

**BLOWFLIES OF THE GENERA *CALLIPHORA*, *LUCILIA*
AND *PROTOPHORMIA* (DIPTERA, CALLIPHORIDAE) IN SOUTH-
MORAVIAN URBAN AND RURAL AREAS WITH RESPECT TO *LUCILIA*
BUFONIVORA MONIEZ, 1876**

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Abstract

Fischer O. A.: *Blowflies of the Genera Calliphora, Lucilia and Protophormia (Diptera, Calliphoridae) in South-Moravian Urban and Rural Areas with Respect to Lucilia bufonivora Moniez, 1876*. Acta Vet. Brno 2000, 69: 225–231

The occurrence of blowflies with public health importance (four species of the genus *Calliphora* Robineau-Desvoidy, 1830, nine species of the genus *Lucilia* Robineau-Desvoidy, 1830 and one species of the genus *Protophormia* Townsend, 1908) was studied in the city of Brno and a village Ketkovice near Brno. A total of 2781 imagoes (1926 from Brno and 855 from Ketkovice) were obtained from both study areas by sweeping, trapping or rearing from eggs. *Calliphora uralensis*, *C. vicina*, *C. vomitoria*, *Lucilia ampullacea*, *L. bufonivora*, *L. caesar*, *L. illustris*, *L. pilosiventris*, *L. regalis*, *L. sericata*, *L. silvarum* and *Protophormia terraenovae* were found in both study areas. *C. loewi* and *L. richardsi* were caught only in Ketkovice and Brno, respectively. *L. sericata* was the dominant species in densely populated places in both areas. *L. caesar* was the dominant species in forests and one forest park in Brno and in the forests around Ketkovice. Although *L. bufonivora* is considered to be a rare species, it was not rare and it was the most numerous in forests and recreation areas near water reservoir and river banks.

Synanthropic flies, densely populated areas, Czech Republic

Human-made environments such as agrobiocoenoses and densely populated areas of towns and villages provide suitable conditions for the development of larvae of synanthropic blowflies (Schoof et al. 1954; Povolný and Rozsypal 1968). The blowflies are able to transmit many causative agents of diseases (Nuorteva 1959; Greenberg 1973; Daniel et al. 1990). Some of the blowflies cause myiasis (Minář et al. 1995; Zavadil et al. 1997). According to Gregor and Rozkošný (1997), four species of the genus *Calliphora* Robineau-Desvoidy, 1830, nine species of the genus *Lucilia* Robineau-Desvoidy, 1830 and one species of the genus *Protophormia* Townsend, 1908 occur in Moravia (Table 1).

The occurrence of blowflies in Brno was studied by Jacentkovský (1941) many years ago. However, within the last 60 years, Jacentkovský's study area has changed dramatically by increased traffic, industrialization, air pollution and growth of densely populated areas, especially large blocks of flats producing enormous amount of municipal garbage. The fly fauna of Brno and its surroundings has been studied by Gregor (1991) and Rozkošný and Vaňhara (1993) during last ten years, but the occurrence of blowflies living in the town centre remained unknown.

Because of increasing popularity of pets, great attention of veterinarians is given not only to well-known blowfly species causing myiasis of birds and mammals, but also to *Lucilia bufonivora* Moniez, 1876, which may attack free-living or house-kept amphibians (Zavadil et al. 1997).

The aim of this study was to compare the occurrence of blowflies of the genera

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Calliphora, *Lucilia* and *Protophormia* in an urban area (the city of Brno and its suburbs) and in a rural area, the village Ketkovice near Brno.

Materials and Methods

Areas under study

The urban area

The South-Moravian city of Brno (N 49°10' E 16°14') is situated 190–425 m above sea level. Faunistic code according to Novák (1989) is 67-6865-66. The city had more than 400 000 inhabitants in 1999. A large area, about 430 km², includes various places with quite different environmental conditions: densely populated city quarters with numerous blocks of flats, streets and squares, public parks, recreation areas around Brno water reservoir and banks of the rivers Svratka and Svitava, spruce and deciduous forests, forest parks and gardens. Most of the municipal garbage is collected in containers and dustbins to be incinerated. Brno suburbs, small villages in surroundings of the city, conserved their rural styles. Most of the kitchen litter is often used as food for domestic animals. Developmental stages of the blowflies (eggs and imagoes) were collected from 24 streets, 7 squares, 8 public parks, two forests, one forest park, three suburb areas and four recreation areas.

