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POLSKIE ARCHIWUM HYDROBIOLOGII (Pol. Arch. Hydrobiol.)	23	3	409–420	1976

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UNIONIDAE AS A SUBSTRATUM FOR *DREISSENA POLYMORPHA* PALL.

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ABSTRACT

The extent of the overgrowth of *Dreissena polymorpha* Pall. on Unionidae was studied in some Mazurian Lakes. It has been found that the overgrowth was very intense, e.g. in the Mikołajskie Lake — 85% of the total number of the examined Unionidae had *D. polymorpha* attached to them and in 35% of the cases the biomass of the adherent *D. polymorpha* is higher than that of the overgrown Unionidae individual. The extent of the overgrowing of Unionidae by *D. polymorpha* is varied at various depths of a lake, in various years, and various lakes. The laboratory experiments to determine the settling-down preferences of *D. polymorpha* showed that live Unionidae and *D. polymorpha* colonies were preferred as compared with empty shells of bivalves or stones. None, unfavourable effects of *D. polymorpha* on Unionidae were observed.

1. INTRODUCTION

Dreissena polymorpha Pall. is a bivalve forming colonies in the littoral and also, though to a smaller extent, in the sublittoral zone of lakes (Stańczykowska 1964). Bivalves of the Unionidae family live, likewise, mainly in the littoral of the lakes (Ökland 1963, Widuto, Kompowski 1968, Lewandowski, Stańczykowska 1975). Due to the sedentary habits of *D. polymorpha* it is, many a time, mechanically connected with the bivalves of this family. *D. polymorpha* attach themselves by means of byssus to submerged solid objects, such as: stones, plant tillers, pieces of wood, empty shells of molluscs, and to live Unionidae, as well.

The purpose of the present study was to determine to what extent Unionidae are overgrown with *D. polymorpha* in the Mazurian Lakes and to define what type of correlations exists between these animals.

Though it is believed generally that mutual relations between Unionidae and *D. polymorpha* are competitive (Dussart 1966, Widuto, Kompowski 1968), nonetheless, the problems of interrelation of these two groups of bivalves were treated as a matter of minor importance and often incidentally at the occasion of studies on some other issues (Sebestyén 1938, Widuto, Kompowski 1968).

2. MATERIALS AND METHODS

Studies were conducted in the lakes of the Mazurian Lake District. Data on the density of *D. polymorpha* populations were obtained (Stańczykowska et al. 1975) and observations of bivalves of the Unionidae family were carried out, as well. The analyses were based on the materials collected from the Mikołajskie Lake, four times within the period between May and September, 1972, at 10 sampling stations located at regular distances along the shores of the lake and representing various types of the littoral zone. The material was collected, at each sampling station, first at the depth of 0.5 m (by hand) and then subsequently at every 1 m deeper (i.e. at the depths of 1.5 m, 2.5 m, 3.5 m, and so on — by means of a dredge) downwards to the depths at which practically Unionidae are not found any more. The obtained in this way samples of 395 Unionidae individuals were measured, after preservation in 4 per cent solution of formalin, than there were determined their age, live weight (after draining off the water), dry body weight (after desiccation

first at the temperature of 60°C. then, after a few hours at the temperature of 105°C — to a constant weight) and the weight of the shell, as well as, the number and live weight (after draining of the water) of *D. polymorpha* attached to single Unionidae individuals.

Additional materials were sampled from other lakes in the Mazurian Lakeland (Śniardwy, Niegocin, Jagodne, and Bełdany). They were collected only once in summer 1972 by a diver from one sampling station in each lake, covering all the various depths at which Unionidae are present. Samples consisting of 40–60 Unionidae individuals were obtained from each of the investigated lakes.

In 1974, only once, materials were collected again from five (the same as previously) sampling stations in the Mikołajskie Lake by means of a dredge and in effect 47 Unionidae individuals were obtained from the depth of 1.5 m.

