

Supplementary material

Supplemental 1. Detail of laboratory subsampling of the most abundant taxa

The sieve was divided into 2, 4, 8 or 16 fractions depending on the estimated density. The whole sieve content was sorted, but the procedure allows to save time by estimating the total abundance of taxa for which at least 40 individuals were counted in a fraction of the sieve. Those taxa had their total abundance estimated by multiplying the fraction abundance by the number of fractions. They were no more counted in the remaining fractions.

Supplemental 2. Remarks on the different biodiversity estimates

0D is sensitive to rare taxa and sampling effort but does not consider community structure. In comparison, 2D reflects community structure better by considering the relative abundance of dominant taxa. Thus, it is not highly sensitive to rare taxa or sampling effort. 1D lies in between by considering both the entire community, including rare taxa, and their relative abundances.

Supplemental 3. Number of benthic macroinvertebrate taxa identified in each pond in the experiment

Taxon	Total	EXT1	EXT2	SI1	SI2	CSIF1	CSIF2	LAG1	LAG2
Ephemeroptera ¹	2 (2)	1 (1)	1 (1)	2 (2)	2 (2)	2 (2)	1 (1)	2 (2)	2 (2)
Odonata ¹	6 (4)	3 (2)	2 (2)	2 (2)	2 (2)	2 (2)	3 (3)	3 (3)	4 (3)
Hemiptera ¹	5 (4)	3 (3)	4 (3)	3 (3)	4 (3)	3 (2)	4 (3)	5 (4)	5 (4)
Diptera ^{1,2}	24 (14)	11 (5)	10 (5)	11 (4)	10 (4)	12 (5)	8 (3)	14 (6)	11 (6)
Trichoptera ¹	10 (4)	0 (0)	0 (0)	6 (4)	6 (3)	2 (2)	3 (3)	5 (3)	5 (2)
Coleoptera ¹	25 (8)	2 (1)	6 (4)	10 (5)	4 (3)	5 (3)	8 (5)	17 (7)	11 (4)
Insecta, others ¹	5 (2)	0 (0)	1 (1)	4 (1)	3 (2)	1 (1)	0 (1)	4 (2)	1 (1)
Crustacea ^{1,3}	8 (7)	2 (2)	3 (3)	3 (3)	3 (3)	4 (4)	2 (2)	5 (4)	4 (4)
Mollusca ¹	10 (6)	3 (3)	1 (1)	3 (3)	5 (5)	2 (2)	3 (3)	4 (4)	9 (6)
Oligochaeta ¹	10 (4)	6 (2)	5 (2)	8 (3)	7 (2)	7 (4)	7 (3)	10 (4)	8 (3)
Achaeta ¹	3 (3)	0 (0)	0 (0)	0 (0)	3 (3)	1 (1)	2 (2)	2 (2)	2 (2)
Turbellaria ²	4 (2)	0 (0)	0 (0)	1 (0)	0 (0)	1 (1)	2 (1)	3 (2)	3 (2)
Invertebrates, others ³	5 (5)	3 (3)	3 (3)	4 (4)	4 (4)	4 (4)	4 (4)	4 (4)	3 (3)

EXT1: extensive pond replicate number 1; SI: semi-intensive pond; CSIF: coupled semi-intensive pond; LAG: lagoon. Exponents indicate the taxonomic resolution of identification in each group: 1 for genus, 2 for family or subfamily, and 3 for class or phylum. Numbers in parentheses indicate family richness.

Supplemental 4. Number of zooplankton taxa identified in each pond in the experiment by major taxonomic group.

Taxon	Total	EXT1	EXT2	SI1	SI2	CSIF1	CSIF2	LAG1	LAG2	CSI1	CSI2
Copepoda ³	3	3	3	3	3	3	3	3	3	3	3
Cladocera ¹	10	8	7	9	10	7	7	7	8	8	9
Crustacea, others ^{1,3}	3	1	0	1	1	2	0	3	2	3	2
Rotifera ¹	20	13	12	14	14	15	16	17	12	17	17
Diptera ²	7	5	2	3	4	3	3	6	5	6	5
Insecta, others ²	6	0	1	1	2	0	0	4	5	4	5
Invertebrates, others ³	9	3	5	7	5	5	3	8	6	9	6

EXT1: extensive pond replicate number 1; SI: semi-intensive; CSIF: coupled semi-intensive; LAG: lagoon

Exponents indicate the taxonomic resolution of identification in each group: 1 for genus, 2 for family or subfamily, and 3 for class or phylum.

