

## Supplementary material

### **Structure, distribution patterns and ecological responses to hydrological changes in benthic macroinvertebrate assemblages in a regulated semi-arid river: baseline for biomonitoring studies**

*Marta Leiva<sup>A,D</sup>, Mercedes Marchese<sup>B</sup> and Liliana Diodato<sup>C</sup>*

<sup>A</sup>Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Instituto de Protección Vegetal (INPROVE), Facultad de Ciencias Forestales (FCF), Universidad Nacional de Santiago del Estero (UNSE), Avenida Belgrano (Sur) 1912, Santiago del Estero, Santiago del Estero, CP 4200, Argentina.

<sup>B</sup>Instituto Nacional de Limnología (INALI), CONICET–Universidad Nacional del Litoral, Ciudad Universitaria – Paraje El Pozo, Santa Fe, CP 3000, Argentina.

<sup>C</sup>Instituto de Protección Vegetal, Facultad de Ciencias Forestales, Universidad Nacional de Santiago del Estero.

<sup>D</sup>Corresponding author. Email address: [martaleiva@unse.edu.ar](mailto:martaleiva@unse.edu.ar)

**Table S1. Environmental variables by samplings (M1–M4) and sites (S1–S8)**

EC, electric conductivity; DO, dissolved oxygen; BOD<sub>5</sub>, biochemical oxygen demand; D, depth; V, current velocity; Q, discharge; OM, organic matter in sediments; Density  $\pm$  s.d.; Tax Rich, taxonomic richness; H', Shannon–Wiener index

Sampling	Site	T (°C)	pH	EC ( $\mu\text{S cm}^{-1}$ )	DO ( $\text{mg L}^{-1}$ )	BOD <sub>5</sub> ( $\text{mg L}^{-1}$ )	D (cm)	V ( $\text{cm s}^{-1}$ )	Q ( $\text{m}^3 \text{s}^{-1}$ )	OM (%)	Density (individuals $\text{m}^{-2}$ )	Tax Rich	H'
M1	S1	23	8.3 4	557	12.42	9.74	66	0.4	95.16	0.94	5903 ( $\pm 767$ )	29	2.6 2
	S2	24	8.5 2	579	12.78	7.43	103	0.76	95.16	0.98	6955 ( $\pm 1805$ )	37	2.5 7
	S3	24	8.1 7	575	6.06	0.86	87	0.9	95.16	0.37	217 ( $\pm 375$ )	2	0.4 3
	S4	23	8.1 7	525	6.06	0.86	170	0.9	95.16	0.34	117 ( $\pm 104$ )	2	0.4 8
	S5	26	8.7 7	596	11.03	5.34	46	0.09	19.25	0.4	50097 ( $\pm 32860$ )	38	2.0 2
	S6	26	8.5	590	4.54	5.34	60	0.83	29.35	0.32	12277 ( $\pm 6972$ )	20	1.7 8
	S7	30	7.1	585	9.33	2.35	80	0.69	29.35	0.35	2029 ( $\pm 790$ )	11	1.3 2
	S8	29	7.5 8	794	3.24	18.7	0	0.71	29.35	0.4	0 ( $\pm 0$ )	0	0
M2	S1	22	7.3 6	492	5.27	2.03	30	0.1	630.21	0.37	584 ( $\pm 290$ )	8	0.8 1
	S2	24	7.8	398	7.86	3.65	110	0	630.21	2.14	2576 ( $\pm 1696$ )	13	1.1 6
	S3	24	7.7 2	493	6.2	0.49	110	1.66	630.21	0.33	485 ( $\pm 408$ )	8	1.6 1
	S5	24	7.9	492	7.54	3.82	70	0.58	580.32	0.33	416 ( $\pm 260$ )	16	2.5 4
	S6	23	7.9 3	572	9.34	3.82	40	0.58	616.38	0.38	411 ( $\pm 141$ )	10	1.7 2
	S7	22	8.1 7	563	7.34	1.33	100	0.55	616.38	0.33	84 ( $\pm 48$ )	3	0.8 5
	S8	22	8.8 9	1118	6.16	20	30	0.32	616.38	0.34	551 ( $\pm 563$ )	6	1.1 5
	M3	S1	19	8.6 6	783	7.46	3.17	70	0.35	91.66	0.88	73448 ( $\pm 59820$ )	36
S2		20	8.4 9	763	8.43	3.41	110	0	91.66	2.73	153268 ( $\pm 87545$ )	42	2.8 2

