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Myxomycetes of the nature reserve near Wałbrzych (SW Poland) Part II. Dependence on the substrate and seasonality

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Results confirm domination of the occurrence of slime moulds on decaying wood of *Fagus* (33 taxa), as well as on *Tilia* (31). The list of species found on wood of *Acer pseudoplatanus* was extended up to 18. In such a specific microhabitat as litter 33 taxa were found, and among them abundant occurrence of *Diachea leucopodia* and *Diderma testaceum* was conspicuous.

Dependence of the occurrence of myxomycetes on climatic conditions is manifested by various periods of "fructification" of particular species. August and September were the most favourable months (49 taxa each) while July was the worst one (30 taxa). Slime moulds inhabiting litter had their maximum from June to August.

Key words: myxomycetes, microhabitats, cohabitation, seasonality, nature reserve

DEPENDENCE OF THE OCCURRENCE OF MYXOMYCETES ON SUBSTRATUM

The study area is conspicuous by its diversified relief. The valleys of both rivers, the Pełcznica and the Szczawnik, are deep, with narrow bottoms and occasional very steep, almost vertical, inaccessible slopes, overgrown with a multispecies forest. The soil is shallow, poorly developed, frequently causing fallen trees during rain-storms and floods (twice in the sampling season).

Wood of stumps and logs at various stages of decomposition is known to be the main substrate for the development of myxomycetes in forest communities. The diversity of tree species of forest communities to some degree influences the taxonomic range of slime moulds occurring in them (Tab. 1). Observations conducted in the valleys of both rivers and completed in 2002 greatly contribute to the knowledge on the relationship between the occurrence of slime moulds and the substrate type. A predominant occurrence of these organisms on decaying wood of deciduous trees

Table 1
Occurrence of Myxomycetes on various types of wood

N°	Name of the species	*Fagus*	*Tilia*	*Quercus*	*Acer pseud.*	*Betula*	*Acer platan.*	*Carpinus*	*Picea*	*Pinus*
1	*Ceratiomyxa fruticulosa*	+	+	+	+	+	+	+	+	+
2	*Hemitrichia clavata*	+	+	+	+	+	+	+	+	+
3	*Lycogala epidendrum*	+	+	+	+	+	+	+	+	+
4	*Trichia varia*	+	+	+	+	+	+	+	+	+
5	*Arcyria denudata*	+	+	+	+	+			+	+
6	*Trichia favoginea*	+	+	+	+	+			+	
7	*T. scabra*	+	+	+	+	+				+
8	*Arcyria obvelata*	+	+	+			+		+	+
9	*Physarum nutans*	+	+	+	+	+				
10	*Ceratiomyxa fruticulosa* var. *porioides*	+	+	+	+				+	
11	*Physarum leucophaeum*	+	+	+	+				+	
12	*Arcyria pomiformis*	+	+	+		+				+
13	*Metatrichia vesparium*	+	+	+	+					
14	*Arcyria incarnata*	+	+	+		+				
15	*Stemonitopsis typhina*	+	+		+			+		
16	*Stemonitis axifera*	+	+		+			+		
17	*Arcyria cinerea*	+	+	+					+	
18	*Stemonitis fusca*	+		+			+		+	
19	*Fuligo septica*	+		+					+	+
20	*Fuligo leviderma*	+	+		+					
21	*Metatrichia floriformis*	+	+						+	
22	*Trichia affinis*	+			+				+	
23	*Cribraria rufa*		+						+	+
24	*Stemonitopsis hyperopta*				+	+			+	
25	*Trichia decipiens* var. *olivacea*	+	+							
26	*T. persimilis*	+	+							
27	*Hemitrichia serpula*	+			+					
28	*Comatricha nigra*		+	+						
29	*Cribraria aurantiaca*		+						+	
30	*Cribraria cancellata*		+						+	
31	*Stemonitis smithii*		+						+	
32	*Cribraria persoonii*		+							+
33	*Tubifera ferruginosa*			+					+	
34	*Cribraria vulgaris*								+	+
35	*Licea variabilis*								+	+
36	*Lycogala exiguum*						+			
37	*Arcyria oerstedtii*	+								
38	*Comatricha pulchella*	+								
39	*Enerthenema papillatum*	+								

40	*Enteridium lycoperdon*	+								
41	*Lamproderma arcyrionema*	+								
42	*Lycogala conicum*	+								
43	*Physarum psittacinum*	+								
44	*Trichia decipiens*	+								
45	*Arcyria affinis*		+							
46	*Badhamia panicea*		+							
47	*Physarum flavicomum*		+							
48	*P. viride* var. *viride*		+							
49	*Symphotocarpus flaccidus*			+						
50	*Trichia botrytis*			+						
51	*Badhamia utricularis*				+					
52	*Arcyria ferruginea*								+	
53	*Cribraria argillacea*								+	
54	*Diderma deplanatum*								+	
55	*Physarum viride* var. *aurantium*								+	
56	*Amaurochaete atra*									+
57	*Physarum citrinum*									+
58	*P. bethelii*									+
Total number of taxa		33	31	21	18	11	7	6	26	16

