-white microtrichia; the first tergite has the same width as the thorax; tergites 1 to 5 have two or more strong white-yellow discal setae at each side. In both males and females only six pregenital tergites are obvious (Figs 2, 3); behind tergite 6, sclerotized areas are reduced in favor of the intersegmental membrane, to allow the torsion of the hypopygium and ovipositor (Figs

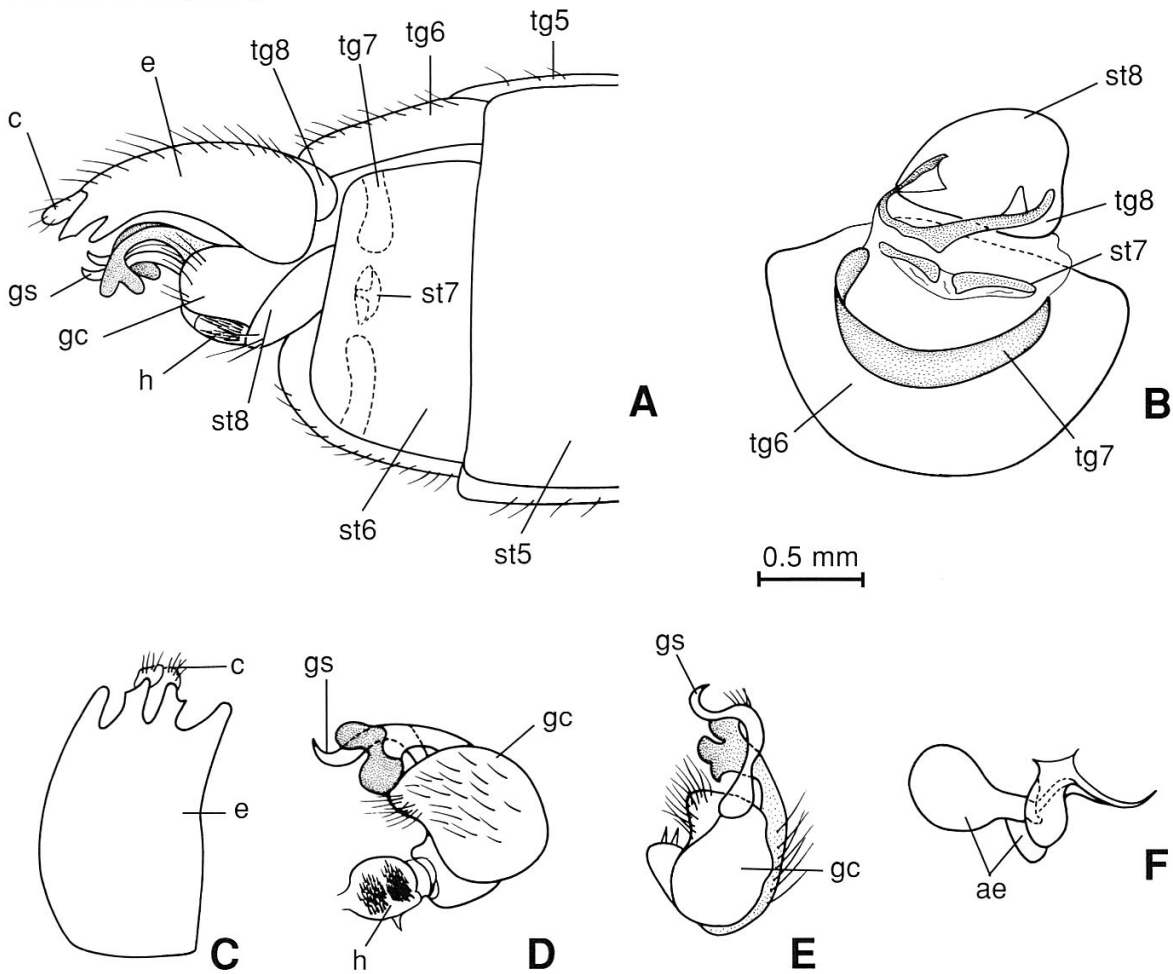
*Psilocurus blascoi* ♂

Fig. 2. *Psilocurus blascoi* n. sp. ♂: A, abdominal segments 5–8 in ventral view and hypopygium in lateral view; B, abdominal segments 6–8 in dorsal view; C, epandrium (e) with cerci (c) in dorsal view; D, gonopod in dorsal view (gc - gonocoxite, gs - gonostylus) and hypandrium (h); E, gonopod in ventral view; F, aedeagus (ae) in lateral view.

2, 3). Segment 7 is much reduced and entirely covered by segment 6 (Figs 2A, 2B). Tergite 8 is like an interrupted ring, partially visible, covered by tergite 6 (Figs 2, 3). Sternite 8 not reduced.

