

A study on the Hungarian freshwater osmylid and sponge-flies fauna (Neuroptera: Osmylidae, Sisyridae)

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ÁBRAHÁM, L.: *A study on the Hungarian freshwater osmylid and sponge-flies fauna (Neuroptera: Osmylidae, Sisyridae)*.

Abstract: There are four species in the Hungarian freshwater Neuroptera fauna according to the redetermined collections found in six Hungarian museums: *Osmylus fulvicephalus*, *Sisyra fuscata*, *Sisyra terminalis*, *Sisyra jutlandica*. The author gives the collecting data, the distribution maps and both the seasonal activity graphs and flight activity patterns of these species. Short evaluations on these species from faunistical, and chorological points of view are also given.

Key words: Neuroptera, Osmylidae, Sisyridae, distribution, seasonal activity, day and night activity.

Introduction

Neuroptera species living presently in the world are known to belong to 17 families (NEW 1989). Most of them are considered to be found in terrestrial habitat, only five of Neuroptera families (Rapismatidae, Osmylidae, Neurothidae, Sisyridae, Polystoechotidae) have aquatic larvae or larvae living only near water. Larvae in family Rapismatidae, Osmylidae and Polystoechotidae are considered to be semiaquatic but Neurothidae and Sisyridae species are truly aquatic.

Now only Osmylidae, Neurothidae and Sisyridae species live in Europe.

Osmylidae have about 160 described species distributed all over the world, except for North America. Both species occur in Europe, *Osmylus fulvicephalus* (Scopoli, 1763) in Hungary, as well, and *Osmylus elegantissimus* Kazanchikov, 1951 in the Crimean peninsula and the Caucasian region. Although species belonging to this genus live near water in damp moss and debris, other species' larvae, being carnivores, are definitely terrestrial.

Neurothidae species (10 sp) are mentioned in Palaearctic region and in Australia (NEW 1989). The only three species, which have not occurred in Hungary yet, live in the Mediterranean region in Europe. Its larvae are truly aquatic spreading in running streams and rivers.

Sisyridae, a small family, is represented by about 50 species all over the world (MONSERRAT 1977), but only five species can be found in Europe (ASPÖCK-HÖLZEL 1994). Their larvae are found to be preying on sponges and bryozoans in deep water lakes and slowly-moving streams and rivers, but in the prepupal and pupal stage within their cocoon, they lie in terrestrial habitats.

This study summarises the knowledge on the

Hungarian freshwater Neuroptera fauna based on the collection of their data from the literature and different collections of Hungarian museums.

Besides, the seasonal activity of freshwater neuropteroids species in Hungary, the flight activity patterns of these species were studied. It gives an important information on their collection possibilities.

Materials and methods

The determined collections found in Bakony Natural History Museum (Zirc), Janus Pannonius Museum Natural History Department (Pécs), Hungarian Natural History Museum (HNHM Budapest), Mátra Natural History Museum (Gyöngyös), Somogy County Museum Natural History Department (Kaposvár) and the Újhegyi's collection (Budapest) later deposited in HNHM, were revised. All the other available data from the databases cited in the Hungarian literature were made use of. Besides, several data come from the author's collecting trips.

Freshwater osmylid and sisyrids were collected by netting and beating techniques along the vegetation of watersides and verges. Several specimens were caught during periods of rest on under bridges, or buildings lying close to the water. Light trapping is a very useful collecting method and, so is collecting them by light personally.

Summarising the collection data can give a possibility for studying the seasonal activity of imagines.

Adults are mainly considered to be flying at night, because Malaise traps and suction traps operating by day can catch only few specimens. Adults in the above mentioned collections, collected personally, were presumably caught by sweeping.

A very simple experiment was carried out to determine the activity patterns of these species.

Living specimens were netted and transported into a lab, then they were placed individually in 300-ml glass containers covered with paper wadding. Experiments started in two hours after keeping these insects in glass containers. At least 10 specimens were used in each experiment. Paper wadding were watered moderately every three hours and temperature was $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$, as DUELLI (1986) pointed out that 100 % of these specimens are active above $20\text{ }^{\circ}\text{C}$. Natural daylight was used in long-day condition but direct sunshine was avoided. All experiment conditions were kept standard except natural light changes. Activity of these speci-

mens was checked visually, every quarter of an hour during a 24-hour-period. At night activity of specimens were observed by the reflected light of a torch, which was operated for 5 seconds for each sample to be checked.

The following abbreviations are used:

AP.	Agócsy P.	RL.	Rézbányai L.
ÁL.	Ábrahám L.	SH.	Steinmann H.
GyP.	Gyulai P.	SzCs.	Szinetár Cs.
HA.	Haris A.	SzGy.	Sziráki Gy.
JJ.	Jablonkay J.	TP.	Tallós P.
KGy.	Kovács Gy.	TS.	Tóth S.
KL.	Kovács L.	UÁ.	Uherkovich Á.
LB.	Liptay B.	ÚS.	Újhelyi S.
MF.	Mihályi F.	VA.	Varga A.
ML.	Móczár L.	WT.	With T.
NS.	Nógrádi S.	Mt.	Malaise trap
PA.	Podlusány A.	lt.	light trap
PS.	Pazsiczy S.		

Osmylus fulvicephalus (Scopoli, 1763)

Abaliget Nyáras valley May 15, 1983 1♀ UÁ, Aggtelek Babótkút June 23, 1993 1♂ Mt, June 24, 1993 1♂ Mt, July 6, 1993 1♂ Mt, Aggtelek Ménes valley May 21, 1990 1♂ SzGy, Aszófő Aug. 10, 1958 1♂ ÚS, June 17, 1965 1♀ ÚS, Bakonybél Szömörke valley July 5,

1968 2♂ RL, July 1, 1973 1♂ RL, Bakonyháza July 19, 1985 1♂ lt, Aug. 10, 1985 1♀ ÁL, Bakonyszentkirály Hajmáspuszta June 5, 1973 1♀ ÚS, Balatonfüred Koloska valley May 27, 1972 3♂ 1♀ TS, May 29, 1974 1♂ 3♀ TS, Bozsok July 28, 1991 1♂ 1♀ NL, Bódvaszilás Vecsem spring May 22, 1990 1♂ 4♀ PA, Bükkzsérc Oldal valley June 27, 1965 1♂ JJ, Cserépfalu Hór valley June 3, 1981 1♂ ?, Cserépfalu Szarka valley July 3, 1981 1♂ ?, Csörötnek July 14, 1993 1♀ NS, Diósjenő Királyháza Aug. 20, 1954 ? ÚS, Dömös May 26, 1957 1♀ ÚS, Forestsmecske June 1, 1989 1♀ lt, June 15, 1989 1♀ lt, July 16, 1990 1♀ lt, Feked Karasica stream June 8, 1987 1♂ UÁ. - NS, June 8, 1989 1♂ UÁ, Felsőszőlők Török stream June 7, 1994 1♀ UÁ, Felsőtárkány Fekete len June 12, 1984 1♂ UÁ, Gálosfa Sárközi forest July 30, 1989 2♂ KL, Gorica Gorica stream May 12, 1988 1♂ UÁ, Gyalóka July 15, 1979 1♂ TS, Gyöngyöshalász July 11, 1979 1♀ lt, Aug. 11, 1979 1♀ lt, Gyöngyössolymos Csór meadow June 14, 1977 2♂ 2♀ ÚS, June 15, 1977 1♂ ÚS, Gyöngyössolymos Nyírvérszűz June 10, 1971 1♂ Varga András, Aug. 14, 1974 1♂ lt, Hajmás stream June 5, 1973 1♂ ÚS, Hidas June 20, 1985 2♀ UÁ, Hidas Mecseknádasdi stream June 2, 1994 1♂ NS, Hont July 2, 1960 1♀ LB, Hosszúhetény Hidas valley July 6, 1951 1♂ 1♀ ÚS, May 16, 1994 2♂

