

Supporting Information to

*Nematode distributions as spatial null models for macroinvertebrate species richness
across environmental gradients: A case from mountain lakes*

Guillermo de Mendoza, Walter Traunspurger, Alejandro Palomo and Jordi Catalan

Ecology and Evolution

Table S1 Species richness regression statistics considering all species in each group.

Figure S1 Species richness patterns across altitude using all species in each group.

Appendix S1 Taxonomic determination of nematodes, oligochaetes and insects.

Appendix S2 Species list, with codes used, and details on altitudinal distribution.

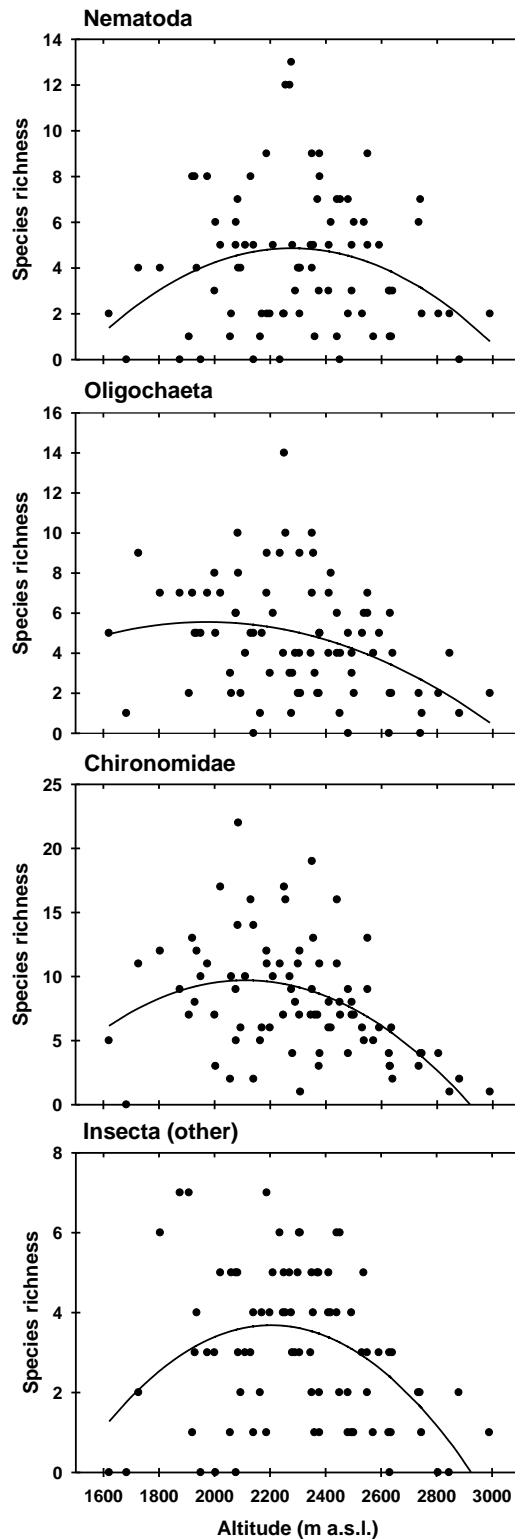
Table S1

Table S1 Simple linear and quadratic regression statistics of species richness against altitude, for each taxonomic group. All species are taken into account (number of species in each group indicated in brackets), with identical results than those provided when considering only species present in at least four lakes (Table 1). For each model, R^2 , adjusted R^2 , P -values, and AICc values are shown. The best model (simple linear or quadratic) is defined as the one with the lowest AIC value (highlighted in boldface). * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Taxonomic group and model	R^2	Adj. R^2	P-value	AICc
Nematoda (S = 30)				
Simple linear	0.0009	-0.0112	0.7852	417.38
Quadratic	0.0821	0.0588	0.0340 *	412.65
Oligochaeta (S = 35)				
Simple linear	0.1003	0.0890	0.0038 **	399.45
Quadratic	0.1335	0.1116	0.0035 **	398.57
Chironomidae (S = 59)				
Simple linear	0.1208	0.1098	0.0014 **	474.61
Quadratic	0.2413	0.2221	< 0.0001 ***	464.73
Insecta (other) (S = 42)				
Simple linear	0.0376	0.0255	0.0811	343.51
Quadratic	0.1863	0.1657	0.0003 ***	331.95

Figure S1

Figure S1 Species richness patterns across altitude in each taxonomic group, taking into account all species. The quadratic regression model was selected over the simple linear model, in all cases (see Table S1). The same results were obtained when using only species present in at least four lakes (see Figure 6).



