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# Fauna naroślinna w stawach nawożonych ściekami cukrowniczymi*

# Phytophilous fauna in ponds fertilized with sugar factory wastes

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Abstract — The work presents investigations carried out from April to September 1971 on the phytophilous fauna of ponds fertilized with beet-sugar factory wastes in the Gołysz near Cieszyn. The investigation covered 3 ponds, the settlement of the plants *Glyceria aquatica*, *Myriophyllum spicatum*, and *Elodea canadensis* by various species and groups of invertebrates being compared. It was found shown in what degree the settlement of plants by the fauna was influenced by the trophic conditions or by the species of plant.

The phytophilous fauna, its occurrence and role, are among those problems not yet fully presented in the literature. The first more comprehensive elaborations in this scope were published by Wundsch (1919) and Nordqvist (1925), while Wunder (1936) was chiefly interested in *Chironomidae* larve and investigated their distribution on various plant species. The role and importance of research on the fauna occurring on aquatic plants were stressed by Starmach (1954a, 1954b, 1956). Submersed plants, being the substratum and feeding grounds of the larvae of insects and other aquatic animals, greatly increase the productive are of the bottom. This area is enlarged by the surface of each individual plant. Hence in the last few years a growing interest is observed in the phytophilous fauna of ponds, lakes, dam reservoirs, and rivers (Ponyi 1957, Stube 1958, Gurzęda 1959, Karas-

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sowska, Mikulski 1960, Matlak 1961, 1963 a, 1963 b, Szumiec 1962, Macan 1965, Wolnomiejski, Dunajska 1966, Kuflikowski 1970, 1974, Kořinkova 1971, Markošova 1974, Soszka 1974, Zięba, Srokosz 1974, and others).

The aim of the present study was to investigate the settlement of aquatic plants by the phytophilous fauna in three ponds characterized by various trophic conditions to determine the dominance of particular animal groups, and the influence of plants and trophic conditions of a pond on its settlement by animal communities.

## The area and method of the investigation

The investigation on the phytophilous fauna was carried out in the ponds of the Experimental Station of the Polish Academy of Science at Gołysz (Cieszyn district), three ponds of the Mnich complex being included:

a) the accumulation pond Zimowy Wielki with an area of 8 ha and a mean depth of 1 m, filled with undiluted wastes from the Chybie sugar factory in autumn 1970;

b) the assimilation pond Łąkowy, also with an area of 8 ha and a mean depth of 1 m, filled with river water and supplemented by sugar factory wastes from the pond Zimowy Wielki, constituting 1/5 of the total volume;

c) Gorol, the control pond with an area of 6.9 ha and a mean depth of 1 m, filled with river water without wastes.

Information on the chemism and zooplankton of the investigated ponds were given by M. Lewkowicz, S. Lewkowicz (1977), on the phytoplankton by Krzeczkowska-Wołoszyn (1977), on the bottom algae by Kyselowa (1977), on the microbenthos by Grabacka (1977), and on the bottom fauna by Zięba (1977).

The samples were collected from April 28 to September 23 1971, at mean intervals of two weeks each time two samples being taken from *Glyceria aquatica* which was a plant common to all three ponds and overgrew their banks, from *Myriophyllum spicatum* in the pond Zimowy Wielki, and from *Elodea canadensis* in the pond Łąkowy. A total number of 94 samples were elaborated: 38 from the pond Zimowy Wielki, 36 from the Pond Łąkowy, and 20 from Gorol.

A bottom sampler with 20×20 cm side length and a net of 0.3 mm mesh was used for "mowing" the plants during 30 seconds. After preliminary washing and separating the thicker parts of plants, the samples were fixed in 4% formalin and taken to the laboratory, where they pass-

ed through a minute selection and were identified as to groups and species. *Oligochaeta* were identified by E. Dumnicka, M. Sci., while the *Coleoptera* species were checked by Docent J. Pawłowski and *Corixidae* by Dr. S. Mielewczyk.

Next, the means from the collected samples and the percentage share of individual groups on the investigated plants were calculated. For the dominating *Chironomidae* group the index of dominance was calculated according to the formula (Kownacki 1971):

$$d = \frac{\overline{Q} \cdot 100}{\underline{Q}} \cdot f$$

where:

$\overline{Q}$ — the number of specimens of a given species,

$\underline{Q}$ — the number of all specimens,

$f$ — frequency $\frac{n}{N}$ — $n$ — number of samples where a given species appeared; $N$ — number of all samples.

