

**Faunistic and ecological characteristics of Sciomyzidae  
in saline habitats of the Polish Baltic coast**

ELŻBIETA KACZOROWSKA

University of Gdańsk, Department of Invertebrate Zoology, Marszałka Piłsudskiego 46, 81-378 Gdynia, Poland,  
e-mail: saline@ocean.univ.gda.pl

**ABSTRACT.** The results of an eight-year study undertaken in years 1999-2006 on Sciomyzidae of the saline habitats of the Polish coast are reported. In the paper, 12 species, among which 9 are new for beaches and brackish areas of the coastal type, are presented. Besides this, similarity of types of habitats, dominance structure and phenology of Sciomyzidae in the sampling plots are discussed.

**KEY WORDS:** Diptera, Sciomyzidae, beaches, brackish area of the coastal type, Baltic coast, Poland.

---

INTRODUCTION

The Sciomyzidae are a relatively poorly known family and a basic revision of the regional species is needed. So far, more than 450 species have been found around the world (ROZKOŠNÝ & ELBERG 1984) and 72 – in Poland (ZATWARNICKI 1991).

The larvae of Sciomyzidae live as predators or/and parasitoids of molluscs and have potential economic importance as a possible biological means of snail control in trematode diseases (FERRAR 1987). In Poland, of 53 sciomyzid species whose life cycles are known, most feed on hygrophilous and exposed aquatic snails. Others kill aquatic, non-operculate snails or snails in terrestrial habitats. Larvae of two species are predators of bivalves, and larvae of the genus *Antichaeta* feed on the embryos of snails belonging to Succineidae and Lymnaeidae (ZATWARNICKI 1985). The distribution of larvae depends directly on the distribution of their hosts and adults occurring near the larval habitats. Therefore, they are ob-

served on marshes, bogs and along shorelines. Others live in mesic wood or are restricted to exposed terrestrial situations (ROZKOŠNÝ & ELBERG 1984). Adults of Sciomyzidae may be also observed in brackish areas. In Poland, in three types of saline habitats, thirteen species were found. Among them, six species were collected in brackish areas of the coastal type, whereas three – on beaches. All of them are recognized as haloxenes (SZADZIEWSKI 1983). As research on Diptera of the Baltic coast has not been carried out for almost twenty five years, I wanted to study the current condition of their fauna, especially Sciomyzidae.

#### MATERIAL AND METHODS

The present study is based on the material collected by the author in the years 1999-2006. Diptera were sampled two times a month, from the beginning of April to the end of October. To estimate the approximate number of imagines, sweeping samples were taken by 400 strokes of an entomological net.

Flies were caught in 24 localities situated on the Polish Baltic Sea coast. The study areas were represented by brackish areas of the coastal type (3 localities), cliffed beaches (10) and sandy beaches (11 sampling plots).

In brackish areas of the coastal type, situated near Gdańsk - Górkki Wschodnie, Diptera were collected in brackish, wet meadows overgrown with *Puccinellio-Spergularietum salinae* association and on a stony dam with scrubs of *Rosa rugosa*. The next study areas were situated near Puck and Mechelinki, adjacent to the Gulf of Puck. In these localities flies were sampled in brackish meadows and grassland (*Juncetum gerardi*), semi-halophilous rushes (*Scirpetum maritime*), and in shrubs of *Phragmites communis* with planted *Rosa rugosa* (BULIŃSKI & PRZEWOŹNIAK 1995).

The cliffed and sandy beaches represented the next types of saline habitats where material were collected. In Poland there are two types of cliffs - clayey, unstable, "living" ones and sandy, geologically stable, "dead" cliffs. The first type of heights is situated near the open sea and between Jastrzębia Góra and Władysławowo. They are overgrown with vegetation belonging to *Senecioni-Tussilaginetum* association, scrubs of *Hippophaë rhamnoides* and planted *Salix caprea*, *Sorbus aucuparia* and *Rosa rugosa*. Next, the bottom part of sandy cliffs in Międzyzdroje is overgrown with *Trifolio-Anthyllidetum maritimae* association and the highest ones – with old mixed forest (PIOTROWSKA 1984).