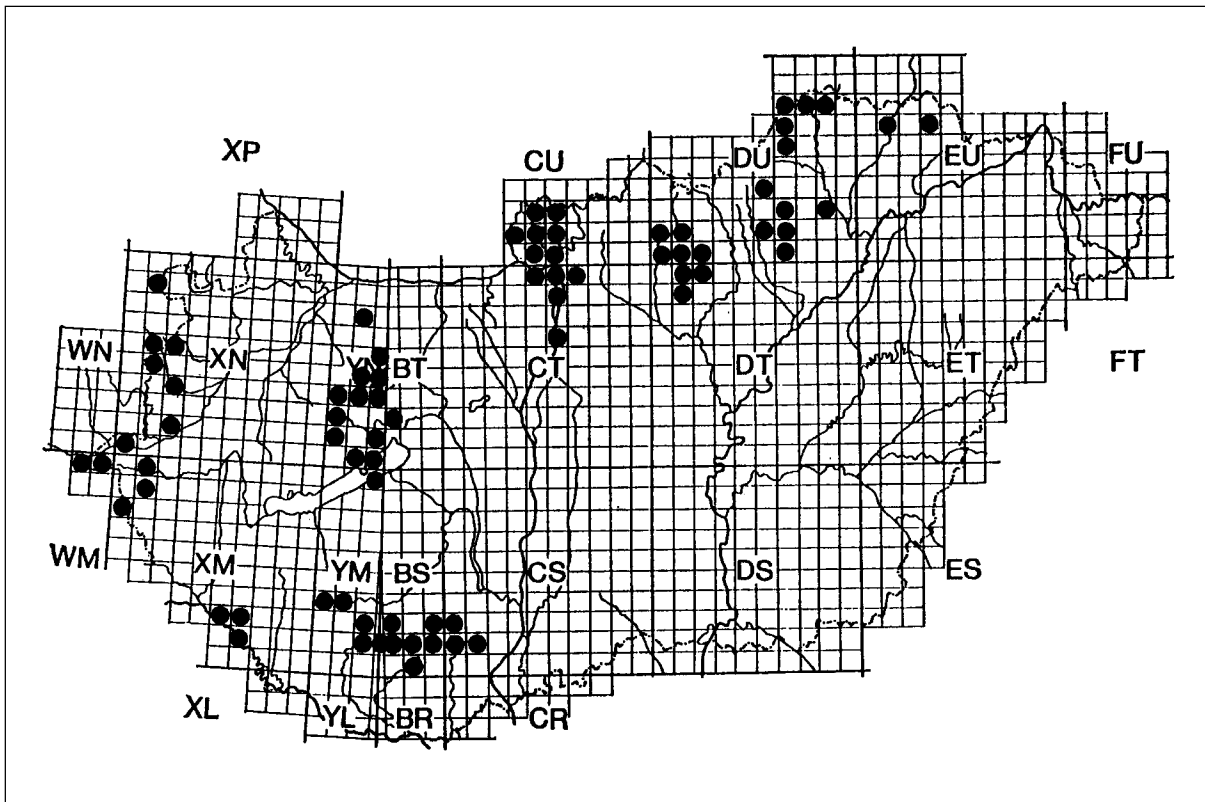


Fig. 1.: Distribution map of *Osmylus fulvicephalus* in Hungary
1. ábra: Az *Osmylus fulvicephalus* elterjedése Magyarországon

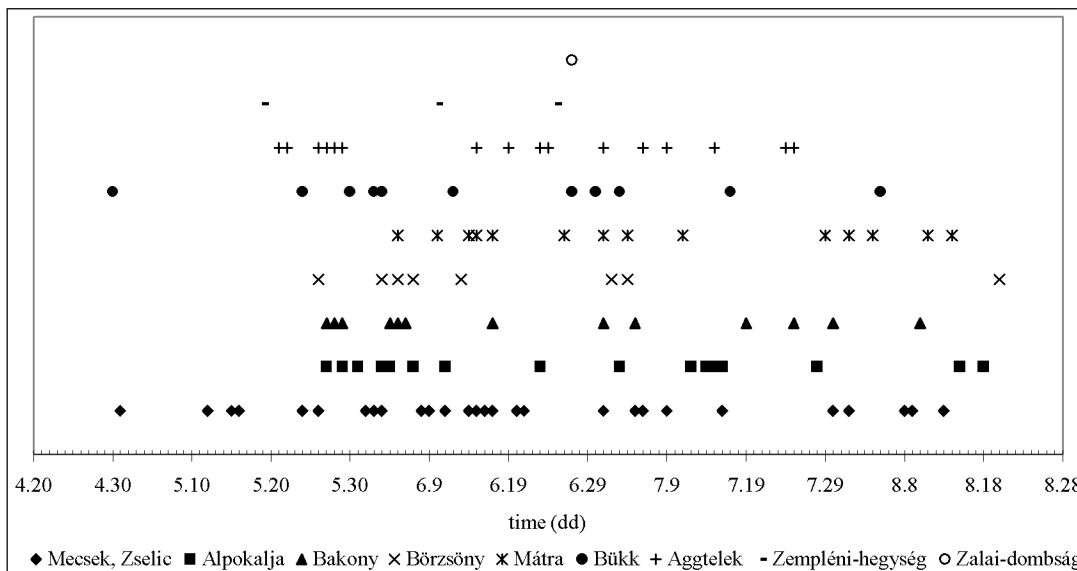


Fig. 2.: Seasonal activity graph of *Osmylus fulvicephalus*
 2. ábra: Az *Osmylus fulvicephalus* szezonális aktivitási diagramja

NS. - UÁ, Jósvafő July 9, 1970 1♂ UÁ, July 1, 1980 ?
 ÚS, Jósvafő Jósva spring May 26, 1989 1♂ 2♀ UÁ,
 May 26, 1989 1♀ Mt, July 24, 1990 1♂ UÁ, Jósvafő
 Kecső May 27, 1989 4♂ 9♀ UÁ, Jósvafő Lófej spring
 May 28, 1989 1♂ 1♀ UÁ, June 19, 1990 1♂ 1♀ It,
 Jósvafő Tengersizem lake May 29, 1992 1♀ SzGy,
 Kaposméről June 16, 1991 1♂ HA, Kemence Keme-
 nce stream June 25, 1950 ?, Kékestető Pisztrángos lake
 July 29, 1958 1♂ ÚS, Kishuta Kőkapu June 10, 1958
 1♀ ÚS, May 19, 1966 3♂ SH, Kismaros June 1, 1952
 ?, Kisújbanya Pásztor spring July 1, 1983 1♂ UÁ,
 Komló Mánfa June 14, 1957 1♂ ML, Komló Mánfa Kő-
 lyuk May 26, 1981 1♂ 1♀ UÁ, June 11, 1981 1♀ UÁ,
 June 15, 1981 1♂ 1♀ UÁ, June 21, 1981 1♀ UÁ, July
 1, 1981 2♂ 1♀ UÁ, Aug. 9, 1981 1♂ UÁ, May 1, 1982
 1♀ UÁ, June 1, 1982 2♂ UÁ, June 3, 1982 3♂ 1♀
 UÁ, July 5, 1982 1♂ 1♀ UÁ, Komló Mánfa Melegmá-
 nyi valley May 24, 1989 1♂ SzCs, Komló Mánfa
 Nagymély valley Aug. 1, 1996 2♂ NS. - UÁ, Korpád
 Sormás valley June 17, 1980 1♂ UÁ, July 1, 1980 3♀
 UÁ, Aug. 1, 1980 1♂ UÁ, Kőszeg Hármas stream May
 29, 1986 2♀ NS. - UÁ, July 3, 1986 1♂ NS, June 23,
 1987 1♀ UÁ, June 23, 1988 1♀ UÁ, July 3, 1988 2♂
 1♀ UÁ, Kőszeg Stájer houses June 3, 1988 1♂ UÁ,
 June 4, 1988 3♂ It, June 11, 1988 1♂ UÁ, Leányfalu
 June 3, 1971 1♀ Sin K, Magyarkút July 10-13, 1958
 2♀ 1? Székessy V, Magyarszombatfa Aug. 15, 1985
 1♂ It, Mátra ? June 8, 1968 1♀ ÚS, Mátrafüred June
 26, 1955 1♀ ÚS, July 1, 1969 1♂ JJ, July 4, 1969 1♂
 JJ, Aug. 1, 1969 1♂ JJ, Aug. 4, 1969 1♂ JJ, Mátrahá-
 za July 11, 1979 1♀ It, Aug. 11, 1979 1♀ It,
 Mátrászentimre Csörgő stream June 17, 1977 1♀ ÚS,
 Mecsekrákos June 13, 1963 1♀ Kovács Gy, Mezőörs

