ACTA MYCOLOGICA
Vol. 37 (1/2): 13–28
2002

Changes in the myxomycete biota of the "Łężczok" nature reserve near Racibórz (SW Poland)

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Stojanowska W., Panek E.: *Changes in the myxomycete biota of the "Łężczok" nature reserve near Racibórz (SW Poland)*. Acta Mycol. 37 (1/2): 13–28, 2002.

The paper presents changes that occured in the myxomycete flora of the nature reserve Łężczok during the last 30 years. The ecological analysis of slime moulds is also given. During the first periode of investigations (1967-1968) only 34 myxomycete species were found. During the second one, i.e. in the years 1996-2001 (except for 2000) – 47 species. In total, the myxomycete flora of the reserve includes 59 taxa. Among them 22, mostly cosmopolitic species were stated during both sampling periods. Twelve species were stated during earlier investigations only, while during recent studies 25 new species were found.

Key words: *Myxomycetes*, slime moulds, ecology, Silesia

INTRODUCTION

Years ago natural values of the "Łężczok" reserve attracted attention of biologists. Old stands of trees, numerous ponds conspicuous by rich flora and fauna were studied many times. During the sixties of the last century the scientific center in Wrocław carried out joint investigations of nature reserves of the Opole Province. The "Łężczok" reserve was also included since administratively it belonged to the former Opole voivodship. Scientists from Cracow, and – recently – Katowice, worked in the reserve, too. The studies included flora and forest communities (Krawiecowa and Kuczyńska 1964; Kuczyńska and Fabiszewski 1962; Sendek 1966, 1986; Rostański 1994), soil microfungi (Badura 1964), macrofungi (Wojewoda 1981; Halama and Panek 2000), mosses (Berdowski 1973), slime moulds (Stojanowska 1974), ecological conditions (Wachowska and Serwatka 1964; Wachowska-Serwatka and Serwatka 1964), and many faunistic peculiarities.

During the years 1963-1968 myxomycetes were searched (Stojanowska 1974) in 8 reserves of the Opole Province. 34 myxomycete species were found in "Łężczok". After 30 years studies in the reserve started again and myxomycetes were observed during five, incomplete growing seasons. The collections were indentified using the following monographs: Krzemieniewska (1960), Martin and Alexopoulos (1969), Neubert et al. (1993, 1995, 2000). The last one is followed in this paper in respect of taxonomy and nomenclature. The analysis of changes in myxomycete biota during the last 30 years is presented in the paper. The autors of photos: 2, 3, 5, 11, 13, 14 – E. Panek, 1, 4, 6, 7, 8, 9, 10, 12 – J. Maciążek.

GENERAL CHARACTERISTICS OF THE RESERVE

The forest-pond nature reserve "Łężczok" is situated in the Odra valley, 5 km to the east of Racibórz (Silesian voivodship). The object, 408 ha in area, has been protected since 1957. Forests cover 136 ha, ponds 245, and the rest falls to meadows, dams and roads. From XIV century up to 1811 the area belonged to Cistertians famous for their fish-culture. A small stream Łęgoń flows across the reserve. Dikes controlling the excess of water in ponds are also present. The protection zone around the reserve is lacking, but land used for farming purposes borders on it (Halama and Panek 2000). In spite of the surroundings the moisture conditions in the reserve are favourable to forest communities. The following forest associations grow there: linden hornbean forest *Tilio-Carpinetum* with *Quercus robur, Carpinus betulus* and *Tilia cordata*, elm–ash carrs *Ficario-Ulmetum campestris* with *Fraxinus excelsior, Ulmus scabra, Acer campestre*, and alder carr *Circeo-Alnetum* with domination of *Alnus glutinosa* and *Betula pendula* (Krawiecowa and Kuczyńska 1964; Sendek 1986). Forest rims are overgrown with fragments of fresh, humid and herb meadows while aquatic and water side plants develope in ponds.

LIST OF TAXA

All species included in the Red List (Stojanowska and Drozdowicz 1992) are indicated with R.L.

MYXOMYCETES

Ceratiomyxales

Ceratiomyxaceae

Ceratiomyxa fruticulosa (Müll.) Macbr. var. *fruticulosa* N. Am. – on rotting wood of deciduous trees, *Quercus, Tilia, Betula*. IX 1967; VIII 1996; VII, VIII 1998; VIII, IX, X 2001.

Liceales

Cribrariaceae

Cribraria piriformis Schrad. – on highly decomposed wood of *Quercus*. VIII 2001.
C. rufa (Roth.) Rost. – on highly decomposed wood of *Betula, Quercus, Fraxinus*. VIII 1996; X 1997; X 2001.
C. vulgaris Schrad. – on a log overgrown with bryophytes. X. 1968.

Dictydiaethaliaceae

Dictydiaethalium plumbeum (Schum.) Rost. – on mouldering wood of *Fagus*. X 1968. Recently not found.

Enteridiaceae

Enteridium lycoperdon (Bull.) Farr. var. *lycoperdon* – on *Tilia* trunks, 2 meters above the ground (abundantly). X. 1968; also on *Quercus* and *Betula* logs. VIII 1996; X 1997.
Lycogala conicum Pers. – on mouldering wood of *Betula*. IX 2001 (Fig. 1).
L. epidendrum (L.) Fries var. *epidendrum* – on mouldering wood of *Quercus, Tilia, Betula, Fagus*. X 1968; X 1997; VII 1998; IX 1999; VIII and X 2001.
L. exiguum Morgan – on decaying wood of a deciduous tree, one specimen. VIII 1996.
Tubifera ferruginosa (Batsch.) J. F. Gmel. – on mouldering wood of *Quercus*. VII 1998; VIII 2001 (Fig. 2).