Appendix S1

Appendix S1 Taxonomic determination of nematodes, oligochaetes and insects. Nematodes were determined following Abebe et al. (2006). Oligochaetes were previously determined (Collado and de Mendoza 2009), following the taxonomical works of Sperber (1948), Nielsen and Christensen (1959, 1961, 1963), and Brinkhurst and Jamieson (1971). Chironomids were mostly found as larval material, which could be determined under the microscope following mainly Wiederholm (1983) and Rieradevall and Brooks (2001), but also Cranston (1982), with the help of M. Rieradevall (G. de Mendoza, M. Rieradevall and J. Catalan, *unpublished manuscript*). More specific references were also used for particular genera, such as *Corynoneura* and *Psectrocladius* (M. Rieradevall, *personal communication*), *Chironomus* (Laville 1971), *Cricotopus* (Hirvenoja 1973; Nyman et al. 2005), and those of the tribe Tanytarsini (Ekrem 2004; Heiri et al. 2004; M. Rieradevall, *personal communication*). Pupae and pupal exuviae found were in most cases determined to species following mainly Langton (1991), but also Wiederholm (1986), and Wilson (1995) as a starting reference. As in the case of larvae, Hirvenoja (1973) was also used for *Cricotopus* and Ekrem (2004) for *Tanytarsus*. Within non-chironomid insects, species determination also followed specific references; for Coleoptera and Trichoptera, see de Mendoza et al. (2012) and de Mendoza et al. (2015), respectively, and references therein; for Megaloptera, Kaiser (1977) and Elliott (1996) were used; and for other groups the taxonomic determinations were obtained through the assistance of taxonomic experts in their respective fields (Ephemeroptera and Plecoptera, M.A. Puig and N. Ubero-Pascal; Odonata, A. Cordero; Hemiptera, A. Millán; non-chironomid Diptera, E. Bulánková and G. González).

Appendix S1

References

- Abebe, E., I. Andr ssy, and W. Traunspurger. 2006. Freshwater nematodes: ecology and taxonomy. CABI, Wallingford.
- Brinkhurst, R. O., and B. G. M. Jamieson. 1971. Aquatic Oligochaeta of the world. Oliver & Boyd, Edinburgh.
- Collado, R., and G. de Mendoza. 2009. Environmental factors and distribution of littoral oligochaetes in Pyrenean lakes. *Advances in Limnology* 62:215–244.
- Cranston, P. S. 1982. A key to the larvae of the British Orthocladiinae (Chironomidae). Freshwater Biological Association, Ambleside.
- de Mendoza, G., E. Rico, and J. Catalan. 2012. Predation by introduced fish constrains the thermal distribution of aquatic Coleoptera in mountain lakes. *Freshwater Biology* 57:803–814.
- de Mendoza, G., M. Ventura, and J. Catalan. 2015. Environmental factors prevail over dispersal constraints in determining the distribution and assembly of Trichoptera species in mountain lakes. *Ecology and Evolution* 5:2518–2532.
- Ekrem, T. 2004. Immature stages of European *Tanytarsus* species I. The *eminulus*-, *gregarius*-, *lugens*-, and *mendax* species groups (Diptera, Chironomidae). *Mitteilungen aus dem Museum f r Naturkunde in Berlin, Deutsche Entomologische Zeitschrift* 51:97–146.
- Elliott, J. M. 1996. British freshwater Megaloptera and Neuroptera: a key with ecological notes. Freshwater Biological Association, Ambleside.
- Heiri, O., T. Ekrem, and E. Willassen. 2004. Larval head capsules of European *Micropsectra*, *Paratanytarsus* and *Tanytarsus* (Diptera: Chironomidae: Tanytarsini). Version 1.0, August 24, 2004. <http://www3.bio.uu.nl/palaeo/Chironomids/Tanytarsini/Intro.htm> [Downloaded on March 20, 2007].
- Hirvenoja, M. 1973. Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera, Chironomidae). *Annales Zoologici Fennici* 10:1–363.
- Kaiser, E. W. 1977.  g og larver af 6 *Sialis*-arter fra Skandinavien og Finland. *Flora Fauna, Arhus* 83:65–79.
- Langton, P. H. 1991. A key to pupal exuviae of West Palearctic Chironomidae. Privately published by P.H. Langton, 3 St Felix Road, Ramsey Forty Foot, Huntingdon, Cambridgeshire.

