THE UNITED KINGDOM UPLAND WATERS MONITORING NETWORK

DATA REPORT FOR 2012– 2013 (YEAR 25)

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Report to the Department for Environment, Food and Rural Affairs
(Contract EPG 1/3/160)

2014

Editors

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2. INTRODUCTION

In 2013 the UK Upland Waters Monitoring Network (UKUWMN) replaced the UK Acid Waters Monitoring Network. Between them, they have been operating continuously since 1988. This report presents summary data for the full suite of measurements at all original sites up until June 2007, and for the reduced numbers of measurements and sites that continued to be funded up until April 2013.

During the first ten years of monitoring biological and chemical data were summarised in an annual series of printed reports. Since the year 2000 annual data reports have also been available from the UKUWMN web page. These are of a similar format to earlier annual reports but focus on graphical representations of time trends in raw data and diagnostic statistics (e.g. species richness and diversity indices). Detailed analysis of data has been presented in five interpretative reports, Kernan *et al*. (2010), Monteith and Shilland (2007), Monteith (2005), Monteith and Evans (2000) and Patrick *et al*. (1995), dealing with 20, 18, 15, 10 and 5 years of accumulated results respectively. All but the oldest can be found in the reports section of the UKUWMN web site. A full description of sampling methods and analytical procedures, together with site descriptions, is also presented on the UKUWMN web page.

3. THE MONITORING NETWORK

The UKUWMN was originally established by the UK Department of Environment (now Defra) in 1988 following the recommendations of the UK Acid Waters Review Group (AWRG, 1987) in order to assess the chemical and biological response of acidified lakes and streams in the UK to planned reduction in emissions.

The UKUWMN sites are all located in relatively acid-sensitive regions, in upland areas with catchments underlain by base-poor soils and geology (Figure 3.1., Table 3.1.). Although monitoring has been underway at most sites continuously since 1988, sampling at certain sites began later and there have also been a small number of interruptions in the record when sampling was not possible (Table 3.2.). The Network originally comprised 10 stream and 10 lakes sites. In 1990 two sites in Northern Ireland were added (Blue Lough and Coneyglen Burn), supported by funding from the Department of Environment (Northern Ireland). At the start of 1991 the Nant y Gronwen (site 18) was removed from the Network following a request from the landowner and was replaced by a nearby moorland stream, Afon Gwy. In 2001, as a result of water abstraction and damming by a local fish farm at Coire nan Arr (Site 1) a new 'control' site was added to the Network, Loch Coire Fionnaraich (Site 23). Due to concerns that the heavily acidified North York Moors area was unrepresented in the Network, in 2011 a new stream site from the region, Danby Beck, was added.

Between 1988-2004 data collection and analyses at 20 of the UKUWMN sites were funded by Air Quality Division at Defra (previously Department of the Environment),

with two sites in Northern Ireland being funded by the Department of Environment (Northern Ireland) (DoE(NI)). The Scottish Executive (SE) and subsequently Scottish Government (SG) contributed 50% of the funding for UKUWMN work by the Scottish Government's Marine Scotland Freshwater Laboratory (MS). In 2001 DoE(NI) withdrew from directly funding the Programme and Defra took up funding of the Network in Northern Ireland.

Following a funding hiatus at Defra in mid-2007, chemical sampling and analyses at several sites were halted and, more widely, fish surveys and lake macrophyte surveys were cancelled for that year.

The reduced Network of sites and analyses that remained after reductions in central funding has been sustained only as a result of significant contributions in kind from the NERC Centre for Ecology and Hydrology (CEH), Marine Scotland (MS) and ENSIS-ECRC at UCL; financial assistance from the Welsh Government, Natural Resources Wales (NRW), the Environment Agency (EA) and the Forestry Commission (FC); and assistance from the School of Biological Sciences, Queen Mary University of London (QMUL) and several private individuals. More recently, Scottish Natural Heritage (SNH) and the Scottish Environmental Protection Agency (SEPA) have also started providing financial support. The impact of the funding cuts has thereby been partly mitigated and consequently the monitoring programme that was in place between 1988-2007 has been maintained as far as possible at most sites in the period since 2007 (Table 3.2.).

All sites have been monitored chemically and biologically according to methodologies described on the methods section of the UKUWMN web site. Water samples are collected monthly at stream sites and quarterly at lake sites. Epilithic diatoms and benthic invertebrates are sampled annually. Aquatic macrophytes are surveyed between June and September, annually at stream sites and biannually at lake sites. Stream sites and the outflow streams of lake sites are electro-fished annually in the autumn.

In addition to the annual surveys, sediment cores were taken from all lake sites during the first five years of monitoring. These were radiometrically dated and analysed for diatoms, carbonaceous particles (derived from the combustion of fossil fuels) (Rose *et al.* 1995) and trace metals. Results of this work are presented in Patrick *et al.* (1995) and Juggins *et al*. (1996).

Sediment traps installed in all lakes are emptied annually. The contents are analysed for diatom species composition, trace metals and the flux of carbonaceous particles, allowing direct comparisons to be made with the historical (sediment core) record. Temperature data from thermistors attached to the sediment traps is downloaded at the same time. At Llyn Llagi a separate thermistor chain is also downloaded annually. Lake and outflow temperature, height and conductivity loggers at Llyn Llagi and Round Loch of Glenhead are downloaded whenever possible during site visits.

All chemical, physical and biological data are stored in a database managed by CEH, MS and ENSIS. Summary data are available to scientific and other interested organisations on request. Further information on the UKUWMN, including site descriptions and photographs, is available via the internet at the address: http://uwmn.defra.gov.uk

Figure 3.1 Location of UK UWMN Sites

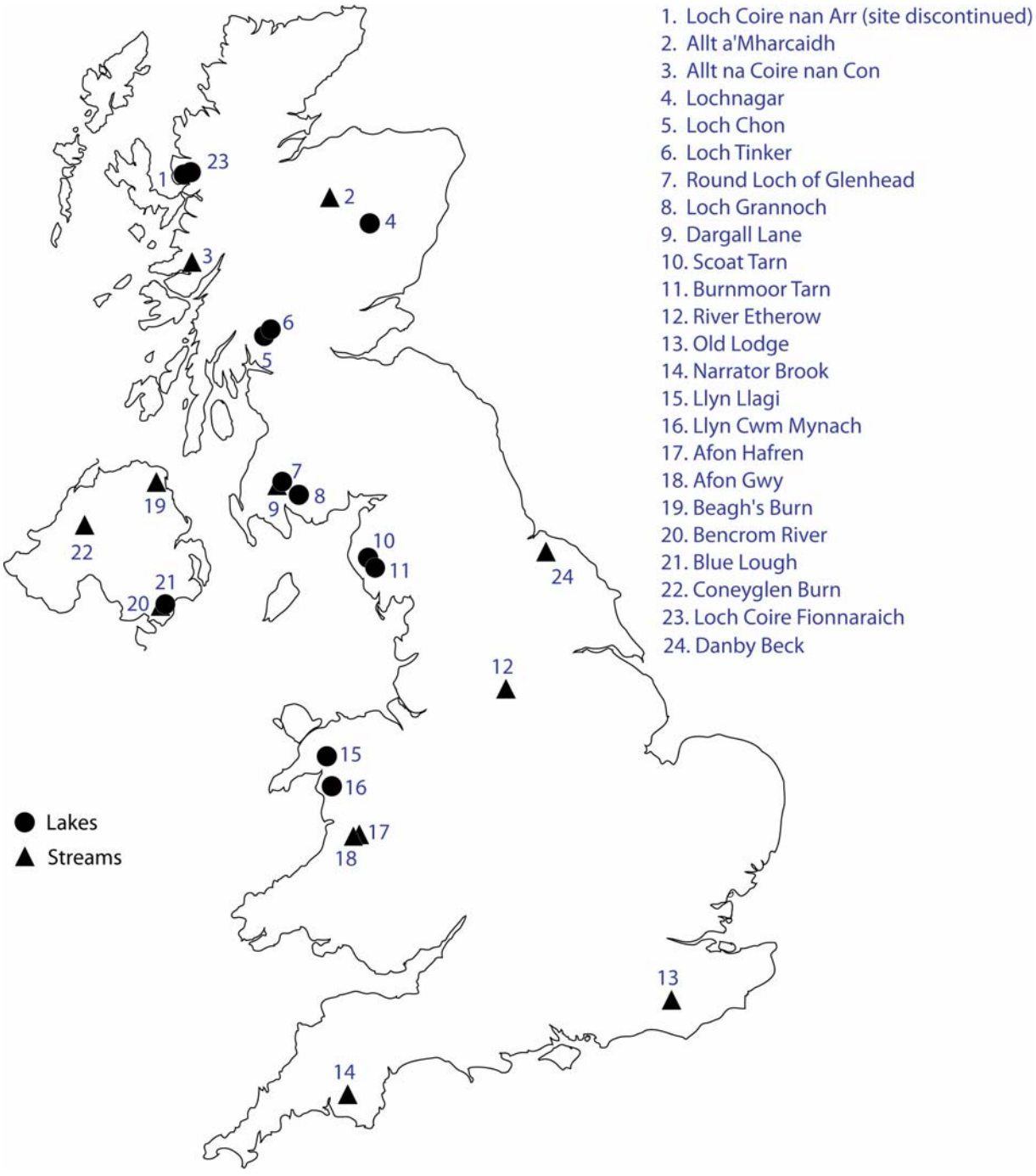


Table 3.1. Locations and physical characteristics of UK Upland Waters Monitoring Network sites

Site	Code	UK Grid Reference	Type	Altitude Range (m)	Geology	Soils	Catchment area (ha)	Forest area (%)	Lake area (ha)	Lake max. depth (m)
1. Loch Coire nan Arr	ARR	NG 808422	Lake	125 – 896	Sandstone	Podzol, gley, peat	897	-	14.4	12
2. Allt a' Mharcaidh	MHAR	NH 881045	Stream	325 – 1111	Granite	Podzol, peat	998	<1	-	-
3. Allt na Coire nan Con	ANCC	NM 793688	Stream	10 – 756	Schist, gneiss	Peaty gley	790	48	-	-
4. Lochnagar	NAG	NO 252859	Lake	785 – 1155	Granite	Alpine podzol	92	-	9.9	27
5. Loch Chon	CHN	NN 421051	Lake	96 – 600	Schist, grits	Podzol, gley	1470	56	105.7	25
6. Loch Tinker	TINK	NN 445068	Lake	418 – 703	Schist, grits	Peat	112	-	11.1	10
7. Round Loch of Glenhead	RLGH	NX 450804	Lake	298 – 531	Granite	Peat, peaty podzol	95	-	12.7	14
8. Loch Grannoch	LGR	NX 542700	Lake	214 – 601	Granite	Gley, podzol, peat	1290	70	111.4	21
9. Dargall Lane	DARG	NX 449786	Stream	225 – 716	Shale, greywackes	Peaty podzol	210	-	-	-
10. Scoat Tarn	SCOATT	NY 159104	Lake	602 – 841	Volcanics	Peaty ranker	95	-	4.3	20
11. Burnmoor Tarn	BURNMT	NY 184044	Lake	252 – 602	Volcanics, granite	Ranker, podzol, peat	226	-	23.9	13
12. River Etherow	ETHR	SK 116996	Stream	280 – 633	Millstone grit	Peat	1300	<1	-	-
13. Old Lodge	LODGE	TQ 456294	Stream	94 – 198	Sandstone	Brown podzol, gley	240	3	-	-
14. Narrator Brook	NART	SX 568692	Stream	225 – 456	Granite	Podzols	475	<1	-	-
15. Llyn Llagi	LAG	SH 649483	Lake	380 – 678	Slate, shale, dolerite	Peaty podzol, peat	157	-	5.1	17
16. Llyn Cwm Mynach	MYN	SH 678238	Lake	285 – 680	Cambrian sedimentary	Rankers, peat	152	55	5.7	11
17. Afon Hafren	HAFR	SN 844876	Stream	355 – 690	Shale, gritstone	Peaty podzol, peat	358	50	-	-
18. Afon Gwy	GWY	SN 842854	Stream	440 – 730	Shale, gritstone	Peaty podzol, peat	210	<1	-	-
19. Beagh's Burn	BEAH	D 173297	Stream	150 – 397	Schist	Peat	273	<1	-	-
20. Bencrom River	BENC	J 304250	Stream	140 – 700	Granite	Peat	298	-	-	-
21. Blue Lough	BLU	J 327252	Lake	340 – 703	Granite	Peat	42	-	2.1	5
22. Coneyglen Burn	CONY	H 641884	Stream	230 – 562	Schist	Peat	1410	15	-	-
23. Loch Coire Fionnaraich	VNG9402	NG 945498	Lake	236 – 933	Sandstone, quartzite	Peat, peaty podsols	550	-	9.3	14
24. Danby Beck	DANB	NZ 692 024	Stream	299 – 432	Sandstone, siltstone and mudstone	Peat	77	<1		

Table 3.2. Monitoring record of UK UWMN sites (* no sampling in 2001 due to foot and mouth)

Site Code	Chemistry	Inverts	Macrophytes	Diatoms	Fish	Sed traps
ARR	1988-2008	1988-2007	1988-1995, 1997, 1999	1988-2007	1989-2000	1991-1999, 2001, 2002
MHAR	1988-2013	1988-2012	1988-2007, 2009-2012	1988-2012	1988-2012	N/A
ANCC	1988-2013	1988-2012	1988-2007, 2009, 2012	1988-2012	1988-2012	N/A
NAG	1988-2013	1988-2012	1988-1995, 1997, 1999, 2001, 2003, 2005, 2009, 2012	1988-2012	1989-2012	1991, 1993-2004, 2006-2012
CHN	1988-2013	1988-2012	1988-1995, 1997, 1999, 2001, 2003, 2005, 2012	1988-2012	1989-2012	1991,1992, 1994-2010, 2012
TINK	1988-2013	1988-2012*	1988-1995, 1997, 1999, 2001, 2003, 2005, 2009, 2012	1988-2012	1989-1999, 2001-2006	1991-2012
RLGH	1988-2013	1988-2012*	1988-1995, 1997, 1999, 2001, 2003, 2005, 2009, 2012	1988-2012	1989-2012	1991-2012
LGR	1988-2013	1988-2010* 2012	1988-1995, 1997, 1999, 2001, 2005, 2012	1988-2012	1989-2004, 2010, 2012	1993-2012
DARG	1988-2013	1988-2012*	1998-2009, 2011-2012	1988-2012	1988-2004, 2006-2012	N/A
SCOATT	1988-2012	1988-2012*	1988-1995, 1997, 1999, 2001, 2003, 2005, 2009, 2012	1988-2012	1989-2005, 2009-2011	1991-2012
BURNMT	1988-2013	1988-2012*	1988-1995, 1997, 1999, 2001, 2003, 2005, 2008, 2012	1988-2012	1989-2004,2008	1992-2012
ETHR	1988-2013	1988-2012	1988-1997, 2000-2012	1988-2012	1989-1993	N/A
LODGE	1988-2013	1988-2012	1988-2006, 2008-2012	1988-2012	1988-2012	N/A
NART	1991-2007, 2008-2013	1988-2007, 2011-2012*	1988-2006, 2010-2012	1988-2006, 2008-2012	1988-2006	N/A
LAG	1988-2013	1988-2012	1988-1995, 1997, 1999, 2001, 2003, 2005, 2009, 2011	1988-2012	1989-1999, 2001-2006, 2008-2011	1993-2012
MYN	1988-2013	1988-2012	1988-1995, 1997, 1999, 2001, 2003, 2005, 2008, 2010, 2012	1988-2012	1989-2006, 2008-2012	1991-2012
HAFR	1988-2013	1988-2012*	1988-2012	1988-2012	1988-2006,2008-2012	N/A
GWY	1991-2013	1991-2012*	1991-1997, 1999-2012	1991-2012	1991-2006,2008-2012	N/A
BEAH	1988-2008, 2009-2013	1988-2007 2012	1988-2000, 2002-2005, 2011	1988-2012	1988-2006	N/A
BENC	1988-2008, 2009-2013	1988-2009 2011-2012	1988-2001, 2003-2006, 2011-2012	1988-2012	1988-2006	N/A
BLU	1990-2013	1989-2009, 2011-2012	1989-1995, 1997, 1999, 2001, 2003, 2005, 2009, 2012	1989-2012	1990-2006	1992-2012
CONY	1990-2008, 2009-2013	1989-2007, 2011-2012*	1989-1999, 2001-2005, 2011	1989-2012	1990-2006	N/A
VNG9402	2001-2013	2002-2012	2003, 2005, 2009, 2012	2001-2012	2001-2012	2002-2009, 2011-2012
Danby Beck	2001-2011 pH 2011-2013	2012	2011-2012	2011-2012	N/A	N/A

4. DATA FORMAT

The chemical and biological data are presented in a series of sections, summarised below, on a site-by-site basis.

Section 1:	Time series graphs of key spot sampled chemical determinands for individual samples. Summary table for key chemical determinands including: the mean over the 1988-1993 baseline period; the mean for the current year (2012-2013) and the standard deviation for the current year. The normal number of observations per year is 4 for lakes and 12 for streams.
Section 2:	Macroinvertebrates. Time series of macroinvertebrate taxon % abundance in annual aggregated samples (5 kick samples from lake littoral habitats or from riffle areas in streams), and annual total number of individual animals. Some species occurring at less than 1% relative abundance are omitted. Macroinvertebrate summary statistic time series: 1) total number of individuals; 2) number of individuals identified at Genus level only (excludes some ubiquitous groups such as the chironomids and oligochaetes); 3) total number of taxa; 4) Diversity Indices: a) Hill's N_1, the exponent of Shannon's Index and a measure of the number of abundant species in a sample (Hill, 1973). b) Hill's N_2, the reciprocal of Simpson's Index and a measure of the number of very abundant species in a sample (Hill, 1973). c) E_5, a measure of evenness based on the ratio $(N_2\text{-}1):(N_1\text{-}1)$. As a single species becomes more and more dominant, E_5 tends to zero.
Section 3:	Salmonids. Summary density diagrams of trout and salmon, if present, in three 50m reaches (number of individuals caught per m^2 survey area) for each year of the monitoring period. (0+ = new recruits, "fry", >0+ = all fish over one year of age prior to going to sea, "parr"). The bottom reach is coloured blue, middle reach pink and top reach green.
Section 4:	Epilithic diatoms. Time series of annual mean percentage frequency (from 3-4 replicate samples) of taxa occurring at greater than 2 % abundance in any one sample. Epilithic diatom summary statistic time series. Mean, maximum and minimum for: a) Hill's N_1 (see above) b) Hill's N_2 (see above) c) E_5 (see above) d) Diatom inferred pH (Di pH), reconstructed from the diatom data using C2 (Juggins, 2007) running the Weighted Averaging Partial Least Squares method and using pH training set data from the SWAP project (Stevenson et al. 1991). Bootstrapping was performed to choose the best Component to use for the reconstruction. Component 2 improved

	the model prediction by over 5% and was therefore chosen, and is shown here alongside the diatom percentage abundance stratigraphy. pH reconstructions are intended only for application to sedimentary diatoms but directional trends in inferred pH of epilithic assemblages should provide an indication of the direction of a response to changing acidity.
Section 5:	Aquatic macrophytes. For lakes relative species abundance determined on a five point scale (comparable to the DAFOR scoring system, Palmer *et al*. 1992) following shoreline survey, shore transects and deep water grapnel trawls, as follows: 1. rare/infrequent 2. occasional but not abundant 3. widespread but not abundant 4. locally abundant 5. widespread and abundant For streams, total macrophyte cover estimated for 5m sections of a 50m survey stretch and each then partitioned into proportional species abundance to provide percentage cover for each species. Data analysed for this report are the mean species cover estimates for the 50m stretches.
Section 6:	For lake sites only. Histogram of diatom species composition from annually retrieved sediment traps. Species occurring at less than 1% abundance in all years are omitted.
Section 7:	For lake sites only. Time series graphs of annual data from thermistors attached to the sediment traps. Thermistor pairs are used, one 1.5m from the lake bottom and the other 1m from the water surface.
Section 8:	Lochnagar only. Time series graphs of annual data from the weather station situated next to the loch. Wind speed, air pressure, air temperature, energy and relative humidity are presented.
Section 8:	Llyn Llagi only. Time series depth-temperature contour plot of data from a thermistor chain suspended near the deepest part of the site. Thermistors are located at 50 cm intervals to 2m water depth and at 1m intervals thereafter.
Section 9:	Llyn Llagi and Round Loch of Glenhead only. Time series graphs of annual data recorded by In-Situ logger devices. One device is situated in the lake and records water temperature and stage height. Another device is positioned in the lake outflow and records temperature, stage height and conductivity.

After the site by site data a final section presents sediment trap Mercury, Lead and Spheroidal Carbonaceous Particle concentrations for all the lake sites.

5. REFERENCES

Hill, M. O. 1973 Diversity and evenness: a unifying notation and its consequences. *Ecology*, **54**, 427-31.

Juggins, S., Flower, R. J. & Battarbee, R. W. (1996) Palaeolimnological evidence for recent chemical and biological changes in UK Acid Waters Monitoring Network sites. *Freshwater Biology* **36**, **1**, 203-219.

Juggins. S. (2007) C2 Version 1.5 User guide. Software for ecological and palaeoecological data analysis and visualisation. Newcastle University, Newcastle upon Tyne, UK. 73pp.

Kernan, M., Battarbee, R. W., Curtis, C. J., Monteith, D. T.& Shilland, E. M. (2010) *UK Acid Waters Monitoring Network 20 Year Interpretative Report*, 1-483, ENSIS Ltd, Environmental Change Research Centre, University College London, London.

Monteith, D. T. (Ed.) 2005 *UK Acid Waters Monitoring Network: 15 Year Report. Analysis and Interpretation of Results, April 1988-March 2003.* ENSIS Ltd, London.

Monteith, D. T. & Evans, C. D. (Eds.) 2000 *UK Acid Waters Monitoring Network: 10 Year Report. Analysis and Interpretation of Results, April 1988-March 1998.* ENSIS Ltd, London.

Monteith, D. T. & Shilland, E. M. (Eds.) 2007 *The United Kingdom Acid Waters Monitoring Network Assessment of the First 18 Years of Data. Data Summary Annex Accompanying Research Project Final Report. Report to the Department for Environment, Food and Rural Affairs (Contract EPG 1/3/160)*. ENSIS Ltd, London.

Palmer, M. A., Bell, S. L. & Butterfield, I. 1992 A botanical classification of standing waters in Britain: applications for conservation and monitoring. *Aquatic conservation: marine and freshwater ecosystems,* **2**, 125-143.

Patrick, S. T., Waters, D., Juggins, S. & Jenkins, A. (Eds.) 1991 *The United Kingdom Acid Waters Monitoring Network. Site descriptions and methodology report.* ENSIS Ltd, London.

Patrick, S. T., Monteith, D. T. & Jenkins, A. 1995 *UK Acid Waters Monitoring Network: The First Five Years. Analysis and interpretation of results, April 1988 - March 1993.* ENSIS Ltd, London.

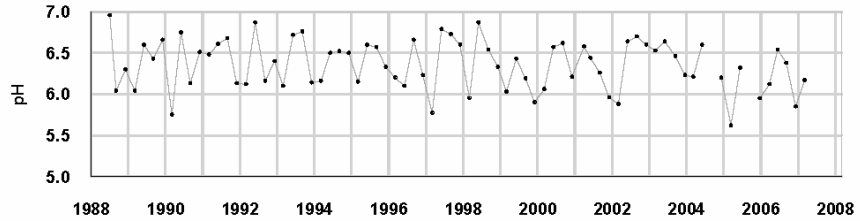
Rose, N. L., Harlock, S., Appleby, P. G. & Battarbee, R. W. 1995 Dating of recent lake sediments in the United Kingdom and Ireland using spheroidal carbonaceous particle (SCP) concentration profiles. *The Holocene*, **5**, **3**, 328-335.

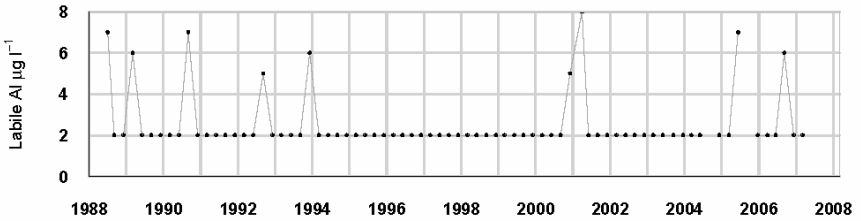
Stevenson, A. C., Juggins, S., Birks, H. J. B., Anderson, N. J., Battarbee, R. W., Berge, F., Davis, R. B., Flower, R. J., Haworth, E. Y., Jones, V. J., Kingston, J. C., Kreiser, A. M., Line, J. M., Munro, M. A. R. & Renberg, I. 1991 *The surface waters acidification project palaeolimnology programme: Modern diatom/lake-water chemistry data-set.* ENSIS Ltd, London.

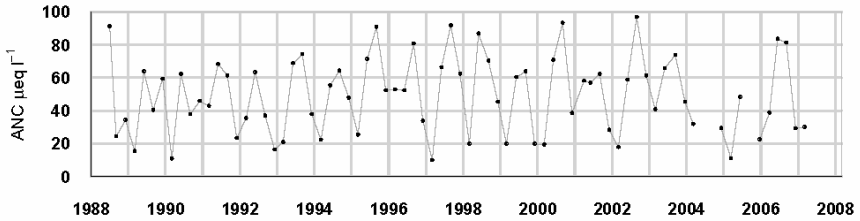
6. SITE DATA

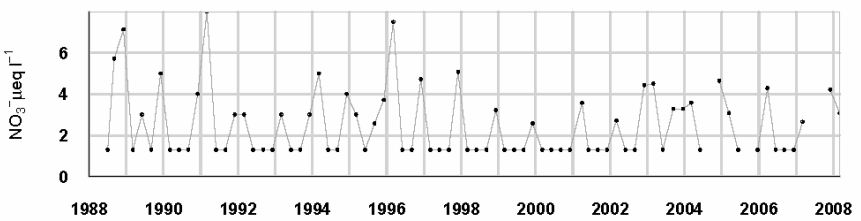
6.1. Loch Coire nan Arr

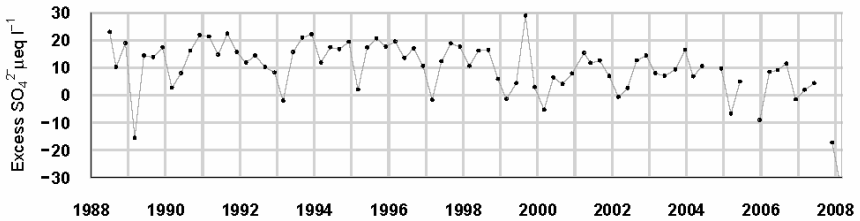
6.1.1. Spot sampled chemistry data

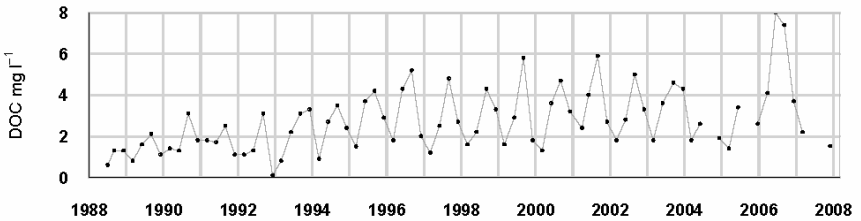


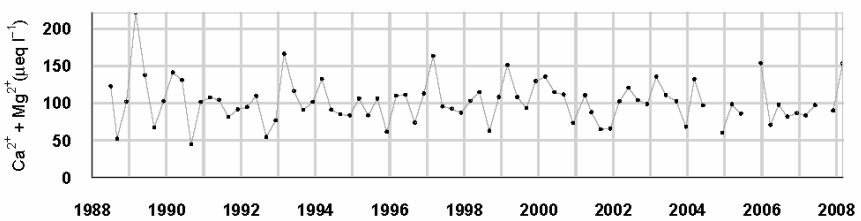


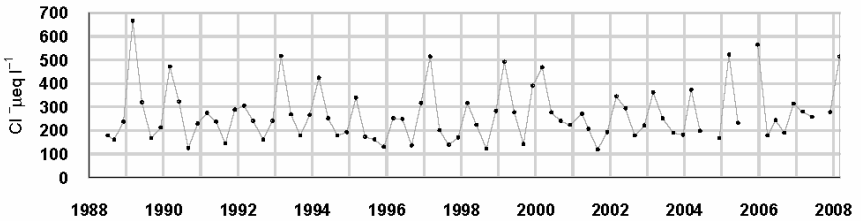










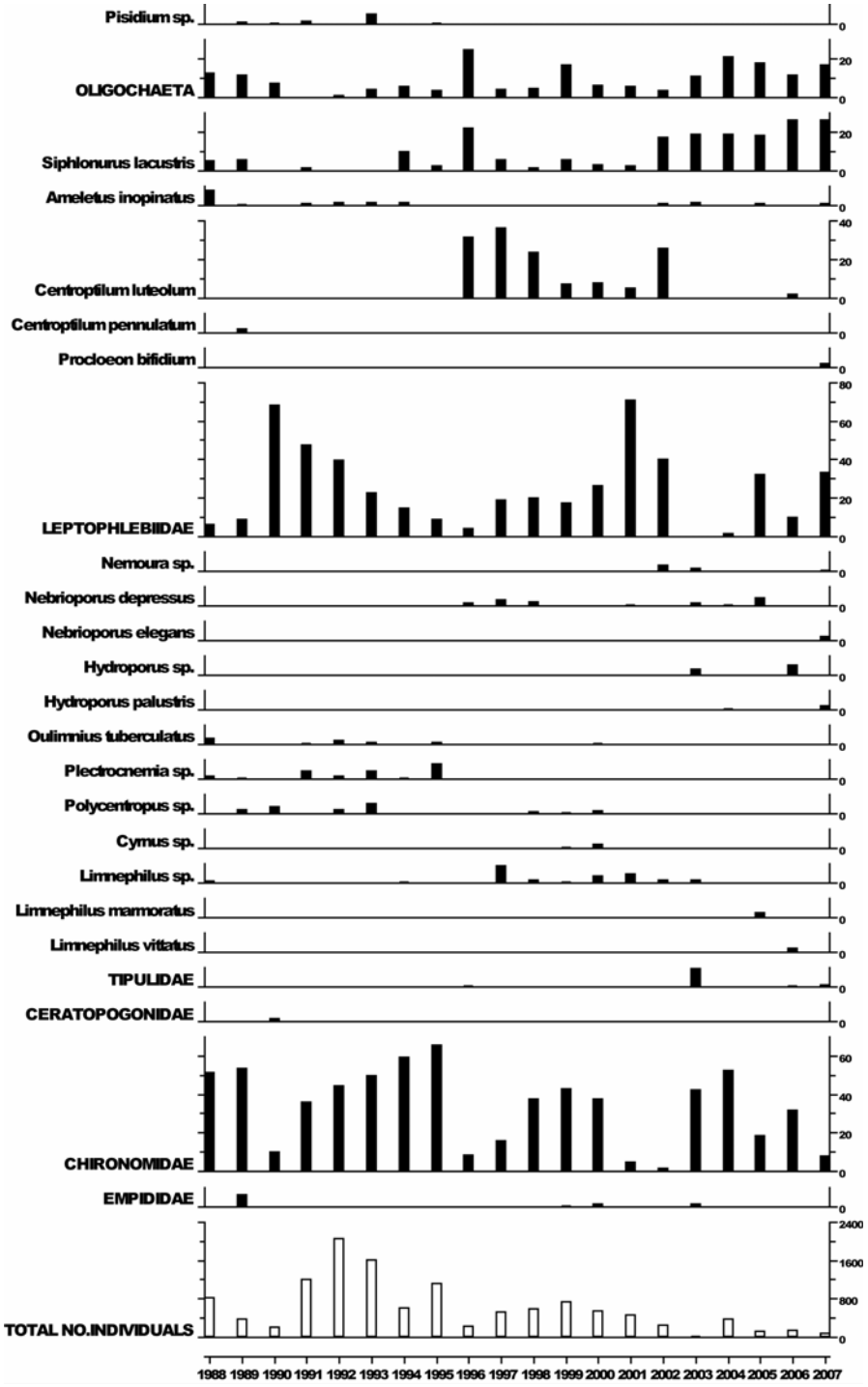


µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4 $^{2-}$	xSO_4 $^{2-}$	NO_3 $^{-}$	**DOC
Mean 1st 5 yrs	6.39	42.66	42.44	62.85	239.69	9.49	12.55	2.85	274.34	41.14	12.37	2.80	1.50
03-08 mean	6.24	45.39	37.75	60.14	230.24	7.80	15.00	2.64	289.60	32.13	1.76	2.57	3.54
03-08 std dev	0.29	23.63	8.90	19.70	75.62	2.68	6.89	1.65	128.36	9.50	12.75	1.27	1.98

Chemistry sampling ceased 2008

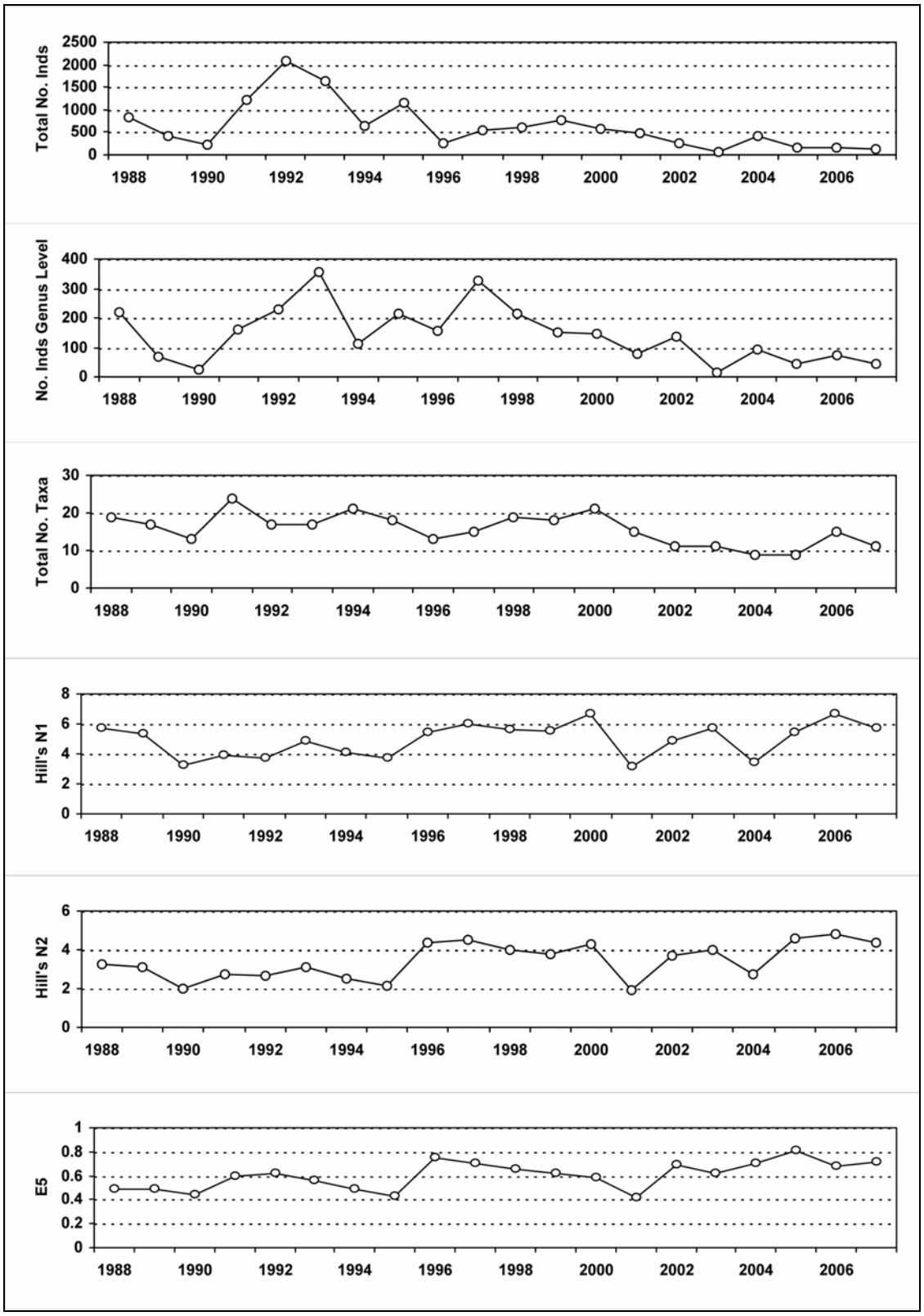
6.1.2. Macroinvertebrate data

6.1.2.1. Percentage abundance summary, Loch Coire nan Arr



Invertebrates not collected after 2007

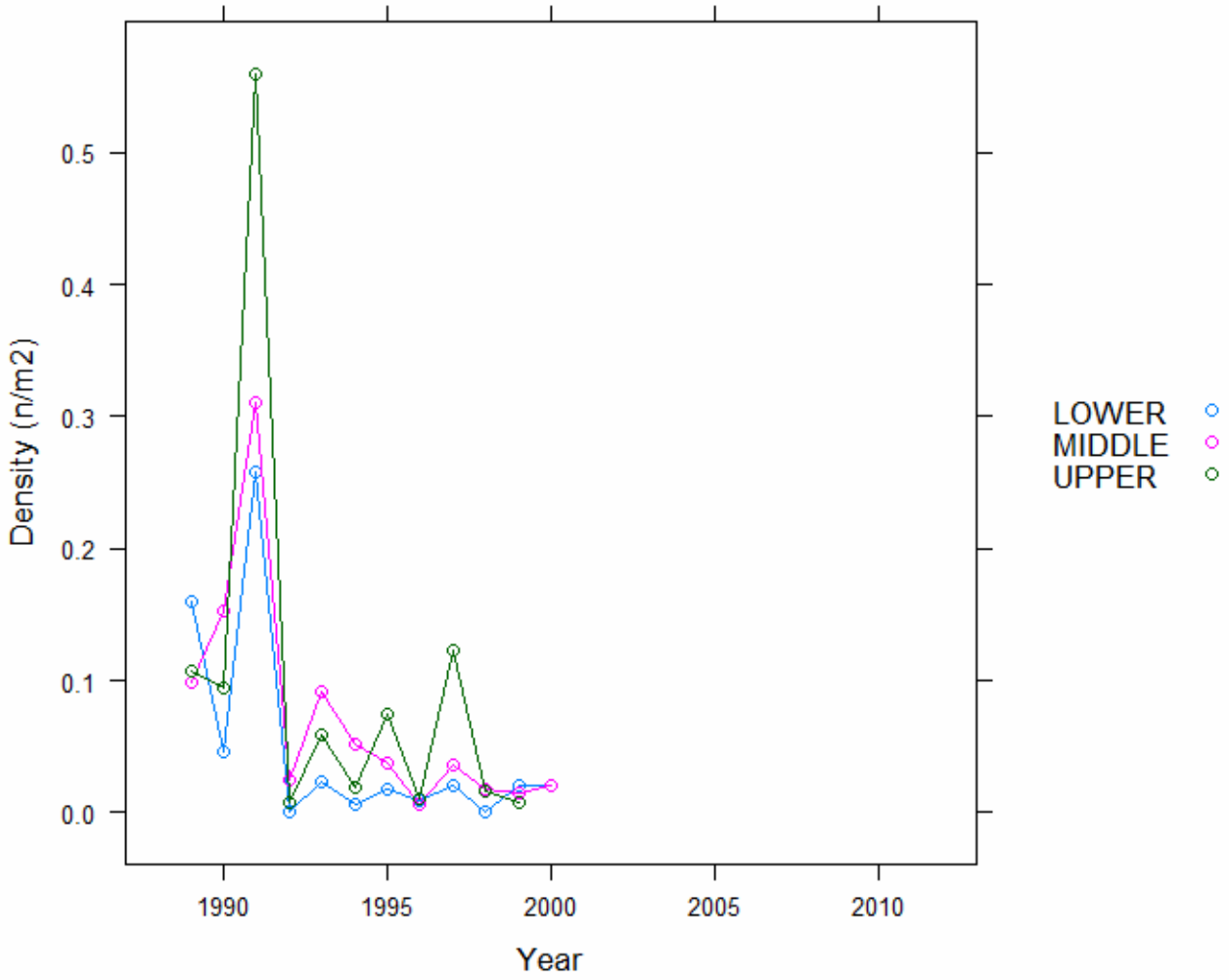
6.1.2.2. Summary statistics, Loch Coire nan Arr