## Results

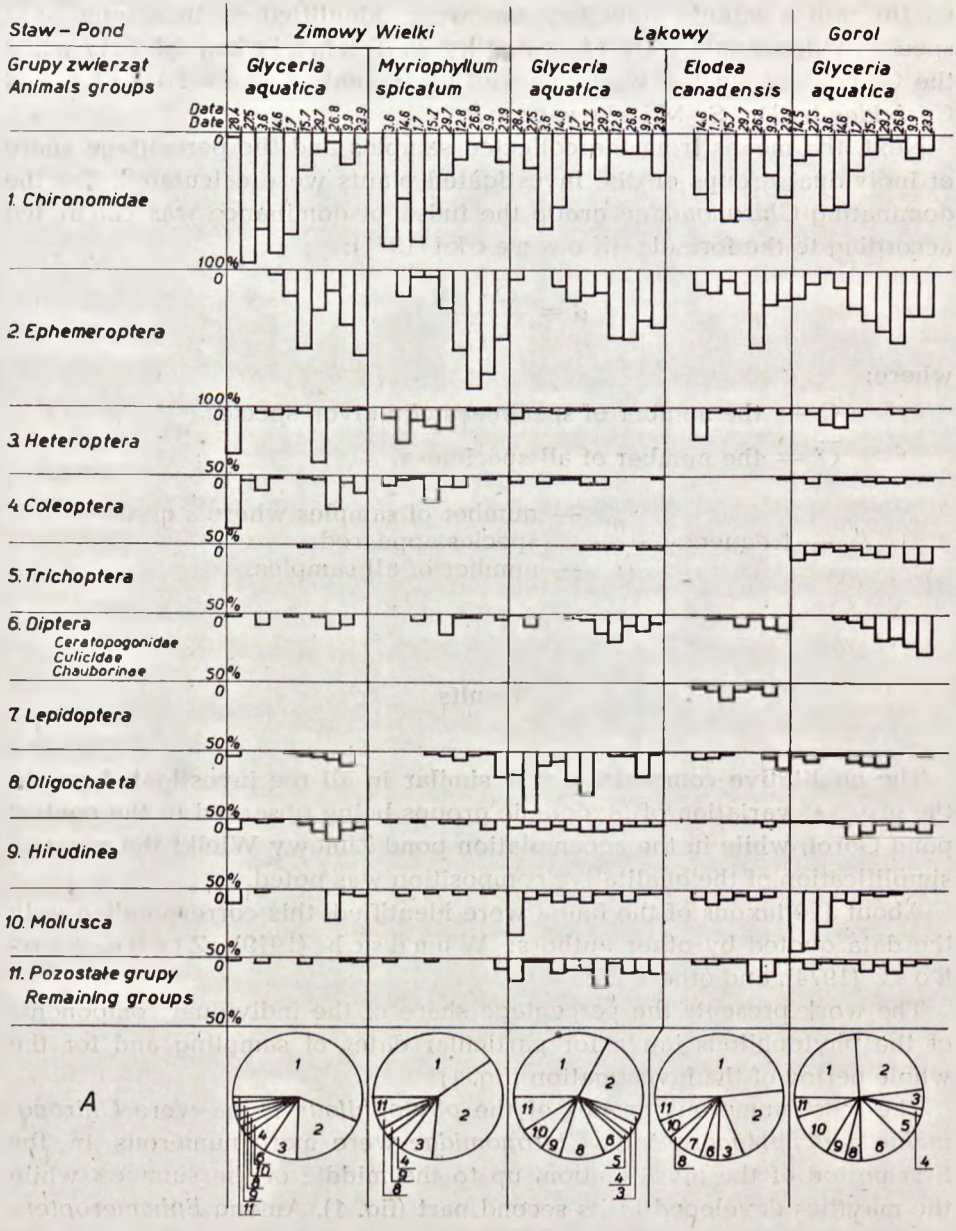
The qualitative composition was similar in all the investigated ponds, the greatest variation of taxonomic groups being observed in the control pond Gorol, while in the accumulation pond Zimowy Wielki the greatest simplification of the qualitative composition was noted.

About 120 taxons of the fauna were identified, this corresponding with the data quoted by other authors: Wundsch (1919), Zięba, Srokosz (1974), and others (Table I).

The work presents the percentage share of the individual components of the phytophilous fauna for particular dates of sampling and for the whole period of the investigation (fig. 1).

The most numerous groups of the *phytophilous* fauna were *Chironomidae* and *Ephemeroptera*. *Chironomidae* were more numerous in the first period of the investigation, up to the middle of the summer, while the mayflies developed in its second part (fig. 1). Among *Ephemeroptera Cloeon* gr. *dipterum* dominated decisively in all ponds and on all the investigated plants, being most numerous on *Myriophyllum spicatum*. Starmach (1960) reported great numbers of this species on *Myriophyllum* sp. and *Elodea*. Moreover, the occurrence of species of the genus *Caenis* and of *Siphlonurus aestivalis* and *Leptophlebia vesperitina*, though not in great numbers, was also noted.

*Heteroptera* occurred in all three ponds and on all plants in a rather




Ryc. 1. Skład procentowy fauny naroślinnej na danych gatunkach roślin w poszczególnych terminach oraz (A) średnie z całego okresu badań

Fig. 1. Percentage share of plant fauna on a given plant species in various periods and (A) the averages for the whole period of investigation

small percentage (about 8%). Species of the genus *Sigara* and their larvae dominated. They were most numerous in the pond Zimowy Wielki, especially in the initial period of the investigation.

Coleoptera were represented both by imagines and their larvae. They occurred in all ponds, their presence being connected rather with the littoral zone, overgrown by *Glyceria aquatica*. They were most numerous in the pond Zimowy Wielki, on both investigated plants: on *Glyceria* species of the genus *Noterus* prevailed, while on *Myriophyllum Hyphydrus ovatus* was most numerous. The representatives of this group were not noted in the samples from *Elodea*.