is confirmed. English names of tree species used in this paper follow Stace (1991). *Fagus sylvatica* and *Tilia cordata* are the two main woody species that fed the greatest numbers of myxomycetes. All together, 50 taxa were found on decaying wood of deciduous trees; 33 taxa on the wood of *Fagus* and 31 on the wood of *Tilia*. Multisubstrate taxa, occurring also on different types of decaying hardwood and softwood, prevailed. The following 8 species were found on the wood of *Fagus*: *Arcyria oerstedtii, Comatricha pulchella, Enerthenema papillatum, Enteridium lycoperdon, Lamproderma arcyrionema, Lycogala conicum, Physarum psittacinum* and *Trichia decipiens*. However, these species were also found on other types of wood outside the study area (Stojanowska 1979). *Trichia decipiens* var. *olivacea* and *Trichia persimilis* were recorded on *Fagus* and *Tilia*, while *Hemitrichia serpula* and *Trichia affinis* - on *Fagus* and *Acer pseudoplatanus*. Firich (1962) mentions *Fagus* wood twice only: for *Badhamia utricularis* and *Trichia affinis*. She reports only 4 species: *Arcyria incarnata, Trichia scabra, T. varia* and *Lamproderma violaceum* from *Tilia* wood. The latter species was not found in the reserve in the present study. It should be added that among deciduous trees the wood of *Tilia* is a substrate for fruiting of some species of the genus *Cribraria*. The occurrence of *Cribraria* is usually strongly connected with the wood of coniferous trees (Stephenson 1983). Nevertheless, the following species were collected from the decaying wood of *Tilia* in the reserve: *Cribraria aurantiaca, C. persoonii, C. rufa* and *C. cancellata*. The latter species was also collected from the decaying wood of *Tilia* earlier in another place (Stojanowska 1972). The wood of *Quercus* is also frequently inhabited by slime moulds: 21 taxa were found on it, and *Symphytocarpus flaccidus* and *Trichia botrytis* occurred only on this substrate. *Arcyria pomiformis* occurred on *Quercus* more often than on other substrates. Firich found only three species on the wood of *Quercus*: *Trichia scabra, Physarum globuliferum* and *Physarum penetrale*. The two latter species were not recorded on this substrate

in the present study. Slime moulds also occur frequently on the wood of *Acer pseudoplatanus*: 18 species were found in the reserve. In the Sudetes (Stojanowska 1983b), only eight species have been collected from this substrate so far. During our field observations, only *Badhamia utricularis* was found exclusively on a sycamore tree. Firich (1962) does not indicate sycamore wood as a substrate available in the reserve. She mentions only the wood of Norway maple. The other species of deciduous trees in the reserve (*Betula pendula*, *Acer platanoides*, *Carpinus betulus, Alnus glutinosa, Populs tremula,* and introduced *Aesculus hippocastanum*) fed 17 species of slime moulds. Firich considers the wood of *Carpinus* as one of the most frequently inhabited substrates, and lists 8 species of slime moulds recorded on it. Only 6 species were found in the present study. Apart from deciduous trees, there are three species of conifers in the reserve: *Picea abies, Pinus sylvestris* and *Taxus baccata*. All together, 32 taxa of slime moulds were recorded on decaying wood of coniferous trees (while 50 on hardwood). The following 9 taxa were found exclusively on this type of substrate (Tab. 1): *Cribraria vulgaris, Licea variabilis* (on various substrates), on Norway spruce only – *Arcyria ferruginea, Cribraria argillacea, Diderma deplanatum, Physarum viride* var. *aurantium*, on Scots pine – *Amaurochaete atra, Physarum citrinum* and *Physarum bethelii*. No species were recorded on yews.

There are numerous microorganisms participating in the decomposition of organic matter. Slime moulds, together with fungi, are active at various stages of succession. In the reserve, they occur on healthy, fresh wood (*Comatricha nigra, Symphytocarpus flaccidus*), on slightly decomposed wood (the majority of slime moulds), or on heavily decomposed wood (for example *Cribraria rufa*). They also occur on wood overgrown with bryophytes (Fig. 1). Logs or stumps covered with bryophytes are conducive to the development of slime moulds, especially because of humidity. Such substrates are inhabited mostly by multisubstrate myxomycetes. We collected 27 taxa from this type of substrate. Apart from *Diderma radiatum, D. umbilicatum, Lepidoderma tigrinum, Badhamia panicea, Physarum gyrosum* and *Stemonitis pallida*, these taxa are given in Tab. 1. Some of them deserve attention: *Diderma deplanatum* occurs on decaying wood of Norway spruce and forms characteristic sporangia - annular, reniform, or semicircularly twisted – which enfold epiphytic bryophytes. *Lepidoderma tigrinum* occurs in both gorges on logs, and produces sporangia within dense, wet turfs of *Orthodicranum montanum*.

Stephenson (1983) includes *Lepidoderma tigrinum* in the group showing "a distinct preference for coniferous substrates." On the other hand, Shnittler and Novozhilov (1996) emphasise its preference for a "thick and wet liverwort and algae cover," on rocks. Thus, the absence of a coniferous substrate is obviously not a factor limiting the occurrence of this slime mould. Moreover, our observations confirm the findings by Shnittler and Novozhilov that the species produces sporocarps late in autumn, when thick bryophyte turfs offer good protection against low nocturnal temperatures.