Sampling	Site	T (°C)	pH	EC ( $\mu\text{S cm}^{-1}$ )	DO ( $\text{mg L}^{-1}$ )	BOD <sub>5</sub> ( $\text{mg L}^{-1}$ )	D (cm)	V ( $\text{cm s}^{-1}$ )	Q ( $\text{m}^3 \text{s}^{-1}$ )	OM (%)	Density (individuals $\text{m}^{-2}$ )	Tax Rich	H'
	S3	22	8.0 4	790	8.23	2.44	90	1.1	91.66	0.45	3164 ( $\pm 1737$ )	18	1.7 9
	S4	22	8.1 5	788	8.59	3.01	60	0.41	91.66	0.48	21858 ( $\pm 9651$ )	26	2.2 9
	S5	21	8.9 1	628	7.3	1.42	50	0.15	22.43	0.51	68622 ( $\pm 8756$ )	43	2.7 6
	S6	15	8.9 6	788	8.27	2.35	50	0.74	39.11	0.45	27474 ( $\pm 20235$ )	31	1.4 4
	S7	19	7.8 3	785	7.26	2.19	70	0.41	39.11	0.26	1456 ( $\pm 516$ )	8	0.6 5
	S8	24	8.9 9	866	7.22	24.69	130	1.06	39.11	0.92	9631 ( $\pm 3975$ )	11	1.2
M4	S1	22	7.7	488	7.14	0.98	90	0.25	235.14	0.28	2011 ( $\pm 1457$ )	21	2.6 8
	S2	23	8.1 7	527	8.43	0.82	30	1	235.14	0.9	6978 ( $\pm 2493$ )	42	2.4 6
	S3	23	8.6 4	493	8.11	4.71	120	1.25	235.14	0.3	331 ( $\pm 192$ )	13	1.9 8
	S4	17	8.5 7	488	7.78	3.73	40	0.66	235.14	0.35	1124 ( $\pm 1338$ )	18	2.2 8
	S5	17	8.8	575	8.59	3.73	30	0.7	188.64	0.31	7747 ( $\pm 5799$ )	40	2.3
	S6	21	8.3	602	8.92	1.46	55	0.43	203.74	0.27	9589 ( $\pm 2365$ )	8	0.3 7
	S7	21	8.4 1	577	9.08	1.62	80	0.36	203.74	0.39	3535 ( $\pm 3210$ )	6	0.7 8
	S8	17	8.9 1	573	8.11	28.54	85	0.51	203.74	0.38	3006 ( $\pm 1683$ )	7	1.5 2

**Table S2. List of taxa recorded, indicating the abbreviations for plot codifications and Functional Feeding Group assignment according to Merrit and Cummins (1996)**

P: predators, C-G: collector-gatherers, C-F: collector-filterers, Scr: scrapers, Min: wood miner. Taxa that were recorded only one specimen are marked with an asterisk (\*). These taxa were excluded from multivariate analysis, but there were taken into account for diversity analysis