The laboratory experiments, concerning the preferences of *D. polymorpha* in settling down on various substrata, were carried out in 1974. They were conducted in nine 15-litre aquariums. The first three aquariums contained: 2 live Unionidae individuals, 2 empty shells, and 2 stones, approximating in size and shape the Unionidae. The next three aquariums contained: 3 Unionidae and 3 empty shells, each, and the last three — 3 Unionidae and 3 stones, each. The bivalves, shells and stones were distributed evenly in sandy substratum and then the aquariums were filled with lake-water. Next, into each of the aquariums, prepared in the above-described manner, 100 *D. polymorpha* individuals were introduced. The animals derived directly from the lake were separated from the colonies, representing natural age structure i.e. containing *D. polymorpha* individuals from every age-group. They were put in one by one with great care so as to make them cover the whole surface of the bottom area, evenly. After 3 days, 20 days, and 2 months following the putting in of *D. polymorpha* into the aquariums the places of their settling down were recorded to determine the number of individuals attached to the Unionidae, to the empty shells, and to the stones. The experiment was performed twice.

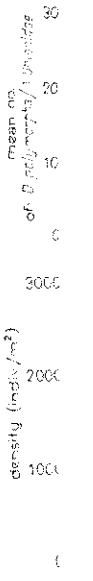
To supplement the issue of the preferences of *D. polymorpha* in settling down on various substrata an additional experiment was carried out in which large *D. polymorpha* individuals — in groups of five, empty shells of *D. polymorpha* — in groups of three, and pebbles — in groups of three were used as the substratum, which in the aggregate had a surface similar to that of the natural grouping of *D. polymorpha*. These experiments were conducted in three repeats each in nine 15-litre aquariums — into which 120 young *D. polymorpha* individuals (4–10 mm body length) were let in and after 20 days the place of their settling down was recorded.

3. RESULTS

A. THE EXTENT OF THE OVERGROWTH OF *D. POLYMORPHA* ON UNIONIDAE

In the collection of Unionidae sampled in 1972 in the Mikołajskie Lake 85% of the total number of individuals had *D. polymorpha* attached to them, mostly in the siphon region. The Unionidae were overgrown to the smallest extent in the case of those collected at the depth of 0.5 m (69% of Unionidae with *D. polymorpha* attached to them) and to the greatest extent when collected at the depth of 1.5 m (94.5%). At greater depths, farther downwards, Unionidae were likewise overgrown with *D. polymorpha* in a high degree: 2.5 m — 89%, 3.5 m — 83%, 4.5 m — 87.5%, and 5.5 m — 91%.

The number of *D. polymorpha* settled down on the individual Unionidae was also very high, averaging 20 specimens per one Unionidae individual. The smallest number of the attached *D. polymorpha* was recorded, likewise, at the depth of 0.5 m (on the average 7 *D. polymorpha* individuals per 1 Unionidae individual.) whereas the greatest number was noted at the depth of 1.5 m (on the average 26 *D. polymorpha* individuals) (Fig. 1 A). At greater depths a gradual, regular decrease in the number of *D. polymorpha* settled down on Unionidae was observed (Fig. 1). This type of *D. polymorpha* distribution corresponds to their distribution in the lakes (Stańczykowska 1966, Stańczykowska et al. 1975) (Fig. 1 B). The number of the attached *D. polymorpha* depends also on the age of the Unionidae and obviously it is greater on the older individuals (Fig. 2).



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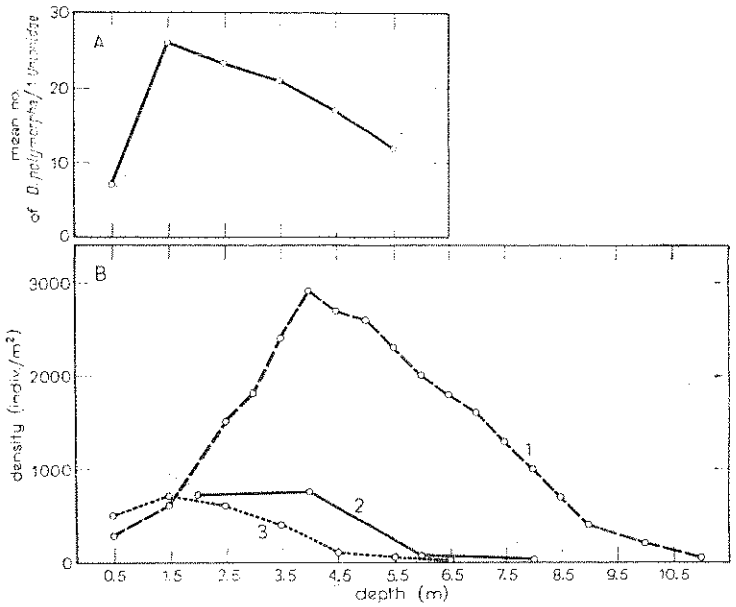

