Description of the male of *Eupeodes lucasi* (Marcos-García & Láska, 1983) and biological data on the species (Diptera, Syrphidae)

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The previously-unknown male of *Eupeodes lucasi* (Marcos-García & Láska, 1983) is described. The female is redescribed and intraspecific variation is detailed. Data on biology and distribution are provided.

Zusammenfassung

Das bisher unbekannte Männchen von *Eupeodes lucasi* (Marcos-García & Láska, 1983) wird erstmals und das Weibchen wieder beschrieben. Die intraspezifische Variabilität wird dargestellt und Daten zur Biologie und Verbreitung der Art mitgeteilt.

Introduction

The original description of *Eupeodes lucasi* was based on females from Spain (Marcos-García & Láska 1983). Recently, we have reared this species. Some of the larvae collected from the same colonies of aphids as females of *E.lucasi* produced males, enabling us to recognize the male of this species. Description and differential diagnosis of the male of *E.lucasi* are given here, for the first time. Some new morphological characters, useful in female diagnosis, are included in the redescription of the female given and intraspecific variation is discussed. All known biological and geographical data are included and discussed.

Methods and terminology

The angle of approximation of the male eyes, and the length of the distance from the anterior ocellus to the nearest yellow margin of the frons, were measured vertically from above, towards the contact area of the eyes (see fig. 1, p. 28 in Mazánek et al. 1998). The width of the face and the width of the head were measured at the mid-point between the antennae and the facial tubercle. The maximum width and the minimum length of the clypeus were measured in vertical view, looking at the clypeal surface. Measurements of the distance from the base of the first antennal segment to the

top of the second antennal segment, and measurements of the maximum width and the minimum length of the third antennal segment, were taken from their inner surfaces. Morphological characters were figured and measured using a drawing tube and ocular micrometer.

The length of the paramere was measured from the base of the basal tooth to the apex of the paramere, from a lateral view. The maximum width of the hypandrium was measured in ventral view. Its height was normally measured from the apex of the distal lobe to the basal margin of the hypandrium, in lateral view. The distal lobe of the hypandrium is the lobe distally projecting over the connection to the paramere.

All characters were measured in the E.-numbered specimens (n=35), and the ranges given are from the minimum to the maximum measured values. The terminology used is that of Dušek and Láska (1976).

Abbreviations: SBC = second basal cell. Abdominal spots = yellow spots on tergites 3 and 4.

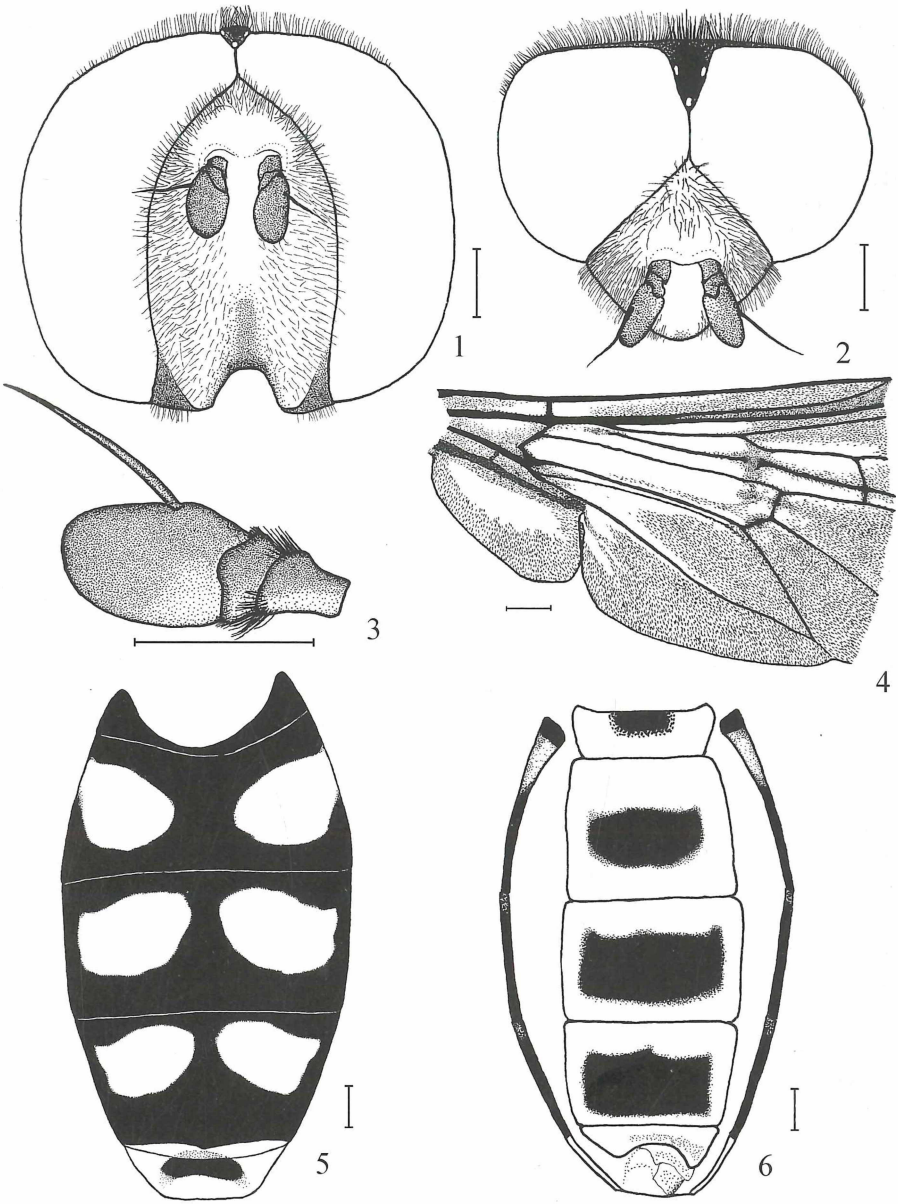
Eupeodes lucasi (Marcos-García & Láska, 1983)