Trichiales

Arcyriaceae

Arcyria cinerea (Bull.) Pers. – on mouldering wood of *Quercus*, *Tilia*, *Picea*, also on trunks overgrown with bryophytes, and on fallen twigs. IX 1967; VIII 1996; VII, VIII 1998; IX 1999; VIII, X 2001.
A. denudata (L.) Wettst. – on decaying wood of *Tilia, Fagus, Carpinus* and on trunks covered with bryophytes. IX 1967; X 1997; VII 1998; IX 1999; VIII, IX, X 2001.
A. ferruginea Sauter – on decaying wood of *Quercus* and on trunks overgrown with bryophytes. X 1968; X 2001.
A. incarnata (Pers.) Pers. – on fallen branches and on logs of *Betula, Tilia, Carpinus*. IX 1967; VIII. 1996; VII 1998; IX 1999; VIII 2001.
A. major (G. Lister) Ing. – on mouldering wood of *Betula*. VIII 2001. The species is new to Silesia. However, there is a specimen found in the "Łężczok" reserve in 1998 by M. Łukasiewicz (unpublished) in herbarial collection of the Wrocław University. In the Krzemieniewska's monograph (1960) under synonymic

name *A. insignis* var. *major* reported from Masurian Lakes only. Until recently new findings in Poland have been lacking (Fig. 3).

A. obvelata (Oeder.) Onsberg. – on decaying wood of *Tilia, Quercus, Picea*. IX 1967; X 1968; X 1997; VIII 1998; VIII 2001.

A. oerstedtii Rost. – on moudered wood of *Fagus, Quercus*. X 1997.

A. pomiformis (Leers.) Rost. – on decaying wood of deciduous trees (*Quercus, Tilia*), and on fallen twigs. IX 1967; VIII 1996; VII, VIII 1998.

A. stipata (Schw.) A. Lister – single specimen on decaying wood of *Betula*. X 2001. Specimens collected by M. Łukasiewicz in the "Łężczok" reserve in 1998 (unpublished) are in the collection of the Wrocław University Herbarium. The species is rare in Poland, reported from the Carpathians' Piedmont and from The Botanical Garden in Wrocław (Krzemieniewska 1957, 1960). R.L. (Fig. 4).

Metatrichia vesparium (Batsch.) Nann.-Brem. – on mouldering wood of deciduous trees (*Fagus, Betula, Tilia, Quercus, Aesculus*), and on trunks overgrown with bryophytes. IX 1967; X 1968; VIII 1996; X 1997; VIII 1998; IX 1999; VII, IX, X 2001 (Fig. 5).

Perichaena corticalis (Batsch.) Rost. var. *corticalis* – on fallen branch of *Tilia* (bark). X 1997.

P. depressa Libert – on bark of *Carpinus*. IX 1967. Recently not found.

Trichiaceae

Hemitrichia clavata (Pers.) Rost. – on decaying wood of deciduous trees (*Carpinus, Fagus, Betula, Aesculus*), and on trunks overgrown with bryophytes. IX 1967; VIII 1996; X 1997; VIII 1998; VIII, IX 2001 (Fig. 6).

H. serpula (Scop.) Rost. – on decaying wood of *Quercus* and *Carpinus*. The species is rare in the reserve. X 1968; VIII 2001.

Trichia affinis de Bary – single specimen on decaying wood of *Carpinus*. X 1968. Recently not found.

T. botrytis (J.F. Gmel.) Pers. – on a log overgrown with bryophytes. X 1968. Not found.

T. contorta (Ditmar) Rost. var. *contorta* – on decaying wood of deciduous trees. X 1968. Recently not found.

T. decipiens (Pers.) Macbr. var. *olivacea* Meylan – on decaying wood of deciduous trees (mostly *Quercus*) and on a fallen branch. X 1968; IX 1999.

T. favoginea (Batsch.) Pers. – on mouldering logs of *Fagus* and *Betula*. VIII 1996; VIII, X 2001. The species is rare in the reserve.

T. persimilis Karst. – on mouldering wood of *Carpinus, Quercus, Betula, Fagus*, and on fallen branches. IX 1967; X 1968; VIII 1996; X 1997; VIII 1998; IX 1999; X 2001.

T. scabra Rost. – on mouldering wood of *Quercus, Betula, Fagus, Aesculus*. IX 1967; X 1968; X 1997; VIII 1998; IX 1999; IX, X 2001 (Fig. 7).

T. varia (Pers.) Pers. – on mouldering wood of various deciduous trees (*Betula, Fagus, Carpinus, Quercus, Aesculus* and *Tilia*), and on logs overgrown with bryophytes. One of the most common myxomycete species in the reserve. IX 1967; X 1968; VIII 1996; X 1997; VIII 1998; IX 1999; VIII, IX, X 2001.