TAXA	Cod	FFG
<b>Cnidaria</b>		
Hydrozoa		
<i>Hydra</i> sp.	<b>Hyd</b>	<b>P</b>
<b>Platyhelminthes</b>		
Turbellaria spp.	<b>Tur</b>	<b>P</b>
<b>Nematoda</b>		
Nematoda spp.	<b>Nem</b>	<b>P</b>
<b>Annelida</b>		
Hirudinea spp.	<b>Hir</b>	<b>P</b>
Polychaeta		
<i>Aeolosoma</i> sp.	<b>Ael</b>	<b>C-G</b>
Oligochaeta		
Naididae		
Naidinae		
<i>Chaetogaster diaphanus</i>	<b>Chdf</b>	<b>P</b>
<i>Ch. diastrophus</i>	<b>Chds</b>	<b>P</b>
<i>Dero obtusa</i>	<b>Dob</b>	<b>C-G</b>
<i>D. digitata</i>	<b>DDi</b>	<b>C-G</b>
<i>D. pectinata</i>	<b>Dpe</b>	<b>C-G</b>
<i>D. sawayai</i>	<b>Dsw</b>	<b>C-G</b>
<i>Stylaria fossularis</i>	<b>Sfo</b>	<b>C-G</b>
<i>Slavina apendiculata</i>	<b>Slap</b>	<b>C-G</b>
<i>S. isochaeta</i>	<b>Sliso</b>	<b>C-G</b>
<i>Nais communis</i>	<b>Nco</b>	<b>C-G</b>
<i>N. variabilis</i>	<b>Nva</b>	<b>C-G</b>
<i>Pristina americana</i>	<b>Pam</b>	<b>C-G</b>
<i>P. jenkiniae</i>	<b>Pje</b>	<b>C-G</b>
<i>P. longidentata</i>	<b>Plo</b>	<b>C-G</b>
<i>P. menoni</i>	<b>Pme</b>	<b>C-G</b>
<i>P. notopora</i>	<b>Pno</b>	<b>C-G</b>
<i>P. osborni</i>	<b>Pos</b>	<b>C-G</b>
<i>P. sima</i>	<b>Psi</b>	<b>C-G</b>
<i>P. synclites</i>	<b>Psy</b>	<b>C-G</b>
<i>P. aequiseta</i>	<b>Paeq</b>	<b>C-G</b>
<i>P. breviseta</i>	<b>Pbre</b>	<b>C-G</b>
<i>P. proboscidea</i>	<b>Ppro</b>	<b>C-G</b>
? <i>Stephensoniana trivandana</i>	<b>Stsp</b>	<b>C-G</b>
Tubificinae		
<i>Aulodrilus pigueti</i>	<b>Api</b>	<b>C-G</b>
<i>Bothrioneurum americanum</i>	<b>Bam</b>	<b>C-G</b>
<i>Limnodrilus hoffmeisteri</i>	<b>Lho</b>	<b>C-G</b>
Haplotaxidae		
<i>Haplotaxis</i> sp.1	<b>Hapl1</b>	<b>P</b>
<i>Haplotaxis</i> sp.2	<b>Hapl2</b>	<b>P</b>
Enchytraeidae		
Enchytraeidae sp.*		<b>C-G</b>
<b>Mollusca</b>		
Gastropoda		
Gastropoda spp.	<b>Gast</b>	<b>Scr</b>
Bivalvia		