The rural area

The village Ketkovice near Brno (N 49°08' E 16°06', faunistic code 6863) is situated 433 m above sea level and 35 km west from Brno (Plate VIII, Fig. 1). The village having 615 inhabitants is surrounded with fields, meadows, spruce and deciduous forests (Plate VIII, Fig. 2). The village is not drained and a small brook flows through the centre of the village. Most of kitchen litter is used as food for animals, other garbage is stored in dustbins to be incinerated. Eggs of the blowflies were collected in the village. Imagoes were caught in the village, three meadows and five checkpoints in the forests.

Sampling of the imagoes

Most of the imagoes obtained in the period from April 25th, 1999 till June 19th, 2000, were swept with a black sweep net of 30 cm in diameter and 60 cm in depth. The imagoes were attracted with bad smell of decaying porcine liver. Commercially obtained porcine liver was stored for 2–3 days at room temperature prior to use. Small pieces (10 g) of porcine liver were placed into 200 ml glass vessels. Open vessels were exposed for 30–60 minutes at checkpoints.

Additionally, small numbers of blowflies were obtained by trapping. The traps according to MacLeod and Donnelly (1956) were baited with porcine liver. Small numbers of blowflies were also swept from meadow plants, mostly *Daucus sativa* var. *silvestris* and *Pastinaca sativa* (Daucaceae), gooseberry bushes or carcasses of small rodents (*Apodemus flavicollis*, *A. sylvaticus*, *Microtus arvalis* and *Clethrionomys glareolus*).

Oviposition of the blowflies was studied in the period from April 25th till June 6th, 1999 both in Brno and Ketkovice. Small pieces (5 g) of fresh porcine liver were placed into open plastic vessels (100 ml) and exposed for 24 hours (beginning in the afternoon). Larvae hatched from the eggs were kept at room temperature and fed small pieces of fresh porcine liver every day. The 3rd stage larvae were placed into 200 ml vessels filled with crumpled paper and allowed to puparize at room temperature. Blowfly imagoes were killed with ethyl acetate vapours, pinned and determined (Zumpt 1956; Gregor 1961; Schumann 1965, 1971).

Results

A total of 2781 imagoes (Table 1) were obtained from Brno (1926 imagoes) and from Ketkovice near Brno (855 imagoes). The majority of the blowflies were caught during the warmest period of the year, from June till September. *C. vicina*, *L. caesar*, *L. sericata* and *L. silvarum* were the most abundant species. *C. uralensis*, *C. vicina*, *C. vomitoria*, *L. ampullacea*, *L. bufonivora*, *L. caesar*, *L. illustris*, *L. pilosiventris*, *L. regalis*, *L. sericata*, *L. silvarum* and *P. terraenovae* were found both in Brno and in Ketkovice. *C. loewi* and *L. richardsi* were caught only in Ketkovice and Brno, respectively (Table 1).

L. bufonivora was attracted with porcine liver, caught to traps and swept from meadow plants, but it did not visit carrions of rodents and gooseberry bushes. This species, the most numerous in forests and recreation areas near water reservoir and river banks, occurred both in Brno and Ketkovice (Table 1, 2 and 3). *L. sericata* was the most abundant species in the streets and squares, public parks, recreation areas and suburbs in Brno as well as in Ketkovice (Tables 2 and 3). *L. caesar* was the most abundant species in the forest park in Brno and in the forests both around Brno and Ketkovice (Tables 2 and 3). *C. vicina*, *L. sericata* and *L. silvarum* were also reared from eggs. *C. vicina* was the most numerous species. Females prevailed over males in *C. vicina* and *L. silvarum* (Table 4).

