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HILARA CROATICA SP. NOV. AND INTER-TAXA COMPETITION BETWEEN *HILARA* AND *RHAMPHOMYIA* (*MEGACYTTARUS*) (DIPTERA: EMPIDIDAE)

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A new species of the genus *Hilara* (Diptera: Empididae), *Hilara croatica* sp. nov., is described from Croatia and illustrated. Distributions of *Hilara* and *Rhamphomyia* (*Megacyttarus*) species in space and across time are briefly discussed.

Key words: dance flies, Empidoidea, Empididae, Croatia, new species, inter-taxa competition

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U radu se daje opis i crteži nove vrste roda *Hilara* (Diptera: Empididae), *Hilara croatica* sp. nov., iz Hrvatske. Kratko se raspravlja o prostornoj i vremenskoj rasprostranjenosti vrsta *Hilara* i *Rhamphomyia* (*Megacyttarus*).

Ključne riječi: muhe plesačice, Empidoidea, Empididae, Hrvatska, nova vrsta, kompeticija među svojtama

INTRODUCTION

The genus *Hilara* Meigen, 1822 is one of the three megadiverse groups within the family Empididae (dance flies, dagger flies or balloon flies), together with *Empis* Linnaeus, 1758 and *Rhamphomyia* Meigen, 1822. Nearly 400 species of this genus have been described worldwide (Xiao & Yang, 2016), about 250 species are currently known from the Palaearctic region (Shamshev, 2016), out of them almost 180 from its western part (Straka, 1976; Wyatt, 2014; Chvála, 2005a, b, 2008, 2013; Chvála & Merz, 2009; Çiftçi & Hasbenli, 2011; Çiftçi *et al*., 2008; Kustov *et al*., 2013; Kanavalová *et al*., 2018).

For details about the biology of *Hilara* spp. see e.g. Chvála (2005a) and references therein. From numerous observations of the behaviour of *Hilara* and *Rhamphomyia* (*Megacyttarus*) by the senior author we derived a hypothesis about competition between these two genera resulting in the partitioning of the environment in space and time resulting in quite different geographic patterns of their occurrence.

MATERIAL AND METHODS

The material was collected by means of a Malaise trap situated in the village of Gornji Muć, located 15 km from the Adriatic coast in the hinterland of the city of Split (Fig. 1).

The trap was placed on a sunny hill slope named Grudina at 500 m a.s.l., in an orchard, at position 43°41'27''N, 16°29'44''E on the southeast foothills of Svilaja Mountain. There are woody hills with pine and oak trees with streams flowing to a cultivated field in the south (Fig. 2).

The samples were collected and preserved together with other catch from the Malaise trap during 2013 (from 27 May to 6 December) and 2014 (from 27 April to 10 December) that had already been partly studied and published by Barták & Kokan (2017).

Genitalia preparations and drawings: genitalia, together with the preceding 2–3 abdominal segments were removed from the rest of the body using small scissors and macerated in potassium hydroxide solution (approx. 10 %) in small vials submerged in hot water for 1–2 hours. After neutralization with 8 % acetic acid (5 minutes), the genitalia were dissected in glycerine and photographed using an ®Olympus E-410 digital camera mounted on an ®Olympus BX51 compound microscope. The resulting images were edited with the computer software Quick Foto micro 2.3 provided with deep focus 3.1. Final images were a montage composed usually of 7–15 layers and were further edited with ® Adobe Photoshop. Images served as models for hand drawings, and the details were added from direct observation of the objects.

The morphological terms used here follow Merz & Haenni (2000), Sinclair (2000), and Sinclair & Cumming (2006). All body measurements (including body and setae length) were taken from dry specimens (therefore the actual length may differ from that of fresh or wet-preserved material) by means of an ocular micrometer mounted on a Nikon SMZ 1500 binocular microscope. Male body length was measured from antennal base to the tip of genitalia and female body length from base of antennae to the tip of cerci. Thoracic setae are counted on one side of body except scutellars.

