Ecography

E4483
Van de Meutter, F., Stoks, R. and De Meester, L. 2006. Lotic dispersal of lentic macroinvertebrates. – Ecography 29: 223–230.

Appendix 1. Physical properties of the 28 pond sampled pond connections. Source and sink ponds are indicated with their respective number (see Fig. 1).

Nr	Source pond	Sink pond	Length (m)	Flow rate (m/s)	Discharge volume (l/s)	Type
1	2	3	35	0.07	12.8	stream
2	2	4	50	0.02	3.4	stream
3	6	2	95	0.03	6.5	stream
4	7	2	45	0.16	5.0	stream
5	8	2	80	0.16	13.0	stream
6	8	2	190	0.13	12.6	stream
7	10	8	375	0.42	6.5	stream
8	11	10	25	0.56	5.7	pipe
9	11	8	620	0.08	4.8	stream
10	12	11	80	0.19	15.2	stream
11	14	12	125	0.14	8.8	stream
12	15	13	80	0.20	3.1	stream
13	16	14	40	0.19	13.4	pipe
14	17	15	40	0.10	6.2	pipe
15	17	16	25	0.22	6.8	pipe
16	23	33	225	0.36	3.8	stream
17	24	22	35	0.15	4.7	stream
18	27	24	10.5	0.16	5.1	pipe
19	28	26	10	0.29	6.2	pipe
20	29	27	10.5	0.18	5.5	pipe
21	30	28	60	0.20	2.5	stream
22	30	34	4.5	0.45	6.2	pipe
23	31	30	115	0.24	6.1	pipe
24	32	17	1400	0.39	15.8	stream
25	32	20	1110	0.04	1.3	stream
26	32	30	455	0.20	3.5	stream
27	32	31	225	0.24	7.5	stream
28	34	29	5	0.56	6.5	pipe

Appendix 2. Macroinvertebrate abundances per family (genus if available) in the source ponds (ponds), in 6 h daytime (day) and nighttime (night) dispersal samples. Abundances are cumulative and based on 19 pond samples for the source ponds, and on 28 and 21 samples for daytime and nighttime dispersal, respectively. Taxa indicated with † are Classes, taxa in bold represent Orders. The mode of overland dispersal is indicated between brackets (A = active flight, P = passive dispersal).

Family	Genus	Source	Dispersal	
		pond	Day	Night
Oligochaeta † (P)		310	9	10
Hirudinea † (P)	*Helobdella*	40	2	0
Basommatophora				
Physidae (P)	*Physa*	1321	18	7
Lymnaeidae (P)	*Lymnaea*	227	9	4
Planorbidae (P)	*Anisus*	2	6	0
	Gyraulus	279	3	18
	Planorbarius	6	0	0
Acroloxidae (P)	*Acroloxus*	799	4	1
Veneroida				
Sphaeriidae (P)	*Pisidum*	2	1	0
	Sphaerium	2	0	0
Aranea				
Argyronetidae (P)	*Argyroneta*	0	1	0
Actinedida (P)		51	1	9
Branchiura				
Argulidae (P)	*Argulus*	1	0	0
Isopoda				
Asellidae (P)	*Asellus*	3	0	4
Amphipoda				
Gammaridae (P)	*Gammarus*	0	0	3
Ephemeroptera				
Baetidae (A)	*Caenis*	2678	13	42
	Cloeon	2154	25	21
Odonata				
Coenagrionidae (A)	*Erythromma*	30	0	0
	Coenagrion/ Ischnura	969	5	2
Aeshnidae (A)	*Anax*	18	0	0
	Aeshna	2	0	0
	Brachytron	1	0	0
Libellulidae (A)	*Crocothemis*	8	0	0
Hemiptera				
Nepidae (A)	*Nepa*	0	3	3
	Ranatra	2	0	0
Corixidae (A)	*Corixa*	2	0	0
	Cymatia	26	0	0
	Hesperocorixa	1	0	0
	Micronecta	15	0	0
	Sigara	777	6	0
Notonectidae (A)	*Notonecta*	2	1	0
Pleidae (A)	*Plea*	12	0	0
Naucoridae (A)	*Ilyocoris*	5	0	0
Coleoptera				
Dytiscidae (A)	*Agabus*	1	2	1
	Coelambus	1	0	0
	Ilybius	1	0	2
Gyrinidae (A)	*Gyrinus*	0	0	1
Noteridae (A)	*Noterus*	27	2	1
Haliplidae (A)	*Haliplus*	48	12	0
Hydrophilidae (A)	*Enochrus*	7	0	0
	Helochares	1	0	0
	Laccobius	1	0	0
Scirtidae (A)	*Cyphon*	7	0	0
Trichoptera				
Ecnomidae (A)		1	0	0
Hydropsychidae (A)		0	25	153
Hydroptillidae (A)		162	0	0
Leptoceridae (A)		4	0	0
Lepidoptera				
Pyralidae (A)	*Cataclysta*	126	7	0
Diptera				
Chironomidae (A)		2938	354	719
Simuliidae (A)		0	66	312
Ceratopogonide (A)		113	0	0
Chaoboridae (A)	*Chaoborus*	0	0	64
Culicidae (A)		316	3	2
Dixidae (A)		147	1	5
Ephydridae (A)		111	0	0
Limoniidae (A)		345	13	1
Muscidae (A)		5	9	1
Sciomyzidae (A)		12	0	0
Stratyomidae (A)	*Stratyomis*	1	0	0
Syrphidae (A)	*Anasymyia*	2	0	0
Tipulidae (A)		3	0	0