Table 1
The occurrence of the blowflies of the genera *Calliphora*, *Lucilia* and
Protophormia in Brno and Ketkovice near Brno

| Species | Brno | | | | Ketkovice near Brno | | | |
|--|----------------|-------|----------|-----------|---------------------|-------|---------|-----------|
| | No. of imagoes | % | M / F | Months | No. of imagoes | % | M / F | Months |
| <i>Calliphora loewi</i> Enderlein, 1903 | 0 | 0 | 0 | 0 | 1 | 0.1 | 0/1 | VIII |
| <i>Calliphora uralensis</i> Villeneuve, 1922 | 1 | 0.1 | 0/1 | IV | 1 | 0.1 | 1/0 | VIII |
| <i>Calliphora vicina</i> Robineau -Desvoidy, 1830 | 175 | 9.1 | 52/123 | IV - IX | 273 | 31.9 | 109/164 | IV - IX |
| <i>Calliphora vomitoria</i> Linnaeus, 1758 | 8 | 0.4 | 2/6 | VII - IX | 11 | 1.3 | 2/9 | VIII - IX |
| <i>Lucilia ampullacea</i> Villeneuve, 1922 | 15 | 0.8 | 1/14 | V - IX | 23 | 2.7 | 6/17 | VIII - IX |
| <i>Lucilia bufonivora</i> Moniez, 1876 | 21 | 1.1 | 8/13 | VI - IX | 16 | 1.9 | 8/8 | VI - VIII |
| <i>Lucilia caesar</i> Linnaeus, 1758 | 202 | 10.5 | 60/142 | IV - IX | 101 | 11.8 | 19/82 | VII - IX |
| <i>Lucilia illustris</i> Meigen, 1826 | 64 | 3.3 | 9/55 | IV - IX | 37 | 4.3 | 4/33 | VIII - IX |
| <i>Lucilia pilosiventris</i> Kramer, 1910 | 3 | 0.2 | 2/1 | VIII - IX | 1 | 0.1 | 1/0 | IX |
| <i>Lucilia regalis</i> Meigen, 1826 | 41 | 2.1 | 11/30 | V - IX | 12 | 1.4 | 4/8 | VIII - IX |
| <i>Lucilia richardsi</i> Collin, 1926 | 8 | 0.4 | 4/4 | VI - VIII | 0 | 0 | 0 | 0 |
| <i>Lucilia sericata</i> Meigen, 1826 | 1278 | 66.3 | 252/1026 | IV - IX | 290 | 33.9 | 52/238 | V - IX |
| <i>Lucilia silvarum</i> Meigen, 1826 | 90 | 4.7 | 40/50 | V - VIII | 87 | 10.2 | 35/52 | VI - VIII |
| <i>Protophormia terraenovae</i> Robineau -Desvoidy, 1830 | 20 | 1.0 | 2/18 | V - IX | 2 | 0.2 | 0/2 | VIII |
| Total | 1926 | 100.0 | 443/1483 | | 855 | 100.0 | 241/614 | |

M - males, F - females

Discussion

Jacentkovský (1941) recorded four *Calliphora* species (*C. loewi*, *C. uralensis*, *C. vicina* and *C. vomitoria*, eight *Lucilia* species (*L. ampullacea*, *L. caesar*, *L. illustris*, *L. pilosiventris*, *L. regalis*, *L. richardsi*, *L. sericata* and *L. silvarum*) and one *Protophormia* species (*P. terraenovae*) from Brno. However, *L. bufonivora* was not mentioned in his paper. According to Zavadil et al. (1997), *L. bufonivora* is not a rare species in the Czech Republic at present. *C. loewi* was not caught in Brno now. *C. loewi* and *C. uralensis* were rare also in Ketkovice. According to Nuorteva (1963), *C. loewi* and *L. bufonivora* are asynanthropic and *C. uralensis* synanthropic. *C. vicina* is polyphagous and synanthropic