Appendix S1

- Laville, H. 1971. Recherches sur les chironomides (Diptera) lacustres du Massif de Néouvielle (Hautes-Pyrénées). Première partie: systematique, écologie, phénologie. *Annales de Limnologie* 7:173–332.
- Nielsen, C. O., and B. Christensen. 1959. The Enchytraeidae, critical revision and taxonomy of European species. *Natura Jutlandica* 8/9:1–160.
- Nielsen, C. O., and B. Christensen. 1961. The Enchytraeidae, critical revision and taxonomy of European species. *Natura Jutlandica* 10 (Suppl. 1):1–23.
- Nielsen, C. O., and B. Christensen. 1963. The Enchytraeidae, critical revision and taxonomy of European species. *Natura Jutlandica* 10 (Suppl. 2):1–19.
- Nyman, M., A. Korhola, and S. J. Brooks. 2005. The distribution and diversity of Chironomidae (Insecta: Diptera) in western Finnish Lapland, with special emphasis on shallow lakes. *Global Ecology and Biogeography* 14:137–153.
- Rieradevall, M., and S. J. Brooks. 2001. An identification guide to subfossil Tanypodinae larvae (Insecta: Diptera: Chironomidae) based on cephalic setation. *Journal of Paleolimnology* 25:81–99.
- Sperber, C. 1948. A taxonomical study of the Naididae. *Zoologiska Bidrag från Uppsala* 28:1–296.
- Wiederholm, T. 1983. Chironomidae of the Holarctic region. Keys and diagnoses. Part 1. Larvae. *Entomologica Scandinavica Suppl.* 19:1–457.
- Wiederholm, T. 1986. Chironomidae of the Holarctic region. Keys and diagnoses. Part 2. Pupae. *Entomologica Scandinavica Suppl.* 28:1–482.
- Wilson, R. S. 1995. A practical key to the genera of pupal exuviae of the British Chironomidae (Diptera: Insecta), unpublished revised version, August 1995, of Wilson, R. S. and J. D. McGill, 1982, A practical key to the genera of pupal exuviae of the British Chironomidae (Diptera: Insecta), University of Bristol Printing Office, Bristol.

Appendix S2

Appendix S2 Species considered, with the associated numbers ('#') used in the main manuscript (Figures 2, 4 and 5), separately for each taxonomic group. Detailed information is given for the frequency of occurrence of species ('Freq.', referred to as the number of lakes where the species was collected, max. 82); for the altitudinal bias in distributions ('Bias', indicating whether the bias is positive or negative in square brackets when significant, $P < 0.05$ in Figure 3); and for the narrow ranging character of species ('Narrow', indicated by asterisks when significant, $P < 0.05$ in Figure 4). Species found in less than four lakes were not considered (n/c) in the main manuscript, but are used in the Supporting Information analyses of Table S1 and Figure S1. Some individuals were not determined to species-level, but belonged to the same morphotype; these cases were considered as of the same species, except in those instances where one morphotype was confidently representing more than one species, thus being discarded from statistical analysis in both the main manuscript and the Supporting Information (as it was the case of the few taxa determined to family-level). *Micropsetra*, *Tanytarus* and *Paratanytarsus* types were assigned following type descriptions of Heiri et al. (2004). In nematodes, oligochaetes and non-chironomid insects, the taxonomic Order to which each species belongs is indicated. As chironomids are a family of insects in the Order Diptera, in this case, the subfamily or tribe of each species is shown.