Fig. 1. Distribution of *D. polymorpha* in the lakes depending on the depths. A — Distribution of *D. polymorpha* overgrowing the Unionidae in the Mikołajskie Lake in 1972 (data from the present study). B — Density of the populations of *D. polymorpha* in various lakes (data from the literature): 1 — mean values from 40 Mazurian Lakes, in the sixties (Stańczykowska 1966); 2 — the Mikołajskie Lake, 1972 (Stańczykowska et al. 1975); 3 — the Balaton Lake (Hungary), in the sixties (Stańczykowska 1966)

The regression coefficient (*b*) for *Unio tumidus* Philipsson (Fig. 2 A) equals 2.35 (significant at the 5 per cent level), and *Anadonta piscinalis* Nilsson (Fig. 2 B) it is 7.00 (highly significant at the 0.1 per cent level). As can be seen, the *A. piscinalis* species is considerably more intensely overgrown with *D. polymorpha*. The difference between the two regression coefficients is highly significant at the 1 per cent level. This results as well from the larger size of *A. piscinalis* as from the fact that *U. tumidus* occurs mainly at the depth of 0.5 m, where *D. polymorpha* is scarce. The highest number of the settled down *D. polymorpha*, recorded in the Mikołajskie Lake during these investigations, was 99 individuals attached to the shell of a 7-year-old *A. piscinalis*.

Among the attached *D. polymorpha* the 12–22 mm long individuals were predominant (60%), there was also quite a great number of the eldest individuals over 22 mm long (over 30%); the largest *D. polymorpha* specimens are up to 30 mm long. The least numerous were, decidedly, the youngest individuals, less than 5 mm long (about 1%).

In 1974 the situation was similar to that in 1972, since at the depth of 1.5 m *D. polymorpha* were attached to 91.5% of the total number of Unionidae. The individuals on which *D. polymorpha* were not attached were representants of the youngest age groups 9–26 mm in length). The number of the attached *D. polymorpha* calculated per 1 Unionidae individual, however, was in 1974 considerably

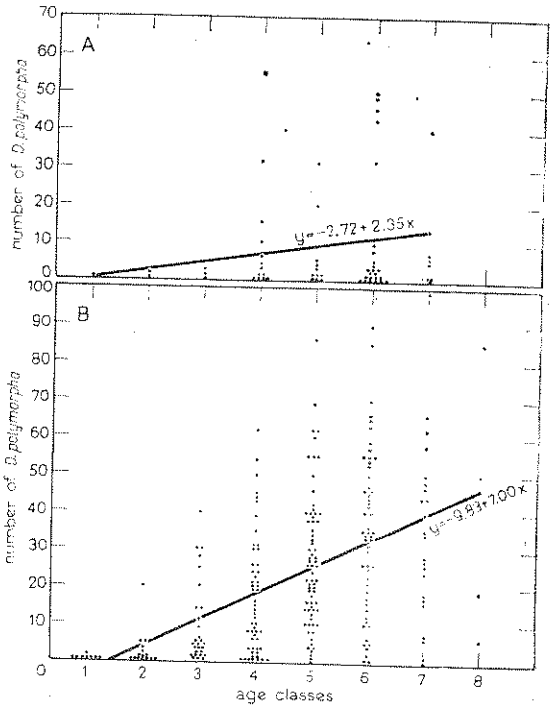

Fig. 2. The overgrowth of *Unio tumidus* (A) and *Anodonta piscinalis* (B) with *D. polymorpha* depending on the age of these molluscs

higher than previously. It was on the average 52 individuals of *D. polymorpha* per 1 individual of Unionidae (the maximum number — 132).