Table 2
The blowflies of the genera *Calliphora*, *Lucilia* and *Protophormia* caught in Brno

| Species | Streets and squares | | Public parks | | Forests and one forest park | | Recreation areas | | Suburbs | |
|-------------------------|---------------------|---------|--------------|--------|-----------------------------|--------|------------------|--------|---------|-------|
| | n = 961 | | n = 430 | | n = 142 | | n = 124 | | n = 141 | |
| | % | M / F | % | M / F | % | M / F | % | M / F | % | M / F |
| <i>C. loewi</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>C. uralensis</i> | 0 | 0 | 0 | 0 | 0.7 | 0/1 | 0 | 0 | 0 | 0 |
| <i>C. vicina</i> | 8.3 | 19/61 | 7.6 | 9/24 | 4.9 | 3/4 | 0.8 | 0/1 | 0.7 | 0/1 |
| <i>C. vomitoria</i> | 0 | 0 | 0 | 0 | 5.6 | 2/6 | 0 | 0 | 0 | 0 |
| <i>L. ampullacea</i> | 0.2 | 0/2 | 0.2 | 0/1 | 7.0 | 1/9 | 1.6 | 0/2 | 0 | 0 |
| <i>L. bufonivora</i> | 0.7 | 2/5 | 0 | 0 | 2.1 | 2/1 | 6.4 | 2/6 | 2.1 | 2/1 |
| <i>L. caesar</i> | 6.2 | 22/38 | 7.0 | 7/23 | 62.7 | 18/71 | 8.9 | 4/7 | 8.5 | 9/3 |
| <i>L. illustris</i> | 2.7 | 1/25 | 1.4 | 2/4 | 3.5 | 0/5 | 8.1 | 0/10 | 12.1 | 6/11 |
| <i>L. pilosiventris</i> | 0.3 | 2/1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>L. regalis</i> | 2.4 | 3/20 | 1.4 | 2/4 | 0 | 0 | 6.4 | 3/5 | 2.8 | 3/1 |
| <i>L. richardsi</i> | 0.5 | 3/2 | 0.5 | 1/1 | 0 | 0 | 0 | 0 | 0.7 | 0/1 |
| <i>L. sericata</i> | 74.4 | 142/573 | 80.0 | 46/298 | 9.2 | 2/11 | 63.7 | 4/75 | 62.4 | 31/57 |
| <i>L. silvarum</i> | 2.7 | 11/15 | 0.5 | 1/1 | 4.2 | 3/3 | 4.0 | 1/4 | 10.6 | 7/8 |
| <i>P. terraenovae</i> | 1.5 | 1/13 | 1.4 | 1/5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 99.9 | 206/755 | 100.0 | 69/361 | 99.9 | 31/111 | 99.9 | 14/110 | 99.9 | 58/83 |

n - number of imagoes M - males F- females

Table 3
The blowflies of the genera *Calliphora*, *Lucilia* and *Protophormia* caught in Ketkovice

| Species | Village n = 535 | | Forests n = 137 | | Meadows n = 15 | |
|-------------------------|--------------------|---------|--------------------|--------|-------------------|-------|
| | % | M / F | % | M / F | % | M / F |
| <i>C. loewi</i> | 0.2 | 0/1 | 0 | 0 | 0 | 0 |
| <i>C. uralensis</i> | 0 | 0 | 0.7 | 1/0 | 0 | 0 |
| <i>C. vicina</i> | 35.3 | 79/110 | 3.6 | 1/4 | 6.7 | 0/1 |
| <i>C. vomitoria</i> | 0.4 | 0/2 | 6.6 | 2/7 | 0 | 0 |
| <i>L. ampullacea</i> | 0.9 | 1/4 | 11.7 | 4/12 | 13.3 | 1/1 |
| <i>L. bufonivora</i> | 0.4 | 2/0 | 8.8 | 5/7 | 13.3 | 1/1 |
| <i>L. caesar</i> | 5.6 | 5/25 | 50.4 | 13/56 | 13.3 | 1/1 |
| <i>L. illustris</i> | 4.7 | 2/23 | 7.3 | 1/9 | 13.3 | 1/1 |
| <i>L. pilosiventris</i> | 0.2 | 1/0 | 0 | 0 | 0 | 0 |
| <i>L. regalis</i> | 2.2 | 5/7 | 0 | 0 | 0 | 0 |
| <i>L. richardsi</i> | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>L. sericata</i> | 43.5 | 18/215 | 0 | 0 | 20.0 | 1/2 |
| <i>L. silvarum</i> | 6.4 | 11/23 | 10.2 | 5/9 | 20.0 | 2/1 |
| <i>P. terraenovae</i> | 0.2 | 0/1 | 0.7 | 0/1 | 0 | 0 |
| Total | 100.0 | 123/411 | 100.0 | 32/105 | 99.9 | 7/8 |

