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ANNUAL ZOOBENTHOS DEVELOPMENT OF THE PONDS LEDNICKÉ RYBNÍKY

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Abstract

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The ponds of Lednice are situated in the area „Lednicko-valtický areál", which is included in the World Heritage List of UNESCO.
The aim of this essay was monitoring of seasonal dynamic zoobenthos development in the ponds Lednické rybníky over the years 2006–2007 and performance of qualitative and quantitative analysis of taken samples. The research was realized on ponds Nesyt, Hlohovecký, Prostřední, Mlýnský and Zámecký. Samples of macrozoobenthos were taken in monthly intervals. Qualitative studies of samples have shown 112 taxa of bentic macroinvertebrates in the localities mentioned above, 17 taxa were determined for the first time. Total number of benthic macroinvertebrates taxa known in the locality Lednické rybníky rose to 316 taxa. The values of macrozoobenthos density and biomass ranged between 22–15 667 ind.m^{-2} and 0.05–40.2 g.m^{-2}, respectively.
With respect to the fact that only few researches with a focus on quality of macrozoobenthos in ponds of Lednice were realized, this research could bring supplementary information about the situation of benthic macroinvertebrates in the studied localities in new conditions of fish farming.

the ponds Lednické rybníky, macrozoobenthos, species composition, density, biomass

This thesis is a follow-up to the study of the ponds Lednické rybníky (Sukop, 2007). The aim of this research was monitoring seasonal cycle of macrozoobenthos in five ponds of Lednice pond system in new conditions of fish-farming. There were only a few researches with focus on zoobenthos quantity realized in contrast to qualitative researches. Solely data about quantitative and qualitative indicators mention Sukop (1974, 2007) and Báňa (1999).

MATERIAL AND METHODS

The samples of macrozoobenthos were taken of by classical limnological methods in monthly intervals over two years (2006–2007) in five selected localities (ponds Nesyt, Hlohovecký, Prostřední, Mlýnský and Zámecký). There were two withdrawal places selected in each locality.

Limnologic sieve with mesh size 0.25 mm and anatomical tweezers were used to taking qualitative samples. Samples were fixated with 4% formaldehyde after sampling. Subsequently, they were worked up in laboratory and determined.

Ekman-Birge dredge with working extent of 225 cm^2 were used to quantitative sampling. Taking of the samples were realized on particular fishponds from the skiff. A mixed sample of 500 cm^2 was taken from each withdrawal place, then silt was removed from the sample by rinsing in sieve with mesh size of 0.25 mm. This sample was kept in plastic bag and fixated with 4% formaldehyde. Individual organisms were taken out to small bottles by subsequent laboratory processing and they were again fixated. Further, individuals were counted, classed to taxonomical groups and samples were weighted (after three months since the material was fixated). Based on these noted values abundance and biomass were determined.

The physic-chemical characteristics of the water (temperature, pH, conductivity, oxygen, transparency) were measured as well.

Following apparatus were used by measuring of above mentioned characteristics:

Temperature, pH, conductivity – Combo pH & EC by firm HANNA
Oxygen – oximetre HANNA HI 9146-04
Transparency of water – has been assessed by Secchi disc.

RESULTS AND DISCUSSION

THE PHYSIC-CHEMICAL CHARACTERISTICS

The physic-chemical characteristics of aquatic environment can have considerable effect on species composition and zoobenthos quantity. Hence, there were also following parameters measured over the whole period of research, see Tab. I–V.