♂ genitalia: Hypopygium and segment 8 are 90° rotated from the body axis (Fig. 2A). Epandrium not divided, apically with four processes (Fig. 2C). Hypandrium very small, fused to the two gonopods (Fig. 2D). Gonopods long, S-curved with pointed apex (Figs 2A, 2D), covered with a bunch of short, black setae, divided in the middle. Gonocoxite short, with a long, curved process ending in a black, broad, distally deeply concave apex (Figs 2D, 2E). Aedeagus simple, narrowly conical, curved, with a large, rounded apodeme (Fig. 2F).

♀ genitalia: Ovipositor and segment 8 are 45° rotated from the body axis (Figs 3A, B), tergite 9 apically with four processes, the middle one the biggest. (Fig. 3D). Hypogynium sclerotized, covered with hairs, apically membranous, in the middle concave, covered with short hairs (Fig. 3C). The gonapodema with the common duct of spermathecae has trident shape (Fig. 3C). Spermathecae long, thin sclerotized tubes, ending in a small spiral made by three torsions (Figs 3B, 3E). The common duct of spermathecae is short and wide (Fig. 3E). Gonapodema U-shaped, with

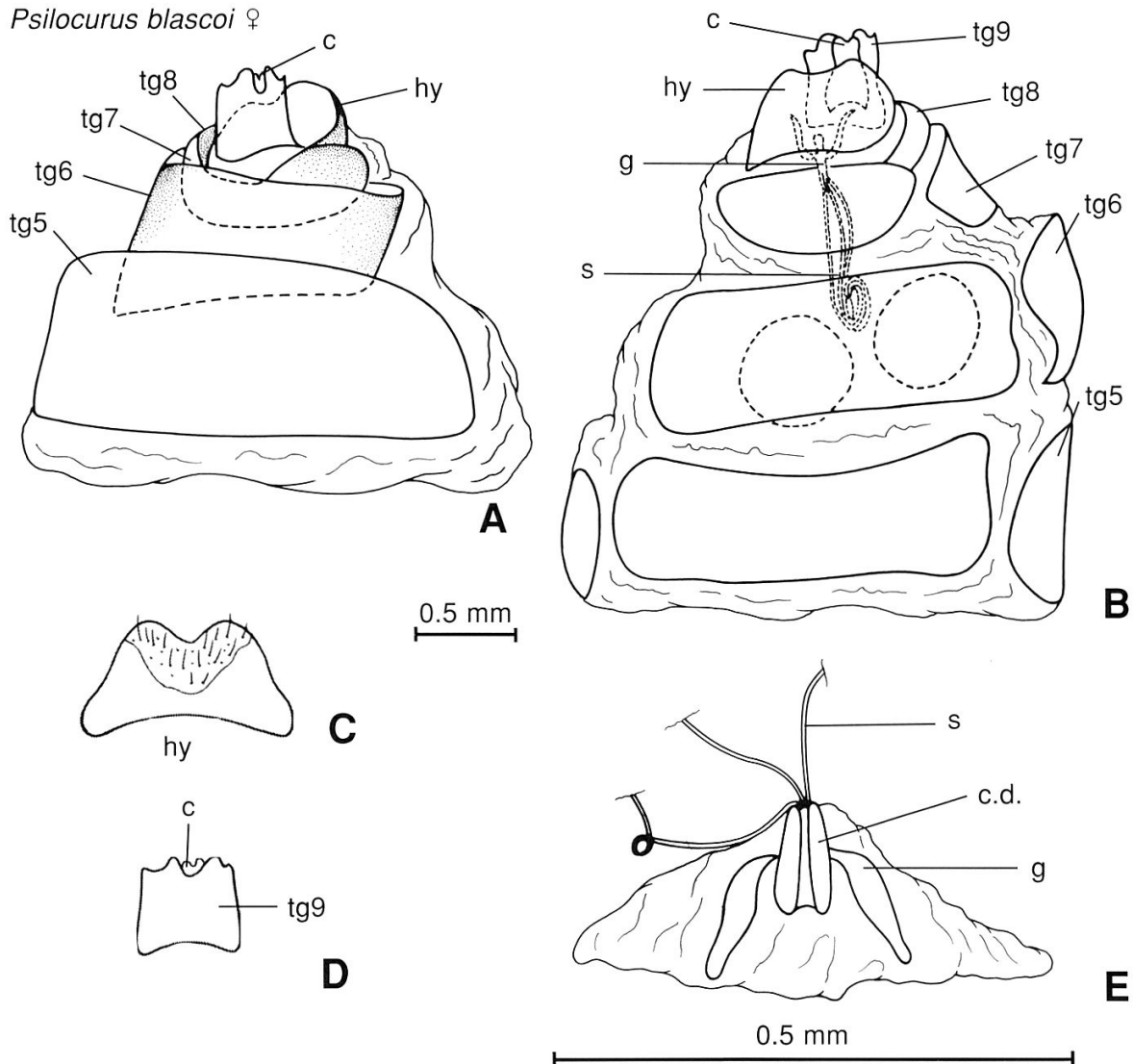


Fig. 3. *Psilocurus blascoi* n. sp. ♀: A, abdominal segments 5 to ovipositor in dorsal view (tg - tergite, st - sternite); B, abdominal segments 5 to ovipositor in ventral view; C, hypogynium (hy) in dorsal view; D, tergite 9 in dorsal view; E, gonapodema (g) in vagina with common duct (c.d.) of spermathecae (s) and their basal portions.

wide arms and large membranes between them (Fig. 3E). The spermathecae reach back to the 6th abdominal segment.

