

# Contents

Introduction to the Ecology of Fishpond Littorals	
S. HEJNÝ and J. KVĚT (With 2 Figures) . . . . .	1
References . . . . .	9

## Section 1

### General Ecology and Inventarization of Biotic Communities

1.1 General Characteristics of the Třeboň Basin and Lednice Region	
Š. HUSÁK and S. HEJNÝ (With 5 Figures) . . . . .	13
1.1.1 Topography and Geomorphology . . . . .	13
1.1.2 Basic Data on the Geological Substrate, Soils and Hydrology . . . . .	15
1.1.3 Description of the Opatovický Fishpond . . . . .	19
1.1.4 Description of the Nesyt Fishpond . . . . .	21
1.2 Higher Plant Communities	
S. HEJNÝ and Š. HUSÁK (With 6 Figures) . . . . .	23
1.2.1 Variation of Plant Community Structures in Space and Time . . . . .	23
1.2.2 Outline of Littoral Macrophyte Communities . . . . .	26
1.2.2.1 General Remarks . . . . .	26
1.2.2.2 Survey of Individual Vegetation Types . . . . .	28
1.2.3 Floristic and Phytogeographical Characteristics of the Opatovický and Nesyt Fishponds . . . . .	59
1.2.4 Phytocenological Comparison of the Opatovický and Nesyt Fishponds . . . . .	62
1.3 Algal Populations Related to Different Macrophyte Communities	
P. MARVAN and J. KOMÁREK . . . . .	65
1.4 Aerial Photography and Mapping of Fishpond Vegetation	
P. ŠMÍD (With 1 Figure) . . . . .	71
1.5 Animal Populations in Fishpond Littorals	
J. PELIKÁN, K. HUDEC, and K. ŠŤASTNÝ (With 2 Figures) . . . . .	74
1.6 Decomposers in the Fishpond Littoral Ecosystem	
B. ŮLEHLOVÁ (With 3 Figures) . . . . .	80
1.7 Development of Wetland and Aquatic Vegetation in the Třeboň Basin Since the Late Glacial Period	
V. JANKOVSKÁ (With 2 Figures) . . . . .	88
References . . . . .	93

## Section 2

### Environmental Factors in Fishpond Littorals

2.1 Climatic Conditions . . . . .	99
2.1.1 Fundamental Climatological Characteristics K. PŘIBÁŇ and P. ŠMÍD (With 2 Figures) . . . . .	99
2.1.2 Microclimate in Fishpond Littoral Ecosystems P. ŠMÍD and K. PŘIBÁŇ (With 4 Figures) . . . . .	104
2.2 Radiation Climate in Fishpond Littoral Plant Communities J. P. ONDOK (With 9 Figures) . . . . .	113
2.3 Water Chemistry in the Fishpond Littorals B. ÚLEHLOVÁ and S. PŘIBIL (With 14 Figures) . . . . .	126
2.3.1 Nesyt Fishpond . . . . .	126
2.3.1.1 Material and Methods . . . . .	127
2.3.1.2 Spatial and Seasonal Variations of the Water Chemistry . . . . .	129
2.3.1.3 Transect Study of Variation in Phosphorus and Nitrogen Water Content . . . . .	133
2.3.2 Opatovický Fishpond . . . . .	138
2.4 Structure and Chemistry of the Fishpond Bottom D. DYKYJOVÁ and B. ÚLEHLOVÁ (With 8 Figures) . . . . .	141
References . . . . .	153

## Section 3

### Primary Production and Production Processes in Littoral Plant Communities

3.1 Plant Growth and Estimates of Production . . . . .	159
3.1.1 Intraspecific and Clonal Variability and Its Importance for Production Estimates . . . . .	159
D. DYKYJOVÁ (With 2 Figures) . . . . .	159
3.1.2 Selection of Sampling Areas in Assessment of Production J. P. ONDOK and J. KVĚT (With 3 Figures) . . . . .	163
3.1.2.1 Destructive Methods . . . . .	164
3.1.2.2 Indirect Methods . . . . .	166
3.1.2.3 Average Shoot Biomass . . . . .	168
3.1.2.4 Relationship Between Shoot Biomass and Production . . . . .	168
3.1.2.5 Estimation of Underground Biomass and Net Production . . . . .	171
3.1.3 Seasonal Development of Helophyte Polycormones and Rela- tionship Between Underground and Aboveground Organs K. FIALA (With 6 Figures) . . . . .	174
3.1.4 Experimental Hydroponic Cultivation of Helophytes D. DYKYJOVÁ and K. VÉBER (With 8 Figures) . . . . .	181
3.1.4.1 Technique of Hydroponic Cultures . . . . .	182
3.1.4.2 Thermoperiodism of Helophytes . . . . .	184
3.1.5 Estimation of Seasonal Growth of Underground Biomass J. P. ONDOK (With 4 Figures) . . . . .	193
3.1.5.1 Growth of Aboveground Stand Biomass . . . . .	193
3.1.5.2 Growth of Underground Biomass and Translocation . . . . .	193