Invertebrates not collected after 2007

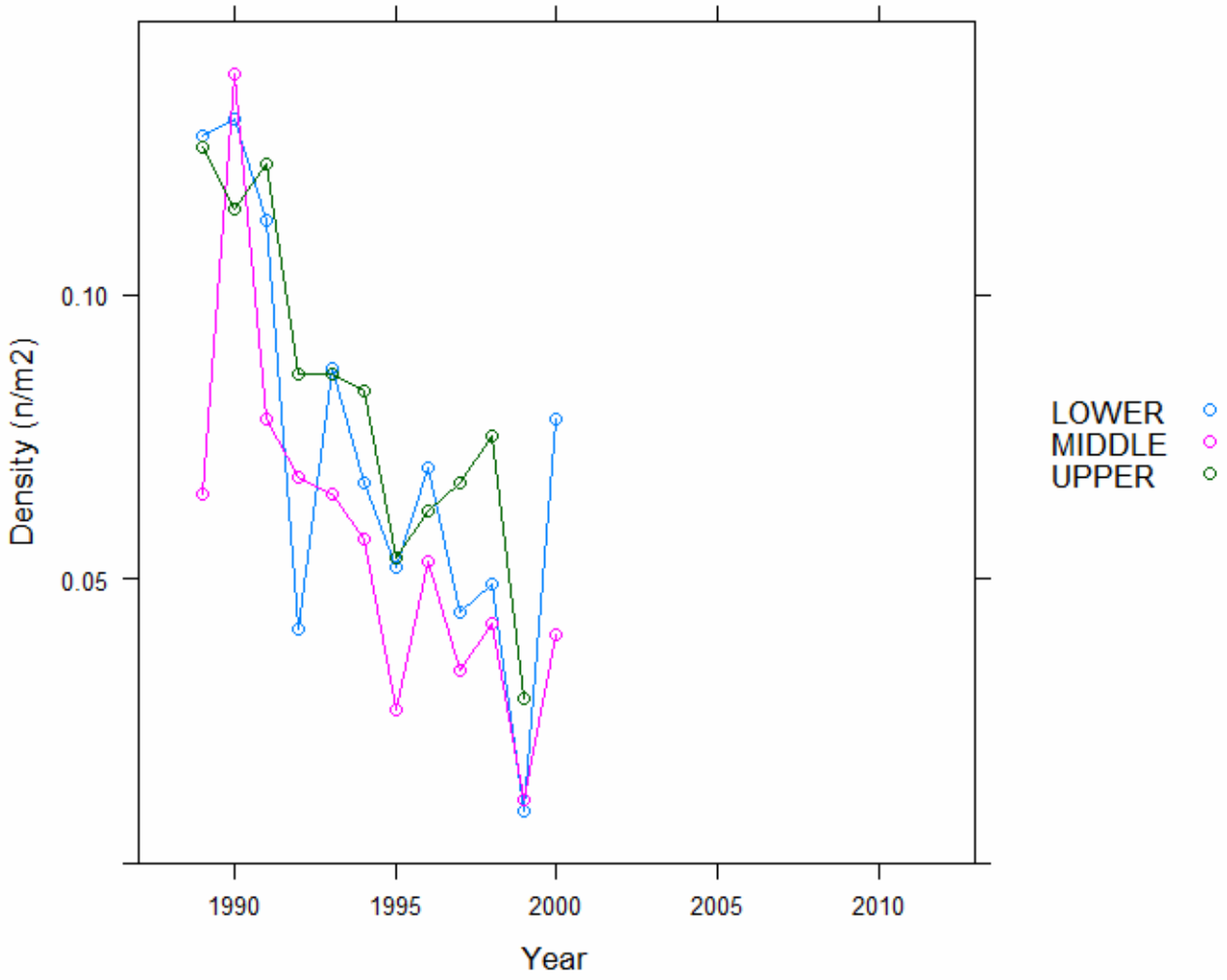
6.1.3. Fish data (for outflow stream)

6.1.3.1. Summary of Trout fry densities (numbers m^{-2}), Loch Coire nan Arr



Not fished after 2000.

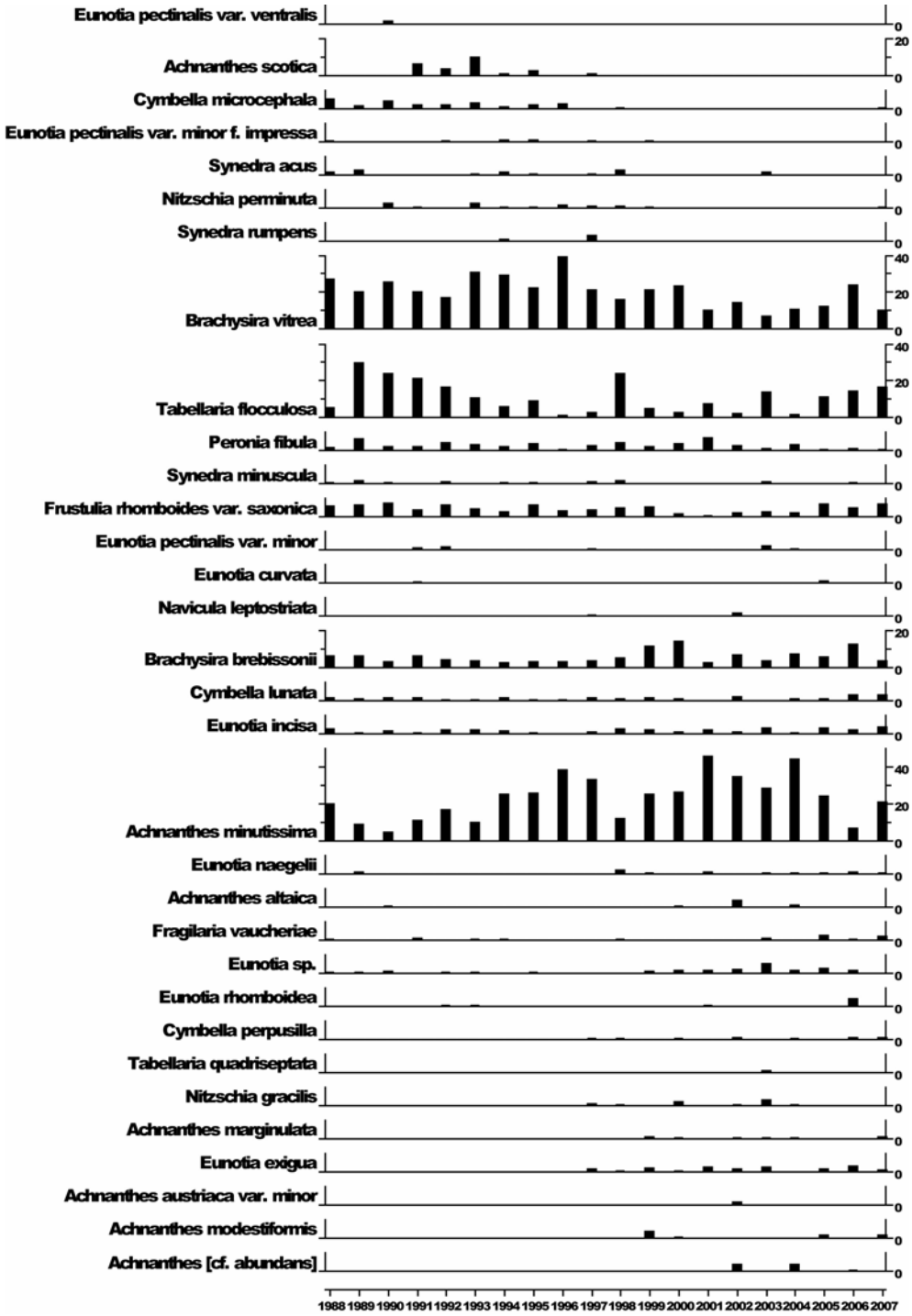
6.1.3.2. Summary of Trout parr densities (numbers m^{-2}), Loch Coire nan Arr



Not fished after 2000

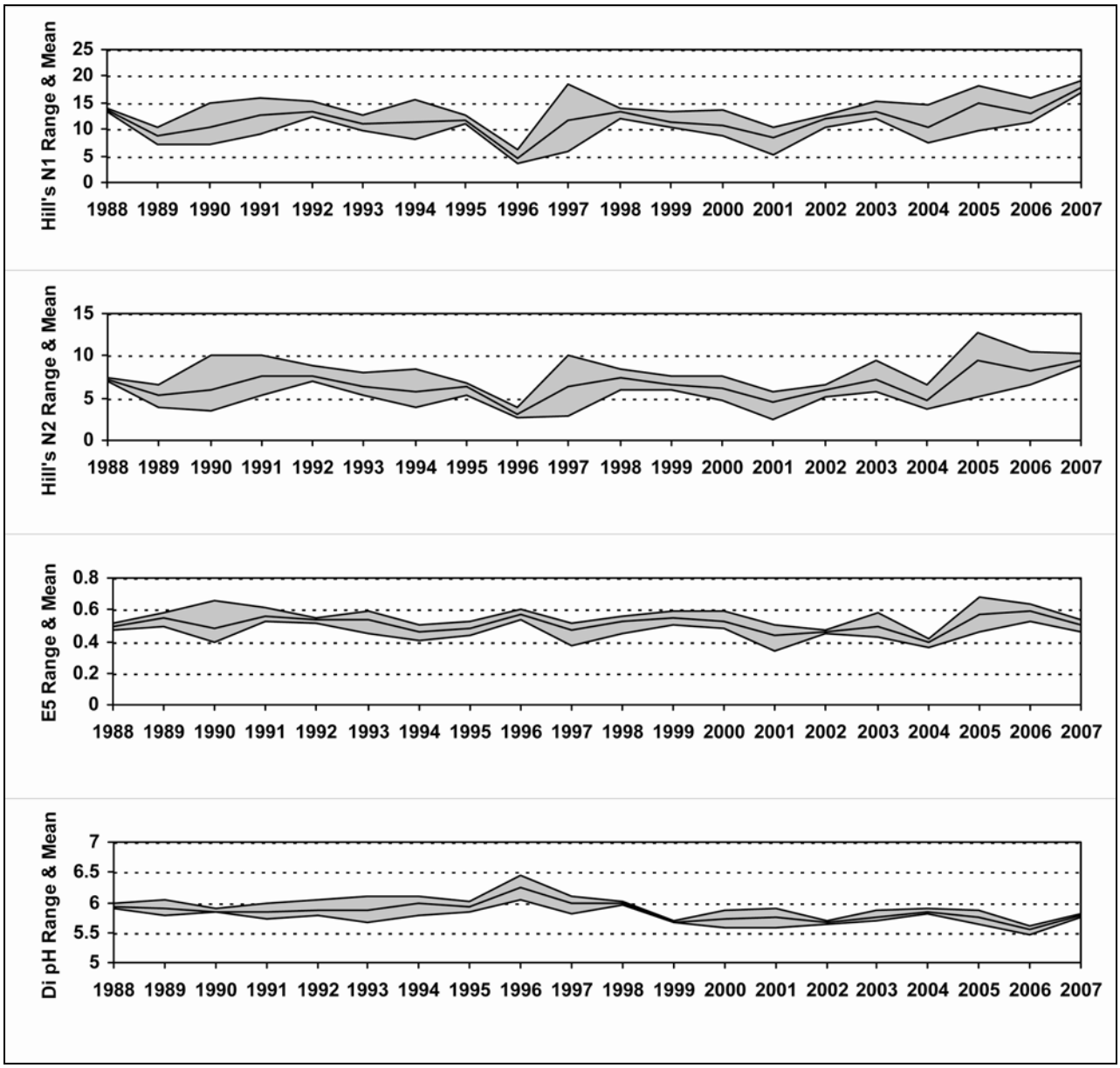
6.1.4. Epilithic diatom data

6.1.4.1. Percentage abundance summary, Loch Coire nan Arr



Diatoms not collected after 2007

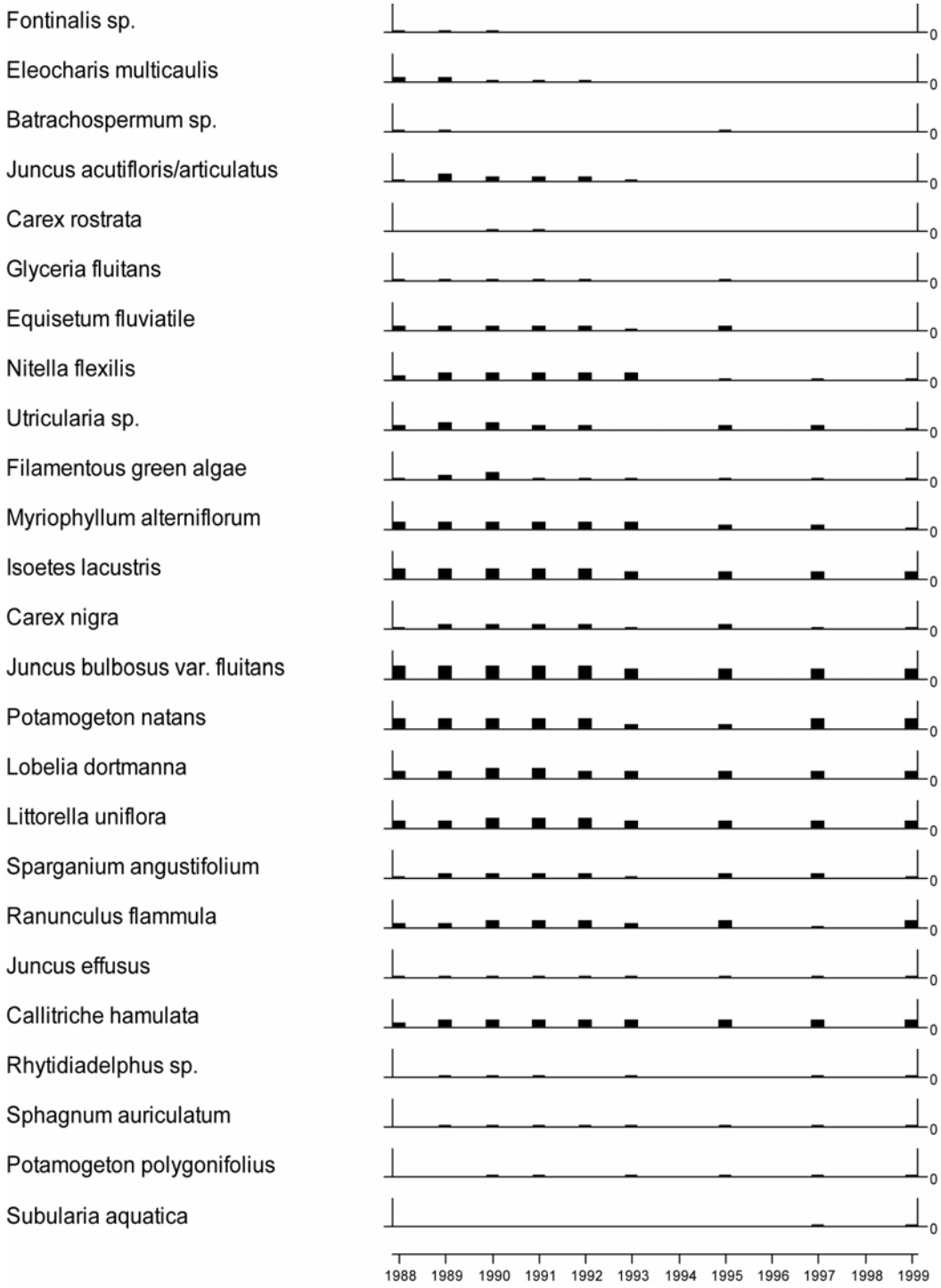
6.1.4.2. Summary statistics, Loch Coire nan Arr



Diatoms not collected after 2007

6.1.5. Aquatic macrophyte data, Loch Coire nan Arr

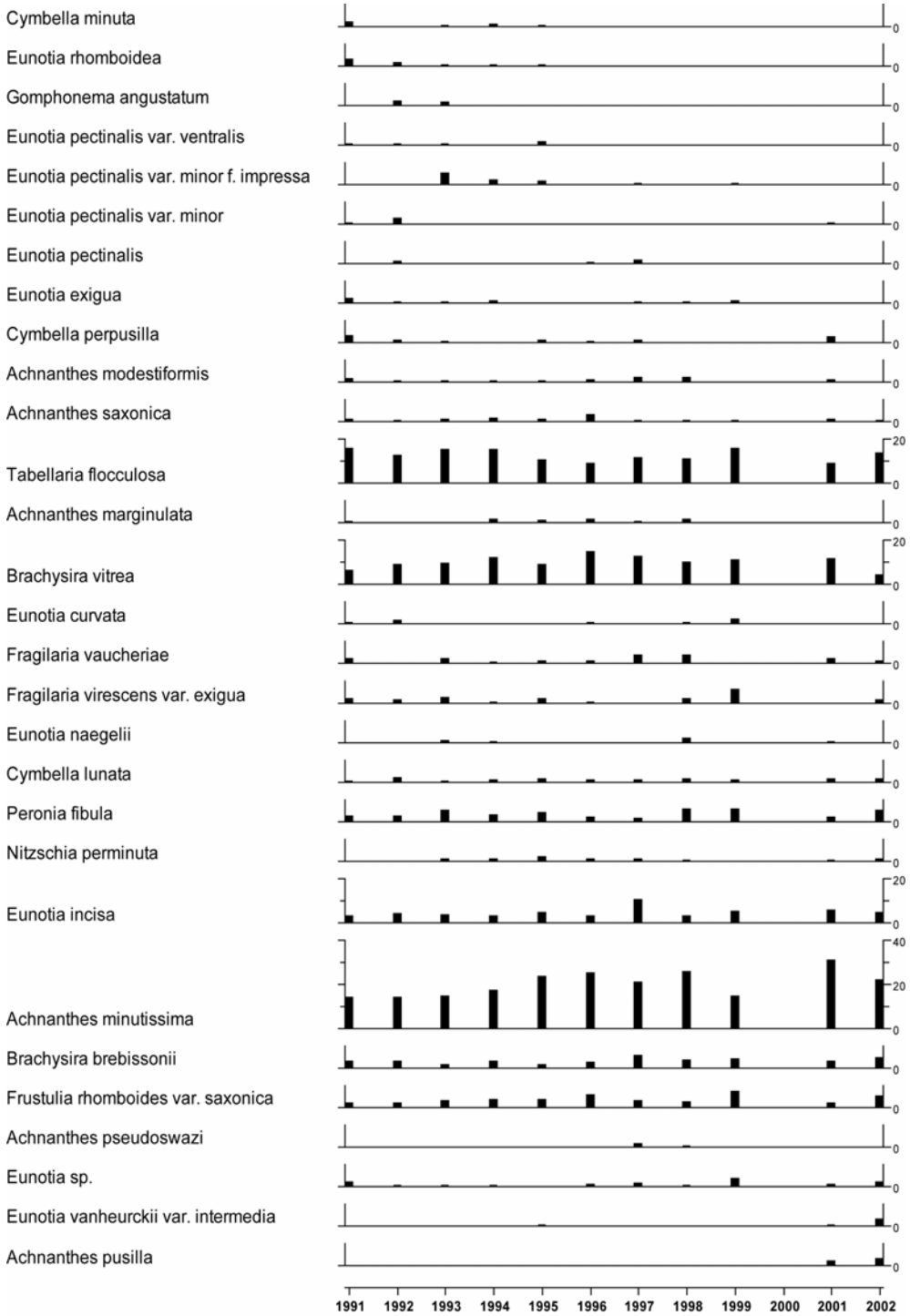
Species Scores (1-5)



Aquatic macrophytes no longer surveyed after 1999.

6.1.6. Sediment trap data, Loch Coire nan Arr

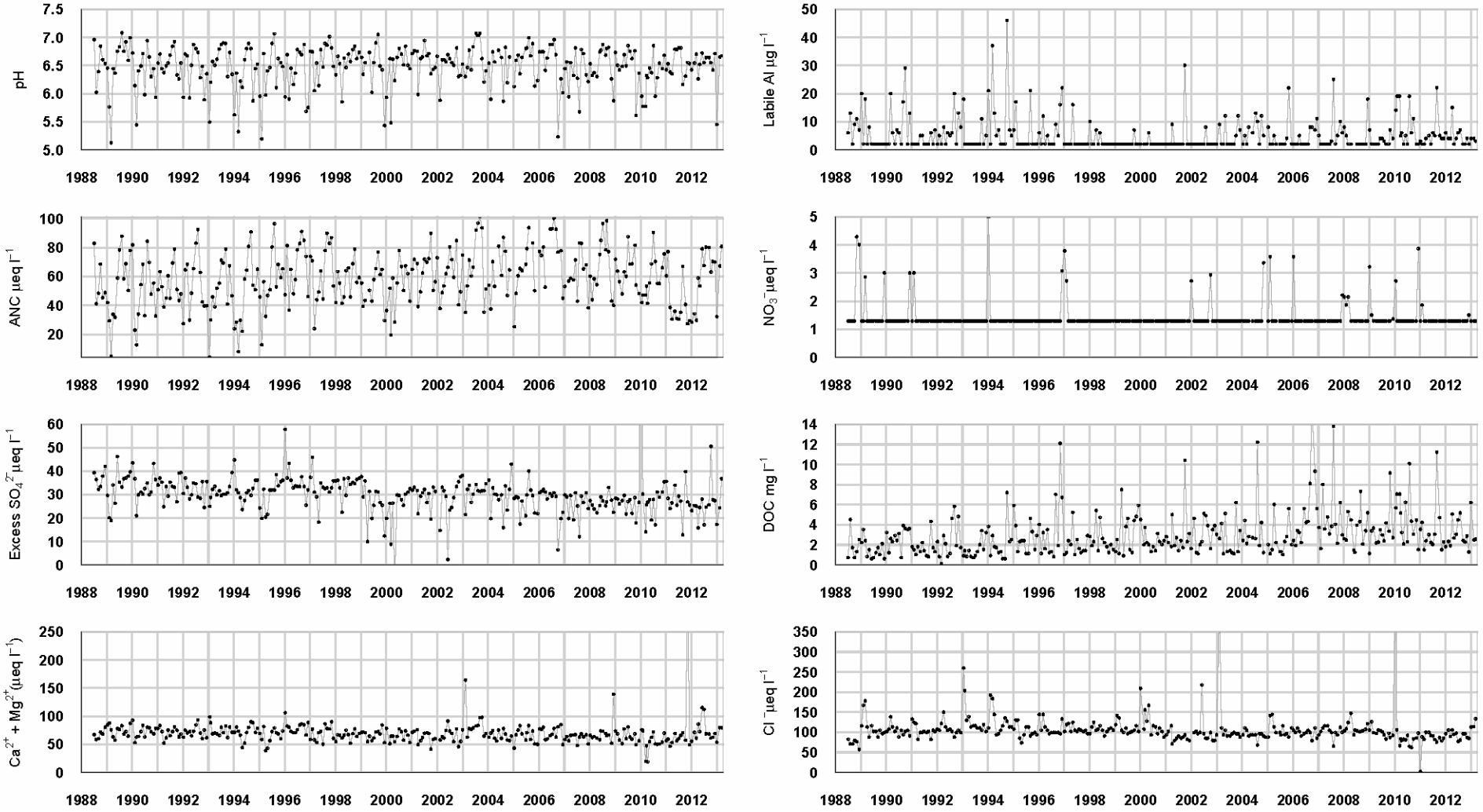
Relative percentage frequency of diatom taxa.



Sediment trap samples no longer collected after 2002.

6.2. Allt a'Mharcaidh

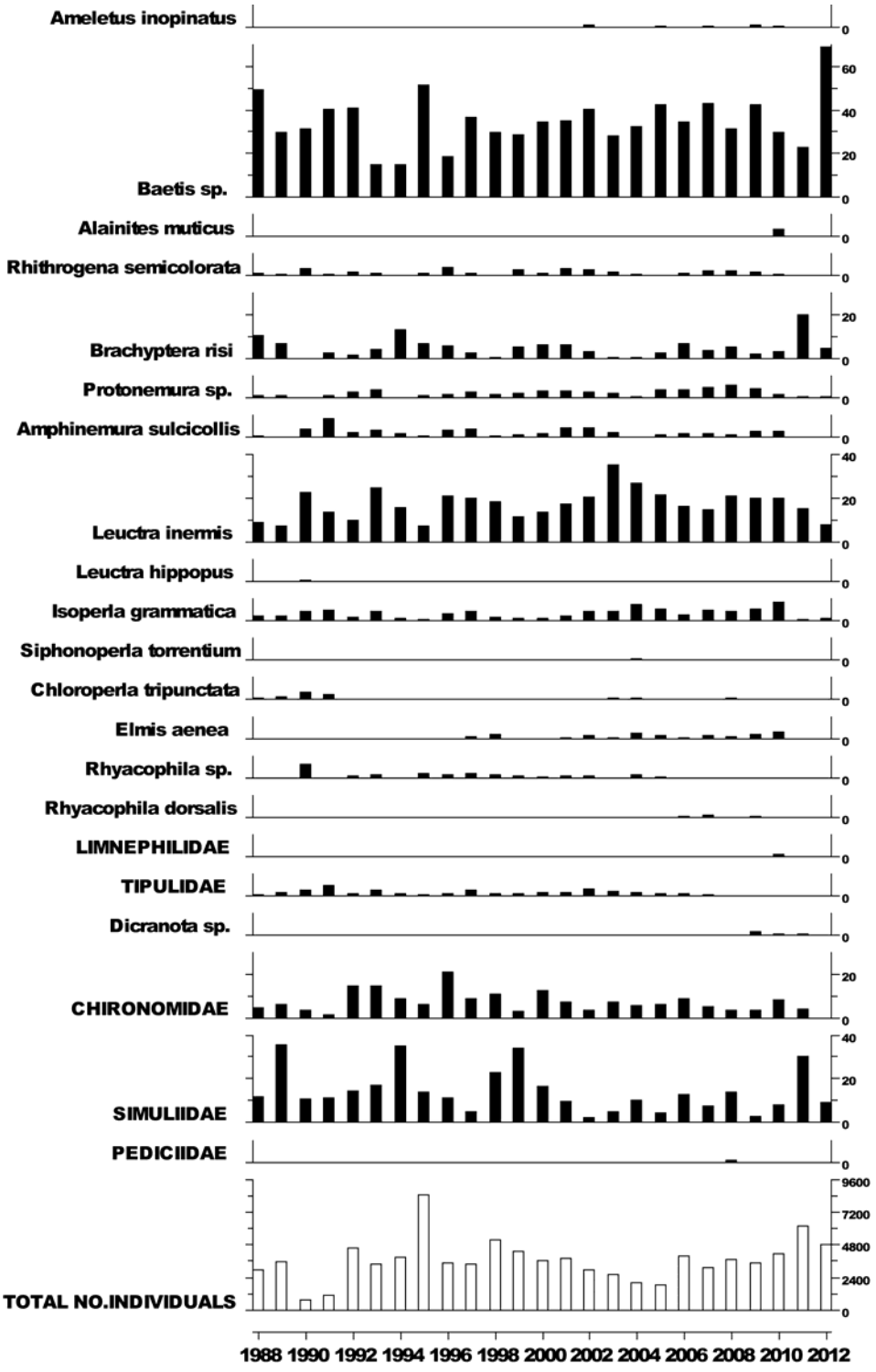
6.2.1. Spot sampled chemistry data



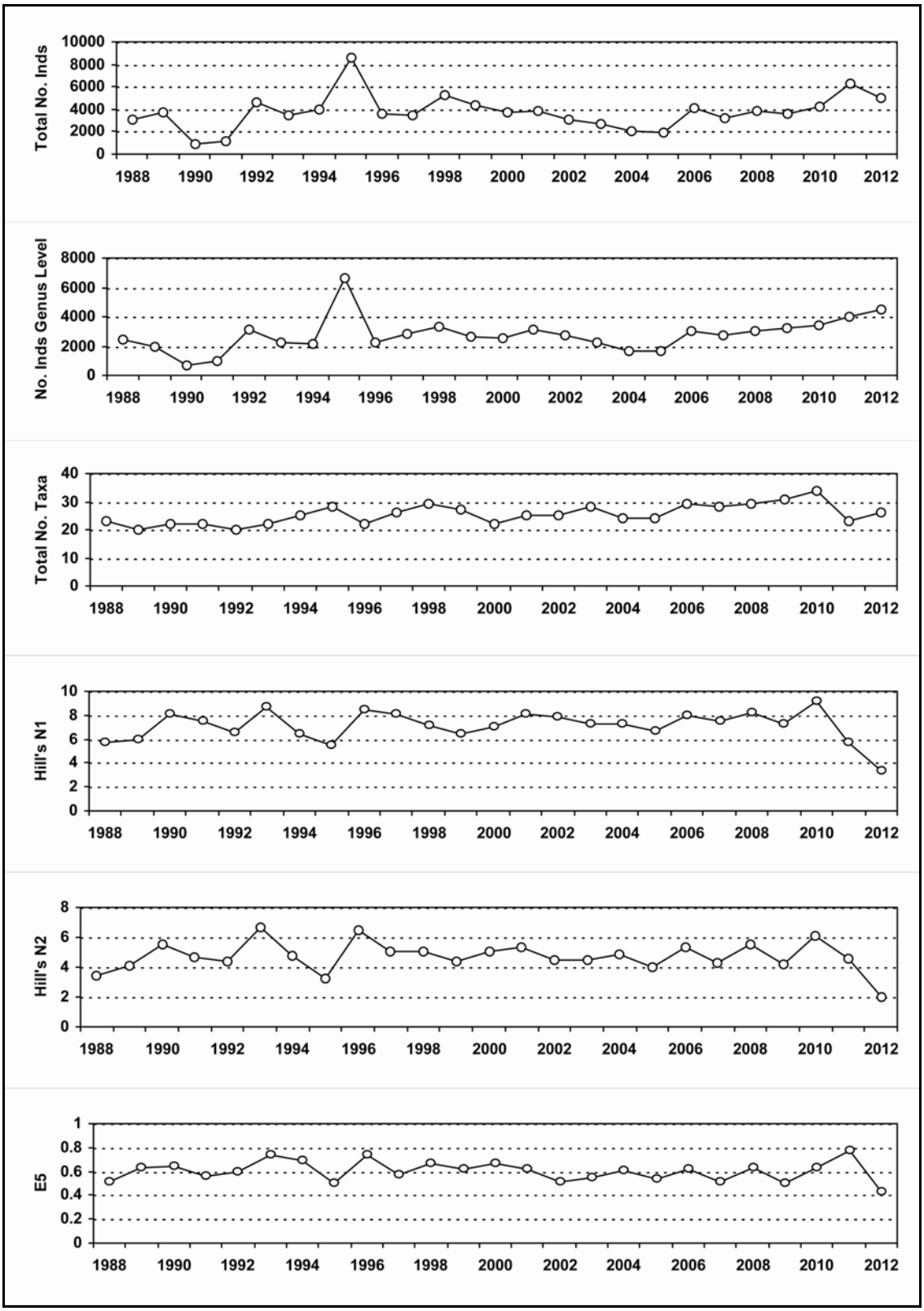
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4 $^{2-}$	xSO_4 $^{2-}$	NO_3 $^{-}$	**DOC
Mean 1st 5 yrs	6.45	51.36	42.30	29.92	132.86	6.65	34.49	6.17	109.16	44.41	32.97	1.50	1.98
12-13 mean	6.48	66.80	50.53	26.46	122.49	5.78	35.67	4.58	97.89	36.87	26.59	1.30	3.36
12-13 std dev	0.35	14.08	19.12	3.19	16.88	1.18	27.82	3.65	16.18	9.92	9.50	0.06	1.48