*Trichoptera:* the representatives of this group were chiefly observed in the control pond Gorol, where they constituted 7.5% of the total number of fauna. Moreover, the occurrence of this group was noted in the pond Łąkowy, on *Glyceria* sp. in greater numbers than on *Elodea* sp. In the pond Zimowy Wielki a few specimens were occasionally found in the samples at the end of the season. Such typical pond forms as *Triaenodes bicolor, Oecetis furva,* and species of the sub-family *Polycentropidae* were among those most frequently encountered.

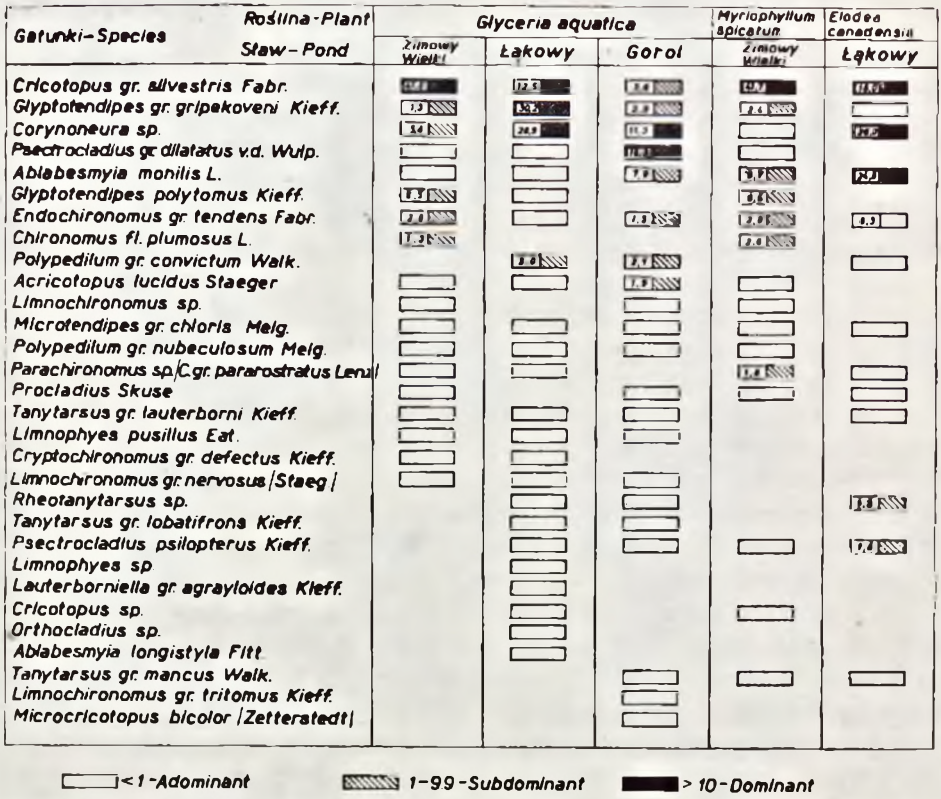
*Diptera:* three groups *Ceratopogonidae, Culicidae,* and *Chauborinae* were examined together and not identified as to species. Among them only *Ceratopogonidae* may be regarded as connected with the aquatic fauna, while the other two groups are encountered rather accidentally in the samples, since the one may be classified to the neustone and the other lives a planktonic life. *Diptera* were most numerous in the control pond, amounting to about 12% of the total fauna.

*Lepidoptera*: the occurrence of two species was noted: *Paraponyx stratiotata* in the pond Łąkowy on *Glyceria,* and *Nymphula nymphaeta* in the control pond Gorol. The latter, however, was most numerous in the pond Łąkowy on *Elodea,* where it constituted as much as 6.3% of the total fauna. The butterfly larvae are connected with higher plants, where they live a mining life (H. Wojtusiak, R. J. Wojtusiak 1960).

*Oligochaeta* constituted a constant component of about 3.5% of the phytophilous fauna, only in the pond Łąkowy on *Glyceria* amounting to 12.5% of the total fauna. Typical phytophilous forms of the family *Naididae, Stylaria lacustris,* species of the genus *Nais* and some *Tubificidae* dominated.

*Hirudinea* constituted 1.3—5.2% of the total fauna, being more numerous on *Glyceria* (in all three ponds) than on other plants. The most frequently encountered species were *Helobdella stagnalis* and *Erpobdella octooculata.*

*Mollusca* (*Gastropoda*) appeared chiefly in the pond Łąkowy (7%) and in the control pond Gorol (19%). They were also sporadically encountered in the accumulation pond Zimowy Wielki. *Gyraulus albus, Lymnea stagnalis,* and *Planorbarius corneus* dominated.




Ryc. 2. Układ dominacji larw *Chironomidae* występujących w stawach ściekowych na poszczególnych roślinach

Fig. 2. The dominance scheme of *Chironomidae* larvae occurring on individual plants in the sewage ponds

Besides, the occurrence of *Hydracarina*, *Aranae*, and *Odonata* was also noted, but these groups constituted only an insignificant part of the fauna.