Sporangia of *Badhamia panicea* occurred in a few circular patches on the surface of a fresh, fallen small-leaved lime whose cracked bark was densely covered with *Brachythecium rutabulum*. Firich reports 8 species of slime moulds developing on decaying wood overgrown with mosses.

COHABITATION

Fallen logs with large decayed areas, and sometimes even small stumps, are good substrates for a simultaneous occurrence of several species of slime moulds. 2-8 species creating various combinations can quite often be found in the same site. Slime moulds occurring repeatedly in one place belong, as a rule, to multisubstrate and cosmopolitan species: *Ceratiomyxa fruticulosa* (Fig. 2), *Lycogala epidendrum* (Fig. 3), *Arcyria cinerea, A. denudata, Hemitrichia clavata, Metatrichia vesparium, Stemonitis fusca, S. axifera* (Fig. 4), *Stemonitopsis typhina*, and species of *Trichia – T. favoginea, T. scabra* and *T. varia*. Mosaics of myxomycetes were most frequently found on beech logs partly overgrown with bryophytes, and on sycamore logs. As an example we describe two beech logs, situated in the opposite parts of the gorge of Pełcznica (Tab. 2), and a sycamore log in the gorge of Szczawnik.

On both beech logs (A and B), most of the slime moulds remain relatively the same. They are differentiated by singular occurrences of species such as: log A – *Lamproderma arcyrionema, Hemitrichia serpula, Metatrichia floriformis* and *Physarum nutans*; log B – *Arcyria incarnata, Comatricha pulchella, Physarum leucophaeum* and *Stemonitis fusca*. The list of cohabiting slime moulds is in fact much more extensive since we do not describe smaller mosaics, containing 2-4 species (Figs 5, 6).

Table 2

Mosaic growth of slime moulds on two (A and B) beech logs in the gorge of Pełcznica

Name of the species	VIII 2002		IX 2002		X 2002	
	Log A	Log B	Log A	Log B	Log A	Log B
Arcyria cinerea	a	a	a			
Stemonitopsis typhina	a	n		r		
Arcyria denudata	r		r			r
Trichia scabra	r	n	r	r	n	n
Ceratiomyxa fruticulosa	r		r	r		
Lycogala epidendrum	r			r		
Physarum nutans	n		r			
Lamproderma arcyrionema	a					
Comatricha pulchella		n				
Stemonitis fusca		n				
Arcyria incarnata				r		
Hemitrichia clavata			n	n	r	r
Trichia varia			r	r	n	n
H. serpula					r	
Physarum leucophaeum					r	
Metatrichia floriformis						r

Explanations: a – abundant, n – numerous, r – rare

In the gorge of Szczawnik, the following species were recorded on various parts of a sycamore log more than 10 m long, densely overgrown with bryophytes (Tab. 3).

Table 3
Mosaic growth of slime moulds on a sycamore log in the gorge of Szczawnik

Name of the species	VIII 2002	IX 2002	X 2002
Arcyria denudata	r		r
Hemitrichia clavata	n	n	
Lycogala epidendrum	r	r	r
Fuligo leviderma		r	
Metatrichia vesparium		n	
Trichia scabra		n	n
T. varia			n
Hemitrichia serpula			r

Explanations: a – abundant, n – numerous, r – rare

The last record of October 24 is of special interest. Except for *Lycogala epidendrum* growing in some distance, slime moulds created a mosaic of species occurring closely side by side on a relatively small surface of wood, lacking a bryophyte cover (Fig. 8). Sporangia of *Trichia varia* occur within a mesh of the plasmodiocarp of *Hemitrichia serpula*. The sets of slime moulds found on sycamores, though a little bit smaller, are similar to those cohabiting on beeches. Several cohabiting myxomycetes were found on other species of deciduous trees, for example *Hemitrichia clavata, Metatrichia floriformis, Physarum leucophaeum* and *Trichia scabra* on *Tilia*; *Lycogala epidendrum, Stemonitis axifera* and *Stemonitopsis typhina* on *Carpinus betulus*; *Arcyria denudata, Hemitrichia clavata, Stemonitopsis hyperopta* and *Trichia scabra* on *Betula pendula*; *Hemitrichia clavata, Metatrichia vesparium, Trichia favoginea* and *T. varia* on *Quercus*; *Physarum compressum, Fuligo leviderma* (Fig. 7) and *Trichia varia* on *Populus tremula*.

Decaying wood of coniferous trees also feeds cohabiting slime moulds. *Fuligo septica* and *Lycogala epidendrum* were recorded on wood on a stump of *Picea*, and *Cribraria vulgaris* occurred on bark in the gorge of Pełcznica in June. In July, *Trichia affinis, Lycogala epidendrum* and *Ceratiomyxa fruticulosa* were found on another stump, and in August the following were recorded on a log of *Picea* several meters long: *Ceratiomyxa fruticulosa* (not numerous), as well as *Cribraria vulgaris* and *C. argillacea*, occurring abundantly. *Arcyria denudata*, together with *Amaurochaete atra,* occurred on a trunk of *Pinus sylvestris* as early as in June; on the same trunk, in August, *Trichia scabra* was very numerous on wood while *Trichia varia* produced its sporangia in cracks of the bark. It should be emphasised, however, that slime moulds mostly occur singly on decaying wood of coniferous trees.

