Drivers of Macroinvertebrate Communities in Mediterranean Rivers: a Mesohabitat Approach

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Supplementary Materials

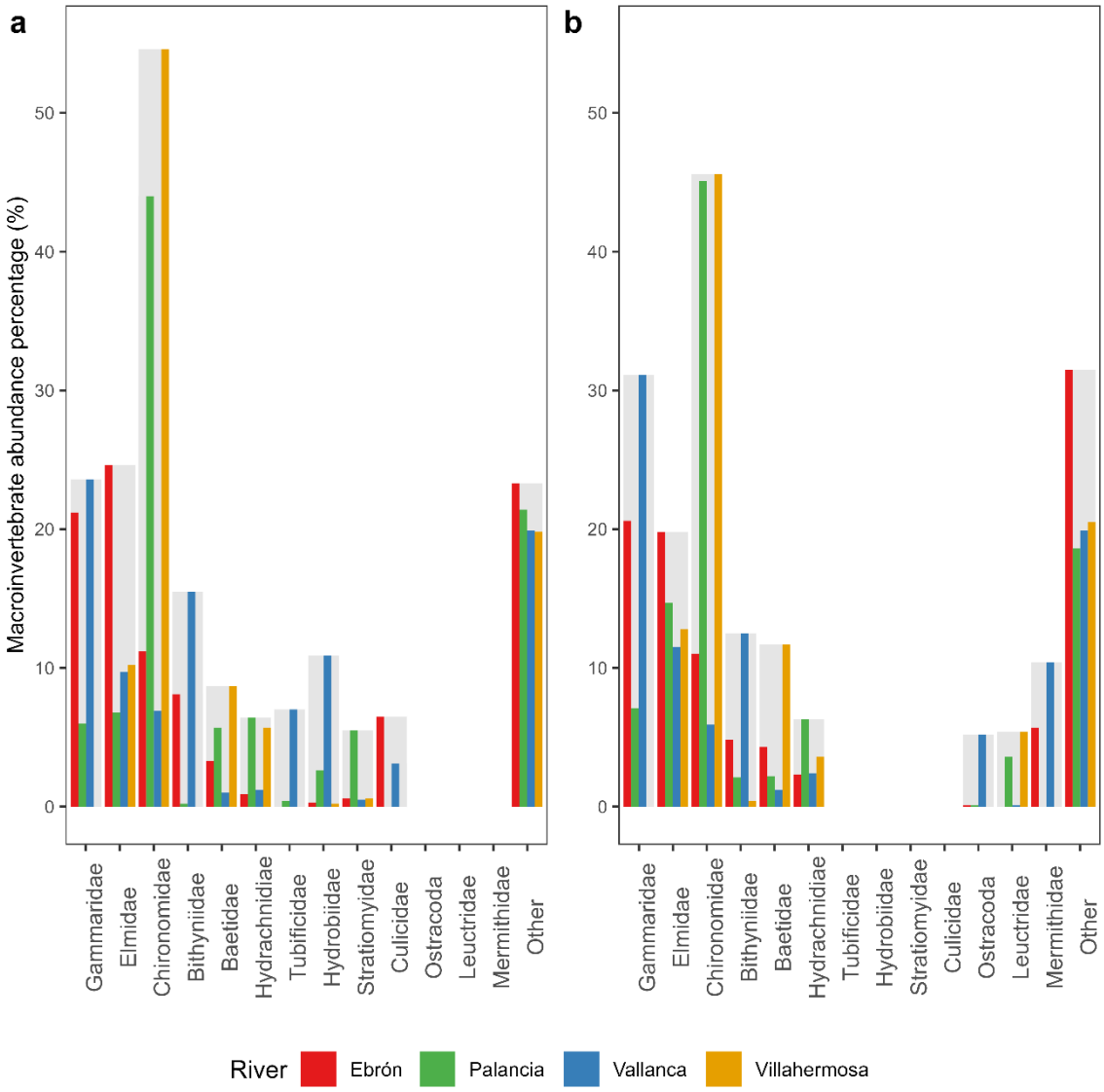

Figure S1. Relative abundance of macroinvertebrates (%) aggregated by families (excluding the order Ostracoda) and river. Data are categorized on habitat types, delineated as (a) slow and (b) fast hydromorphological units (HMUs). Other families comprise taxa present in less than 5 % of the samples in any of the four rivers.

Table S1. Relative abundance of macroinvertebrates (%) pooled by river. Data are displayed by habitat type (slow and fast hydromorphological units or HMUs).