Among the other lakes under investigation — the most intensively overgrown with *D. polymorpha* were the Unionidae in the Niegocin Lake; the maximum number per 1 individual amounted to 186 (Fig. 3, No. 6). The least overgrown with *D. polymorpha* were the Unionidae in the Bełdany Lake (Fig. 3, No. 1). As can be seen in Fig. 3., the degree of the overgrowth is in close connection with the density of *D. polymorpha* population in the lake. The correlation coefficient is 0.958 and is highly significant at the 1 per cent level. The directly proportional correlation between the mean density of *D. polymorpha* population in the area of its occurrence in a given lake and the size of its communities was reported by Stańczykowska (1964). Though in the present study only one specific form of *D. polymorpha* community, formed on Unionidae, is taken under consideration, nonetheless, this correlation is very distinctly evident.

This correlation is observed not only in various lakes but also in all places where the density of *D. polymorpha* is variable, hence, at the various depths of the lakes, or when compared in the same lake in different years (Stańczykowska 1975).

For a more complete illustration of the extent of *D. polymorpha* settling down on Unionidae in the Mikołajskie Lake apart from the number also the weight of the attached *D. polymorpha* was analysed and compared with the body weight of of Unionidae. Out of the total number of Unionidae 59 individuals (15%) were not

overgrown with *D. polymorpha*. The weight of *D. polymorpha* overgrowing 198 individuals of Unionidae (50%) was lower than the weight of a single Unionidae (the mean ratio of *D. polymorpha*/Unionidae weight is 0.43). In the remaining 138 Unionidae individuals (35%) the weight of the attached *D. polymorpha* exceeded the weight of the individual Unionidae carrying them (the mean weight ratio is 1.93). In extreme cases the weight of *D. polymorpha* was 17 times more than the weight of *A. piscinalis* carrying them.

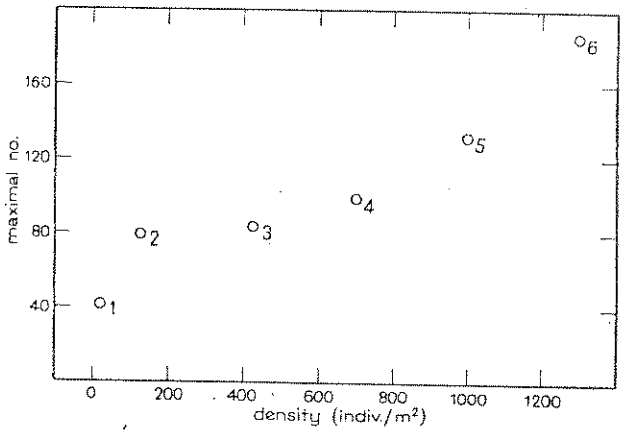

Fig. 3. Dependence of the maximum number of *D. polymorpha* overgrowing one individual Unionidae on the density of *D. polymorpha* population in the range of their occurrence in the Mazurian Lakes (data on the density of *D. polymorpha* by Stańczykowska et al. 1975). 1 — the Bełdany Lake, 1972; 2 — the Jagodne Lake, 1972; 3 — the Śniardwy Lake, 1972; 4 — the Mikołajskie Lake, 1972; 5 — the Mikołajskie Lake, 1974; 6 — the Niegocin Lake, 1972

Usually *D. polymorpha* settling down on the shell of the Unionidae append concomitantly with their byssus filaments plant remnants, pebbles, empty shells of various species of snails or bivalves, etc. Among the affixed animals there were numerous Hydrozoa, Turbellaria, Hirudinea, *Asellus aquaticus*, larvae of Chironomidae and Ephemeroptera, Gastropoda, and now and then, molluscs of the Sphaeriidae family and many other groups of invertebrate organisms. The specific fauna accompanying communities of *D. polymorpha* overgrowing submerged stones was described by Dusoge (1966). In comparison with the weight of *D. polymorpha* communities attached to Unionidae the value of the biomass of the accompanying fauna is very small.