Quite a different composition of cohabiting slime moulds was found in the litter (Tab. 4). In the reserve, the litter occurs not only under trees but it is wind-blown into numerous depressions, rock bands, and into hollows made by wind-fallen trees, creating very specific habitats. Litter composition is not homogeneous; dry leaves prevail in one place while they are mixed with small fallen twigs in another. Yet, in some places, much bigger fallen twigs occur singly. Each of these components of the litter creates to some extent a separate microhabitat. Bigger twigs are inhabited by multisubstrate myxomycetes, i.e. those dominating on decaying wood: *Arcyria cinerea, A. incarnata, A. pomiformis, Trichia decipiens* var. *olivacea, T. ferruginea, T. scabra,* and other. In this group, 12 species were found, 4 of which occurred exclu-

Fig. 1. A log overgrown with bryophytes.

Fig. 2. *Ceratiomyxa fruticulosa.*

Fig. 3. *Lycogala epidendrum.*

Fig. 4. *Stemonitis axifera.*

Fig. 5. Cohabitation of *Physarum compressum* and *Trichia varia*.

Fig. 6. Cohabitation of *Metatrichia clavata* and *M. floriformis*.

Fig. 7. *Fuligo leviderma.*

Fig. 8. Cohabitation of *Trichia scabra, T. varia, Arcyria denudata* and *Hemitrichia serpula.*

Fig. 9. *Physarum cinereum.*

Fig. 10. *Diderma testaceum.*

Table 4
Occurrence of Myxomycetes on various compounds of litter

Taxa \ Substrate	Fallen twigs	Dry leavs	Bark	Herbaceous plants	Mosses	Wood remnants
Diderma spumarioides	+					
Perichaena corticalis	+					
P. depressa	+					
Physarum globuliferum	+					
Arcyria incarnata	+					+
A. pomiformis	+					+
Enteridium lycoperdon	+					+
Lamproderma arcyrionema	+					+
Physarum viride var. *viride*	+					+
Trichia favoginea	+					+
T. decipiens var. *olivacea*	+					+
T. scabra	+					+
Arcyria cinerea	+	+				+
Stemonitis fusca	+	+				+
Physarum leucophaeum	+	+	+			+
P. nutans	+	+	+			+
Diachea leucopodia	+	+	+	+	+	
Diderma testaceum	+	+		+	+	
Physarum cinereum	+	+		+		
Craterium minutum	+	+				
Didymium nigripes	+	+				
Comatricha pulchella var. *flexuosa*		+				
Craterium leucocephalum		+				
Diderma chondrioderma		+				
Diderma effusum		+				
Didymium melanospermum		+				
Physarum bivalve		+				
P. leucopus			+			
Trichia contorta			+			
P. virescens				+	+	
Didymium serpula				+		
Fuligo septica var. *rufa*				+		
Lamproderma columbium					+	
Total number	21	15	5	6	4	12

sively on fallen twigs: *Diderma spumarioides, Physarum leucopus, Perichaena depressa* and *P. corticalis*. The two latter species inhabit mainly fallen twigs of *Tilia*, and their sessile sporangia are characteristically plunged in the bark. That is why in various publications (Stojanowska 1983a), the occurrence of these species is reported in two ways: either on fallen twigs or on bark. Only 5 species were collected from pieces of fallen bark. Firich (1962) recorded 12 slime mould on bark, and they were mostly multisubstrate species.

The main components of the litter are decaying leaves accumulating in layers. Together with other organisms, slime moulds participate in their decomposition. Sporangia are found frequently in the upper, less compact layer. In the reserve, 16 taxa of myxomycetes were recorded. *Arcyria cinerea, Stemonitis fusca, Physarum leucophaeum* and *P. nutans* are mutlisubstrate species on dry leaves of beech, small-leaved lime, pedunculate oak, Norway maple and sycamore, while 12 species were associated with this microhabitat and formed characteristic conglomerations. *Physarum cinereum* is noteworthy in this group of slime moulds (Fig. 9). Its sporangia appeared abundantly in mid June on twigs and needles of a wind-fallen, small Norway spruce in the gorge of Szczawnik. No other species of myxomycetes were found in this place until the end of the vegetative season. In the gorge of Pełcznica, *Physarum cinereum* was recorded in June and August on dry leaves of deciduous trees and on herbaceous plants. The occurrence maximum of slime moulds in the litter was determined in the gorge of Pełcznica from the second half of June to August. The dominant and accompanying species could be distinguished. *Diachea leucopodia* belongs to the first group of dominant species. It occurred abundantly not only on decaying leaves but also on small twigs, bark (*Betula*), on herbaceous plants growing nearby, and on mosses. The accompanying species were: *Diderma effusum, Craterium minutum, Physarum bivalve, P. nutans, P. leucophaeum* and *Diderma testaceum*.

Diderma testaceum was the dominant species in the second group. It also occurred abundantly on dry leaves, fallen twigs, fruits (*Fagus, Tilia*), moss (*Mnium hornum*), herbaceous plants, and even on bare rock. *Diachea leucopodia, Didymium melanospermum, D. nigripes, Physarum bivalve* and *Craterium minutum* were accompanying species, in this case in smaller quantities.