Male (figs. 1-12)

Head: Eye practically bare, very feebly hairy with inconspicuous hairs about 0.02-0.03 mm. Anterior angle of approximation of eyes 82-89%. Eye suture usually distinctly longer than the black hairs on the frons. Shortest distance between anterior ocellus and frons 0.48±0.09 mm (fig. 2). Dark spots above antennae absent. Antenna brown, darker in upper half. Third antennal segment elongate oval, about 1.2-1.3 times longer (0.44±0.06 mm) than wide (0.33±0,05 mm), distinctly longer than segments 1 and 2 together (fig. 3). Face pale, facial tubercle in profile usually sloping towards oral margin, lower part of tubercle usually darkened medioventrally. Oral margin yellow laterally, darkened under facial tubercle and posteriorly. Clypeus usually a little longer (0.28±0.04 mm) than wide (0.24±0.04 mm). Face yellow haired, sometimes with some black hairs intermingled. Width of face 41% - 48% of width of head (fig. 1). Postocular orbit usually a little wider than in *E. luniger*, near vertex a little wider than half of its maximal width. All hairs on postocular orbit yellow.

Thorax: Notum with golden-yellow hairs 0.31±0.04 mm long in the central area and 0.42±0.04 mm long on the posterior margin. Scutellum covered by black hairs on disc, their length 0.34±0.04 mm, sometimes only a few black hairs present on posterior half of disc of scutellum. Hind margin of scutellum with long (0.6±0,1 mm) yellow hairs, often with some black hairs mixed in darker specimens. Alula with distinct bare area on basal part. SBC with only distal 10-20% covered in microtrichia (fig. 4). Base of first anal cell almost bare, without continuous stripe of microtrichia reaching the basal point; margin of first anal cell along first anal vein bare. Legs predominantly yellow, with femora extensively black on basal 1/4-1/3 in fore and mid femora and 2/3-3/4 in hind femur. Fore and mid femora pale haired, with row of long black hairs on apical part of posterolateral surface. Sometimes a few short, black hairs present on anterior side near apical end of mid femora. Hind tibiae sometimes darkened at middle. Tarsomeres 2-4 usually darkened above.