On the sandy, flat beaches Diptera were sampled in epi- and supralittoral zones. They were swept in the white dune zone with vegetation of *Elymo-Ammophiletum* association, grey dune zone with planted *Salix daphnoides*, and coniferous forest (*Empetro nigri-Pinetum*) near the seashore (HERBICH et al. 1991).

To describe the dominance structure of communities, a dominance index (D) was used:

$$D = n/N \times 100\%$$

where:

n = the abundance of a given species,

N = the accumulated abundance of all Sciomyzidae species.

The dominance index (D) classified the species into four classes:

- eudominants (over 15.0% of all collection);
- dominants (from 5.1% to 15.0%);
- subdominants (from 1.1% to 5.0%);
- accessory species (up to 1.0%).

Sciomyzidae collected on the sampling plots were determined using the key included in "The Sciomyzidae (Diptera) of Fennoscandia and Denmark" (ROZKOŠNÝ 1984). The distribution is cited according to data included in Fauna Europaea ([www.faunaeur.org](http://www.faunaeur.org)).

The material is deposited at the Department of Invertebrate Zoology, University of Gdańsk.

## RESULTS AND DISCUSSION

### 1. Systematic review

#### Subfamily Sciomyzinae

#### Tribe Sciomyzini

#### *Colobaea punctata* (LUNDBECK, 1923)

#### Distribution

Palearctic Region.

#### Ecology

*C. punctata* was collected on beaches of the Black Sea coast (BESCHOVSKI 1973). This species is rare, scarce and hygrophilous (ROZKOŠNÝ 1999). Larvae are predators of hydro-

philous and exposed aquatic snails (KNUTSON 1970).

#### **Material examined**

Jastarnia, 22.07.2004, 1 male.

#### ***Sciomyza simplex* FALLÉN, 1820**

#### **Distribution**

Europe, East Palaearctic and Nearctic Region.

#### **Ecology**

*S. simplex* was observed on beaches of the North Sea (BRAUNS 1959) and in brackish areas of the coastal type (SZADZIEWSKI 1983). This species is recognized as hygrophilous – mesophilous, frequent and very numerous subdominant. Its larvae are parasitic – predators (ROZKOŠNÝ 1999). Adults dwell in the more open marshes containing herbaceous vegetation. The natural food of the larvae seems to be one or more species of *Oxyloma* snails. In Europe, this species passes the winter as a quiescent or diapausing pupa within the puparium (FOOTE 1958).

#### **Material examined**

Puck, 28.06.2001, 1 male; Gdynia – Orłowo, 20.08.2001, 1 male; Jastrzębia Góra, 15.07.2003, 1 female; Gdańsk – Górki Wschodnie, 6.07.2006, 1 female.

#### **Tribe Tetanocerini**

#### ***Coremacera marginata* (FABRICIUS, 1775)**

#### **Distribution**

Europe and Near East.

#### **Ecology**

This is euryecious, very frequent and very numerous eudominant. Its larvae are parasitic – predators (ROZKOŠNÝ 1999). In Poland, *C. marginata* is common (ZATWARNICKI 1985).

**Material examined**

Puck, 28.06.2001, 9 males, 7 females; Gdynia – Wzgórze Św. Maksymiliana, 10.08.2001, 1 male; Puck, 3.07.2003, 1 female; Darłowo, 1.08.2004, 2 males, 1 female; Krynica, 26.08.2004, 1 male.

***Dictya umbrarum* (LINNAEUS, 1758)****Distribution**

Europe and East Palaearctic.

This species was observed in brackish areas of the coastal type in Poland (SZADZIEWSKI 1983). Its larvae are aquatic predators (KNUTSON 1970).

**Material examined**

Mechelinki, 7.05.2006, 2 males, 1 female.

***Elgiva cucularia* (LINNAEUS, 1767)****Distribution**

Europe, East Palaearctic and North Africa.

**Ecology**

This species is hygrophilous, frequent and numerous dominant. Its aquatic larvae are predators (ROZKOŠNÝ 1999).

**Material examined**

Puck, 28.06.2001, 3 males; Mechelinki, 3.05.2006, 1 female; Mechelinki, 9.05.2006, 3 males, 2 females; Mechelinki, 18.05.2006, 1 male.