Appendix S2

Nematoda					
Species name	Family (Order)	#	Freq.	Bias	Narrow
<i>Ironus longicaudatus</i> de Man	Ironidae (Enoplida)	15	17		*
<i>Ironus tenuicaudatus</i> de Man	Ironidae (Enoplida)	4	16		
<i>Eutobrilus grandipapillatus</i> (Brakenhoff)	Tobrilidae (Triplonchida)	12	31		
<i>Semitobrilus pellucidus</i> (Bastian)	Tobrilidae (Triplonchida)	7	15		
<i>Tobrilus gracilis</i> (Bastian)	Tobrilidae (Triplonchida)	19	8		
<i>Tripyla glomerans</i> Bastian	Tripylidae (Triplonchida)	14	35		
<i>Crocodyrlaimus flavomaculatus</i> (Linstow)	Dorylaimidae (Dorylaimida)	2	9		
<i>Dorylaimus</i> cf. <i>stagnalis</i> Dujardin	Dorylaimidae (Dorylaimida)	9	45		
<i>Mesodorylaimus</i> sp.1 (<i>conurus</i> ?)	Dorylaimidae (Dorylaimida)	13	4		
<i>Prodorylaimus</i> cf. <i>rotundiceps</i> Loof	Dorylaimidae (Dorylaimida)	8	5		
<i>Paractinolaimus macrolaimus</i> (de Man)	Actinolaimidae (Dorylaimida)	6	16		*
<i>Epidorylaimus consobrinus</i> (de Man)	Qudsianematidae (Dorylaimida)	16	44		
<i>Eudorylaimus similis</i> (de Man)	Qudsianematidae (Dorylaimida)	20	7		
<i>Aporcelaimellus obtusicaudatus</i> (Bastian)	Aporcelaimidae (Dorylaimida)	10	24		
<i>Anatonchus dolichurus</i> (Ditlevsen)	Anatonchidae (Mononchida)	1	12	[-]	
<i>Coomansus zschokkei</i> (Menzel)	Mononchidae (Mononchida)	17	9		
<i>Mononchus truncatus</i> Bastian	Mononchidae (Mononchida)	18	19		
<i>Ethmolaimus</i> cf. <i>pratensis</i> de Man	Ethmolaimidae (Chromadorida)	3	4		
<i>Plectus aquatilis</i> Andr�ssy	Plectidae (Plectida)	5	8		
<i>Plectus cirratus</i> Bastian	Plectidae (Plectida)	11	4		
<u>Discarded (present in less than four lakes)</u>					
<i>Tobrilus</i> sp.2	Tobrilidae (Triplonchida)	-	1	n/c	n/c
<i>Tripyla filicaudata</i> de Man	Tripylidae (Triplonchida)	-	1	n/c	n/c
<i>Ischiodorylaimus</i> cf. <i>cognatus</i> Andr�ssy	Dorylaimidae (Dorylaimida)	-	1	n/c	n/c
<i>Prodorylaimus filiarum</i> Andr�ssy	Dorylaimidae (Dorylaimida)	-	1	n/c	n/c
<i>Clarkus papillatus</i> (Bastian)	Mononchidae (Mononchida)	-	2	n/c	n/c
<i>Prionchulus</i> cf. <i>punctatus</i> (Cobb)	Mononchidae (Mononchida)	-	1	n/c	n/c
<i>Prionchulus muscorum</i> (Dujardin)	Mononchidae (Mononchida)	-	2	n/c	n/c
<i>Achromadora terricola</i> (de Man)	Achromadoridae (Chromadorida)	-	2	n/c	n/c
<i>Monhystera</i> cf. <i>paludicola</i> de Man	Monhysteridae (Monhysterida)	-	2	n/c	n/c
<i>Aphanolaimus aquaticus</i> von Daday	Aphanolaimidae (Plectida)	-	2	n/c	n/c
<u>Discarded (not determined to species level)</u>					
Mermithidae (undetermined)	Mermithidae (Mermithida)	-	31	n/c	n/c