May 28, 1995 2♀ UÁ, Miskolc Lillafüred Garadna val-
 ley May 24-28, 1954 1♀ ÚS, May 24, 1954 1♂, April
 30, 1957 1♀ WT, April 30, 1959 2♂ ?, June 30, 1959
 1♂ ?, Nagybörzsöny Király meadow June 13, 1957
 1♂ 4♀ MF, June 5, 1966 1♂ ÚS, Nagyvisnyó Leány
 valley June 3, 1957 1♂ ?, Noszvaj Síkfőkút Aug. 5,
 1956 1♂ ?, Palé July 9, 1979 1♂ It, Parád July ? 1930
 1♂ 2♀, ? PS, Pásztó Ólombérc June 10, 1975 1♀
 VA, Pécs Szentkút June 9, 1992 3♀ ÁL,
 Porrogszentpál June 27, 1991 1♂ 3♀ UÁ,
 Püspökszentlászló June 20, 1989 1♂ It, Aug. 8, 1989
 1♂ It, Aug. 13, 1989 2♀ It, Sopron Tolvaj valley July
 15, 1996 1♀ ÁL, Szakonyfalu June 23-25, 1957 1♀
 TP, July 16, 1957 1♂ ÚS, Aug. 18, 1957 1♀ ÚS, July
 12, 1959 ? AP, Szarvaskő Margit spring July 17, 1976
 3♂ ?, July 17, 1976 1♂ 2♀ Zöld L, Szarvaskő Margit
 valley June 2, 1961 1♂, June 2, 1961 1♂ JJ, Szigliget

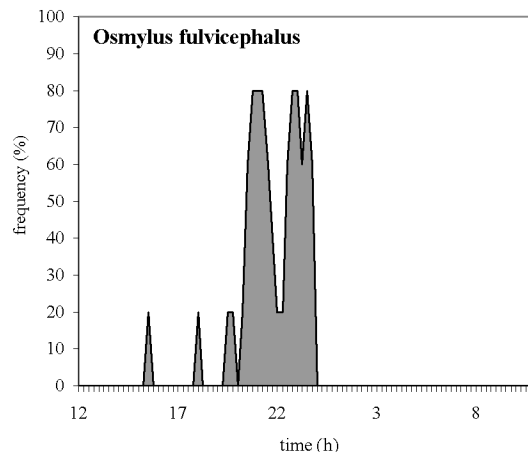


Fig. 3.: Day and night activity graph of *Osmylus fulvicephalus*
 3. ábra: Az *Osmylus fulvicephalus* napi aktivitási diagramja

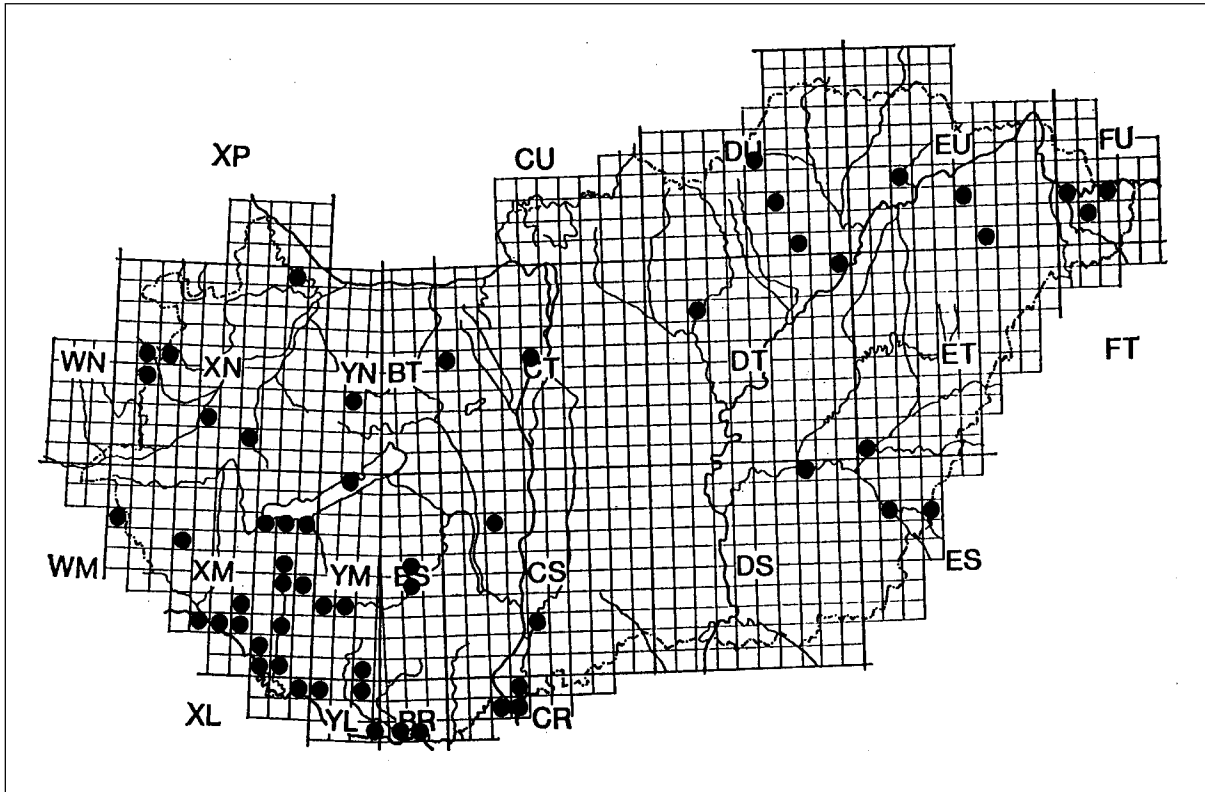


Fig. 4.: Distribution map of *Sisyra fuscata* in Hungary
4. ábra: A *Sisyra fuscata* elterjedése Magyarországon

Hideg kút July 25, 1990 1♀ UÁ. - NS, Szin Ménes valley June 15, 1987 1♀ 1? Bartos - Merkl O, Szinpetri May 26, 1989 2♂ 1♀ UÁ, May 27, 1989 2♂ 1♀ UÁ, Szögliget Medvegardeni spring July 25, 1990 1♂ UÁ. - NS, Szögliget Ménes valley July 15, 1990 3♀ UÁ. - NS, Szöce May 31, 1978 1♀ ÚS, Velem June 4, 1981 ? ÚS, Velem Hosszú valley May 27, 1986 1♂ UÁ, Veszprém Séd stream June 4, 1957 1♀ Papp J, Visegrád July 4, 1954 1♀ ÚS, Zebegény June 7, 1944 1♂ ?, Zirc Cuha valley July 30, 1974 1♂ RL, Zirc Szarvaskút June 6, 1974 1♂ 2♀ TS,