As was stressed above, *Chironomidae* were dominants in the investigated ponds, therefore more attention was paid to this group. The indices of dominance of *Chironomidae* larvae occurring in these ponds on all the investigated plants were compared (fig. 2) and it was found that in the three ponds, characterized by various degress of trophicity, different *Chironomidae* species dominated on one common plant, *Glyceria aquatica*. In the accumulation pond Zimowy Wielki the first and only dominant was *Cricotopus* gr. *silvestris*, in the accumulation pond Łąkowy the dominants were: I — *Glyptotendipes* gr. *gripekoveni*, II — genus *Corynoneura*, III — *Cricotopus silvestris*, while in the control pond Gorol, the first dominant was *Psectrocladius dilatatus* and the second the genus *Corynoneura*.

Tabela I. Procentowy udział poszczególnych gatunków na danych roślinach w trzech stawach jako średnie z całego okresu badań.
GL. - Glyceria aquatica, MYR. - Myriophyllum spicatum, EL. - Elodea canadensis
* Grupę dipterum tworzą współwystępujące w stawach na południu Polski gatunki: C. dipterum (L.), C. cognatum Steph., C. insciptum Bngts.

Table I. Percentage share of particular species on some plants in three ponds as the means from the whole investigation period
GL. - Glyceria aquatica, MYR. - Myriophyllum spicatum, EL. - Elodea canadensis
* The Dipterum group is formed by coexisting species in ponds in the south of Poland: C. dipterum (L.), C. cognatum Steph., C. insciptum Bngts.

| Gatunki / Species — Staw / Pond | Zimowy Wielki | | Łąkowy | | Gorol |
|---|---|---|---|---|---|
| | GL. | MYR. | GL. | EL. | GL. |
| Hydra vulgaris L. | | 1.0 | 0.1 | 1.0 | 0.1 |
| Nematodes n. det. | | | 0.1 | | |
| Oligochaeta (Stylaria lacustris L., | 2.3 | 3.7 | 12.2 | 2.7 | 3.6 |
| Nais communis Piguet, Nais simplex Pig. | | | | | |
| Ophidonais serpentina (Müll.), Dero | | | | | |
| obtusa d'Udek, Limnodrilus hoffmeisteri | | | | | |
| Clap., L. udekemianus Clap., Limnodrilus | | | | | |
| claparedeanus Rat., Limnodrilus sp. | | | | | |
| Lumbriculus variegatus (Müll.) | | | | | |
| Araneae | | | | | |
| Argyroneta aquatica L. | | | 1.3 | 0.4 | 2.2 |
| Hydracarina n. det. | 1.0 | 0.3 | 6.0 | 3.4 | 0.6 |
| Crustacea | | | | | |
| Asellus aquaticus L. | | | 0.1 | | 0.1 |
| Ephemeroptera | | | | | |
| Cloëon gr. dipterum L.* | 19.5 | 36.4 | 21.5 | 18.5 | 24.1 |
| Caenis horaria L. | 0.1 | 0.2 | 0.8 | 1.7 | 0.9 |
| - moesta Bgtss. | | | 0.7 | | 0.1 |
| Siphlonurus aestivalis Etn. | | | 0.4 | | |
| Leptophlebia vespertina L. | | | 0.1 | | |
| Odonata | | | | | |
| Platycnemis pennipes (Pallas) ? | | 0.1 | | | |
| Erythromma najas (Charp.) | | | 0.1 | | |
| Lestes sponsa (Hansem.) | | | | | 0.7 |
| Coenagrion pulchellum Lind. | | | 0.2 | | |
| Coenagrion sp. | | 0.3 | | 0.6 | 0.1 |
| Enallagma cyathigerum (Charp.) | | | 0.1 | | |
| Anisoptera juv. | | | 0.1 | 0.5 | 0.2 |
| Heteroptera | | | | | |
| Sigara praeusta Fieb. | 1.0 | 2.0 | 0.1 | 0.6 | |
| - falleni Fieb. | 1.4 | 1.4 | 0.8 | 0.6 | 0.6 |
| - striata L. | 0.6 | 1.1 | | | |
| Sigara sp. (concima ?) | | 0.1 | | | |
| Cymyntia bransdorffi Sahlb. | | 0.1 | | | |
| Corixidae (larvae) | 4.5 | 3.8 | 0.8 | 5.1 | 2.4 |
| Notonecta glauca L. | | | 0.1 | | 0.1 |
| Ilyocoris cimicoides L. | 0.3 | | 0.4 | 0.4 | 0.8 |
| Ranatra linearis L. | | | | | 0.1 |
| Gerris lacustris L. | | | | | 0.4 |
| Coleoptera | | | | | |
| Enochrus testaceus F. | 0.4 | 0.4 | 0.5 | | 0.6 |
| Berosus sp. (larvae) | | 0.2 | 0.1 | | |
| Spercheus emaginatus Schlb. | 0.1 | 0.2 | 0.1 | | |
| Laccobius sp. | | | 0.1 | | |
| Hyphydrus ovatus L. | 0.3 | 1.7 | 0.1 | | |
| Noterus clavicornis Deg. | 1.2 | 0.1 | 0.7 | | 0.3 |
| - crassicornis Müll. | 1.2 | 0.3 | 0.2 | | 0.1 |
| Laccophilus variegatus Germ. | 0.1 | 0.2 | 0.1 | | |
| - hyalinus Deg. | 0.1 | 0.2 | 0.1 | | |
| Laccophilus sp. (minutus L.) | 0.1 | 0.3 | | | |
| Laccophilus sp. (larvae) | 0.9 | | 0.4 | | |
| Hydroporini (larvae) | | 0.1 | | | |
| Graphoderus cinereus L. | | | 0.1 | | 0.2 |
| Dytiscus marginalis L. | | 0.1 | | | 0.1 |
| Rhantus exoletus Forst. | 0.1 | | | | |
| Rhantus sp. larvae | | 0.6 | 0.1 | | |
| Dytiscidae (larvae) n. det. | 0.1 | 0.5 | 0.1 | | |
| Haliplidae (larvae) | 0.4 | 0.1 | 0.2 | | 0.2 |
| Hydrophilidae n. det. | | | | | 0.2 |
| Oulimnius sp. | | | 0.1 | | |
| Gyrinus aeratus Steph. | | | 0.1 | | |
| Trichoptera | | | | | |
| Phryganea grandis L. | | | | | 0.1 |
| Triaenodes bicolor Mc. Lachl | 0.1 | 0.2 | 0.4 | 0.2 | 3.7 |
| Oecetis furva Ramb. | | | 0.2 | 0.1 | 0.9 |
| Oecetis gr. ochracea Curt. | | | | | 0.2 |
| Oecetis sp. | | | 0.1 | | |
| Limnophilus flavicornis Fbr. | | | 0.1 | | 0.4 |
| Limnophilus sp. | | | | | 0.1 |