Appendix S2

Oligochaeta

Species name	Family (Order)	#	Freq.	Bias	Narrow
<i>Lumbriculus variegatus</i> (Müller)	Lumbriculidae (Lumbriculida)	17	26		
<i>Stylogdrilus heringianus</i> Claparède	Lumbriculidae (Lumbriculida)	21	23		
<i>Bothrioneurum vej dovskyanum</i> Stolc	Naididae (Haplotaxida)	3	4	[-]	
<i>Chaetogaster diaphanus</i> (Gruithuisen)	Naididae (Haplotaxida)	4	7		
<i>Chaetogaster diastrophus</i> (Gruithuisen)	Naididae (Haplotaxida)	5	7		
<i>Limnodrilus hoffmeisteri</i> Claparède	Naididae (Haplotaxida)	20	8		
<i>Nais barbata</i> Müller	Naididae (Haplotaxida)	2	5		
<i>Nais bretscheri</i> Michaelsen	Naididae (Haplotaxida)	9	15		
<i>Nais cf. communis</i> Piguet	Naididae (Haplotaxida)	18	6		
<i>Nais pardalis</i> Piguet	Naididae (Haplotaxida)	14	6		
<i>Nais pseudobtusa</i> Piguet	Naididae (Haplotaxida)	7	12	[-]	
<i>Nais simplex</i> Piguet	Naididae (Haplotaxida)	11	24	[-]	*
<i>Nais variabilis</i> Piguet	Naididae (Haplotaxida)	15	53		
<i>Slavina appendiculata</i> (d'Udekem)	Naididae (Haplotaxida)	16	4		
<i>Specaria josinae</i> (Vejdovský)	Naididae (Haplotaxida)	10	42	[-]	*
<i>Spirosperma ferox</i> (Eisen)	Naididae (Haplotaxida)	6	10	[-]	*
<i>Tubifex tubifex</i> (Müller)	Naididae (Haplotaxida)	22	17		
<i>Uncinai s uncinata</i> (Ørsted)	Naididae (Haplotaxida)	1	4	[-]	
<i>Vejdovskyaella comata</i> (Vejdovský)	Naididae (Haplotaxida)	8	14	[-]	
<i>Cognettia glandulosa</i> (Michaelsen)	Enchytraeidae (Haplotaxida)	19	43		*
<i>Cognettia sphagnetorum</i> (Vejdovský)	Enchytraeidae (Haplotaxida)	23	16	[+]	
<i>Cognettia</i> sp.3	Enchytraeidae (Haplotaxida)	13	10		
<i>Henlea perpusilla</i> Friend	Enchytraeidae (Haplotaxida)	12	6		

Discarded (present in less than four lakes)

<i>Chaetogaster crystallinus</i> Vejdovský	Naididae (Haplotaxida)	-	2	n/c	n/c
<i>Nais alpina</i> Sperber	Naididae (Haplotaxida)	-	2	n/c	n/c
<i>Pristina aequisetata</i> Bourne	Naididae (Haplotaxida)	-	2	n/c	n/c
<i>Pristina cf. jenkinae</i> (Stephenson)	Naididae (Haplotaxida)	-	1	n/c	n/c
<i>Pristina</i> sp.3	Naididae (Haplotaxida)	-	1	n/c	n/c
<i>Buchholzia appendiculata</i> (Buchholz)	Enchytraeidae (Haplotaxida)	-	1	n/c	n/c
<i>Henlea</i> sp.2	Enchytraeidae (Haplotaxida)	-	3	n/c	n/c
<i>Mesenchytraeus armatus</i> (Levinsen)	Enchytraeidae (Haplotaxida)	-	1	n/c	n/c
<i>Fridericia cf. bulboides</i> Niels. & Christens.	Enchytraeidae (Haplotaxida)	-	1	n/c	n/c
<i>Fridericia</i> sp.2	Enchytraeidae (Haplotaxida)	-	1	n/c	n/c
Lumbricidae (undetermined) ¹	Lumbricidae (Haplotaxida)	-	1	n/c	n/c
<i>Aeolosoma</i> sp.	Aeolosomatidae (Haplotaxida)	-	2	n/c	n/c

Discarded (not determined to species level)

<i>Cernosvitoviella</i> spp.	Enchytraeidae (Haplotaxida)	-	49	n/c	n/c
<i>Achaeta</i> spp.	Enchytraeidae (Haplotaxida)	-	20	n/c	n/c

¹ Only one individual found, therefore only one species.