Towards the end of summer and at the beginning of autumn, the number of taxa and the occurrence intensity of slime moulds in the litter decrease in the reserve. However, sporangia of taxa earlier not found start to appear singly: *Diderma chondrioderma, Comatricha pulchella* var. *fusca, Craterium leucocephalum*. Firich (1962) reports the following species from decaying leaves and small, fallen twigs: *Craterium aureum, C. minutum, Diachea leucopodia, Diderma effusum, Enerthenema papillatum* and *Physarum cinereum*. Other species mentioned by her are multisubstrate slime moulds. Table 2 also includes 6 species occurring on herbaceous plants and on mosses. These are mostly species already mentioned for other microhabitats where they occur abundantly (for example *Diachea leucopodia, Diderma testaceum, Physarum cinereum*).

In the gorge of Szczawnik, *Physarum virescens* was collected from a fern frond, mosses growing nearby, and from young stems of *Chamaenerion angustifolium* at the beginning of June. In the gorge of Pełcznica, *Didymium serpula* was found on a young leaf of *Rubus caesius* in the second half of June. Also in June, in a glade situated at the mouth of the gorge of Pełcznica, 3 aethalia of *Fuligo septica* var. *rufa*

were found on a dry grass and on herbaceous plants (taxon not included in Tab. 4). The plasmodium of litter-inhabiting slime moulds frequently moves and produces sporangia on mosses growing nearby, similarly to *Diderma testaceum* on *Mnium hornum*, mentioned above (Fig. 10). Sporangia of *Lamproderma columbinum* were recorded directly on mosses such as *Tetraphis pellucida* or *Dicranum scoparium*. Slime moulds occurred also on epixylous mosses: *Brachythecium rutabulum, B. salebrosum, Dicranum scoparium, Orthodicranum montanum*. Occasionally, *Dicranum scoparium* occurred at the base of a trunk or a stump, although it is not an epixylous species. In such cases, sporangia of myxomycetes were also found on this moss species.

DEPENDENCE OF THE OCCURRENCE OF SLIME MOULDS ON CLIMATIC FACTORS

Microclimatic conditions of the studied reserve greatly depend on the formation of the area. The deep valleys of both rivers – Pełcznica and Szczawnik – are protected by steep slopes from winds and intense insolation, and ground humidity is almost stable throughout the vegetative season. Temperature additionally influences the development of slime moulds. The climatic factors mentioned above were favourable for the occurrence of slime moulds in the vegetative season of 2002. The previous winter was mild, with a thin snow cover, spring was early and warm, and summer hot, with few but heavy rainfalls (floods occurred twice in both valleys).

The first phenological observations were carried out at the end of May. The number of recorded species was small. *Lycogala epidendrum* and *Arcyria denudata* were most numerous. In a few places only fructifications of *Tubifera ferruginosa*,

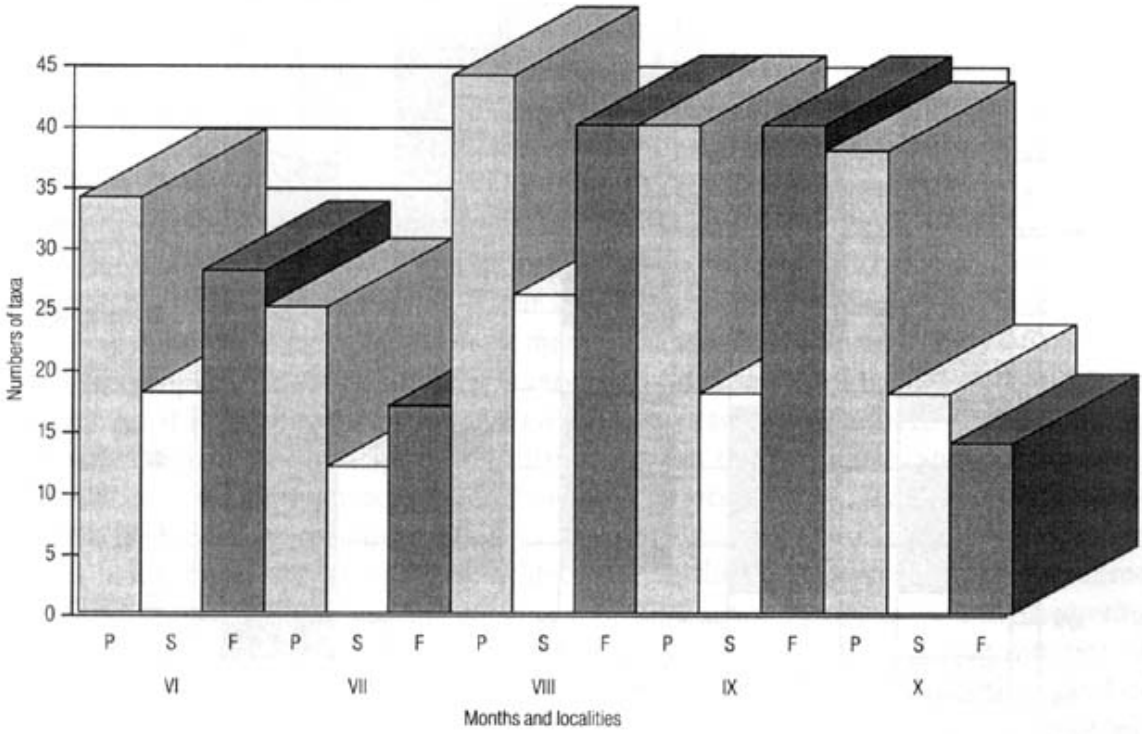

Fig. 11. Occurrence of slime moulds in gorges of Pełcznica and Szczawnik during months of the vegetative season of 2002 on the background of Firich's data.
P - Gorge of Pełcznica, S - Gorge of Szczawnik, F - Firich