n - number of imagoes M - males F- females

Table 4
The blowflies reared from eggs layed in period April 25th - June 6th, 1999
in densely populated areas

| Species | Brno | | Ketkovice | |
|--------------------|---------|-------|-----------|-------|
| | n = 128 | | n = 168 | |
| | % | M / F | % | M / F |
| <i>C. vicina</i> | 41.4 | 21/32 | 46.4 | 29/49 |
| <i>L. sericata</i> | 30.5 | 27/12 | 32.1 | 33/21 |
| <i>L. silvarum</i> | 28.1 | 17/19 | 21.4 | 17/19 |
| Total | 100.0 | 65/63 | 100.0 | 79/89 |

n - number of imagoes M - males F- females

(Havlík and Čeledová 1962; Világiová and Peťko 1994). Females of this species are able to lay their eggs in darkness (Daněk et al. 1987). *C. vicina* is the most important fly species from the epidemiological point of view (Mihályi 1967). *C. vomitoria* is polyphagous (Rozkošný and Vaňhara 1993) and hemisynanthropic (Gregor and Povolný 1958). This blowfly was presented as forest species by Nuorteva (1963) and considered to be hemisynanthropic by Gregor and Povolný (1958). Blowflies of the *Lucilia* genus are necrophagous and polyphagous (Rozkošný and Vaňhara 1993). Gregor (1991) arranged their sequence depending on light intensity from “shade-tolerating forest” to the “steppe and semi-desert” species in the following order: *L. ampullacea*, *L. caesar*, *L. illustris*, *L. silvarum*, *L. sericata*, *L. regalis* and *L. pilosiventris*. Jacentkovský (1941) recorded from Brno not only typical species of the zone of deciduous forests, *L. ampullacea* and *L. caesar* (Gregor 1986, 1991), but also the steppe species *L. pilosiventris*, *L. regalis* and *L. richardsi*. Our recent findings from 1999 and 2000 were in accordance with information of Jacentkovský (1941) and Rozkošný and Vaňhara (1993). In addition, another species, *Lucilia bufonivora* Moniez, 1876, has been found. *L. bufonivora* has suitable conditions for its development in Brno, because forests, forests parks, river banks, public parks and gardens are populated with amphibians. Larvae of *L. silvarum* are saprophagous or occasionally internal parasitoids of the frogs (Nuorteva 1963).

L. sericata is necrophagous, but also polyphagous in urban environments (Povolný and Rozsypal 1968). In contrast to *C. vicina* visiting the shade-exposed cadavers, *L. sericata* visits the cadavers exposed in the sun (Isiche et al. 1992). This species is able to transmit many causative agents of diseases, cause myiasis in humans and animals, visit cadavers and faeces but also human food (Nuorteva 1959; Minář et al. 1995). *P. terraenovae* is a polyphagous and synanthropic species (Havlík and Čeledová 1962; Világiová and Peťko 1994). This species can visit dead human bodies (Adair 1999) and transmit causative agents of nosocomial infections (Daniel et al. 1990). Two species dominant in public dining-rooms of Košice city were synanthropic blowflies *L. sericata* and *P. terraenovae* (Világiová and Peťko 1994). Great abundance of *L. sericata* in recreation areas in Brno may be explained by affinity of this species to kitchen litter. Small pubs and kiosks near water reservoir produce kitchen litter attracting the blowflies. *L. caesar* is a synanthropic species, too. However, this forest species differs from *L. sericata* by its lower temperature requirements (Povolný and Rozsypal 1968). Our observations from Brno and Ketkovice have shown a frontier between forest territories occupied mostly by *L. caesar* and sunny areas of both city and village, where heliophilous *L. sericata* prevailed.