#### Subfamily Asilinae

#### *Cerdistus* LOEW, 1849

European *Cerdistus* flies live in grassy communities with predominant Gramineae, preferring steppes and deserts.

In 1988, LEHR included 23 species in *Cerdistus*; but after his revision (LEHR, 1995), only 14 species remained in this genus.

The shape of the genitalia of the two Monegros specimens of *Cerdistus* prove that they belong to an undescribed species. This species is closest to what THEODOR (1980) considered to be *Cerdistus erythrurus*. But according to his drawings, his

specimen is different from the lectotype of this species kept in the Paris Museum (WEINBERG & TSACAS, 1976). THEODOR (1980) described a new species, *C. erythroides*, with comparative illustrations of some elements of the genitalia for both sexes, to show the differences between his *C. erythroides* and the species which he considered to be *C. erythrurus*.

It seems that THEODOR's "*C. erythrurus*" is in fact another, most probably undescribed species. Unfortunately, THEODOR said nothing about the origin of his "*C. erythrurus*" specimens. LEHR (1995) obtained by TSACAS specimens of "*C. erythrurus*" examined by THEODOR. In the drawings of genitalia made by WEINBERG & TSACAS (1976) of the lectotype specimen of *C. erythrurus*, the apex of the aedeagus shows characteristic membranous pointed lobes, not rounded as shown in THEODOR's drawings and our new species. It is clear that THEODOR's "*C. erythrurus*" has genital components different from our specimens from Spain. It is also clear that LEHR (1995) did not comment on the true *C. erythrurus*, represented by MEIGEN's lectotype (WEINBERG & TSACAS, 1976), but on "*C. erythrurus*" examined by THEODOR.

***Cerdistus blascozumetai* n.sp.**

(Figs 1B, 4, 5)

Material: Holotype ♂, 25.VIII.1991, collected with Malaise trap, pinned, dissected, genitalia stored in a microvial fixed to the pin (NHMGA). Allotype ♀, 7.VIII.1991, collected with Malaise trap, pinned, dissected, genitalia stored in a microvial fixed to the pin (NHMGA).

Diagnosis ♂ ♀: Length 8–10 mm. greyish-brown microtrichia, mesonotum and abdomen dorsally distinctly brown. Most closely related to *C. erythrurus*, but differing in the shape of the genitalia.

Description

Head: Face with greyish microtrichia, narrow near the antennae. The facial gibbosity rounded, occupying lower part of face, mystax with white setae. Setulae on ocellar tubercle black. Setulae on front in male black, in female snow-white. Antennae black, scape and pedicel with longer white and shorter black setulae. 1st flagellomere missing. Proboscis and palpi black with white setulae. Occipital setae whitish, with black ones in the middle.

Thorax with a dark brown median stripe, lateral areas with greyish microtrichia. Short setae of thorax black, black setae and two whitish ones in front of the scutellum. Two marginal scutellar setae, whitish. Pleura with white microtrichia. Fringe in front of the halteres with white setae.

Wings (Fig. 1B): Uniformly smoky. Halteres orange.

Legs: Coxae are black with greyish microtrichia. Femora black on anterior side, reddish-yellow on posterior side, as are tibiae and basitarsi, the apex of the tibiae and the other 4 tarsomeres are darker. Fore femora ventrally with long, thin, white setae. Setae on legs white and black.

Abdomen with brown microtrichia in the middle with short setulae, laterally with long ones. Discal setae weak. Sternites with long setae. Sternite 8 of ♂ with straight posterior margin.

♂ genitalia: Hypopygium reddish-yellow. Epandrium (Fig. 4A) in dorsal view apically rounded with a plate shaped, rounded apical process and on the inner side with two rounded processes, one at the base of the cercus and one in its apex. Gonopods (Fig. 4B) triangular. Gonocoxite (Figs 4B, C) with a round process at the apex