Fuligo septica and *Ceratiomyxa fruticulosa* were found, while last year's specimens of *Trichia favoginea, T. persimilis, Metatrichia vesparium* and *M. floriformis* were noticed frequently. The situation changed after two weeks: the number of taxa increased and some of them occurred abundantly. In the first half of June, *Lycogala epidendrum, Ceratiomyxa fruticulosa* and *C. fruticulosa* var. *porioides* prevailed on decaying wood. In the second half of this month, *Stemonitis axifera, Arcyria cinerea* and *A. denudata* dominated. *Diachea leucopodia* and *Diderma testaceum* were the most numerous species in the litter. Altogether, 36 taxa were recorded in both gorges. The differences between the number of taxa occurring in both gorges during the vegetative season were conspicuous and difficult to explain (Fig. 11). In June, 34 taxa were recorded in the gorge of Pełcznica and only 18 in the gorge of Szczawnik. Firich (1962) reports 28 taxa collected in both gorges in June. Many taxa of myxomycetes were found in the reserve exclusively in June. These were: *Amaurochaete atra, Diderma spumarioides, Didymium serpula, Fuligo septica* var. *rufa, Physarum gyrosum. P. psittacinum, P. virescens* and *Trichia decipiens*. Firich (l. c) reports 11 such taxa: *Craterium minutum, Diderma effusum, Didymium squamulosum, Lycogala exiguum, Physarum bethelii, P. cinereum, P. citrinum, P. psittacinum, P. viride, Stemonitis splendens* and *Trichia decipiens* var. *olivacea* (Tab. 1 in the first part of this paper) (Stojanowska and Panek 2004). As for the number of taxa, the following families dominated in June: Physaraceae – 27.78 %, Stemonitidaceae – 22.22 % and Didymiaceae – 13.89 %. The participation of families in the myxomycete biota in consecutive months of the vegetative season is presented in Fig 12.

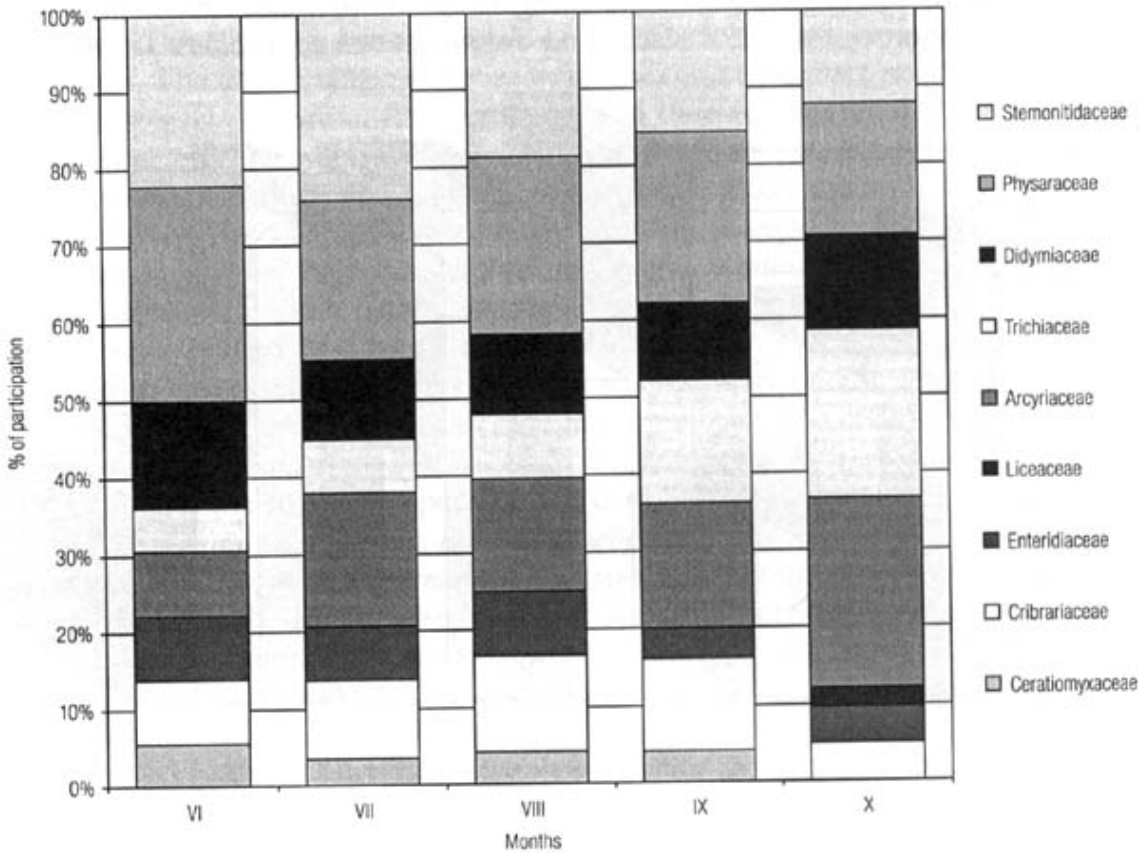

Fig. 12. Participation of myxomycete families in consecutive months of the vegetative season of 2002.