Appendix S2

Chironomidae						
Species name	Subfamily / tribe	#	Freq.	Bias	Narrow	
<i>Ablabesmyia longistyla</i> Fittkau	Tanypodinae	19	26	[-]	*	
<i>Ablabesmyia monilis</i> (Linnaeus)	Tanypodinae	8	25	[-]		
<i>Ablabesmyia phatta</i> (Egger)	Tanypodinae	32	9			
<i>Trissopelopia</i> sp.	Tanypodinae	24	7			
<i>Conchapelopia</i> sp.	Tanypodinae	22	6			
<i>Thienemannimyia</i> sp.	Tanypodinae	5	6	[-]		
<i>Macropelopia</i> gr. <i>notata</i>	Tanypodinae	33	23		*	
<i>Macropelopia</i> gr. <i>nebulosa</i>	Tanypodinae	34	39			
<i>Prodiamesa olivacea</i> (Meigen)	Prodiamesinae	2	5	[-]		
<i>Chaetocladius</i> sp.	Orthoclaadiinae	17	6			
<i>Corynoneura lacustris</i> -type	Orthoclaadiinae	26	37		*	
<i>Cricotopus pirifer</i> Hirvenoja	Orthoclaadiinae	3	11	[-]		
<i>Cricotopus</i> gr. <i>reversus</i>	Orthoclaadiinae	21	7			
<i>Cricotopus</i> gr. <i>sylvestris</i>	Orthoclaadiinae	11	15	[-]		
<i>Heterotrissoclaadius marcidus</i> (Walker)	Orthoclaadiinae	31	64		*	
<i>Metricnemus</i> gr. <i>hygropetricus</i>	Orthoclaadiinae	15	8			
<i>Paratrithoclaadius</i> sp.	Orthoclaadiinae	36	5	[+]		
<i>Psectrocladius</i> gr. <i>psilopterus</i>	Orthoclaadiinae	27	16		*	
<i>Psectrocladius</i> gr. <i>sordidellus</i>	Orthoclaadiinae	7	16	[-]		
<i>Synorthoclaadius semivirens</i> (Kieffer)	Orthoclaadiinae	28	35			
<i>Thienemannia</i> sp.	Orthoclaadiinae	9	7			
<i>Chironomus commutatus</i> -type	Chironomini	1	13	[-]		
<i>Cladopelma</i> sp.	Chironomini	4	8	[-]		
<i>Microtendipes</i> gr. <i>pedellus</i>	Chironomini	10	14	[-]	*	
<i>Pagastiella orophila</i> (Edwards)	Chironomini	13	10	[-]	*	
<i>Paracladopelma</i> sp.	Chironomini	16	9			
<i>Polypedilum nubens</i> -type	Chironomini	14	15	[-]		
<i>Polypedilum albicorne</i> -type	Chironomini	6	11	[-]		
<i>Pseudochironomus prasinatus</i> (Stæger)	Pseudochironomini	23	5			
<i>Cladotanytarsus</i> gr. <i>mancus</i>	Tanytarsini	12	13	[-]		
<i>Micropsectra radialis</i> -type	Tanytarsini	35	15	[+]		
<i>Micropsectra</i> C-type	Tanytarsini	20	4			
<i>Nezavrelia</i> A-type (<i>luteola</i> ?)	Tanytarsini	29	6			
<i>Paratanytarsus austriacus</i> -type	Tanytarsini	30	56			
<i>Paratanytarsis penicillatus</i> -type	Tanytarsini	18	28	[-]	*	
<i>Tanytarsus lugens</i> -type	Tanytarsini	25	41			
 <u>Discarded (present in less than four lakes)</u>						
<i>Pseudokiefferiella parva</i> (Edwards)	Diamesinae	-	2	n/c	n/c	
<i>Brillia</i> sp.	Orthoclaadiinae	-	1	n/c	n/c	
<i>Corynoneura</i> cf. <i>lobata</i> Edwards	Orthoclaadiinae	-	1	n/c	n/c	
<i>Cricotopus pulchripes</i> -type	Orthoclaadiinae	-	3	n/c	n/c	
<i>Cricotopus</i> species A	Orthoclaadiinae	-	1	n/c	n/c	
<i>Cricotopus</i> gr. <i>obnixus</i>	Orthoclaadiinae	-	1	n/c	n/c	
<i>Heterotanytarsus</i> sp.	Orthoclaadiinae	-	1	n/c	n/c	
<i>Paraccladius</i> sp.	Orthoclaadiinae	-	3	n/c	n/c	
<i>Parakiefferiella coronata</i> (Edwards)	Orthoclaadiinae	-	1	n/c	n/c	
<i>Parorthoclaadius</i> sp.	Orthoclaadiinae	-	2	n/c	n/c	
<i>Psectrocladius</i> (<i>Mesopsectrocladius</i>) sp.	Orthoclaadiinae	-	2	n/c	n/c	
<i>Rheocricotopus</i> sp.	Orthoclaadiinae	-	1	n/c	n/c	
<i>Tvetenia</i> sp.	Orthoclaadiinae	-	1	n/c	n/c	
<i>Dicrotendipes tritonus</i> (Kieffer)	Chironomini	-	3	n/c	n/c	
<i>Einfeldia pagana</i> (Meigen)	Chironomini	-	1	n/c	n/c	
<i>Parachironomus</i> gr. <i>arcuatus</i>	Chironomini	-	1	n/c	n/c	
<i>Phaenopsectra</i> sp.	Chironomini	-	2	n/c	n/c	
<i>Stictochironomus</i> sp.	Chironomini	-	1	n/c	n/c	

