

# FIRST RECORD OF ALIEN SPECIES *Chymomyza amoena* [DIPTERA, DROSOPHILIDAE] IN CROATIA

## PRVI NALAZ STRANE VRSTE *Chymomyza amoena* [Diptera, Drosophilidae] U HRVATSKOJ

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### Summary

The alien species *Chymomyza amoena* (Loew 1862) is recorded in Croatia for the first time. This phytophagous drosophilid native to North America was first discovered in Europe in 1975 in the former Czechoslovakia. *C. amoena* breeds in parasitized fruits and nuts damaged from primary pest attack. It is considered to be the principal drosophilid with this kind of developmental habits in both North America and Europe. The currently known host plants, species morphology and biology, the location of the first finding and possible ways of expanding in the territory of Croatia are briefly reviewed. This work provides new insights into distribution of *C. amoena* in Europe.

**KEY WORDS:** Diptera, Drosophilidae, invasive species, host plants, dispersal prognosis

### INTRODUCTION UVOD

The arrival of alien species of Diptera to Europe has exponentially increased since the second half of the 20<sup>th</sup> century. Ninety-eight species of Diptera have already been established in Europe, 18 of which belonging to the family of Drosophilidae. The majority of alien Diptera were introduced into or within Europe unintentionally. Almost one-third of them originate from North America (Skuhrová et al., 2010).

The genus *Chymomyza* is represented by four Neotropical species in Europe and *Chymomyza amoena* (Loew 1862) (Diptera; Drosophilidae) is the only species considered to be fully established in Europe (Bächli et al., 2002, 2004; Skuhrová

et al., 2010). This phytophagous drosophilid native to North America (Skuhrová et al., 2010) was first discovered in Europe in 1975 in the former Czechoslovakia and was probably introduced into Europe on apples (Burla & Bächli, 1992; Jong & Van Zuijlen, 2003). Five years later (1980) it was recorded in two Croatian neighboring countries, Hungary and Serbia. In the coming years first records were reported for Slovakia (1983), Poland (1984), and Germany (1985). In neighboring Slovenia it was recorded in 2013 (Seljak, 2013). To this date it was established in 15 European countries (Skuhrová et al., 2010; Máca & Bächli, 1994; Band et al., 2005) and in all the countries surrounding Croatia except Bosnia and Herzegovina (Fauna Europaea, 2017). The presence of *C. amoena* was identified during the monitoring of *D. suzukii*, another new alien species for Croatia.

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### Host plants – *Biljke domaćini*

In its natural habitat of North America *C. amoena* develops in broad spectrum of suitable firm substrates as fallen unripe and ripe frassy apples (*Malus domestica* Borkh) and native crabapples (*Malus coronaria* L.), oak acorns (*Quercus* spp. L.) and black walnut husks (*Juglans nigra* L.) (Band, 1991; Band et al., 2005; Jong & Van Zuijlen, 2003). Several studies in forests and orchards in Central and Southern Europe have confirmed its presence in chestnuts (*Castanea sativa* Miller), pedunculate oaks (*Quercus robur* L.) as well as in fleshy fruits such as apples (*Malus domestica* Borkh), wild sweet cherries (*Prunus avium* L.) and plums (*Prunus domestica* L.) (Band et al., 2006).

The ability of *C. amoena* larvae to live in various parasitized or damaged fruits and nuts, feeding on decaying frass and other media supporting micro-organisms shows that this species can be considered a food generalist (Band & Band, 1984 cit. Máca & Bächli, 1994).

### Morphology and biology of species – *Morfologija i biologija vrste*

The body length of species ranges between 2 and 4 mm. *C. amoena* has strikingly bright red eyes, yellowish to brownish matt colored thorax and black brownish colored abdomen (Insekten Box, 2017). Morphological characteristics unique to this species are yellowish legs and wings with two distinct brown transverse bands and a dark spot along R1 (Bächli et al., 2004) (Figure 1).

The biology of *C. amoena* was studied in detail in North America. It is a multivoltine species which can produce a new generation within a month during the breeding season (Band, 1988). The most *Chymomyza* species breed under the bark of various trees and the adults are usually attracted to the peeled areas of trees and to cut logs. *C. amoena* is the ex-



**Figure 1.** Left wing of species *Chymomyza amoena*, male (Photo: D. Lemić).

**Slika 1.** Lijevo krilo vrste *Chymomyza amoena*, mužjak (Foto: D. Lemić).

ception while it breeds in parasitized fruits and nuts damaged from primary pest attack (Bächli et al., 2004, Band et al., 2005). In eastern United States, the species overwinters as the third instar larva in a variety of substrates such as black walnut husk, native crabapples and domestic (imported) apples and breeds from spring through autumn. In spring, females prefer to oviposit in soften overwintered native crabapples and later in fallen parasitized plums. In summer oviposition continues in early fallen parasitized unripe apples as well as in ripening parasitized fallen and unfallen apples. Parasitized apples and pears may continue to be used for oviposition in autumn but females also switch to nuts, especially parasitized black walnut husk and other suitable substrates which will serve as overwintering sites for the developing larvae. In early fallen and ripening apples, females oviposit in scars, codling moth tunnels or frass which also serves as food for females. In nuts, it prefers parasitized rather than just damaged acorns and use native crabapples as the breeding substrate (Band, 1988; Band et al., 2005). Experimental studies in Europe have revealed that breeding in parasitized fruits and nuts had been maintained in European specimens of *C. amoena*. Further research established its presence in European apple orchards and chestnut forests and is considered to be the principal drosophilid breeding in parasitized fruits and nuts in both North America and Europe.