| Gatunki / Species — Staw / Pond | Zimowy Wielki | | Łąkowy | | Gorol |
|---|---|---|---|---|---|
| | GL. | MYR. | GL. | EL. | GL. |
| Polycentropus flavomaculatus Pict. | | | 0.1 | 0.1 | 1.5 |
| Holocentropus picicornis Steph. | | 0.1 | 0.2 | | 1.0 |
| Agraylea multipunctata Curt. | | | 0.1 | | |
| Agraylea sp. | | | | | 0.1 |
| Trichoptera n. det. | | | | | 0.1 |
| Lepidoptera | | | | | |
| Nymphula nymphaeta L. | | | | 6.3 | 0.3 |
| Paraponyx stratiotata L. | | | 0.1 | | |
| Megaloptera | | | | | |
| Sialis flavilatera L. | | 0.1 | 0.1 | | |
| Ceratopogonidae | 0.3 | 0.1 | 3.7 | 1.1 | 4.2 |
| Culicidae | | 0.6 | 0.4 | 0.1 | 0.3 |
| Chaoborinae | 2.1 | 1.1 | 2.0 | 3.2 | 7.0 |
| Tipulidae | | | 0.1 | 0.1 | |
| Tabanidae | 0.1 | | | | |
| Limoniidae (Dicranota sp.) | 0.1 | | | | |
| Stratiomyidae (Stratiomyia sp.) | | | 0.1 | | 0.2 |
| Chironomidae | | | | | |
| Ablabesmyia gr. monilis (L.) | 0.1 | 4.9 | 0.3 | 13.4 | 2.6 |
| - longistyla Fitt. | | | 0.1 | | |
| - phatta (Eggert) | | | | 0.1 | |
| Procladius Skuse | 0.1 | 0.3 | | 0.1 | 0.4 |
| Corynoneura spp. | 3.4 | 0.3 | 9.5 | 14.5 | 3.5 |
| Psectrocladius gr. dilatatus v.d Wulp. | 0.1 | 0.1 | 0.4 | | 6.7 |
| - gr. psilopterus Kieff. | | 0.1 | 0.1 | 1.5 | 0.8 |
| Cricotopus (Isocladius) gr. silvestris | 37.2 | 18.6 | 5.0 | 10.2 | 2.2 |
| Acricotopus lucidus (Staeg.) | 2.5 | 0.2 | 0.1 | | 1.6 |
| Microcricotopus bicolor Zett. | | | | | 0.1 |
| Cricotopus + Orthocladius sp. | | | 0.1 | | |
| Orthocladius sp. | | | 0.1 | | |
| Limnophyes pusillus Eat. | 0.1 | | 0.1 | | 0.4 |
| Limnophyes sp. | | | 0.1 | | |
| Orthocladinae n. det. | | 0.1 | | | |
| Endochironomus gr. tendens F. | 1.6 | 2.2 | 1.6 | 3.6 | 0.8 |
| - gr. dispar (Meig.) | | 0.3 | | | |
| Limnochironomus gr. nervosus Staeg. | 0.9 | 0.2 | 0.3 | 0.8 | 0.2 |
| - gr. tritomus (Kieff.) | 2.3 | 0.1 | | | 0.1 |
| Limnochironomus sp. | 0.3 | 0.6 | 0.1 | | |
| Microtendipes gr. pedellus (Meig.) | 0.3 | 0.6 | 1.3 | 0.9 | 0.5 |
| Glyptotendipes gr. gripekoveni Kieff. | 1.1 | 1.7 | 9.2 | 0.4 | 1.2 |
| Glyptotendipes polytomus (Kieff.) | 4.0 | 5.0 | 0.2 | | |
| Chironomus f l plumosus L. | 1.5 | 3.1 | | | |
| Polypedilum gr. convictum (Walk.) | | | 2.1 | 0.4 | 1.0 |
| - gr. nubeculosum (Meig.) | 0.3 | 0.2 | 0.2 | | |
| Lauterborniella gr. agrayloides (Kieff.) | | | 0.1 | | |
| Cryptochironomus gr. defectus | | | 0.1 | | |
| Parachironomus sp.(C.gr. pararostratus) | 0.6 | 0.9 | 0.2 | 0.2 | |
| Tanytarsus gr. gregarius Kieff. | | 0.1 | | | |
| - gr. lauterborni Kieff. | 0.1 | | 0.1 | 0.3 | 0.4 |
| - gr. lobatifrons Kieff. | | | 0.1 | | 0.1 |
| Cladotanytarsus sp. (mancus Walk.) | | 0.1 | | 0.7 | 0.1 |
| Rheotanytarsus sp. | | | 0.1 | 0.6 | 0.2 |
| Hirudinea | | | | | |
| Helobdella stagnalis (L.) | 1.9 | 0.9 | 1.3 | 0.4 | 0.6 |
| Erpobdella octooculata (L.) | 0.5 | 0.2 | 3.1 | 0.4 | 2.8 |
| Glossiphonia complanata (L.) | 0.7 | 0.1 | 0.3 | 0.1 | 0.6 |
| - heteroclita (L.) | | 0.1 | 0.5 | | |
| Theromyzon tesselatum (O.F. Müll.) | | | | | 1.2 |
| Mollusca | | | | | |
| Gyraulus crista L. | | | 0.1 | | |
| - albus Müll. | 0.6 | 0.7 | 2.4 | 2.8 | 4.8 |
| Anisus vortex L. | 0.4 | | 0.3 | | 3.5 |
| Planorbarius corneus L. | 0.3 | 0.3 | 0.6 | | |
| Lymnea stagnalis L. | | | 2.3 | 1.2 | 0.4 |
| Galba truncatula Müll. | | | | | 1.1 |
| Radix peregra Müll. | | | 0.1 | 1.0 | 1.3 |
| - auricularia L. | | | 0.1 | | |
| Physa fontinalis L. | | 0.1 | 0.1 | | |
| Segmentina notida Müll. | 0.6 | 0.1 | 0.2 | | 1.1 |