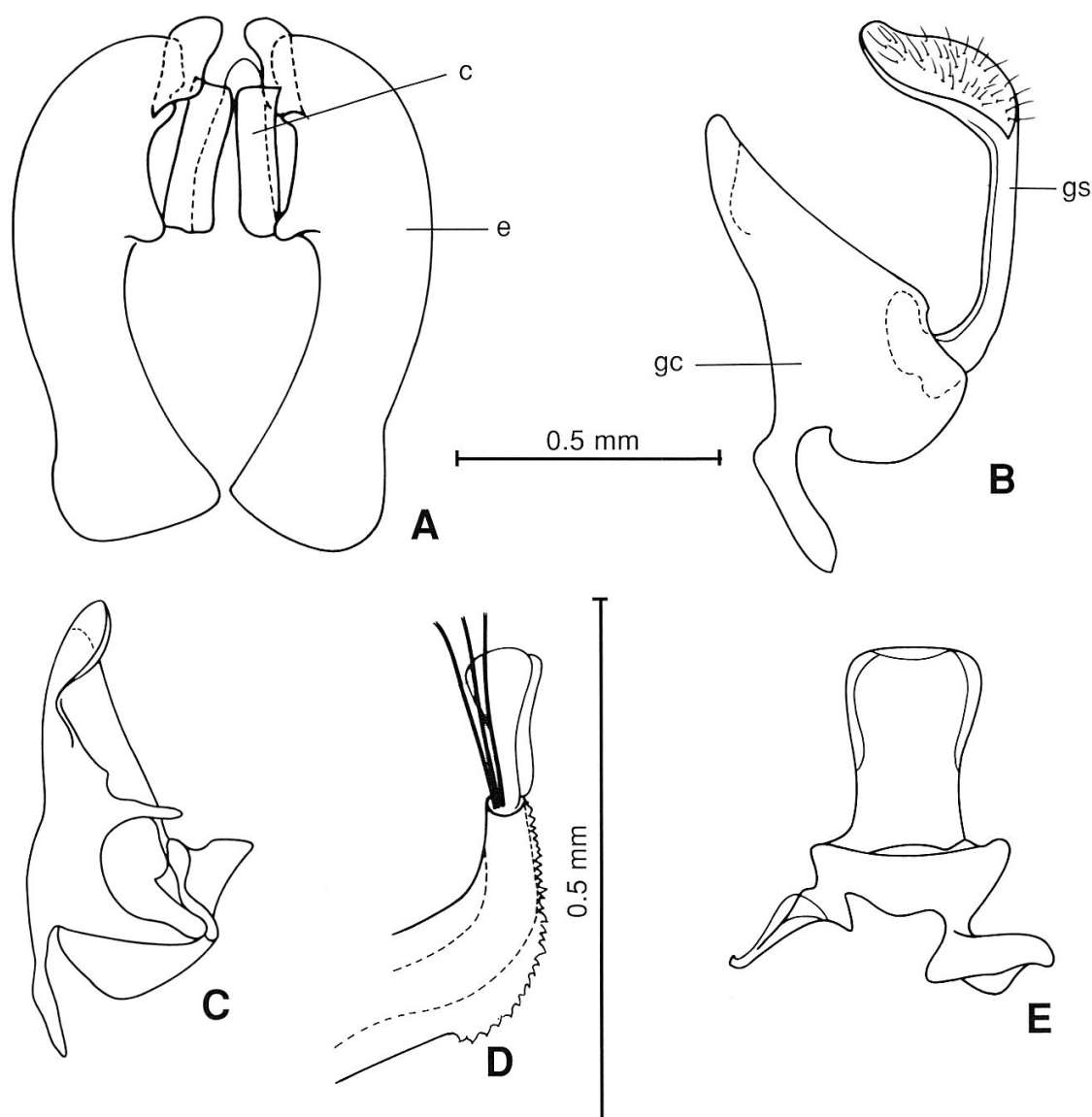
*Cerdistus blascozumetai* ♂

Fig. 4. *Cerdistus blascozumetai* n. sp., ♂ genitalia: A, epandrium (e) with cerci (c) in dorsal view; B, gonopod (gc, gs) in dorsal view; C, gonocoxite in ventral view; D, apex of aedeagus in lateral view; E, dorsal plate of aedeagus.

and a finger-shaped process ventrally near the base of the gonostylus. Gonostylus (Fig. 4B) long, curved, slender, wider apically. Aedeagus (Fig. 4D) ending in three long tubes and two leaf-shaped processes which are membranous and characteristic. In the apical part ventrally with denticles. At the base above the aedeagus, there is a large, dorsal, broadly rounded plate (Fig. 4E) which is characteristic for the species.

♀ genitalia: Ovipositor slender, triangular, laterally compressed. Gonapodema (Fig. 5A) sclerotized, long, apically narrow, basally widened, with two anterior and two posterior corners. Lateral arms short, only in the posterior part of the vagina and slightly sclerotized. All three spermathecae are of the same form (Fig. 5B). They end on the gonapodema membrane. Spermathecae are long tubes with three diameters which are wide at the base and tapering to the long, thinner end.