I: *The physic-chemical characteristics in the pond Nesyt in years 2006–2007*

Date	temperature °C	transparency cm	pH	oxygen mg.l^{-1}	oxygen %	conductivity µS.cm^{-1}
23. 6. 2006	20.5	75	7.9	5.13	65.2	1365
11. 7. 2006	22.6	45	8.4	8.01	87.1	1321
1. 8. 2006	19.6	35	8.7	6.28	89.4	1242
4. 9. 2006	17.4	25	8.4	9.86	102.9	1298
2. 10. 2006	13.9	60	7.9	8.41	92.2	1180
27. 3. 2007	10.3	95	9.1	12.09	152.0	1229
23. 4. 2007	16.7	80	8.7	10.32	118.0	1232
28. 5. 2007	19.5	65	8.2	8.81	92.0	1256
25. 6. 2007	23.8	35	8.2	7.13	66.0	1386
23. 7. 2007	25.1	30	8.0	3.21	41.0	1429
27. 8. 2007	22.8	25	8.1	6.50	84.0	1654
24. 9. 2007	16.1	45	8.7	7.16	85.0	1693
22. 10. 2007	13.2	65	8.0	6.82	74.0	1548

II: *The physic-chemical characteristics in the pond Hlohovecký in years 2006–2007*

Date	temperature °C	transparency cm	pH	oxygen mg.l^{-1}	oxygen %	conductivity µS.cm^{-1}
25. 6. 2006	19.6	55	8.1	4.38	62.7	1195
11. 7. 2006	23.1	45	8.3	6.05	68.4	1269
1. 8. 2006	19.8	40	8.6	6.24	89.6	1281
5. 9. 2006	18.7	40	8.4	11.52	124.2	1288
3. 10. 2006	14.3	65	7.9	9.42	105.1	1169
28. 3. 2007	10.2	80	8.9	10.13	105.0	1410
24. 4. 2007	16.4	75	8.7	8.79	94.0	1347
29. 5. 2007	19.8	60	8.4	8.61	87.0	1287
26. 6. 2007	23.3	45	8.6	9.70	91.0	1323
24. 7. 2007	24.9	25	8.5	5.48	61.0	1382
28. 8. 2007	23.7	40	8.6	17.68	118.0	1407
25. 9. 2007	14.4	55	9.4	6.92	72.0	1420
23. 10. 2007	12.5	70	8.9	9.27	98.0	1433

III: *The physic-chemical characteristics in the pond Prostřední in years 2006–2007*

Date	temperature °C	transparency cm	pH	oxygen mg.l^{-1}	oxygen %	conductivity µS.cm^{-1}
25. 6. 2006	20.4	65	8.0	6.43	98.8	1327
12. 7. 2006	23.8	55	8.6	9.40	102.5	1304
2. 8. 2006	21.1	50	8.8	7.52	111.2	1169
5. 9. 2006	19.2	45	8.6	8.59	106.4	1245
3. 10. 2006	14.2	55	8.2	9.61	109.7	1298
28. 3. 2007	10.4	85	8.8	9.74	98.0	1325
24. 4. 2007	16.2	70	8.5	6.98	73.0	1341
29. 5. 2007	19.3	65	8.2	7.01	68.0	1353
27. 6. 2007	23.6	55	8.8	4.68	52.0	1322
25. 7. 2007	25.4	50	8.6	3.92	47.0	1285
29. 8. 2007	23.2	55	8.7	8.76	89.0	1342
26. 9. 2007	15.0	55	9.2	7.38	76.0	1337
24. 10. 2007	12.6	65	9.1	9.07	91.0	1349

IV: *The physic-chemical characteristics in the pond Mlýnský in years 2006–2007*

Date	temperature °C	transparency cm	pH	oxygen mg.l^{-1}	oxygen %	conductivity µS.cm^{-1}
24. 6. 2006	21.5	60	8.1	8.76	108.4	1296
12. 7. 2006	24.2	45	8.4	12.01	132.2	1259
3. 8. 2006	21.0	40	8.7	8.59	120.8	1112
6. 9. 2006	19.8	40	8.5	6.94	91.7	1275
4. 10. 2006	15.3	60	8.3	9.27	116.4	1308
28. 3. 2007	10.5	90	8.8	10.48	113.0	1370
25. 4. 2007	16.7	75	8.7	9.32	97.0	1345
30. 5. 2007	20.0	70	8.6	5.48	82.0	1292
27. 6. 2007	24.1	60	8.3	9.81	95.0	1377
25. 7. 2007	25.5	55	8.5	5.23	54.0	1322
29. 8. 2007	23.8	65	8.6	11.85	123.0	1368
26. 9. 2007	15.6	75	8.9	3.37	39.0	1361
24. 10. 2007	12.8	85	8.8	8.22	83.0	1372