Sisyra fuscata (Fabricius, 1799)

Babócsa Rinya stream July 28, 1995 2♀ UÁ, Balatonkeresztúr Aug. 26, 1987 1♀ NS, Bánréve Aug. 5, 1985 1♀ It, Aug. 19, 1985 1♀ It, Barcs Sept. 12, 1984 1♂ NS, Nov. 12, 1984 1♂ NS, April 24, 1986 1♀ ÁL, Barcs fish ponds May 4, 1983 1♂ UÁ, Aug. 28, 1983 1♀ UÁ, Aug. 29, 1983 ? UÁ, May 27, 1984 3♀ UÁ, Aug. 6, 1984 ? UÁ, Aug. 26, 1984 ? UÁ, Sept. 1, 1984 1♀ UÁ, Barcs Kisbók June 8, 1995 1♀ UÁ, July 18, 1995 4♂ 1♀ ÁL, April 22, 1996 1♂ 1♀ NS. - UÁ, June 26, 1996 4♂ 1♀ ÁL, Barcs Középrigóc Aug. 29, 1984 1♂ UÁ, June 24, 1986 1♀ ÁL, Barcs Rinya Ó-Dráva May 18, 1996 5♂ 20♀ UÁ, Bejegyertyános Aug. 15, 1990 1♀ It, Bélavár Dráva river July 7, 1995 1♂ ÁL, Bélavár Dzsála May 6, 1996 2♀ NS. - UÁ, July

14, 1996 1♂ It, Bélavár Kerek hill July 18, 1995 1♂ ÁL, Bélavár Palinai forest June 20, 1995 1♂ ÁL, July 2, 1995 1♂ 1♀ ÁL, Bodrogkisfalud Aug. 1, 1993 1♀ It, June 22, 1994 2♀ It, Aug. 9, 1994 1♀ ?, Bodrogszegi July 1, 1993 1♂ 3♀ It, Böhönye July 25, 1988 2♀ ÁL, Csákvár Hajdúvágás Okt. 11, 1961 1♂ MF, Csepreg Ablánc stream May 28, 1986 1♂ UÁ, May 28, 1989 1♀ UÁ, Darány juniper woodland Aug. 7, 1995 1♀ ÁL, June 18, 1996 2♂ 2♀ UÁ, June 29, 1996 1♂ UÁ, Darány Nagyberek May 7, 1990 1♂ UÁ, Dobsza Kisdobsza Aug. 14, 1984 1♂ UÁ, Aug. 25, 1985 1♂ 3♀ UÁ, May 14, 1986 1♀ UÁ, May 16, 1986 1♀ ÁL, July 8, 1986 1♂ UÁ, July 23, 1986 1♂ UÁ, July 25, 1986 1♂ UÁ, Dombóvár Mászlony Aug. 1, 1986 1♂ UÁ, Drávapalkonya Dráva river May 4, 1993 2♀ UÁ, Fehérgyarmat Birhó Tár stream Aug. 24, 1993 2♀ Somlai T, July 9, 1994 1♂ NS. - UÁ, Fehérgyarmat Öreg-Túr June 22, 1993 2♂ 1♀ UÁ, Fonyód Berek canal July 6, 1985 1♂ UÁ, Fonyód Bozót canal Aug. 7, 1986 1♀ It, April 30, 1987 1♀ It, Aug. 24, 1989 1♂ It, Gelej Mezőcsát Aug. 22, 1995 1♀ Gyulai P, Gerla Aug. 27, 1962 1♀ It, Sept. 4, 1962 1♀ It, June 8, 1963 1♂ It, July 27, 1963 1♀ It, July 30, 1963 1? It, Hercegszántó Budzsák June 5, 1989 1♂ It, June 6, 1991 1♂ SzGy, June 17, 1991 3♂ UÁ, Hercegszántó Karapanca July 3, 1989 1♂ 1♀ It, July 4, 1989 1♂

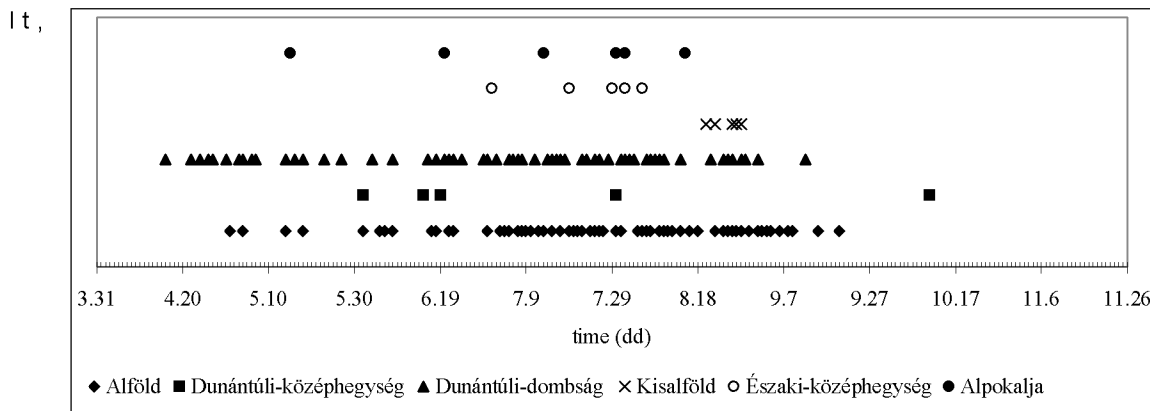


Fig. 5.: Seasonal activity graph of *Sisyra fuscata*
 5. ábra: A *Sisyra fuscata* szezonális aktivitási diagramja

July 5, 1989 1♀ It, July 7, 1989 1♂ It, July 24, 1989 4♂ It, Aug. 26, 1989 1♂ It, Aug. 28, 1991 1♀ UÁ, Hecgszántó Ó-Duna May 1, 1990 4♂ UÁ, Hosszúvíz Boronka stream April 16, 1989 2♂ 2♀ It, June 16, 1989 2♂ 2♀ It, June 29, 1989 1♂ It, July 11, 1989 2♂ 1♀ It, July 15, 1989 1♂ It, July 26, 1989 1♀ It, Aug. 10, 1989 1♀ It, Aug. 21, 1989 1♂ It, July 17, 1990 1♂ It, Jászvölgyszállás June 30, 1988 1♂ 1♀ It, July 13, 1988 1♂ It, July 26, 1988 1♂ It, Kaposfő May 3, 1987 1♂ It, Kaposvár June 30, 1952 1♀ Pázsiczky S, Kállósemjén July 19, 1960 1♂ It, Kemece Sept. 9, 1937 1♂ Sátori J, Kocsola July 16, 1986 1♂ It, Aug. 6, 1986 1♀ It, Kölked Boki gátörház July 31, 1989 1♂ It, Kölked Boki forest June 5, 1989 1♂ It, July 30, 1989 1♂ It, Körösladány Aug. 24, 1989 1♂ 1♀ It, Aug. 25, 1989 1♂ It, Kőszeg Chernel garden May 15, 1985 1♀ It, Kőszeg Malom valley July 13, 1988 1♂ It, Aug. 3, 1988 1♀ UÁ, Magyarszombatfa July 30, 1985 1♂ It, Aug. 25, 1985 1♂ It, Mecsér Aug. 22, 1992 1♂ 4♀ SzCs, Megyer Marcal river Aug. 20, 1988 1♂ 1♀ UÁ, Mezőtúr Peresi ox-bow lake May 14, 1988 2♂ It, May 18, 1988 1♂ 3♀ It, June 18, 1988 1♂ 3♀ It, July 10, 1988 2♂ 4♀ It, July 12, 1988 4♂ 7♀ It, July 13, 1988 49♂ 64♀ It, July 15, 1988 2♂ 16♀ It, July 17, 1988 2♂ 2♀ It, July 19, 1988 53♂ 54♀ It, Aug. 10, 1988 8♂ 9♀ It, Aug. 12, 1988 17♂ 21♀ It, Aug. 14, 1988 36♂ 35♀ It, Aug. 16, 1988 18♂ 15♀ It, Aug. 18, 1988 1♀ It, Sept. 15, 1988 7♂ 4♀ It, July 25, 1990 1♂ It, Miskolc Lillafüred Hámori lake July 29, 1937 1♂ 1♀ ?, Nagyatád Rinya stream July 5, 1995 1♂ UÁ, Nagyba-jom Aranyos stream Aug. 8, 1988 2♀ ÁL, Nagytétény July 31, 1961 1♂ It, Aug. 2, 1961 1♂ It, Németkér Sept. 3, 1987 1♂ ÁL, Olcsvaapáti Öreg-Túr, zsilip July 9, 1994 1♀ NS. - UÁ, Órtilos Dráva river April 27, 1992 1♂ ÁL, Órtilos railway station May 23, 1992 1♂ It, June 22, 1992 1♀ It, July 22, 1992 1♂ 1♀ It, July 31, 1992 5♂ 6♀ It, Aug. 22, 1992 2♂ It, Aug. 26, 1992 4♂ 2♀ It, Aug. 27, 1992 4♀ It, Aug. 28, 1992 3♂ 4♀