***Hydromya dorsalis* (FABRICIUS, 1775)****Distribution**

Palaearctic and Afro-Tropical Regions.

**Ecology**

*H. dorsalis* was observed near a dune lake in Norway (ARDÖ 1957) and on beaches of the Black Sea coast between *Juncus* sp. (BESCHOVSKI 1972). This species is recognized as

hygrophilous – mesophilous, very frequent and numerous dominant (ROZKOŠNÝ 1999). Adults are found from early April to early October. Larvae are observed in habitats with a thin film of constantly flowing water. The first instar larvae are parasitoid, staying in the first snail attacked for 2-3 days. They adopt predatory habits later, kill and feed on non-operculate aquatic species. *H. dorsalis* overwinter as puparia (BEAVER 1972).

#### **Material examined**

Jastrzębia Góra, 15.07.2003, 1 male, 1 female; Puck, 3.07.2004, 1 female; Darłowo, 1.08.2004, 1 male; Mechelinki, 23.06.2006, 2 females.

#### ***Ilione albiseta* (SCOPOLI, 1763)**

#### **Distribution**

Europe, East Palaearctic and North Africa.

#### **Ecology**

*I. albiseta* was observed near dune lakes in Norway (ARDÖ 1957), on beaches of the North Sea coast (BRAUNS 1959) and in brackish areas of the coastal type in Poland (SZADZIEWSKI 1983). It is hygrophilous species, recognized as very frequent and numerous dominant. The aquatic larvae are predators (ROZKOŠNÝ 1999). Adults are found commonly in the wet dune slacks, between June and September. Larvae show predatory habits in all three instars and can attack a wide range of aquatic and terrestrial snails. Between meals, the larvae often remain completely submerged below the filter paper at the bottom of the rearing dish. In natural habitats the time spent in the egg and larval stages is prolonged and they have a long adult life, however they mostly overwinter as larvae (BEAVER 1972).

#### **Material examined**

Jastrzębia Góra, 15.07.2003, 3 males.

#### ***Limnia unguicornis* (SCOPOLI, 1763)**

#### **Distribution**

Europe, East Palaearctic and Near East.

#### **Ecology**

*Limnia unguicornis* has been observed in the dune ridge zone on the Danish North Sea coast (ARDÖ 1957), on beaches of the Black Sea coast (BESCHOVSKI 1972) and in saline

inland habitats in Poland (SZADZIEWSKI 1983). This species is Eurasian, hygrophilous – mesophilous, very frequent and very numerous eudominant. Aquatic larvae are parasitic – predators (ROZKOŠNÝ 1999). Adults are caught from the end of May to the end of July. The first and second instars larvae have parasitoid habits. The third instar larvae become more predatory and eat dead *Lymnaea*, *Physa*, *Planorbis* and *Succinea* (BEAVER 1972).

#### **Material examined**

Darłowo, 1.08.2004, 1 female.

#### ***Psacadina verbekei* ROZKOŠNÝ in KNUTSON et al., 1975**

#### **Distribution**

Europe, Near East and North Africa.

#### **Ecology**

It is Eurasian, hygrophilous, medium frequent and numerous dominant. Aquatic larvae are parasitic – predators (ROZKOŠNÝ 1999). Adults were found at various wet habitats and occurred frequently in disturbed, cultivated situations. They were collected by sweeping over a water-filled ditch at the margin of a dense, unshaded stand of *Phragmites communis*. Adults were also swept from herbaceous vegetation at the margin of a small, spring-fed lake, along small irrigation ditches along forest paths and in densely cultivated garden plots. Its larvae kill and feed on snails belonging to *Lymnaea*, *Physa*, *Planorbis* and *Succinea*. They are not typical aquatic predators but are specialized for life at the margins of aquatic situations (KNUTSON et al. 1975).

#### **Material examined**

Puck, 8.08.2000, 1 male, 1 female; Darłowo, 1.08.2004, 2 males; Mechelinki, 9.05.2006, 4 females.

#### ***Sepedon spinipes* (SCOPOLI, 1763)**

#### **Distribution**

Palearctic Region.