Abdomen (figs. 5, 6): Antero-lateral extremities of yellow spots on tergite 2 reaching lateral margins of tergite, only failing to reach margins in occasional dark



Figs. 1-6: ***Eupeodes lucasi*** **(Marcos-García & Láska, 1983)**, male (all Spain, Alicante). – 1. head, frontal view (E. 500); – 2. head, vertical view on the connection of eyes (E. 502); – 3. antennae, interior surface (E. 470); – 4. SBC and cell 1A of wing (E. 470); – 5. abdomen, dorsal view (E.500); – 6. sternites, ventral view (E.500). – Scale bares 0.5 mm.

specimens. Abdominal spots rather distinctly separated in the mid-line, connected only rarely and narrowly, always separated from lateral margins of tergites. Abdominal spots oblique, each spot with its anterolateral corner about 2 x (on tergite 3) and 2.5 x (on tergite 4) further from basal margin of tergite than is the most anterior part of its edge medially. Abdominal spots usually broader in medial half. Tergite 5 with a black semicircular spot or band separated from yellow lateral margins of tergite, anterolateral corners of tergite 5 sometimes dark. Dark spots on sternites large, on sternites 3 and 4 rectangular and of almost equal size.

Male terminalia: Similar to *E. tirolensis*. Base of aedeagus (head of pyxis, fig. 7-10) with a pair of long basal teeth and a pair of smaller apical teeth. Each apical tooth distinctly shorter than half of length of long tooth and sometimes inconspicuous (fig. 9). Paramere (fig. 11) rather oval, with small basal tooth (about 0.02 mm) in lateral view. Margin basal of this tooth forming periphery of paramere towards the symmetrical rounded apex. Length of paramere 0.21±0.01 mm. Hypandrium (fig. 12) only slightly wrinkled, rather angular, as broad as high, about 0.38±0.05 mm, distal lobes undeveloped, lingula vague or absent.

Length: Body 8.3 mm - 11.2 mm, wing 7.2 mm - 10 mm.

Female

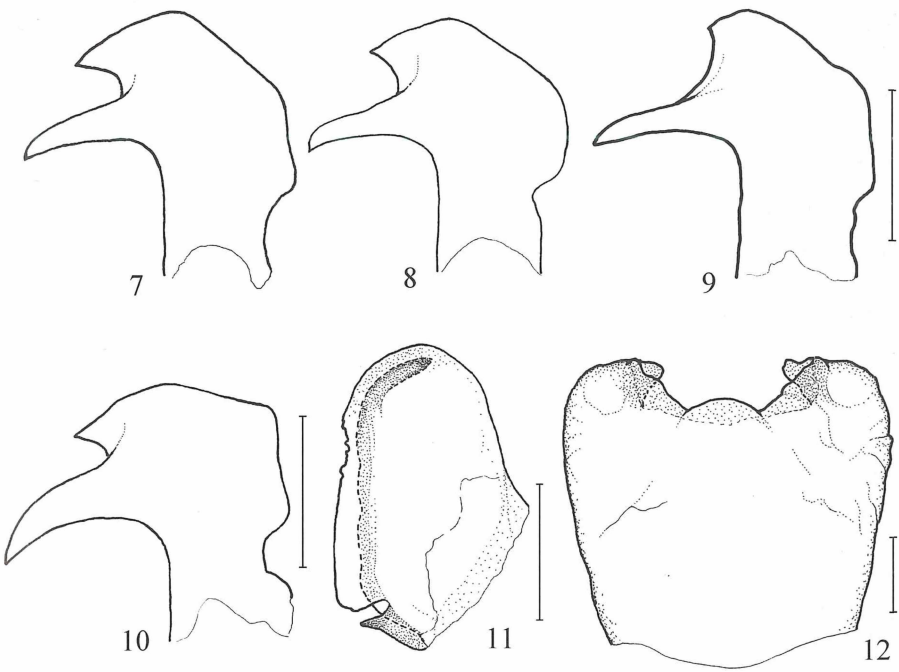
Head: Width of vertex about 21%±2% of width of head. Distance between posterior ocelli similar to distance between posterior ocellus and eye margin. Black colour on vertex reaching 1/3 to nearly 2/3 of distance between front ocellus and upper margin of antennal insertions. Frons shining, with reduced dusting, dusted narrow stripes along eyes sometimes forming small obscure dust spots near transition of black and yellow area. Distance between outer margins of antennal insertions about the same as, or a little longer than, width of vertex. Third antennal segment c.1.2-1.5 x longer (0.5±0.1 mm) than wide (0.4±0,06 mm), distinctly longer than segments 1 and 2 together. Width of face about 42% - 47% width of head.