The identification of most of the European species of the genus *Hilara* is possible using the keys in monographs: Chvála (2005a, 2008) and Chvála & Merz (2009); taking into consideration also species described more recently (Chvála, 2013; Çiftçi *et al*., 2008; Çiftçi & Hasbenli, 2011; Kustov *et al*., 2013; Kanavalová *et al*., 2018).

Systematics

***Hilara croatica* sp. nov.**

(Figs 1, 2)

Type material: HOLOTYPE ♂, **Croatia**, Gornji Muć, 500 m a.s.l., orchard, 43°41'27''N, 16°29'44''E, leg. B. Kokan, 11.-27.iv.2014 (CULSP). **PARATYPES:** 1♂, 2♀, same data as holotype; 3♂, 2♀, same locality but 27.iv.-10.v.2014 – (CULSP, NHMST).

Diagnosis: Middle-sized very light grey *Hilara* species with occiput dull black from dorsal view, lacking large frontal setae, lateral setae on antepronotum present, quadriserial acrostichals, black legs, fore basitarsus swollen and about 3x longer than deep, dirty (almost brownish) yellow halteres, silvery grey abdomen, and hypandrium evenly narrowed apically.

Fig. 1. Position of the village Gornji Muć and the city of Split in Croatia.

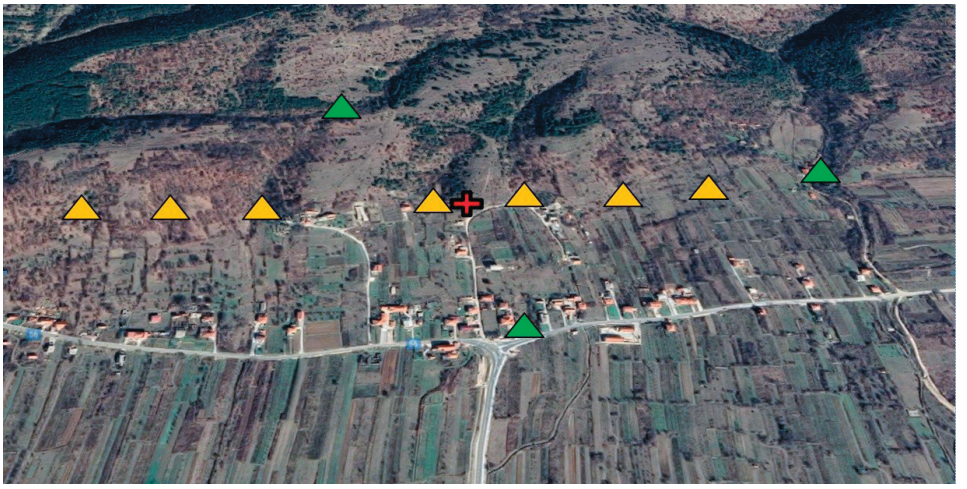

Fig. 2. Locality of Grudina (red cross) in Gornji Muć with periodic brooks (yellow triangles) and permanent creeks (green triangles) in vicinity.

Etymology: The name of the species is adjectival toponym after country of its origin (Croatia).

Description: Male head black, occiput dull black from dorsal view and dark brownish grey in posterior view with slight indication of somewhat lighter diffuse V-shaped spot behind ocelli; frons wide (0.14 mm broad at narrowest point – slightly more than twice as broad as anterior ocellus) grey (lighter than occiput even in dorsal view) with dull black margins; face even more light grey than frons and equally wide (only slightly broadening ventrally). Eyes with anteroventral facets slightly larger (7 each 0.10 mm) than posterodorsal ones (12 each 0.10 mm). Frons with 4–7 equally long setae (about as long as scape), large pair not developed. Ocellar setae moderately long (0.25 mm –