Appendix 3. Repeatability and representativeness of the pond sampling method

Trireplicate samples of three ponds in de study area were taken (N = 9 samples) on 19 October 2005 and sorted and identified (same method as described in the Material and Methods section) in the laboratory. The ponds were chosen for their specific properties (pond 3 [large pond], pond 18 [large pond] and pond 26 [species rich pond]; see Fig. 1 for their position in the study area) that challenge the repeatability and representativeness of the sampling method. We obtained the following results:

a) univariate analysis
Bray-Curtis similarities (both taking into account species presence and abundance) were calculated for every sample combination. Similarity values (maximal range 0=very dissimilar – 1=very similar) ranged from 0.83-0.92 between samples of the same pond, and between 0.36-0.60 for samples of different ponds. Because of interdependence of pairwise derived similarity data, we cannot perform one general statistical test including all similarity data. However, since samples of the same pond were always very similar (see higher), we performed 1-way ANOVA's on similarities comparing one replicate of each pond to all other samples (three subsets): similarities of replicate 1 (R1) of pond 3 to all other samples, similarities of R1 of pond 18 to all other samples and similarities of R1 of pond 26 to all other samples. Pond (three levels: p3, p18, p26) was used as categorical variable. All three analyses were highly significant (R1p3: $F_{2,5}=280$, $p<0.0001$; R1p18: $F_{2,5}=142$, $p<0.0001$; R1p26: $F_{2,5}=242$, $p<0.0001$), indicating that samples of the same pond were much more similar to each other than to samples of other ponds. The significance of these patterns remains after Bonferroni corrections. We acknowledge that the data for the three analyses presented were derived from the same raw dataset, and thus are to some degree dependent. Yet, in our opinion these analyses should not be seen as a full and rigid test but rather represent a comprehensive view on the patterns in the data.

b) multivariate analysis
Detrended Correspondence Analysis (DCA) is an indirect unconstrained ordination method. This means that it explores maximal variation within the data but does not explore specific gradients (such as environmentally imposed variation; in this case the different ponds). When the prime variation gradients found in DCA coincide with focal gradients, than this strongly suggests that the focal gradient (or a strong correlate) dominates in shaping variation in the data. As shown in the DCA plot (Fig. A), the triplicate samples of the three ponds nicely segregate along the first and the second axis. Moreover, these axes explain 83.3% of all variation present in the data, indicating that variation among replicate samples of the same pond is probably negligible compared to variation among samples of different ponds.