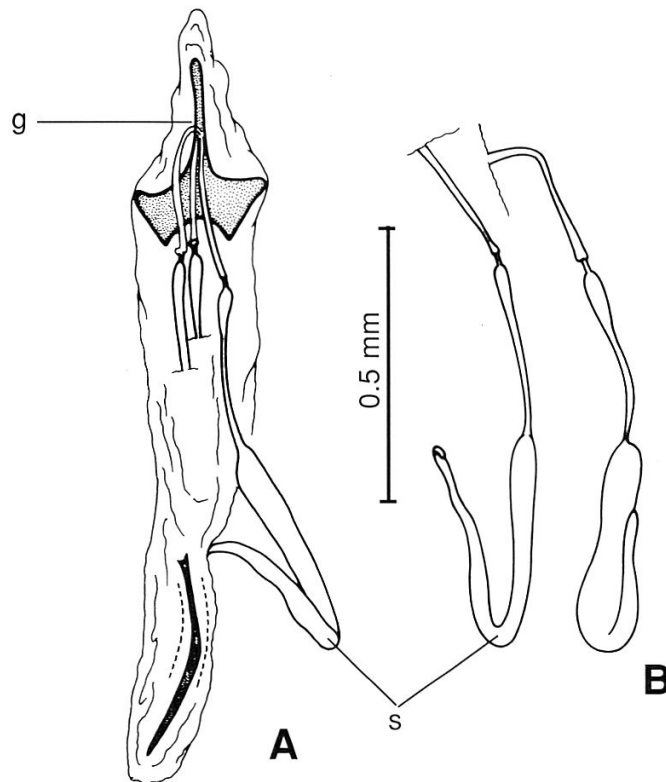
*Cerdistus blascozumetai* ♀

Fig. 5. *Cerdistus blascozumetai* n. sp., ♀ genitalia: A, gonapodema (g) in vagina with basal portions of spermathecae; B, spermathecae (s).

***Machimus* LOEW, 1849**

LEHR (1988) included in the genus *Machimus* 74 Palearctic species. In the literature (SÉGUY, 1927; ENGEL, 1926–1930; LEHR 1972, 1992, 1996; THEODOR, 1980) the species of *Machimus* have been assigned either to several genera, or are at least partially included in *Machimus*. After examination of the genitalia of several *Machimus* species, THEODOR (1980) showed that some species placed in *Machimus* belong to other genera. Obviously, the species of the *Machimus* complex urgently need revision. Based on the known diagnostic characters, it is difficult to separate Palearctic species; most of these characters are not specific. Unfortunately, descriptions of many Palearctic Asilinae species were made on the basis of one sex only, and before about 1960, illustrations of the hypopygium or the ovipositor are very rare. Morphological characters of *Machimus* species are very much alike, a fact even in the external shape of the genitalia.

In a comparative study of the descriptions of *Machimus* species (e.g. by SÉGUY, 1927; ENGEL, 1926–1930; RICHTER, 1968; LEHR, 1972, 1992, 1996; THEODOR, 1976, 1980, WEINBERG & BAEZ, 1992) we found out that the Monegros specimens do not belong to any of the existing species and at most show a few affinities. Their assignment to *Machimus* was based on the shape of the aedeagus.

In the 17 Monegros specimens of *Machimus*, external habitus and color are very much alike and morphological differences between them are expressed only in femora coloration and wing veins. Regarding the femora coloration, the specimens form two groups: femur black in basal half, then red-orange. Regarding the wing veins, the two groups are characterized by the terminal position of the veins  $R_4$  and

R<sub>5</sub>, the ending of the cross-vein r-m on the discal cell and the length of the stalk of the cells r<sub>1</sub> and m<sub>3</sub> (Figs 1C, D).

For both these groups we studied the genitalia of both sexes and established the existence of two different, new species.

The two species can be clearly distinguished by the following characters: for males by the apex of aedeagus the gonopods in ventral view, and the epandrium in dorsal view and for females by the form of the gonapodema and the common duct of the spermathecae.

We found also some differences in setae coloration, but since this character is subject to variability, we do not insist on it.

### *Machimus blascoi* n. sp.

(Figs 1C, F, 6)

Material: Holotype ♂, 9.VI.1991, collected by net sweeping on *Suaeda vera*, pinned, dissected, genitalia stored in a microvial fixed to the pin (MNHGA). Allotype ♀, 20.VI.1991, collected with color plates between *Suaeda vera*, pinned, dissected, genitalia stored in a microvial and fixed to the pin (MNHGA).

Paratypes: 1 ♂, 21.VI.1989, collected by net sweeping on *Juniperus thurifera*, pinned (MNHGA). 1 ♂, 28.VI.1990, collected by net sweeping on ground, pinned (MNHGA). 1 ♂, 1 ♀, 9.VI.1991, collected by net sweeping on *Suaeda vera*, pinned (MNHGA). 1 ♂, 20.VI.1991, collected with color plates between *Suaeda vera*, pinned, (ZMZ). 1 ♀, 9.VI.1991, collected by net sweeping on *Suaeda vera*, pinned (ZMZ). 1 ♂, 1 ♀, 20.VI.1991, collected with color plates between *Suaeda vera*, pinned (CBZ).

Diagnosis ♂ ♀: Length 10–15 mm, greyish-brown, mesonotum and abdomen dorsally brown. Most closely related to *M. fuscus* (MACQUART, 1839), but differing by the shape of the genitalia.

