

Zeitschrift: Mitteilungen der Schweizerischen Entomologischen Gesellschaft =
Bulletin de la Société Entomologique Suisse = Journal of the Swiss
Entomological Society

Herausgeber: Schweizerische Entomologische Gesellschaft

Band: 67 (1994)

Heft: 1-2

Artikel: On the distribution of *Chymomyza amoena* (Loew), a species recently
introduced into Europe

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DOI: <https://doi.org/10.5169/seals-402554>

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On the distribution of *Chymomyza amoena* (LOEW), a species recently introduced into Europe

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The actual known distribution of *Chymomyza amoena* (LOEW) in the Palearctic is given and the question, how and when this Nearctic species was introduced into Europe, is discussed.

Keywords: *Chymomyza amoena*, Drosophilidae, distribution.

INTRODUCTION

In 1983, KEKIĆ & BÄCHLI reported for the first time the presence of *Chymomyza amoena* (LOEW, 1862), a species endemic to eastern North America (BAND, 1988a), in a collection made in 1980 at Popovica, Serbia. MÁČA & LAŠTOVKA (1985) and MÁČA (1985) showed that this species had already been found in 1975 at Purkarec, southern Bohemia. In the following years, additional records dating from the beginning of the eighties, were published by several authors (e.g. MÁČA, 1987; PAPP & PECSENYE, 1987; SCHUMANN, 1987; CEIANU, 1989), showing a continuous increase of the species' range. Ecological, behavioral and other studies as well as a re-description of this species are due to BAND & BAND (1984), SCHUMANN (1987), BAND (1988a, 1988b, 1989, 1991, and earlier references cited therein) and to BURLA & BÄCHLI (1991b, 1992); the identity of the European specimens was confirmed by crosses of Swiss and North American strains (H.T. BAND, pers. note). The question arose, how and when the introduction into Europe was established.

RESULTS

The distribution of *C. amoena* as known to date is given in Tab. 1. Unpublished data refer to collections checked by the authors and to personal information by trustworthy colleagues. Most of the flies were collected by using fermenting fruits etc. as baits. Other data are based on collections made by netting, others by rearing from various substrates, e.g. apples, crabapples, cherries, pears, plums, black walnut husks, chestnuts, acorns (BAND, 1988a, 1988b, 1989, 1991; BURLA & BÄCHLI, 1991b, 1992), spruce cones (I. CEIANU, pers. note). Except for a few cases (SCHUMANN, 1987; BURLA & BÄCHLI, 1992), the number of collected flies was small, suggesting that the species' density was low at most collecting sites, or that *C. amoena* is not readily attracted by banana baits. This seems to be the reason why the recaptures from already ascertained localities are sparse (e.g. one recapture at Purkarec in 1993; a few specimens at Hönningerberg in 1990, 1991, 1992, and at Dietikon in 1991 and 1992, two localities regularly sampled). However, as shown in Tab. 1,

Tab. 1. Collection sites of *Chymomyza amoena* (LOEW) in the western Palearctic, in chronological order of the year of collection. Recapture records are not given.