As the above facts show, the trophic conditions were decisive for the communities settling on higher plants. Moreover, in the pond Łąkowy dominants from the other two ponds were noted. The settlement by *Chironomidae* larvae on two different plants was compared in the same pond. In the accumulation pond Zimowy Wielki the community settling on *Glyceria* and *Myriophyllum* was examined and no differences were found, the structure of dominance being similar. On both plants the typical bottom forms *Chironomus* f.l. *plumosus* and *Glyptotendipes polytomus* appeared as sub-dominants. These species dominated among the bottom fauna and attained numbers of about 26 000 and 5800 specimens/$m^2$ respectively (Zięba 1976). The occurrence of these two species as sub-dominants only in the pond Zimowy Wielki suggests that in a pond where great amounts of nutritive substance occurs differences between the bottom and plants disappear.

In the assimilation pond Łąkowy the settlement of *Glyceria* and *Elodea* by *Chironomidae* was compared and it was found that certain species, e.g. *Ablabesmyia* gr. *monilis*, preferred *Elodea* (similarly to the larvae of the aquatic butterfly *Nymphula nymphaeta*), while *Glyptotendipes* gr. *gripekoveni* settle *Glyceria* more willingly. On these two plants no bottom forms were noted, contrary to the observations in the accumulation pond Zimowy Wielki.

## Recapitulation

The aim of the work was to investigate the settlement of aquatic plants by the phytophilous fauna, to determine the domination of animal groups, and to find out in what measure the settlement of plants was controlled by the trophic conditions rather than by plants.

The investigation covered three ponds, two of them containing various percentage of wastes from the Chybie sugar factory, and the third containing no wastes, and being used as the control. *Glyceria aquatica* was a plant common to all three ponds. Besides the samples were collected from *Myriophyllum spicatum* (the accumulation pond Zimowy Wielki) and from *Elodea canadensis* (the assimilation pond Łąkowy).

1) It was noted that about 120 taxonomic units appeared in the examined samples.

2) The greatest differentiation of taxonomic groups and species was observed in the control pond Gorol and the smallest in the accumulation pond Zimowy.

3) In all the investigated ponds and on all the investigated plants the larvae of *Chironomidae* and *Ephemeroptera (Cloëon* gr. *dipterum)* were

the dominant organisms. *Chironomidae* dominated in the first vegetation period (up to the middle of summer); in the later period, up to autumn, the mayflies prevailed.