It, June 16, 1993 1♀ It, Penyige Gögő Szenke June 20, 1995 1♂ NS. - UÁ, Sarkad Malom valley June 1, 1989 2♂ 2♀ It, July 3, 1989 1♂ It, July 5, 1991 1♀ It, July 13, 1991 1♂ It, Aug. 4, 1991 2♂ 1♀ It, June 21, 1992 3♂ 4♀ It, July 22, 1992 1♂ It, Aug. 22, 1992 1♂ It, Sept. 20, 1992 3♂ It, Aug. 30, 1994 4♂ It, Somogyiszob Kanizsaberek July 5, 1988 1♂ It, Somogyudvarhely gravel pits June 3, 1996 1♀ NS. - UÁ, July 23, 1996 1♂ 1♀ ÁL, Sumony June 1, 1990 1♂ It, Sükösd Dunavölgyi canal June 22, 1995 1♂

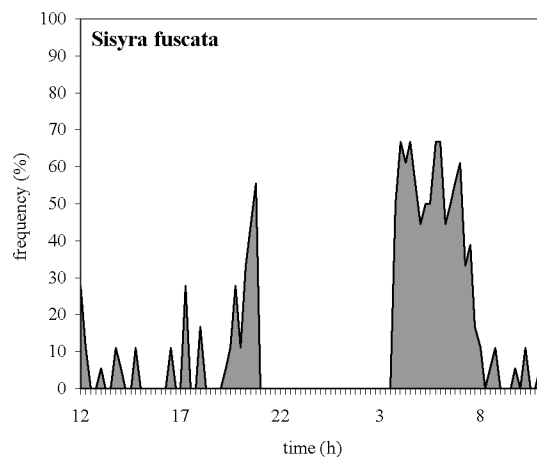


Fig. 6.: Day and night activity graph of *Sisyra fuscata*
 6. ábra: A *Sisyra fuscata* napi aktivitási diagramja

1♀ NS, UÁ, Szaporca Ó-Dráva Kisinci July 21, 1995 1♂ NS. - UÁ, Szentábalás lake Aug. 9, 1988 1♀ ÁL, Szentlőrinc July 31, 1986 1♀ UÁ, Szentlőrinc Okor víz July 8, 1987 1♂ UÁ, Szentpéterfőldé Aug. 1, 1986 1♀ It, Aug. 15, 1986 1♀ It, June 15, 1990 1♀ It, Aug. 15, 1990 1♀ It, Tard May 23, 1960 1♂ Tóth S, Tihany Sajkod June 1, 1990 2♂ It, June 15, 1990 1♂ 2♀ It, June 19, 1990 1♀ It, Túrístvándi Aug. 4, 1994 1♂ It, Aug. 5, 1994 1♂ It, Aug. 6, 1994 2♂ It, Aug. 7, 1994

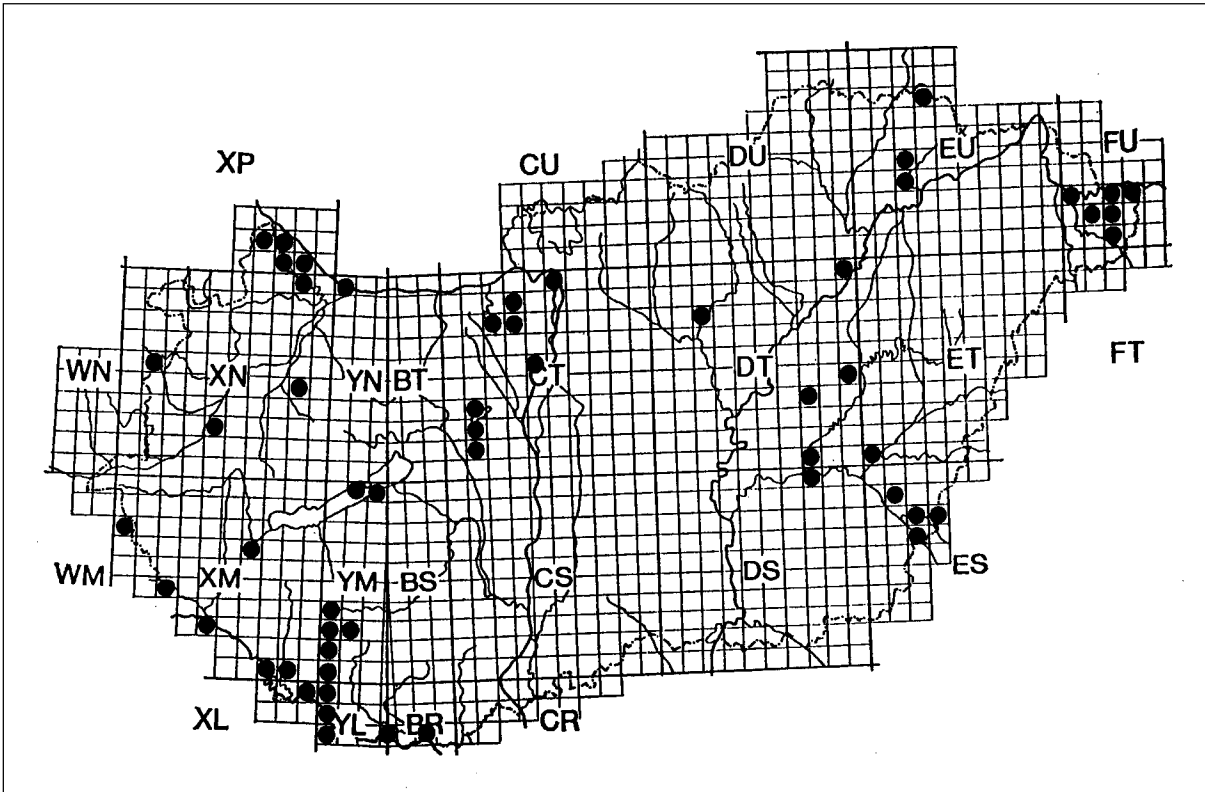


Fig. 7.: Distribution map of *Sisyra terminalis* in Hungary
 7. ábra: A *Sisyra terminalis* elterjedése Magyarországon