Supplemental 5. Table of BMI raw abundances

		Date	May								Sept.								
		Pond	EXT1	EXT2	SI1	SI2	CSIF1	CSIF2	LAG1	LAG2	EXT1	EXT2	SI1	SI2	CSIF1	CSIF2	LAG1	LAG2	
		Total abundance	7135	3384	6805	6370	5390	13958	12257	10684	219	2010	5594	1710	1243	1284	9417	9340	
Phylum-Order	Family	Identified taxa																	
Diptera	Chironomidae	Chironomini	348	44	807	1235	638	1710	1087	1020	4	29	968	458	182	776	560	10	
		Tanytarsini	169	0	187	198	269	274	1928	2284	1	0	499	530	108	163	1	8	
		Orthoclaadiinae	2282	2738	492	185	370	1043	808	676	9	13	235	109	72	6	26	4	
		Corynoneurinae	204	104	290	16	24	113	76	430	0	0	0	0	36	0	195	0	
		Tanypodinae	30	0	34	202	41	45	648	606	9	2	10	4	1	17	356	71	
		Chironomidae pupae	53	31	31	31	26	78	80	304	0	0	81	20	1	14	40	8	
	Ceratopogonidae	Ceratopogoninae	0	0	6	20	0	0	0	16	0	0	0	0	0	0	0	0	12
		Dasyhelinae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
	Dixidae	Dixa sp.	0	0	10	0	0	20	0	0	0	0	0	0	2	8	0	0	
		Dixella sp.	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	
	Chaoboridae	Chaoborus sp.	48	83	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	Culicidae	Culicinae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	22	0	
		Anophelinae	34	5	0	0	0	0	0	0	0	56	1	4	4	3	35	14	
		Culicidae pupae	3	0	0	0	0	0	0	0	0	2	8	0	0	0	6	0	
	Psychodidae	Psychodidae	1	0	0	2	0	0	0	2	0	0	0	0	1	0	0	0	

	Tipulidae	Tipulidae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Limoniidae	Limoniini	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	32	0
	Tabanidae	Tabanidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
	Ephydriidae	Ephydriidae	0	0	0	0	0	0	0	4	0	8	0	0	0	0	5	5
	Rhagionidae	Rhagionidae	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	Sciomyidae	Sciomyidae	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scatophagidae	Scatophagidae	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
		Brachycera pupae	0	0	2	0	0	0	21	0	0	0	0	0	0	0	0	0
Trichoptera	Leptoceridae	Oecetis sp.	0	0	14	9	0	0	14	0	0	0	0	1	0	1	55	44
		Mystacides sp.	0	0	2	1	0	0	4	0	0	0	0	0	0	0	0	4
		Leptocerus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88
		Triaenodes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
		Athripsodes sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Hydroptilidae	Oxyethira sp.	0	0	8	0	0	0	2	0	0	0	0	0	0	0	0	0
		Orthotrichia sp.	0	0	0	9	0	0	0	0	0	0	113	60	0	0	0	0
		Agraylea sp.	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0
	Polycentropodidae	Holocentropus sp.	0	0	0	0	0	0	0	0	0	0	51	0	1	1	0	0
	Ecnomidae	Ecnomus tellenus	0	0	0	2	0	0	0	0	0	0	226	104	10	64	3	8
		Trichoptera pupae	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Ephemeroptera	Baetidae	Cloeon sp.	2	0	61	1	0	4	1	2	1	5	421	22	5	7	174	120

		Hydrophilinae larvae	9	14	0	0	6	0	0	0	0	0	0	0	0	0	2	0
	Helophoridae	Helophorus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0
	Haliplidae	Peltodytes sp.	0	0	14	0	0	0	2	8	0	0	16	0	0	0	18	18
		Haliplus sp.	0	0	1	0	0	0	4	1	0	3	5	0	0	0	9	4
	Dryopidae	Dryops sp.	0	4	0	12	2	2	0	0	0	0	0	0	0	4	0	0
	Curculionidae	Curculionidae	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0
	Gyrinidae	Gyrinus sp.	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
	Scirtidae	Scirtes sp.	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0
		Helodes sp.	0	0	7	0	0	6	0	5	0	0	0	0	0	6	0	0
		Hydrocyphon sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Cyphon sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Hemiptera	Corixidae	Corixinae	6	13	37	28	149	6	44	139	0	0	51	0	0	1	1	370
	Notonectidae	Notonecta sp.	10	12	35	2	11	1	36	22	0	0	0	0	0	0	2	1
	Naucoridae	Naucoridae	4	1	6	4	0	12	0	0	0	0	0	0	0	5	1	19
	Pleidae	Plea leachi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	40
	Gerridae	Gerris aquaticus	0	2	0	0	6	4	6	7	0	1	0	7	0	0	0	9
	Sialidae	Sialis sp.	0	0	7	95	9	0	153	3	0	1	0	0	0	0	2	2
Hymenoptera	Hymenoptera	Hymenoptera	0	0	0	12	2	2	7	0	0	0	0	0	0	0	13	1
Lepidoptera	Crambidae	Elophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
		Parapoynx sp.	0	0	2	0	0	0	0	0	0	0	0	5	0	0	0	0
		Cataclysta sp.	0	0	0	0	0	0	0	0	0	0	1	2	0	0	4	0