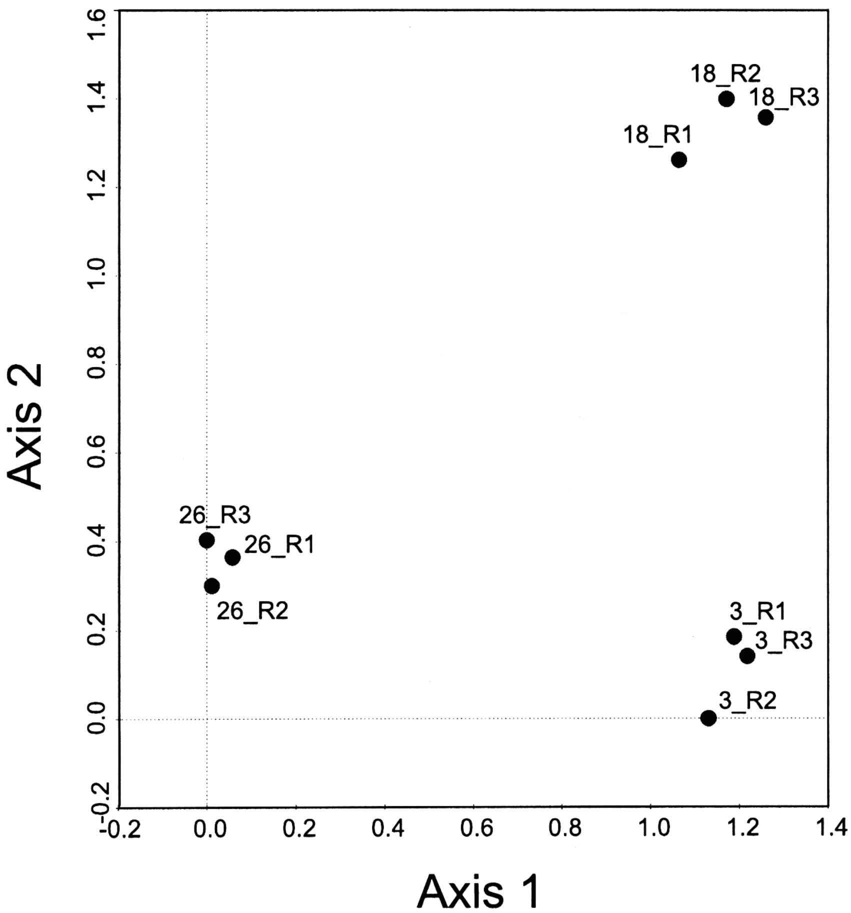

Fig. A. Biplot presenting the trireplicate samples of the macroinvertebrate community of ponds 3, 18 and 26 in De Maten along axes 1 and 2 of the DCA. Samples were taken with the time-effort (time=10') method using a dipnet (500 µm). Axes 1and 2 together explain 83.3% of all variability present in the data.

Appendix 4. Taxa found in incoming streams, connecting streams and connecting pipes of De Maten on 19 October 2005. Sampling was done by forcing a dipnet (500 µm) through spatial structures in streams (branches, dead leafs, tree roots, water plants, …) during 5 min. Samples were supplemented by 30 s kick-samplings at two locations within the streams. For pipes we scraped the interior wall and collected the loosened matter by holding a net downstream at the outlet of the pipe. Samples were sorted and identified as in Appendix 3. Single "x" indicates numbers <10, "xx" indicates numbers >10. Taxa were ordered to visualize patterns of occurrence.

Taxon	Incoming streams		Connecting streams					Pipes	
Hydropsychidae	xx	xx	x		x	xx	x	xx	xx
Simuliidae	xx	xx	xx	x	x	x	x	xx	xx
Asellidae	xx	x	x	xx	x	xx			
Bithyniidae	x	x			x	x			
Chironomidae	xx	x	xx	x	xx	xx	xx	x	
Dytiscidae	xx	x	x						
Gammaridae	xx	xx	x	x					
Oligochaeta	xx	x	xx	x	x	xx	xx		
Sphaeriidae	xx	xx	xx	x		x	xx		
Actinedida			xx	x					
Baetidae			x			x			
Ceratopogonidae			x	x					
Coenagrionidae			xx	x	x	xx			
Hirudinea			x						
Lepidoptera						x			
Lymnaeidae			x				x		
Physidae	x		xx		x	x	xx		
Planorbidae			x						