Locality	Country	Longitude E	Latitude N	Year	Reference
Purkarec	Czech Republic	14°26'	49°05'	1975	Máča & Laštovka, 1985
Óriszentpéter	Hungary	16°25'	46°51'	1980	Papp & Pecsénye, 1987
Popovica	Serbia	19°49'	45°10'	1980	Kekić & Bächli, 1983
Kunice	Czech Republic	14°40'	49°50'	1981	Máča & Laštovka, 1985
Brno	Czech Republic	16°40'	49°13'	1983	Máča, 1985
Kysihýbel	Slovakia	19°00'	48°25'	1983	Máča, 1987
Lednice	Czech Republic	16°48'	48°48'	1983	unpublished
Stakčín	Slovakia	22°13'	49°00'	1983	Máča, 1987
Nová Vieska	Slovakia	18°33'	47°55'	1984	Máča, 1987
Vysoká nad Labem	Czech Republic	15°49'	50°09'	1984	unpublished
Warszawa	Poland	21°00'	52°15'	1984	Razowski, 1991
Bindárka	Slovakia	18°05'	48°50'	1985	Máča, 1987
Dobříš	Czech Republic	14°11'	49°47'	1985	unpublished
Ivanka pri Dunaji	Czech Republic	17°15'	48°10'	1985	Máča, 1987
Snina	Slovakia	22°07'	48°59'	1985	unpublished
Veselí nad Lužnicí	Czech Republic	14°43'	49°12'	1985	Máča, 1987
Berlin	Germany	13°25'	52°32'	1986	Schumann, 1987
Budakeszi	Hungary	19°00'	47°30'	1986	Papp, 1992a
Praha	Czech Republic	14°26'	50°05'	1986	unpublished
Streda nad Bodrogom	Slovakia	21°40'	48°22'	1986	unpublished
Verőcsemaros	Hungary	19°02'	47°20'	1986	Papp, 1992a
Cimpulung	Romania	25°34'	47°32'	1987	Ceianu, 1989
Nová Sedlica	Slovakia	22°30'	49°03'	1987	unpublished
Třešň	Czech Republic	15°30'	49°18'	1987	unpublished
Vlasatice	Czech Republic	16°29'	48°55'	1987	unpublished
Aggtelek	Hungary	20°30'	48°28'	1988	Papp, 1992b
Beilngrieß	Germany	11°30'	49°02'	1988	unpublished
Budapest	Hungary	19°03'	47°30'	1988	Papp, 1992a
Durmitor	Crna Gora	19°02'	43°10'	1988	Kekić & Bächli, 1991
Miskolc	Hungary	20°47'	48°07'	1988	Papp, 1992b
Origgio	Switzerland	8°57'	46°03'	1988	Burla & Bächli, 1992
Putna	Romania	25°33'	47°50'	1988	Ceianu, 1989
Savognin	Switzerland	9°37'	46°36'	1988	unpublished
Somazzo	Switzerland	8°59'	45°50'	1988	Burla & Bächli, 1992
Chroustovice	Czech Republic	15°00'	50°04'	1989	unpublished
Gordola	Switzerland	8°52'	46°12'	1989	Burla & Bächli, 1992
Hönggerberg	Switzerland	8°30'	47°25'	1989	unpublished
Nová Rabyň	Czech Republic	14°26'	44°49'	1989	unpublished
Schöngesing	Germany	11°14'	48°07'	1989	unpublished
Serpukhov	Russia	37°36'	54°52'	1989	unpublished
Tübingen	Germany	9°03'	48°32'	1989	unpublished
Visegrád	Hungary	19°00'	47°46'	1989	Papp, 1992b
Biett	Switzerland	8°37'	46°20'	1990	Burla & Bächli, 1992
Bignasco	Switzerland	8°36'	46°21'	1990	Burla & Bächli, 1991
Cevio	Switzerland	8°37'	46°19'	1990	Burla & Bächli, 1991
Dietikon	Switzerland	8°25'	47°24'	1990	unpublished
Lukovištia	Slovakia	20°02'	48°29'	1990	unpublished
Nagyvisnyó	Hungary	20°25'	48°27'	1990	Papp, 1992a
Pečky	Czech Republic	15°05'	50°07'	1990	unpublished
Serpiano	Switzerland	8°57'	45°53'	1990	Burla & Bächli, 1992
Someo	Switzerland	8°40'	46°18'	1990	Burla & Bächli, 1991
Wien	Austria	16°22'	48°13'	1990	Gross, 1992
Čelákovice	Czech Republic	14°46'	50°10'	1991	unpublished
Albertovec	Czech Republic	18°03'	49°57'	1991	unpublished
Boňany	Slovakia	22°03'	48°30'	1991	unpublished
Klöntal	Switzerland	8°57'	47°01'	1991	unpublished
Lodano	Switzerland	8°42'	46°16'	1991	Burla & Bächli, 1992
Maggia	Switzerland	8°43'	46°15'	1991	Burla & Bächli, 1992
Opava	Czech Republic	17°54'	49°56'	1991	unpublished
Gergebil'	Dagestan	47°04'	42°29'	1992	unpublished
Malé Trakany	Slovakia	22°03'	48°28'	1992	unpublished
Merishausen	Switzerland	8°37'	47°45'	1992	unpublished
München	Germany	11°35'	48°08'	1992	unpublished
Pěkná na Šumavě	Czech Republic	14°00'	48°49'	1992	unpublished
Roztoky	Czech Republic	14°22'	50°09'	1992	unpublished
Vidnava	Czech Republic	17°12'	50°25'	1992	unpublished
Duchcov	Czech Republic	13°43'	50°37'	1993	unpublished
Gockhausen	Switzerland	8°36'	47°23'	1993	unpublished
Leuk	Switzerland	7°39'	46°19'	1993	unpublished
Tinizong	Switzerland	9°37'	46°35'	1993	unpublished
Visp	Switzerland	7°53'	46°18'	1993	unpublished

there is an increasing number of localities at which the species was found after its first records, and we assume that by intensive collecting the species could be found at even more localities.