V: *The physic-chemical characteristics in the pond Zámecký in years 2006–2007*

Date	temperature °C	transparency cm	pH	oxygen mg.l^{-1}	oxygen %	conductivity µS.cm^{-1}
26. 6. 2006	22.1	85	7.9	3.60	50.2	589
13. 7. 2006	23.4	70	8.1	11.02	140.1	471
4. 8. 2006	20.6	55	8.5	7.95	92.7	453
7. 9. 2006	18.1	75	8.2	10.82	118.5	542
5. 10. 2006	13.5	120	8.1	9.16	80.9	576
29. 3. 2007	9.7	150	8.7	12.97	121.0	626
26. 4. 2007	15.2	120	8.9	9.61	96.0	667

Date	temperature °C	transparency cm	pH	oxygen mg.l^{-1}	oxygen %	conductivity µS.cm^{-1}
31. 5. 2007	20.6	120	8.8	8.74	92.0	628
28. 6. 2007	24.4	110	8.5	5.46	58.0	645
26. 7. 2007	25.2	100	8.6	5.12	56.0	634
30. 8. 2007	23.9	85	8.3	9.87	118.0	632
27. 9. 2007	14.6	95	9.5	12.80	122.0	607
25. 10. 2007	12.1	120	8.9	10.63	107.0	568

Species composition of zoobenthos of the ponds Lednické rybníky

Zoobenthos of the ponds Lednické rybníky is in terms of qualitative composition monitored since 1916. Detailed summary of species composition from 1916 to 1999 in these localities states Opravilová *et al.* (1999). Over this long period 299 zoobenthos taxa were determinated in fish-pond system Lednické rybníky. During our research realized in years 2006–2007 112 of taxa were identified, whereas 17 of them were determined for the first time. Therefore, number of benthic water invertebrate organisms taxa, which were discovered in ponds Lednické rybníky, has increased to 316 until now.

Presence of species in every single pond during years 2006–2007 is stated in abbreviations of titles of particular localities: Nesyt = N, Hlohovecký = H, Prostřední = P, Mlýnský = M, Zámecký = Z. Organisms inscribed with underlined letter are taxa that were shown in ponds Lednické rybníky for the first time.

Hydrozoa: *Hydra* sp. – P, M, Z

Turbellaria: *Dugesia polychroa* – Z

Oligochaeta: *Criodrilus lacuum* – P, Z, *Dero* sp. – H, P, *Chaetogaster* sp. – N, H, P, M, Z, *Gordius* sp. – Z, *Limnodrilus claparedeanus* – N, *L. hoffmeisteri* – N, *L.* sp. – N, H, P, M, Z, *Nais* sp. – N, H, P, M, Z, *Stylaria lacustris* – N, H, P, M, Z, *Tubifex tubifex* – N, H, P, M, Z

Hirudinea: *Helobdella stagnalis* – N, H, P, M, Z, *Hemiclepsis marginata* – N, H, M, Z, *Erpobdella octoculata* – N, H, P, M, Z, *Glossiphonia complanata* – H, Z, *G. heteroclita* – N, P, M, *Piscicola geometra* – N, Z, *Theromyzon tessulatum* – N, H, P, Z

Gastropoda: *Acroloxus lacustris* – N, Z, *Anisus vortex* – Z, *A. vorticulus* ? – Z, *Bythinia tentaculata* – H, P, M, Z, *Lymnaea peregra* – N, P, M, Z, *L. stagnalis* – N, H, P, M, Z, *Physa fontinalis* – N, H, P, M, Z, *Physella acuta* – N, H, P, M, Z, *Planorbarius corneus* – P, Z, *Valvata piscinalis* – N, Z

Bivalvia: *Musculium lacustre* – Z

Isopoda: *Asellus aquaticus* – N, H, P, M, Z

Amphipoda: *Gammarus roeselii* – P

Ephemeroptera: *Caenis robusta* – N, H, P, M, Z, *Cloeon dipterum* – N, H, P, M, Z