#### **Ecology**

*S. spinipes* was observed on beaches of the Black Sea coast, among hygrophilous vegetation (BESCHOVSKI 1972). This hygrophilous species is recognized as very frequent and

very numerous eudominant (ROZKOŠNÝ 1999). Larvae are predators of aquatic snails and they crawl onto vegetation well above the water surface. This species can overwinter as adult or larva or in the puparium and it is distinguished by a potentially very short larval life (BEAVER 1972).

#### **Material examined**

Puck, 4.09.2001, 1 female; Puck, 9.05.2003, 2 females; Puck, 7.07.2003, 1 male, 9 females; Władysławowo, 25.07.2003, 2 females; Puck, 22.08.2003, 2 females; Puck, 3.07.2004, 1 female; Jastarnia, 22.07.2004, 1 female; Gdańsk – Górkki Wschodnie, 29.07.2004, 1 female; Darłowo, 1.08.2004, 1 female; Mechelinki, 4.06.2006, 1 male.

#### ***Tetanocera robusta* LOEW, 1847**

#### **Distribution**

Europe, East Palaearctic and Nearctic Region.

#### **Ecology**

*T. robusta* is primarily a predator of aquatic snails but usually rests on emergent plants or debris (BEAVER 1972). Its larvae may prey on stranded snails and attack molluscs that are still alive. Larvae continue feeding on the decaying tissue after they kill the snail (FERRAR 1987). This species overwinter as puparia (BEAVER 1972).

#### **Material examined**

Puck, 28.06.2001, 1 female; Gdańsk – Górkki Wschodnie, 23.06.2004, 2 females.

#### ***Trypetoptera punctulata* (SCOPOLI, 1763)**

#### **Distribution**

Palaearctic Region.

#### **Ecology**

*T. punctulata* has been observed near dune lakes in Norway, in the dune heath zone of the North Sea coast in Sweden (ARDÖ 1957) and on beaches of the Black Sea coast (BESCHOVSKI 1973). It is euryecious species, recognized as frequent and a very numerous eudominant. Its larvae are parasitic – predators (ROZKOŠNÝ 1999) and terrestrial (BEAVER 1972).

### Material examined

Jastrzębia Góra, 15.07.2003, 2 females.

## 2. Ecological and faunistic review

2.1. Quantitative and qualitative characteristics of Sciomyzidae fauna of saline habitats of the Polish Baltic coast. The dominance structure.

During the eight-year study on Diptera of brackish areas of the coastal type and beaches in Poland, more than 90,000 flies, belonging to 56 families were collected (KACZOROWSKA, in press). In the sampled material, the Sciomyzidae were relatively weakly represented, because there were only 85 specimens. Most of these flies were found in brackish areas of the coastal type, where 62 specimens, making up 72.94% of the total material, were collected (Table 1, Fig. 1). This result is strictly connected with the biology of the Sciomyzidae. Brackish areas of the coastal type are shady, wet and have convenient facilities for breeding of snails, which are food for preimaginal stages of many sciomyzid' species. Adults are mainly noticed in the neighborhood of the larvae habitat (ROZKOŠNÝ & ELBERG 1984); that is why in this type of saline area, representing by only three localities, Sciomyzidae were observed in such high abundance.

On two types of beaches the abundance of Sciomyzidae is similar. On the cliffed beaches, 13 specimens (e.g. 15.29%) were sampled, whereas on the sandy ones – 10 flies, making up 11.76% of the total material (Table 1, Fig. 1). It is clear, that both types of beaches are places where abiotic and biotic conditions necessary for breeding and feeding of sciomyzid' larvae are not convenient. These sampling plots are too sunny and dry. Besides, the molluscs, which are a source of nourishment for the Sciomyzidae in larval stages, are absent. The occurrence of sciomyzid' adults may be recognized as accidental, especially since all collected species are haloxenes (Table 1).