Thorax: Hairing shorter than in male; on disc of scutellum 0.2 - 0.3 mm. Wing microtrichia somewhat more restricted than in male. Legs yellow with basal 1/10 - 1/3 of fore and mid femora and 2/3 - 3/4 of hind femora darkened, often completely yellow. Posterior side of fore femur usually only with some long black hairs on distal part.

Abdomen: Yellow spots on tergites as in males, but a little narrower. Dark spots on sternites large and usually clearly rectangular; sternite 3 usually with the most developed spots and sternite 5 with less developed spot.

Differential diagnosis of males

E. lucasi is very similar in general appearance to *E. luniger* (Meigen, 1822), but with basal 2/3-3/4 of hind femora dark (in *E. luniger* usually about 1/2) and sternites with large rectangular spots (in *E. luniger* the spots are smaller and rather oval). Base



Figs. 7-12: *Eupeodes lucasi* (Marcos-García & Láska, 1983), male terminalia (all Spain). – **7-10: base of aedeagus, lateral view.** – 7. (E. 471); – 8. (E. 500); – 9. (E. 496); – 10. (E. 502). – **11. left paramere, inner lateral view (E. 471). – 12. hypandrium, ventral view (E.497).** – Scale bares 0.1 mm.

of aedeagus of *E. lucasi* differs from that in *E. luniger* by less developed apical teeth.

E. lucasi differs from *E. tirolensis* (Dušek et Láska, 1973) in having the oral margin partly yellow (in *E. tirolensis* oral margin is completely dark), having a narrower face, that is less than 50 % the width of the head (in *E. tirolensis* face is more than 50 % the width of the head) and in having the third antennal segment elongated (in *E. tirolensis* the third antennal segment is oval, about as long as the first and second segments together).

E. lucasi differs from *E. nuba* (Wiedemann, 1830) in having the femora with black bases (completely pale in *E. nuba*) and in having the dark spots on sternites rectangular (small, round or absent in *E. nuba*).

E. lucasi differs from *E. tjanshanicus* (Peck, 1966) in having the abdominal spots separated in the mid-line and not reaching the lateral margins of tergites (in *E.*

tjanshanicus the abdominal spots are connected in bands and usually reach the lateral margins of tergites by elongated anterolateral corners), in having the third antennal segment shorter (in *E. tjanshanicus* the third antennal segment is about 1.5-1.6 times longer than wide) and in having a narrower face (in *E. tjanshanicus* face is more than 50 % the width of the head).

E. lucasi differs from *E. vandergooti* (Dušek et Láska, 1973) by having a shorter, almost angular clypeus (in *E. vandergooti* the clypeus is very elongate, almost 2 x longer than wide).

E. lucasi can be distinguished from *E. flaviceps* (Rondani, 1857) by separated and oblique abdominal spots (in *E. flaviceps* abdominal spots are usually connected at the mid-line, to make pale bands, and not so oblique; the distance of the anterolateral corners of the spots or band on tergite 3 from the basal margin of the tergite is, at maximum, 1.8 x of the distance from that same margin to the closest part of their anterior edge, medially, and on abdominal tergite 4 they are at maximum 2 x the distance from the basal margin of the tergite anterolaterally as is the most anterior part of their edge medially).

E. lucasi differs from other similar species in the genus in having a large area bare of microtrichia on the alula. In some specimens of the similar species *E. bucculatus* (Rondani,1857), a small bare area can occur on the alula, but *E. bucculatus* has the abdominal spots usually connected in the mid-line and at least 1/2 of the surface of SBC covered in microtrichia (less than 1/4 is covered in *E. lucasi*).

Variability

Similar to other species of *Eupeodes* (see Dušek & Láska, 1973, 1974). In *E. lucasi* the colouration of the abdomen seems to be more stable in both sexes. Also pale specimens from laboratory breeding have abdominal spots usually clearly separated. Leg colour is very variable in females, the legs (especially the hind legs) often being completely yellow in pale specimens. In males leg colour is stable, though in teneral specimens the dark colours may be under-developed. Variability was observed in the shape of the base of the aedeagus even within one population (see figs. 8, 10). Variability in the extent of dusting on the frons of females is remarkable. In Spanish populations the frons has no dust spots. But dust spots are visible on the frons in females from other parts of Europe (also Corsica) and in some freshly emerged Spanish females. There are also two females without frontal dust spots from Italy (Campigna, Valle d´Aosta), that are similar in size to the larger, pale, Spanish females of *E. lucasi*. These females differ from Spanish *E. lucasi* in having a vertex that is distinctly narrower than the distance between the outer margins of the antennal insertion, in having a facial tubercle that is symmetrical in profile, in lacking a dark spot on sternite 5 and in the shape of the abdominal spots, which are narrowed medially. These differences seem to be due to intraspecific variability, but few specimens have yet be available to examine.