		Crambidae other	0	0	4	0	0	0	2	0	0	0	0	0	0	0	0	0
Oligochaeta	Naididae	Ophidonais serpentina	91	0	2307	44	4	320	1309	1419	0	0	868	14	6	48	79	90
		Stilaria lacustris	0	0	16	174	0	12	20	12	0	0	97	0	0	0	0	0
		Dero sp.	48	0	0	348	85	132	149	88	0	4	12	0	49	12	64	48
		Chaetogaster sp.	662	4	0	20	0	0	24	36	0	0	0	0	0	0	0	0
		Naididae other	744	224	8	396	164	2897	1476	226	0	0	1152	13	132	10	74	0
	Tubificidae	Branchiura sowerbyi	9	0	109	0	0	7	9	61	2	23	1	0	5	9	0	342
		Tubificidae other	149	4	502	428	1538	387	911	818	169	1179	454	128	256	74	54	1770
	Lumbriculidae	Lumbriculidae	0	0	17	0	2	1	66	7	0	0	0	0	0	0	0	3
	Lumbricidae	Lumbricidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Achaeta	Glossiphoniidae	Hellobdella stagnalis	0	0	0	1	1	6	2	23	0	0	0	2	0	0	38	47
	Erpobdellidae	Erpobdella sp.	0	0	0	4	0	2	6	8	0	0	0	0	0	0	0	0
	Piscicolidae	Piscicola sp.	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0
Crustacea	Gammaridae	Gammarus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		Echinogammarus sp.	0	0	0	0	23	65	0	0	0	1	0	0	16	0	99	1081
	Asellidae	Asellus aquaticus	0	0	2	13	9	26	361	255	0	0	0	7	138	4	6277	1163
	Cambaridae	Procambarus clarkii	0	1	0	0	5	0	0	0	0	1	0	0	3	0	1	0
		Cladocera	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.
		Copepoda	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.	pres.
		Ostracoda	537	65	56	20	18	0	663	152	0	0	0	0	4	0	9	16
		Argulus sp.	8	0	3	0	0	0	0	0	0	0	18	4	0	0	0	9

Arachnida	Hydracarina	Hydracarina	8	0	205	31	1	2	34	22	1	4	17	0	0	0	4	69			
Gastropoda	Physidae	Physa sp.	574	0	2	131	0	17	110	0	0	0	0	9	0	22	66	2489			
		Acroloxiidae	Acroloxus sp.	4	0	4	4	5	0	0	0	1	84	132	36	140	8	0	86		
		Lymnaeidae	Radix peregra	1056	0	0	564	0	0	0	0	0	0	0	1	0	0	0	5	69	
		Planorbiidae	Gyraulus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75	
			Hypeutis sp.	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	8	0
			Planorbis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	
			Planorbarius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
			Armiger sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	
			Bythinidae	Bythinia sp.	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	237	
Bivalvia	Sphaeridae	Sphaerium sp.	0	0	0	4	0	2	0	0	0	0	0	0	0	0	0	2			
Bryozoa	Bryozoa	Bryozoa	0	0	4	5	4	7	3	8	1	0	7	1	0	4	0	1			
Plathyhelminthe	Dugesidae	Dugesia tigrina	0	0	0	0	0	1	114	2	0	0	0	0	5	0	328	25			
		Phagocata sp.	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0			
		Platheminthe autre	0	0	0	0	0	0	0	0	0	0	0	26	0	0	0	323	90		
Nematoda	Nematoda	Nematoda	0	0	16	6	5	8	48	0	0	0	0	0	0	0	0	0			
Hydrozoa	Hydridae	Hydra sp.	8	0	1432	2079	1941	6676	1886	1959	10	554	39	0	0	0	0	220			

Presence (no counting) in the samples is recorded as pres.