To obtain a better view of the possible ways of colonization, we have plotted the localities in a map of central Europe (Fig. 1). Obviously, *C. amoena* was found at far distant localities a very few years after its first detection: Popovica, about 1000 km southeast, in 1980, and Stakčín, about 950 km east, in 1983. The most extreme localities in the East are Serpukhov (near Moscow, in 1989), and Gergebil' (Dagestan, North Caucasus, in 1992), some 2000 km and 3000 km, respectively, apart from its first record. *C. amoena* is apparently rare at high altitude; there are only a few records of more than 800 m above sea level: Durmitor at 1500 m, Savognin at 1360 m, Tinizong at 1300 m.

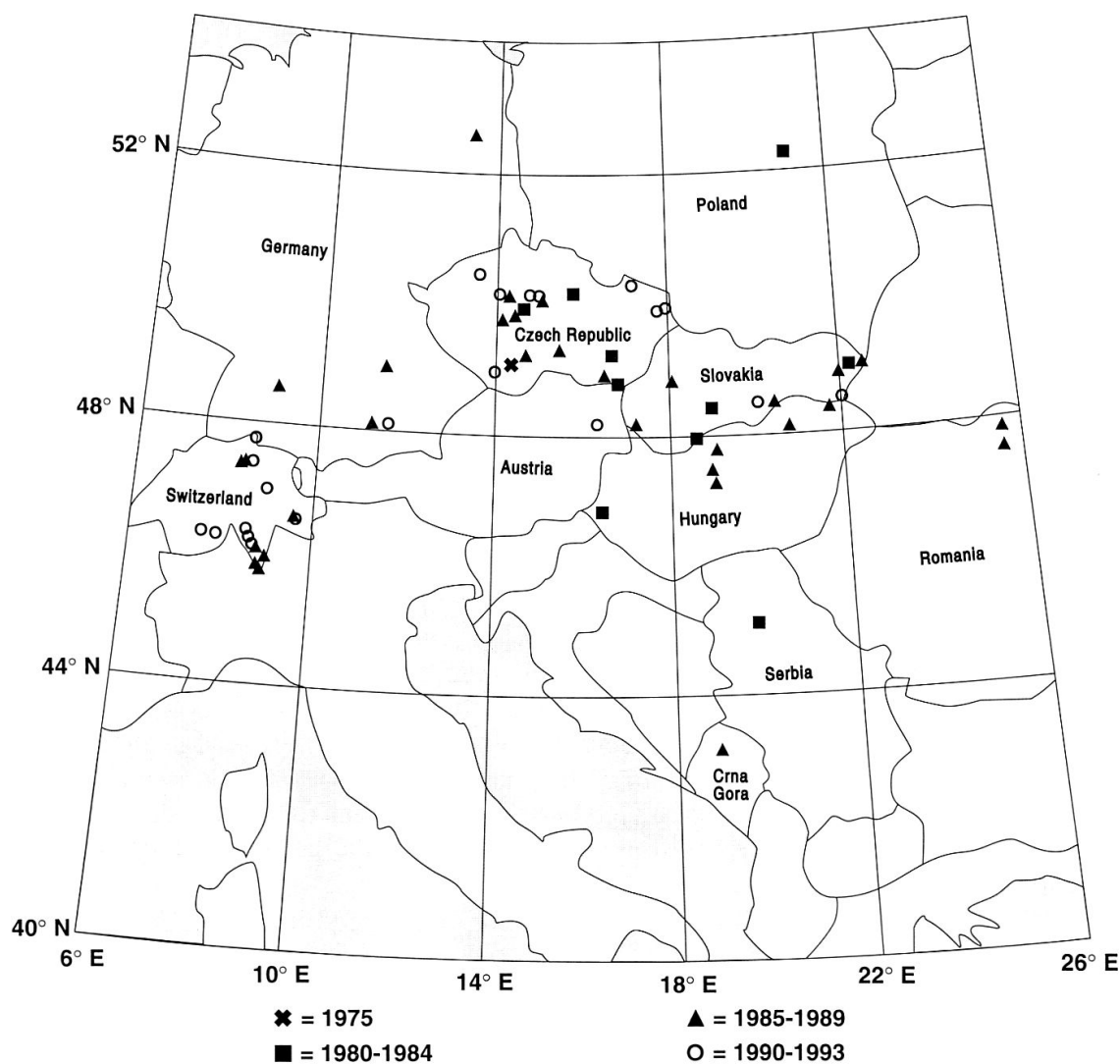


Fig. 1. Geographical distribution of *Chymomyza amoena* (Loew) in central Europe. Two localities outside central Europe, Serpukhov (near Moscow, Russia) and Gergebil' (Dagestan, North Caucasus), are not shown.