3♂ 1♀ It, Aug. 9, 1994 1♂ 1♀ It, Aug. 10, 1994 1♂ It, Aug. 11, 1994 2♂ 1♀ , Aug. 12, 1994 1♂ It, Sept. 1, 1994 2♂ 1♀ It, Sept. 2, 1994 5♂ 3♀ It, Sept. 3, 1994 2♂ 1♀ It, Sept. 4, 1994 3♂ 1♀ It, Sept. 6, 1994 1♂ It, Sept. 8, 1994 2♂ It, Sept. 9, 1994 2♂ It, Vejtői Dráva river July 20, 1995 2♀ UÁ, Vízvár June 21, 1992 1♂ It, July 2, 1992 1♀ It, Aug. 3, 1995 1♀ ÁL, Vörs Kisbalaton Aug. 24, 1947 1♂ ?, Zákány vasútoldal July 8, 1996 1♂ It, Zirc Cuha valley July 30, 1974 1♂ RL, *Sisyra terminalis* Curtis, 1854

Aba Aug. 2, 1996 1♀ It, Agárd June 16, 1976 3♀ ÚS, July 4, 1976 1♀ ÚS, Babócsa Rinya stream July 28, 1995 3♂ UÁ, Balatonmagyaród pond July 10, 1988 1♀ It, Barcs fish ponds Aug. 29, 1983 1♀ UÁ, Aug. 6, 1984 2♂ UÁ, Bodrogkisfalud Aug. 18, 1992 1♀ It, Aug. 1, 1993 1♀ It, June 22, 1994 1♂ 2♀ It, Bodrogszegi July 1, 1993 1♂ It, Bőszénfa Ropolyusztva June 9, 1996 1♂ ÁL, Darány Nagyberék Aug. 23, 1989 1♀ NS, June 18, 1996 1♂ UÁ, Dobsza Kisdobsza Aug. 25, 1985 4♂ 1♀ UÁ, Drávapalkonya Dráva river May 20, 1993 1♂ UÁ, July 26, 1993 2♂

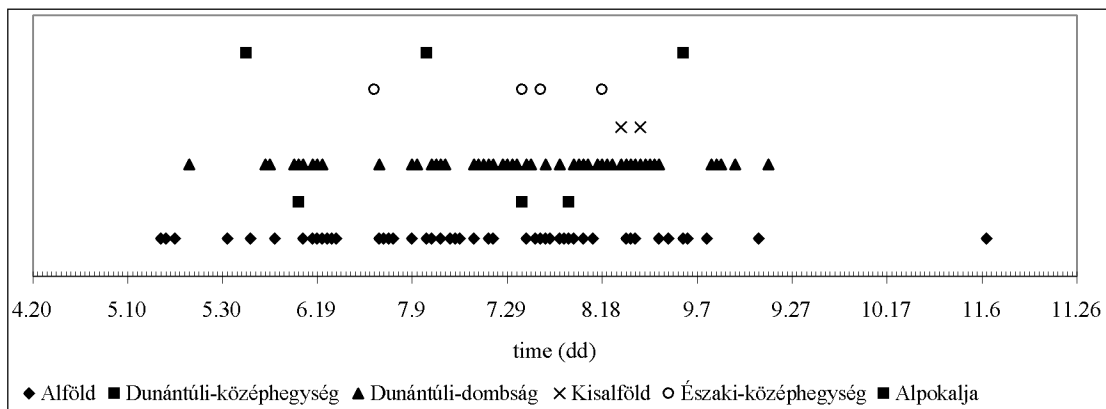


Fig. 8.: Seasonal activity graph of *Sisyra terminalis*
 8. ábra: A *Sisyra terminalis* szezonális aktivitási diagramja

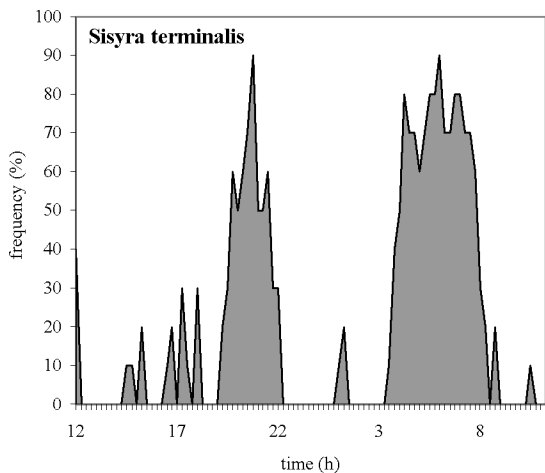


Fig. 9.: Day and night activity graph of *Sisyr terminalis*
 9. ábra: A *Sisyr terminalis* napi aktivitási diagramja

2♀ UÁ, Drávasztára Dráva river July 18, 1993 14♂
 3♀ UÁ, Fehérgyarmat Gögő Szenke June 22, 1993
 1♂ UÁ, Gulács Tisza ox-bow lake July 9, 1994 1♂
 NS. - UÁ, Gyula Szana-zúg Sept. 5, 1988 1♂ UÁ, Ha-
 lászi July 2, 1992 1♂ It, Hollóháza Aug. 1, 1986 1♀
 ÁL, Jászvölgy szállás July 26, 1988 1♂ It, Aug. 2, 1988
 1♀ It, Aug. 10, 1988 1♀ It, Kétújfalu July 3, 1993 1♀
 Sár J, Kisszentmárton Majlátpuszta Aug. 11, 1990 1♀
 It, Körösladány Aug. 24, 1989 1♂ It, Aug. 25, 1989 1♂

It, Kőszeg Malom valley June 4, 1988 1♀ UÁ, Lipótfá
 July 31, 1986 1♂ It, Aug. 17, 1986 1♂ It,
 Magyarszombatfa July 12, 1984 1♂ It, Sept. 4, 1984
 1♂ 1♀ It, Mecsér Aug. 22, 1992 1♀ SzGy, Mezőtúr
 Peresi ox-bow lake May 18, 1988 1♂ It, June 10, 1988
 1♂ It, June 18, 1988 1♂ It, July 12, 1988 5♂ 4♀ It,
 July 13, 1988 1♂ 2♀ It, July 15, 1988 1♂ 5♀ It, July
 17, 1988 2♂ 2♀ It, July 19, 1988 2♂ 2♀ It, Aug. 10,
 1988 1♂ It, Aug. 12, 1988 4♂ It, Aug. 14, 1988 3♂
 2♀ It, Aug. 16, 1988 1♂ 5♀ It, May 31, 1989 1♂ UÁ,
 July 25, 1990 2♂ 2♀ It, Murarátka Mura river July 13,
 1993 1♀ UÁ, Nagybjacs Aug. 26-29, 1996 47 exx. ?,
 Őrtilos railway station May 23, 1992 1♀ It, July 9, 1992
 2♂ 2♀ It, July 22, 1992 14♀ It, July 23, 1992 2♂ 3♀
 It, July 24, 1992 3♂ 3♀ It, July 25, 1992 1♂ It, July
 26, 1992 5♂ 2♀ It, July 29, 1992 1♂ It, July 30, 1992
 1♂ It, July 31, 1992 29♂ 67♀ It, Aug. 22, 1992 36♂
 36♀ It, Aug. 23, 1992 2♂ 3♀ It, Aug. 24, 1992 6♂
 3♀ It, Aug. 25, 1992 5♂ 11♀ It, Aug. 26, 1992 33♂
 98♀ It, Aug. 27, 1992 8♂ 25♀ It, Aug. 28, 1992 6♂
 32♀ It, Aug. 30, 1992 4♂ 5♀ It, Sept. 22, 1992 1♂ It,
 June 14, 1993 1♀ It, June 15, 1993 2♀ It, June 16,
 1993 1♂ 3♀ It, June 18, 1993 1♀ It, June 19, 1993
 3♀ It, June 20, 1993 1♂ 5♀ It, July 14, 1993 1♂ 1♀
 It, July 15, 1993 1♀ It, July 16, 1993 5♂ 9♀ It, Aug.
 3, 1993 1♀ ÁL, Aug. 12, 1993 1♂ 2♀ It, Aug. 13,