Taxa	Slow HMUs				Fast HMUs			
	Ebrón	Palancia	Vallanca	Villahermosa	Ebrón	Palancia	Vallanca	Villahermosa
Dugesiidae	0.8	1.8	0.3	0.4	1.1	0.9	0.1	1.3
Planariidae	0.2	–	0.2	–	–	0.7	0.1	0.1
Dendrocoelidae	0.2	–	–	–	–	–	–	–
Tubificidae	–	0.4	7.0	–	–	–	1.8	–
Naididae	0.3	–	–	–	1.1	–	0.2	–
Haplotaxidae	–	–	0.2	–	0.1	–	0.4	0.4
Lumbriculidae	0.1	–	0.3	–	0.5	–	1.4	–
Lumbricidae	2.2	0.5	2.5	–	2.1	0.3	1.2	–
Hirudinidae	0.1	–	–	–	0.1	–	–	–
Erpobdellidae	–	–	0.1	–	–	–	0.4	–
Glossiphoniidae	0.4	–	0.1	–	0.1	–	–	–
Bithyniidae	8.1	0.2	15.5	–	4.8	2.1	12.5	0.4
Ancylidae	0.2	–	0.5	–	0.4	–	2.1	–
Planorbidae	0.1	–	0.1	–	–	–	0.2	–
Lymnaeidae	–	0.9	1.1	–	–	0.4	0.2	0.4
Hydrobiidae	0.3	2.6	10.9	0.2	0.6	1.6	0.9	0.4
Pisidiidae	0.1	–	0.3	–	–	–	0.2	–
Sphaeriidae	0.1	0.1	0.2	–	0.1	–	0.1	–
Gammaridae	21.2	6.0	23.6	–	20.6	7.1	31.1	–
Asellidae	–	–	–	–	–	–	–	–
Ostracoda	–	0.4	0.5	–	0.1	0.1	5.2	–
Gerridae	–	0.1	–	0.2	–	0.1	0.1	–
Corixidae	–	–	0.3	–	–	–	–	–
Aphelocheiridae	–	–	–	–	–	–	–	–
Hydrometridae	–	–	–	–	–	–	–	–
Nepidae	–	–	–	–	–	–	–	–
Mesovellidae	–	0.2	–	–	–	–	–	–
Elmidae	24.6	6.8	9.7	10.2	19.8	14.7	11.5	12.8
Gyrinidae	–	–	0.5	–	–	–	–	0.1
Dytiscidae	–	0.1	0.1	–	–	–	0.1	0.1
Scirtidae	0.3	–	1.4	–	0.1	0.1	1.2	–
Hydraenidae	–	–	–	–	–	–	–	–
Hydrophilidae	–	–	–	–	–	–	–	–
Haliplidae	–	0.2	–	0.5	–	–	–	–
Helodidae	–	0.3	–	0.1	–	–	–	0.2
Dryopidae	–	0.3	–	–	–	–	–	–
Empididae	1.5	0.7	0.2	0.4	0.7	1.0	0.3	0.8
Tabanidae	0.1	–	0.6	–	0.2	–	0.1	–
Stratiomyidae	0.6	5.5	0.5	0.6	2.9	4.2	0.9	1.0
Athericidae	0.6	0.2	1.7	–	0.4	0.2	–	–
Anthonomyidae	–	–	–	0.2	–	–	–	0.1
Ceratopogonidae	–	0.1	0.2	1.1	0.1	0.2	0.1	0.4
Chironomidae	11.2	44.0	6.9	54.6	11.0	45.1	5.9	45.6

(Continuation)

Table S1. Relative abundance of macroinvertebrates (%) pooled by river. Data are displayed by habitat type (slow and fast hydromorphological units or HMUs). (Continuation)

Taxa	Slow HMUs				Fast HMUs			
	Ebrón	Palancia	Vallanca	Villahermosa	Ebrón	Palancia	Vallanca	Villahermosa
Culicidae	6.5	–	3.1	–	4.4	–	1.0	–
Simuliidae	0.6	0.2	–	0.5	0.3	0.6	0.2	3.2
Tipulidae	0.1	–	–	0.1	–	–	–	–
Limoniidae	0.2	0.9	0.1	0.9	–	0.3	0.3	0.8
Psychodidae	1.2	0.2	0.1	–	2.0	0.3	–	–
Dixidae	–	0.1	–	–	–	–	–	0.1
Ephydridae	–	–	–	–	–	–	–	–
Hydroptilidae	0.1	1.3	1.6	1.4	0.2	1.1	0.1	1.1
Polycentropodidae	0.4	0.8	–	1.6	0.1	0.6	0.1	0.3
Philopotamidae	0.9	0.3	–	0.1	0.3	–	0.4	0.2
Odontoceridae	0.2	0.2	–	–	–	–	0.1	0.4
Rhyacophilidae	0.7	0.2	0.3	0.2	0.6	0.1	–	–
Glossosomatidae	0.5	0.2	2.2	0.1	0.9	0.2	1.4	0.1
Hydropsychidae	0.9	1.4	0.1	0.8	3.2	1.5	0.7	0.8
Sericostomatidae	0.6	–	0.1	–	1.0	–	–	–
Psychomyidae	–	0.1	0.1	0.1	0.1	0.1	0.3	0.2
Ecnomidae	0.1	–	–	2.1	–	–	–	0.5
Beraeidae	0.2	–	–	–	–	–	–	–
Calamoceratidae	0.1	–	–	–	0.1	–	–	–
Brachycentridae	–	–	–	0.6	–	–	–	–
Leptoceridae	–	0.1	–	0.2	–	–	0.1	0.1
Lepidostomatidae	–	–	–	0.1	–	–	–	–
Leuctridae	0.1	2.4	0.1	2.2	–	3.6	0.1	5.4
Nemouridae	–	0.1	–	–	–	–	0.3	2.1
Perlidae	0.1	–	–	0.1	–	–	–	–
Perlodidae	–	0.2	–	–	–	–	–	–
Ephemerellidae	1.2	3.2	0.1	0.1	2.3	2.9	0.7	0.4
Heptageniidae	1.4	–	0.6	0.3	2.0	–	0.3	0.2
Oligoneuriidae	0.7	–	–	–	0.1	–	0.2	–
Ephemeridae	0.2	0.1	–	–	–	–	–	–
Baetidae	3.3	5.7	1.0	8.7	4.3	2.2	1.2	11.7
Caenidae	2.9	1.1	0.9	3.0	3.1	0.5	0.7	1.3
Leptophlebiidae	0.1	0.9	–	0.3	0.1	0.3	–	–
Pothamanthidae	–	–	0.3	0.4	–	–	–	–
Prosopistomatidae	0.1	–	–	–	–	–	–	–
Libellulidae	–	–	–	0.6	–	–	–	–
Calopterygidae	–	0.7	0.1	0.1	–	0.1	0.1	–
Cordulegasteridae	0.1	0.6	0.3	–	–	–	0.2	–
Gomphidae	–	0.9	0.2	1.3	0.1	0.2	0.6	3.4
Aeshnidae	–	0.1	–	–	–	0.1	–	–
Coenagrionidae	–	0.1	0.1	–	–	–	–	–
Mermithidae	2.3	–	1.4	–	5.7	–	10.4	–
Hydrachnidiae	0.9	6.4	1.2	5.7	2.3	6.3	2.4	3.6