Material examined

Czech Republic: Bohemia or., Dobré (sq. 7763), 430 m, 11.VI.1998, 1♀, (E.825) (ex larva leg. in aphid colony on *Malus silvatica*) leg. L. Mazánek.

France: **Corse**: Asco, Mt. Cinto, 4.VII.1967, 1♂ (E.717), leg. V.S. v.d.Goot; Col de Vizzavona, 900-1000m, 9.VII.1961,2♂ (E.720, E.721), leg. H.T.P. Lambeck; 1150m, 16.VII.1967, 1♂ (E.507), leg. V.S. v.d.Goot; 17.VII.1967, 2♂ (E.718, E.719), leg. V.S.v.d.Goot; 23.VII.1967, 1♀ (E.582), leg. V.S. v.d.Goot. **Pyrenees Atlantiques**: Foret d'Iraty, 4.VI.1981, 1♀, leg. Lambert (C.M.S.). **Pyrenees Orientales**: Foret de Massane, 750m, 9.VI.1984, 1♂, leg. M.C.D. Speight (C.M.S.); 12.VI.1984, 1♂, leg. M.C.D. Speight (C.M.S.); 17.VI.1984, 1♂, leg. M.C.D. Speight (C.M.S.).

Greece: Insel Lesbos, SE, S Ayiásos, Pinus, Castanea-Wald, 17.V.1995, 1♀ (E.820), leg. G. Miksch; Platania/Volos, 10.II.2000, 1♂, leg. L. Standfuss; 5.V.2000, 1♀ and 11.IV.2000, 1♀, leg. K. Standfuss; Kastania-Kallirroi, river Atieloos, 15.VII.1998, 1♂, leg. A. Vujić; Pindos mountain, Kastanea, 13.VII.1998, 1♀, leg. S. Radenković, 1♀, leg. S. Šimić; Kastoria, Neapoli, 21.IV.1990, 1♂, leg. A. Vujić.

Hungary: Darány, Osborókás, 11.VI, 1976, 1♀ (E.826), leg. S. Tóth.

Italy: Sicily, Etna, 1450m, 5.VI.1999, 1♂ (E.821), leg. B. Merz; I.d'Ischia, 1/9.IX.1970, 1♀ (E.822), leg. Lindner; Valle d´Aosta, St. Pierre 600m, 15.V.1999, 1♀ (E. 590), leg. Merz & Schmid-Egger; Campigna, Nr. Forli, Emilia Romagna, 750m, 3.VII.1988, 1♀, leg. et coll. M.C.D. Speight.