Odonata: *Aeshna grandis* – Z, *Anax imperator* – P, *Cordulia aenea* – P, Z, *Crocothemis erythrea* – H, Z, *Enallagma cyathigerum* – H, P, Z, *Ischnura elegans* – Z, *I. pumilio* – N, H, P, Z, *Platycnemis pennipes* – N, *Somatochlora metallica* – Z, *Sympecma fusca* – P, *Sympetrum danae* – Z

Heteroptera: *Gerris* sp. – M, *Ilyocoris cimicoides* – H, P, Z, *Nepa cinerea* – N, P, Z, *Plea minutissima* – Z, *Ranatra linearis* – Z

Megaloptera: *Sialis lutaria* – N, H, P, M, Z

Lepidoptera: *Acentria ephemerella* – Z, *Acentropus niveus* – Z, *Cataclysta lemnata* – Z, *Parapoynx stratiotatum* – Z

Trichoptera: *Athripsodes aterrimus* – Z, *Cyrnus crenaticornis* – M, Z, *Ecnomus tenellus* – N, *Holocentropus dubius*? – Z, *H. picicornis* – Z, *Grammotaulius nigropunctatus* – M, *Leptocerus tineiformis* – Z, *Limnephilus* sp. (*decipiens*?) – H, *Mystacides longicornis* – N, P, Z, *Oecetis furva* – N, *O. ochracea* – N, H, P, M, Z

Coleoptera: *Berosus luridus* – N, *B. spinosus* – H, *Haliplus* sp. – P, Z, *Helodes* sp. – M, *Hyphydrus ovatus* – M, Z, *Laccophilus minutus* – N, H, Z, *Limnebius pappus* – Z

Diptera: Chironomidae: *Ablabesmyia monilis* ? – Z, *Apsectrotanypus trifascipennis* – H, M, *Cladopelma* gr. *viridula* – N, H, P, M, Z, *Cladotanytarsus* gr. *mancus* – N, H, P, M, Z, *Cricotopus* sp. – N, H, M, Z, *Cryptochironomus* gr. *defectus* – N, H, P, M, Z, *Chironomus* gr. *plumosus* – N, H, P, M, Z, *Ch.* gr. *reductus* – P, Z, *Ch.* gr. *semireductus* – N, H, P, M, Z, *Ch.* gr. *tentans* – M, Z, *Ch.* gr. *thummi* – M, *Dicrotendipes nervosus* – N, H, P, M, Z, *Einfeldia* gr. *pagana* – H, P, M, Z, *E.* gr. *pectoralis* – N, H, P, M, Z, *Endochironomus* gr. *nymphoides* – N, H, P, Z, *Glyptotendipes barbipes* – N, H, P, M, Z, *G.* gr. *gripekoveni* – N, H, P, M, Z, *Harnischia* gr. *conjugens* – H, *Macropelopia nebulosa* – N, H, P, M, Z, *Orthocladinae* g. sp. – N, P, *Parachironomus* gr. *cryptotomus* – N, H, P, M, Z, *Paratanytarsus* gr. *lauterborni* – Z, *Polypedilum* gr. *convictum* – N, H, P, M, *P. laetum* – Z, *P.* gr. *nubeculosum* – N, H, P, M, Z, *P. pedestre* – Z, *P.* gr. *scalaenum* – H, P, *Procladius* sp. – N, H, P, M, Z, *Psectrocladius psilopterus* – M, *Psectrotanypus varius* – N, *Tanypus kraatzi* – H, M, Z, *T. punctipennis* – N, H, P, M, Z, *T. vilipennis* – H, *Tanytarsus* gr. *gregarius* – H, *Ceratopogonidae* g. sp. – N, H, P, M, Z, **Chaoboridae:** *Chaoborus crystallinus* – Z, **Stratiomyidae:** *Odontomyia angulata* – Z, *Stratiomys furcata* – P, **Limoniidae:** *Eriptera* sp. – P, *Helius* sp. – H

Quantity of the zoobenthos

Tab. VI–X describe course of the quantitative values in all of the monitored ponds. Values regarding each date are averages of two samplings performed in all fish-ponds.