6.2.2. Macroinvertebrate data

6.2.2.1. Percentage abundance summary, Allt a'Mharcaidh

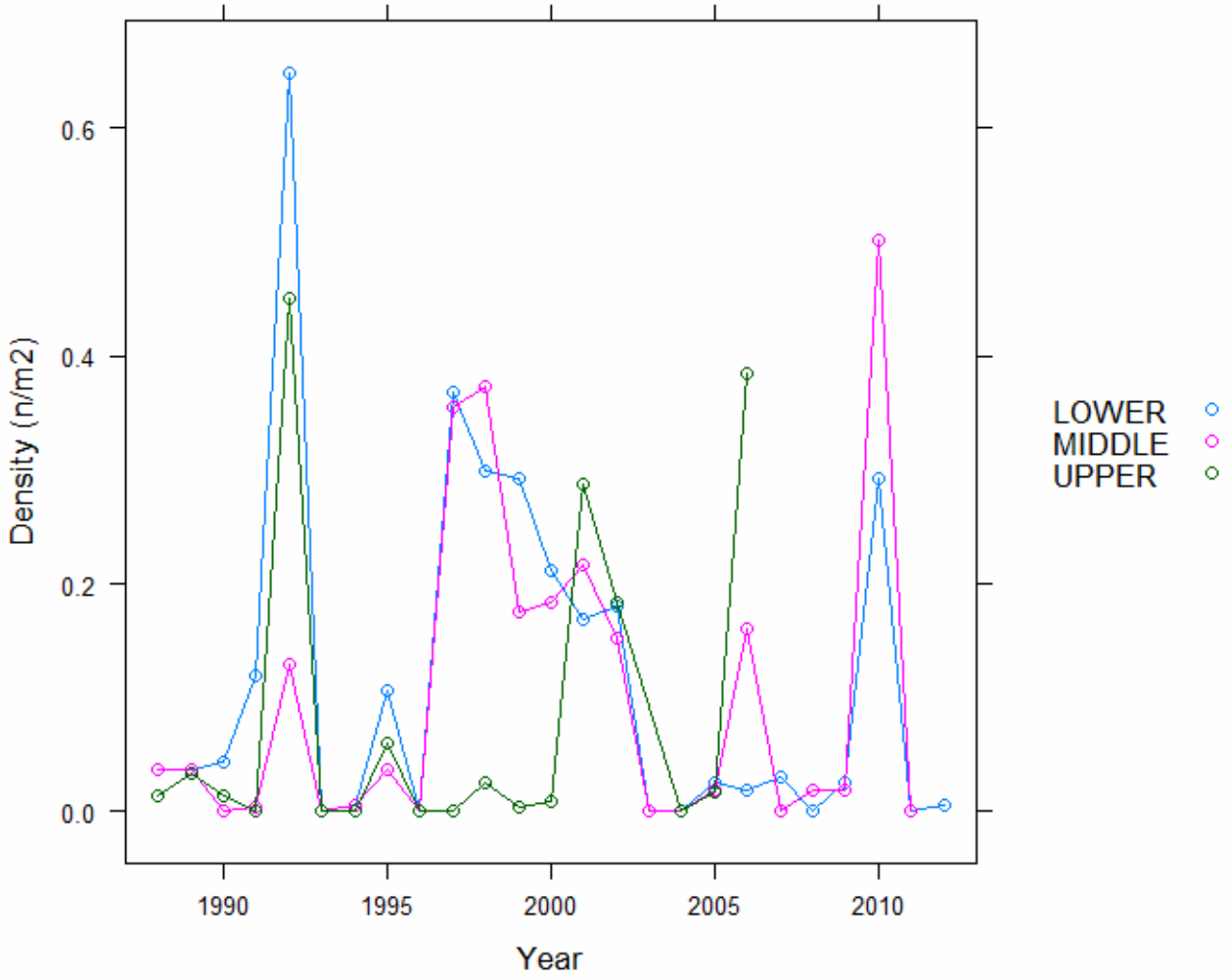


6.2.2.2. Summary statistics, Allt a'Mharcaidh

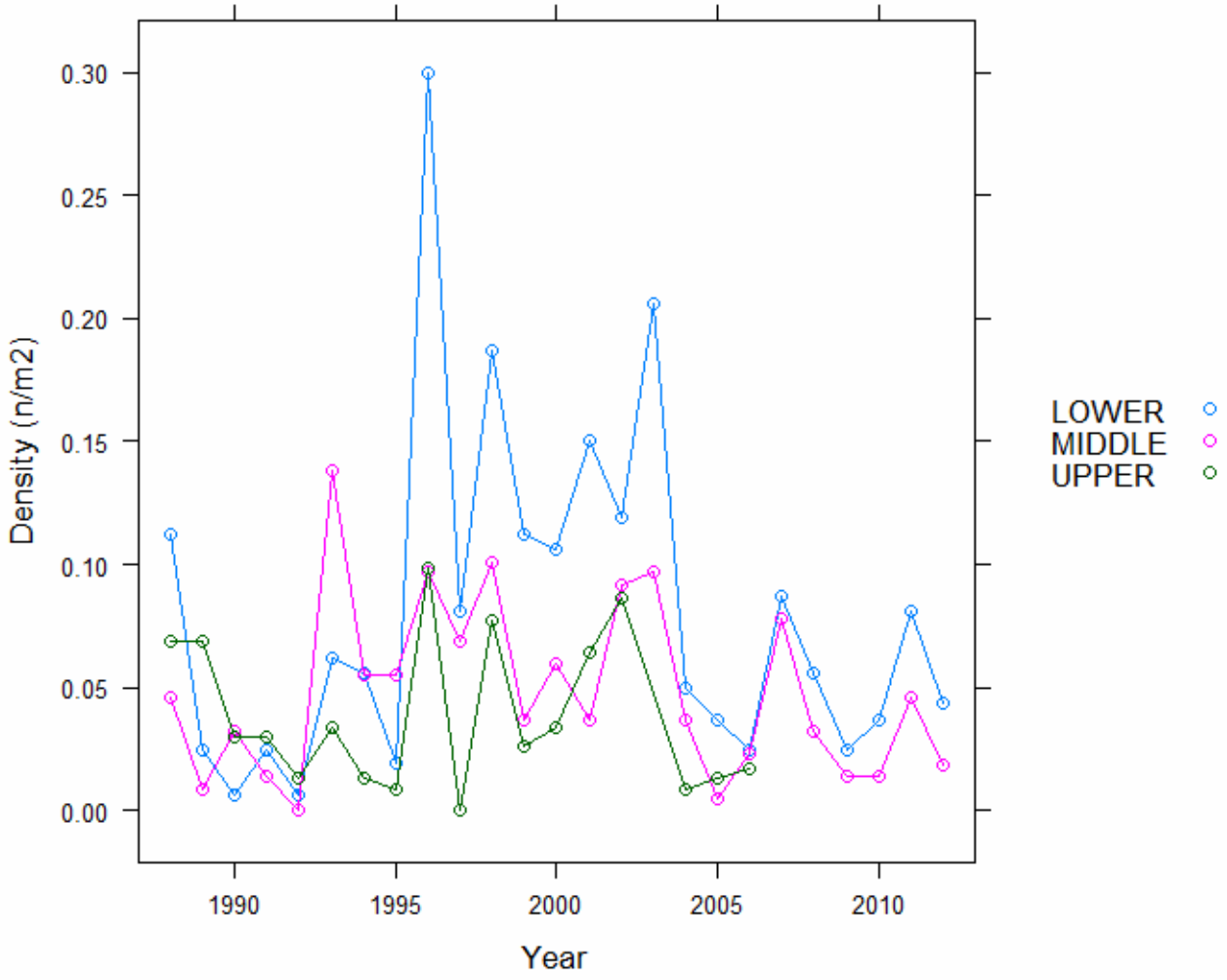


6.2.3. Fish data

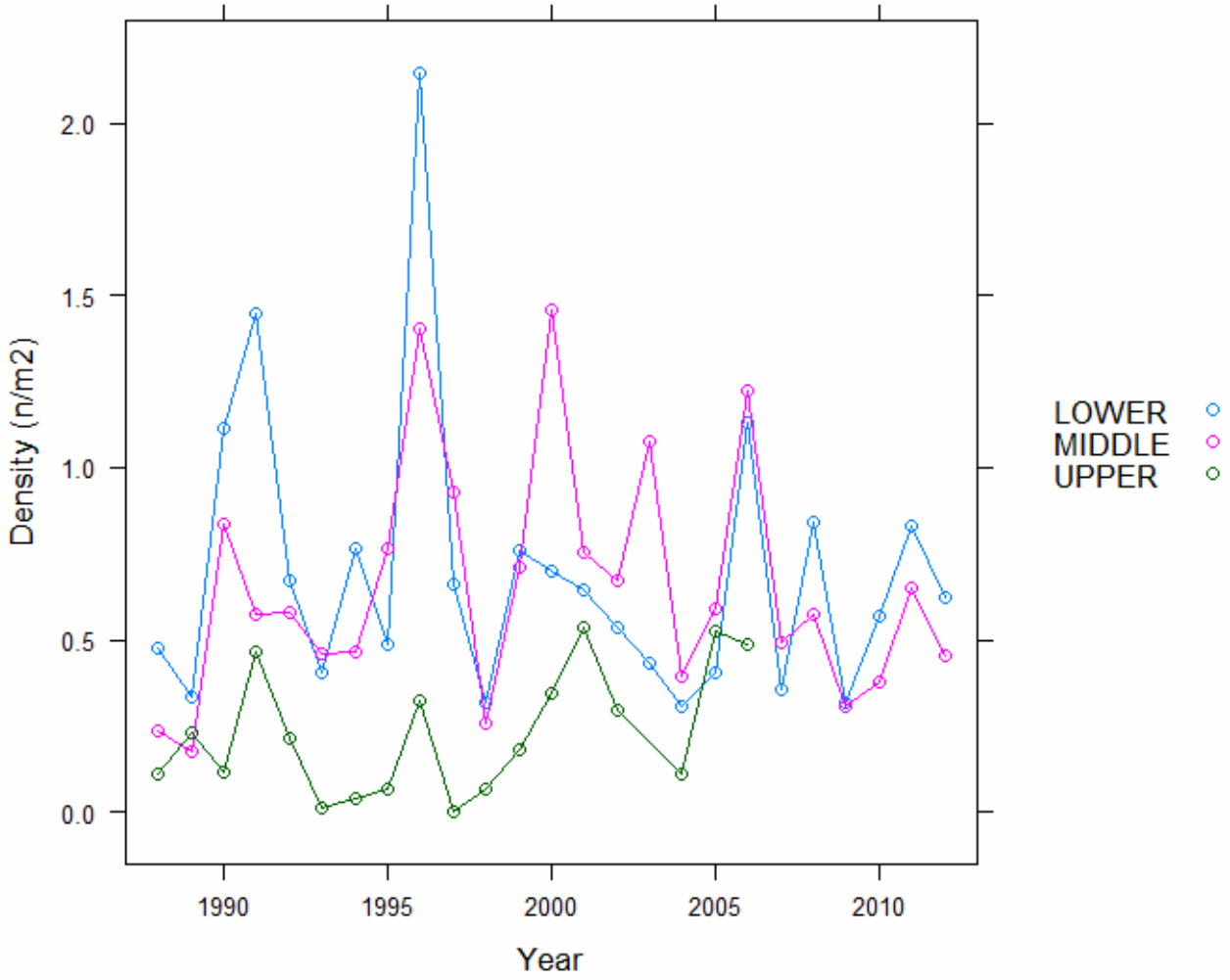
6.2.3.1. Summary of Salmon fry densities (numbers m^{-2}), Allt a'Mharcaidh



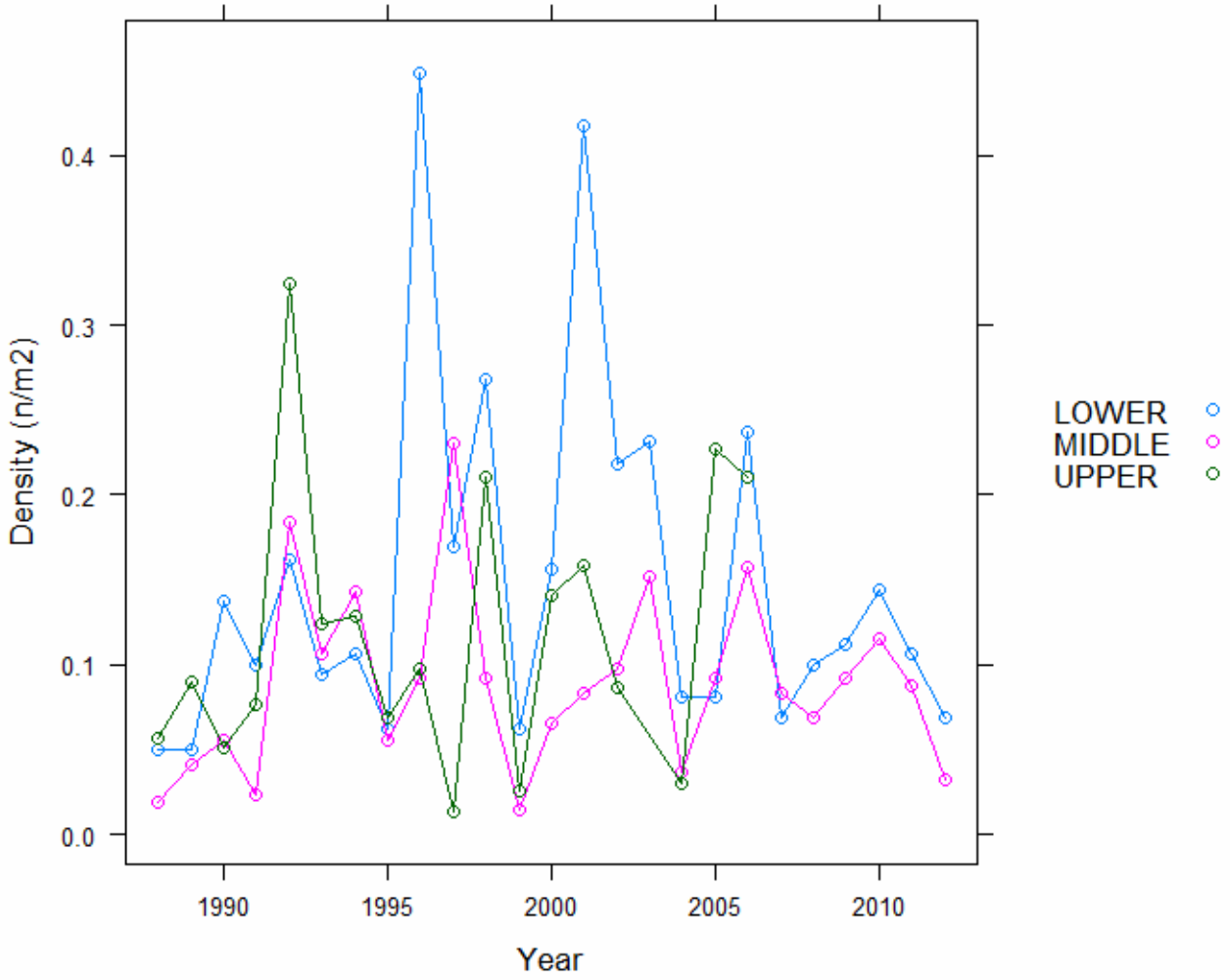
6.2.3.2. Summary of Salmon parr densities (numbers m^{-2}), Allt a'Mharcaidh



6.2.3.3. Summary of Trout fry densities (numbers m^{-2}), Allt a'Mharcaidh

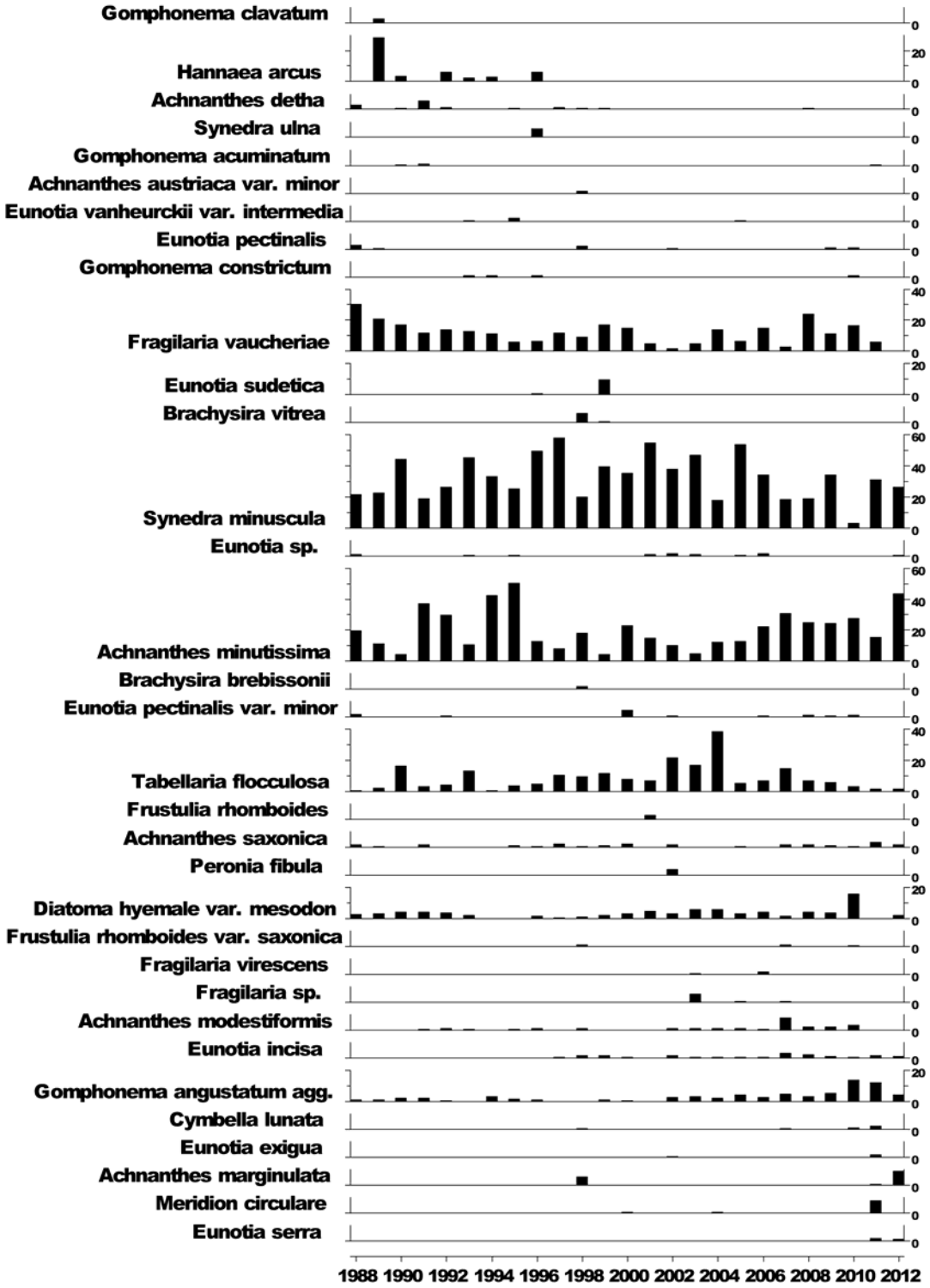


6.2.3.4. Summary of Trout parr densities (numbers m^{-2}), Allt a'Mharcaidh

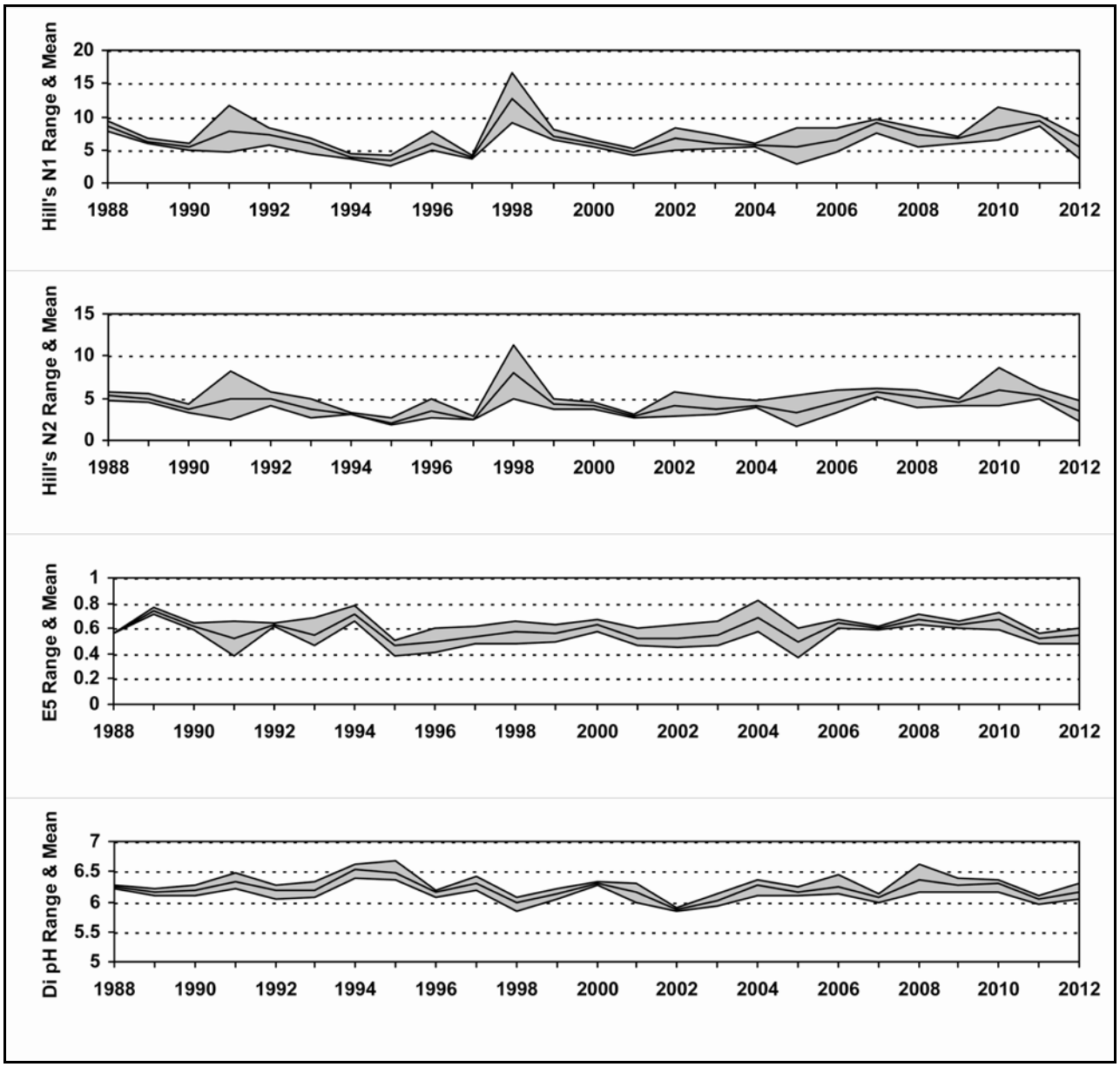


6.2.4. Epilithic diatom data

6.2.4.1. Percentage abundance summary, Allt a'Mharcaidh

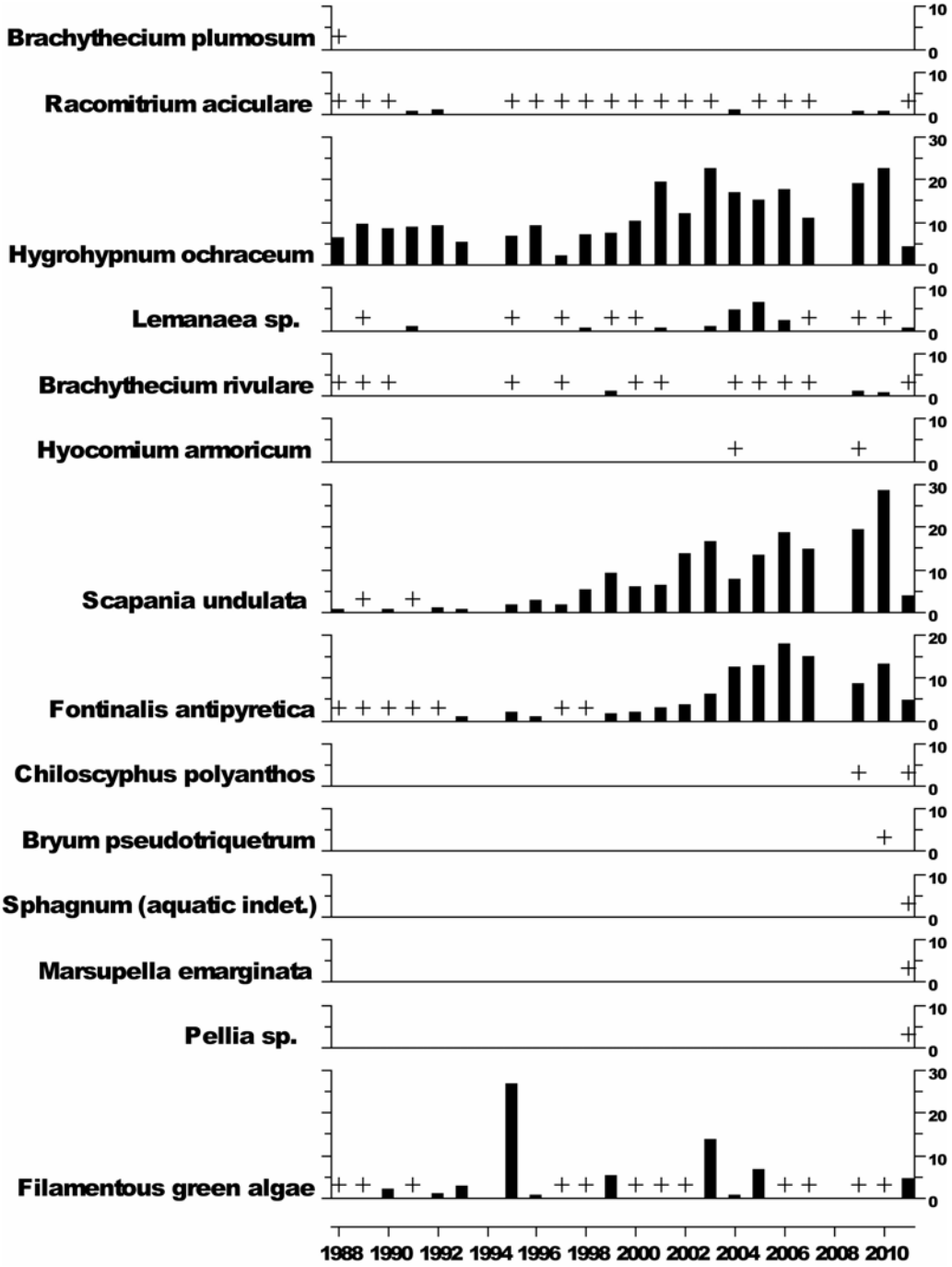


6.2.4.2. Summary statistics, Allt a'Mharcaidh



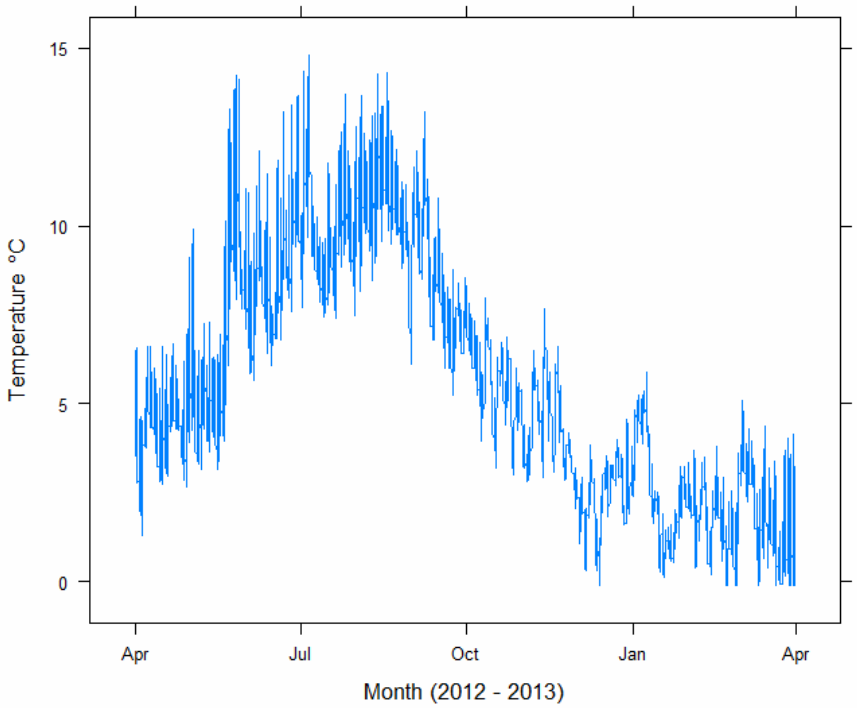
6.2.5. Aquatic macrophyte data, Allt a'Mharcaidh

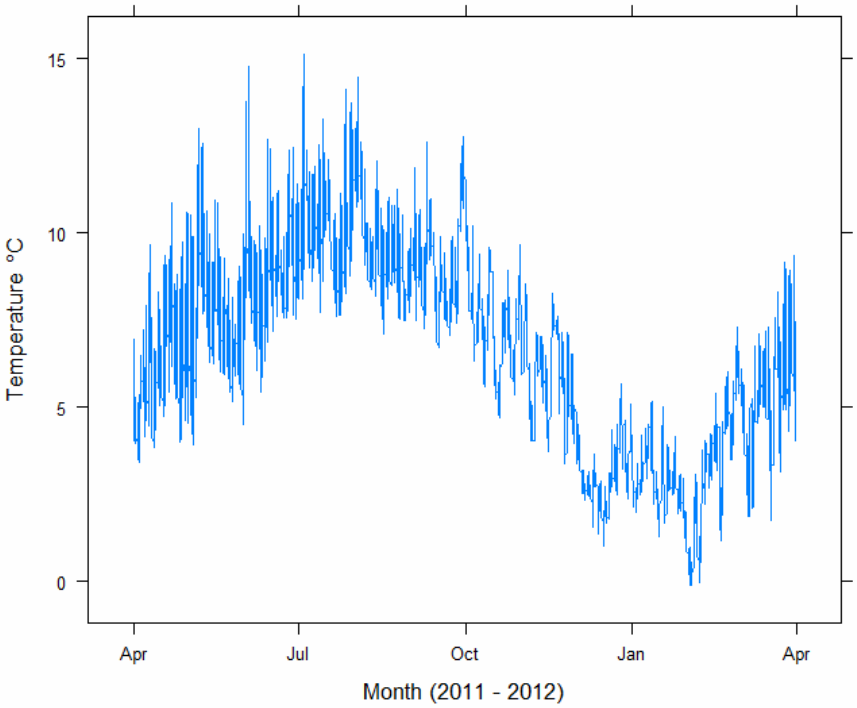
Percentage Species Cover



\+ Represents <0.9% abundance
No survey in 2008 due to spate conditions

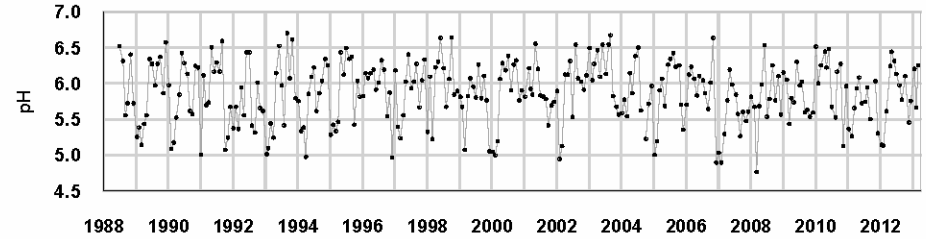
6.2.6. Thermistor data, Allt a'Mharcaidh

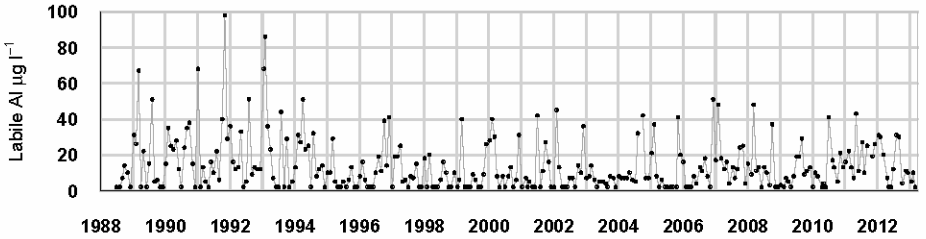


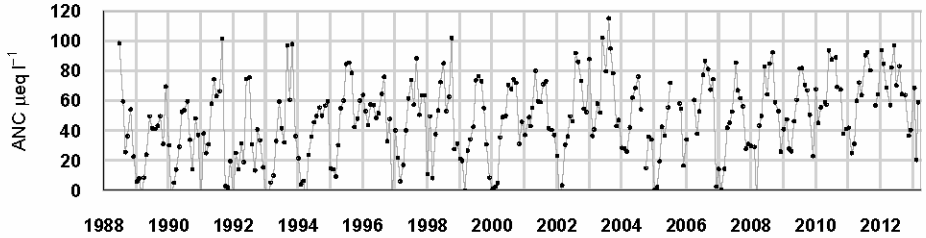


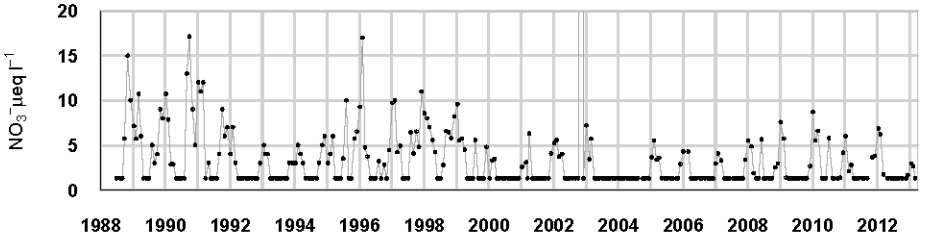
6.3. Allt na Coire nan Con

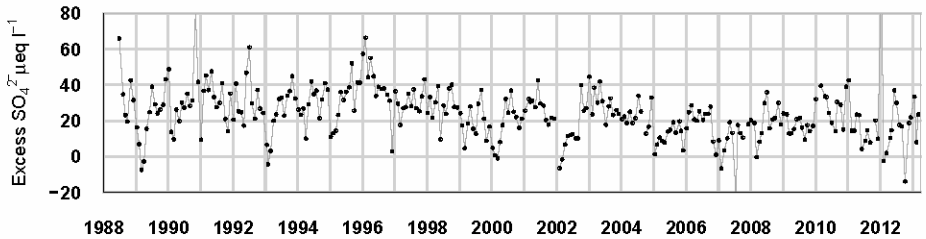
6.3.1. Spot sampled chemistry data

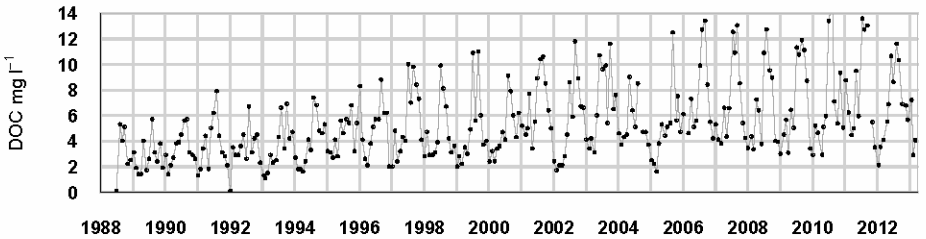


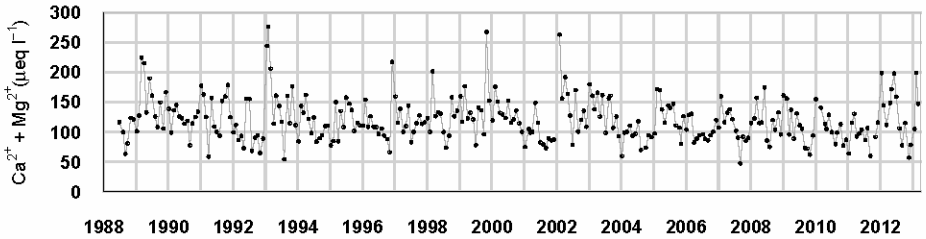


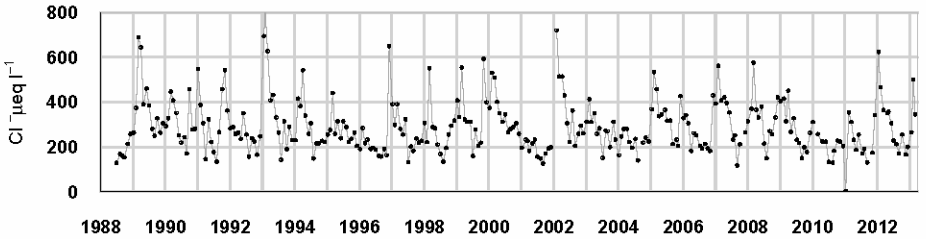








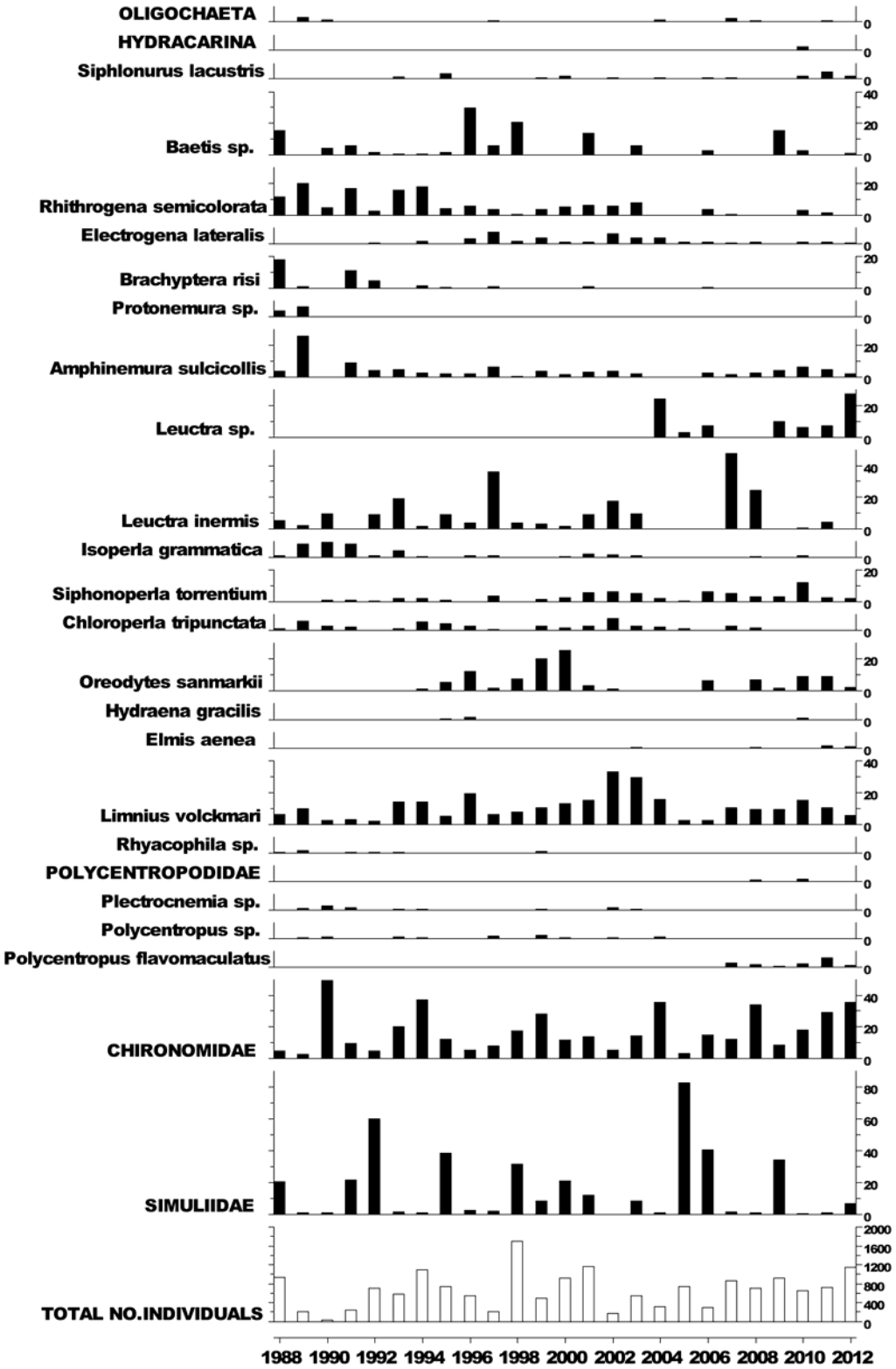




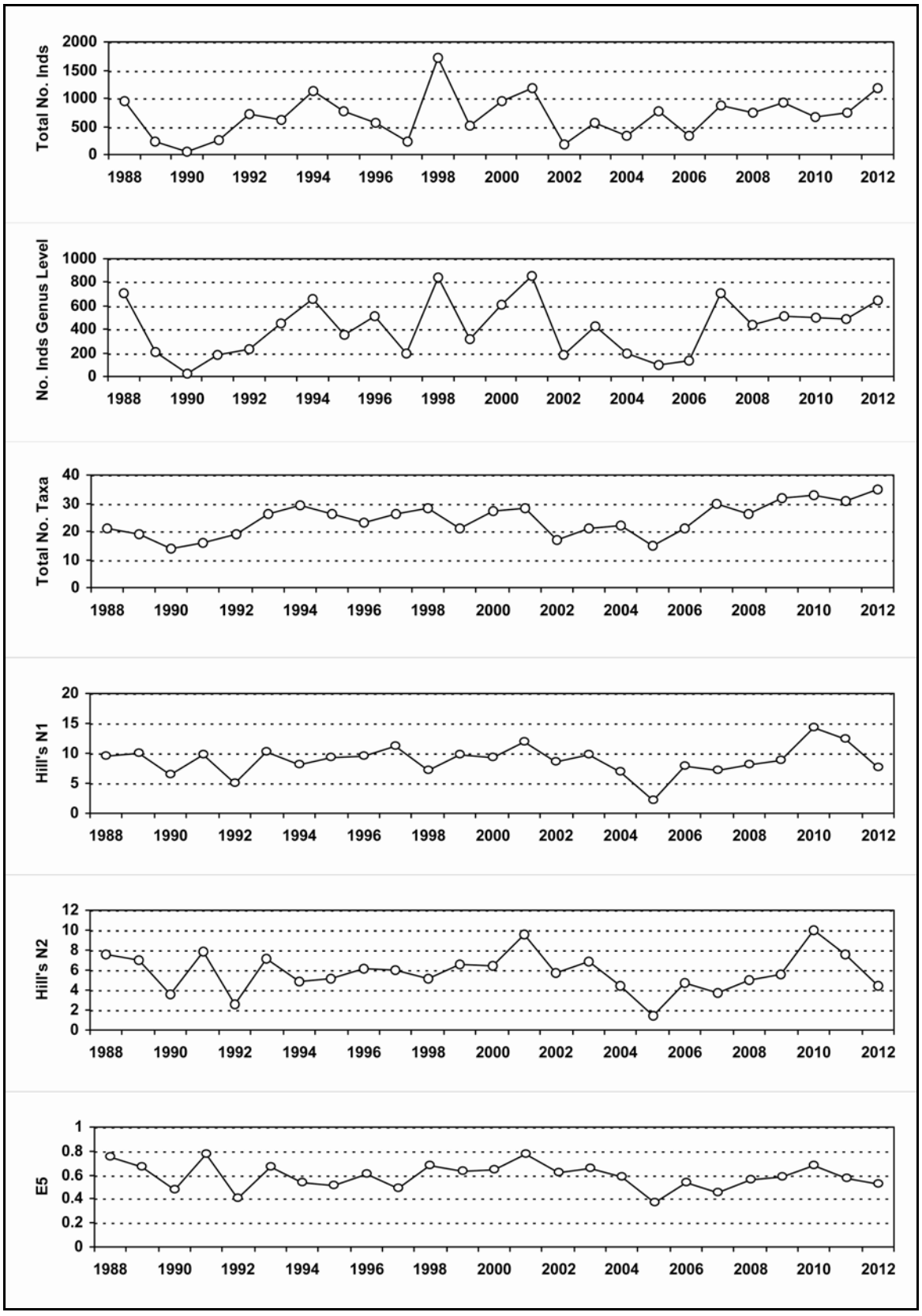
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.81	32.14	58.91	70.20	274.34	9.14	64.76	21.47	325.23	62.07	27.96	4.79	3.18
12-13 mean	6.02	61.64	64.99	64.72	258.75	7.11	73.75	10.50	278.48	47.23	18.02	1.57	7.25
12-13 std dev	0.30	21.53	29.43	22.78	63.60	2.73	35.51	10.02	97.26	15.39	13.39	0.58	2.64