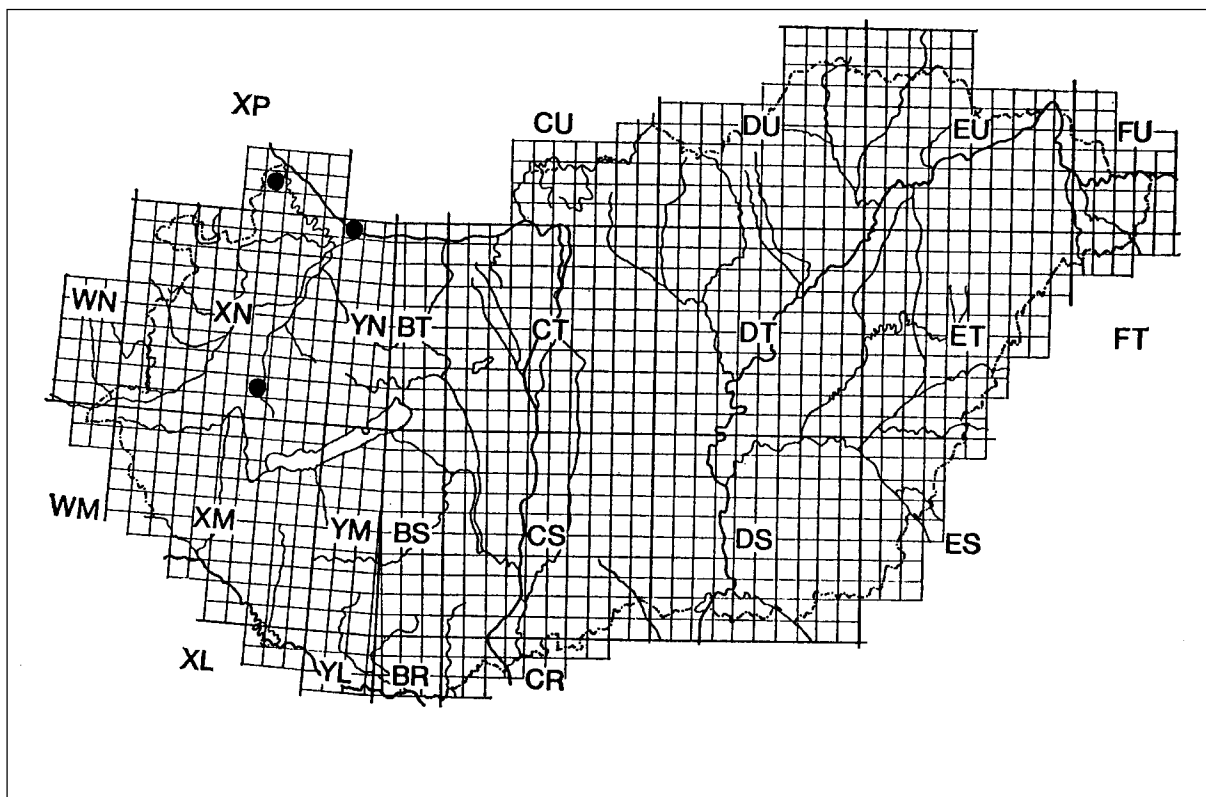


Fig. 10.: Distribution map of *Sisyr jutlandica* in Hungary
 10. ábra: A *Sisyr jutlandica* elterjedése Magyarországon

1993 5♂ 4♀ It, Aug. 14, 1993 2♂ 2♀ It, Aug. 15, 1993 3♂ 1♀ It, Aug. 19, 1993 1♀ It, Aug. 20, 1993 8♂ 1♀ It, Sept. 10, 1993 2♂ It, Sept. 11, 1993 1♂ 1♀ It, Sept. 12, 1993 1♂ 3♀ It, Sept. 12, 1993 1♀ UÁ, Sept. 15, 1993 1♂ 2♀ It, Nagytétény Aug. 11, 1961 1♂ It, Panyola Öreg-Túr June 19, 1995 3♂ NS. - UÁ, Patosfa July 29, 1986 1♀ UÁ, Piliscsaba Aug. 1, 1990 1♀ It, Sarkad Malom valley June 5, 1989 11♂ 6♀ It, Aug. 4, 1991 3♂ It, June 21, 1992 1♀ It, July 22, 1992 3♂ 7♀ It, Sept. 20, 1992 3♂ 5♀ It, Aug. 30, 1994 1♂ It, Szegilong Aug. 5, 1993 1♂ GyP, Szentborbás July 5, 1989 1♀ It, Aug. 23, 1989 1♂ 3♀ It, Tihany Sajkod June 15, 1990 1♀ It, Aug. 2, 1990 1♀ It, Tiszabecs Kút June 20, 1993 2♂ 1♀ UÁ, Tiszakeszi June 22, 1993 2♂ UÁ, Túrístvándi Öreg-Túr June 23, 1993 1♂ UÁ, Aug. 5, 1994 7♂ 4♀ It, Aug. 6, 1994 1♂ It, Aug. 7, 1994 1♂ 2♀ It, Aug. 9, 1994 2♀ It, Aug. 10, 1994 2♂ It, Aug. 11, 1994 1♂ It, Sept. 1, 1994 1♀ It, Sept. 4, 1994 1♂ It, Sept. 9, 1994 1♂ It, Uszka Batár stream June 21, 1993 2♂ UÁ, June 21, 1993 1♂ UÁ. - Vass I, Vejti Dráva river May 17, 1993 1♀ NS. - UÁ, Nov. 7, 1993 1♂ UÁ, Vízvár Dráva river July 2, 1992 1♀ It, Aug. 2, 1992 1♂ 1♀ It, Aug. 9, 1992 1♂ It, Aug. 18, 1992 1♂ It, June 8, 1993 1♂ 2♀ UÁ, July 16, 1993 1♀ NS, July 18, 1995 1♂ ÁL,

Sisyra jutlandica Esben Petersen, 1915

Megyer Aug. 20, 1988 1♀ UÁ, Nagybjacs July ? 1995 1 exx. sticky plate, Rajka dikereev's house Aug. 27, 1994 1 exx. UÁ,

Results and discussion

In the course of revision, six museological collections of the Hungarian osmylid and sisyrid flies were redetermined. Besides, data collected from all papers published on the Hungarian Neuroptera fauna were summarised, as well.

I found that the Hungarian freshwater Neuroptera fauna has one species belonging to Osmylidae and three species belonging to Sisyridae.

Although we can find data about them in several papers (STEINMANN 1967, SZIRÁKI et al. 1992), but *Sisyra dalii* McLachlan, 1866 has not come up in the Hungarian fauna yet. This specimen had been identified wrongly and was actually *Psectra* diptera (Burmeister, 1839) (Tarhos July 13, 1959 light trap) in coll.: HNHM. ASPÖCK et al. (1980) did not mention this species in Hungary in their European faunawork. However, ELLIOT (1996) mentioned it with positive record in east Balkans without citing paper, but I have not found its reference. This species occurs mainly in north-west Europe. Collecting site closest to Hungary is at Polstejn (Czech Republic), where it was caught in

1958 (ZELENY 1961). Our knowledge of its habitat and distribution is poor (KILLINGTON 1936-37, ELLIOT 1996). Records for adults suggest that larvae live in fast-floating rivers and streams and near small lakes and canals. Very few specimens have been recently recorded in the northwestern parts of Europe, especially in Germany and Great Britain.