Average value of zoobenthos density in the pond Nesyt during years 2006–2007 reached 1 838 ind.m^{-2},

VI: *Density (D = ind.m^{-2}) and biomass (B = g.m^{-2}) of zoobenthos in the pond Nesyt during years 2006–2007*

Date of sampling	D	B
31. 5. 2006	1478	5.35
23. 6. 2006	645	6.65
11. 7. 2006	334	2.10
1. 8. 2006	411	1.05
4. 9. 2006	300	1.35
2. 10. 2006	1056	4.45
27. 3. 2007	1289	5.55
23. 4. 2007	2533	5.45
28. 5. 2007	1434	2.35
25. 6. 2007	1856	3.60
23. 7. 2007	7122	20.10
27. 8. 2007	2256	10.00
24. 9. 2007	3478	4.90
22. 10. 2007	1533	4.70

VII: *Density (D = ind.m^{-2}) and biomass (B = g.m^{-2}) of zoobenthos in the pond Hlohovecký during years 2006–2007*

Date of sampling	D	B
25. 6. 2006	867	8.00
11. 7. 2006	489	3.60
1. 8. 2006	123	0.30
5. 9. 2006	622	0.65
3. 10. 2006	1089	1.70
27. 3. 2007	1589	2.20
24. 4. 2007	15667	32.45
29. 5. 2007	5234	24.30
26. 6. 2007	5800	4.10
24. 7. 2007	1144	3.90
28. 8. 2007	1378	2.45
25. 9. 2007	2467	6.10
23. 10. 2007	2286	5.10

VIII: *Density (D = ind.m^{-2}) and biomass (B = g.m^{-2}) of zoobenthos in the pond Prostřední during years 2006–2007*

Date of sampling	D	B
25. 6. 2006	1156	5.10
12. 7. 2006	467	0.95
2. 8. 2006	22	0.05
5. 9. 2006	367	1.10
4. 10. 2006	2833	4.35
28. 3. 2007	467	2.55
24. 4. 2007	3712	9.00
29. 5. 2007	8500	17.75
27. 6. 2007	8200	14.30
25. 7. 2007	4089	13.30
29. 8. 2007	3223	2.20
26. 9. 2007	2167	2.90
24. 10. 2007	2200	10.00

IX: *Density (D = ind.m^{-2}) and biomass (B = g.m^{-2}) of zoobenthos in the pond Mlýnský during years 2006–2007*

Date of sampling	D	B
24. 6. 2006	1378	24.70
12. 7. 2006	289	0.75
3. 8. 2006	189	0.20
6. 9. 2006	978	1.35
4. 10. 2006	312	1.70
28. 3. 2007	278	3.30
25. 4. 2007	10834	40.20
30. 5. 2007	12912	17.30
27. 6. 2007	589	4.30
25. 7. 2007	2978	6.25
29. 8. 2007	467	5.20
26. 9. 2007	4834	7.00
24. 10. 2007	1478	4.45

X: *Density (D = ind.m^{-2}) and biomass (B = g.m^{-2}) of zoobenthos in the pond Zámecký during years 2006–2007*

Date of sampling	D	B
25. 5. 2006	2244	12.20
26. 6. 2006	678	3.80
13. 7. 2006	434	2.15
4. 8. 2006	967	4.65
7. 9. 2006	933	5.45
5. 10. 2006	828	13.45
29. 3. 2007	489	10.40