Рис. 1. *Lycogala conicum*

Рис. 2. *Tubifera ferruginosa*

Рис. 3. *Arcyria major*

Рис. 4. *Arcyria stipata*

Рис. 5. *Stemonitis axifera* and *Metatrichia vesparium*

Рис. 6. *Hemitrichia clavata*

Рис. 7. *Trichia scabra*

Рис. 8. *Diachea leucopodia*

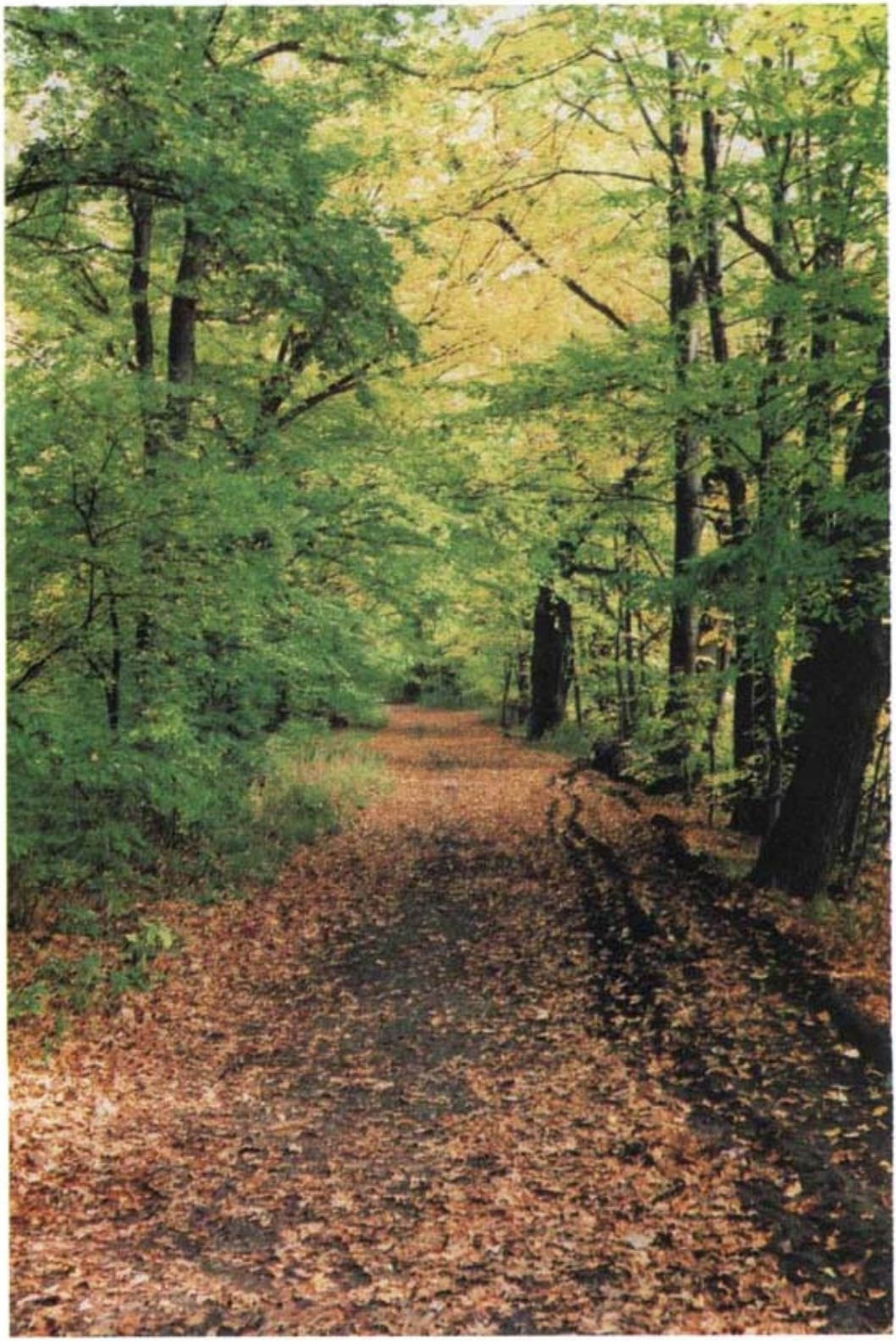
Рис. 9. *Diderma floriforme*

Рис. 10. *Fuligo leviderma*

Рис. 11. *Fuligo septica*

Рис. 12. *Physarum viride* var. *viride*

Рис. 13. *Brefeldia maxima*



Ryc. 14. The „Polish Hussars Alley" on the top of dam in the „Łężczok" reserve. Late summer.

Physarales

Didymiaceae

Diachea leucopodia (Bull.) Rostaf. – on dry leaves, small twigs, and on herbaceous plants. VIII 1996; VIII 1998; VIII 2001 (Fig. 8).

Diderma deplanatum Fr. – on mouldering leaves. VIII 1996. In Poland reported exclusively from Silesia. Schroeter (1889) found this species in the vicinity of Brynica, Stojanowska (2000) collected it from dry potato stems near to Biała Prudnicka (Province of Opole). R.L.

D. effusum (Schwein.) Morgan var. *effusum* – single specimen on a grass leaf. VIII 1996. The species is rare in Poland, reported from Książ in Lower Silesia (Firich 1962), beech reserve at Muszkowice, and from Kletno (East Sudety Mts.) (Stojanowska 1980, 1983a), also from Ojców National Park (Drozdowicz 1992).

D. floriforme (Bull.) Pers. – on highly decayed wood of *Quercus*. VII 1998; IX 1999. Hitherto the species was known only from localities in the Carpathians and the Carpathians' Piedmont (Krzemieniewska 1960), now in Ukraine (Komorowska 1978). Hence, the species is new to Poland (Fig. 9).

Didymium iridis (Ditmar) Fr. – one specimen on wood of a deciduous tree. X 1968. Recently not found.

Physaraceae

Badhamia panicea (Fr.) Rostaf. – single specimen on mouldering wood of *Fagus* trunk, together with *Dictydiaethalium plumbeum*. X 1968.

Craterium aureum (Schumach.) Rostaf. – on litter, fallen twig, and on herbaceous plants. VIII 1996. The species is rare in the reserve. R.L.

C. leucocephalum (Pers.) Ditmar var. *leucocephalum* – abundantly on litter, and on fallen *Carpinus* bark. VIII 1996; IX 1999.

Fuligo leviderma H. Neubert, Nowotny et K. Bauman – on mouldering wood of *Betula* and *Fagus*. X 1997; X 2001. Krzemieniewska (1960) gives a wrong name *Fuligo rufa* for this species (Stojanowska 2000a) (Fig. 10).

F. muscorum Alb. et Schwein. – on mosses. VII, VIII. 1998. The species is new to Silesia. In 2001 found by Stojanowska in the Karkonosze Mts., Krzemieniewska (1960) reports it from four localities: Międzyrzecz, Białowieża Primeval Forest, Kampinos Forest, Carpathians. R.L.

F. septica (L.) Wiggers var. *septica* – on decaying wood of deciduous and coniferous trees (*Quercus, Sorbus, Tilia, Picea*). Previously not found, now dispersed in the reserve. VIII 1996; X 1997; VII, VIII 1998; IX 1999; VIII, IX, X 2001 (Fig. 11).

Physarum cinereum (Batsch.) Pers. var. *cinereum* – on mouldering wood of *Fagus*. Single specimen. VIII 1998.

P. flavicomum Berk. – on a fallen *Carpinus* branch. X 1968. Rare in Poland. Reported by Krupa from a greenhouse (Krzemieniewska 1960), and by Drozdowicz (1992) from the Ojców National Park. R.L.

P. leucophaeum Fr. – on mouldering wood of *Quercus*, on trunks overgrown with bryophytes, and on fallen twigs. VIII 1996; VIII 1998; IX 1999.