6.3.2. Macroinvertebrate data

6.3.2.1. Percentage abundance summary, Allt na Coire nan Con

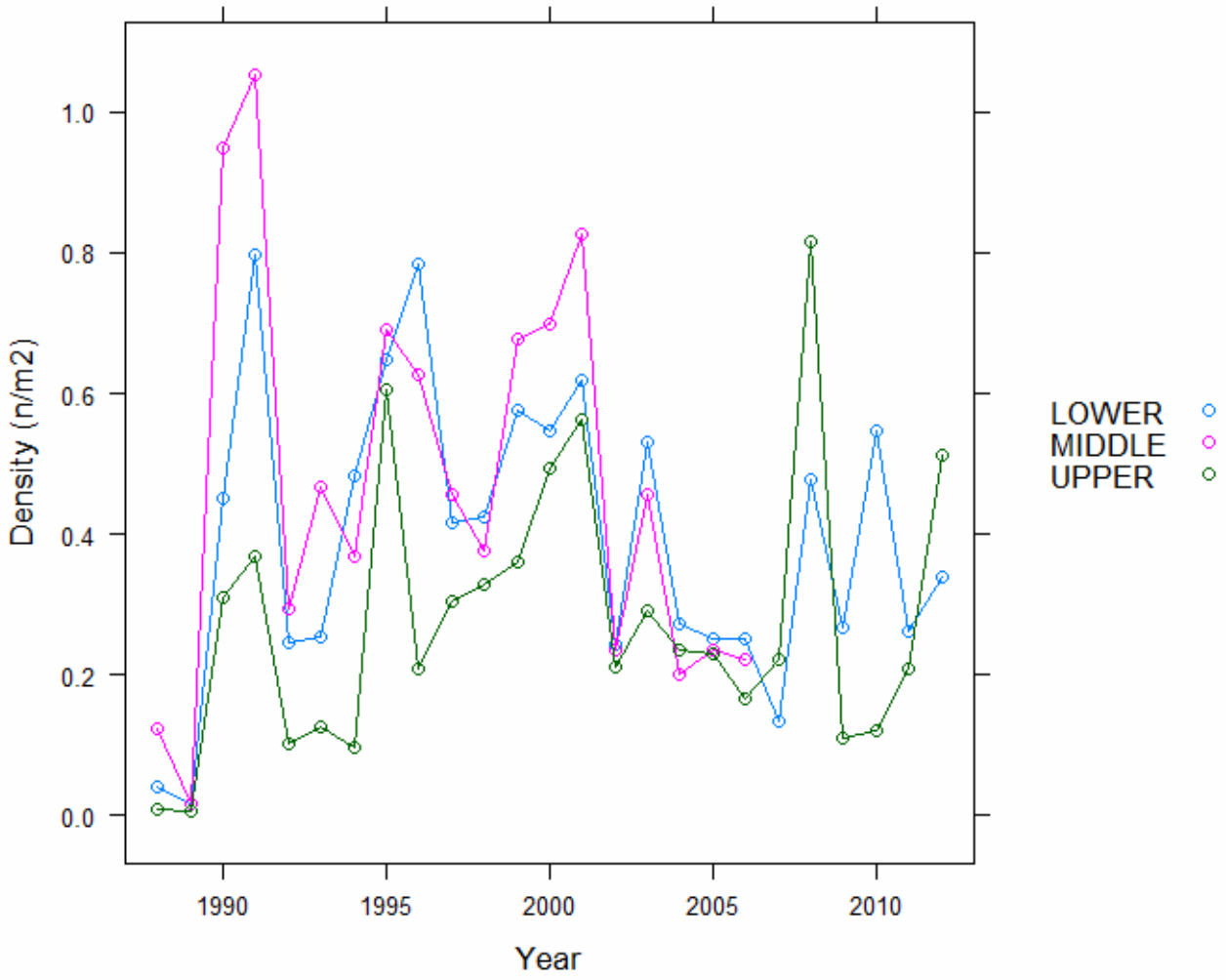


6.3.2.2. Summary statistics, Allt na Coire nan Con

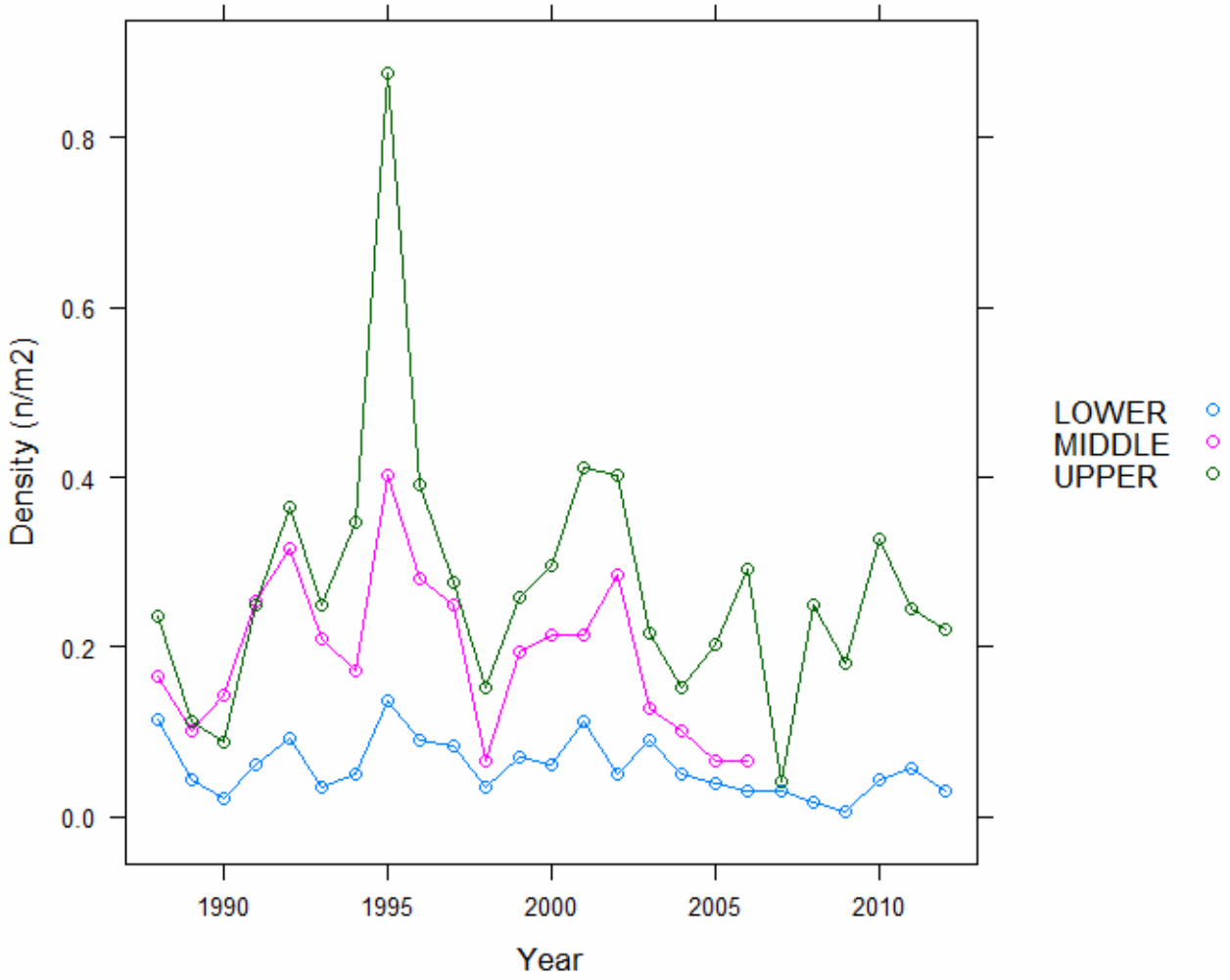


6.3.3. Fish data

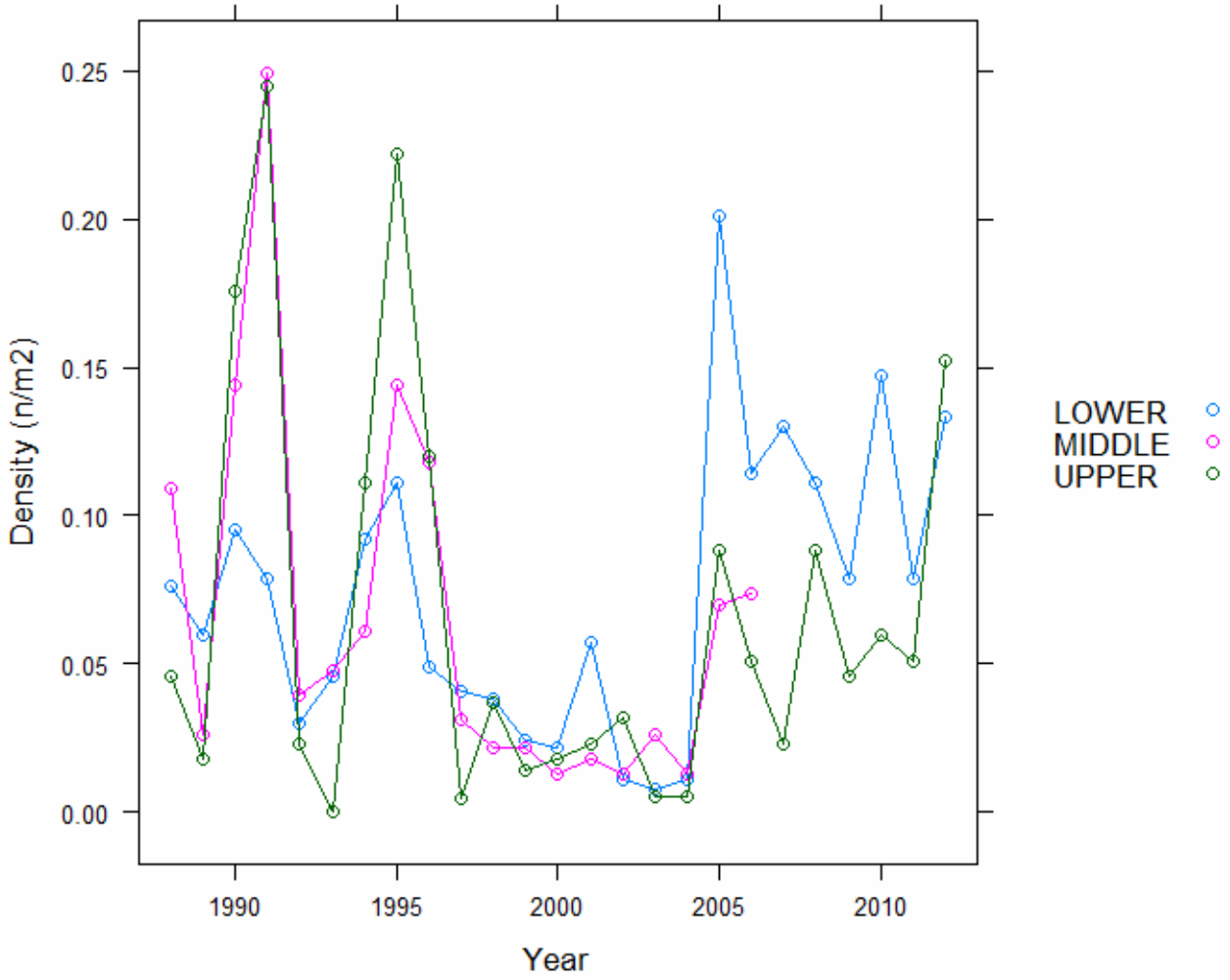
6.3.3.1. Summary of Salmon fry densities (numbers m^{-2}), Allt na Coire nan Con



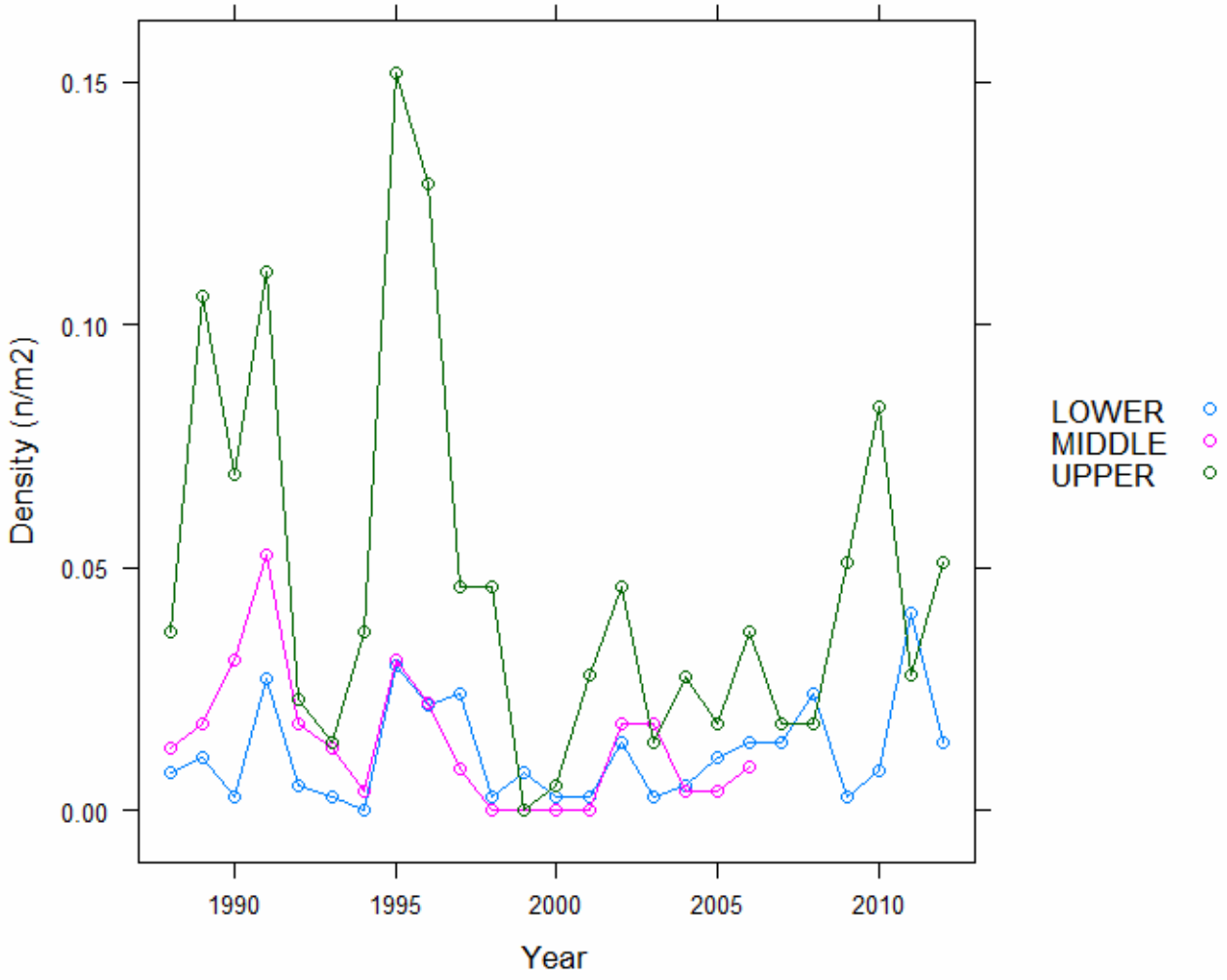
6.3.3.2. Summary of Salmon parr densities (numbers m^{-2}), Allt na Coire nan Con



6.3.3.3. Summary of Trout fry densities (numbers m^{-2}), Allt na Coire nan Con

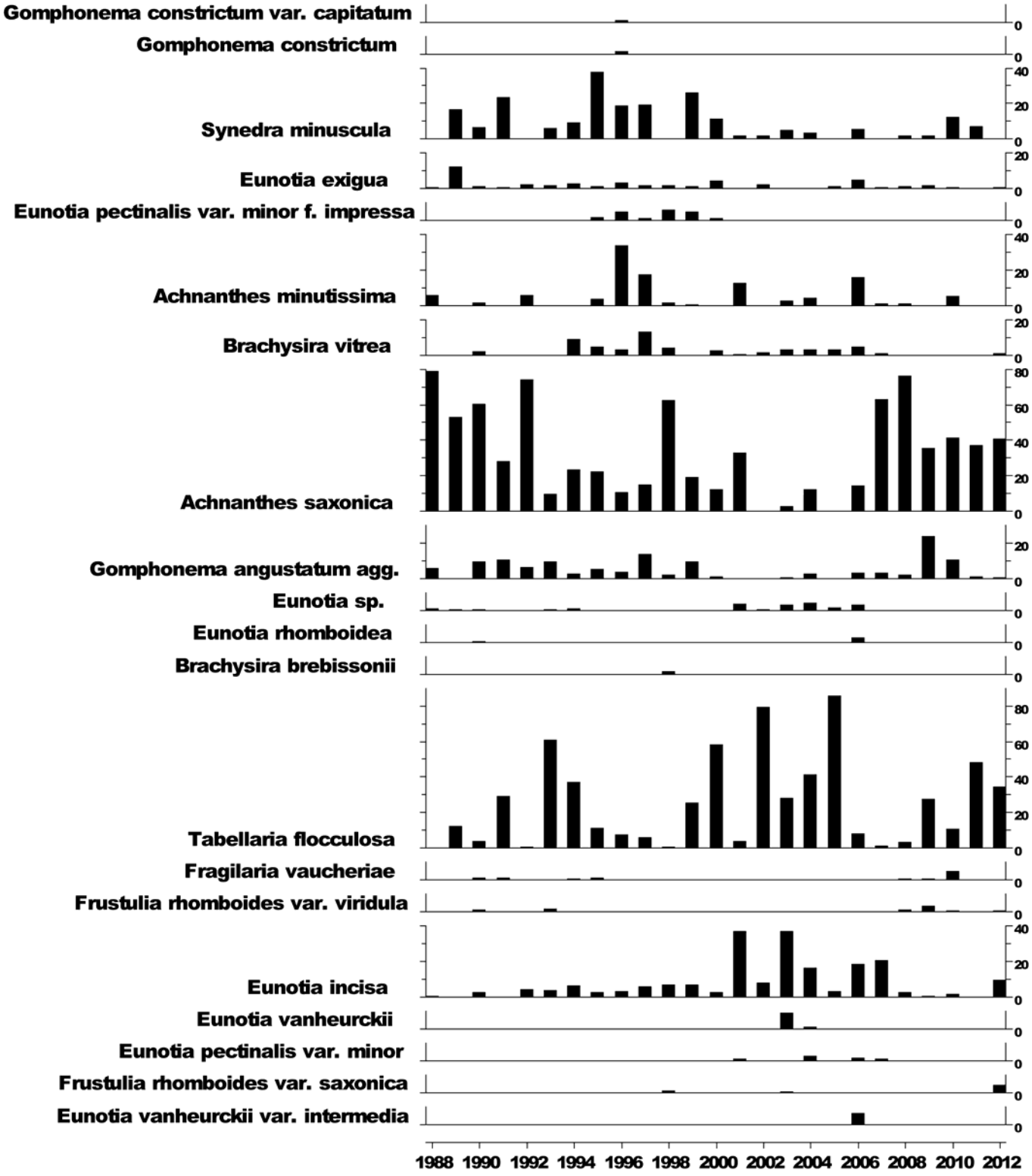


6.3.3.4. Summary of Trout parr densities (numbers m^{-2}), Allt na Coire nan Con

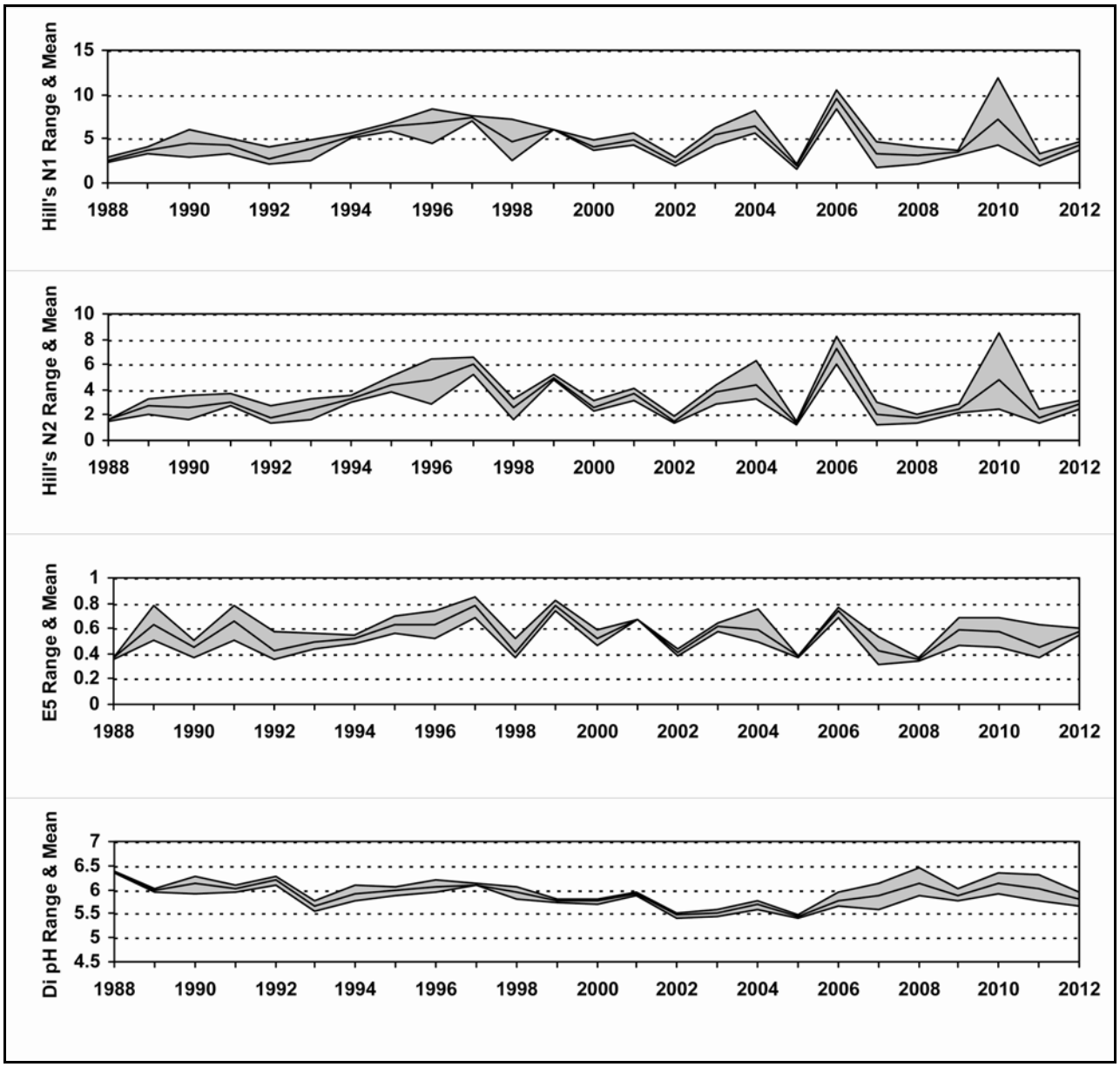


6.3.4. Epilithic diatom data

6.3.4.1. Percentage abundance summary, Allt na Coire nan Con

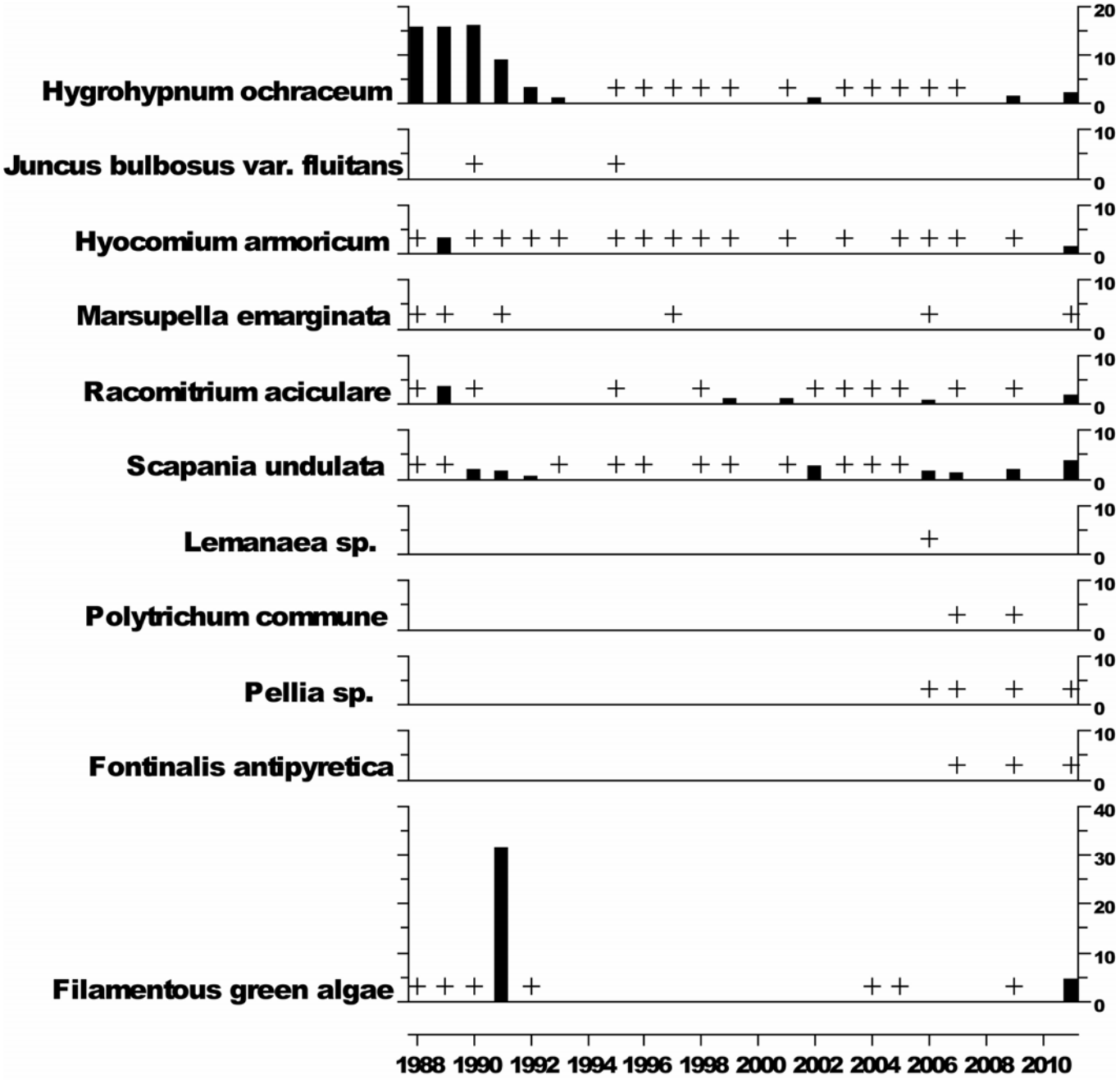


6.3.4.2. Summary statistics, Allt na Coire nan Con



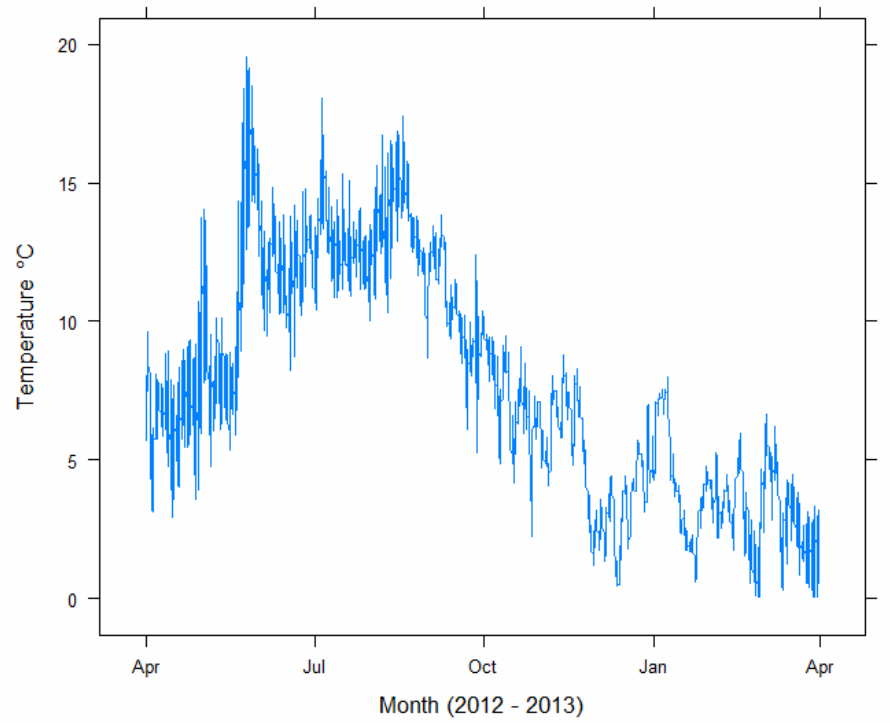
6.3.5. Aquatic macrophyte data, Allt na Coire nan Con

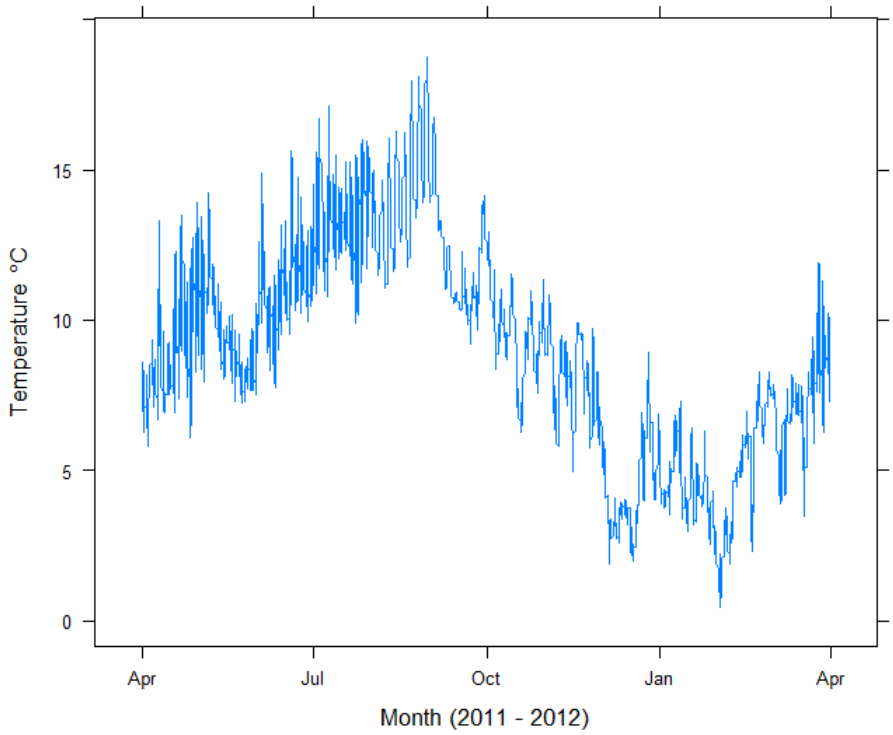
Percentage Species Cover



\+ Represents <0.9% abundance
No surveys in 2008 and 2010 due to spate conditions

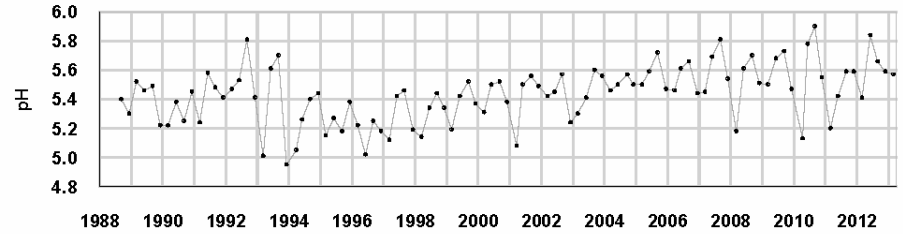
6.3.6. Thermistor data, Allt na Coire nan Con