Appendix S2

Chironomidae (continued)					
Species name	Subfamily / tribe	#	Freq.	Bias	Narrow
<i>Micropsectra insignilobus</i> -type	Tanytarsini	-	1	n/c	n/c
<i>Neozavrelia</i> B-type	Tanytarsini	-	1	n/c	n/c
<i>Stempellinella</i> (?) sp.	Tanytarsini	-	1	n/c	n/c
<i>Tanytarsus chinyensis</i> -type	Tanytarsini	-	2	n/c	n/c
<i>Tanytarsus nemorosus</i> -type	Tanytarsini	-	2	n/c	n/c
<u>Discarded (not determined to species level)</u>					
<i>Zavrelimyia</i> spp.	Tanypodinae	-	45	n/c	n/c
<i>Procladius</i> spp.	Tanypodinae	-	47	n/c	n/c
<i>Diamesa</i> spp.	Diamesinae	-	4	n/c	n/c
<i>Pseudodiamesa</i> spp.	Diamesinae	-	15	n/c	n/c
<i>Corynoneura scutellata</i> -type	Orthoclaadiinae	-	43	n/c	n/c
<i>Orthocladus</i> spp.	Orthoclaadiinae	-	11	n/c	n/c
<i>Psectrocladius octomaculatus</i> -type (spp.)	Orthoclaadiinae	-	34	n/c	n/c
<i>Chironomus / Einfeldia</i> C-type	Chironomini	-	4	n/c	n/c
<i>Micropsectra aristata</i> -type (spp.)	Tanytarsini	-	35	n/c	n/c
<i>Tanytarsus mendax</i> -type	Tanytarsini	-	16	n/c	n/c

Appendix S2

Insecta (other)

Species name	Family (Order)	#	Freq.	Bias	Narrow
<i>Aeshna</i> sp.	Aeshnidae (Odonata)	1	4	[-]	
<i>Cloëon schoenemundi</i> Bengtsson	Baetidae (Ephemeroptera)	4	19	[-]	*
<i>Capnia vidua</i> Klapálek	Capniidae (Plecoptera)	14	4	[+]	
<i>Arctocoris carinata</i> (Sahlberg)	Corixidae (Hemiptera)	5	7		
<i>Sialis lutaria</i> (Linnaeus)	Sialidae (Megaloptera)	7	46	[-]	*
<i>Boreonectes cf. ibericus</i> (Dutton & Angus)	Dytiscidae (Coleoptera)	8	7		
<i>Oreodytes cf. sanmarkii</i> (Sahlberg)	Dytiscidae (Coleoptera)	11	4		
<i>Agabus cf. bipustulatus</i> (Linnaeus)	Dytiscidae (Coleoptera)	12	14		
<i>Platambus maculatus</i> (Linnaeus)	Dytiscidae (Coleoptera)	3	7		
<i>Plectrocnemia cf. laetabilis</i> McLachlan	Polycentropodidae (Trichoptera)	9	25		*
<i>Polycentropus flavomaculatus</i> (Pictet)	Polycentropodidae (Trichoptera)	6	24	[-]	*
<i>Drusus cf. rectus</i> (McLachlan)	Limnephilidae (Trichoptera)	13	6	[+]	*
<i>Annitella cf. pyrenaea</i> (Navás)	Limnephilidae (Trichoptera)	10	27		
<i>Mystacides azurea</i> (Linnaeus)	Leptoceridae (Trichoptera)	2	12	[-]	*

Discarded (present in less than four lakes)