Spain: **Alicante**: Benasau, 26.V.1992, 2♂ (E.498, E.501), leg. S. Rojo (ex-larva, Refs. 557, 558); Alcoy, Font Roja, 31.V.1992, 1♀ (E.588), leg. S. Rojo (ex-larva, Ref. 682); 17.VII.1992, 1♂, leg. P.M. Isidro; 29.VII/12.VIII.1992, 1♀ (Malaise Trap), leg. F. Luna; 30.VI.1993, 1♀, leg. P.M. Isidro; 13.VII.1993, 3♂, leg. P.M. Isidro; 15.VII.1993, 2♂, leg. P.M. Isidro; 27.VII.1993, 6♂ (E.470, E.500, E.502), leg. P.M. Isidro; 17.VIII.1993, 3♂, leg. P.M. Isidro; 25.IV.1994, 1♀, leg. L. Sonet; 29.V.1994, 1♀ leg. P.M. Isidro; 17.VI.1994, 4♂, leg. J.V. Falcó; Confrides (Fuente Arbol), 2.VIII.1992, 2♂, (E.495, E.496), leg. S. Rojo (ex-larva, Refs. 1898, 1899); 3.VIII.1992, 1♂ (E.494), leg. S. Rojo (ex-larva, Ref. 1900); Tibi, 4.V.1993, 1♂ (E.469), leg. S. Rojo (ex-larva, Ref. 5193); 6.VI.1993, 1♂, leg. S. Rojo (ex-larva, Ref. 5317); 7.VI.1993, 1♂ (E.471) & 1♀, leg. S. Rojo (ex-larva, Refs. 5221, 5224); 4.VI.1993, 1♀, leg. S. Rojo (ex-larva, Ref. 5193), 7.VI.1993, 2♀, leg. S. Rojo (ex-larva, Refs. 5222, 5223); Vall de Alcala, 2.VI.1992, 1♀, leg. S. Rojo (ex-larva, Ref. 806); Villena, 27.V.1993, 1♂, leg. S. Rojo (ex-larva, Ref. 3356). Avila: Cereceda, 4.V.1982, 1♂, leg, M.P.; Navarredonda de Gredos, 7.VII.1972, 1♀ (E. 514), leg. V. S. v.d.Goot & J.A.W. Lucas (P. Láska coll.). Vielba (*E. luniger* in Marcos-García 1985). Cáceres: Hervás, 600m, 28.X.1980, 1♀ (E. 583), leg. M.A. Marcos-García (Paratype); Pto. El Torno, 700m, 6.VII.1980, 1♂ (E.497), leg. M.A. Marcos-García; Robledillo de Gata, 1100m, 17.VIII.1980, 1♀ (E.584), leg. M.A. Marcos-García (Paratype); Torre de Don Miguel, 24.V.1980, 1♂, leg. M.A. Marcos-García (*E. luniger* in Marcos-García 1985); Valverde del Fresno, 950m, 23.V.1980, 1♂, leg. M.A. Marcos-García (*E. luniger* in Marcos-García, 1985). **Cuenca**: Nacimiento Rio Cuervo, 6.VII.1997, 1♀ (E.591), leg. M.A. Marcos-García. Huesca: Chía, Collado de Sahún, 1950m, 1♀, leg. E. Galante. León: Brañillín, 14.VI.1986, 1♀, leg. M.A. Marcos-García; El Bierzo, IX.1998, 1♀, leg. Tizado-Morales; Morgovejo, 10.VII.1986, 1♂, leg. G Remaudière (ex-larva); Murias de Paredes, 7.XI.1986, 1♀, leg. M.A. Marcos-García; Valdeteja, 1200m, 17.VII.1977, 1♀ leg. M.A. Marcos-García (Paratype); Villanueva de Carrizo, 26.V.1990, 1♂, leg. Tizado-Morales (ex-larva). **Lérida**: Isil, 8.VIII.1918, 1♂, leg. A. Codina. **Madrid**: 1♀ (M.N.C.N.M.). Salamanca: Agallas, 1050 m, 17.VIII.1980, 1♂, leg. M.A. Marcos-García (*E. luniger* in Marcos-García 1985); Batuecas (Fuente Gaspar), 29.IX.1980, 1♂, leg. M.A. Marcos-García; El Payo (Pto. Perales), 860m, 24.V.1980, 1♂, leg. M.A. Marcos-García (*E. luniger* in Marcos-García 1985); Garcibuey, 20.IV.1981, 1♂, leg. M.A. Marcos-García (*E. luniger* in Marcos-García 1985); La Alberca, 4.VII.1981, 1♂, leg. M.A. Marcos-García (*E. luniger* in Marcos-García 1985); 4.7.1981, 1♀, leg. M.A. Marcos-García (Paratype); Escurial de la Sierra, 17.VI.1980, 1♀, leg. M.A. Marcos-García (Paratype); La Honfría, 1250m, 18.IX.1980, 1♂, leg. M.A. Marcos-García (*E. luniger* in Marcos-García 1985); Linares, 20.VII.1977, 1♂, leg. M.E. Herrera (*E. luniger* in Marcos-García 1985); Los Villares, 7.VII.1978, 1♂, leg. M.A. Marcos (ex-larva, *E. luniger* in

Marcos-García 1981); Navasfrías, 19.IV.1981, 1♀, leg. M.A. Marcos-García (Paratype); Sierra de Candelario, 1500m, 15.VII.1977, 1♀ leg. M.A. Marcos-García (ex-ovo, Paratype); Sierra de Candelario, 1700m, 14.VII.1980, 1♀ leg. M.A. Marcos-García (Holotype). **Santander**: Vada, 22.VI.1987, 1♀ (E.585), leg. M.A. Marcos-García. Soria: Fuente de Agreda, 20.VI.1983, 1♂ (E.499), leg. E. Galante (*E. luniger* in Marcos-García 1986). **Teruel**: Frías, 7.VII.1997, 1♂ & 1♀ (E.589), leg. M.A. Marcos-García; Orihuela del Tremedal, 8.VII.1997, 1♀, leg. M.A. Marcos-García. **Valencia**: Requena, 890m, 22.VI.1994, 1♂ (E.472), leg. C. Pérez-Bañón.