In the brackish areas of the coastal type, 8 species of Sciomyzidae were found. Among them the most abundant and recognized as eudominants are:

1. *S. spinipes* (29.03% of the total material) (Table 1) – it is a common species, inhabiting hygrophilous vegetation (BEAVER 1972), so it comes across convenient habitat conditions in these study areas;

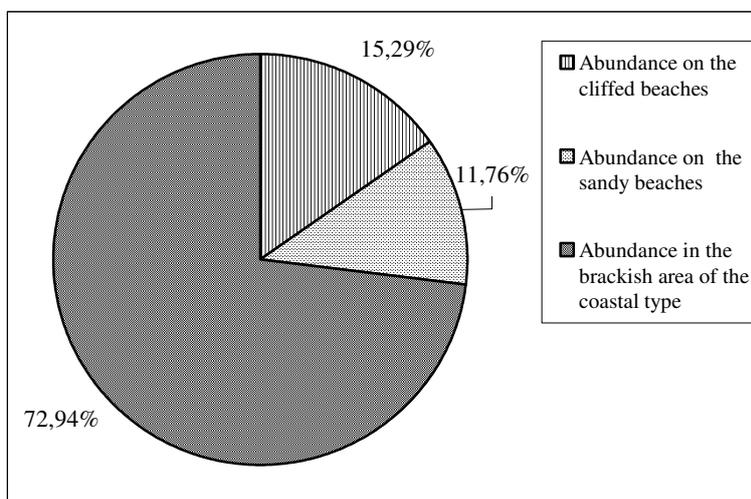
2. *C. marginata* (27.42%) (Table 1) – this species is euryecious (ROZKOŠNÝ 1999) and common in the whole territory of Poland (ZATWARNICKI 1985);

3. *E. cucularia* (16.13%) – it is recognized as hygrophilous (ROZKOŠNÝ 1999), and it is why this species is noticed in wet, saline habitats of the coastal type.

**Table 1.** Ecological group, abundance and dominance structure of the Sciomyzidae species in brackish areas of the coastal type and on cliffed and sandy beaches.

Hx – haloxene, Eud – eudominant, Dom – dominant, Sub – subdominant

Species	Ecological group	Brackish areas of the coastal type	%	Dominance structure	Cliffed beaches	%	Dominance structure	Sandy beaches	%	Dominance structure	Total	%	Dominance structure
<i>Colobaea punctata</i>	Hx	0	0.00	-	0	0.00	-	1	10.00	Dom	1	1.18	Sub
<i>Sciomyza simplex</i>	Hx	2	3.23	Sub	2	15.38	Eud	0	0.00	-	4	4.71	Sub
<i>Coremacera marginata</i>	Hx	17	27.42	Eud	1	7.69	Dom	4	40.00	Eud	22	25.88	Eud
<i>Dicya umbrarum</i>	Hx	3	4.84	Sub	0	0.00	-	0	0.00	-	3	3.53	Sub
<i>Elgiva cucularia</i>	Hx	10	16.13	Eud	0	0.00	-	0	0.00	-	10	11.76	Dom
<i>Hydromya dorsalis</i>	Hx	3	4.84	Sub	2	15.38	Eud	1	10.00	Dom	6	7.06	Sub
<i>Ilione albiseta</i>	Hx	0	0.00	-	3	23.08	Eud	0	0.00	-	3	3.53	Sub
<i>Limnia unguicornis</i>	Hx	0	0.00	-	0	0.00	-	1	10.00	Dom	1	1.18	Sub
<i>Psacadina verbekei</i>	Hx	6	9.68	Dom	0	0.00	-	2	20.00	Eud	8	9.41	Dom
<i>Sepedon spinipes</i>	Hx	18	29.03	Eud	3	23.08	Eud	1	10.00	Dom	22	25.88	Eud
<i>Tatanocera robusta</i>	Hx	3	4.84	Sub	0	0.00	-	0	0.00	-	3	3.53	Sub
<i>Trypetoptera punctulata</i>	Hx	0	0.00	-	2	15.38	Eud	0	0.00	-	2	2.35	Sub
<b>Total</b>		<b>62</b>	<b>100.00</b>		<b>13</b>	<b>100.00</b>		<b>10</b>	<b>100.00</b>		<b>85</b>	<b>100.00</b>	
<b>%</b>		<b>72.94</b>			<b>15.29</b>			<b>11.76</b>			<b>100.00</b>		