In July, the lowest numbers of myxomycete fructifications were observed. In both gorges, 30 taxa were found: 26 in the gorge of Pełcznica and 12 in the gorge of Szczawnik; 8 taxa occurred simultaneously in both gorges. *Lycogala exiguum,* found in the gorge of Szczawnik in June and July, was not recorded in the gorge of Pełcznica. We recorded the following taxa exclusively in the gorge of Pełcznica in July: *Physarum citrinum*, *Didymium squamulosum* and *Symphytocarpus flaccidus*. Firich also gives a small number of taxa for July, i.e. 17. In July, the participation of the family Stemonitidaceae increased to 24.14 %, and was the highest throughout the vegetative season. The participation of Physaraceae decreased to 20.7 % but the participation of Arcyriaceae increased to 17.24 %.

The summer was characterised by a sudden increase in the number of slime moulds, probably caused by a prolonged period of high temperature in the preceding months and intense rainfalls in July. In August and September, the greatest numbers of taxa were recorded – 49 (Pełcznica) and 46 (Szczawnik) (Fig. 11). In August, 44 taxa were recorded in the gorge of Pełcznica, and 26 in the gorge of Szczawnik. The following species were recorded exclusively in August: *Arcyria minuta, Comatricha pulchella, Cribraria microcarpa, Didymium nigripes, Physarum leucopus* and *P. viride* var. *aurantium*. Accordingly to Firich (1962), 40 taxa occurred in both gorges in August, and the following exclusively in this month: *Arcyria ferruginea, Comatricha pulchella, Cribraria vulgaris, Licea minima, L. pusilla* and *Oligonema nitens*. In August, the dominating families were: Physaraceae – 22.92 %, Stemonitidaceae – 18.75 % and Arcyriaceae – 14.58 %. The participation of the family Cribrariaceae – 12.5 % - is also considerable. As late as in August, sporangia of *Cribraria rufa* and *C. aurantiaca* were found, and these two species should be considered to be summer ones, as other species (*Cribraria argillacea, C. cancellata* and *C. vulgaris*) were recorded already in June. The participation of Trichiaceae increased in August (6.9 % in July, 8.33 % in August). Although first sporangia of *Trichia decipiens* were recorded in June, and in July *Trichia affinis, T. scabra* and *T. favoginea* occurred sporadically, a mass occurrence of Trichiaceae is recorded in August, September and October. Sporangia of the genus *Trichia* are quite persistent and, hidden in various nooks and corners of logs and stumps, can "survive" until spring months of next year. As regards abundance, *Trichia varia* and *Hemitrichia clavata,* prevailed at the end of August and the beginning of September. Their sporangia covered decaying wood of almost all deciduous and coniferous trees in masses. *Metatrichia vesparia* and *M. floriforme* were accompanying species. In September, 46 taxa occurred in both gorges: 40 in the gorge of Pełcznica, and 18 in the gorge of Szczawnik. Members of Physaraceae prevailed, while the participation of other families (Arcyriaceae, Stemonitidaceae, Trichiaceae) was almost equal, reaching slightly above 17%. The participation of Cribrariaceae (13.04%) and Didymiaceae (10.87%) was also important. On the other hand, there was a conspicuous decrease in the occurrence of common slime moulds - *Fuligo septica, Lycogala epidendrum, Ceratiomyxa fruticulosa* and *Stemonitis fusca*. No sporangia of *Stemonitis axifera* were recorded. Although the number of taxa found in the gorge of Szczawnik was considerably smaller – less than half of the number found in the gorge of Pełcznica – the following 6 taxa were recorded only there: *Lamproderma columbinum, Trichia contorta, Badhamia utricularis, Stemonitis fusca, Cribraria cancellata* and *Trichia decipiens* var. *olivacea*. In September, the following species were recorded exclusively in the gorge of Pełcznica: *Diderma*

chondrioderma, Physarum flavicomum, P. globuliferum, Craterium leucophaeum and *Arcyria oerstedtii*. The latter species occurred also in October. Firich's collection of September 1960 includes 40 species, and the following were recorded only in this month: *Badhamia utricularis, Craterium aureum, Enteridium lobatum, Physarum globuliferum* and *Trichia botrytis.*