P. nutans Pers. var. *nutans* – on decaying wood of deciduous trees (*Carpinus, Tilia, Betula*), and on fallen twigs. IX 1967; X 1968; VIII 1996; IX 1999; IX 2001.

P. pusillum(Berk. et M. A. Curtis) G. Lister – single specimen on mouldering wood of a deciduous tree. X 1968. Recently not found. R.L.

P. viride (Bull.) Pers. var. *viride* – on decaying wood of *Quercus, Carpinus*, and on fallen twigs. VII 1998; IX 1999; VIII 2001 (Fig. 12).

P. viride var. *aurantium* (Bull.) Lister – on mouldering wood of *Quercus*. Together with *Stemonitis axifera* and *Arcyria cinerea*. IX 1967. Recently not found.

Stemonitales

Stemonitidaceae

Brefeldia maxima (Fr.) Rostaf. - on grass and litter, large (up to 40 cm) plasmodium with sporangia just being formed (Fig. 13). The species rare in Poland, reported from the vicinity of Ząbkowice Śląskie (Schroeter 1889), and from Białystok voivodship (Krzemieniewska 1960). Not found until recently. R.L.

Comatricha nigra (Pers.) J. Schroet. – on fallen twigs, and on decaying *Quercus* log. IX 1967; X 1968; VIII 1996.

Enerthenema papillatum (Pers.) Rostaf. – on unidentified mouldering wood, and on *Quercus* wood. IX 1967; VIII 1996.

Lamproderma violaceum Rost. – on bark and wood of a deciduous tree. X 1968. Rare species, reported from the Białowieża Primeval Forest (Krzemieniewska 1960), and from the vicinity of Książ in Lower Silesia (Firich 1962). Recently not found.

Stemonitis axifera (Bull.) Macbr. – on mouldering wood of deciduous trees (*Quercus, Fagus*), and on trunks covered with bryophytes. IX 1967; X 1968; VIII 1996; VIII 1998 (Fig. 5).

S. flavogenita E. Jahn – single specimen on mouldering wood of *Tilia*. VII 1998.

S. fusca Roth. – on mouldering wood of various trees (*Quercus, Fagus, Carpinus, Betula, Picea*), on trunks overgrown with bryophytes, and on litter. IX 1967; X 1968; VIII 1996; X 1997; VII 1998; IX 1999; VIII, IX, X 2001. One of the most common species in the reserve.

S. smithii Macbr. – single occurrence on highly decayed wood of *Quercus*. VIII 2001.

Stemonitopsis typhina var. *typhina* (F. H. Wigg.) Nann.-Brem. – on mouldered wood of *Fagus, Carpinus, Betula*, on trunks overgrown with bryophytes. IX 1967; X 1968; X 1997; VIII 1998; VIII, X 2001.

CHARACTERISTICS OF THE MYXOMYCETE BIOTA

Quantitative analysis

Changes in the myxomycete biota of the reserve that occured during the last 30 years are discussed in this section. Some comments on ecology of this interesting gro-

up are also presented. First investigations were carried out during two months (i. e. September and October of 1967 and 1968) and 34 myxomycete species were collected then (Stojanowska 1974). Further observations were made during five growing seasons of the years 1996-2001 (there are no data for the year 2000) and 47 species have been identified. During both sampling periods, in all forest communities of the reserve, 52 myxomycete taxa have been stated. Members of the families: *Physaraceae* (13 species), *Arcyriaceae* (12), *Trichiaceae* (10), and *Stemonitidaceae* (9) prevail among them. Five species represent families: *Enteridiaceae* and *Didymiaceae*, three – *Cribrariaceae*, and one – *Ceratiomyxaceae*. Accordingly to the new systematics (Neubert et al. 1993-2000) some families distinguished previously by Krzemieniewska (1960) are not valid any more. These are: *Reticulariaceae, Lycogalaceae, Tubiferaceae, Perichaenaceae, Didermaceae* and *Lamprodermaceae*. On the other hand, new genera have been distiguished and that is why *Hemitrichia vesparium* is transferred into the genus *Metatrichia*, and *Comatricha typhoides* into *Stemonitopsis*. The myxomycete flora of the investigated area is conspicuous by domination of species of the following genera: *Arcyria* (9 species), *Trichia* (8), *Physarum* (7), *Stemonitis* (4). Three species represent the genera: *Cribraria, Lycogala, Diderma* and *Fuligo*. More than half of the genera found are represented by two or one species only. During the earliest investigations members of the genera: *Fuligo, Craterium, Diachea, Diderma, Brefeldia* and *Tubifera* were not found, while during the recent ones the presence of the genera: *Badhamia, Dictydiaethalium, Didymium* and *Lamproderma* was not recorded. Despite of searching 12 from among previously found myxomycete species were not stated in the field recently. These are: *Badhamia panicea, Cribraria vulgaris, Dictydiaethalium plumbeum, Didymium iridis, Lamproderma violaceum, Perichaena depressa, Physarum flavicomum, P. pusillum, P. viride* var. *aurantium, Trichia affinis, T. contorta* and *T. botrytis* (Table 1).

However, recent investigations enriched the list of myxomycetes with 25 new species. The following 15 occurred in one season only: *Arcyria major, A. oerstedtii, A. stipata, Brefeldia maxima, Craterium aureum, Cribraria piriformis, Diderma deplanatum, D. effusum, Fuligo muscorum, Lycogala conicum, L. exiguum, Perichaena corticalis, Physarum cinereum, Stemonitis flavogenita* and *S. smithii*. The remaining 10, excluding *Diderma floriforme*, are cosmopolitic species found in the reserve more frequently: *Fuligo septica, F. leviderma, Tubifera ferruginosa, Trichia favoginea, Physarum leucophaeum, P. viride, Cribraria rufa, Craterium leucocephalum* and *Diachea leucopodia*. The species indicated in the Red List (Stojanowska and Drozdowicz 1992) belong to the species rare not only in the reserve but also in Poland: *Physarum flavicomum, P. pusillum, Diderma effusum, Craterium aureum, Brefeldia maxima, Arcyria stipata, A. major, Fuligo muscorum, Diderma deplanatum* and *D. floriforme*. Attention should be paid to the last four species. Modern systematics treats *Arcyria major* as an independent species. Krzemieniewska (1960) describes it as a variety of *Arcyria insignis* and as such it was included into the Red List, variety not indicated. The species is new to Silesia. Krzemieniewska (1960) reports it from the Masurian Lakes only, and until now its occurrence in Poland was not confirmed. Another new species to Silesia is also *Fuligo muscorum* reported in Poland from four localities (Krzemieniewska 1960) and found in 2001 in the Karkonosze Mts. by Stojanowska. *Diderma deplanatum* is the species known in Poland only from Silesia. First loca-