#### Description

Head: Face covered with white-silvery microtrichia, the facial gibbosity occupying the lower half of the face, mystax with white setae in the middle and black, long setae on the upper part and also laterally. Antennae black (Fig. 1F). Scape one and a half times as long as pedicel; 1st flagellomere, without arista, slightly longer than the sum of scape and pedicel; arista slightly shorter than 1st flagellomere. Occipital setae white with a few black ones.

Thorax with a dark brown median stripe divided by greyish microtrichia. Short setulae black, setae white and black. Scutellum with 2–4 white marginal setae, rarely with black ones. Pleura with greyish microtrichia. Fringe in front of the halteres white.

Legs: Coxae black with greyish-white microtrichia, femora black, tibiae and tarsi reddish yellow, apex blackish.

Wings (Fig. 1C) smoky at apex. Halteres whitish-yellow.

Abdomen with greyish microtrichia and short white setulae. Discal setae weak, white. Sternites with white, long setae. Sternite 8 of ♂ with straight posterior margin.

♂ genitalia: Hypopygium reddish with white hairs. Epandrium (Fig. 6A) slender with tapering and rounded apex. Hypandrium (Fig. 6B) with rounded sides. Gonopods (Fig. 6C) broadly triangular, gonocoxite (Fig. 6C) with two short processes at the apex and a finger-shaped process ventrally near the base of the gono-