### First record in Croatia – *Prvi nalaz u Hrvatskoj*

*C. amoena* was first recorded in Croatia on 6<sup>th</sup> October, 2016 on locality Zebanec Donji (Međimurje County) situated in northern part of Croatia, at N 46°28'1.2", E 16°24'0" (Figure 2). Two male specimens of fly were caught in integrated production vineyard situated relatively close to the border with Slovenia by feeding traps based on apple vinegar.

The grape cultivars traditionally grown in this region are Sauvignon blanc and Riesling. The climate of this region is of a moderate continental type, with warm summers and maximum precipitation in the spring and summer. The average temperature of the coldest and warmest months (January and August) is -2°C and 25°C, respectively. Average annual precipitation is 850 mm. The collecting site is surrounded by forest and extensive production orchard in which apples (*Malus domestica* Borkh), pears (*Pyrus communis* L.), sweet cherries (*Prunus avium* L.) and walnuts (*Juglans regia* L.) are grown.

Left and right hind wings were removed from two male individuals and slide mounted according to the standard procedures (Upton & Mantel, 2010) by using the fixing agent Euparal (Australian Entomological Supplies, Melbourne, Australia) (Figure 1). The keys and illustrations by Bächli et al. (2004) were used for the species identification. Slide mounted specimens are deposited in the Department for Agricultural Zoology, University of Zagreb, Faculty of Agriculture (Det. G. Seljak, leg. M. Šubić).



**Figure 2.** Site of first record of species *C. amoena* in northern part of Croatia (Zebanec Donji) (original).

**Slika 2.** Lokalitet prvog pronalaska vrste *C. amoena* u sjevernom dijelu Hrvatske (Zebanec Donji) (original).

This finding confirms the presence of new, invasive alien species in Croatia.

### Expanding of species *C. amoena* on Croatian territory – Širenje vrste *C. amoena* na području Hrvatske

When Nearctic *C. amoena* entered the former Czechoslovakia in 1975 and began to spread, it entered a Continent where wide variety of available hosts (domestic apples, English oaks, European chestnuts) were present, and where primary pest insects attack developing fruits and nuts (Band et al., 2005). *C. amoena* is now widespread in the chestnut forests of southern Europe (Canton Ticino in Switzerland, northern Italy, and southern Austria) where it is the only drosophilid using fallen parasitized chestnuts as a breeding substrate (Band et al., 2005). In two Croatia's neighboring countries (Hungary and Serbia) the species was first recorded in 1980s so we can assume that the species is present on our territory for some time, but was undetected. In the coming years we can expect re finding of species in northern Croatia, since this is an area of intensive production of apples which are one of the main breeding hosts of species. Considering the fact that relatively close to this area are situated chestnut forests (Medvednica and Samobor Mountains) expansions of species in this area could also be expected.

Since only two specimens of *C. amoena* were found in Međimurje County, its distribution in northern Croatia and other parts of the country should be examined more closely.

The species is not considered to be agricultural or forestry pest, as it uses parasitized fruits and nuts of host plants as breeding sites. Work presents the first report of *C. amoena* in the field of Croatian territory and provides new insights into its distribution in Europe.

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## Sažetak

Strana vrsta *Chymomyza amoena* (Loew 1862) zabilježena je prvi puta u Hrvatskoj. Ova fitofagna vrsta octene muhe porijeklom iz Sjeverne Amerike otkrivena je u Europi 1975. godine na području nekadašnje Čehoslovačke, a već 1980. godine zabilježena u dvije nama susjedne države (Mađarskoj i Srbiji). Smatra se da se *C. amoena* proširila uvozom jabuke iz Amerike u Europu, a velik broj dostupnih biljaka domaćina (domaće jabuke, engleski hrast te europski kesten) zaslužan je za široku rasprostranjenost vrste u Europi. U radu se navode biljke domaćini, morfologija i biologija vrste, lokalitet prvog pronalaska, te se prognozira širenje vrste na području Hrvatske. *C. amoena* razvija se u različitim vrstama orašastih, jezgričavih i koštičavih plodova oštećenim od primarnih štetnika, te se smatra jedinom vrstom octene muhe s ovakvim razvojnim navikama u Sjevernoj Americi i Europi. Poznati domaćini u Europi su šumske vrste (kesten i hrast crnika) te voćne vrste (jabuka, divlja trešnja i šljiva). *C. amoena* ne pričinjava primarne štete u uzgoju, stoga se ne smatra štetnikom u poljoprivredi i šumarstvu. Dva primjerka vrste pronađena su tijekom 2016. godine u vinogradu na području Međimurske županije okruženim šumom i zapuštenim voćnjakom jabuke. S obzirom da je Međimurska županija poznata voćarska regija, a u relativnoj blizini u okolici Medvednice, Hrvatskom zagorju i Samoborskom gorju nalaze se i kestenove sastojine, pretpostavlja se da bi vrsta mogla biti proširena na području Sjeverozapadne Hrvatske, te na drugim sastojinama pitomog kestena u Hrvatskoj. Rad predstavlja prvi nalaz vrste *C. amoena* na području Hrvatske, te pruža nove uvide o rasprostranjenosti vrste u Europi.

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**KLJUČNE RIJEČI:** Diptera, Drosophilidae, invazivna vrsta, biljke domaćini, prognoza širenja