Date of sampling	D	B
26. 4. 2007	3033	39.25
31. 5. 2007	722	7.00
28. 6. 2007	1300	23.45
26. 7. 2007	433	4.65
30. 8. 2007	811	6.45
27. 9. 2007	1500	35.30
25. 10. 2007	722	8.30

average value of biomass 5.5 g.m^{-2}. Average density of zoobentos in the pond Hlohovecký was 2 981 ind.m^{-2}, biomass 7.3 g.m^{-2}. Average density of zoobenthos in the pond Prostřední amounted 2 877 ind.m^{-2}, biomass 6.4 g.m^{-2}. There was an average value of zoobenhos density 2 886 ind.m^{-2} and average biomass 9 g.m^{-2} measured with respect to the Mlýnský pond. Average density in Zámecký pond was 1 078 ind.m^{-2}, average biomass 12.6 g.m^{-2}. Relatively high levels of zoobenthos biomass in this pond compared to other mentioned ponds were caused by increased incidence of the gastropods (*Planorbarius corneus, Valvata piscinalis*) in some periods of monitoring, e.g. April, June, September 2007. Biomass at these dates comprised also the weight of mollusc shells.

Size of fish stock and its predation pressure upon water invertebrates influence the quantity of zoobenthos as well. In autumn 2006 there were 135 980 kg of carp, 42 550 kg of bream and 4 840 kg of silver crucian carp fished out in the pond Nesyt. In 2007 bottom of this pond was dried and fish were planted into the residual water part according to a plan of care: 180 kg of tench, 100 kg of sole fish. Two rescue pond fishing outs were realized in consequence of drying-up of the pond during the summer period (in June and July) with following results: 5 220 kg of carp (residuum from 2006), 15 kg of tench and 50 kg of sole fish. There were 69 900 kg of the carp fished out from the Hlohovecký pond in autumn 2006 and in 2007 quantity of carp amounted 12 000 kg in this pond. As regards the Prostřední pond 9 000 kg of carp and 2 000 kg of white fish were fished out in autumn 2006. In 2007 fish stock of carp amounted about 3 000 kg. The quantity of carp fished out from the Mlýnský pond in 2006 was 43 200 kg. In 2007 the haul came to 37 400 kg of carp and 24 800 kg of crucian carp. The fish stock was not planted into the Zámecký pond over the monitored period, however, there are some fish present that enter this pond through tributary from river Dyje.

First data about the quantity of zoobenthos in the ponds Lednické rybníky published Sukop (1974). From 1968 to 1969 quantity of the zoobenthos was monitored in fingerling ponds, which are situated to the east of the pond Nesyt. Total density of zoobenthos in these ponds ranged between 326–13 021 individuals.m^{-2}, total biomass fluctuated between 6.5–79.6 g.m^{-2}. As the fingerling ponds differ from fish-farming ponds in many respects such as their character or present fish stock, we can not compare the zoobenthos quantity of each other.

Other quantitative data about the pond Nesyt were obtained in years 1995–1997 when only density of the zoobenthos was described. Density of zoobenthos fluctuated between intervals 5–4 547 individuals.m^{-2}. However, there were high fish stocks in the pond at this time, which could be the reason of occurrence of only 14 zoobenthos taxa during the monitored period.

Dynamic development of zoobenthos in Zámecký pond was researched within the frame of the thesis (Báňa, 1999). Total density of zoobenthos in this pond fluctuated between intervals 15–2 370 ind.m^{-2} in given period, total biomass ranged between 0.2–8 g.m^{-2}. There was a pure species spectrum noticed during this monitoring as well, only 14 taxa of zoobenthos were present.

According to Lellák (1958, 1961, 1978), zoobenthos density of carp ponds reaches it is maxima generally in autumn and at the beginning of winter (October–December) owing to the presence of young individuals from wintering generation. As the individual weight of zoobenthos is low, increase in density has only a small impact on values of zoobenthos biomass. Peak of the biomass values occurs in spring (February–April). There is a decrease of zoobenthos at the end of spring and during summer. This fact is caused by massive flight of the imagos and by higher predation of fish. The minimal values of density and biomass of zoobenthos are noticed most often in June and July. Values of biomass increase again in autumn due to the occurrence of the living mass of young individuals. The quantitative parameters can vary in each individual year.