Both Brno and Ketkovice provide suitable food resources for the blowflies, because their

larvae can develop in cadavers of small animals or in remnants of human food available at both locations. Imagoes of the blowflies can visit feces (Nuorteva 1963) and cadavers (Isiche et al. 1992). Synanthropic species are the most dangerous, because they may contaminate fruits and other human food with causative agents of many diseases (Greenberg 1973). The important sanitary role of the blowflies in nature, where they remove cadavers, should not be neglected, nevertheless, it is necessary to pay great attention to their potential health hazard for humans and animals.

**Bzučivky rodů *Calliphora*, *Lucilia* a *Protophormia* (Diptera, Calliphoridae)
na městské a venkovské lokalitě se zřetelem k *Lucilia bufonivora* Moniez, 1876**

V městě Brně a v obci Ketkovicích u Brna byl zjišťován výskyt čtyř druhů bzučivek rodu *Calliphora* Robineau-Desvoidy, 1830, devíti druhů rodu *Lucilia* Robineau-Desvoidy, 1830 a jednoho druhu rodu *Protophormia* Townsend, 1908. Z obou lokalit bylo smýkáním, chytáním do pastí nebo vychováním z vajíček získáno 2781 imag. 1926 z nich pocházelo z Brna a 855 z Ketkovic. Z obou lokalit byla získána *Calliphora uralensis*, *C. vicina*, *C. vomitoria*, *Lucilia ampullacea*, *L. bufonivora*, *L. caesar*, *L. illustris*, *L. pilosiventris*, *L. regalis*, *L. sericata*, *L. silvarum* a *Protophormia terraenovae*. *C. loewi* byla chycena pouze v Ketkovicích a *L. richardsi* pouze v Brně.

Na obou lokalitách byla v hustě osídlených místech nejhojnější *L. sericata*. Nejhojnějším druhem v lesích a jednom lesoparku v Brně i v lesích v okolí Ketkovic byla *L. caesar*. Ačkoliv je *L. bufonivora* považována za vzácnou, vzácná nebyla a byla nejhojnější v lesích a rekreačních oblastech poblíž přehrady a na březích řek.

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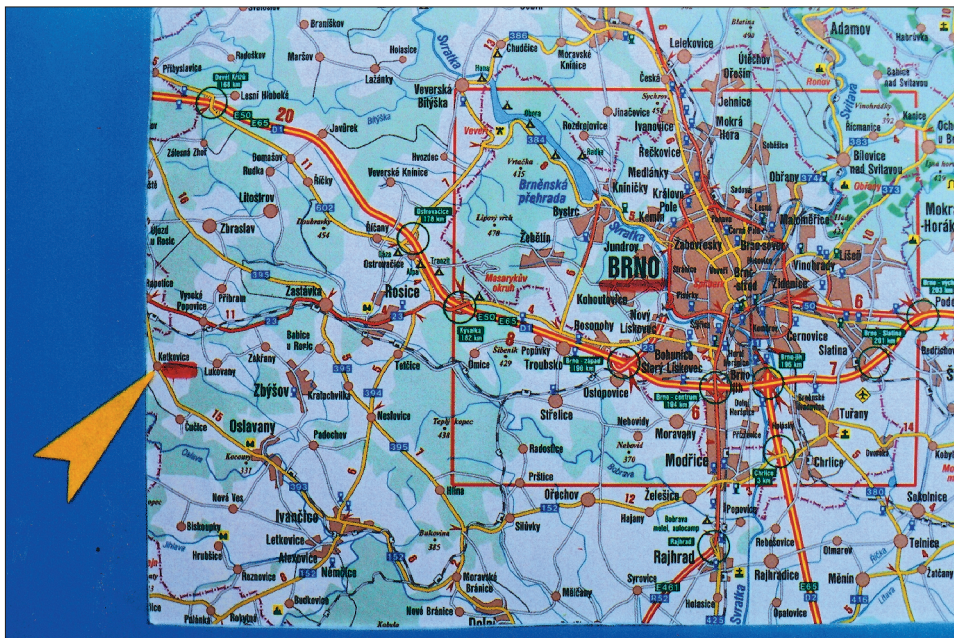


Fig. 1: The South-Moravian village Ketkovice (arrow) is 35 km west from Brno.



Fig. 2: The village Ketkovice is surrounded with fields and forests. Foto: DAN AIR Picture, Ltd.