October 2002 was unique in respect of myxomycetes occurrence. Differences between diurnal and nocturnal temperatures were considerable, and local humidity was slightly higher due to frequent fogs. In both gorges, 41 taxa were recorded: 38 in the gorge of Pełcznica and only 18 in the gorge of Szczawnik. It could be assumed that general factors influencing the development of slime moulds deteriorated in autumn. Nevertheless, new taxa, not recorded previously, were found in October. In both gorges, *Hemitrichia serpula, Lepidoderma tigrinum* and *Perichaena depressa* occurred; the following taxa were found exclusively in the gorge of Pełcznica: *Arcyria affinis, A. ferruginea, Diderma radiatum, D. umbilicatum, Licea variabilis, Perichaena corticalis* and *Trichia botrytis*. *Badhamia panicea* and *Diderma deplanatum* occurred solely in the gorge of Szczawnik. It should be emphasised that Firich collected only 14 species in October, including *Lamproderma violaceum*, which occurred only in this month while *Hemitrichia serpula*, mentioned above, is reported by her in August and September, and *Arcyria affinis* in September and October. October is characterised by a high participation of taxa of the families Arcyriaceae (24.38 %) and Trichiaceae (21.95 %). The latter family reached its seasonal maximum. The participation of taxa of Didymiaceae was relatively stable throughout the vegetative season and fluctuated between 10 and 13 %, while the number of species oscillated between 4 and 5.

Field observations came to an end in November because of the following reasons: 1 – lack of Firich's data, 2 – unfavourable climatic conditions, however not preventing the occurrence of some, late slime moulds, 3 – thick layer of fallen leaves covering not only logs and stumps but also slippery stones and rocks making field studies dangerous. A great occurrence diversity of some slime moulds can be noticed on the basis of the observations conducted throughout the vegetative season. Their occurrence depended on temperature, humidity and monthly precipitation. A chance factor is always important in field studies on slime moulds. Sudden changes of climatic conditions, such as droughts or heavy rainfalls when sporangia and even plasmodia can be destroyed, are some of the most important factors. Such changes took place in the reserve in mid June when all fructifications of *Ceratiomyxa fruticulosa* disappeared after a rain-storm, and again in August when sporangia of *Lamproderma arcyrionema* perished a few days after the species was found. The last species produced its fructifications in the open area, on decayed and very damp wood of *Fagus sylvatica*. Undoubtedly, the type of the preceding weather should be considered for field studies.

The author of photos – E. Panek

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Myxomycetes rezerwatu koło Wałbrzycha (SW Polska) Część II. Zależność od substratu i sezonowość

Streszczenie

Analiza ekologiczna potwierdziła częściowo dotychczasowe wiadomości o zależności występowania śluzowców od podłoża. Największą liczbę taksonów stwierdzono na butwiejącym drewnie drzew liściastych (50), a wśród nich – na buku 33, na lipie 31 (Tab. 1). Na lipie zebrano między innymi *Cribraria aurantiaca, C. cancellata* (Stojanowska 1972), *C. persoonii* i *C. rufa* choć na ogół występowanie gatunków z rodzaju *Cribraria* wiąże się z butwiejącym drewnem drzew iglastych. Została również poszerzona – do 18 – liczba gatunków występujących na jaworze (Stojanowska 1983b). Firich (1962) wymienia drewno grabu pośród najczęściej zasiedlanych przez śluzowce, notując na nim 8 gatunków.

Na butwiejącym drewnie drzew iglastych stwierdzono w sumie 32 gatunki Myxomycetes, bardzo często występujących obok siebie w różnych kombinacjach i tworzących w badanym rezerwacie mozaiki złożone z 2 – 8 gatunków.

Zupełnie inny skład gatunkowy śluzowców występujących obok siebie stwierdzono w ściółce leśnej. Główne nasilenie ich pojawów zanotowano w Wąwozie Pełcznicy od czerwca do sierpnia. W mikrosiedliskach, jakimi są suche liście stwierdzono 16 taksonów a dominowały wśród nich *Diachea leucopodia* i *Diderma testaceum*. Do tej grupy należą przeważnie śluzowce z rzędu Physarales, rodzaje: *Diderma, Craterium, Didymium* i *Physarum* (Tab. 2).

Zależność śluzowców od czynników klimatycznych przejawia się w różnym okresie zarodnikowania poszczególnych gatunków. Pierwsze obserwacje fenologiczne przeprowadzono już pod koniec maja. Stwierdzono wówczas tylko 5 gatunków, natomiast w czerwcu znaleziono aż 36 taksonów. Największą liczbę stwierdzono w sierpniu i wrześniu, kolejno 49 i 46 taksonów. Miesiącem najmniej korzystnym dla rozwoju śluzowców był lipiec (30 taksonów). Różne gatunki miały swoje maksima występowania w różnym okresie. W pierwszej połowie czerwca na butwiejącym drewnie masowo występowały *Ceratiomyxa fruticulosa* wraz z odmianą i *Lycogala epidendrum*. W drugiej połowie miesiąca *Stemonitis axifera, Arcyria denudata* oraz *A. cinerea*. W ciągu całego okresu badań występowały trudne do wyjaśnienia różnice w liczbach taksonów stwierdzanych w obu wąwozach, pomimo panujących tam podobnych warunków. Niektóre gatunki pojawiły się dopiero pod koniec sezonu wegetacyjnego m. in. *Lepidoderma tigrinum, Hemitrichia serpula, Diderma radiatum, D. deplanatum, Arcyria affinis* i *A. ferruginea*. Na wyniki badań może mieć wpływ pogoda poprzedzająca penetrację terenu, ponieważ ulewne deszcze niszczą zarodnie, zwłaszcza tych gatunków, które występują na powierzchni kłód i pniaków.