3.1.6	Growth Analysis of Fishpond Littoral Communities J. KVĚT (With 6 Figures) . . . . .	198
3.1.6.1	Helophytes and Their Communities . . . . .	198
3.1.6.2	Communities of Emerged Fishpond Shores and Bottoms M. REJMÁNEK and J. VELÁSQUEZ (With 2 Figures) . . . . .	206
3.1.7	Primary Data on Biomass and Production Estimates in Typical Stands of Fishpond Littoral Plant Communities J. KVĚT and Š. HUSÁK (With 1 Figure) . . . . .	211
3.1.8	Determination of Energy Content and Net Efficiency of Solar Energy Conversion by Fishpond Helophytes D. DYKJJOVÁ (With 1 Figure) . . . . .	216
3.2	Photosynthesis . . . . .	221
3.2.1	Estimation of Net Photosynthetic Efficiency from Growth Analytical Data J. P. ONDOK (With 5 Figures) . . . . .	221
3.2.1.1	Parameters Used for Estimating Net Photosynthetic Efficiency . . . . .	221
3.2.1.2	Results Obtained in Hydroponic Cultures . . . . .	222
3.2.1.3	Results Obtained in Field Cultures . . . . .	225
3.2.1.4	Estimation of NAL in a <i>Phragmites</i> Stand . . . . .	225
3.2.2	Net Photosynthesis and Dark Respiration of Reed Estimated by Gas-Exchange Measurements J. GLOSER (With 7 Figures) . . . . .	227
3.2.3	Modeling of Photosynthetic Production in Littoral Helophyte Stands J. P. ONDOK and J. GLOSER (With 10 Figures) . . . . .	234
3.2.3.1	Basic Assumptions . . . . .	234
3.2.3.2	Derivation of the Model . . . . .	236
3.2.3.3	Stand Photosynthesis Investigated by the Model . . . . .	240
3.3	Water Relations. Water Balance, Transpiration, and Water Turnover in Selected Reeds swamp Communities M. RYCHNOVSKÁ (With 3 Figures) . . . . .	246
3.3.1	Physiological Features of Detached Shoots and Leaves of <i>Phragmites communis</i> . . . . .	246
3.3.1.1	Water Content in Whole Shoots, Leaf Blades and Leaf Discs at Full Turgidity . . . . .	246
3.3.1.2	Gradients of Water Content in Leaves According to Their Level of Insertion and Along the Leaf Blade . . . . .	247
3.3.1.3	Desiccation Rates of Shoots and Detached Leaf Blades . . . . .	249
3.3.2	Water Relations in Intact Shoots of <i>Phragmites communis</i> and Their Response to Environmental Factors . . . . .	250
3.3.2.1	Water Saturation Deficit (WSD): Its Daily Variation in the Shoots, Leaves, and Leaf Discs . . . . .	251
3.3.2.2	Transpiration Rate . . . . .	253
3.3.2.3	Sources of Homeostatic Water Relations in Shoots . . . . .	254
3.3.3	Water Relations in Different Fishpond Littoral Communities in Comparison with Grassland Communities . . . . .	255

3.4 Nutrient Uptake by Littoral Communities of Helophytes	
D.DYKYJOVÁ (With 13 Figures)	257
3.4.1 Absorption, Accumulation and Translocation of Nutrients in Plant Tissues	257
3.4.1.1 Analysis of Plant Biomass	257
3.4.1.2 Seasonal Changes in the Contents of Mineral Nutrients	258
3.4.2 Control of Helophyte Production by Nutrient Availability	265
3.4.3 Verification of Field Data by Experiments in Hydroponic Cultures	272
3.5 Growth, Production and Nutrient Uptake of Duckweeds in Fishponds and in Experimental Cultures	
E.REJMÁNKOVÁ (With 6 Figures)	278
References	285

## Section 4

### Structure and Functioning of Algal Communities in Fishponds

4.1 Structural Elements. Principal Populations of Algae.	
Spatial Distribution	
P.MARVAN, J.KOMÁREK, H.ETTL, and J.KOMÁRKOVÁ (With 4 Figures)	295
4.2 Dynamics of Algal Communities	
P.MARVAN, J.KOMÁREK, H.ETTL, and J.KOMARKOVA (With 2 Figures)	314
4.2.1 Phytoplankton	314
4.2.2 Epiphyton	316
4.2.3 Floating Clusters of Filamentous Algae	318
4.3 Primary Production and Functioning of Algae in the Fishpond Littoral	
J.KOMÁRKOVÁ and P.MARVAN (With 5 Figures)	321
4.3.1 Phytoplankton	322
4.3.2 Periphyton	331
References	335