Supplemental 6. Details of SIMPER dissimilarity analysis

For BMI, *Asellus aquaticus* contributed to dissimilarity between LAG and all other pond types and was the taxon that contributed most to this dissimilarity (over 25% of dissimilarity with CSIF and SI, and 23% with EXT). *Physa* sp. contributed 10.7% to the dissimilarity between LAG and CSIF, but only 9.8% to that between LAG and EXT. Other taxa that contributed significantly to dissimilarity contributed less than 10% each: subfamily Tanypodinae, *Echinogammarus berilloni*, subfamily Corixinae, and *Dugesia tigrina* contributed significantly to the dissimilarity between LAG and CSIF and EXT, and *Caenis* sp. to that between LAG and CSIF. *Ecnomus tellenus* was the only taxon that contributed significantly to the dissimilarity between SI and EXT.

Hydra sp., “other” Naididae, and *Sympetrum* sp. contributed significantly to dissimilarity between dates, albeit less than 10% each. These taxa were less productive in September than in May. Taxa that contributed significantly to dissimilarities in pond types but not to those among dates were more productive in September than in May, except the subfamily Tanypodinae.

For ZPK, %: Ceriodaphnia sp., which differed significantly between LAG and CSIF (19.4%) or SI (13.5%); Keratella sp. between CSIF and SI (13.8%); and, *Bosmina longirostris* between EXT and CSIF (50.6%), LAG (40.7%), and SI (49.5%).

Significant contributions to differences between dates were due to : Ceriodaphnia sp. between May and August (14.5%); Keratella sp. between October and May (13.9%), July (12.6%), and November (14.5%); *Bosmina longirostris* between May and September (43.3%), and between August and October (42.5%); and adult copepods of the order Cyclopoida between May and June (27.4%), May and October (23.2%), June and October (28.9%) and June and November (27.0%).

Supplemental 7. Comparison of taxonomic richness of benthic macroinvertebrates in ponds and lakes. Richness values are means or ranges (in parentheses) at the pond level or total number of taxa at the group or study level. Taxonomic richness corresponds to the maximum taxonomic resolution in the study (often the genus).

System type (number)	Location	Pond α family richness	Pond α	Group or study γ		Source
			taxonomic richness	Group or study γ family richness	taxonomic richness	
EXT ponds (2)	France (Atlantic)	14.5 (9-20)	25 (15-35)	31	47	this study
SI ponds (2)	France (Atlantic)	26 (20-32)	40.5 (30-51)	45	75	this study
CSIF ponds (2)	France (Atlantic)	23.5 (17-30)	36.5 (29-44)	43	64	this study
LAG ponds (2)	France (Atlantic)	33 (25-41)	50.5 (44-57)	54	96	this study
CSI ponds (4)	France (Atlantic)			60	107	this study
All ponds (8)	France (Atlantic)	25 (9-41)	38 (15-57)	64	116	this study
Ponds (11)	France (Atlantic)	23 (13-31)	33 (21-47)		105	Roucaute, unpublished
Fishponds (95)	France (3 regions)			59		Broyer and Curtet 2011
Fishponds (39)	France (Continental)	12.87		49		Broyer and Curtet 2011
Fishponds (38)	France (Atlantic)	12.97		51		Broyer and Curtet 2011
Fishponds (18)	France (Continental)	12.61		36		Broyer and Curtet 2011
Ponds (19) and lakes (1)	UK (Atlantic)	16.3 (2 - 32)	32.7 (5-67) ¹			Davies <i>et al.</i> 2008
Ponds (13)	UK (Atlantic)	14.5 (3-27)	29.7 (3-62) ¹			Davies <i>et al.</i> 2008
Ponds (20) and lakes (9)	France (Mediterranean)	13.5 (2-21)				Davies <i>et al.</i> 2008
Ponds (425)	UK (Atlantic)		27.2 (2-99)		277	Hassal <i>et al.</i> 2011
Ponds (52)	Europe (Atlantic)				145	Cereghino <i>et al.</i> 2012