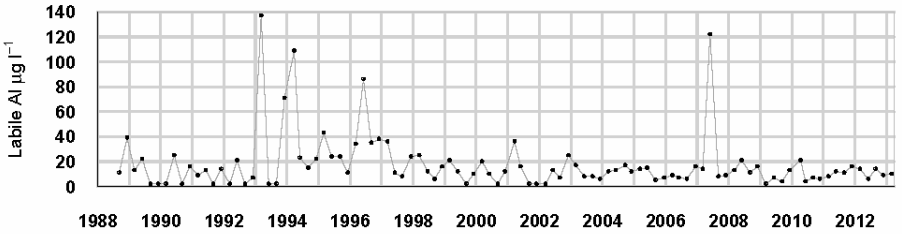


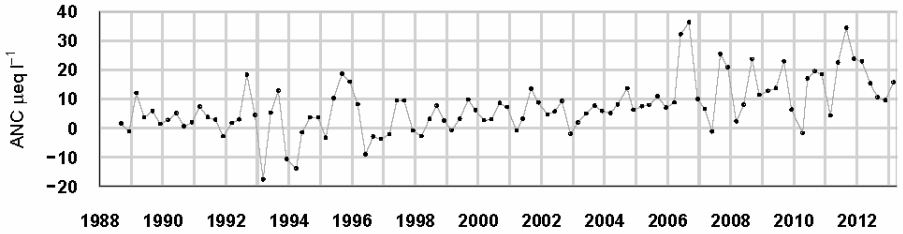


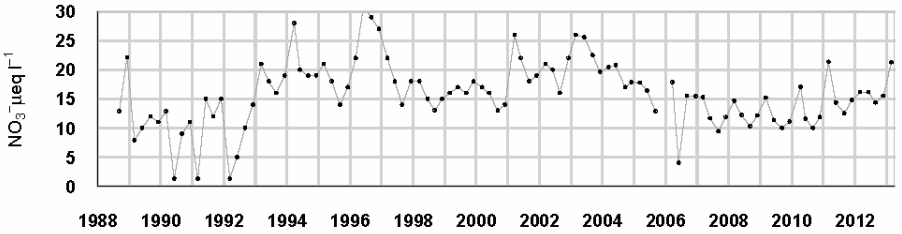
6.4. Lochnagar

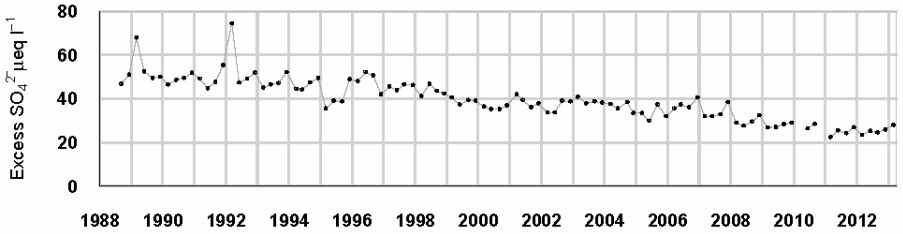
6.4.1. Spot sampled chemistry data

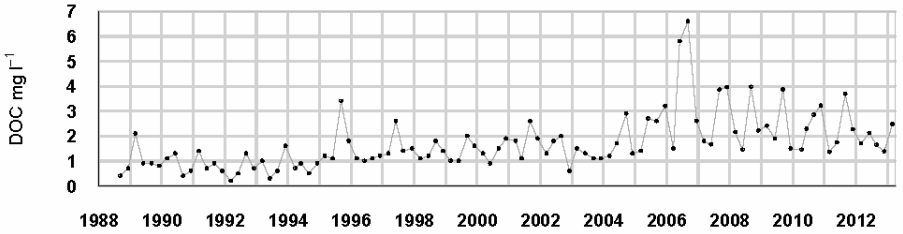


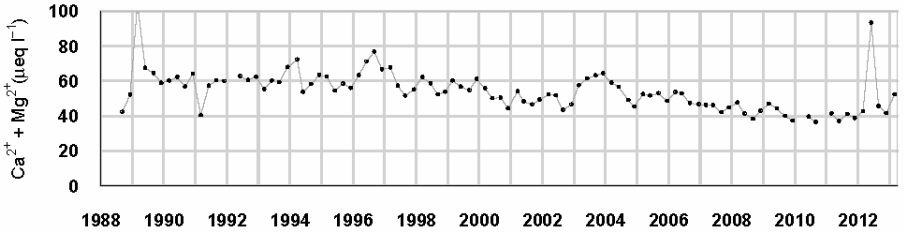


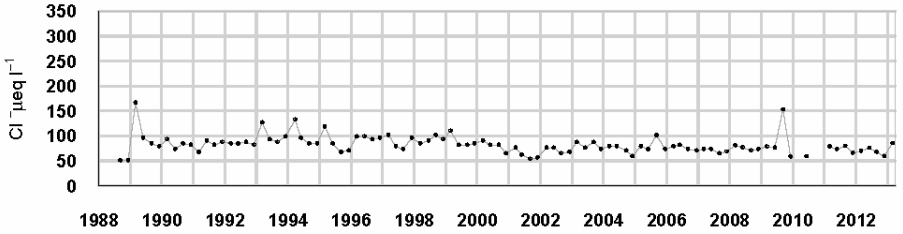








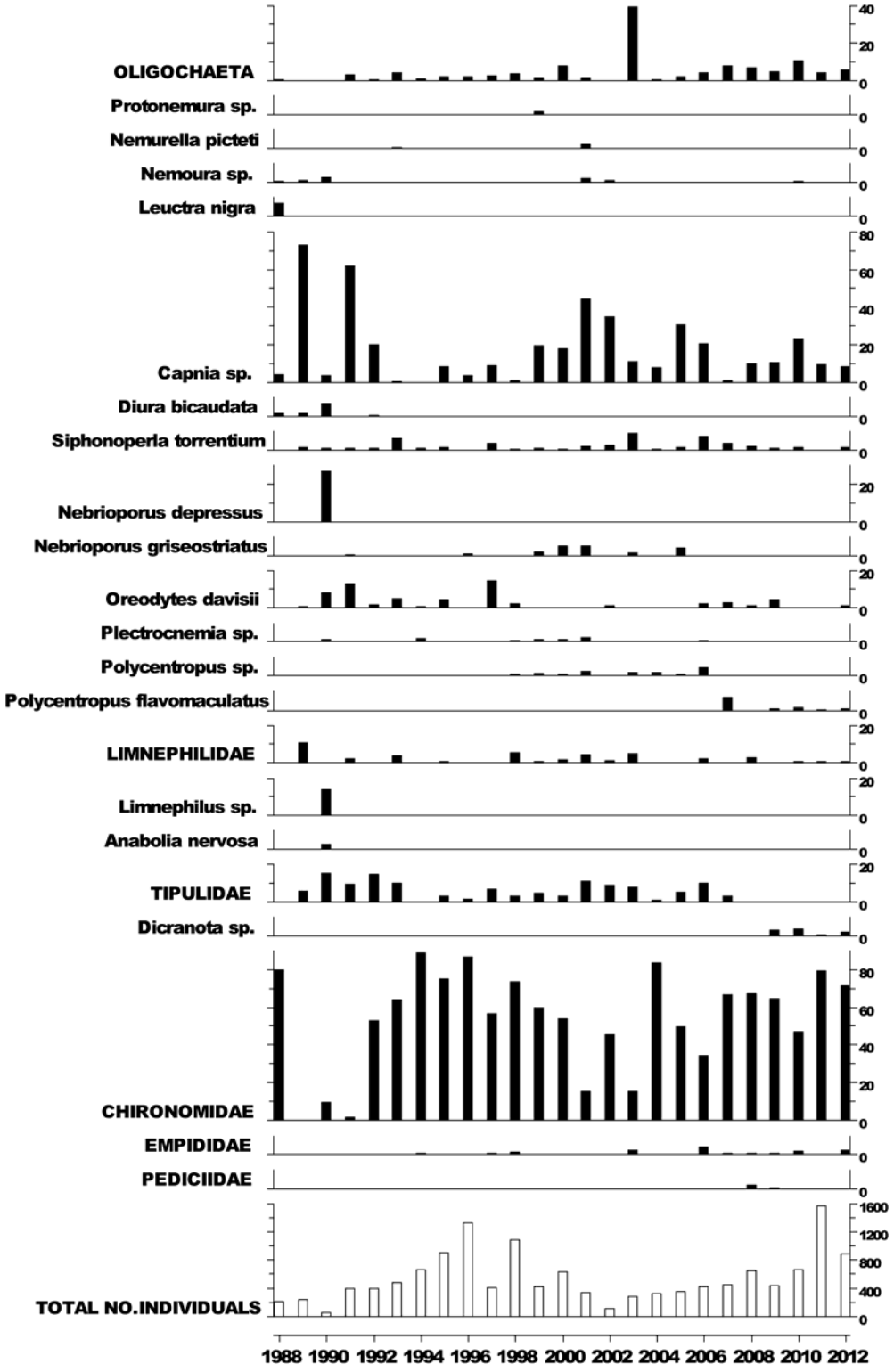




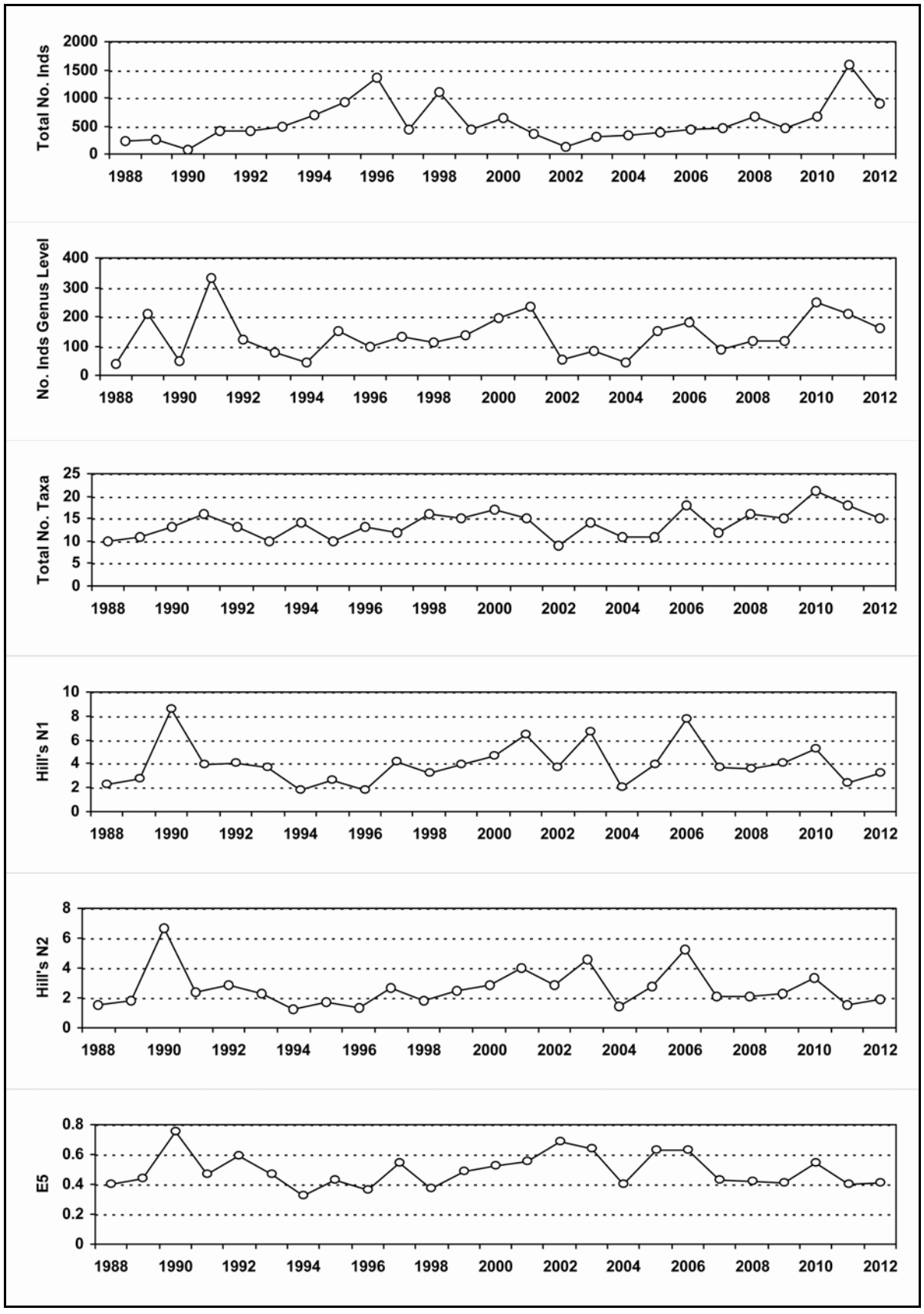
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.41	2.96	28.86	30.35	92.22	7.62	30.88	17.15	87.31	60.41	51.25	11.13	0.84
12-13 mean	5.66	12.74	33.40	24.78	77.10	5.09	23.75	9.75	71.94	33.43	25.87	16.82	1.90
12-13 std dev	0.12	3.19	24.03	3.09	9.49	0.55	3.30	3.30	11.08	2.37	1.48	3.07	0.49

6.4.2. Macroinvertebrate data

6.4.2.1. Percentage abundance summary, Lochnagar

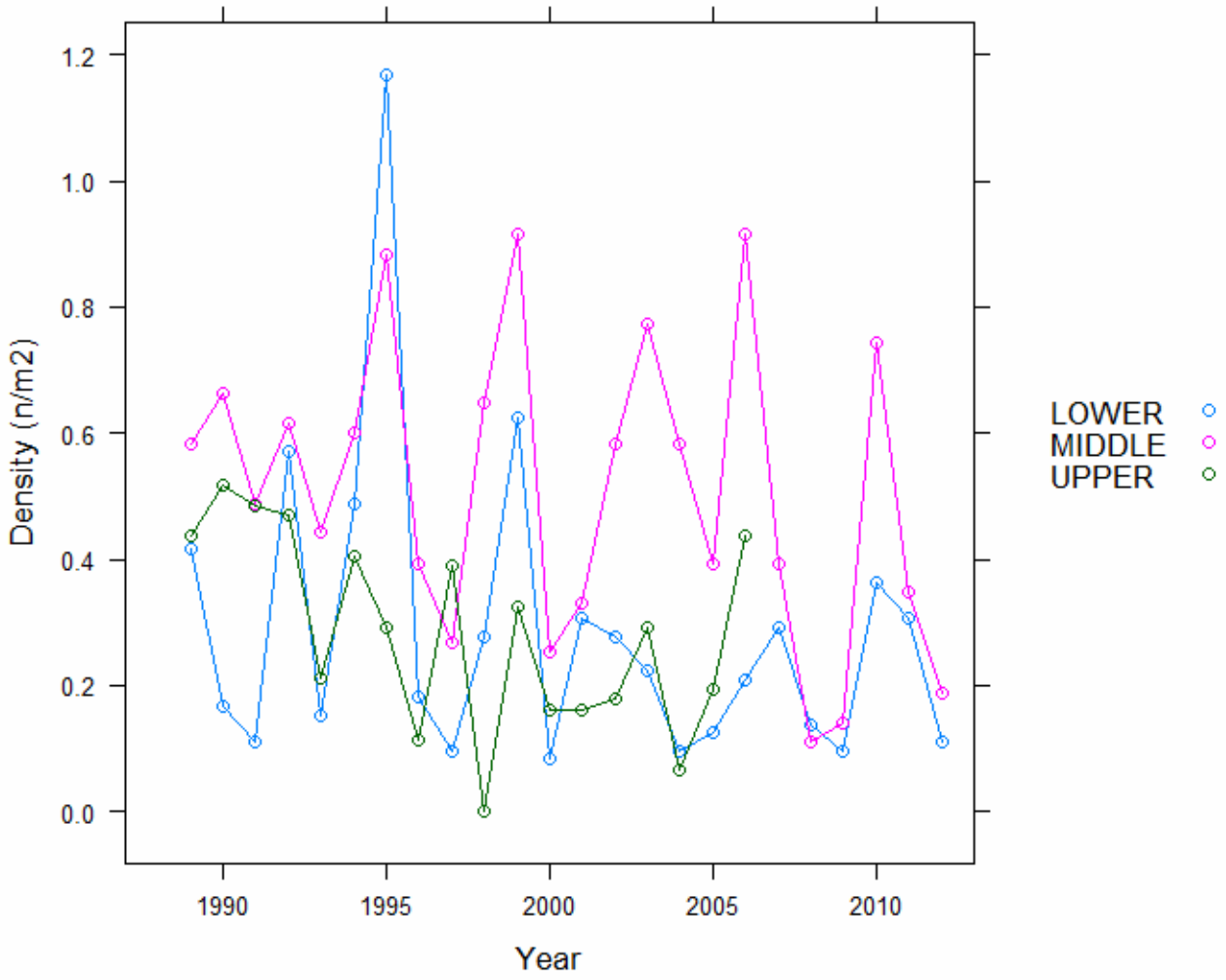


6.4.2.2. Summary statistics, Lochnagar

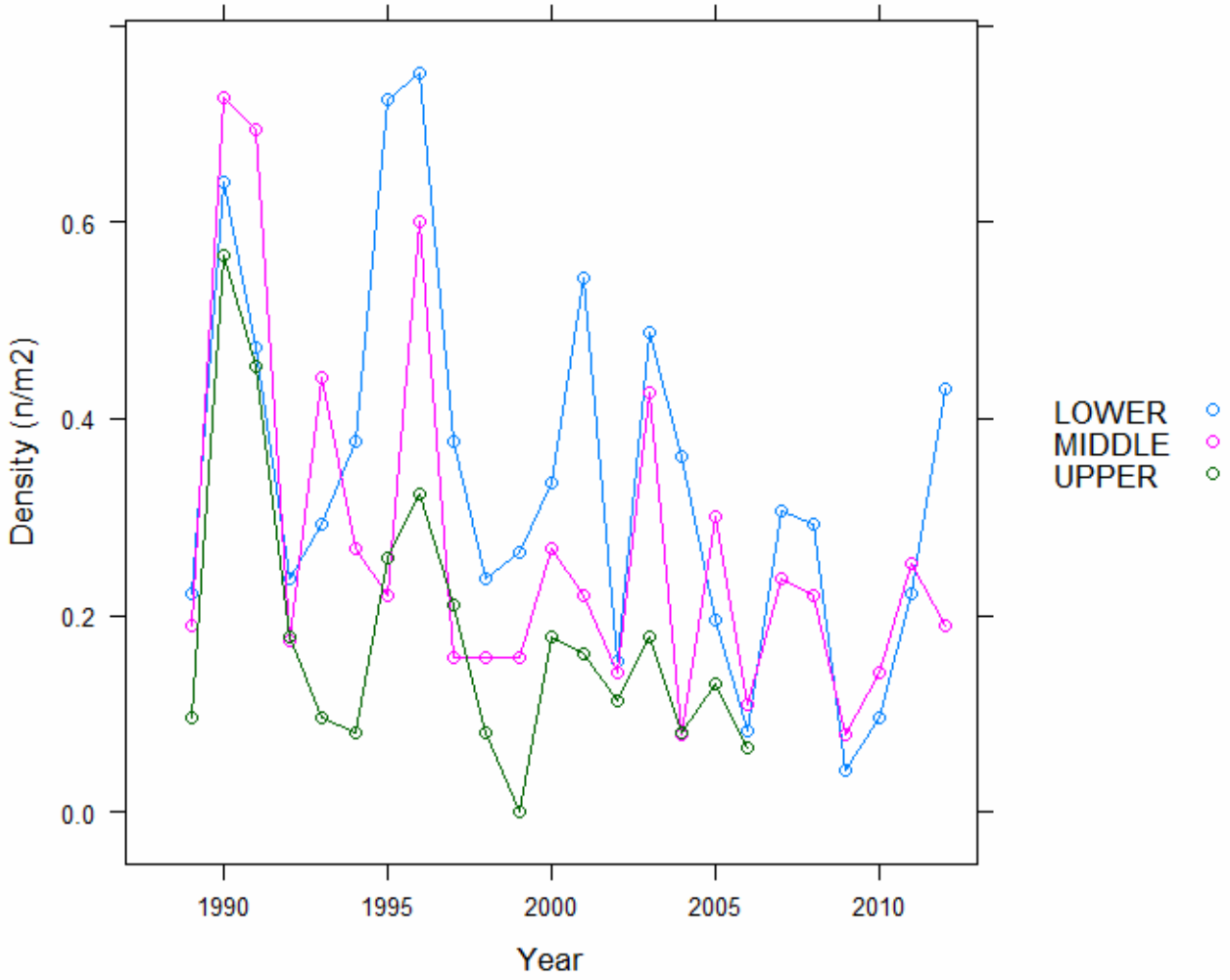


6.4.3. Fish data (for outflow stream)

6.4.3.1. Summary of Trout fry densities (numbers m^{-2}), Lochnagar

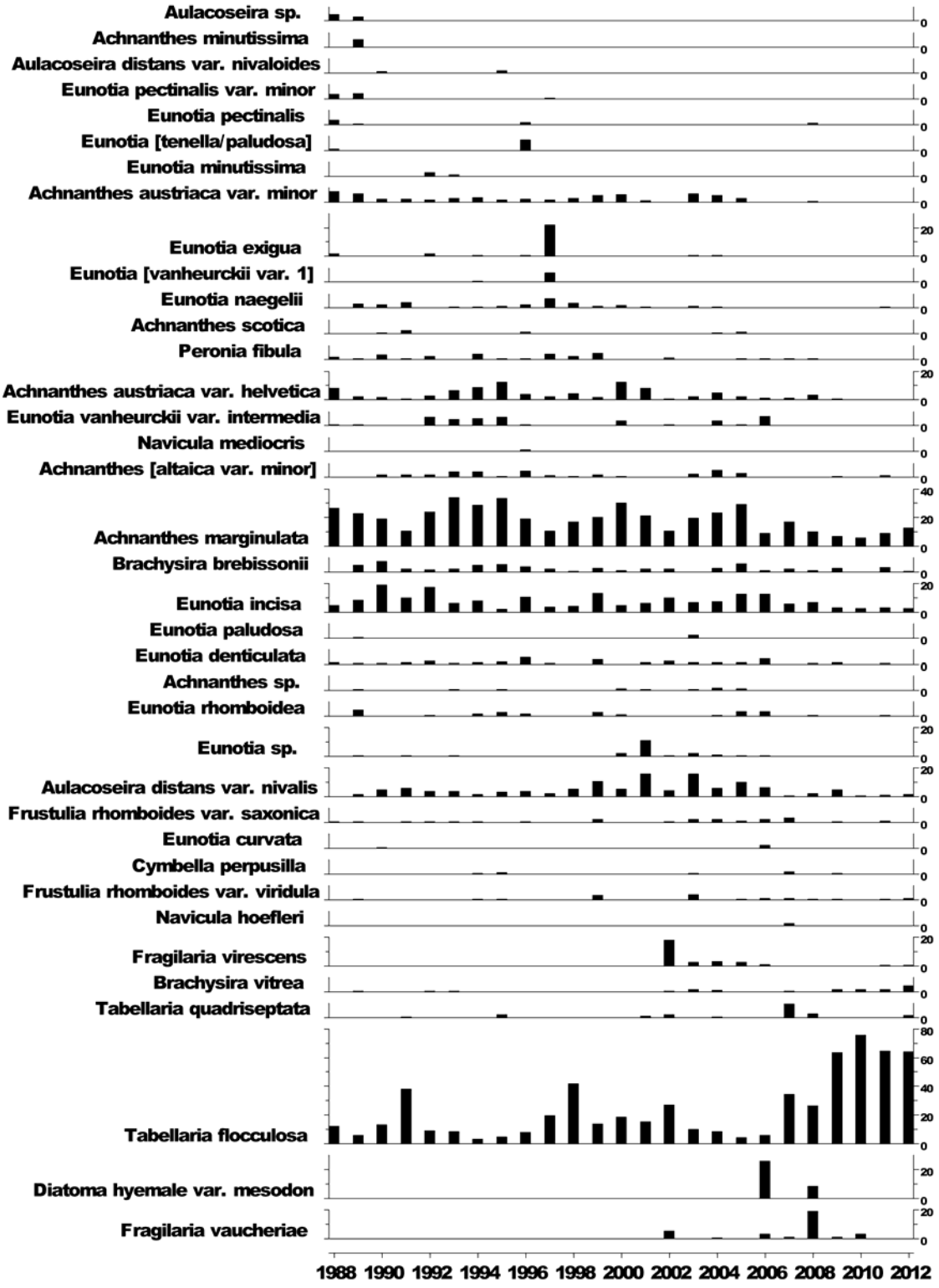


6.4.3.2. Summary of Trout parr densities (numbers m^{-2}), Lochnagar

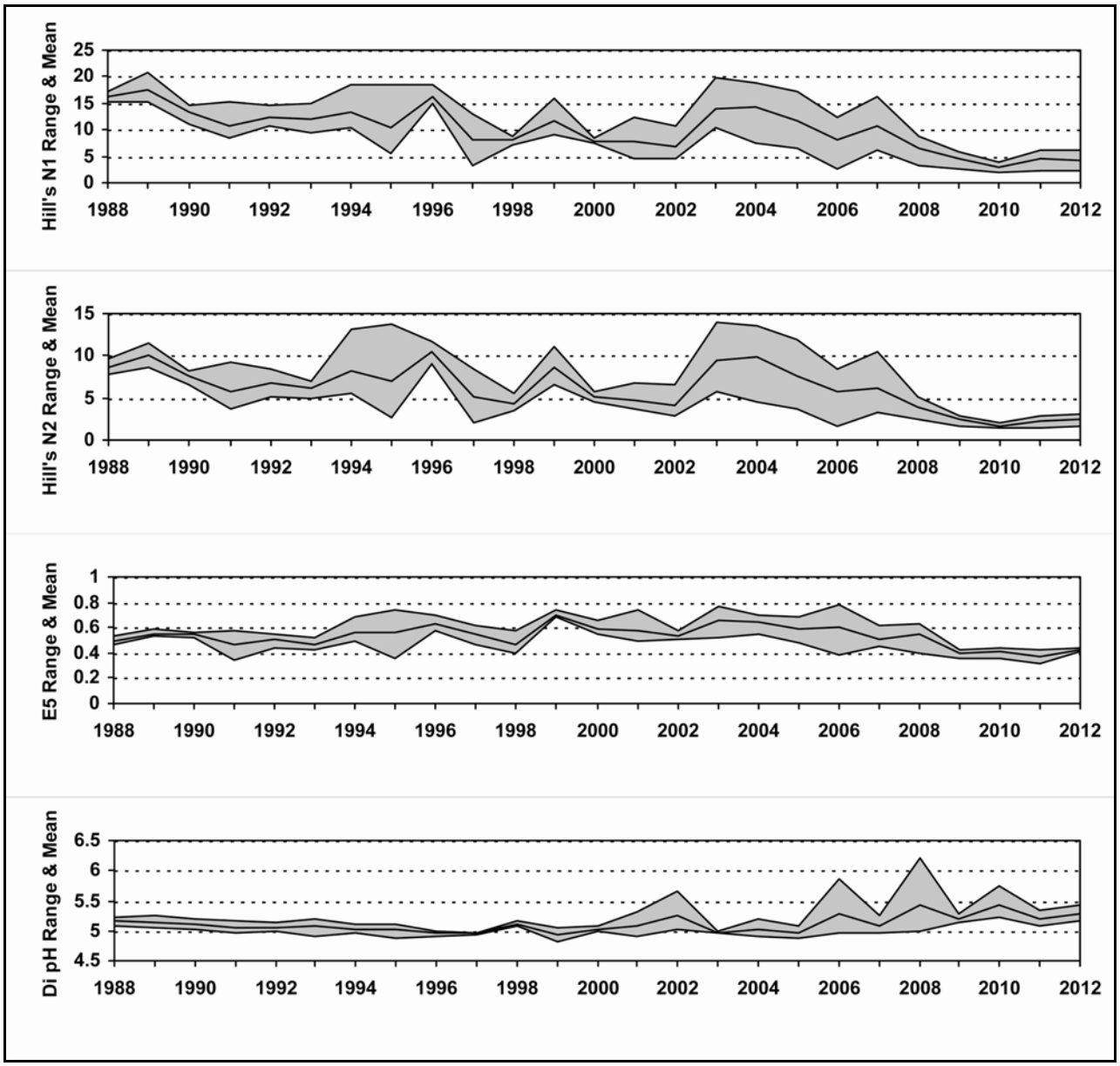


6.4.4. Epilithic diatom data

6.4.4.1. Percentage abundance summary, Lochnagar

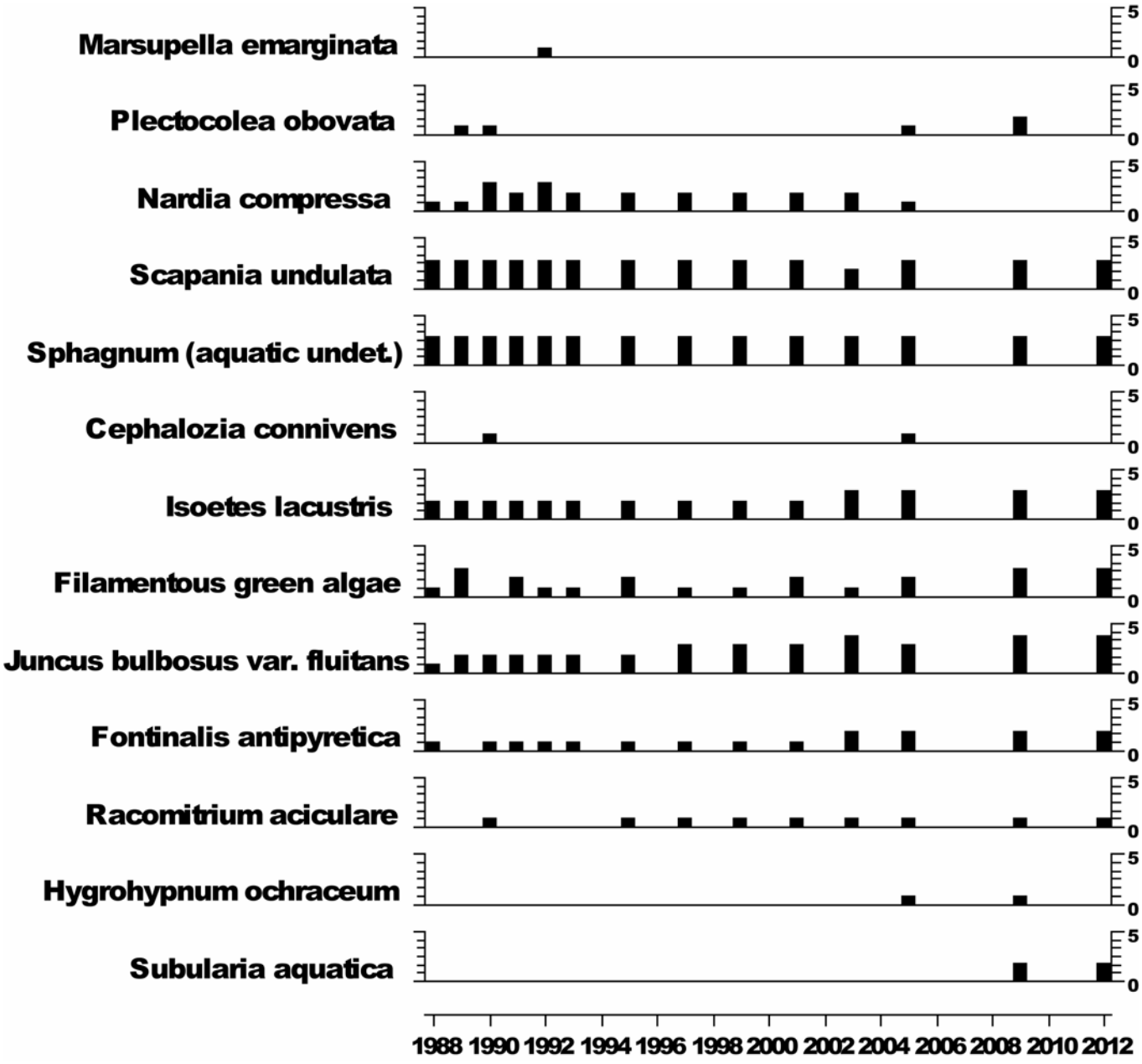


6.4.4.2. Summary statistics, Lochnagar



6.4.5. Aquatic macrophyte data, Lochnagar

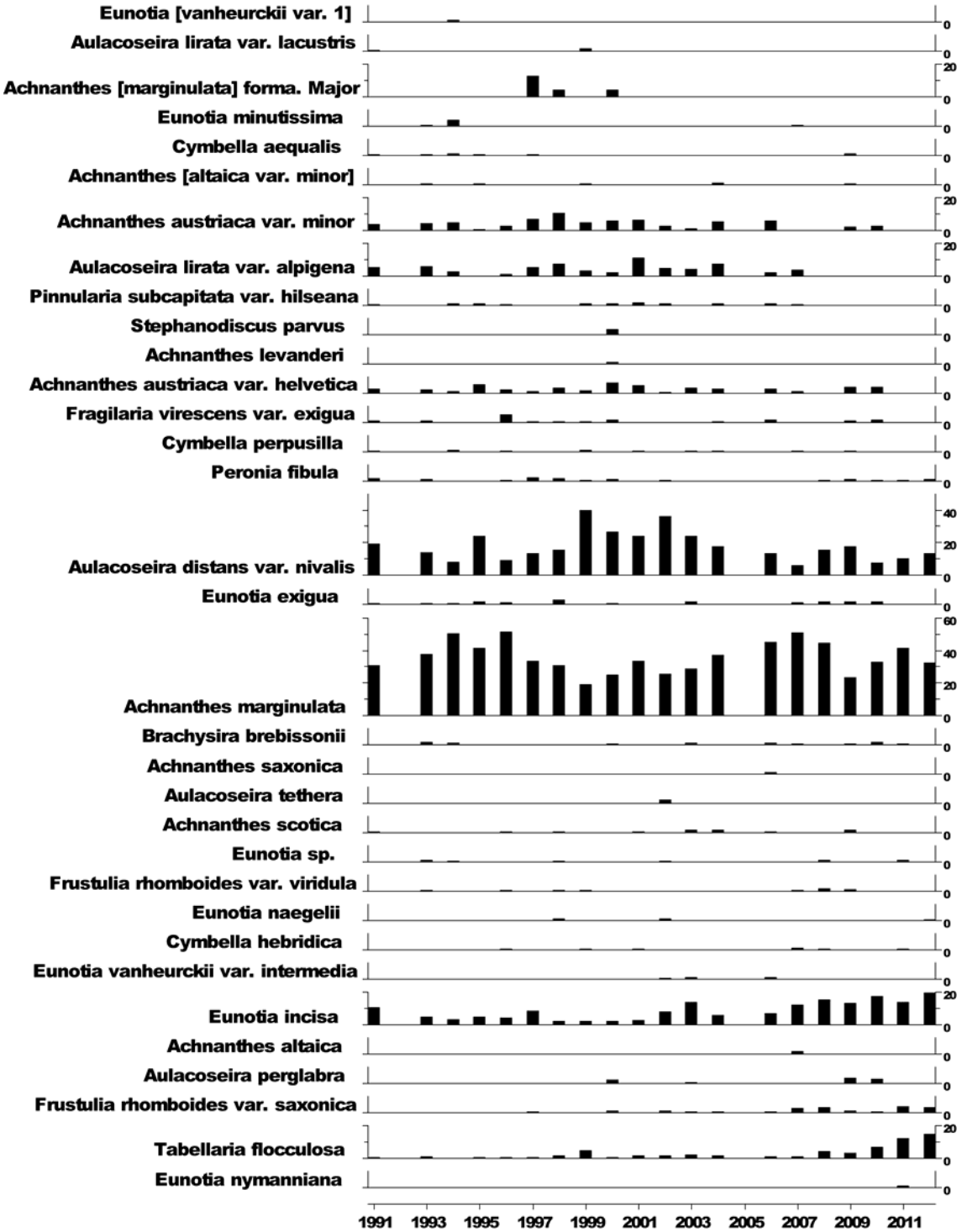
Species Scores (1-5)



No survey in 2007 due to funding cuts
2012 Bryophyte IDs pending

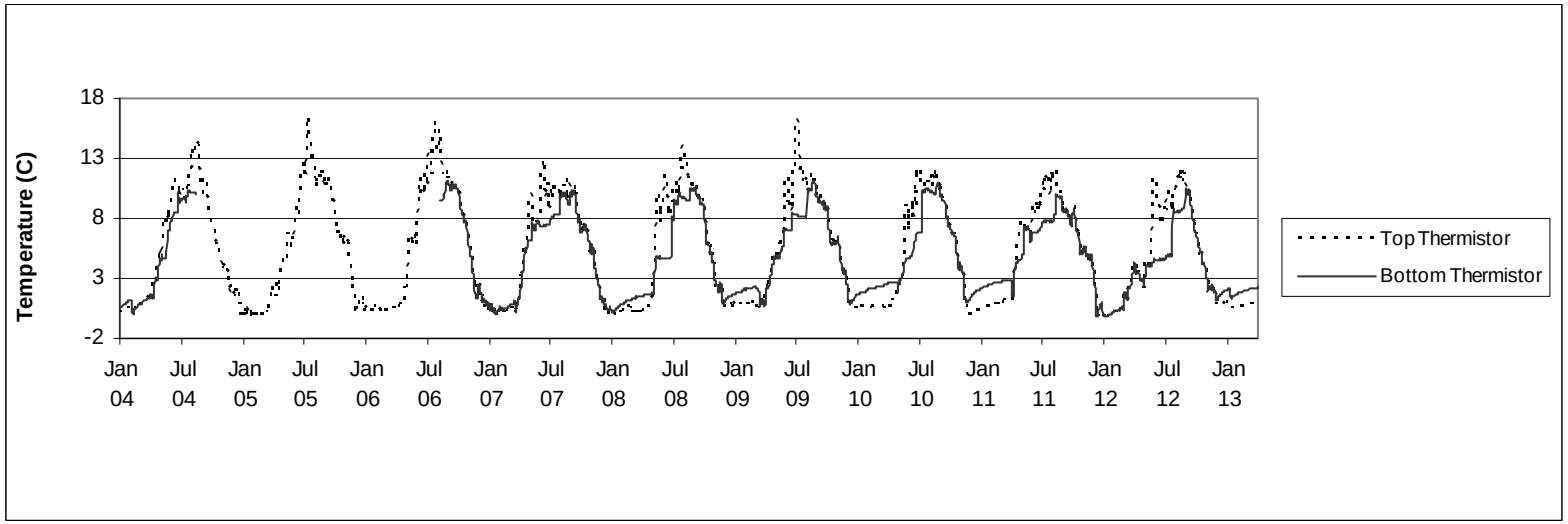
6.4.6. Sediment trap data, Lochnagar

Relative percentage frequency of diatom taxa

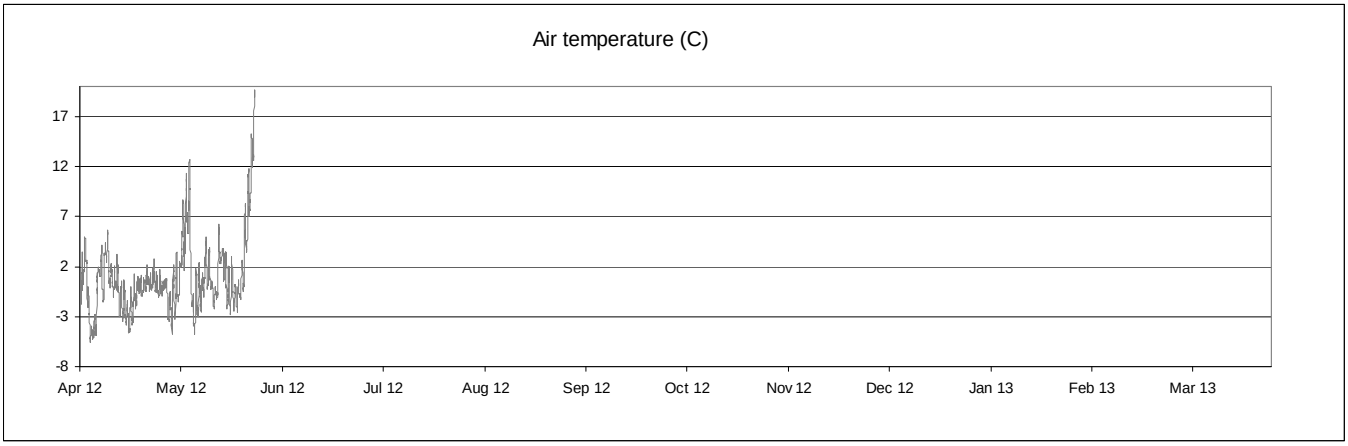


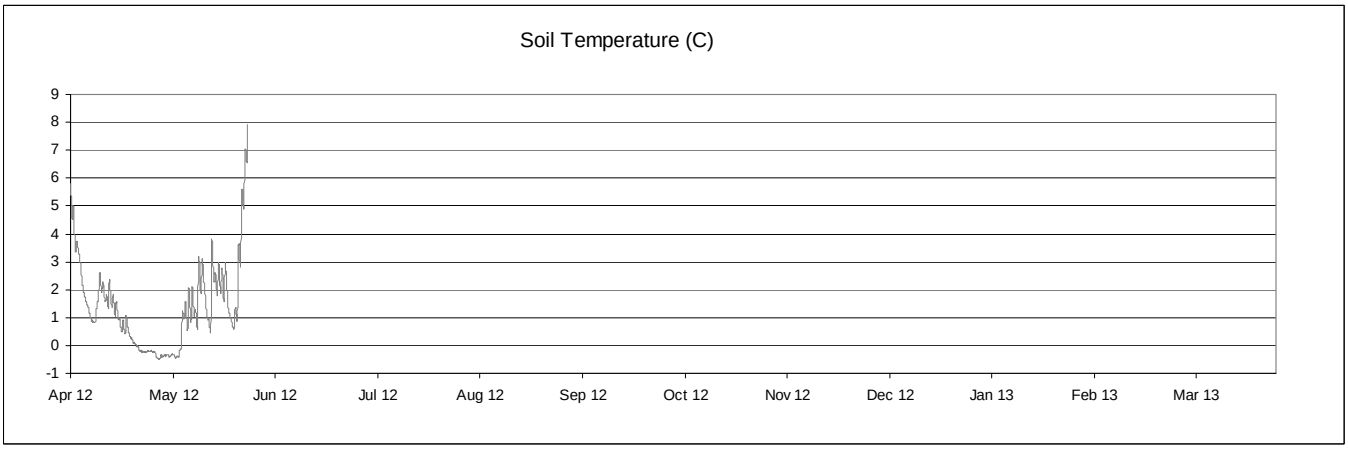
Sediment traps not recovered in 1992 or 2005