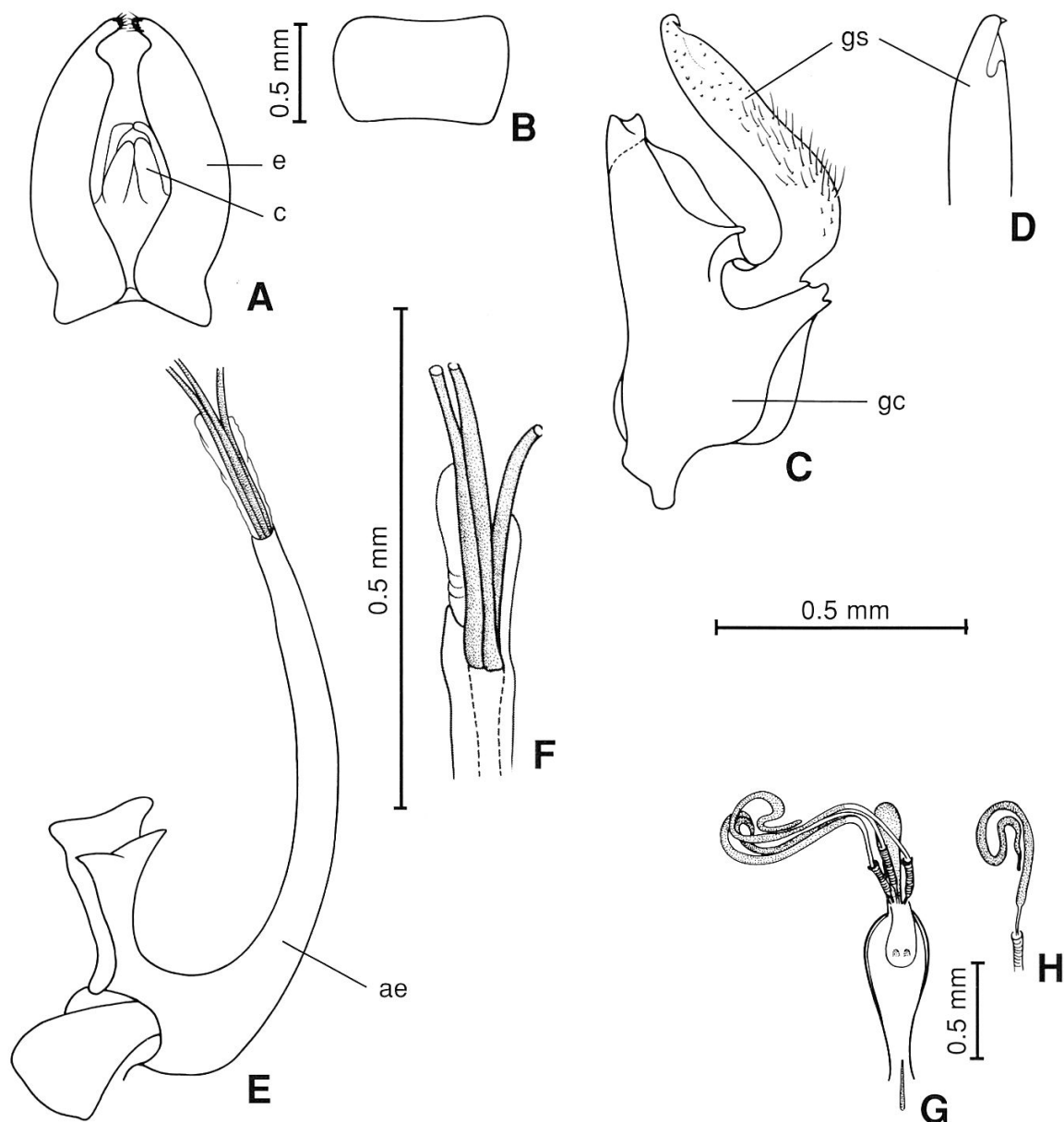
*Machimus blascoi*

Fig. 6. *Machimus blascoi* n. sp. ♂ genitalia: A, epandrium (e) with cerci (c) in dorsal view; B, hypantrium in dorsal view; C, gonopod (gc, gs) in ventral view; D, apex of gonostylus in dorsal view; E, aedeagus (ae) in lateral view; F, apex of aedeagus in ventral view. – ♀ genitalia: G, gonapodema with spermathecae; H, spermatheca.

stylus. Gonostylus (Figs 6C, D) straight, parallel-sided in its greater part, tapering to a slightly curved, narrow apex with a spine. Aedeagus of the *Machimus* type (Fig. 6E), moderately long, curved, ending in 3 long pigmented tubes (Fig. 6F).

♀ genitalia: Ovipositor shining black, slender, triangular, laterally compressed, as long as the two last segments. Gonapodema (Fig. 6G) relatively short and wide, with a relatively long apodeme and long lateral arms. At the opening into the vagina, there is a median sclerite between the posterior end of the lateral arms. Three spermathecae, with sclerotized tubes (Fig. 6H) which are opening into the common duct, which is short and open between the lateral arms. In the common duct, there

are basally two small, rounded sclerotizations. All three spermathecae show the same form: tubular with recurved thinner end.

***Machimus javieri* n. sp.**

(Figs 1D, G, 7)

Material: Holotype ♂, 16.IX.1990, collected with color plates, pinned, dissected, genitalia and antenna stored in a microvial fixed to the pin (MNHGA). Allotype ♀, same data and collecting methods, pinned, dissected, genitalia and antenna stored in a microvial fixed to the pin (MNHGA).

Paratypes: 1 ♂, same data and collecting method as holotype, pinned (MNHGA). 1 ♂, 28.VI.1990, collected by net sweeping on ground, pinned, dissected, genitalia in a microvial fixed to the pin (MNHGA). 1 ♀, 20.VI.1991, collected with color plates placed between *Suaeda vera*, pinned (ZMZ). 1 ♂, 16.IX.1990, collected with color plates, pinned (CBZ). 1 ♀, 12.VIII.1992, collected by net sweeping in *Salsola kali*, pinned (CBZ).

Diagnosis ♂ ♀: Length 13–16 mm, greyish-brown, brown on mesonotum and abdomen. Most closely related to *M. inconstans* (WIEDEMANN, 1820), but differing in the shape of the genitalia.

**Description**

Head: Face and frons covered with white microtrichia; all head setulae and setae white. Facial gibbosity occupying the lower half of the face. Antenna black (Fig. 1G). Scape twice as long as pedicel (Fig. 1G). 1st flagellomere, without arista, slightly shorter than the sum of scape and pedicel. Arista slightly shorter than 1st flagellomere.

Thorax with brown median stripe divided by greyish microtrichia. Setulae and setae black, rarely with one or two yellow ones. Scutellum with 2 yellow marginal setae. Pleura with greyish microtrichia. Fringe in front of the halteres yellow.

Legs: Coxae black, with white microtrichia; femora black on anterior side, red-orange on posterior side, including tip; tibiae and tarsi reddish-yellow, all of them apically blackish brown. Fore tibia and all tarsi with black and white setae.

Wings (Fig. 1D) smoky at apex. One ♀, collected 20.VI.1991, with an abnormal innervation: on both wings the vein  $M_2$  is inserted on the discal cell very close to the vein  $M_1$ . Halteres yellow.

Abdomen with brown microtrichia, with short, white setulae, laterally longer on tergite 1. Discal setae weak, white. Sternite 8 of ♂ with straight apical margin.

♂ genitalia: Hypopygium (Fig. 7A) reddish-yellow. Epandrium (Fig. 7B) parallel-sided, slightly curved near the apex, with a concavity on the inner margin and slender processes apically. Hypandrium (Fig. 7C) concave on the posterior margin. Gonopods (Fig. 7D) broadly triangular. Gonocoxite (Fig. 7D) with two short processes apically and a short finger-shaped process ventrally on the base of the gonostylus. Gonostylus (Fig. 7E) long, slender, apically rounded, laterally near the apex with a short corner. Aedeagus (Fig. 7F) of the *Machimus* type, moderately long, curved, ending in three pigmented tubes (Fig. 7G), shorter than in *M. blascoi* and wider basally.

♀ genitalia: Ovipositor shining black, as long as the last two abdominal segments. Hypogynium reddish-brown. Gonapodema (Fig. 7H) long and narrow; common duct longer than in *M. blascoi*, basally with two small, longish sclerotizations. All three spermathecae (Fig. 7I) show the same form, tubular, with curled thinner end.