Osmylus fulvicephalus (Scopoli, 1763)

It is a holomediterranean faunaelement. Developing near water it has three larval stages from which probably the second or third instar is overwintering (ASPÖCK et al 1980).

Pupation lasts for about two weeks. Adults can be recorded mainly beside shady streams. Fig. 1. shows the distribution of the species in Hungary. It can be concluded that *Osmylus fulvicephalus* is definitely spread in mountainous and hilly areas in Hungary but it is missing from the plain territories, such as the Great Hungarian Plain, the Little Hungarian Plain (Kisalföld) and the intensively studied Inner Somogy as well. Although it occurs in the hilly area of the Zselic, Vas and Zala hilly areas where the average altitude is below 350 m. According to the collecting sites its habitat is close to running water, limnokren springs and their surroundings, mountainous streams (lower courses) and brooks, rivulets where banks are shaded by the overhanging vegetation causing colder microclimatological effect than the open banks. It is an univoltin species. Seasonal activity graph of the adults is shown in Fig. 2. It is a sensitive species as to its habitat changes. The metapopulation can be heavily decreased by cutting trees down along the banks. Fortunately, habitat destruction does not occur very frequently, land and water pollution are not characteristic which is not suited for agriculture. This species has not been protected in Hungary yet.

Sisyra fuscata (Fabricius, 1799)

It is widely distributed in the Holarctic area. It can be found in almost all European countries except for the Mediterranean region. Sisyridae in Hungary are characterised by being spread only in the flat areas. As Fig. 4. shows the distribution area of *Sisyra fuscata* can be found along the large running rivers (lower courses) and different types of stagnant water. Its larvae is parasitic, their hosts are *Ephydia fluviatilis*, *Spongilla lacustris* and other sponges and bryozoans hosts (WEISSMAIR 1994a). Their habitats are different types of canals, dykes and ditches, rivulets, rivers and stagnant water, moor, marches and fens, lakes, ponds. Although it is considered to be a bivoltin species, this can not be proved by the data shown in the activity graph. The scale of water pollution is not known, either, so it is not yet clear how this species can cope with it.

Sisyra terminalis Curtis, 1854

It is a polycentric extramediterranean faunaelement. This species has a life history and way of life similar to *Sisyra fuscata*. Studying its life cycle and duration of larval stage, WEISSMAIR (1994b) found that it depended on water temperature and host conditions. ÚJHELYI

(1978) recorded this species for the first time at Agárd near Lake Velence in Hungary, although the first specimen had been collected in 1961 but it was misidentified as *Sisyra fuscata*. In Hungary it can also be found along large rivers and lakes, though it has not been collected near the lower courses of the Danube or the Tisza; on the other hand it was abundant in light trap samples at Őrtilos next to the Drava River (ÁBRAHÁM 1995). Seasonal activity graph is shown in Fig. 8. The characteristic habitats of *Sisyra terminalis* are in running water: large rivers, rivulets, streams and in stagnant water: gravel pits, reservoirs, stagnant river branches, water body with temporary in-flow, lakes, ponds.

Sisyra jutlandica Esben-Petersen, 1915

At present, categorisation of the faunaelement of this species can not be stated yet, as its distribution is not sufficiently known. It appears only in Europe, mainly in the countries of the Baltic basin. An isolated population of the species was first discovered at Illmnitz (HÖLZEL et al. 1980) near Lake Fertő in Austria. At first the species was recorded at Megyer next to the Marcal river (ÁBRAHÁM 1989) in Hungary, it also occurred in Szigetköz near the Danube river region in northwest Hungary (SZIRÁKI 1997).

Sisyra jutlandica seems to belong to bivoltin species, its life cycle is being studied by WEISSMAIR (1994b). Its characteristic habitats are stagnant waters: littoral lakes, shallow ponds, running waters: rivers, rivulets. The population in the Little Hungarian Plain (Kisalföld) in Hungary is very significant both from zoogeographically and nature conservation points. In Hungary it has not been protected by law yet.

Data concerning the appearances of the imagines¹ were examined by different methods as suggested by MONTGOMERY (1942) SOÓS (1958) DÉVAI (1976) BENEDEK - JÁSZAI (1971). According to the assumption, the diagram of seasonal activity of imagines should reveal normal distribution. However, due to few sample materials, the above statement could not be proved statistically by data of imagines used in this study. As a matter of fact, the activity graph from the few available data were unsatisfactory, so another method was presented. Seasonal activity graphs as shown in Figs.: 2. 5. 8. were drawn considering each

region in Hungary and the days and months of their appearance marked along the time line. The first and last dots inform us about start and end of seasonal activity while density of dots point out the frequency of seasonal activity of imagines, while the dots density and their connection to each other show the probable increase of collected specimens. Data on the activity graph gives information on microclimatological changes of the different collection sites.

Seasonal activity of *Osmylus fulvicephalus* on the south slopes of the Mecsek Mountains and the Aggteleki Karszt, for instance, begins earlier than on the northern slopes of the same region, which are microclimatologically colder. All those specimens collected in the Mecsek Mountains in the first decade of August live in cooler habitat for example: Komló Mánfa Kőlyuk, Komló Mánfa Nagymély valley, Püspökszentlászló. As shown in figure: 2. seasonal activity is influenced by latitude and geographical position of collection site in Hungary.

A very simple examination was carried out to study the daytime activity of Hungarian freshwater neuropteroid fauna. It gives information on their collection possibilities and the distribution of the collected materials. All movement types were recorded to define the absolute frequency of their activities. Three movement types were registered for agile antenna movement in resting position, walking and flying. At the end activity graphs were compared with types of flight activity patterns showed by DUELLI (1986).

New information can be concluded from these results on freshwater neuropteroids concerning day and night activities.

Activity pattern of *Osmylus fulvicephalus* belongs to carnea type and it is listed as nocturnal activity. *Sisyra fuscata* and *Sisyra terminalis* seem to belong to basalis type characterised by two activity peaks at dawn and at dusk.

Activity patterns are strongly modified by temperature changes in nature. Besides, we must take into consideration the homeostasis of insect as well.

Seeing the last two diagrams on *Sisyra* species, the hypothesis, saying that basalis type flying activity patterns with two peaks at dusk and at dawn is probably a consequence of the island habitat must be rejected, based on the results of experiments on the *Sisyra* spe-

¹ Terminology used in Hungarian literature is sometimes confusing, as it also happens with the English literature. Words and phrases denoting seasonal activity are as follows: flight activity, time-distribution of adults, appearances of imagines, phenology, voltinims.

Phenology and voltinims are not used correctly, the first meaning the complete description of life history and is not limited to the flight activity of the imagines, the latter referring to the entire life cycle. Words and phrases used for day and night activity are: flight activity, and flight activity patterns.

Sok publikáció helytelenül a fenológia szót alkalmazza a rajzási adatok ismertetésekor. A fenológia a fejlődésmentet teljes leírása és nem korlátozódik az imágók repülési aktivitására. A vizsgálat csak az imágókra terjedt ki, éppen ezért a teljes egyedfejlődés időbeli lefutására csak következtetni tudunk.

A repülési aktivitás, rajzási aktivitás, szezonális aktivitás és a helytelenül használt fenológia szó is ugyanazt a jelenséget takarja. A napi mozgás aktivitásra, mint szinonim megfelelőjét használják a repülési aktivitás szót is a magyarban, de emellett e fogalmat alkalmazzuk a gyűjtések során az állatok abundancia viszonyainak megjelölésére is.

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cies in Hungary.

None of them are protected in Hungary yet, although these species are listed in Red Books in some of the neighbouring countries (Austria, Slovenia, Germany).

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