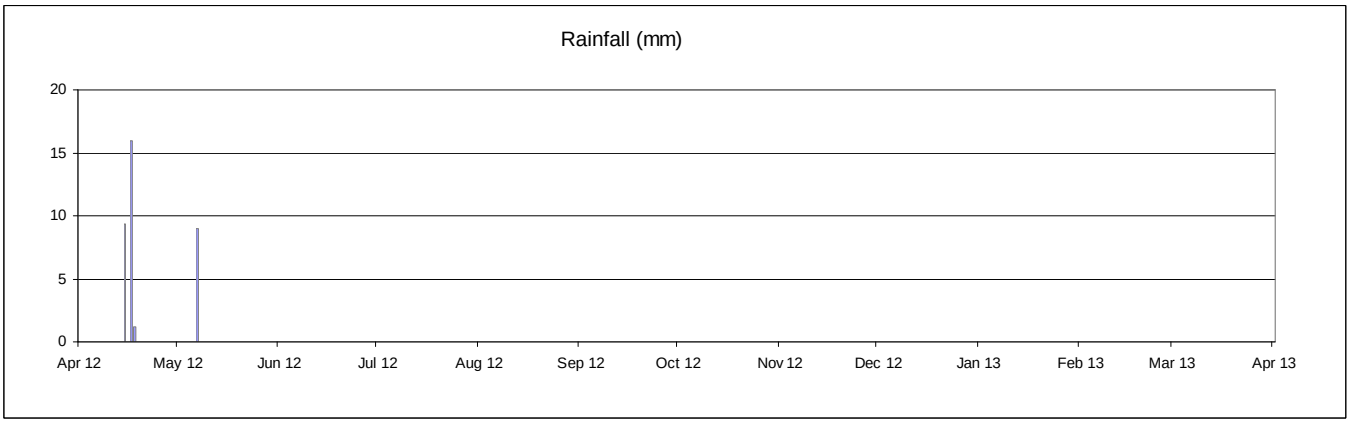
6.4.7. Thermistor data, Lochnagar



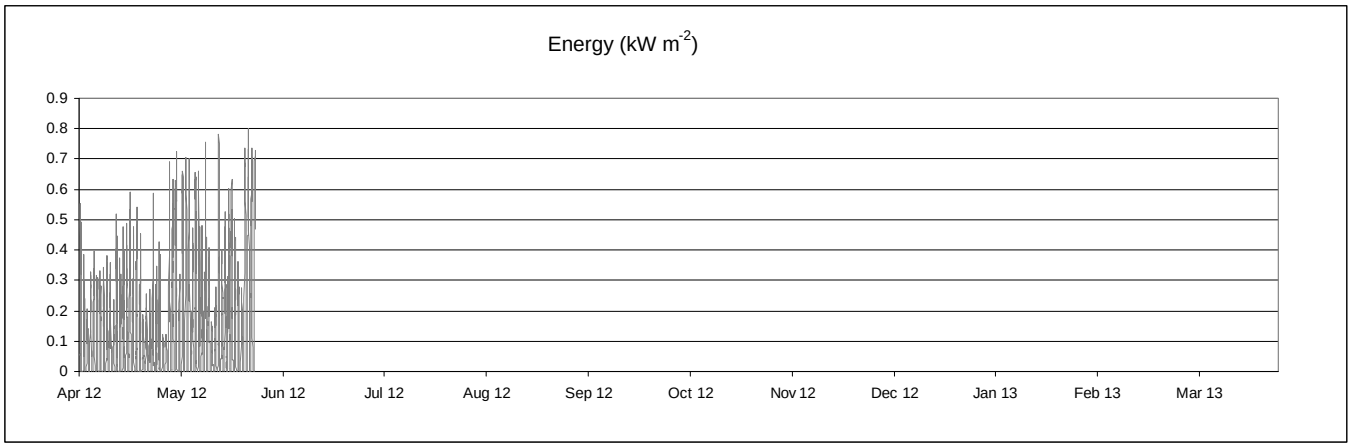
6.4.8. Weather station data, Lochnagar

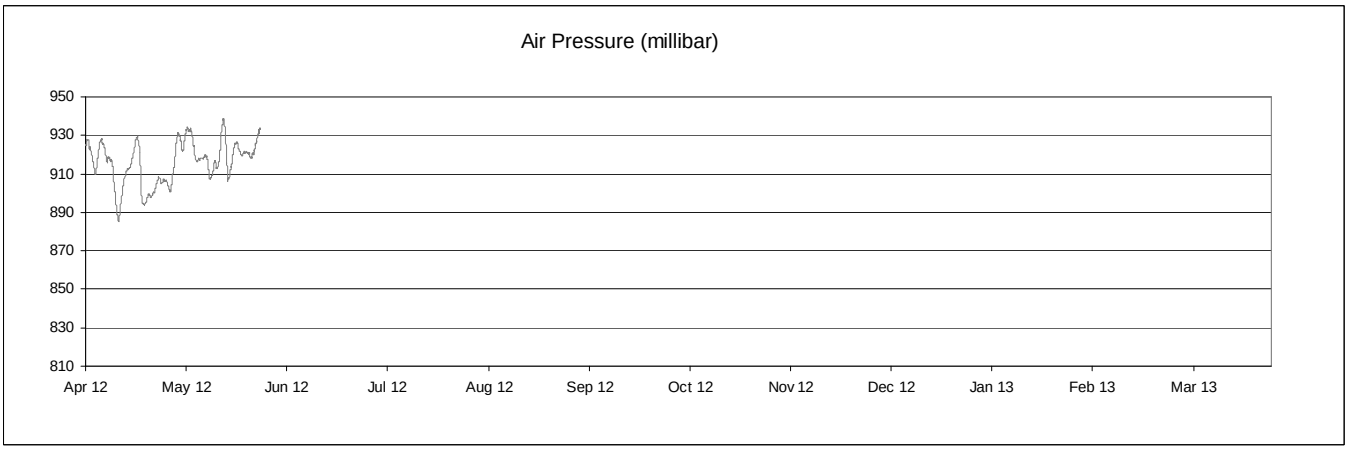


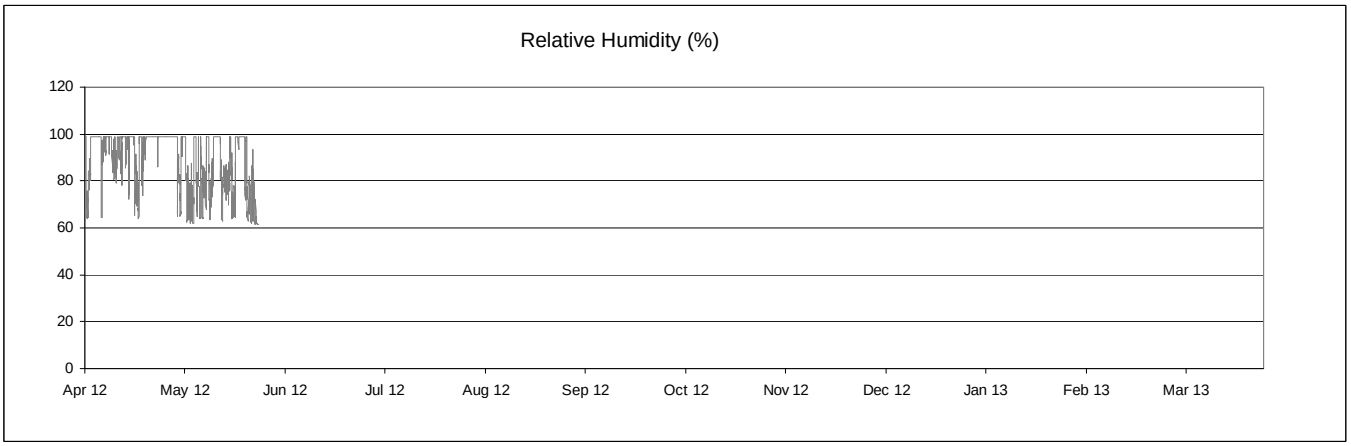




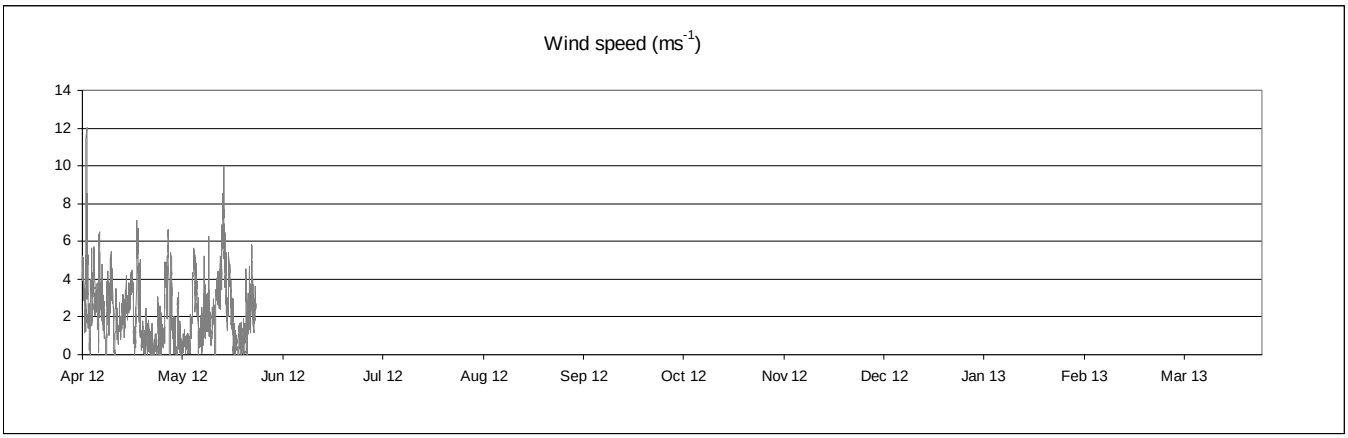
Data gap due to station malfunction and repair.







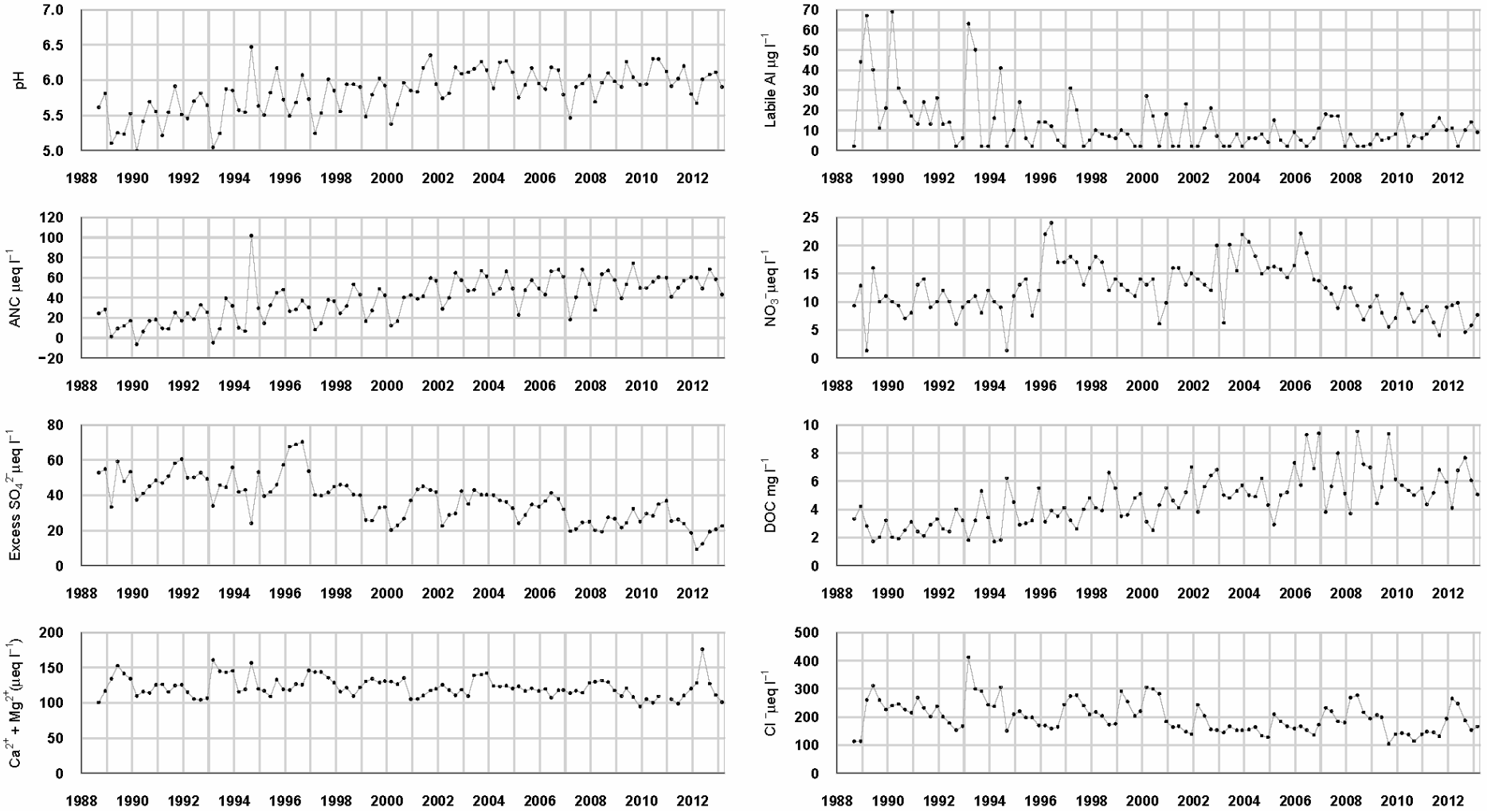
Data gaps due to station malfunction and repair.



Data gaps due to station malfunction and repair.

6.5. Loch Chon

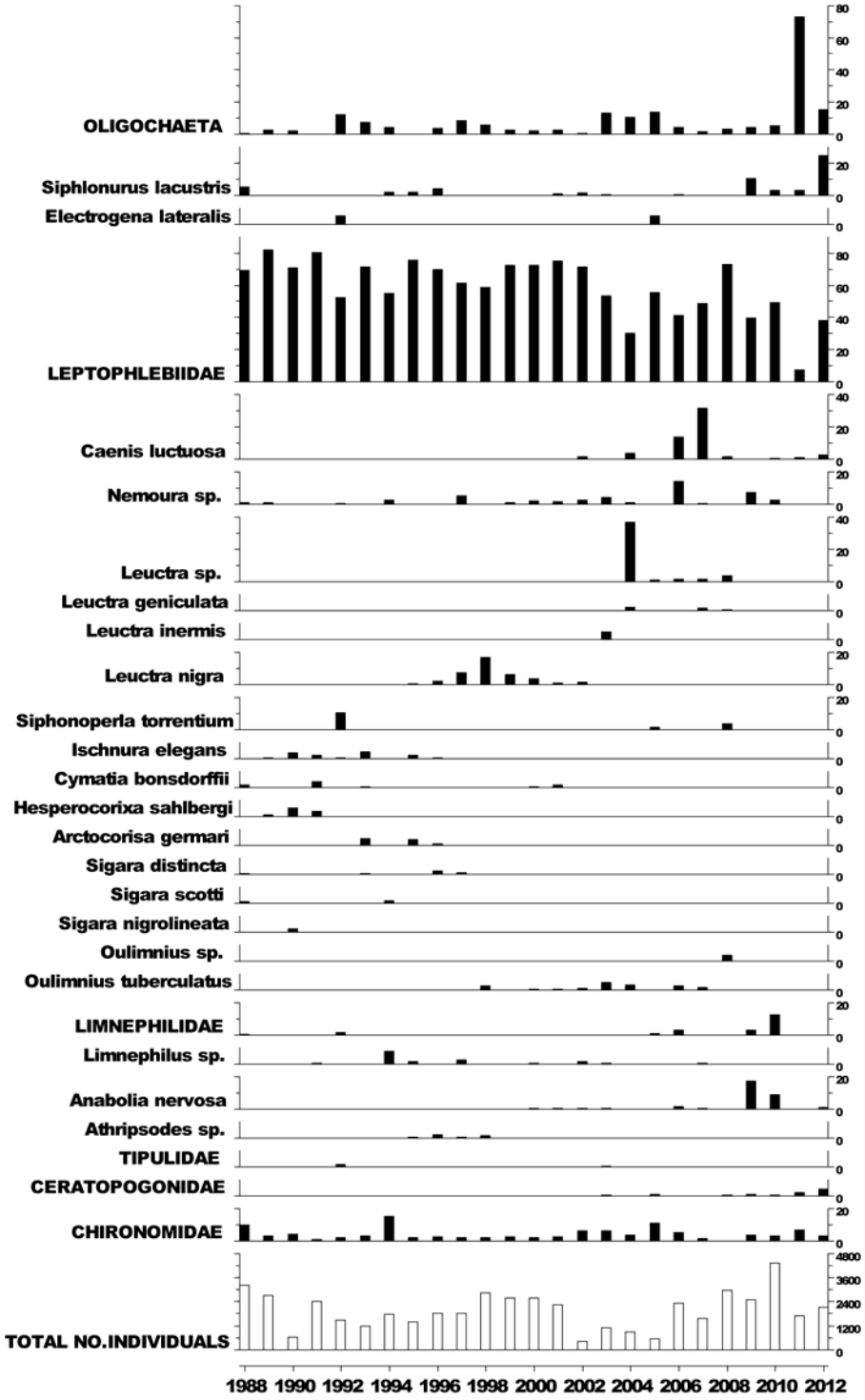
6.5.1. Spot sampled chemistry data



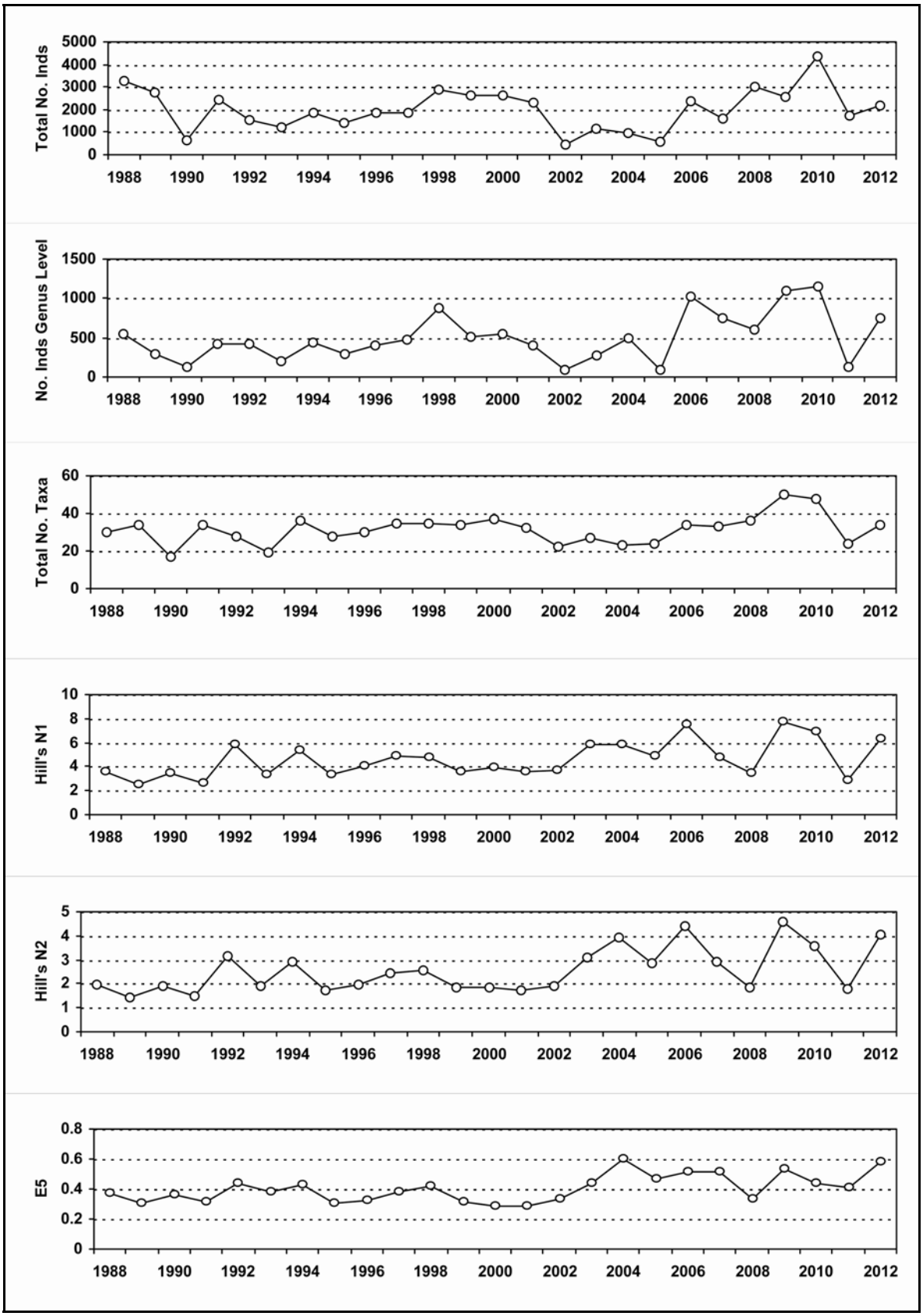
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4 $^{2-}$	xSO_4 $^{2-}$	NO_3 $^{-}$	**DOC
Mean 1st 5 yrs	5.46	14.54	76.17	47.42	189.44	5.79	66.65	27.50	227.51	72.38	48.53	9.94	2.73
12-13 mean	6.02	54.66	84.21	44.42	153.66	4.58	47.25	8.75	187.81	38.33	18.60	6.95	6.38
12-13 std dev	0.09	11.00	27.74	5.92	26.28	0.64	5.50	4.99	41.59	1.31	4.45	2.28	1.10