B. THE EFFECT OF *D. POLYMORPHA* ON UNIONIDAE

It seems that such an intense overgrowth of Unionidae with *D. polymorpha* may have a substantial effect on the growth of Unionidae and all the more so as *D. polymorpha* settles down practically only in the region of their siphons. Consequently, a greater number of the attached *D. polymorpha* may impede the inflow of the water into the Unionidae siphons. Moreover, if one takes into account, additionaly, the fact that *D. polymorpha* is also a filtrator feeding on the same kind of food as Unionidae then one may suggest that the water with seston flowing into

Table I. Comparison of the mean weight of the shell and dry body weight of *A. piscinalis* intensely overgrown with *D. polymorpha* (A) and those not overgrown at all or overgrown only to a slight degree (B). (The Mikołajskie Lake, in 1972)

Body length of *A. piscinalis* (m)	Mean length of an individual (mm)		Number of analysed individuals		Weight of the shell (g)		Weight of the body (g)	
	A	B	A	B	A	B	A	B
45–49	46.7	46.5	10	11	2.57	2.26	0.36	0.32
50–54	51.9	52.1	20	11	4.04	3.42	0.52	0.43
55–59	57.0	57.1	22	12	4.91	4.59	0.56	0.64
60–64	61.6	62.0	20	11	6.79	6.21	0.71	0.69
65–70	67.4	67.3	24	13	8.35	7.81	0.93	0.91
Differences			$n_A = 96$	$n_B = 58$	$\overline{W}_A = 5.73$ S^2_A* $= 5.058$ d** $= 2.1282$ significant at the 5 per cent level	$\overline{W}_B = 4.96$ $S^2_B = 4.578$	$\overline{W}_A = 0.65$ $S^2_A = 0.0635$ $d = 0.8756$ non significant	$\overline{W}_B = 0.61$ $S^2_B = 0.0828$

* S^2 — variance.
** d — comparison of means of means of two large samples (Bailey 1959).

the inlet siphon of Unio or Anodonta overgrown with *D. polymorpha* may be impoverished in nutrient substances.

To ascertain whether the settling down of *D. polymorpha* on Unionidae has an unfavourable effect on them special measurements were performed in various age groups of *A. piscinalis*, differing in length one from another by 5 mm, analysing the mean dry body weight and the mean weight of the shells of individuals intensely overgrown with *D. polymorpha* (dozens of them attached to one Unionidae) — Group A. Analogical measurements were carried out in respect of individuals of Unionidae not overgrown or only slightly overgrown with *D. polymorpha* — Group B (Tab. I). An intense overgrowing with *D. polymorpha* appeared not to have any unfavourable effect on the mean dry body weight of *A. piscinalis* (Group A). Its value quite often exceeded the analogical value of the mean dry body weight of *A. piscinalis* from the Group B. On the other hand, a tendency was observed towards a greater weight of the shells of individual Unionidae intensely overgrown with *D. polymorpha*, which means that the thickness of their shells has increased.

A comparison of the mean length values of the shells of *A. piscinalis* shows an inhibiting effect of *D. polymorpha* on the growth of the young age groups of *A. piscinalis* (up to 4-year-old) (Tab. II). In older individuals even a great number of the attached *D. polymorpha* does not inhibit the process of growth.

Table II. Comparison of the mean length of the shell of *A. piscinalis* intensely overgrown with *D. polymorpha* (A) and not overgrown at all (B) (The Mikołajskie Lake, in 1972)

Age-groups of *A. piscinalis* (years)	Number of analysed individuals		Length of the shell (mm)	
	A	B	A	B
3	10	17	39.0*	44.3*
4	30	18	49.9**	56.0**
5	34	23	59.0	60.0
6	39	12	64.5	65.0
7	11	10	73.8	74.1

* differences significant at the 5 per cent level (*t*-test).
** differences significant at the 1 per cent level.