lity is given by Schroeter (1889) from the vicinity of Brynica in the Opole Province. Also in the Opole Province, in Biała Prudnicka, the species was found in 1970 on dry potato stems (Stojanowska 2000) together with *Didymium iridis*. *Diderma floriforme* – a species new not only to Silesia but also to Poland, is also of special interest. Komorowska (1978) in her analysis of the myxomycete flora of the Carpathians emphasizes that localities reported by Krzemieniewska (1960) from the Carpathians and the Carpathians' Piedmont are now outside Poland. In the Herbarium of Natural Museum of Wrocław University there are specimens of *Diderma floriforme* collected in the year 2000 in Henryków (Lower Silesia) (Weretelnik, not published), and one specimen found in Oborniki Śląskie (near Wrocław) in the year 1999, during students' field practice.

Table 1
The species composition of *Myxomycetes* in particular years

Myxomycete taxa	Years of collection						
	1967	1968	1996	1997	1998	1999	2001
Metatrichia vesparium	+	+	+	+	+	+	+
Stemonitis fusca	+	+	+	+	+	+	+
Trichia varia	+	+	+	+	+	+	+
T. persimilis	+	+	+	+	+	+	+
T. scabra	+	+	.	+	+	+	+
Physarum nutans	+	+	+	.	.	+	+
Stemonitopsis typhina	+	+	.	+	+	.	+
Arcyria obvelata	+	+	.	+	+	.	+
A. incarnata	+	.	+	.	+	+	+
A. cinerea	+	.	+	.	+	+	+
Hemitrichia clavata	+	.	+	+	+	.	+
Arcyria denudata	+	.	.	+	+	+	+
Lycogala epidendrum	.	+	.	+	+	+	+
Fuligo septica	.	.	+	+	+	+	+
Stemonitis axifera	+	+	+	.	+	.	.
Ceratiomyxa fruticulosa	+	.	+	.	+	.	+
Comatricha nigra	+	+	+	.	.	.	.
Arcyria pomiformis	+	.	+	.	+	.	.
Enteridium lycoperdon	.	+	+	+	.	.	.
Cribraria rufa	.	.	+	+	.	.	+
Physarum leucophaeum	.	.	+	.	+	+	.
Diachea leucopodia	.	.	+	.	+	.	+
Physarum viride	.	.	.	.	+	+	+
Enerthenema papillatum	+	.	+	.	.	.	.
Trichia decipiens var. *olivacea*	.	+	.	.	.	+	.
Hemitrichia serpula	.	+	.	.	.	.	+
Arcyria ferruginea	.	+	.	.	.	.	+
Craterium leucocephalum	.	.	+	.	.	+	.

Tab. 1 cont.

Trichia favoginea	.	.	+	.	.	.	+
Fuligo leviderma	.	.	.	+	.	.	+
Diderma floriforme	.	.	.	.	+	+	.
Tubifera ferruginosa	.	.	.	.	+	.	+
Physarum viride var. *auran-tium*	+	.	.	.	.	.	.
Perichaena depressa	+	.	.	.	.	.	.
Badhamia panicea	.	+	.	.	.	.	.
Cribraria vulgaris	.	+	.	.	.	.	.
Dictydiaethalium plumbeum	.	+	.	.	.	.	.
Didymium iridis	.	+	.	.	.	.	.
Lamproderma violaceum	.	+	.	.	.	.	.
Physarum flavicomum	.	+	.	.	.	.	.
P. pusillum	.	+	.	.	.	.	.
Trichia affinis	.	+	.	.	.	.	.
T. botrytis	.	+	.	.	.	.	.
T. contorta	.	+	.	.	.	.	.
Brefeldia maxima	.	.	+	.	.	.	.
Craterium aureum	.	.	+	.	.	.	.
Diderma deplanatum	.	.	+	.	.	.	.
D. effusum	.	.	+	.	.	.	.
Lycogala exiguum	.	.	+	.	.	.	.
Arcyria oerstedtii	.	.	.	+	.	.	.
Perichaena corticalis	.	.	.	+	.	.	.
Fuligo muscorum	.	.	.	.	+	.	.
Physarum cinereum	.	.	.	.	+	.	.
Stemonitis flavogenita	.	.	.	.	+	.	.
Arcyria major	.	.	.	.	.	.	+
A. stipata	.	.	.	.	.	.	+
Cribraria piriformis	.	.	.	.	.	.	+
Lycogala conicum	.	.	.	.	.	.	+
Stemonitis smithii	.	.	.	.	.	.	+
Number of taxa	19	25	25	16	24	16	28

The greatest number of myxomycete species was collected in 2001 – 28 species. 24-25 species were found in 1968, 1996 and 1998. In the remaining years the numbers of species found were lower than 20.

ECOLOGICAL ANALYSIS

Location of the reserve in the Odra valley, presence of numerous ponds, mild climate and variety of plant communities create good ecological conditions for the development of myxomycetes. The full developmental cycle is conditioned by the proper temperature, humidity and availability of decaying plant material. Due to abundance of various woody material (logs, stumps, fallen twigs) and thick layer of

litter, the reserve offered rare opportunity of research of myxomycetes. Field observations confirm the hitherto published data that the greatest numbers of myxomycete species occur on decaying wood of broad-leaved trees. The greatest number of species was found on *Quercus* wood – 27 (Table 2).