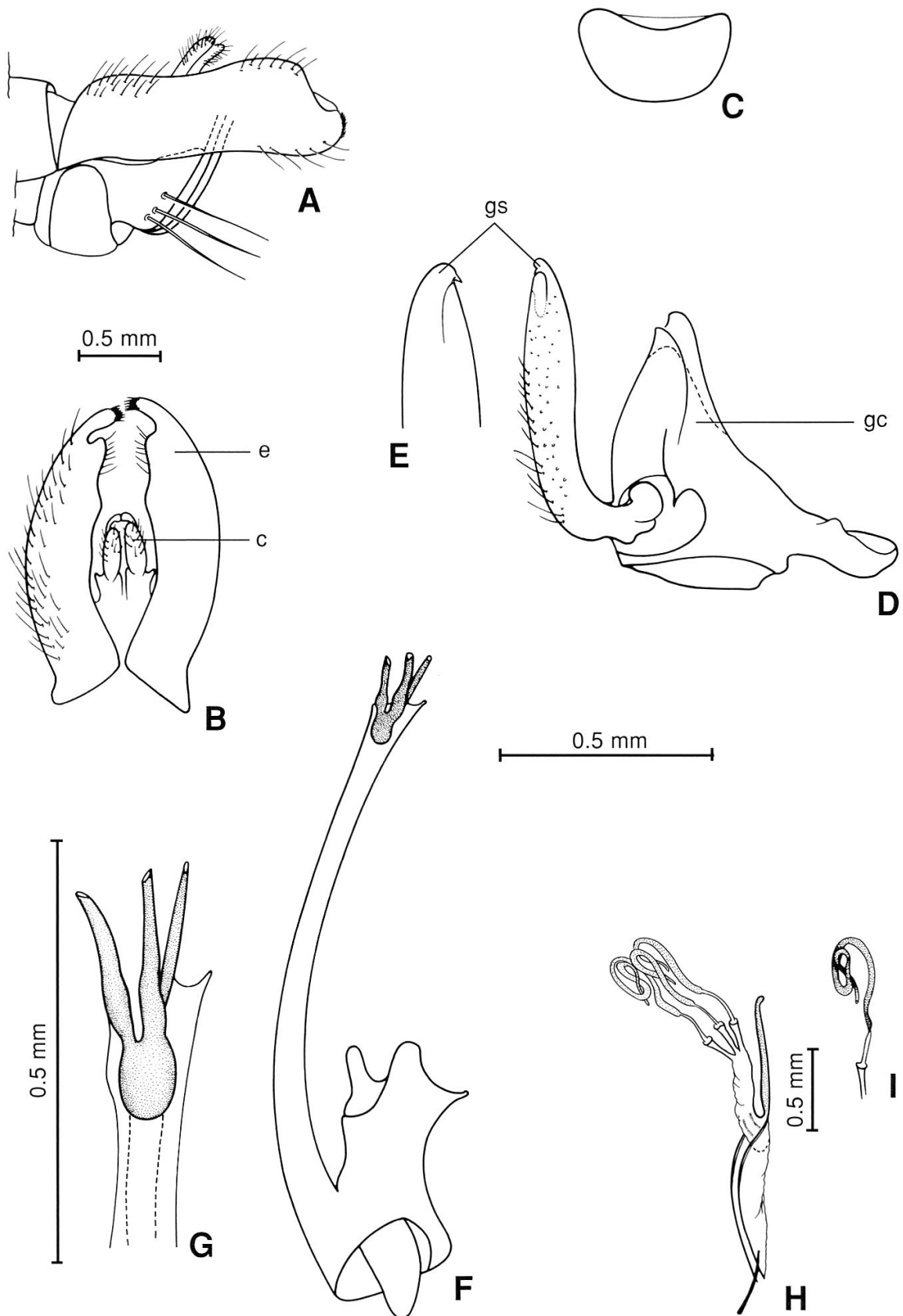
*Machimus javieri*

Fig. 7. *Machimus javieri* n. sp. ♂ genitalia: A, hypopygium in lateral view; B, epandrium (e) with cerci (c) in dorsal view; C, hypandrium in dorsal view; D, gonopod (gc, gs) in lateral view; E, apex of gonostyle in ventral view; F, aedeagus in lateral view; G, apex of aedeagus. – ♀ genitalia: H, gonapodema and spermathecae; I, spermatheca.

## CONCLUSIONS

Our study of the Asilidae of the *Juniperus thurifera* forest show once more how far we are from a complete and correct inventory. There is a need for modern, complete descriptions based on clear characters, in order to allow quick, correct identifications.

Previously, WEINBERG & BLASCO-ZUMETA (in print) mentioned 35 species from the Monegros area, including one species of *Psilocurus* and one of *Machimus* (containing all 17 *Machimus* specimens mentioned above). In the present paper, we add two species to the list. Therefore, the total number of known asilid species of Spain is 152.

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