A distinct effect of the presence of *D. polymorpha* colony on the examined specimens is sometimes evident in a strong deformation at the posterior (siphon) part of their shells. In the Mikołajskie Lake the deformation of the shell was found only in the *A. piscinalis* species, which has a considerably thinner and more fragile shell than other species of the Unio genus. The deformation of the shells consists, above all, in formation of hollows and bulges on their surface, bending of the shell-edge and a general change of the shape of the siphon part of the shell, as compared with the normal, typical shells. On the specimens with deformed shells a particularly great number of the settled down *D. polymorpha* was recorded. This phenomenon, however, is not very common — in the whole material under examination merely

Differences	$n_A = 96$ $n_B = 58$	$\bar{W}_A = 5.73$ $S_A^{2*} = 5.058$ $d^{**} = 2.1282$ significant at the 5 per cent level	$W_B = 4.96$ $S_B^2 = 4.578$	$W_\Delta = 0.62$ $S_\Delta^2 = 0.0635$ $d = 0.8756$ non significant	$W_{\Delta_{\max}} = 1.151$ $S_{\Delta_{\min}}^2 = 0.0828$

* S^2 — variance.
** d — comparison of means of two large samples (Bailey 1959).

8 individuals were found with such deformations and the comparison of their weight with that of the individuals of the same body length but less strongly overgrown with *D. polymorpha* showed once more that the attached *D. polymorpha*, apart from a slight effect on the increase in the weight of the shell, did not exert any marked effect on the body weight of *A. piscinalis*.

Similar deformations were also observed in the case of *D. polymorpha*. This occurs in the individuals found in deeper layers of the densely packed colonies and the deformations are caused by a constant, mutual squeeze between the neighbouring individuals (Wiktor 1969).

C. PREFERENCES IN THE SETTLING DOWN OF *D. POLYMORPHA*

Among different notions concerning the mobility of *D. polymorpha* the prevailing opinion is that mainly young individuals are moving around. It is quite obvious that the motion of the individuals living deep-seated within a community and forming strong byssus interconnections is rendered difficult. *D. polymorpha*, however, being able to dissolve byssus filaments retains its ability to move around in the older age, as well, which is evidenced in the observations of the aquariums or in simple field experiments. A series of tests were made by means of submerging various substrata in the lake. For instance, a brick was placed at the bottom of the Mikołajskie Lake, at the depth of 1.5 m, and in the course of two months (from May to July) over 100 *D. polymorpha* individuals have settled down on it. In the greatest part (56%) these were young individuals up to 12 mm in length, nevertheless, there were also present the oldest individuals — over 20 mm in length (6%). Thus, *D. polymorpha* may remain mobile and change its settling places practically throughout its whole life.

It is known from the literature that young postweligers are settling down on various substrata, selectively, and that some kinds of the substrata are preferential (Walz 1973). About the adult individuals nothing is known as regards this matter. To make sure whether there exists a preference in settling down of the adult *D. polymorpha* on the bivalves of Unionidae family, as compared with other hard substrata (such as, empty shells of Unionidae and stones) a series of laboratory experiments was carried out.

The observations showed that *D. polymorpha* settles down more frequently and in greater numbers on live Unionidae than on empty shells or stones (Tab. III). The readings recorded after 2 months were different from the results obtained after 3 days and 20 days following the introduction of the examined *D. polymorpha* into the aquariums, so they show motility during the whole stay in the aquariums. If one takes under consideration those cases in which a greater number of *D. polymorpha*, i.e. more than 15 individuals, were attached to a stone, an empty shell, Unio or Anodonta, then it becomes evident that in case of stones this occurs only in 5.7% of cases in relation to the total number of readings (the highest number of the settled down *D. polymorpha* was 21); in case of empty shells of Unionidae — in 9.0% of cases (the maximum number of *D. polymorpha* — 24); whereas in case

of live Unionidae the percentage amounted to 28.8 % (the maximum of the attached *D. polymorpha* was 36).

In case when Unionidae are replaced by aggregates of large individuals of *D. polymorpha*, its empty shells and pebbles (Tab. III), then, likewise, *D. polymorpha* settles down mainly on live specimens used as substratum (at the outmost 35 individuals per 5 *D. polymorpha*). On the empty shells and on the pebbles *D. polymorpha* are settling down less intensely (at the outmost 12 individuals per 5 shells, each, or per 3 pebbles, each). The results of this last experiment proves that an already well-formed colony may exert an attractive effect on the single individuals of *D. dolymorpha*.