<i>Enallagma cyathigerum</i> (Charp)	Coenagrionidae (Odonata)	-	1	n/c	n/c
<i>Caenis horaria</i> (Linnaeus)	Caenidae (Ephemeroptera)	-	2	n/c	n/c
<i>Ecdyonurus cf. forcipula</i> (Pictet)	Heptageniidae (Ephemeroptera)	-	1	n/c	n/c
<i>Electrogena lateralis</i> (Curtis)	Heptageniidae (Ephemeroptera)	-	1	n/c	n/c
<i>Habroleptoides gr. umbratilis</i>	Leptophlebiidae (Ephemeroptera)	-	1	n/c	n/c
<i>Siphonurus lacustris</i> Eaton	Siphonuridae (Ephemeroptera)	-	1	n/c	n/c
<i>Arcynopteryx compacta</i> (McLachlan)	Perlodidae (Plecoptera)	-	3	n/c	n/c
<i>Perlodes intricata</i> (Pictet)	Perlodidae (Plecoptera)	-	2	n/c	n/c
<i>Siphonoperla torrentium</i> (Pictet)	Chloroperlidae (Plecoptera)	-	3	n/c	n/c
<i>Nemoura cinerea</i> Retzius	Nemouridae (Plecoptera)	-	3	n/c	n/c
<i>Nemoura mortoni</i> Ris	Nemouridae (Plecoptera)	-	1	n/c	n/c
<i>Nemurella pictetii</i> Klapálek	Nemouridae (Plecoptera)	-	1	n/c	n/c
<i>Leuctra leptogaster</i> Aubert	Leuctridae (Plecoptera)	-	2	n/c	n/c
<i>Micronecta poweri</i> (Douglas & Scott)	Corixidae (Hemiptera)	-	1	n/c	n/c
<i>Halipilus cf. fulvus</i> (Fabricius)	Haliplidae (Coleoptera)	-	3	n/c	n/c
<i>Helophorus</i> sp.	Helophoridae (Coleoptera)	-	1	n/c	n/c
<i>Elmis</i> sp.	Elmidae (Coleoptera)	-	1	n/c	n/c
<i>Limonia</i> sp.	Limoniidae (Diptera)	-	1	n/c	n/c
<i>Erioptera</i> sp.	Limoniidae (Diptera)	-	1	n/c	n/c
<i>Limnophila</i> sp.	Limoniidae (Diptera)	-	1	n/c	n/c
<i>Simulium</i> sp.	Simuliidae (Diptera)	-	1	n/c	n/c
<i>Chrysops</i> sp.	Tabanidae (Diptera)	-	1	n/c	n/c
<i>Lispe</i> sp.	Muscidae (Diptera)	-	1	n/c	n/c
<i>Agrypnia</i> sp.	Phryganeidae (Trichoptera)	-	1	n/c	n/c
<i>Potamophylax latipennis</i> (Curtis)	Limnephilidae (Trichoptera)	-	3	n/c	n/c
<i>Limnephilus cf. gadarramicus</i> Schmid	Limnephilidae (Trichoptera)	-	3	n/c	n/c
<i>Thremma gallicum</i> McLachlan	Limnephilidae (Trichoptera)	-	3	n/c	n/c
<i>Athripsodes aterrimus</i> (Stephens)	Leptoceridae (Trichoptera)	-	1	n/c	n/c

Discarded (not determined to species level)

<i>Hydroporus</i> spp. ²	Dytiscidae (Coleoptera)	-	28	n/c	n/c
Ceratopogonidae (undetermined)	Ceratopogonidae (Diptera)	-	6	n/c	n/c

² Only one species was found in our lake survey, *H. foveolatus* Heer, but the genus is highly diversified in the Pyrenees (Ribera et al., 1993), and other species are likely present.

Appendix S2

References

- Heiri, O., T. Ekrem, and E. Willassen. 2004. Larval head capsules of European *Micropsectra*, *Paratanytarsus* and *Tanytarsus* (Diptera: Chironomidae: Tanytarsini). Version 1.0, August 24, 2004. <http://www3.bio.uu.nl/palaeo/Chironomids/Tanytarsini/Intro.htm> [Downloaded on March 20, 2007].
- Ribera, I., C. Hernando, X. Fresneda, P. Aguilera, G. N. Foster, and S. Bignal. 1993. A preliminary checklist of the Hydradephaga from the Pyrenees. *Latissimus* 3:6–10.