For comparison of zoobenthos quantity of ponds Lednické ryníky with zoobenthos quantity of other ponds in Czech Republic we can use following data: Winkler (1951) performed monitoring of two ponds (Velký Pálenec and Hadí) near town Blatná. He detected 21 species of zoobenthos in the first studied pond, density was 1225 ind.m^{-2}, biomass 8.5 g.m^{-2}. In the second pond he determined 25 kinds of zoobenthos, density was 1 100 ind.m^{-2}, biomass 8.8 g.m^{-2}. Laupy (1970) monitored zoobenthos in the same locality. In the pond Hadí density fluctuated between 1 360–26 670 ind.m^{-2}, biomass between 3–75.7 g.m^{-2}. A research of the pond Žoldánka showed values of density between 700–1 374 ind.m^{-2}, biomass between 1.1–135.5 g.m^{-2}. Seďa (1985) monitored zoobenthos of two ponds in the surrounding of the town Znojmo. There were 54 taxa of zoobenthos found in the pond Karlov. Average zoobenthos density was 7 310 ind.m^{-2}, values fluctuated between 2 500–17 900 ind.m^{-2}, average biomass was 18.5 g.m^{-2} and ranged between 5.6–38.8 g.m^{-2}. As regards the pond Křídlovický 42 taxa were recorded, average density of zoobenthos amounted 1 550 ks.m^{-2} at intervals 150–7 500 ind.m^{-2}, average biomass was 4.9 g.m^{-2} and ranged between 0.5–22.5 g.m^{-2}. Losos, Pár (1971) studied zoobenthos of fingerling ponds near Jaroslavice. Density of zoobenthos fluctuated between 1 400–4 200 ind.m^{-2}, biomass between 10.1–18.9 g.m^{-2}.

In the plan of care for the nature preserve ponds Lednické rybníky in period 2007–2011 is considered that bottoms of individual ponds will be partly exposed, except for the pond Zámecký (ponds will not be drained absolutely, only margins of pond will be dried up). This problematic issue aroused an extensive dispute in the press in 2007. Hence, we add some commentary to this point.

Drying-up of ponds, which mentioned already Dubravius (1545) and later e.g. Kostomarov (1953),

can be considered as one of the oldest meliorating measure realized on ponds. This method of the meliorating preparation is based on draining the pond and exposing the mud bottom to climatic influences. Improvement of physical and chemical characteristics of pond bottom, acceleration of organic matters mineralization and elimination of the soft vegetation, fibrous algae or fish parasites and some pathogenic germs is achieved owing to this procedure. At present time, water level manipulation of ponds has primarily meliorating and hygienic function, in contrast to the past when a production importance predominated. Disadvantage of the summer drying-up of ponds is the fact that a loss of fish production occurs in respective vegetation period in comparison to winterizing of ponds. Janeček *et al.* (1966), Herzog (1970) and Herzog, Vavruška (1974) concerned with the issue of ponds drying-up in summer period in our conditions. Regeneration of zoobenthos after summer draining of ponds was monitored by e.g. Lellák (1966, 1969) and Matěna (1979). From their work follows that practically the entire fauna, except for a modicum of individuals on bottom of the fishpond tributary, perish during the pond drying-up. However, regeneration of zoobenthos after drying-up proceeds quickly, thus there is an incoming massive development of zoobenthos, imprimis of chironomids larvae, in several months after pond filling-up. Regeneration of permanent zoobenthos element runs much slower, as the colonization of newly filled pond is more difficult in their case.

It results from our collected data that there was no decrease in zoobenthos quantity in flooded part of pond during drying-up of the pond Nesyt in year 2007. Average value of zoobenthos density in 2006 was 704 ind.m^{-2} and average biomass 3.5 g.m^{-2}. Quantity of zoobenthos increased in both cases of density (2688 ind.m^{-2}) and also biomass (7.1 g.m^{-2}) in the following year 2007. This fact was evidently caused by low fish stock and low predation pressure upon zoobenthos. However, it can not be ruled out that quantitative parameters will be lower after filling-up the pond in the area which was drained in 2007, in accordance with the knowledge by Janeček *et al.* (1966) and other authors mentioned above.