Table III. Settling down of *D. polymorpha* on various substrata in the experimental aquariums

Duration of experiments	Mean number of *D. polymorpha* settled down on:		
	live Unionidae	the shells of Unionidae	the stones
3 days	10	7	6
20 days	10	7	5
2 months	13	6	9
	D. polymorpha colonies	*D. polymorpha* shells	pebbles
20 days	14	3	4

4. DISCUSSION

An abundant overgrowth of Unionidae with *D. polymorpha* in great numbers was observed by various authors. For instance — in the Kortowskie Lake (Mazurian Lakeland) *D. polymorpha* was found on 41 % of the total number of Unionidae individuals (Widuto, Kompowski 1968). As a matter of fact, many cases of a much more intense overgrowth of Unionidae with *D. polymorpha* were described. Wagner (1936) reports that up to 1000 specimens of the settled down *D. polymorpha* may be found on an individual *Anadonta cygnea* L. Several hundreds of *D. polymorpha* individuals are attached to each of a few specimens of Unionidae collected from the Balaton Lake (Hungary) and photographed by Sebestyén (1935). The data from literature, observations from the Mazurian Lakes, as well as the laboratory experiments, indicate alike that *D. polymorpha* prefers to use as a substratum live bivalves, both, the Unionidae and the already formed colonies of *D. polymorpha*, as well.

Giving a careful consideration to the causes of this phenomenon the motility of Unionidae should be taken into account (some slight mobility was observed even in the experimental aquariums), owing to their ability to move around they have greater possibilities to get in touch with *D. polymorpha* than with still objects

or motionless substrata. It seems that mobility of Unionidae may have a substantial significance for *D. polymorpha* settling down on them — it may render easier for *D. polymorpha* to find better environmental conditions in various seasons of the year.

In the Mikołajskie Lake, stones — another kind of the substratum suitable for *D. polymorpha* — are found in the shallow places, which at a low water-level and freezing of the water in the lakes in winter, many a time deep downwards to the depth of scores of centimetres, certainly does not create favourable conditions for these animals. Aquatic plants are a relatively short-lasting substratum. On the other hand, in deeper places of the lakes with muddy bottom Unionidae may be practically the only hard substratum available for the settling down *D. polymorpha* individuals.

Bivalves from the Unionidae family live from a few to several years and during all that time they are exposed to the settling down of *D. polymorpha*, which is evidenced by the fact that the number of the settled down *D. polymorpha* is proportional to the age of *A. piscinalis*.

All these aspects may, therefore, play some role in the mass-overgrowth of live Unionidae with *D. polymorpha*.

It seems, however, that besides all that the regions of the siphons are as a settling place exceptionally favourable for *D. polymorpha* from the trophic point of view. As results from the field observations in case of the Unionidae overgrown with *D. polymorpha* only to a small extent single specimens of *D. polymorpha* are settling down close to the edge of the shells, just round the siphons, though there is plenty of room nearby. Therefore, likely enough, it is not only a question of a hard substratum.

In the present considerations one cannot rule out a possibility of some advantages, which the Unionidae overgrown with *D. polymorpha* may benefit by, e.g. something of the kind like directing a stream of water with seston by *D. polymorpha* colonies making it more easily accessible to the Unio or Anadonta species. In the present investigations no radically negative effect of *D. polymorpha* was observed in relation to the entire populations of Unionidae. Solely, a slight negative effect on the growth in length of the shells of younger individuals was observed (Tab. I), these animals, however, were for abvious reasons (small size and short life-time) least frequently overgrown with *D. polymorpha* (Fig. 2). Even in the individuals with deformed shells, to which *D. polymorpha* colonies were most certainly attached for several years, it was not possible to detect any marked differences in their weight, as compared with individuals of the same body length but considerless intensely overgrown with *D. polymorpha*.