Table 2
The occurrence of *Myxomycetes* on wood of various trees

Myxomycete taxa	Trees						
	Quercus	*Betula*	*Fagus*	*Tilia*	*Carpinus*	*Aesculus*	*Picea*
Trichia varia	+	+	+	+	+	+	-
Metatrichia vesparium	+	+	+	+	-	+	-
Stemonitis fusca	+	+	+	-	+	-	+
Trichia persimilis	+	+	+	-	+	-	-
Lycogala epidendrum	+	+	+	+	-	-	-
Trichia scabra	+	+	+	-	-	+	-
Arcyria cinerea	+	-	-	+	-	-	+
Hemitrichia clavata	-	+	+	-	+	+	-
Ceratiomyxa fruticulosa	+	+	-	+	-	-	-
Arcyria obvelata	+	-	-	-	+	-	+
Fuligo septica	+	-	-	+	-	-	+
Enteridium lycoperdon	+	+	-	+	-	-	-
Arcyria incarnata	-	+	-	+	+	-	-
Physarum nutans	-	+	-	+	+	-	-
Stemonitopsis typhina	-	+	+	-	+	-	-
Arcyria denudata	-	-	+	+	+	-	-
A. oerstedtii	+	-	+	-	-	-	-
Stemonitis axifera	+	-	+	-	-	-	-
Arcyria pomiformis	+	-	-	+	-	-	-
Hemitrichia serpula	+	-	-	-	+	-	-
Physarum viride	+	-	-	-	+	-	-
Cribraria rufa	+	+	-	-	-	-	-
Fuligo leviderma	-	+	+	-	-	-	-
Trichia favoginea	-	+	+	-	-	-	-
T. affinis	-	-	-	-	+	-	-
Stemonitis flavogenita	-	-	-	+	-	-	-
Badhamia panicea	-	-	+	-	-	-	-
Dictydiaethalium plumbeum	-	-	+	-	-	-	-
Physarum cinereum	-	-	+	-	-	-	-
Arcyria major	-	+	-	-	-	-	-
A. stipata	-	+	-	-	-	-	-
Lycogala conicum	-	+	-	-	-	-	-
Arcyria ferruginea	+	-	-	-	-	-	-
Comatricha nigra	+	-	-	-	-	-	-
Cribraria piriformis	+	-	-	-	-	-	-
Diderma floriforme	+	-	-	-	-	-	-

Tab. 2 cont.

Enerthenema papillatum	+	-	-	-	-	-	-
Physarum leucophaeum	+	-	-	-	-	-	-
P. viride var. *aurantium*	+	-	-	-	-	-	-
Stemonitis smithii	+	-	-	-	-	-	-
Trichia decipiens var. *olivacea*	+	-	-	-	-	-	-
Tubifera ferruginosa	+	-	-	-	-	-	-
Number of taxa	27	18	16	12	12	4	4

Ten of them occured exlusively on this substrate – the substrate preferred by *Diderma floriforme* (Neubert et al. 1995), and two were also found on wood overgrown with mosses. On decaying wood of *Betula* 18 species were found but only *Arcyria major* and *A. stipitata* are restricted to this substrate. On *Fagus* 16 species occured and *Badhamia panicea, Dictydiaethalium plumbeum* and *Physarum cinereum* were not found on other type of wood. 12 species were found on each: *Tilia* and *Carpinus*, 4 species on a log of *Aesculus hippocastanum*, single species were found on a log of *Fraxinus excelsior* (*Cribraria rufa*) and *Sorbus aucuparia* (*Fuligo septica*). Within the reserve there is a small stand of artificially introduced common spruce. Only 3 myxomycete species (*Stemonitis fusca, Arcyria obvelata, A. cinerea*) were observed on decaying wood of *Picea* during the first periode of observations. Later, another species (*Fuligo septica*) was found. The total number of myxomycete species found on wood of broad-leaved trees is 48. Among them *Lycogala exiguum, Lamproderma violaceum, Didymium iridis, Trichia contorta* and *Physarum pusillum* were found on wood of unidentified tree species, while *Trichia botrytis* and *Cribraria vulgaris* occured on log overgrown with bryophytes.

Myxomycetes occur not only on logs or trunks, where the humidity is high. Sometimes their plasmodia move on the substrate vertically to a conspicuous hight, or wind transported spores are deposited there and the life cycle starts high above the ground level. In autumn of 1968 on a dead *Tilia* trunk, few large fruiting bodies of *Enteridium lycoperdon*, together with *Arcyria obvelata*, were found 2 meters above the ground level. During the second investigative period *Fuligo septica* (on a trunk of a living *Quercus*), and *Fuligo leviderma* (on *Betula*) were collected on a similar hight.

In the reserve, on some logs or trunks a mosaic of jointly growing species can be found. During the first sampling period, on a *Quercus* log, cohabitation of the following species was recorded: *Hemitrichia serpula, Lycogala epidendrum, Trichia persimilis, T. scabra* and *T. varia*. *Stemonitis axifera, Arcyria cinerea* and *Physarum viride* var. *aurantium* occured together on another one. Such a taxonomic composition was never found again. On a log overgrown with bryophytes the following species were collected: *Arcyria ferruginea, A. pomiformis, Cribraria vulgaris, Stemonitis axifera, Trichia botrytis, T. scabra, T. persimilis* and *T. varia*. On the same substrate, in the second sampling period, similar, though sligtly poorer set of species was found – *Metatrichia vesparium, Hemitrichia clavata, Trichia scabra, T. persimilis* and *T. varia*. *Badhamia panicea* and *Dictydiaethalium plumbeum* found on a *Fagus* trunk during the first periode were never collected in the reserve again. However, cohabitation of myxomycete species was stated many times: on *Fagus* wood, e.g. *Arcyria denudata, Metatrichia vesparium, Stemonitopsis typhina, Stemonitis axifera, Trichia scabra, T. persimilis, T. varia*, on *Betula* – *Hemitrichia clavata, Trichia scabra, T. persimilis, T. varia*, on

a *Carpinus* log – *Arcyria denudata* and *Physarum nutans*, and on an *Aesculus* log – *Metatrichia vesparium, Trichia varia, T. scabra* and *Hemitrichia clavata*. From the above one can see that cohabiting species are often the same and are not associated with a particular tree species or type of substrate (multi-substrate species) and as a rule they are cosmopolitic species.