TAXA	Cod	FFG
Corbiculidae		
? <i>Corbicula fluminea</i>	<b>Cor</b>	<b>C-F</b>
<b>Arthropoda</b>		
Crustacea		
Maxillopoda		
Copepoda spp.	<b>Cop</b>	<b>C-F</b>
Ostracoda		
Ostracoda spp.	<b>Ost</b>	<b>C-F</b>
Branchiopoda		
Cladocera spp.	<b>Cla</b>	<b>C-F</b>
Amphipoda		
Hyalellidae		
<i>Hyalella</i> sp.*		<b>C-G</b>
Arachnida		
Acari		
Hydrachnidia spp.	<b>Acr</b>	<b>P</b>
Hexapoda		
Collembola spp.	<b>Coll</b>	<b>C-G</b>
Insecta		
Ephemeroptera		
Caenidae	<b>Cen</b>	<b>C-G</b>
Baetidae	<b>Bet</b>	<b>C-G</b>
Ethylocidae	<b>Eut</b>	<b>P</b>
Leptohiphidae	<b>Lephy</b>	<b>C-G</b>
Leptophlebiidae	<b>Lept</b>	<b>C-G</b>
Polymitarcidae	<b>Poly</b>	<b>P</b>
Oligoneuriidae	<b>Olig</b>	<b>C-F</b>
Odonata		
Gomphidae	<b>Gom</b>	<b>P</b>
Zygoptera	<b>Dict</b>	<b>P</b>
Trichoptera		
Polycentropodidae	<b>Polc</b>	<b>C-F</b>
Hydropsichidae		
<i>Smicridea</i> sp.	<b>Smi</b>	<b>C-F</b>
Hydropsychidae sp.	<b>Hyds</b>	<b>C-F</b>
Hydroptilidae		
<i>Hydroptila</i> sp.	<b>Hydt</b>	<b>Scr</b>
<i>Metrichia</i> sp.	<b>Metr</b>	<b>C-F</b>
<i>Abtrichia</i> sp.*		<b>C-F</b>
Trichoptera sp.	<b>Tric</b>	<b>C-F</b>
Coleoptera		
Georissidae		
<i>Georissus</i> sp.*		<b>P</b>
Dytiscidae	<b>Dit</b>	<b>P</b>
Coleoptera sp.	<b>Colsp</b>	<b>P</b>
Diptera		
Chironomidae		
Tanypodinae		
<i>Ablabesmyia</i> sp.	<b>Abl</b>	<b>P</b>
<i>Djalmabatista</i> sp.	<b>Dja</b>	<b>P</b>
<i>Pentaneura</i> sp.	<b>Pen</b>	<b>P</b>
<i>Procladius</i> sp.	<b>Pro</b>	<b>P</b>
Chironominae		
<i>Aedokritus</i> sp.	<b>Aed</b>	<b>C-G</b>
<i>Apedilum</i> sp.	<b>Ape</b>	<b>C-G</b>
<i>Caladomyia</i> sp.	<b>Cal</b>	<b>C-F</b>
<i>Cardiocladius</i> sp.	<b>Car</b>	<b>C-F</b>
<i>Chironomus</i> sp.	<b>Chi</b>	<b>C-G</b>
<i>Cladotanytarsus</i> sp.	<b>Cladt</b>	<b>C-F</b>

TAXA	Cod	FFG
<i>Cryptochironomus</i> sp.	<b>Cry</b>	<b>P</b>
<i>Dicrotendipes</i> sp.	<b>Dic</b>	<b>C-G</b>
<i>Endotribelos</i> sp.	<b>End</b>	<b>C-G</b>
<i>Fissimentum</i> sp.*		<b>C-G</b>
<i>Goeldichironomus</i> sp.	<b>Goe</b>	<b>C-G</b>
<i>Harnischia</i> sp. 1	<b>Har1</b>	<b>C-G</b>
<i>Harnischia</i> sp. 2	<b>Har2</b>	<b>C-G</b>
<i>Oukuriella</i> sp.	<b>Ouk</b>	<b>C-G</b>
<i>Parachironomus</i> sp.	<b>Par</b>	<b>C-G</b>
<i>Pelomus</i> sp.	<b>Pel</b>	<b>C-G</b>
<i>Polypedilum</i> spp.	<b>Pol</b>	<b>C-G</b>
<i>Rheotanytarsus</i> sp.	<b>Rhe</b>	<b>C-G</b>
<i>Riethia</i> sp.	<b>Rie</b>	<b>C-G</b>
<i>Tanytarsus</i> sp. 1	<b>Tan</b>	<b>C-F</b>
<i>Tanytarsus</i> sp. 2	<b>Tan2</b>	<b>C-F</b>
<i>Xestochironomus</i> sp.*		<b>Min</b>
Orthoclaadiinae		
<i>Cricotopus</i> sp.	<b>Cri</b>	<b>C-G</b>
<i>Lopescladius</i> sp.	<b>Lop</b>	<b>C-G</b>
<i>Onconeura</i> sp.	<b>Onc</b>	<b>C-G</b>
<i>Thienemanniella</i> sp.	<b>Thi</b>	<b>C-G</b>
Culicidae	<b>Cul</b>	<b>C-G</b>
Dolichopodidae	<b>Dol</b>	<b>P</b>
Empididae*		<b>P</b>
Athericidae*		<b>P</b>
Ephydriidae	<b>Epd</b>	<b>C-G</b>
Simuliidae	<b>Sim</b>	<b>C-F</b>
Ceratopogonidae	<b>Cer</b>	<b>C-G</b>
Psocoptera**	<b>Pso</b>	<b>C-G</b>
Megaloptera		
Corydalidae		
<i>Corydalus</i> sp.*		<b>P</b>