about as long as longest postocellar setae), ocellar triangle with several additional small and fine setulae. Occiput in dorsal half with two rows of black setae, postocular row complete, second row consists of smaller setae, ventral half with more densely and irregularly covered white setae. Clypeus with anterior part shiny (also lowermost part of face shiny), remaining parts including narrow gena light grey microtrichose. Palpus black, light grey microtrichose, with fine rather long white setae ventrally (the longest up to 0.25 mm long – half as long as labrum). Labrum brownish black, polished, 2/3 as long as head height; postmentum microtrichose, white haired, nearly as broad and long as black setose labellae. Antenna black, both basal segments short setose; length of antennal segments (scape: pedicel: postpedicel: 1st segment of stylus: stylus: bare part of stylus) = 0.10–0.13 mm: 0.06–0.08 mm: 0.27–0.32 mm: 0.01–0.02 mm: 0.11–0.13 mm: 0.02–0.03 mm. **Thorax** black, very light grey microtrichose, mesoscutum in anterior view with two darker and less microtrichose stripes between rows of setae (in some specimens with more or less apparent three brownish stripes along rows of setae), in posterior view with three darker stripes, central one below acrostichals and broader lateral ones reaching from inner dorsocentrals to notopleuron; prescutellar depression and scutellum very light grey from almost all points of view; pleuron light grey. Chaetotaxy: proepisternum with many fine pale setulae; prosternum with several white setae; acrostichals black, irregularly quadriserial (with tendency to be triserial anteriorly) and very short (about 0.07 mm); dorsocentrals almost uniserial in several specimens up to irregularly 2–3 serial in other specimens, equally small or slightly longer than acrostichals, ending in 1–2 pairs of long prescutellars; postpronotum with several pale setulae and mostly with a single more or less differentiated short and fine dark seta; posthumeral seta short and fine, intrahumeral not differentiated; antepronotum with two not very strong and long usually yellow to brownish setae on sides and several additional shorter white setulae between them; notopleuron with 2–3 strong black setae on posterior part and several rather long both pale and dark setae on anterior part; 1 supraalar and 1 postalar seta, prealar region with several short setulae; 2 pairs of scutellars. **Legs:** coxae concolorous with pleura, mostly with yellow setae (Fig 3); more distal parts of legs brownish-black, mostly white haired, larger setae brown, tarsi almost black, microtrichose, knees narrowly yellowish. Fore femur with short setae posteriorly, other surface including antero- and posteroventral only with very short pile. Fore tibia anteriorly with dense short hairs giving almost silvery appearance, posteriorly with pale setae subequally long as tibia depth, and with several mostly dark anterodorsals slightly longer than tibia depth, posterodorsals poorly differentiated, 2–3 preapicals slightly longer than depth of tip of tibia, fore basitarsus (Fig. 3) swollen, ¾ as long as fore tibia, dorsally with pale fine setae shorter than its diameter, tarsomeres 2–5 shorter than basitarsus. Mid femur short setose, subbasal ventral hair fine and short, anterior setae poorly differentiated. Mid tibia short setose. Hind femur with short dorsal setae, ventrally with only a silvery pile. Hind tibia thin, short setose, with 2 setae dorsally slightly longer than tibia depth; mid and hind basitarsi short setose, ventrally with very short spines, segments 2–5 of mid and hind tarsi short.

Wing as in Fig. 4: clear or very slightly brownish, veins yellowish-brown to brown, anal vein in apical part apparent as fold, radial fork not very long, axillary angle obtuse, costal seta long. Vein Sc complete. Halter dirty (almost brownish) yellow, calypter whitish yellow with yellow fringes.

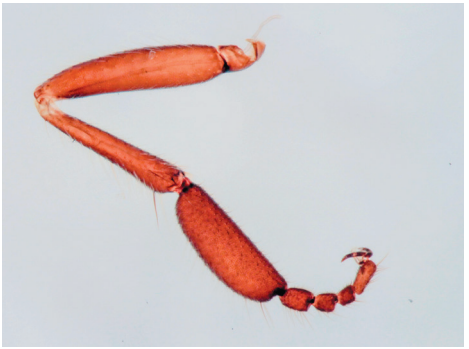

Fig. 3. Fore leg of *Hilara croatica* sp. nov. (posterior view).

Fig. 4. Wing of *Hilara croatica* sp. nov.