**Fig. 1.** Percentage of Sciomyzidae in particular types of habitats.

On the cliffed beaches, only 13 specimens of Sciomyzidae were sampled, however they belonged to 6 species (Table 1-2). This species diversity may be the result of abiotic and biotic conditions prevailing in the sampling plots. These beaches are represented by two types of cliffs – the sandy and clayey ones, overgrown with rich and various vegetations, attracting many dipterous species, including Sciomyzidae. Besides, the highest parts of the Polish cliffs border on old, shady and wet mixed forests, from which sciomyzid may be carried by the wind. In this type of habitat, the most abundant species are *S. spinipes* and *I. albiseta*, collected in the number of three each (Table 1). Both species were sampled on beaches earlier - *S. spinipes* – on the beaches of the Black Sea coast (BESCHOVSKI 1972), and *I. albiseta* – in localities adjacent to the North Sea (ARDÖ 1957). Thus, the occurrence of these species in material collected on the cliffed beaches is a confirmation of the earlier observations.

The sciomyzid fauna of the sandy beaches is represented by 6 species (Table 1-2). Among them, the most abundant and recognized as eudominant is *C. marginata* (described above). It was collected in the number of 4 specimens, making up 40% of the total material from this type of habitat (Table 1).

**Table 2.** The Sciomyzidae of extensive brackish areas and cliffed and sandy beaches – a comparison.

Species	Brackish areas of the coastal type	Cliffed beaches	Sandy beaches
<i>Colobaea punctata</i>	-	-	+
<i>Sciomyza simplex</i>	+	+	-
<i>Coremacera marginata</i>	+	+	+
<i>Dictya umbrarum</i>	+	-	-
<i>Elgiva cucularia</i>	+	-	-
<i>Hydromya dorsalis</i>	+	+	+
<i>Ilione albiseta</i>	-	+	-
<i>Limnia unguicornis</i>	-	-	+
<i>Psacadina verbekei</i>	+	-	+
<i>Sepedon spinipes</i>	+	+	+
<i>Tatanocera robusta</i>	+	-	-
<i>Trypetoptera punctulata</i>	-	+	-
<b>Total</b>	<b>8</b>	<b>6</b>	<b>6</b>

## 2.2. Comparison of Sciomyzidae fauna of the saline habitats of the Polish Baltic coast

During the eight-year study, *C. marginata*, *H. dorsalis* i *S. spinipes* were sampled in all three types of the saline habitats of the Polish Baltic coast (Table 2). These species are recognized as numerous and common in Europe (ROZKOŠNÝ 1999) and the two last were collected on seashore earlier (ARDÖ 1957, BESCHOVSKI 1972).

Next, *D. umbrarum*, *E. cucularia* and *T. robusta* were collected only in brackish areas of the coastal type (Table 2). The first species was sampled in this type of habitat earlier (SZADZIEWSKI 1983), so this result is a confirmation of that observation. The following two species are new for fauna of the Polish saline habitats.

*I. albiseta* (described above) and *T. punctulata* were sampled only on the cliffed beaches (Table 2). This last species was noticed on the beaches of the North Sea (ARDÖ 1957) and the Black Sea coasts (BESCHOVSKI 1973), so its occurrence on the Polish seashore was anticipated.

Next, *C. punctata* and *L. unguicornis* were observed only on the sandy beaches (Table 2). Earlier, both species were collected on beaches of the Black Sea coast (BESCHOVSKI 1972, 1973), the second one – also on seashore of the North Sea (ARDÖ 1957). As *L. unguicornis* was sampled in inland saline habitats in Poland (SZADZIEWSKI 1983), its occurrence on beaches may be the result of environmental preferences of this species.

### 2.3. Phenology

The Sciomyzidae were collected from the beginning of April to the end of October in each season of years 1999-2006. During this research none of analyzed flies were sampled in April and October, and the peak of abundance was observed in spring and early summer. In these periods Sciomyzidae have been collected in the number of 30 specimens in June and 27 – in July, making up respectively 35.29% and 31.76% of the total material (Table 3, Fig. 2).

This abundance is strictly connected with the occurrence of *C. marginata* and *S. spinipes* in the sampled material. Both species are recognized as hygrophilous, very frequent and very numerous eudominant (ROZKOŠNÝ 1999), also common in Poland.