Ponds without fish	Belgium (Atlantic)		27		Lemmens <i>et al.</i> 2015
Fishponds (young fish)	Belgium (Atlantic)		22		Lemmens <i>et al.</i> 2015
Ponds (28)	Belgium (Atlantic)		33		Lemmens <i>et al.</i> 2015
Pond (1)	France (Atlantic)	26 (20-36)	39	66	Lagadic <i>et al.</i> 2016
Ponds (10)	France (Atlantic)	27 (22-33)	45	67	Lagadic <i>et al.</i> 2016
Pond (1)	France (Alps)	31 (24-39)	45	66	Lagadic <i>et al.</i> 2016
Pond (1)	France (Mediterranean)	15 (5-22)	28	31	Lagadic <i>et al.</i> 2016
Ponds (13)	France			115	Lagadic <i>et al.</i> 2016
Pond mesocosms					
without fish (4)	France		16.9 (8-26)	67	Bayona <i>et al.</i> 2015
Ponds	Switzerland (continental)	>32.2 ²			Menetrey <i>et al.</i> 2011
Ponds	Switzerland (continental)	<26 ³			Menetrey <i>et al.</i> 2011
Ponds (84)	France (continental)	11.4	48		Wezel <i>et al.</i> 2014

For exponents, 1 corresponds to species-level identification, 2 is the threshold for high ecological quality, and 3 is the threshold for low ecological quality for Swiss lowland ponds and lakes.

Supplemental 8. Comparison of biomass (B) and secondary production (P) of benthic macroinvertebrate (BMI) and zooplankton (ZPK) in studies of ponds and lakes.

Group	System type	Location	B mg DM.m ⁻²	P g DM.m ⁻² .year	Source
BMI	EXT ponds (2)	France (Atlantic)	228	3.6	this study
BMI	SI ponds (2)	France (Atlantic)	478	5.6	this study
BMI	CSIF ponds (2)	France (Atlantic)	245	3.4	this study
BMI	LAG ponds (2)	France (Atlantic)	1920	14.5	this study
BMI	CSI ponds (4)	France (Atlantic)	1082	8.9	this study
BMI	Ponds	France (Atlantic)	190.3-2204.4	2.5-16.4	this study
BMI	Fishponds (39)	France (Continental)	6800 ± 1900		Broyer <i>et al.</i> 2009
BMI	Fishponds (38)	France (Atlantic)	2800 ± 500		Broyer <i>et al.</i> 2009
BMI	Fishponds (18)	France (Continental)	1100 ± 200		Broyer <i>et al.</i> 2009
BMI	Fishponds (20)	France (Continental)	2200 ± 400		Broyer <i>et al.</i> 2009
BMI	Shallow lake	United Kingdom (Atlantic)		4.8-13.3	Oertli 1993
BMI	Pond	USA (subtropical)		12.9	Oertli 1993
BMI	Lake	USA (continental)		13.3	Oertli 1993
BMI	Abandoned farm pond	USA (subtropical)		20.1	Oertli 1993
BMI	Lake shore	Denmark (Atlantic)		56.7	Oertli 1993
BMI	Forest pond	Switzerland (continental)	3530.6	64.6	Oertli 1993
ZPK	EXT ponds (2)	France (Atlantic)	559	49	this study
ZPK	SI ponds (2)	France (Atlantic)	272	20.9	this study
ZPK	CSIF ponds (2)	France (Atlantic)	60	3.7	this study
ZPK	LAG ponds (2)	France (Atlantic)	379	19.3	this study
ZPK	CSI ponds (4)	France (Atlantic)	219	11.5	this study
ZPK	Range for all ponds	France (Atlantic)	33.4-957.6	2.4-50	this study
ZPK	Fishponds 0+ yr. carp (6)	Poland (Continental)	274-339 ^a		Kloskowski 2011
ZPK	Fishponds 1+ yr. carp (6)	Poland (Continental)	209-404 ^a		Kloskowski 2011
ZPK	Fishponds 2+ yr. carp (6)	Poland (Continental)	285-300 ^a		Kloskowski 2011
ZPK	Lakes	Northern hemisphere	21-1126 ^a		Pederson 1976
ZPK	Lake shore	Switzerland (continental)		8.4-12.6	Lemke <i>et al.</i> 2009
ZPK	Wetland ponds	USA (subtropical)	143-203	6.28-13.76	Lemke <i>et al.</i> 2009
ZPK	Pond mesocosms (no fishes)	France (Atlantic)	36-74	22-36.8	Bayona <i>et al.</i> 2014
ZPK	Aerated waste stabilization pond	Belgium (Atlantic)		288-593	Cauchie <i>et al.</i> 2000

^a B mg DM.m⁻³