6.5.2. Macroinvertebrate data

6.5.2.1. Percentage abundance summary, Loch Chon

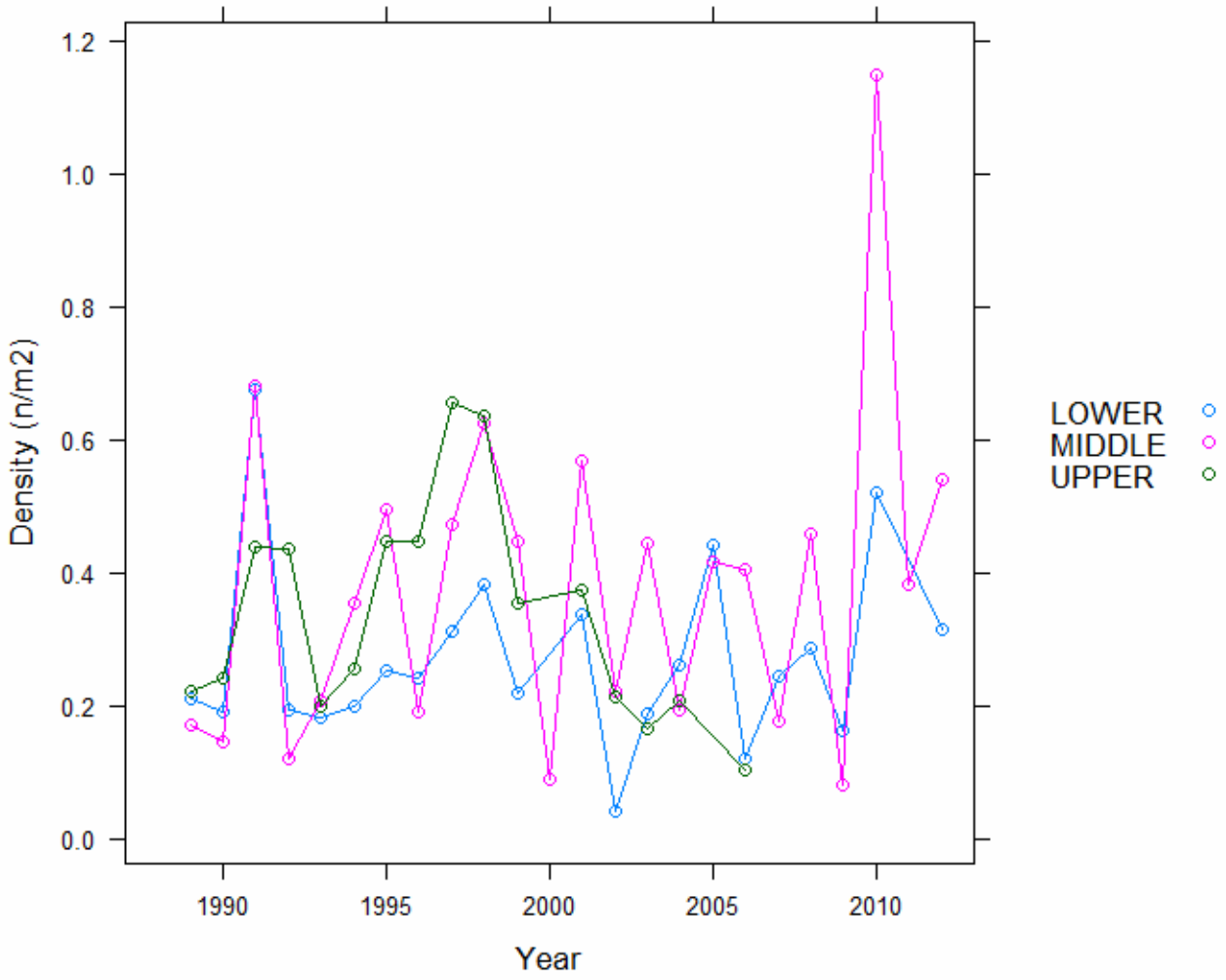


6.5.2.2. Summary statistics, Loch Chon

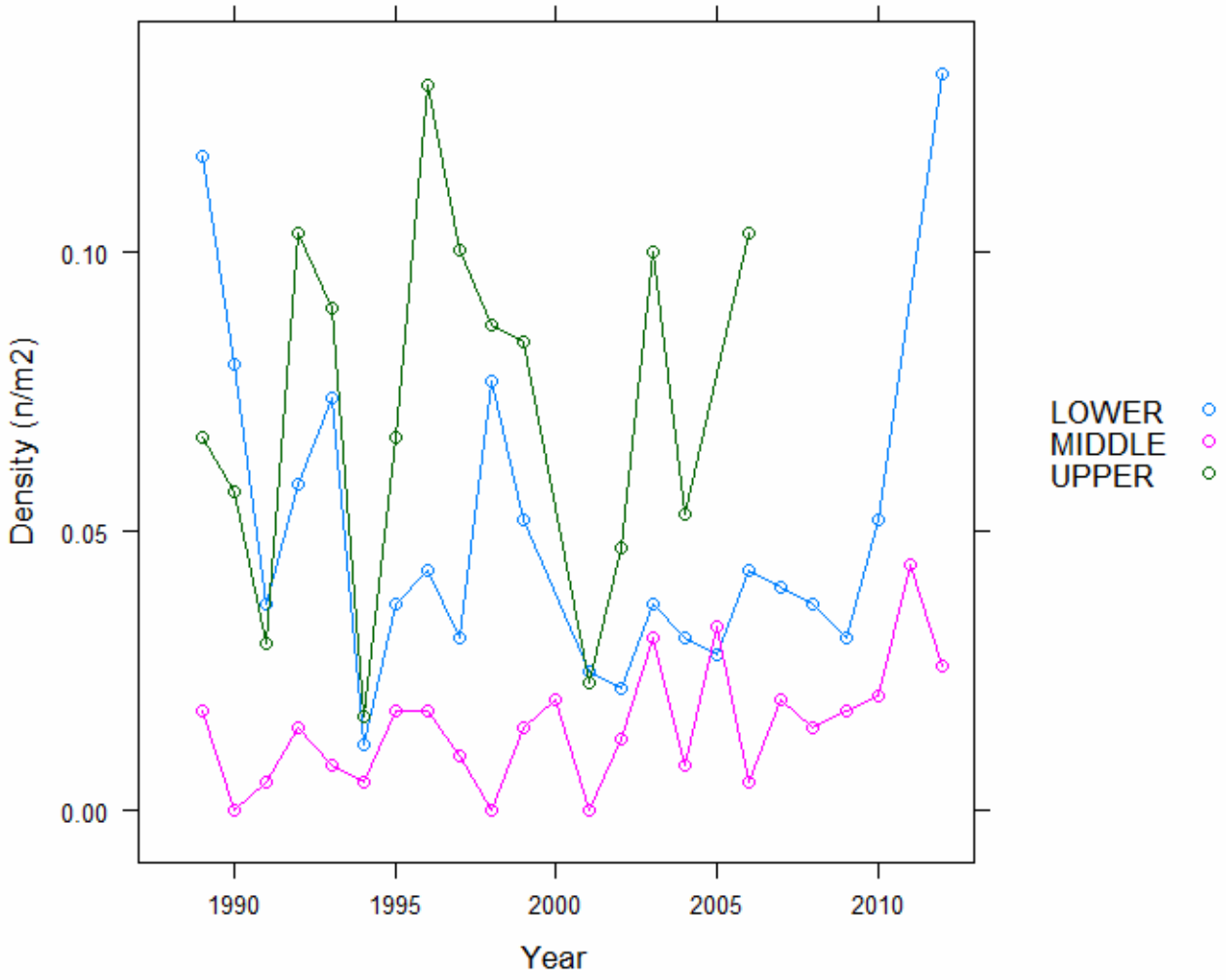


6.5.3. Fish data (for outflow stream)

6.5.3.1. Summary of Trout fry densities (numbers m^{-2}), Loch Chon

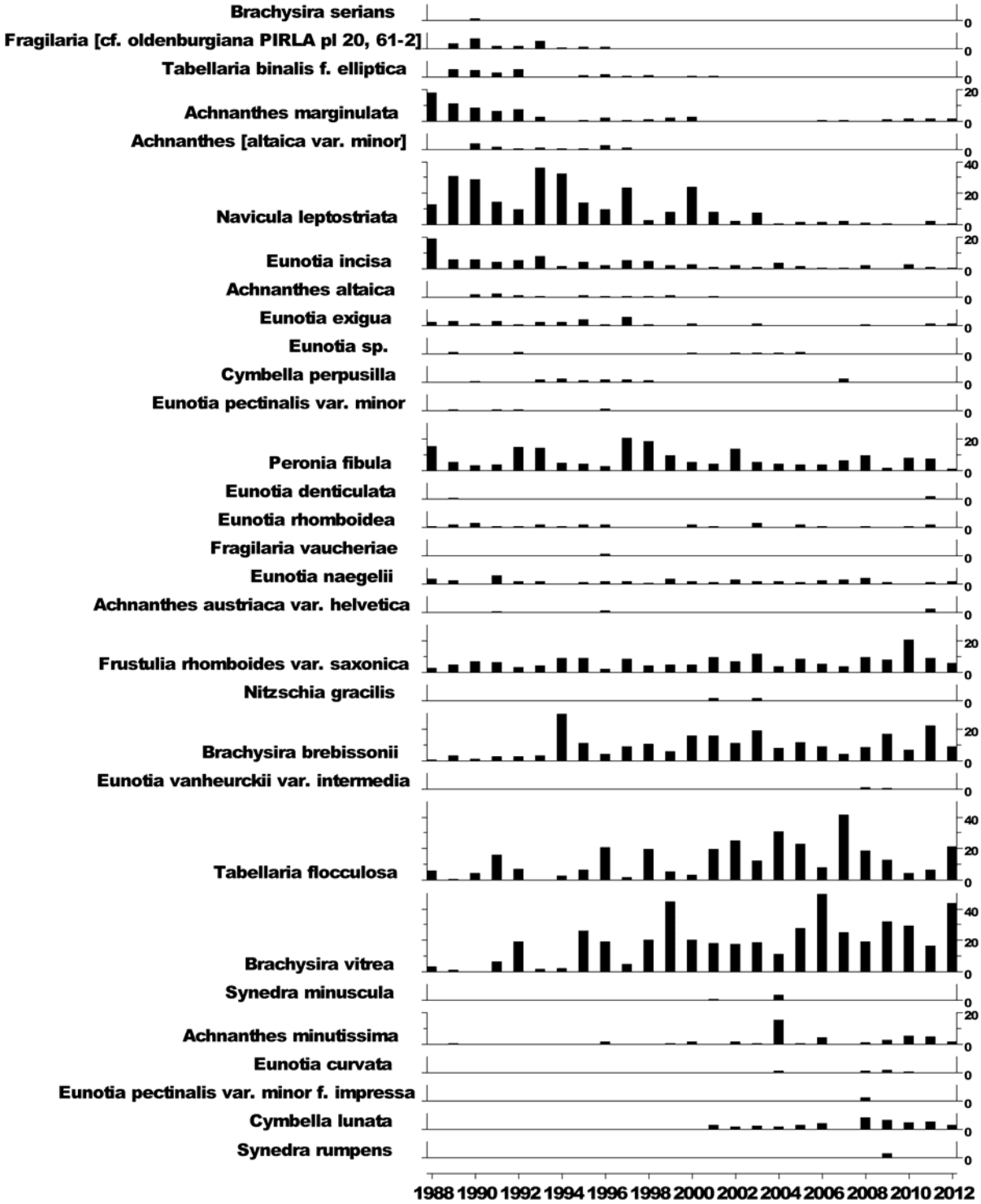


6.5.3.2. Summary of Trout parr densities (numbers m^{-2}), Loch Chon

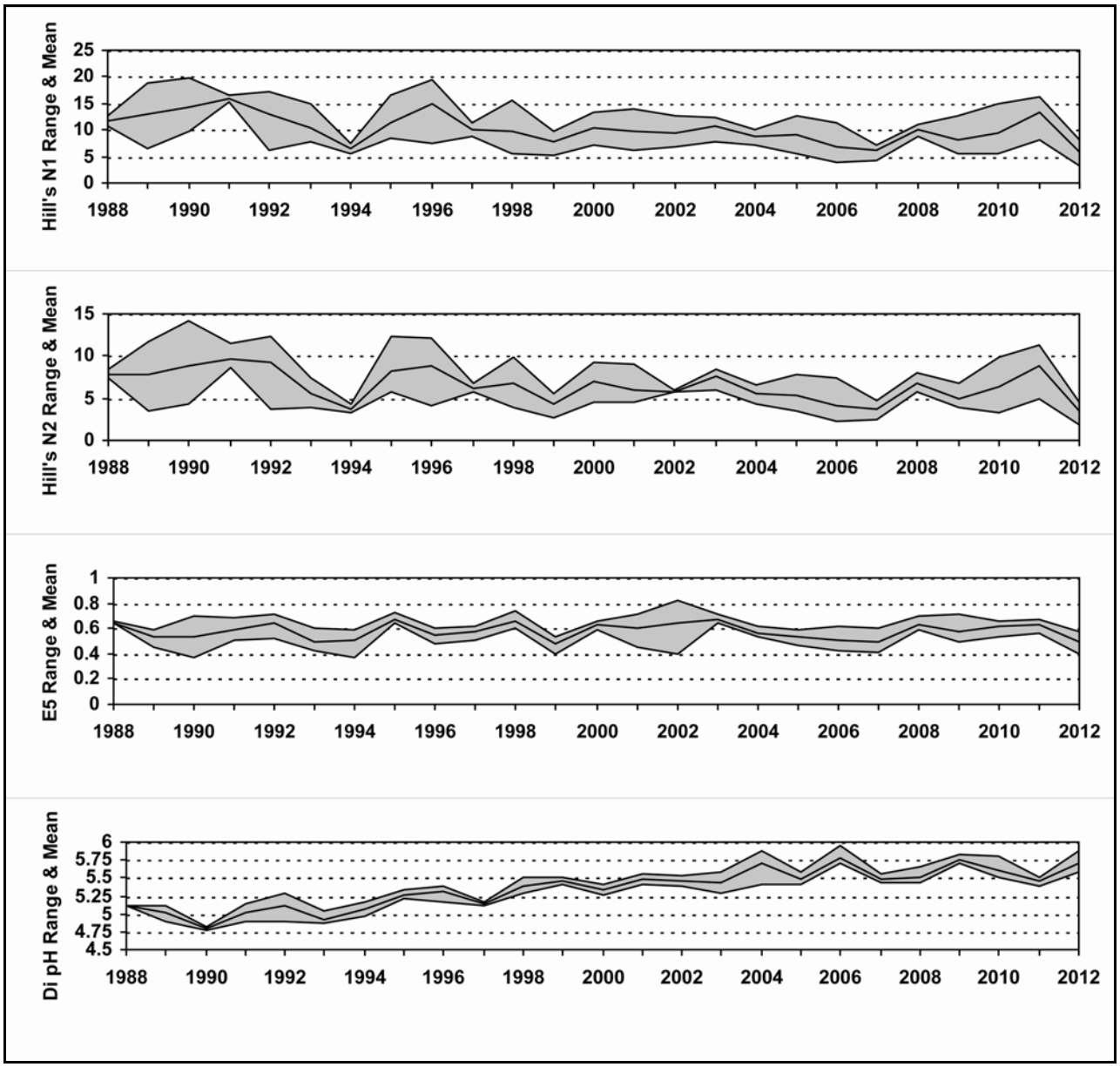


6.5.4. Epilithic diatom data

6.5.4.1. Percentage abundance summary, Loch Chon

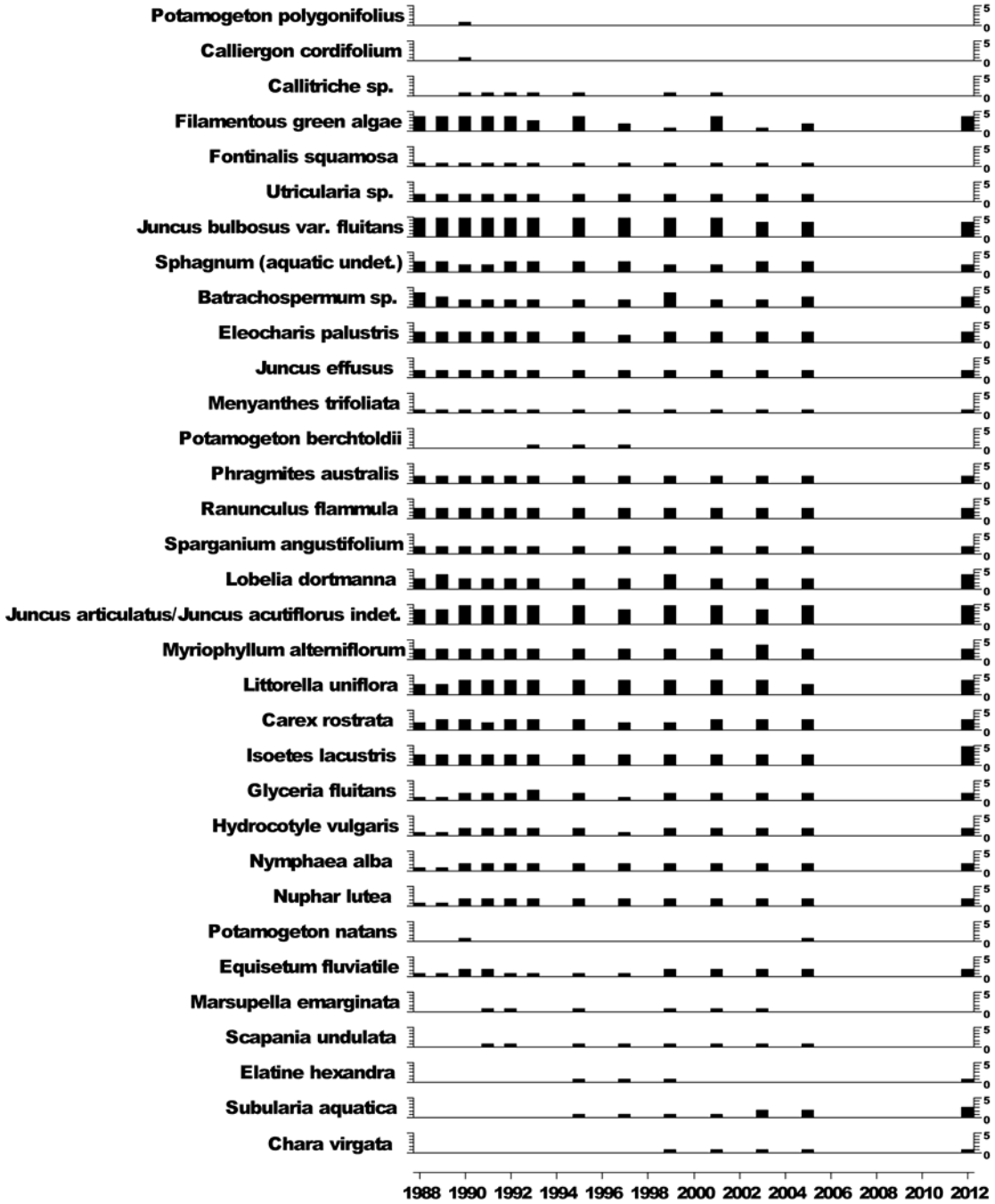


6.5.4.2. Summary statistics, Loch Chon



6.5.5. Aquatic macrophyte data, Loch Chon

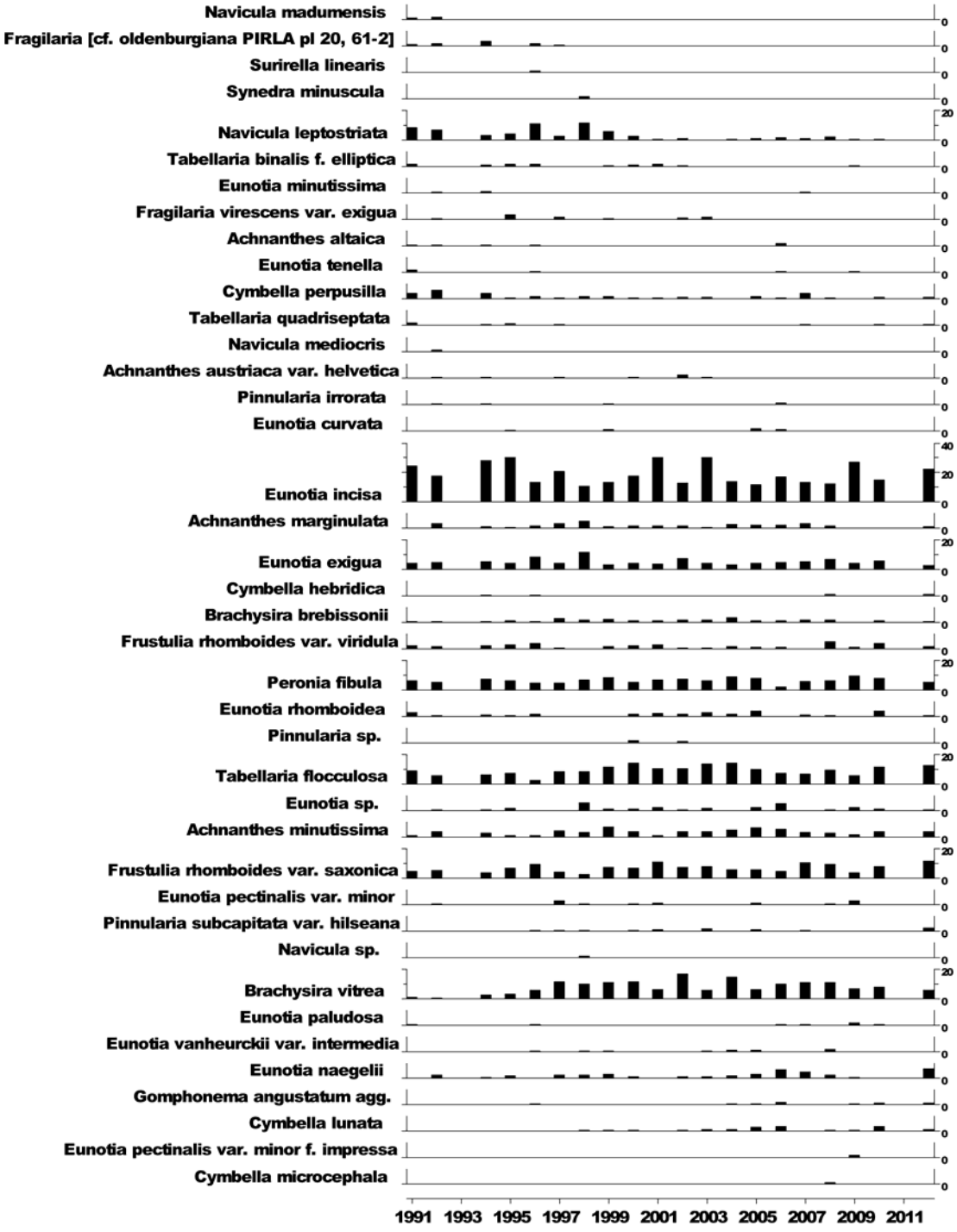
Species Scores (1-5)



No surveys between 2007 and 2012 due to funding cuts
2012 Bryophyte IDs pending

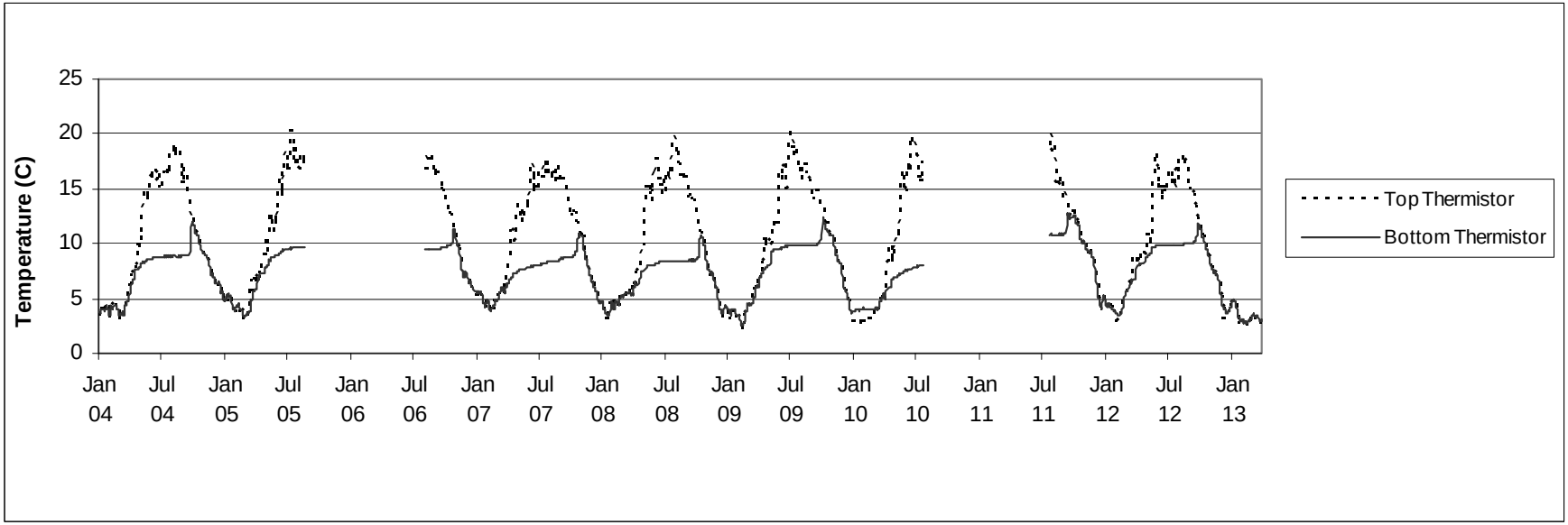
6.5.6. Sediment trap data, Loch Chon

Relative percentage frequency of diatom taxa



Traps not recovered in 1993 or 2011

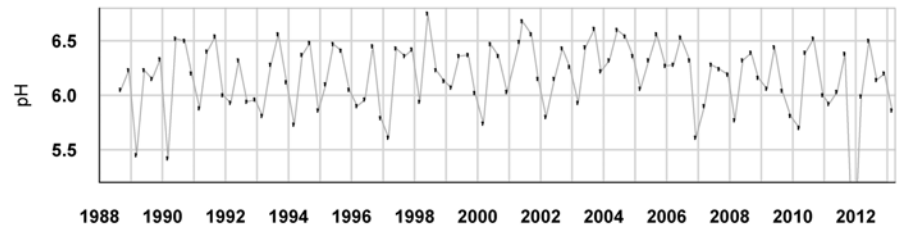
6.5.7. Thermistor data, Loch Chon

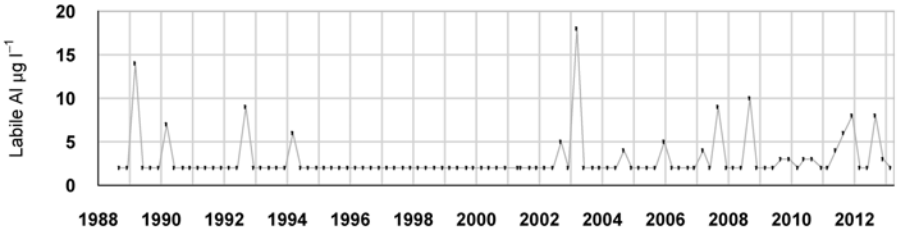


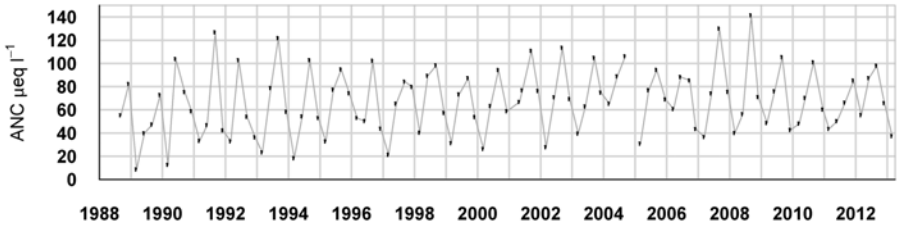
Thermistors not recovered in 2006 or 2011

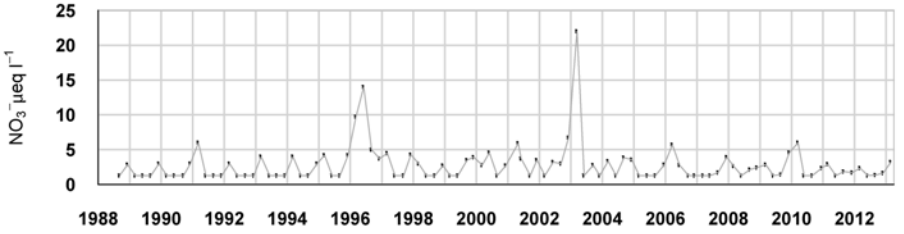
6.6. Loch Tinker

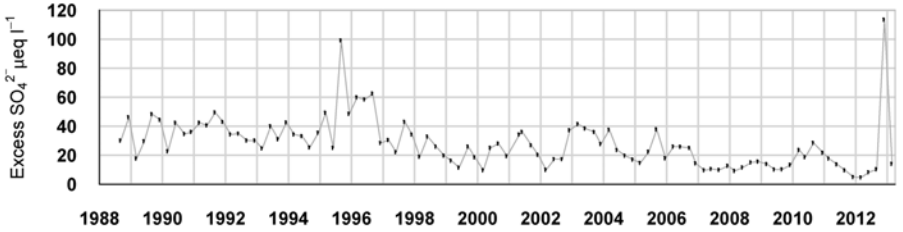
6.6.1. Spot sampled chemistry data

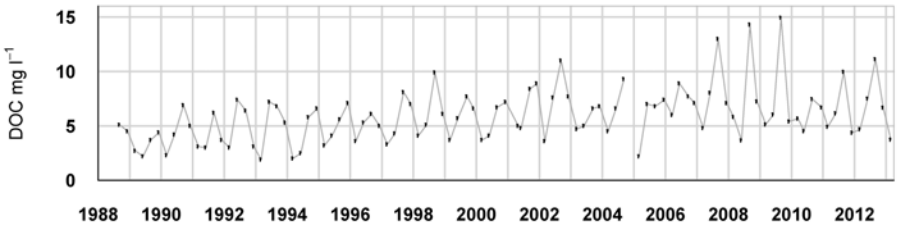


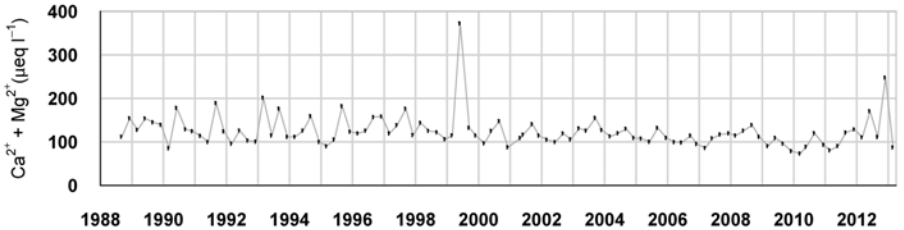


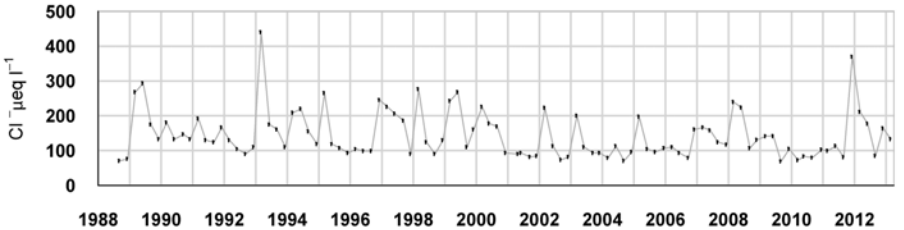








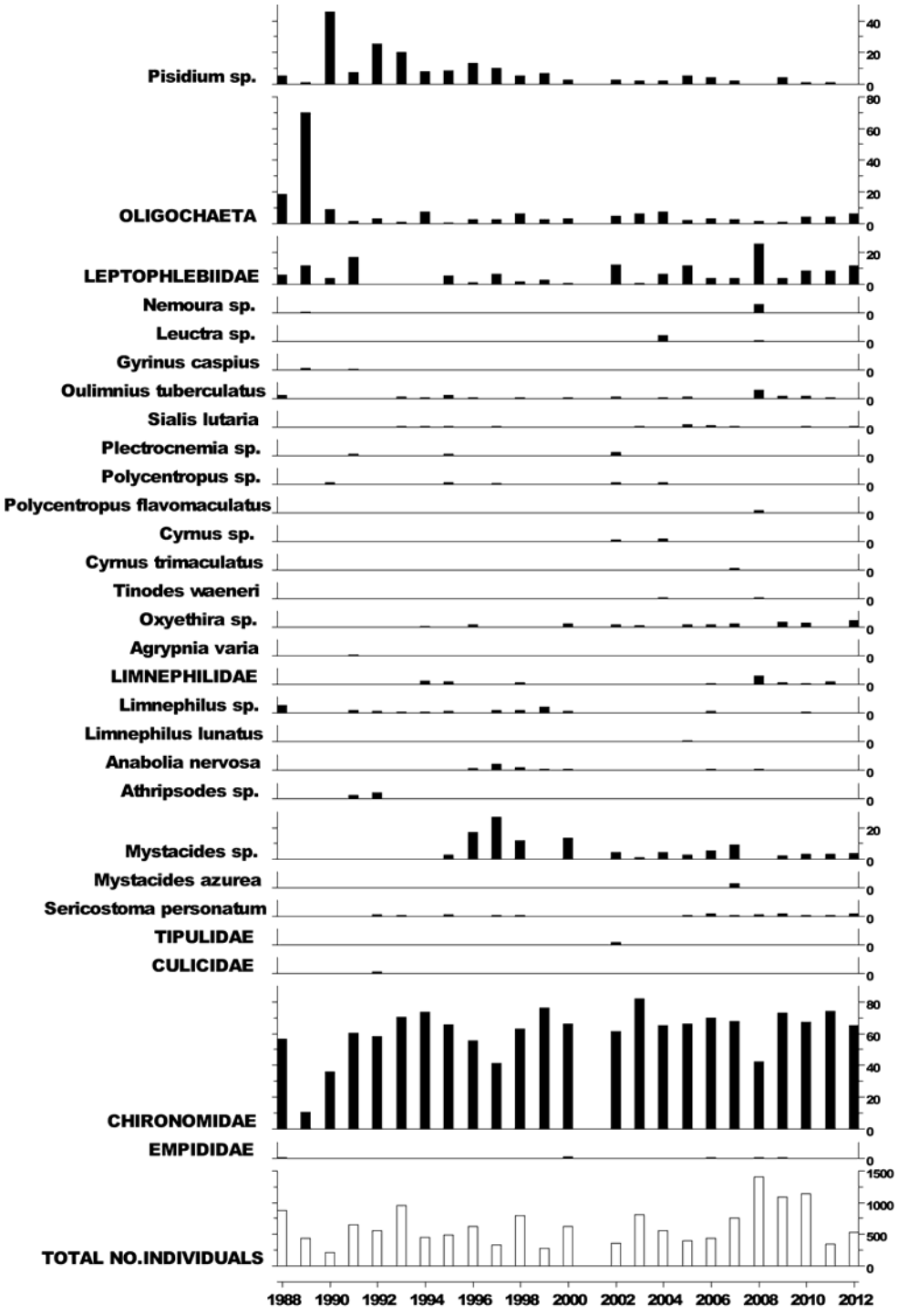




µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	6.11	56.67	84.93	45.90	141.38	7.57	18.90	3.20	163.48	53.22	36.08	1.99	4.30
12-13 mean	6.18	72.09	96.93	57.15	141.70	8.45	17.75	3.75	139.71	51.18	36.53	1.87	7.26
12-13 std dev	0.26	26.76	38.47	40.47	65.37	4.15	8.34	2.87	40.98	53.09	51.31	0.91	3.05

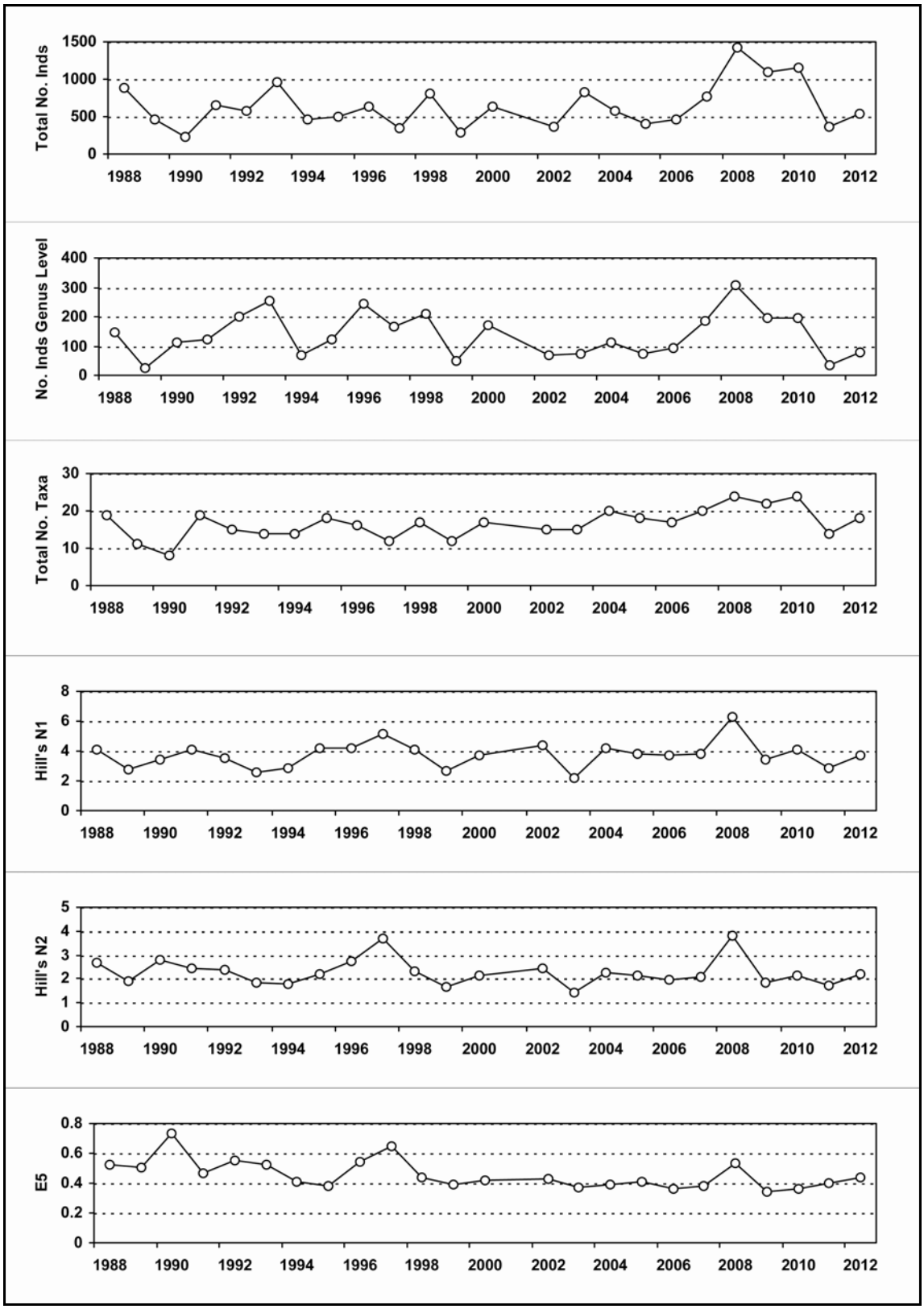
6.6.2. Macroinvertebrate data

6.6.2.1. Percentage abundance summary, Loch Tinker



No sampling in 2001 due to Foot and Mouth restrictions.

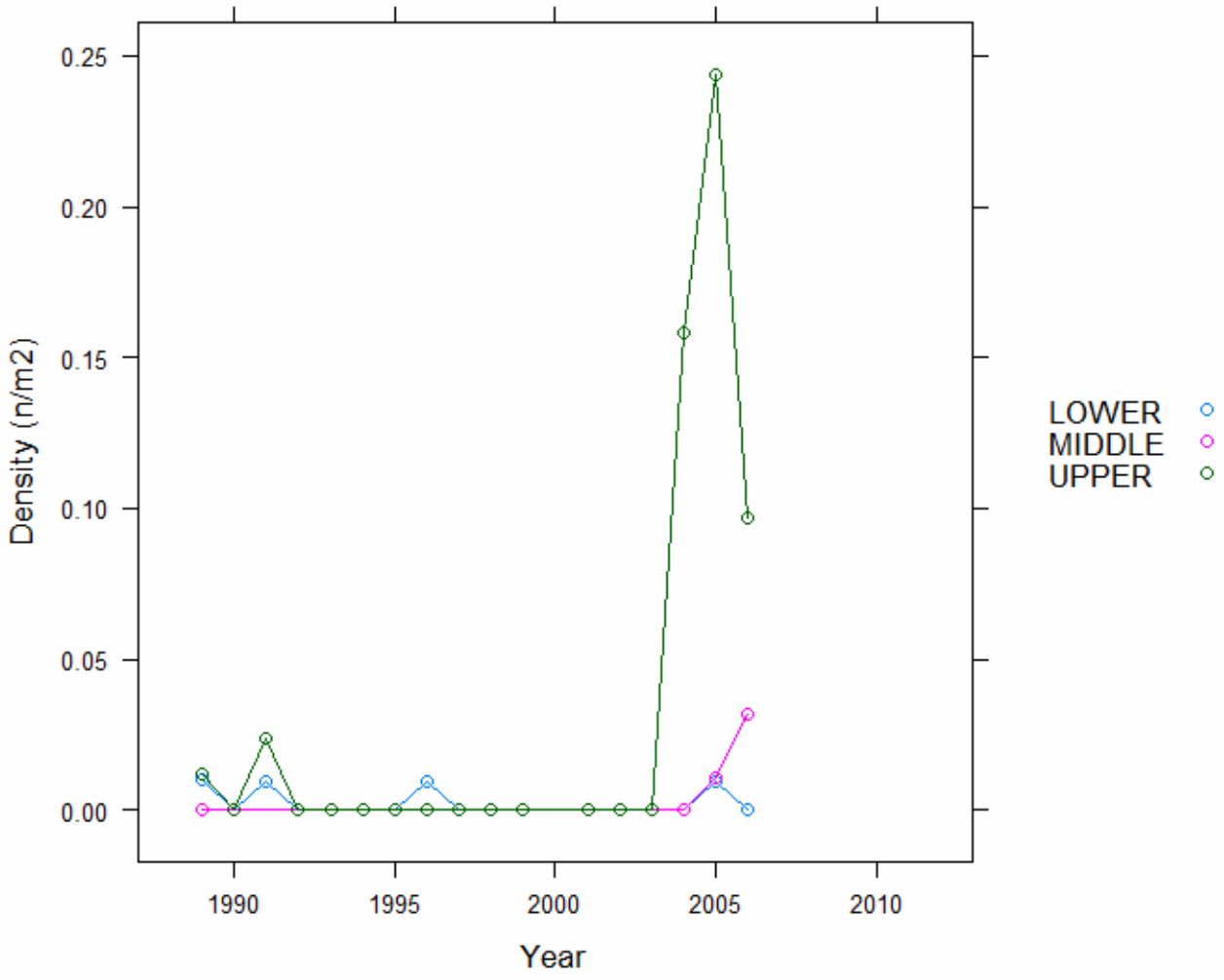
6.6.2.2. Summary statistics, Loch Tinker



No sampling in 2001 due to Foot and Mouth restrictions.

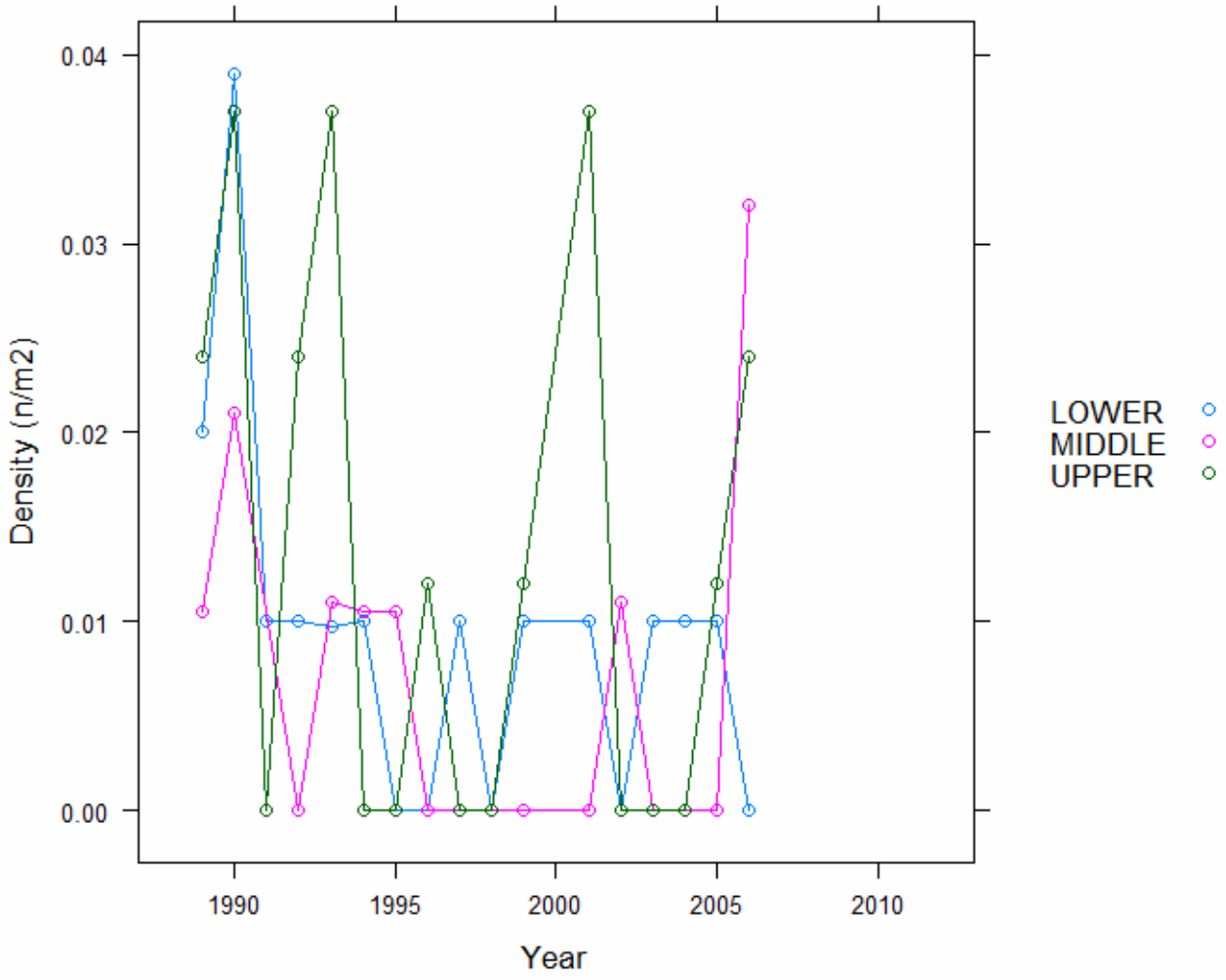
6.6.3. Fish data (for outflow stream)

6.6.3.1. Summary of Trout fry densities (numbers m^{-2}), Loch Tinker



No analysis after 2006 due to funding cuts.

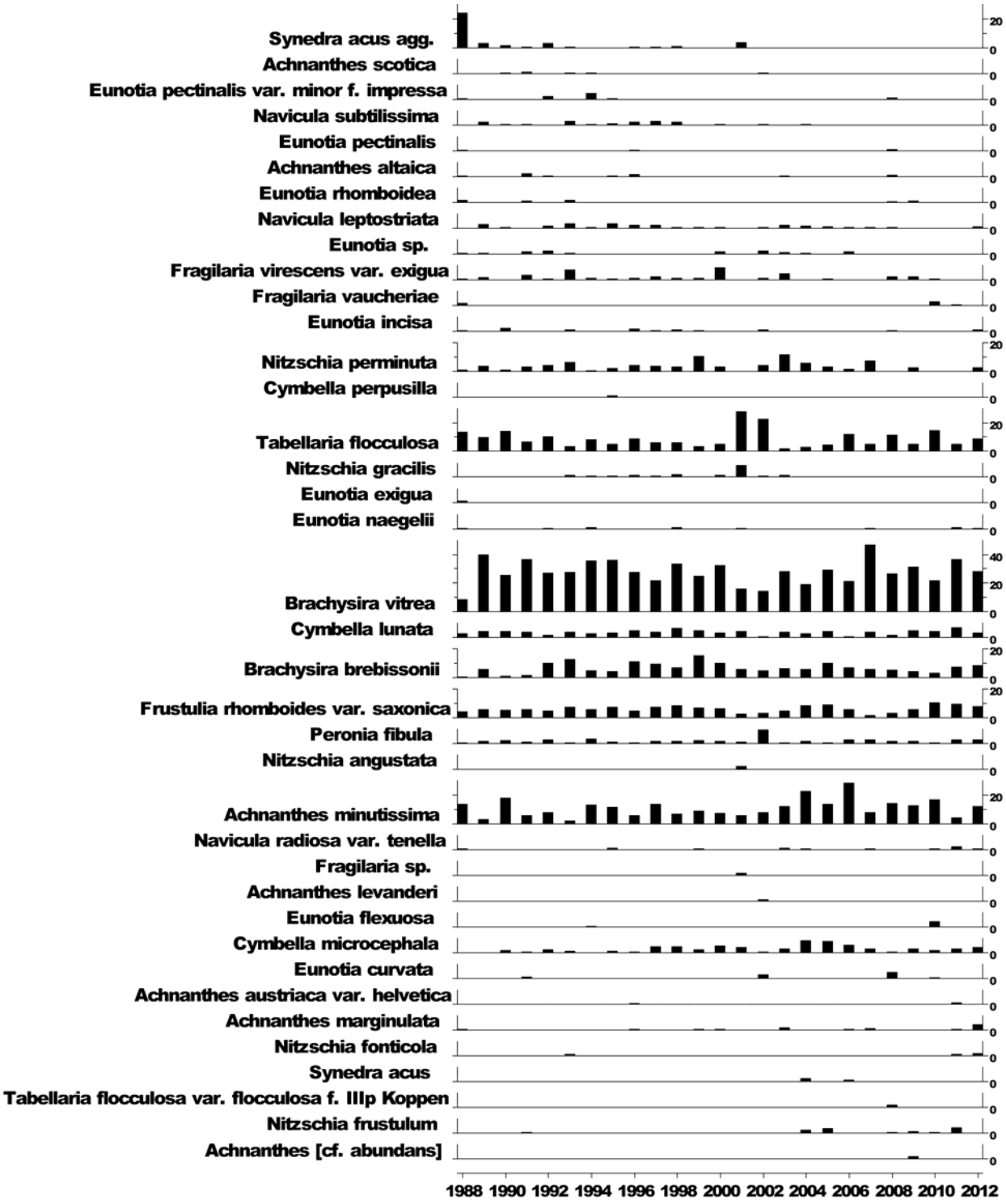
6.6.3.2. Summary of Trout parr densities (numbers m^{-2}), Loch Tinker



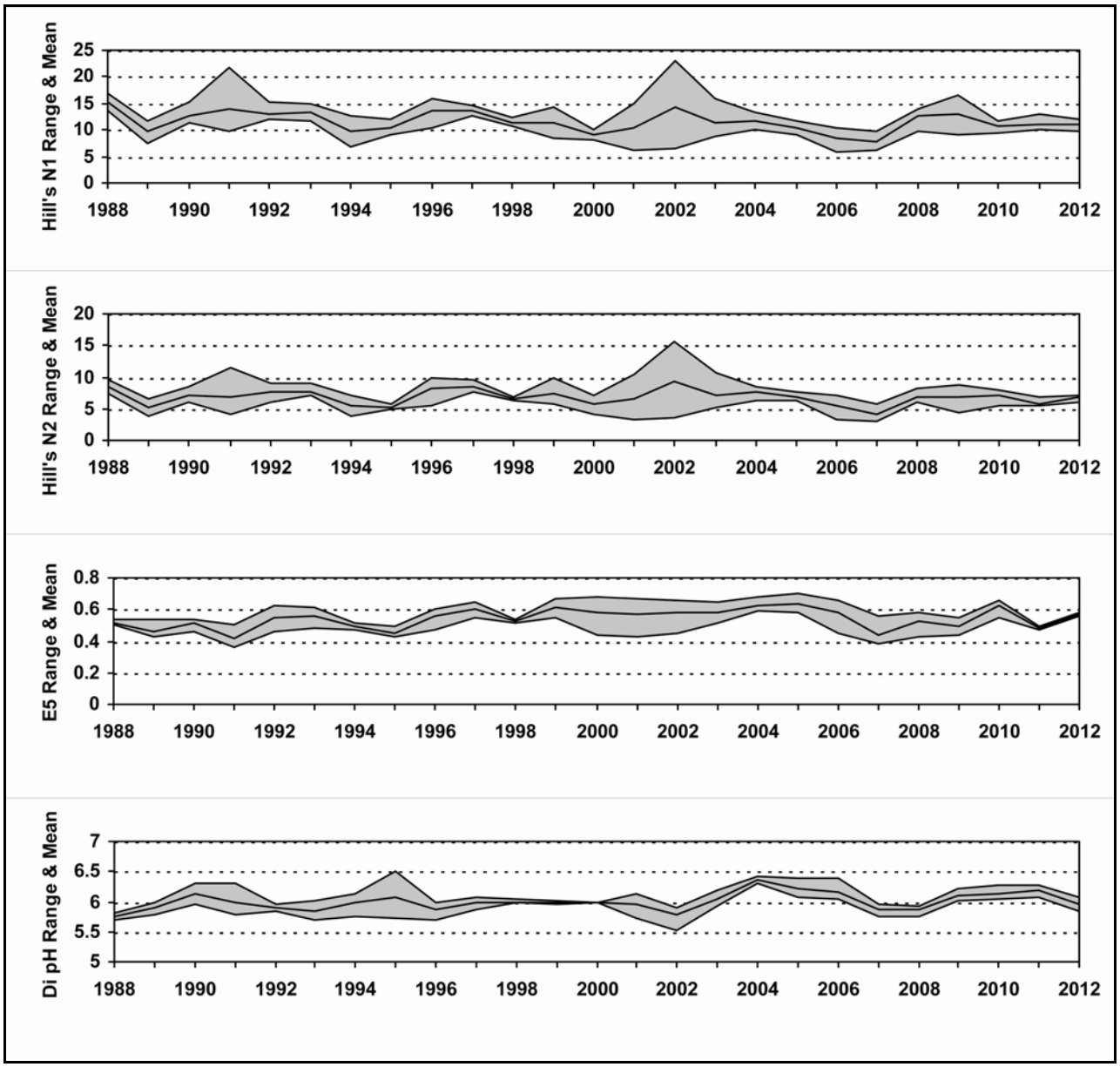
No analysis after 2006 due to funding cuts.