Different aspects (botanical and ornitological) of the drying-up of the pond Nesyt in 2007 were described by Sychra *et al.* (2008). Their report shows that pond drying-up had a positive effect on ornitofauna. There was a nidation of some rare birds observed like e.g. pied avocet (*Recurvirostra avosetta*), common spoonbill (*Platalea leucorodia*), barnacle goose (*Branta leucopis*) etc. Botanical research of the pond Nesyt in 2007 proved occurrence of critically endangered species of plants e.g. swamp pricklegrass (*Heleochloa schoenoides*), meadow false fleabane (*Pulicaria dysenterica*), salt sandspurry (*Spergularia salina*), seaside brookweed (*Samolus valerandi*), narrow-leaf dock (*Rumex stenophyllus*), buttered goosefoot (*Chenopodium chenopodioides*) etc. on a pond bottom.

CONCLUSION

National natural preserve the ponds Lednické rybníky is in possession of state and under administration of Agency for nature conservation and landscape protection of the Czech Republic. From facts mentioned above follows that drying-up of the pond Nesyt had a substantial importance with respect to subject of protection in this locality, i.e. wetland birds and aquatic macrophytes.

That begs the question for the future if there will be enough water for filling-up of partly drained ponds in the case of assumed global warming and consequent aridisation of southern Moravia. This presented study can serve as a base for comparison of benthic circumstances of the ponds Lednické rybníky in new conditions of fish farming stated in the plan of care for period 2008–2011 (Heralt, Kmet, 2006).

SOUHRN

Roční cyklus zoobentosu Lednických rybníků

Lednické rybníky se nacházejí v oblasti Lednicko-Valtického areálu, jež je součástí světového kulturního a přírodního dědictví UNESCO. Rybniční soustava začíná největším moravským rybníkem Nesyt (325 ha), následují rybníky Hlohovecký (104 ha), Prostřední (48 ha) a Mlýnský (109 ha). Zámecký rybník (30 ha) již nepatří přímo do zmíněné soustavy, ale je rovněž řazen mezi Lednické rybníky. Tento rybník napájí řeka Dyje. Lednické rybníky jsou lokalizovány na slaném podloží a mají tedy vyšší salinitu, než je tomu u většiny rybníků na území ČR.

Cílem této práce bylo sledovat kvalitu a kvantitu zoobentosu v Lednických rybnících v průběhu dvou let (2006–2007) a měřit základní fyzikálně-chemické parametry vodního prostředí.

Kvalitativní a kvantitativní odběry vzorků zoobentosu byly zahájeny v červnu roku 2006 a ukončeny v říjnu roku 2007. Za tuto dobu bylo na pěti lokalitách odebráno celkem 195 vzorků, z čehož 130 bylo kvantitativních a 65 kvalitativních. Vzorky byly odebírány klasickými limnologickými metodami v měsíčních intervalech, následně laboratorně zpracovány a determinovány. Jako doprovodné byly měřeny základní fyzikálně-chemické parametry vodního prostředí.

Na vybraných lokalitách bylo v rámci tohoto výzkumu zjištěno 112 druhů zoobentosu, 17 druhů bylo determinováno v této oblasti poprvé. Celkový počet taxonů vodních bezobratlých determinovaných na Lednických rybnících tak vzrostl na 316. Abundance se pohybovala v rozmezí 22–15 667 ks.m^{-2},

biomasa nabývala hodnot 0,05–40,2 g.m^{-2}. Na zkoumaných rybnících dosahovaly kvantitativní ukazatele vyšších hodnot vždy na počátku a na konci vegetačního období, nejnižší byla abundance a biomasa v období letním. Tento fakt byl způsoben hromadným výletem imag vodního hmyzu koncem jara a zvýšeným predačním tlakem ryb v letních měsících.
Vzhledem k tomu, jak málo sledování se zaměřením na kvantitativní množství zoobentosu v lednických rybnících bylo doposud provedeno, přináší tento výzkum rozšíření informací o stavu vodních bezobratlých na sledovaných lokalitách v nových podmínkách hospodaření.

Lednické rybníky, zoobentos, druhové složení, abundance, biomasa

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