Islas Baleares, Menorca: Colarsaga, IV.1933, 1♀, leg. Esp i Vil (M.M.B.).

Switzerland: The Alps, Bretolet, 1900-2000m, 28.V.1962, 1♀ (E.823), 1.IX.1962, 1♀ (E.824) (Maibach et al. 1992).

* New citations of *E.lucasi* in bold letters.

Table 1: Relationships *E. lucasi* larva-aphid-plant. (*) Cited like *Eupeodes luniger* (Meigen, 1822). (**) Cited like *Eupeodes flaviceps* (Rondani, 1857)

Aphis epilobiaria	*Epilobium parviflorum*	Tizado-Morales et al. 1991
Aphis fabae	*Arctium lappa*	Tizado-Morales et al. 1991
Aphis fabae	*Cynara scolymus*	Rojo & Marcos-García 1998 (*)
Aphis fabae	*Vicia faba*	Rojo & Marcos-García 1998 (*)
Aphis pomi	*Malus domestica*	New data
Aphis punicae	*Punica granatum*	New data
Brachycaudus amygdalinus	*Prunus dulcis*	New data
Brachycaudus cardui	*Cirsium* spec.	Marcos-García 1981 (*)
Brachycaudus cardui	*Cynara scolymus*	Rojo & Marcos-García 1998 (*)
Brachycaudus cardui	Laboratory	Marcos-García & Láska 1983
Brachycaudus helichrysi	*Doronicum carpetanum*	Marcos-García & Láska 1983
Brachycaudus persicae	*Prunus dulcis*	New data
Dysaphis plantaginea	*Malus domestica*	Tizado-Morales et al. 1991
Dysaphis plantaginea	*Malus domestica*	New data
Myzus cerasi	*Cerasus avium*	New data
Phorodon humuli	*Prunus domestica*	Nuñez-Pérez & Tizado 1993 (**)
Rhopalosyphum insertum + *Dysaphis plantaginea*	*Malus domestica*	Tizado-Morales et al. 1991(**)
Uroleucon spec.	Laboratory	Marcos-García 1981 (*)

Life History

There is little published data about the biology of *Eupeodes lucasi*. As for the diet of the larvae, most of them refer to aphids attacking cultivated (Rojo & Marcos-García 1998) and wild herbaceous plants (Marcos-García & Láska 1983), although some of them are also related to fruit trees (Tizado-Morales et al. 1991). Tab. 1 summarizes all known relationships of syrphid-aphid-plant, including the new material studied in this paper.

Preferred environment: Speight (1999) indicates that this species is present in forest/open ground; open areas in mesophilous *Fagus*, *Quercus pyrenaica* and *Castanea* forest and dry grassland, including mountain pastures.

The preferred habitat of *Eupeodes lucasi* in Spain is in mountain ranges or areas with cold temperatures in winter. The larvae have been captured preying on aphids belonging to various genera (Tab. 1). The data presented here show that there is a significant presence of *E.lucasi* in colonies of aphid pests on Mediterranean fruit trees. Length of developmental stages: Larva = 8-9 days; Puparium = 10-11 days (n= 15). Rearing took place in a growth chamber at 16-22° C, 80 ± 5% r h with a constant photo-regime of 15L : 9D photoperiod.

Flight period: April/October peaking in June-July. Larvae: from May to September.

Distribution: Spain, French Pyrenees, Corsica, Alps, Apennines (northern Italy), Sicily, FR Yugoslavia (Serbia, Montenegro), FRY Macedonia (Kozuf mountain) (Vujić et al. in prep.), Greece, Hungary and Czech Republic. Frequent in Iberian peninsula and Corsica, in other parts of Southern and Central Europe probably rare and misidentified as *E. luniger* (Meigen, 1822).

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