The localities as shown in Fig. 1 indicate records of *C. amoena* and the respective chronology. Regional crowding of these localities reveals, in the first place, diligent collecting. The figure does not disclose a pattern of abundance of *C. amoena* in the respective regions, nor do blank areas signify absence of the species. These areas are blank either because of absence of *C. amoena*, or of insufficient collecting.

DISCUSSION

Is *C. amoena* an indigenous Palearctic, hitherto overlooked species? Collecting of drosophilids was intensive enough to get information on natural populations of many species, in Switzerland (BURLA & BÄCHLI, 1991a) as well as in some other countries. *C. amoena* with distinctly banded wings would not have been overlooked. We are convinced that, in spite of its usually rather small numbers, it was recorded soon after its introduction. A possible way to reach Europe would have been by crossing the Eurasian continent through Siberia, but there are no records from the eastern Palearctic so far (OKADA, 1988; SIDORENKO, 1993); therefore we do not consider it an original Palearctic species.

The pattern in Fig. 1 leaves the question open as to where *C. amoena* invaded Europe. The invasion might have been a single event, or happened more than once, at one place or various places. Tentatively the port of entry might be sought in central or eastern Europe, perhaps in the Danube valley, but in reality it might have been elsewhere.

That larvae of *C. amoena* can live in various parasitized or damaged fruits and nuts, feeding on decaying frass and other media supporting micro-organisms, has several times been reported (BAND, 1988a, 1988b, 1991; BURLA & BÄCHLI, 1991b, 1992). The ability to utilize very different resources shows that this species can be considered a food generalist (BAND & BAND, 1984), which fact is corroborated by its being easily cultured on the usual *Drosophila* culture media (H. BURLA, pers. note). Such a versatile species, once introduced, could find various resources enabling its persistent establishment; by its ecological capacities, it was able to spread out in the area, undetected for a while and probably in low numbers.

The American origin of the introduced flies is unknown so far (H.T. BAND, pers. note). We assume that *C. amoena* was brought to Europe in connection with fruit imports, probably apples, from the USA. In the Nearctic, as other *Chymomyza* species, it is supposed to be originally a wild species, but has expanded its ecological niche (BAND & BAND, 1984; BAND 1988a, 1988b) to become a domestic (or at least semi-domestic) species. The species is able to lay eggs in frass of unripe apples (BAND, 1988a). Emergence of flies may then happen in a different continent. Apples are traded from the USA to Europe for two reasons: either for selling ripe fruit on the market, or for planting seedlings. The former principally involves western Europe, the latter eastern Europe.

That certain drosophilid species have been introduced into very distant areas has been discussed by STURTEVANT (1921) in the case of *Drosophila melanogaster* MEIGEN. His arguments were based on its first records in North America, according to data on the labels of specimens in different old collections. In the last decades, studies of the means of wide-range distribution of this species have again been made using genetic, cytological or microbiological methods (e.g. PERIQUET *et al.*, 1989). In the interesting case of the introduction of *Drosophila subobscura* COLLIN into North and South America, many details of the possibilities of genetical adaptation

have been shown (e.g. PREVOSTI *et al.*, 1989). In 1990, one male of an additional Nearctic species of *Chymomyza*, *C. procnemoides* WHEELER, was found near Budapest by PAPP (1992a), who also discussed the probable means of its introduction. A comparable case is the Nearctic *Chymomyza procnemis* WILLISTON, which has been introduced in the seventies into Japan (OKADA, 1976). Thus, the active or passive introduction of drosophilid species does not seem to be restricted, but the consecutive successful establishment of an introduced species obviously depends on the possibility to become adapted to an open ecological niche, or to superior competitive ability. *C. amoena* has the advantage of living in domestic as well as natural habitats, and it has at its disposal a variety of developmental strategies (BAND, 1988a, 1988b, 1991).

ZUSAMMENFASSUNG

Anhand des gegenwärtig bekannten Ausbreitungsareals wird diskutiert, wann und wie die nearktische Art *Chymomyza amoena* (LOEW) in Europa eingeschleppt wurde.

ACKNOWLEDGEMENTS

We thank Dr. M. BARTÁK, Agricultural College, Praha, Dr. H. BURLA, Zoological Museum, Zürich, Dr. I. CEIANU, Bucuresti, Prof. J.R. DAVID, CNRS, Gif-sur-Yvette, Dr. B. MERZ, Entomologisches Institut der ETH, Zürich, Dr. J. ROHÁČEK, Silesian Museum, Opava, W. SCHACHT, Zoologische Staatssammlung, München, Dr. J. VAŇHARA, Agricultural College, Brno, for additional information about the distribution area. Useful notes and comments to the manuscript were given by Dr. H.T. BAND and Dr. H. BURLA.

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(received March 4, 1994, accepted April 8, 1994)