4) In the pond of great trophicity (Zimowy Wielki) no qualitative or quantitative differences were noted in the taxocenes settling the two investigated plants, while the appearance of typical bottom forms (as sub-dominants) was observed.

5) It was found that in the pond with poorer trophic conditions (Łąkowy) the influence of plants on the fauna settling on them was evident. *Ablabesmyia* gr. *monilis* and *Nymphula nymphaeta* prefer *Elodea*, while *Glyptotendipes gr. gripekoveni* settle on *Glyceria aquatica*.

6) In the investigated ponds the development of *Cricotopus* gr. *silvestris* depended on the trophic conditions — the better the trophic conditions, the greater the domination coefficient, while the genus *Corynoneura* developed in the pond with medium trophic conditions, and *Psectrocladius* gr. *dilatatus* preferred an environment poorer in organic matter.

## STRESZCZENIE

W pracy przedstawiono badania prowadzone nad fauną fitofilną stawów nawożonych ściekami cukrowniczymi w Gołyszu koło Cieszyna. Badaniami objęto trzy stawy o różnych warunkach troficznych: Zimowy Wielki — napełniony nie rozcieńczonymi ściekami z cukrowni Chybie, Łąkowy — napełniony wodą rzeczną i dopełniony w 1/8 objętości ściekami oraz Gorol — kontrolny, napełniony wodą rzeczną bez dodatku ścieków. Wykazano około 120 jednostek taksonomicznych w badanych stawach, przy czym największe ich zróżnicowanie zaobserwowano w stawie kontrolnym Gorol, najmniejsze w akumulacyjnym — Zimowym Wielkim. Dominującymi organizmami we wszystkich stawach były larwy *Chironomidae* (do połowy lata) i *Ephemeroptera* (*Cloëon* gr. *dipterum* — w późniejszym okresie do jesieni).

Porównano zasiedlenie roślin: *Glyceria aquatica*, *Myriophyllum spicatum* i *Elodea canadensis* przez poszczególne gatunki i grupy zwierząt bezkręgowych. W stawie Zimowy Wielki nie stwierdzono różnic jakościowych i ilościowych w taksocenach zasiedlających obie badane rośliny (manna i wywłocznik) natomiast zaobserwowano liczne występowanie typowych form dennych. W stawie Łąkowy (o gorszych warunkach troficznych) zaobserwowano różnice w zasiedlaniu roślin przez faunę. Pewne organizmy (*Ablabesmyia* gr. *monilis*, *Nymphula nymphaeta*) wyraźnie preferowały moczarkę kanadyjską, larwy zaś *Glyptotendipes* gr. *gripekoveni* chętniej zasiedlały mannę.

Obliczono wskaźniki dominacji dla *Chironomidae* i stwierdzono dla *Glyceria aquatica*, że każdy staw ma innego pierwszego dominanta (Zimowy Wielki — *Cricotopus* gr. *silvestris*, Łąkowy — *Corynoneura* sp., Gorol — *Psectrocladius* gr. *dilatatus*). Rozwój *Cricotopus* gr. *silvestris* uzależniony był od warunków troficznych: im lepsze warunki troficzne, tym wyższy współczynnik dominacji. Rodzaj *Corynoneura* rozwijał się w stawie o pośrednich warunkach troficznych (Łąkowy), *Psectrocladius* gr. *dilatatus* preferował zaś środowisko uboższe w materię organiczną.

## REFERENCES


Grabacka E., 1977. Wpływ ścieków cukrowniczych na mikrofaunę dna w stawach rybnych — The influence of beet-sugar factory wastes on bottom microfauna in fish ponds. Acta Hydrobiol., 19 (w druku — in press).

Gurzęda A., 1959. Stosunki ekologiczne między fauną bezkręgową a roślinnością zanurzoną. Przegląd metodyki — Ekologičeskie otnošenija meždu faunoj bespozvonočnych i pogružennoj rastitel'nostju. Ekol. Pol., B, 5, 139—145.

Karassowska K., J. S. Mikulski. 1960. Studia nad zbiorowiskami zwierzęcymi roślinności zanurzonej i pływającej jeziora Drużno — Studies of animal aggregations associated with immersed and pleustonic vegetations in Lake Drużno. Ekol. Pol., A, 8, 335—353.

Kořinkova J., 1971. Sampling and distribution of animals in submerged vegetation. Vestn. Ceskosl. Spol. Zool., 35, 209—221.

Kownacki A., 1971. Taksoceny *Chironomidae* potoków Polskich Tatr Wysokich — Taxocens of *Chironomidae* in streams of the Polish High Tatra Mts. Acta Hydrobiol., 13, 439—464.

Krzeczkowska-Wołoszyn Ł., 1977. Wpływ ścieków cukrowniczych na fitoplankton stawów — Influence of beet-sugar factory wastes on phytoplankton of ponds. Acta Hydrobiol., 19, (w druku — in press).