Abdomen rather long and narrow, brownish-black, silvery grey microtrichose, pale setose. Lateral marginal setae not differentiated, more apparent only on dorsal part of last three tergites, sternites very short pale setose. Genitalia as in Fig. 5: cercus long and narrow, hypandrium with tip strongly and equally narrowed; epandrial lamella with rather long dorsal outgrowth; paramera corkscrew-like. Length: body 4.8–5.2 mm, wing 4.1–4.2 mm.

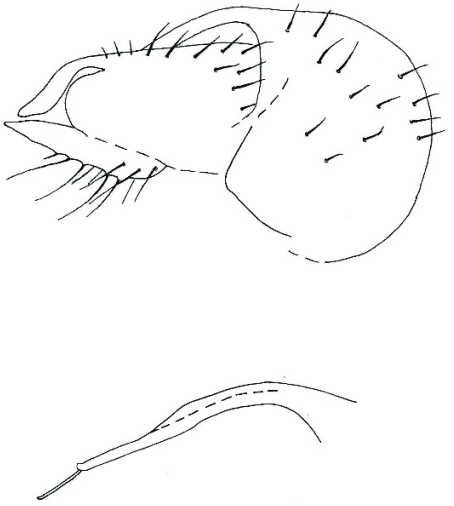

Fig. 5. Male genitalia of *Hilara croatica* sp. nov. (lateral view).

Female: Similar to male but darker: brown stripes along rows of setae on mesoscutum more apparent, abdomen in dorsal view yellowish brown and in lateral view dorsal halves of tergites yellowish brown. Wing membrane slightly brownish and veins darker brown than in male. All parts of legs thin and very short setose with the exception of preapicals and 1–2 dorsal setae on fore and hind tibia, mid tarsal segments 3–4 equally short as in male. Abdomen with very short setae, without marginals. Length: body 3.7–5.1 mm, wing 4.3–5.0 mm.

Remarks: *Hilara croatica* **sp. nov.** (HC) resembles members of the *H. maura* group. However, the presence of posthumeral seta, setae on antepronotum and postpronotum (even if rather small and fine), absence of prothoracic sensorial pit and presence of marginal setae on last three abdominal segments exclude the above described species from *H. maura* group. In the key to Mediterranean *Hilara* by Chvála (2008), HC leads to *H. cothurnata* Engel; however, considering shape of genitalia and fore leg, HC is much more similar to *H. albipilosa* Engel (HA). The most striking differences between HC and HA (beside absence of lateral seta on antepronotum in HA) are as follows: fore basitarsus in HA (depicted on Textfig. 117, p. 218 by Engel 1941-43) is twice as broad as it is long, but three times as long as it is broad in HC (see Fig. 3); mid basitarsus in HA exhibits long setosity ("lang and dicht pubeszent" – Engel, 1941-43), the same character

similarly described by Collin 1960, describing *H. meralis* (a junior synonym of HA) but mid tarsus in HC is uniformly very short setose; abdomen in HA is "bräunlich gelbgrau bestäubt" (Engel 1941-43) or "slightly dusted greyish" (Collin, 1960), but silvery grey in HC. Moreover, tip of hypandrium is also different, much shorter and broader in HA (Fig. 15 B by Collin, 1960, p. 418) than in HC (Fig. 5).

DISCUSSION

The majority of *Hilara* species occur in early spring to late summer, mostly in the vicinity of both standing and running waters. Hunting swarms are formed above water surface (rarely above solid ground) and general biology is very similar to that of the *Rhamphomyia* subgenus *Megacyttarus*. It seems to us that strong inter-taxa competition was developed between these groups. We several times observed in Central Europe strong partitioning of the environment, when in May, above a pond, there was a dense aggregation of *R.* (*M.*) *crassirostris* (large species) and above a small brook watering the pond there were swarms of several smaller *Hilara* spp. and a month later (June), the situation reversed and above the pond there were dense swarms of several *Hilara* spp. and above the brook mostly *R.* (*M.*) *poissoni*. Maybe this inter-taxa competition explains why in Europe Hilara spp. are generally much more abundant whereas in North America it is mostly Megacyttarus spp. that dominate near water bodies. Possibly this causes a redistribution ecological niches in terms of time and space. The precise evaluation of this hypothesis will require more accurate experiments.

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