## Section 5

### Decomposition Processes in the Fishpond Littoral

B.ÚLEHLOVÁ (With 5 Figures)	341
5.1 Biomass and Production of Microorganisms	341
5.2 Methods of Evaluating the Decomposition Processes	343
5.3 Microbial Transformations of Dead Organic Matter and Their Role in Detritus Formation and Mineralization	344
5.4 Spatial and Temporal Variation in Litter and Cellulose Decomposition in the Nesyt Fishpond Littoral	348
References	352

## Section 6

### Structure and Role of Animal Populations in Fishpond Littorals

6.1 Mammals in the Reedswamp Ecosystem	
J.PELIKÁN (With 1 Figure)	357

6.1.1 Species Diversity . . . . .	357
6.1.2 Distribution of Species . . . . .	358
6.1.3 Herbivores . . . . .	359
6.1.4 Insectivores . . . . .	362
6.1.5 Carnivores . . . . .	364
6.1.6 Final Energy Budget . . . . .	364
6.2 Birds in the Reedswamp Ecosystem	
K. HUDEC and K. ŠTASTNÝ (With 2 Figures) . . . . .	366
6.2.1 Species Composition of Breeding Birds . . . . .	366
6.2.2 Birds Occurring Outside the Breeding Season . . . . .	367
6.2.3 Spatial Distribution . . . . .	369
6.2.4 Interaction Between Birds and Plant Communities . . . . .	369
6.2.5 Density and Production . . . . .	372
6.3 Soil Surface Arthropods	
R. OBRTL . . . . .	373
6.3.1 Coleoptera . . . . .	373
6.3.2 Araneidea . . . . .	374
6.4 Invertebrates: Destroyers of Common Reed	
V. SKUHRAVÝ (With 9 Figures) . . . . .	376
6.4.1 Species Injuring the Growing Point of the Common Reed Without Transforming it into a Gall . . . . .	376
6.4.2 Species Transforming the Growing Points of the Common Reed into a Gall . . . . .	379
6.4.3 Experimental Simulation of Common-Reed Infestation by Pests Destroying the <i>Phragmites</i> Growing Point . . . . .	383
6.4.4 Insect Species Developing on the Stems of <i>Phragmites</i> . . . . .	384
6.4.5 Species Causing Secondary Attack in Lateral Shoots of Common Reed . . . . .	386
6.4.6 Species Living on Leaves of <i>Phragmites</i> . . . . .	387
6.5 Macrofauna of Invertebrates in Helophyte Communities	
J. DVOŘÁK . . . . .	389
6.5.1 Communities and Their Biotopes . . . . .	389
6.5.2 Inventarization . . . . .	389
6.5.3 Biomass Estimates . . . . .	391
References . . . . .	393

## Section 7

### Effect of Fishpond Management on the Littoral Communities. Exploitation of Reed

7.1 Management Aspects of Fishpond Drainage	
S. HEJNÝ (With 4 Figures) . . . . .	399
7.1.1 Summer Drainage . . . . .	400
7.1.2 Winter Drainage . . . . .	402

7.2 Control of Reed and Reed Mace Stands by Cutting Š. HUSÁK (With 2 Figures) . . . . .	404
7.3 Ecological Effects of Fishpond Amelioration S. HEJNÝ and Š. HUSÁK (With 1 Figure) . . . . .	409
7.3.1 Amelioration Employing Heavy Machinery . . . . .	409
7.3.1.1 Principles . . . . .	409
7.3.1.2 Regeneration of Macrophyte Communities and Their Further Succession . . . . .	410
7.3.2 Amelioration by Waterfowl Farming . . . . .	414
7.4 Propagation, Cultivation and Exploitation of Common Reed in Czechoslovakia K. VÉBER (With 4 Figures) . . . . .	416
7.4.1 Cultivation and Propagation . . . . .	416
7.4.1.1 Propagation by Dividing a Reed Polycormone . . . . .	416
7.4.1.2 Propagation by Layering . . . . .	417
7.4.1.3 Propagation by Stem Cuttings . . . . .	417
7.4.1.4 Propagation by Rhizome Cuttings . . . . .	419
7.4.1.5 Propagation by Seed . . . . .	419
7.4.2 Recultivation of Reed Plantations . . . . .	420
7.4.3 Introduction of Reed Ecotypes and Forms . . . . .	420
7.4.4 Survey of Exploited Reed Beds . . . . .	421
References . . . . .	424

## Section 8

### Conservation of Plant Communities and Waterfowl in Wetlands of Czechoslovakia

8.1 Conservation of Plant Communities in Fishpond Littorals S. HEJNÝ (With 1 Figure) . . . . .	429
8.2 Conservation of Wildfowl in Fishpond Regions K. HUDEC and K. ŠŤASTNÝ . . . . .	434
References . . . . .	438
Taxonomic Index . . . . .	439
Subject Index . . . . .	451