Forest litter is a special type of substrate for myxomycetes. It is diversified, composed of – in the lowermost layer – semi-decayed organic debries, covered with mouldering fallen leaves, with pieces of bark, branches and twigs on the surface. Myxomycetes, together with other organisms, play an important role in decomposition of forest litter. In the litter, as well as in the upper layer of humus myxomycetes are present as spores, sclerotia, plasmodia, small sporangia or large fruiting bodies. Stojanowska (1983) presented a list of 50 myxomycete species inhabiting forest litter. Almost half of them are multi-substrate species occurring most frequently on rotting wood. Such species were found on fallen branches; in the reserve to this group belong: *Trichia persimilis, T. decipiens* var. *olivacea, Arcyria cinerea, A. incarnata, A. pomiformis, Physarum nutans, P. leucophaeum* and *P. viride*. In total, 15 myxomycete species were found on fallen twigs and *Comatricha nigra, Physarum flavicomum, Perichaena depressa* and *P. corticalis* seem to prefer this substrate. The last two species inhabit bark of twigs. Mouldering leaves create the main component of litter. In its uppermost layer leaves lay loosely and are mixed with small twigs. Here occur: *Diachea leucopodia, Craterium aureum, C. leucocephalum* and *Diderma deplanatum*. Myxomycetes inhabiting the uppermost layer of forest litter can "creep" onto mosses or herbaceous plants growing nearby and sporulate there. On stems of herbaceous plants *Diachea leucopodia* and *Diderma effusum* were collected, while *Fuligo muscorum* on mosses. In somewhat open space, on a layer of bowed down leaves of grasses, mixed with fallen leaves of trees, a huge (up to 40 cm) plasmodium of *Brefeldia maxima* was found. It was young, with mature sporangia only on the rim. The species is rare in Poland, first reported from Lower Silesia by Schroeter (1889). The other finding of this species is reported by Krzemieniewska (1960) from northeastern Poland (the former Białystok voivodship). Since then it has not been collected. It is a new species to Silesia.

In total, in the "Łężczok" reserve 18 taxa of myxomecetes were found on all components of forest litter. Among them members of *Physarales* prevail. It is interesting that species like *Leocarpus fragilis* and members of the genus *Didymium*, frequent on such substrates in other investigated areas (Stojanowska 1983) are lacking here.

It is widely assumed that the quantitative and qualitative composition of the myxomycete biota depends not only on substrate but also on specific, microclimatic conditions created by a given plant community (Table 3). Our ecolgical analysis did not show any dependence of the occurrence of slime moulds on the type of plant community. It showed, however, that the occurrence of myxomecetes depended on the type of substrate. What is more, in spite of earlier data, the greatest number of myxomycete taxa was found not on the wood of *Fagus*, but on that of *Quercus*. Fruiting season of myxomycetes starts in lowlands in spring, on the turn of May and June but the number of species occurring at that time is low (Stojanowska 1980, 1983a). In the "Łężczok" reserve first observations were made as late as in July. Only 14 species were collected. Cosmopolitic species dominated, occurring throughout the growing

season, i.e. for four or three months. Table 3 shows that the greates number of myxomycetes occured in August and October, and somewhat less in September.

Table 3
The occurrence of *Myxomycetes* in particular months

Myxomycete taxa	Months			
	VII	VIII	IX	X
Fuligo septica	+	+	+	+
Stemonitis fusca	+	+	+	+
Arcyria denudata	+	+	+	+
Lycogala epidendrum	+	+	+	+
Ceratiomyxa fructiculosa	+	+	+	+
Metatrichia vesparium		+	+	+
Hemitrichia clavata		+	+	+
Arcyria obvelata		+	+	+
Physarum nutans		+	+	+
Stemonitopsis typhina		+	+	+
Stemonitis axifera		+	+	+
Trichia varia		+	+	+
T. persimilis		+	+	+
T. scabra		+	+	+
Comatricha nigra		+	+	+
Arcyria cinerea	+	+	+	
A. pomiformis	+	+	+	
A. incarnata	+	+	+	
Physarum leucophaeum	+	+	+	
P. viride	+	+	+	
Diderma floriforme	+		+	
Fuligo muscorum	+	+		
Tubifera ferruginosa	+	+		
Stemonitis flavogenita	+			
Enerthenema papillatum		+	+	
Trichia favoginea		+	+	
Craterium leucocephalum		+	+	
Enteridium lycoperdon		+		+
Cribraria rufa		+		+
Hemitrichia serpula		+		+
Trichia decipiens var. *olivacea*			+	+
Diachea leucopodia		+		
Arcyria major		+		
Stemonitis smithii		+		
Cribraria piriformis		+		
Diderma effusum		+		
D. deplanatum		+		

Tab. 3 cont.

Craterium aureum		+		
Lycogala exiguum		+		
Brefeldia maxima		+		
Physarum cinereum		+		
P. viride var. *aurantium*			+	
Perichaena depressa			+	
Lycogala conicum			+	
Arcyria ferruginea				+
A. oerstedtii				+
A. stipata				+
Badhamia panicea				+
Cribraria vulgaris				+
Dictydiaethalium plumbeum				+
Didymium iridis				+
Fuligo leviderma				+
Perichaena corticalis				+
Physarum flavicomum				+
P. pusillum				+
Lamproderma violaceum				+
Trichia affinis				+
T. botrytis				+
T. contorta				+
Number of taxa	14	38	28	34

It is supposed that the decrease in the number of myxomycetes in September depended on climatic conditions, i.e. temperature and humidity. It is not easy to ascertain the frequency of occurrence of myxomycetes in particular months bacause in the reserve 60 % of species appeares in one or two months only. Members of *Arcyriaceae, Stemonitaceae* or *Physaraceae,* occur with almost identical frequency throughout the growing season and only members of *Trichiaceae* start to appeare at the end of August and become abundant in September and October. However, the greatest number of myxomycete taxa found in the last year of investigations (i.e. 2001) suggests that the span of sampling period can be important. Only in 2001 slime moulds were collected through three consecutive months while earlier searchings were limited to one or two months.