### 2.4. Fauna of Sciomyzidae of saline habitats of the Polish Baltic coast – current condition. Conclusion

During this research, among the representatives of 56 families, 85 specimens of Sciomyzidae were found. These flies belong to twelve species (Table 1-3). Among them, nine species are new for saline habitats of the Polish Baltic coast. Therefore, based on this material and literature data (SZADZIEWSKI 1983) it can be concluded that 18 sciomyzid species are actually known to occur in these study areas. They represent 25% of Polish Sciomyzidae fauna.

Besides this, new localities were recognized for previously collected species. For example, *S. simplex*, collected by SZADZIEWSKI (1983) in the coastal brackish areas, during this research was noticed also on the cliffed beaches, similarly as *I. albiseta* (Table 2).

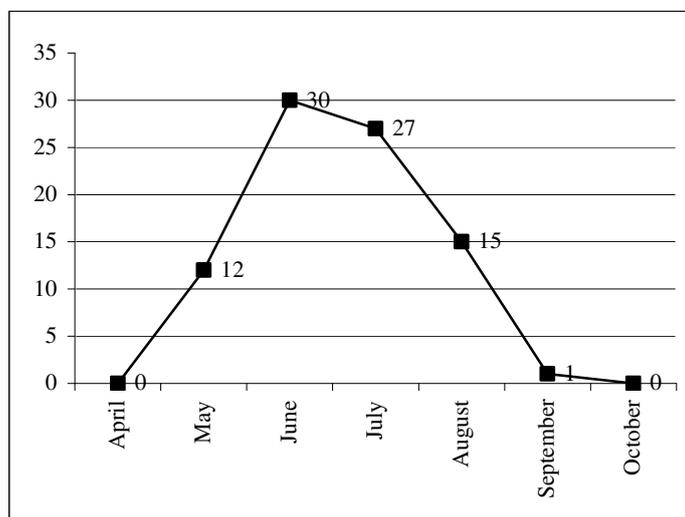


Fig. 2. Phenology of Sciomyzidae during the eight-year study in 1999-2006.

Table 3. Seasonal changes in soldier fly abundance and percentage in the saline habitats of the Polish coast in 1999-2006.

Species	April	May	June	July	August	September	October	Total	%
<i>Colobaea puctata</i>	0	0	0	1	0	0	0	1	1.18
<i>Sciomyza simplex</i>	0	0	1	2	1	0	0	4	4.71
<i>Coremacera marginata</i>	0	0	16	1	5	0	0	22	25.88
<i>Dicya umbrarum</i>	0	3	0	0	0	0	0	3	3.53
<i>Elgiva cucularia</i>	0	7	3	0	0	0	0	10	11.76
<i>Hydromya dorsalis</i>	0	0	2	3	1	0	0	6	7.06
<i>Ilione albiseta</i>	0	0	0	3	0	0	0	3	3.53
<i>Limnia unguicornis</i>	0	0	0	0	1	0	0	1	1.18
<i>Psacadina verbekai</i>	0	0	4	0	4	0	0	8	9.41
<i>Sepedon spinipes</i>	0	2	1	15	3	1	0	22	25.88
<i>Tatnocera robusta</i>	0	0	3	0	0	0	0	3	3.53
<i>Trypetoptera punctulata</i>	0	0	0	2	0	0	0	2	2.35
<b>Total</b>	<b>0</b>	<b>12</b>	<b>30</b>	<b>27</b>	<b>15</b>	<b>1</b>	<b>0</b>	<b>85</b>	<b>100.00</b>
<b>%</b>	<b>0.00</b>	<b>14.12</b>	<b>35.29</b>	<b>31.76</b>	<b>17.65</b>	<b>1.18</b>	<b>0.00</b>	<b>100.00</b>	