If the settled down *D. polymorpha* would impede mechanically the inflow of food for the overgrown individuals of Unionidae then, as it seems, in such situation Unionidae could filtrate more intensely and for a longer time. The phenomenon of a more intense filtration at a lower concentration of the accessible food was previously observed in some other bivalves, such as: *D. polymorpha* (Micheev 1966) and *Sphaerium corneum* L. (Mitropolskij 1966). Therefore, the food intake by Unionidae, overgrown and non-overgrown with *D. polymorpha*, may be similar

in quantity, hence, no differences were observed in the body length or body weight of these two groups of Unionidae.

Thus, it seems that between the bivalves of the Unionidae family and *D. polymorpha* settled down on their shells the arising interrelations do not have necessarily a competitive character or at least are not thoroughly base on competition. Probably, it would be possible to find other types of correlations between tham (e.g. neutrality, commensalism, or else protoco-operation).

5. SUMMARY

In the Mikołajskie Lake, as well as, in the four other Masurian Lakes (Bełdany, Jagodne, Niegocin and, Śniardwy) the occurrence of the phenomenon of the mass-overgrowth of bivalves of the Unionidae family with *Dreissena polymorpha* Pall was investigated. It has been determined that in the Mikołajskie Lake, in 1972, 85% of the total number of the examined Unionidae had *D. polymorpha* attached to them, on the average 20 individuals per one Unio or Anadonta. In 35% of Unionidae the biomass of the attached *D. polymorpha* was higher, often many times higher, than the biomass of the specimen overgrown with them.

The extent of the overgrowth of Unionidae with *D. polymorpha* is different at various depths of the lake (the highest at the depth of 1.5 m), in various lakes and in various years and is proportional to the density of *D. polymorpha* population at a given depth, at a given water body and, a given year.

A markedly distinct unfavourable effect of an intense overgrowth with *D. polymorpha* on the body growth and body weight of Unionidae, to which they were attached, was not observed.

Laboratory experiments were carried out to ascertain the preference of *D. polymorpha* in settling down on various substrata. It was demonstrated that live Unionidae and already formed *D. polymorpha* colonies were preferential — empty shells of the bivalves and stones were less intensely overgrown.

A hypothesis was set forth that the interrelations between *D. polymorpha* and Unionidae do not have necessarily a competitive character.

ACKNOWLEDGMENTS

My grateful thanks are due to Dr. Anna Stańczykowska and Dr. Ewa Kamler for their help and most valuable advice and to Mr. Zygmunt Fąfara, M.Sc., for his contribution in the underwater collection of the materials.

6. STRESZCZENIE

W Jeziorze Mikołajskim oraz w 4 innych jeziorach mazurskich (Bełdany, Jagodne, Niegocin, Śniardwy) stwierdzono występowanie zjawiska masowego opanowania małży z rodziny Unionidae przez *Dreissena polymorpha* Pall. Określono, że w Jeziorze Mikołajskim w roku 1972 85% wszystkich Unionidae miało na sobie przytwierdzone *D. polymorpha*, średnio po 20 osobników na Unio lub Andonta. U 35% Unionidae biomasa osiadłych *D. polymorpha* przewyższa, często wielokrotnie, biomasę opanowanego przez nie osobnika.

Stopień opanowania Unionidae przez *D. polymorpha* jest różny na różnych głębokościach (największy na głębokości 1.5 m), w różnych jeziorach i w różnych latach i proporcjonalnie zależny od liczebności *D. polymorpha* na danej głębokości, w danym zbiorniku i w danym roku.

Nie stwierdzono aby intensywne opanowanie przez *D. polymorpha* wpływało wyraźnie niekorzystnie na wzrost i ciężar ciała Unionidae.

Wykonano eksperymenty laboratoryjne nad wybiórczością osiedlania się *D. polymorpha* na różnych podłożach. Preferowane okazały się żywe Unionidae i ukształtowane kolonie *D. polymorpha*, słabiej zasiedlane były puste muszle małży i kamienie.

Wysunięto hipotezę, że stosunki panujące między *D. polymorpha* a Unionidae nie muszą mieć charakteru konkurencji.

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