The taxa found 30 years ago, and not recorded recently, can hardly be treated as extinct in the reserve. Huge and diversified area of the reserve creates so many possible habitats that the "lost" species could simply stayed unnoticed. In general, the flora of *Myxomycetes* of the "Łężczok" reserve increased in number. Our data and other observations (Halama and Panek 2000) indicate that during the last decades ecological conditions in the reserve remained stable and favourable to some groups of organisms, at least. It is necessary to continue investigations of this unique and valuable Silesian nature sanctuary (Fig. 14).

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Zmiany w biocie śluzowców rezerwatu "Łężczok" koło Raciborza

Streszczenie

Rezerwat leśno-stawowy "Łężczok" leży w województwie śląskim, ok. 5 km na wschód od Raciborza. Powierzchnia rezerwatu wynosi 408 ha, z tego na lasy przypada 136 ha. W zbiorowiskach leśnych rezerwatu, w dwóch okresach, przeprowadzono obserwacje nad występowaniem śluzowców. Pierwszy okres to wrzesień 1967 i październik 1968 roku. W celu ustalenia zmian, jakie zaszły w składzie flory śluzowców w ciągu 30 lat, badania powtórzono w pięciu niepełnych sezonach wegetacyjnych w latach 1996-2001 (brak danych z roku 2000). W pierwszym okresie stwierdzono 34 gatunki, w drugim zebrano 47 taksonów. W sumie, śluzowce rezerwatu liczą 59 taksonów. Wśród znalezionych śluzowców przeważają przedstawiciele rodzin: *Physaraceae* (13 gatunków), *Arcyriaceae* (12), *Trichiaceae* (10), *Stemonitidaceae* (9); po 5 gatunków reprezentuje rodzinę *Enteridiaceae* i *Didymiaceae*, rodzinę *Cribrariaceae* 3, zaś *Ceratiomyxaceae* 1 gatunek. Śluzowce badanego terenu charakteryzują się dominacją gatunków należących do niektórych rodzajów jak: *Arcyria* (9), *Trichia* (8), *Physarum* (7), *Stemonitis* (4). Rodzaje: *Cribraria, Diderma, Fuligo* i *Lycogala* są reprezentowane przez 3 gatunki, przeszło połowa rodzajów jest dwu- lub jednogatunkowa. W pierwszym okresie badań nie notowano przedstawicieli rodzajów: *Craterium, Brefeldia, Diachea, Diderma, Fuligo* i *Tubifera*. W drugim nie potwierdzono obecności rodzajów: *Badhamia, Didymium, Dictydiaethalium* i *Lamproderma*. Pomimo skrzętnych poszukiwań, z listy uprzednio podanych śluzowców nie potwierdzono występowania w terenie 12 gatunków: *Badhamia panicea, Cribraria vulgaris, Dictydiaethalium plumbeum, Didymium iridis, Lamproderma violaceum, Perichaena depressa, Physarum flavicomum, P. viride* var. *aurantium, Trichia affinis, T. contorta* i *T. botrytis*. Natomiast badania ostatniego okresu wzbogaciły listę śluzowców o 25 nowych gatunków, wśród nich 15 występowało tylko w jednym sezonie wegetacyjnym. 22 gatunki, przeważnie kosmopolityczne, były wspólne dla obu okresów badań. Do rzadkich śluzowców nie tylko w rezerwacie, ale i na terenie Polski, umieszczonych na czerwonej liście, należą: *Diderma floriforme* – gatunek nowy dla Polski, podawany z Karpat i Podkarpacia (Krzemieniewska 1960), lecz z terenów leżących obecnie poza granicami Polski (Komorowska 1978), *Fuligo muscorum* – gatunek nowy dla Śląska, znaleziony przez Stojanowską w roku 2001 także w Karkonoszach, *Arcyria major* nowy gatunek dla Śląska, podawany pod synonimem *Arcyria insignis* var. *major* (Krzemieniewska 1960) tylko z Pojezierza Mazurskiego. Do grupy gatunków rzadkich należą także: *Arcyria stipata, Brefeldia maxima, Craterium aureum, Diderma deplanatum, D. effusum, Physarum flavicomum* i *P. pusillum*. Najwięcej śluzowców zebrano w sezonie wegetacyjnym 2001 roku (28 gatunków), nieco mniej w 1968 (25), 1996 (25) i 1998 (24), zaś w pozostałych latach stwierdzono poniżej 20 gatunków.

Przeprowadzona analiza ekologiczna nie pozwala na wykazanie zależności występowania śluzowców od rodzaju zbiorowiska roślinnego. Wskazuje jednak na zależność ich występowania od rodzaju podłoża. Potwierdzono dotychczasowe wiadomości, że najwięcej gatunków występuje na butwiejącym drewnie drzew liściastych. Do tej pory przeważało przekonanie, że najodpowiedniejsze siedlisko dla śluzowców stanowi butwiejące drewno buka (m.in. Stojanowska 1980, 1983), jednak w rezerwacie "Łężczok" największą liczbę śluzowców notowano na drewnie dębu, t.j. 27 gatunków a na buku tylko 16. Specyficznym podłożem dla rozwoju śluzowców jest ściółka leśna, której grube warstwy zalegają na terenie rezerwatu. Na butwiejących liściach zebrano zarodnie: *Diachea leucopodia, Craterium aureum, C. leucocephalum, Diderma deplanatum*. Na wznoszących się ponad ściółkę mchach i roślinach zielnych występowały: *Diachea leucopodia, Diderma effusum, Fuligo muscorum* i *Brefeldia maxima*, zaś na gałązkach leżących na ziemi zanotowano 15 gatunków. Interesującym jest fakt, że na terenie rezerwatu "Łężczok" na ściółce nie stwierdzono *Leocarpus fragilis* – gatunku bardzo pospolitego na różnych składnikach ściółki w innych terenach badań (Stojanowska 1983).