Table S2. Pearson correlation coefficients between biological parameters (abundance, richness and diversity indices) and environmental attributes in (a) slow and (b) fast hydromorphological units (HMUs). HMU width (Wid), mean depth (Dmed), maximum depth (Dmax), substrate coarse (Scoarse), substrate medium (Smed), substrate fine (Sfine), aquatic vegetation (Veg), density of woody debris (WD), embeddedness (Emb), shade (Sha). No significant outcomes were found for Wid and Sfine. Only significant relationships are shown ($p < 0.05$).

		Dmed	Dmax	Scoarse	Smed	Veg	WD	Emb	Sha
(a) Slow HMUs									
Ebrón	Abundance	-	-	-	-	-	-	-	-
	Richness								
	Shannon	0.744***	-	-	-	-0.712**	-	-	-
	Simpson	0.754***	0.652*	-	-	-0.607*	-0.725**	-	-
Vallanca	Abundance	-	-	-	-	0.792***	-	-	-
	Richness	-	-	-	-	-	-	-	-
	Shannon	0.617*	-	-0.641*	-	-	-	-	-
	Simpson	-	-	-0.640*	-	-	-	-	-
Palancia	Abundance	-	-	-	-	-	-	-	-
	Richness	-	-	-	-	-	-	-	-
	Shannon	-	-	-	-	-0.678*	-	-	-
	Simpson	-	-	-	-	-0.700*	-	-	-
Villahermosa	Abundance	-	-	-	-	-	-	-	-
	Richness	-	-	-	-	-	-	-	-
	Shannon	0.742*	-	-	-	-	-	-	-
	Simpson	0.806*	-	-	-	-	-	-	-

*p < 0.05; **p < 0.01; ***p < 0.005.

(Continuation)

Table S2. Pearson correlation coefficients between biological parameters (abundance, richness and diversity indices) and environmental attributes in (a) slow and (b) fast hydromorphological units (HMUs). HMU width (Wid), mean depth (Dmed), maximum depth (Dmax), substrate coarse (Scoarse), substrate medium (Smed), substrate fine (Sfine), aquatic vegetation (Veg), density of woody debris (WD), embeddedness (Emb), shade (Sha). No significant outcomes were found for Wid and Sfine. Only significant relationships are shown ($p < 0.05$). (Continuation)

		Dmed	Dmax	Scoarse	Smed	Veg	WD	Emb	Sha
(b) Fast HMUs									
Ebrón	Abundance	-	-	-	-	-	-	-	-
	Richness	-	-	-	-	-	-	-	-
	Shannon	-	-0.692*	-	-0.614*	-	-	-	0.658*
	Simpson	-	-	-	-	-	-	-	0.693*
Vallanca	Abundance	-	-	-	-	-	-	-	-
	Richness	-	-	-	-	-	-	-	-
	Shannon	-	-	-	-	-	-	-	-
	Simpson	-	-	-	-	-	-	-	-
Palancia	Abundance	-	-	-	-	-	-	-	-
	Richness	-	-	-	-	-	-	-	0.716*
	Shannon	-	-	-	-	-	-	-	-
	Simpson	-	-	-	-	-	-	-	-
Villahermosa	Abundance	-	-	-	-	-	-	-	-
	Richness	-	-	-	-	-	-	0.765*	-
	Shannon	-	-0.779*	-	-	-	-	0.872***	-
	Simpson	-	-	-	-	-	-	-	-

*p < 0.05; **p < 0.01; ***p < 0.005.