## REFERENCES

- ARDÖ P. 1957. Studies in marine shore dune ecosystem with special reference to the Dipterous fauna. *Opusc. Entomol. suppl.* **XIV**: 9-255.
- BEAVER O. 1972. Notes on the biology of some British Sciomyzid flies (Diptera: Sciomyzidae). II. Tribe Tetanocerini. *The Entomologist*, pp.: 284-299.
- BESCHOVSKI V. 1972. A contribution to the dipterofauna (Diptera, Brachycera) in the region of the Bulgarian Black Sea coast. *Bull. Inst. Zool. Mus.* **XXXIV**: 5-14.
- BESCHOVSKI V. 1973. Contribution to the dipterofauna (Diptera: Brachycera) of the Bulgarian Black Sea Coast. III. *Bull. Inst. Zool. Mus.* **XXXVII**: 33-41.
- BRAUNS A. 1959. Autökologische Untersuchungen über die thalassicolone Zweiflügler (Diptera) im schleswig-holsteinischen Bereich der Nord- und Ostsee. *Arch. F. Hydrobiol.* **55**: 453-594.
- BULIŃSKI M., PRZEWOŹNIAK M. Rezerwat Kępa Redłowska. [in:] PRZEWOŹNIAK M. (eds.). *Materiały do monografii przyrodniczej regionu Gdańskiego, tom I. Nadmorskie Rezerваты Przyrody (część 1)*, pp.: 5-174.
- FERRAR P. 1987. A guide to the breeding habits and immature stages of Diptera Cyclorhapha. *Entomograph* **8**, 478 pp.
- FOOTE B.A. 1958. Biology and life history of the snail-killing flies belonging to the genus *Sciomyza* FALLEN (Diptera, Sciomyzidae). *Ann. Entomol. Soc. Am.* **52**: 31-43.
- HERBICH J., HERBICHOWA M., MARKOWSKI R. 1997. Szata roślinna Nadmorskiego Parku Krajobrazowego. [in:] JANTA A. (eds.). *Nadmorski Park Krajobrazowy*. Wydawnictwo Nadmorskiego Parku Krajobrazowego, pp.: 36-56.
- KACZOROWSKA E. (in press). Trophic communities of dipterofauna (Insecta: Diptera) in saline habitats of the Baltic coasts. *Frag. Faun.*
- KNUTSON L.V. 1970. Biology of snail-killing flies in Sweden (Dipt., Sciomyzidae). *Ent. Scan.* **1**: 307-314.
- KNUTSON L.V., ROZKOŠNÝ R., BERG C.O. 1975. Biology and immature stages of *Pherbina* and *Pseudocadina* (Diptera, Sciomyzidae). *Acta Sc. Nat. Brno*, **IX**: 1-38.
- PIOTROWSKA H. 1984. Szata roślinna. [in:] B. Augustowski (eds.). *Pobrzeże Pomorskie*. Ossolineum, Wrocław, pp.: 218-316.
- ROZKOŠNÝ R. 1984. The Sciomyzidae (Diptera) of Fennoscandia and Denmark. *Fauna Entomol. Scand.* **14**: 9-224.
- ROZKOŠNÝ R. 1999. Phaeomyiidae, Sciomyzidae. [in:] R. ROZKOŠNÝ & J. VANHARA (eds.). *Diptera of the Palava Biosphere Reserve of UNESCO, II. Folia Fac. Sci. Nat. Uni. Masaryk. Brun., Biol.*, **100**: 281-286.
- ROZKOŠNÝ R., ELBERG K. 1984. Family Sciomyzidae. [in:] Á.SOÓS, L.PAPP (eds.). *Catalogue of Palaearctic Diptera. Vol. 9. Micropezidae - Agromyzidae*. Akadémiai Kiadó, Budapest, pp.: 167-193.
- SZADZIEWSKI R. 1983. Flies (Diptera) of the saline habitats of Poland. *Pol. Pismo Entomol.* **53**: 31-76.
- ZATWARNICKI T. 1985. Sciomyzidae (Diptera) of Poland – a faunistic review. *Pol. Pismo Entomol.* **55**: 343-380.
- ZATWARNICKI T. 1991. Sciomyzidae. [in:] J.RAZOWSKI (eds.). *Wykaz zwierząt Polski. Vol. II*. pp.: 181-183.
- [www.faunaeur.org](http://www.faunaeur.org)

Received: May 31, 2007

Accepted: September 03, 2007