Kuflikowski T., 1970. Fauna naroślinna stawów karpiowych w Goczałkowicach — Fauna in vegetation in carp ponds at Goczałkowice. Acta Hydrobiol., 12, 439—456.

Kuflikowski T., 1974. Fauna fitofilna zbiornika zaporowego w Goczałkowicach — The phytophilous fauna of the dam reservoir at Goczałkowice. Acta Hydrobiol., 16, 189—207.

Kyselowa K., 1977. Glony denne w stawie po akumulacji ścieków cukrowniczych — Benthic algae in a pond after the accumulation of beet-sugar factory wastes. Acta Hydrobiol., 19, 215—231.

Lewkowicz M., S. Lewkowicz, 1977. Restytucja stawu po pięcioletnim okresie użyźniania ściekami cukrowniczymi. Czynniki chemiczne i zooplankton — Restoration of a pond after a five year period of fertilization with beet-sugar factory wastes. Chemical factors and zooplankton. Acta Hydrobiol., 19, (w druku — in press).

Macan T. T., 1965. The fauna in the vegetation of a moorland fishpond. Arch. Hydrobiol., 61, 273—310.

Markošova R., 1974. Seasonal dynamics of the periphytic macrofauna in carp ponds in South-West Bohemia. Vest. Ceskosl. Spol. Zool., 38, 251—270.

Matlak O., 1961. Fauna naroślinna stawów rybnych. Gosp. Ryb., 13, 5, 9—11.

Matlak O., 1963 a. Występowanie zwierząt bezkręgowych na roślinach wodnych w stawach rybnych — The appearance of invertebrates on aquatic plants in fishponds. Acta Hydrobiol., 5, 1—30.

Matlak O., 1963 b. Obserwacje nad zasiedleniem strzałki i manny przez fitofilne larwy *Tendipedidae*. Gosp. Ryb., 15, 8, 18.

Nordquist H., 1925. Studien über die Vegetations- und Bodenfauna ablassbarer Teiche. Lund-Leipzig.

Panyi E., 1957. Untersuchungen über die Crustaceen der Wasserpflanzen in Plattensee. Arch. Hydrobiol., 53, 537—551.

Soszka H., 1974. *Chironomidae* associated with pond-weeds (*Potamogeton perfoliatus* L.) in the Mikołajskie Lake. Bull. Acad. Pol. Scie., Cl. 2., 22, 239—276.

Starmach K., 1954 a. Metody badań środowiska stawowego — Schemat ogólnego opisu rybackiego i hydrologicznego stawów rybnych — Die Untersuchungsmethoden der Teichslebendbedigungen. Biul. Zakł. Biol. Stawów PAN, 2, 10—21.

Starmach K., 1954 b. O potrzebie szczegółowych badań stawów rybnych. Kosmos, A, 3, 158—172.

Starmach K., 1956. Staw jako środowisko hodowlane. (W — in: Gościński W., Rudnicki A. (red.): Hodowla ryb stawowych. Warszawa, PWRiL), 13—78.

Starmach K., 1960. Biologia sanitarna. Kraków, PWN.

Stube M., 1958. The fauna of a regulated lake. Rep. Inst. Freshwat. Res. Drottningholm, 39, 162—224.

Szumiec J., 1962. Zwierzęta zasiedlające skoszoną roślinność w stawach — Animals living on mowed vegetation in ponds. Acta Hydrobiol., 4, 119—149.

Wojtusiak H., R. J. Wojtusiak, 1960. Biologia, występowanie i użytkowność motyli wodnych z podrodziny *Hydrocampinae* w stawach doświadczalnych PAN Ochaby — Biology, distribution and economical value of the water-moths from the subfamily *Hydrocampinae* in the experimental ponds of the Polish Academy of Sciences in Ochaby. Pol. Arch. Hydrobiol., 8 (21), 253—260.

Wolnomiejski N., B. Dunajska, 1966. Studies on the groupings of macroperiphytonic fauna in the Lake Jeziorak Mały — Obserwacje nad zgrupowaniami fauny makroperifitynowej jeziora Jeziorak Mały. Zeszyty Nauk. Uniw. M. Kopernika, 16, 77—88.

Wunder W., 1936. Die Chironomidenlarven in der Uferregion und aus den weichen Wasserpflanzen im Karpfenteich. Ztschr. Fisch., 34, 213—224.

Wundsch H. H., 1919. Studien über die Entwicklung der Ufer- und Bodenfauna. Ztschr. Fisch., 4, 408—542.

Zięba J., K. Srokosz, 1974. Makrofauna bezkręgowych w stawach narybkowych w Gołyszu. Cz. 1. Strefa roślinności przybrzeżnej — Macrofauna of invertebrates in the fry ponds at Gołysz. Part 1. Littoral vegetation zone. Acta Hydrobiol., 16, 331—343.

Zięba J., 1977. Makrobentos stawu karpiowego zasilanego przez kilka lat ściekami z cukrowni i stawu karpiowego zasilanego przez kilka lat ściekami z cukrowni i stawu kontrolnego — Macrobenthos of a carp pond enriched for some years with beet-sugar factory wastes and of a control pond. Acta Hydrobiol., 19 (w druku — in press).

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