6.6.4. Epilithic diatom data

6.6.4.1. Percentage abundance summary, Loch Tinker

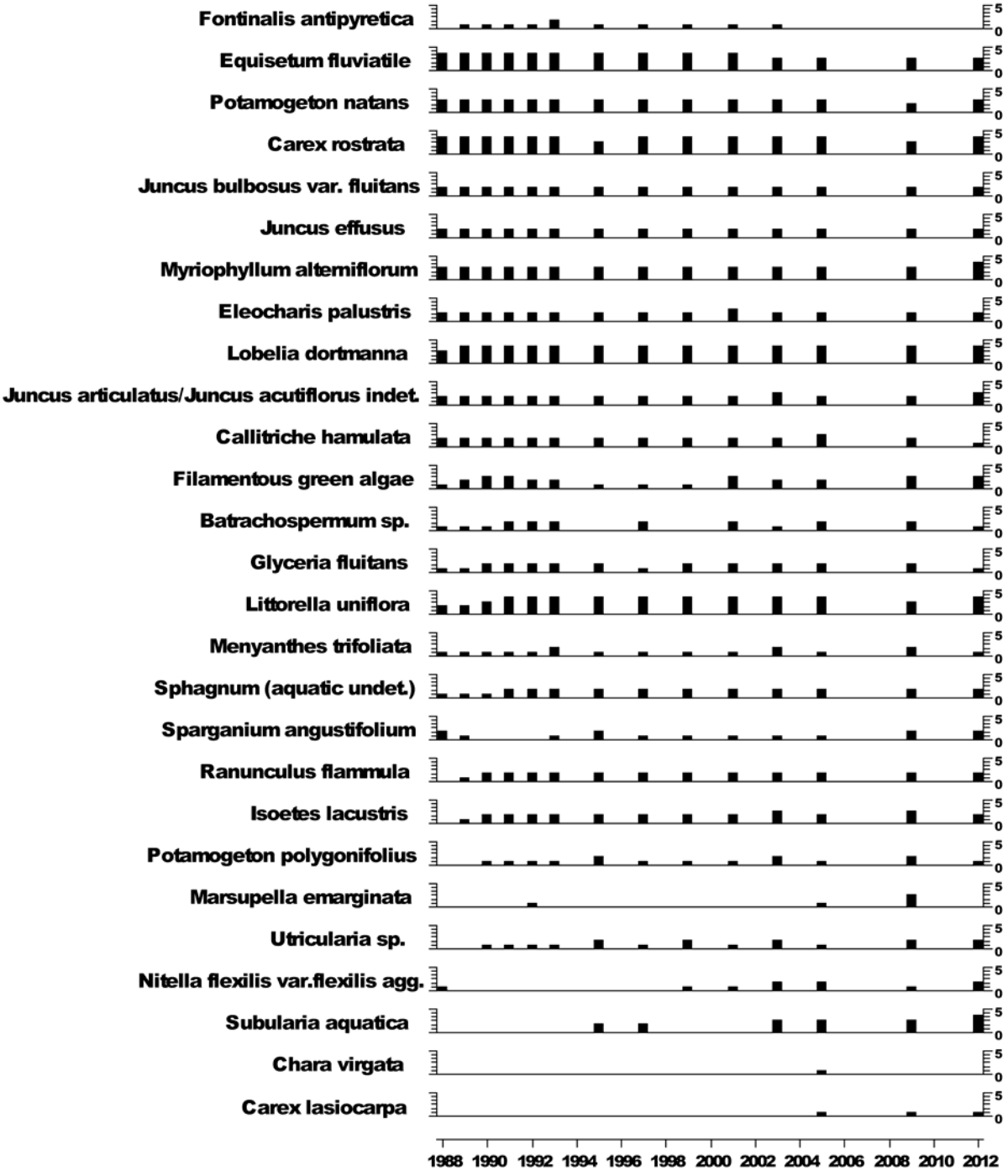


6.6.4.2. Summary statistics, Loch Tinker



6.6.5. Aquatic macrophyte data, Loch Tinker

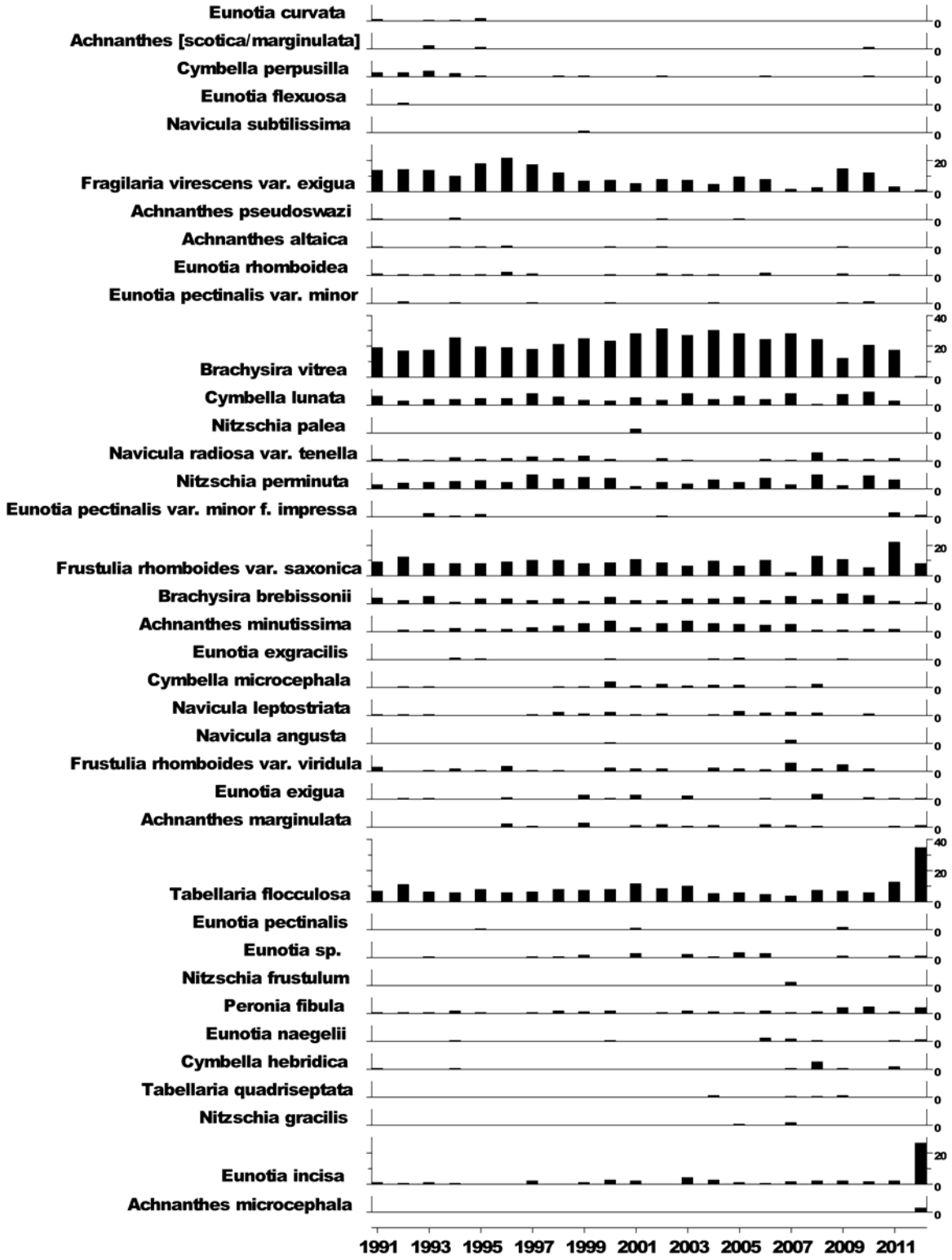
Species Scores (1-5)



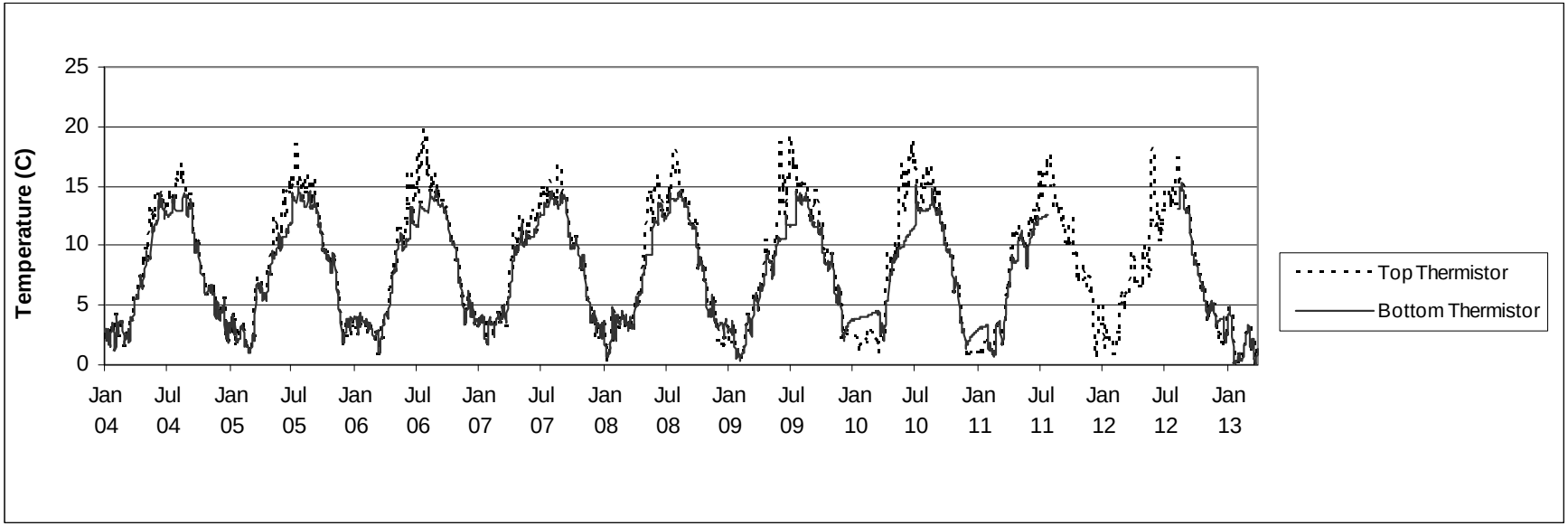
No survey in 2007 due to funding cuts
2012 Bryophyte IDs pending

6.6.6. Sediment trap data, Loch Tinker

Relative percentage frequency of diatom taxa

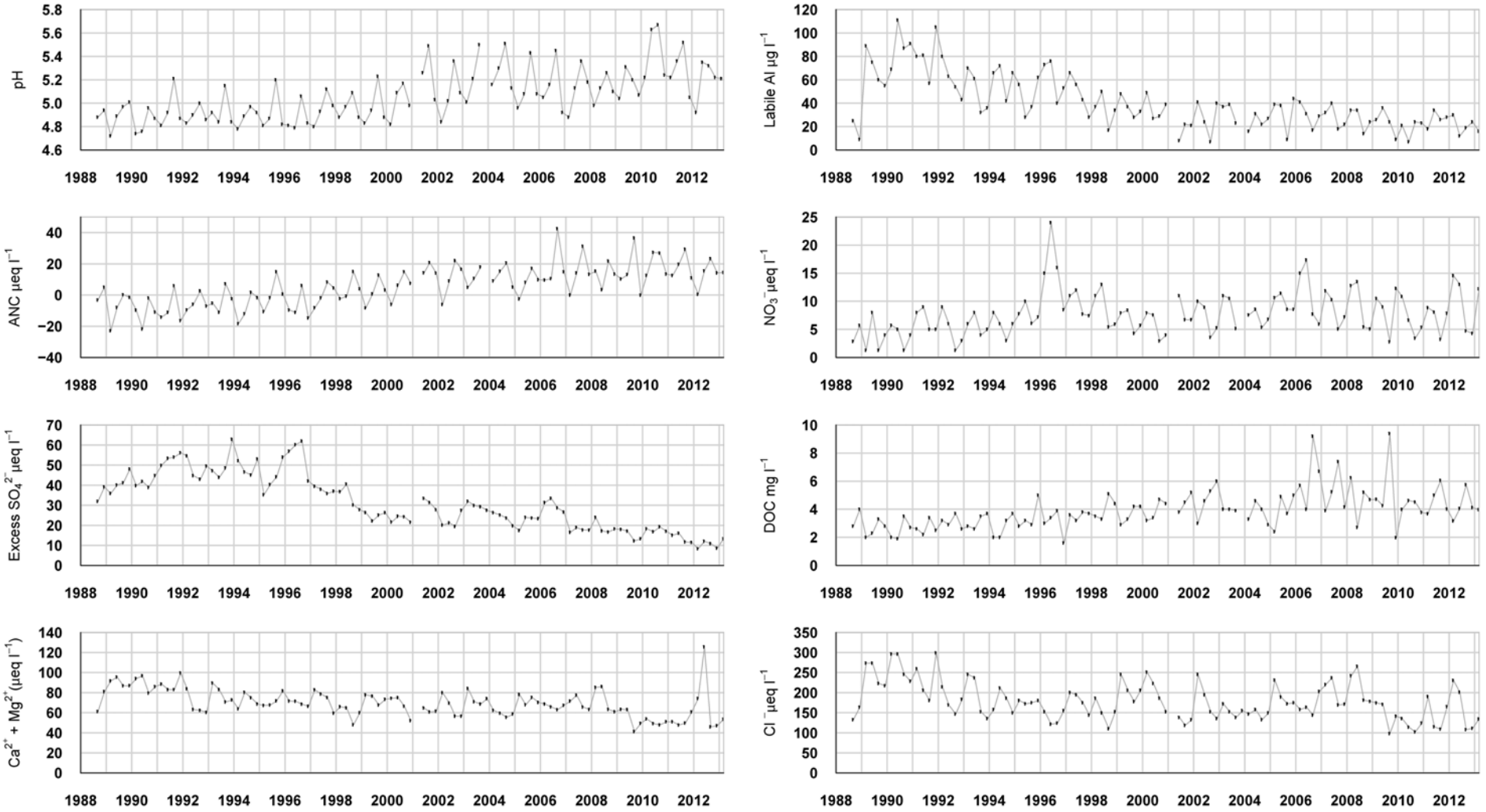


6.6.7. Thermistor data, Loch Tinker



6.7. Round Loch of Glenhead

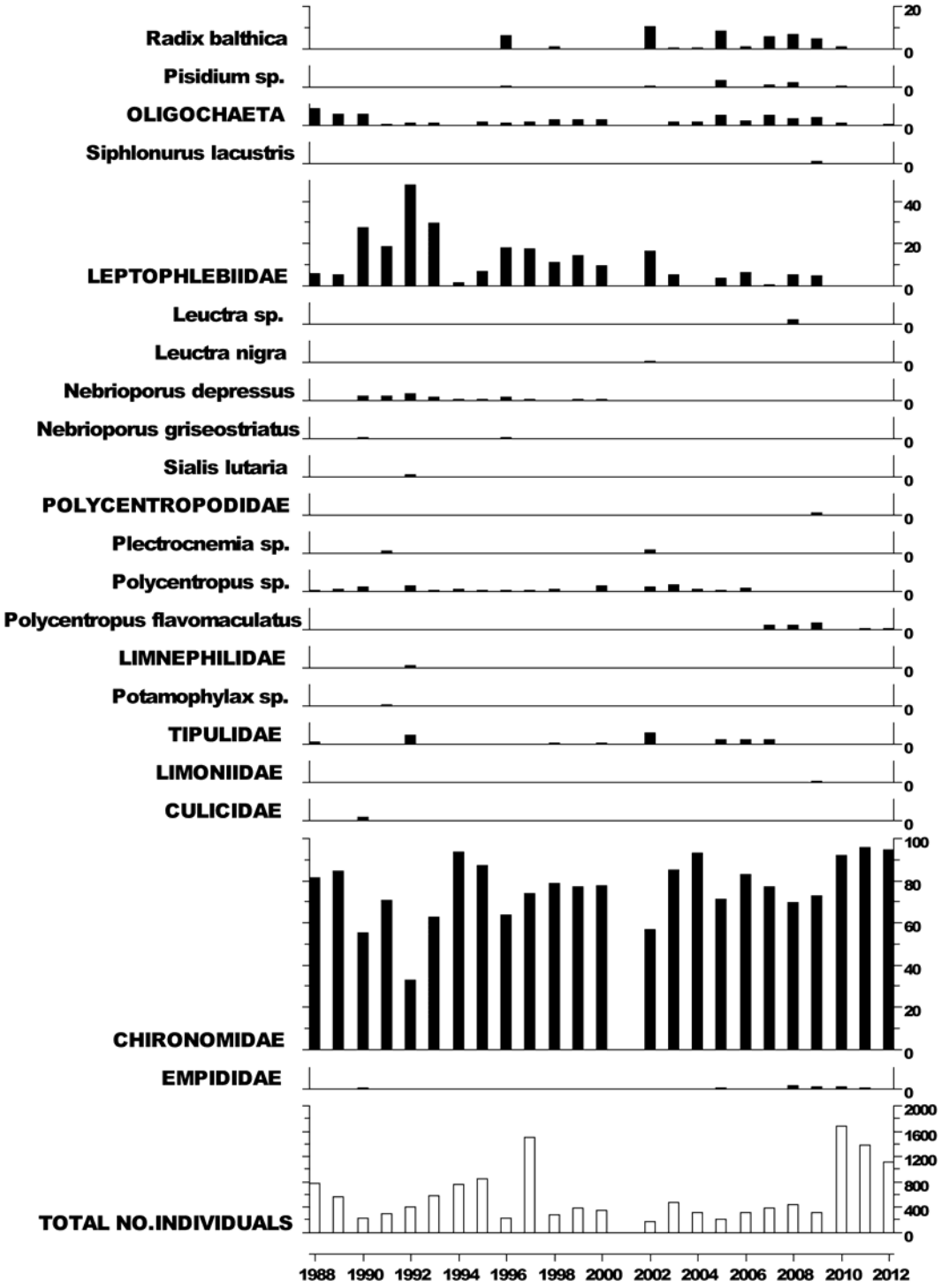
6.7.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO$_4$ $^{2-}$	xSO$_4$ $^{2-}$	NO$_3$ $^{-}$	**DOC
Mean 1st 5 yrs	4.90	-7.33	35.20	47.59	192.27	8.66	98.25	68.25	224.55	68.43	44.88	4.97	2.79
12-13 mean	5.28	16.85	35.75	32.27	123.76	5.32	67.00	17.75	138.58	25.73	11.21	8.55	4.47
12-13 std dev	0.07	4.33	29.74	9.07	39.69	1.82	13.74	5.06	43.34	5.77	1.99	4.69	0.85

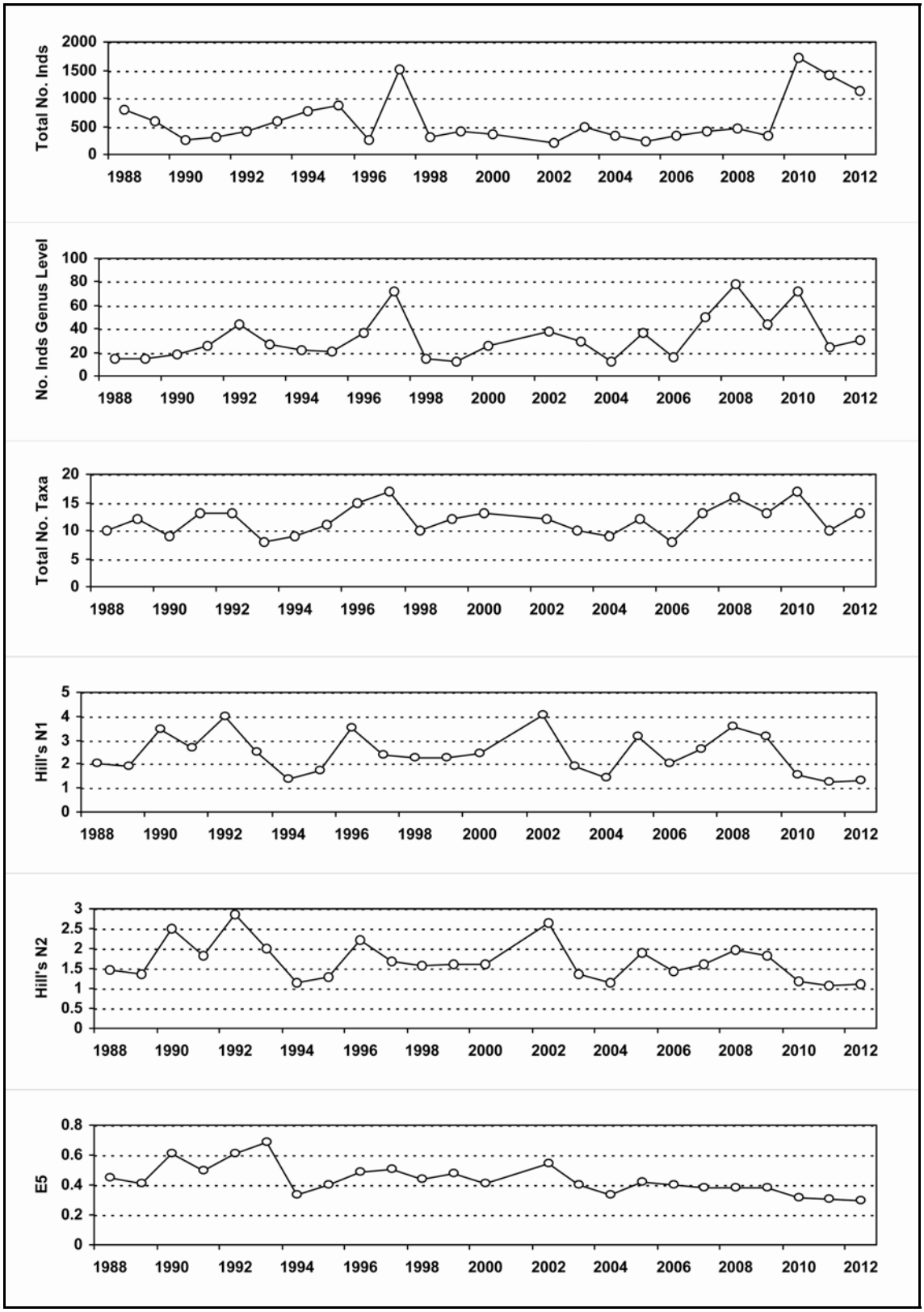
6.7.2. Macroinvertebrate data

6.7.2.1. Percentage abundance summary, Round Loch of Glenhead



No sampling in 2001 due to Foot and Mouth restrictions.

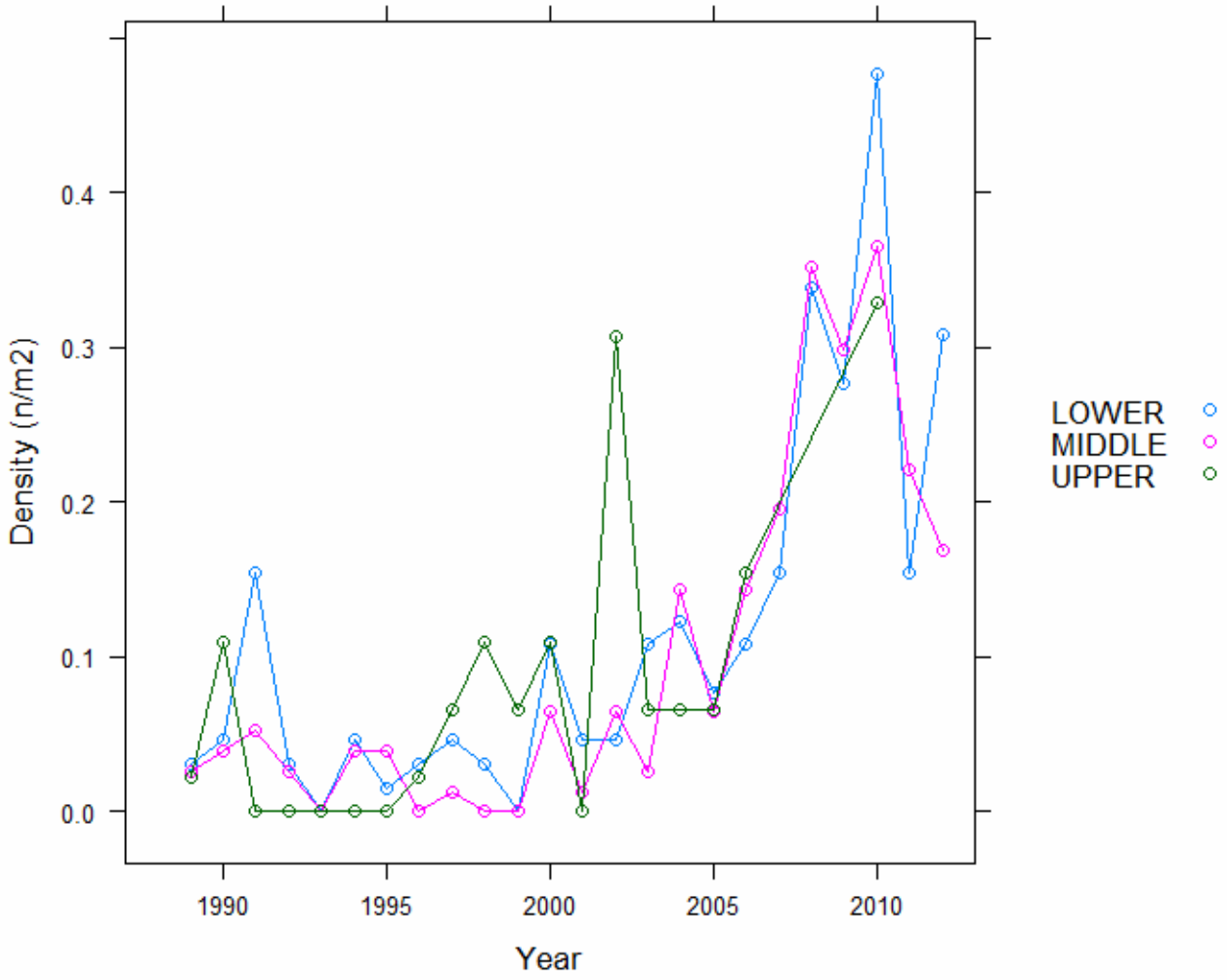
6.7.2.2. Summary statistics, Round Loch of Glenhead



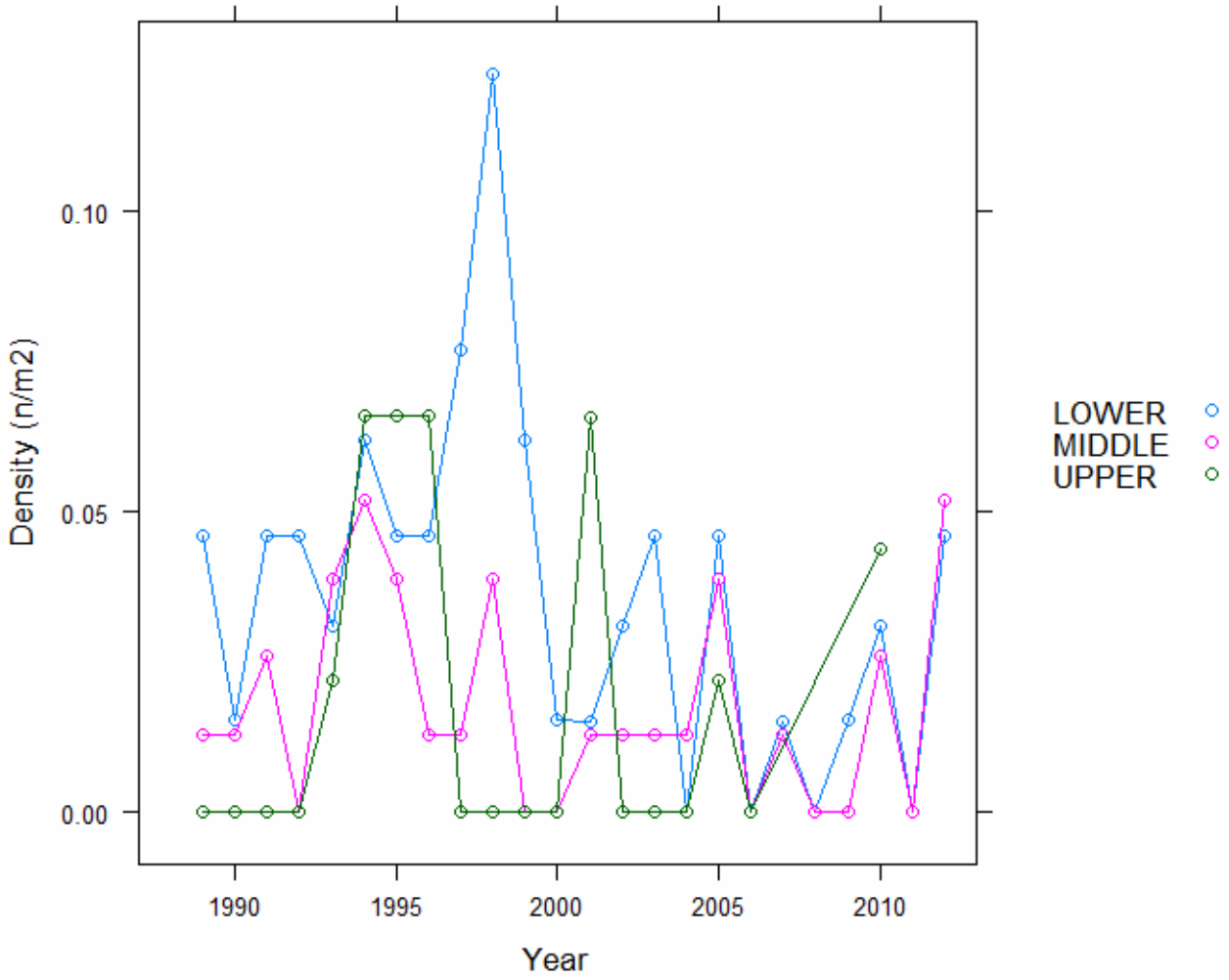
No sampling in 2001 due to Foot and Mouth restrictions.

6.7.3. Fish data (for outflow stream)

6.7.3.1. Summary of Trout fry densities (numbers m^{-2}), Round Loch of Glenhead

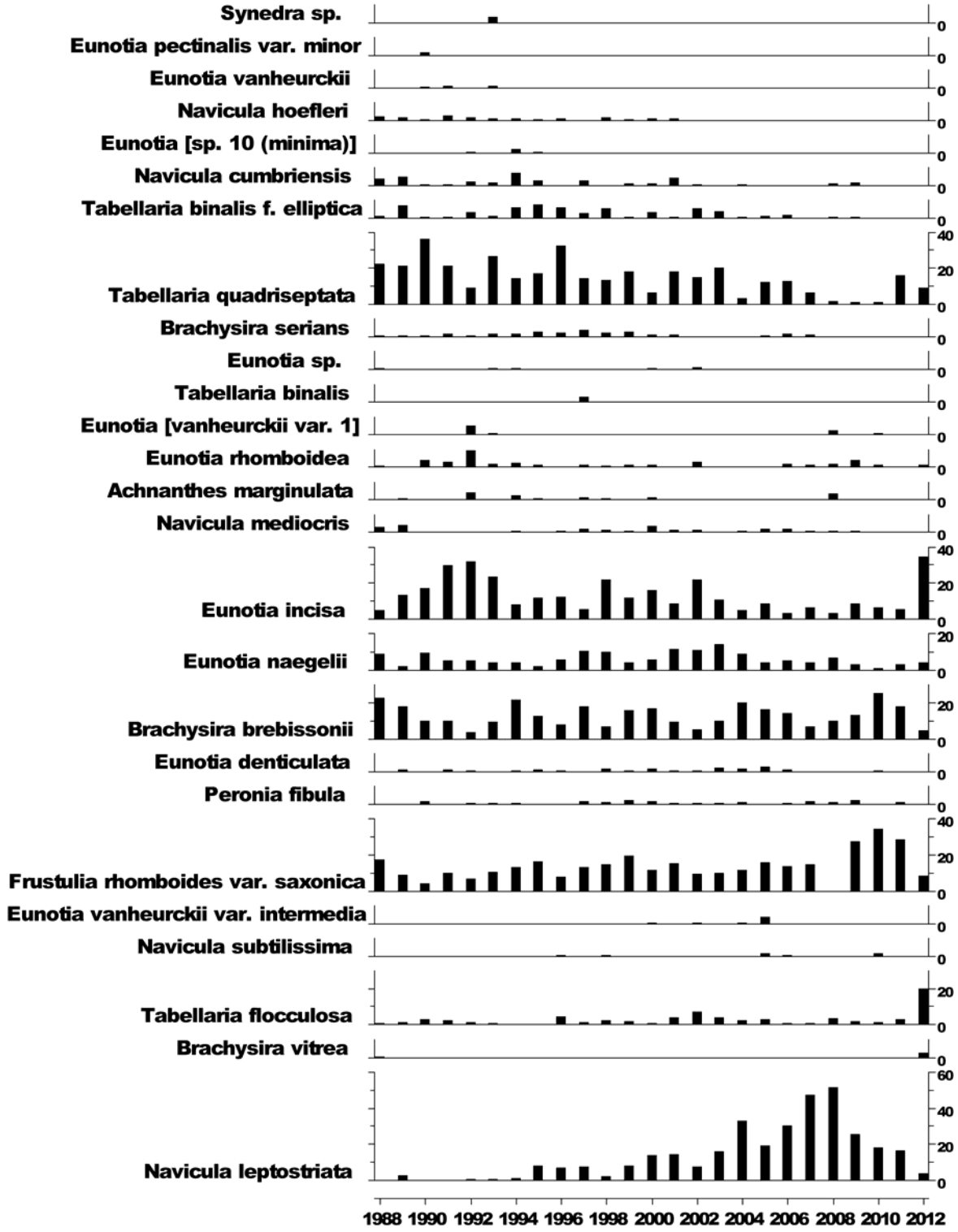


6.7.3.2. Summary of Trout parr densities (numbers m^{-2}), Round Loch of Glenhead

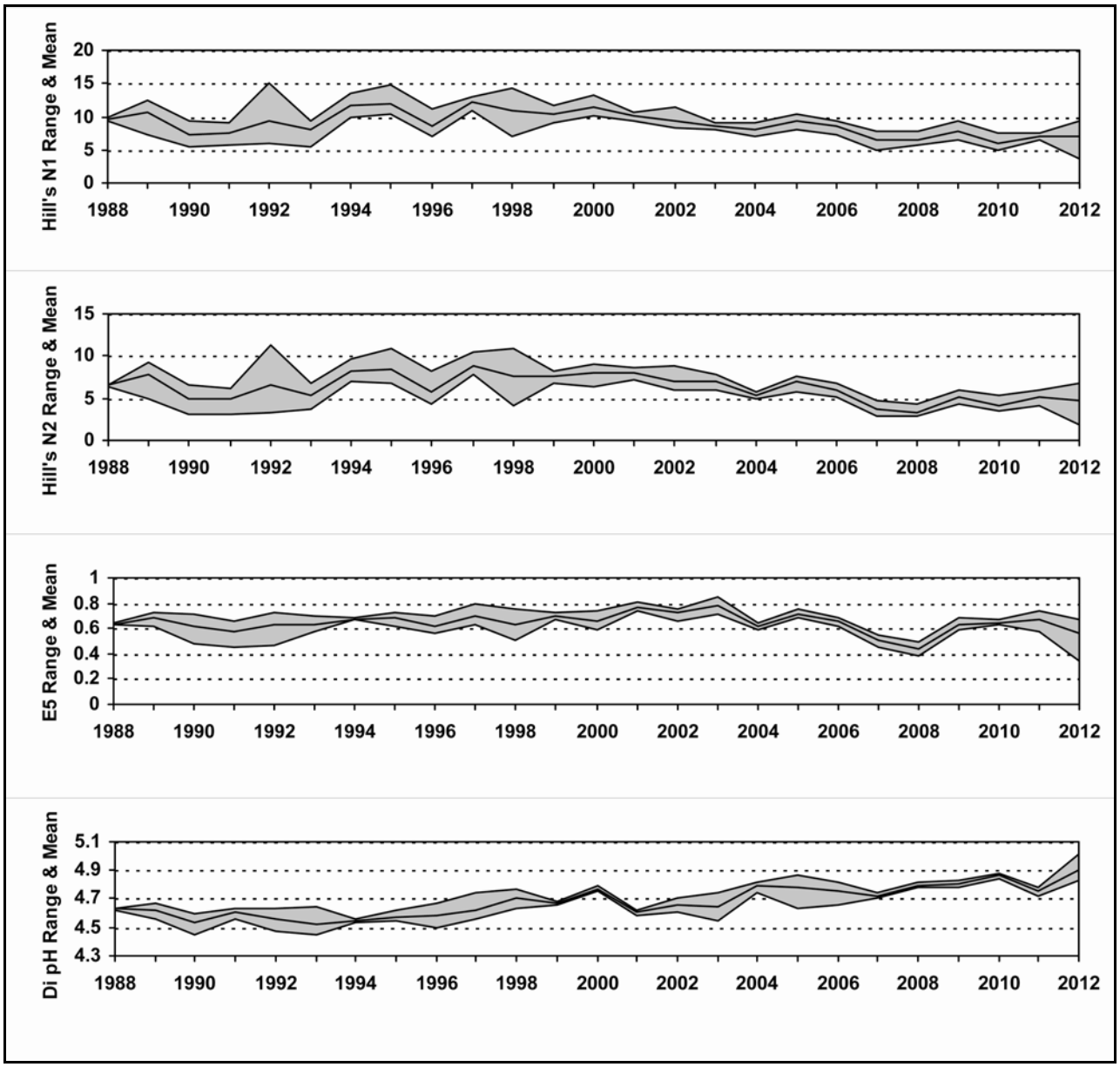


6.7.4. Epilithic diatom data

6.7.4.1. Percentage abundance summary, Round Loch of Glenhead

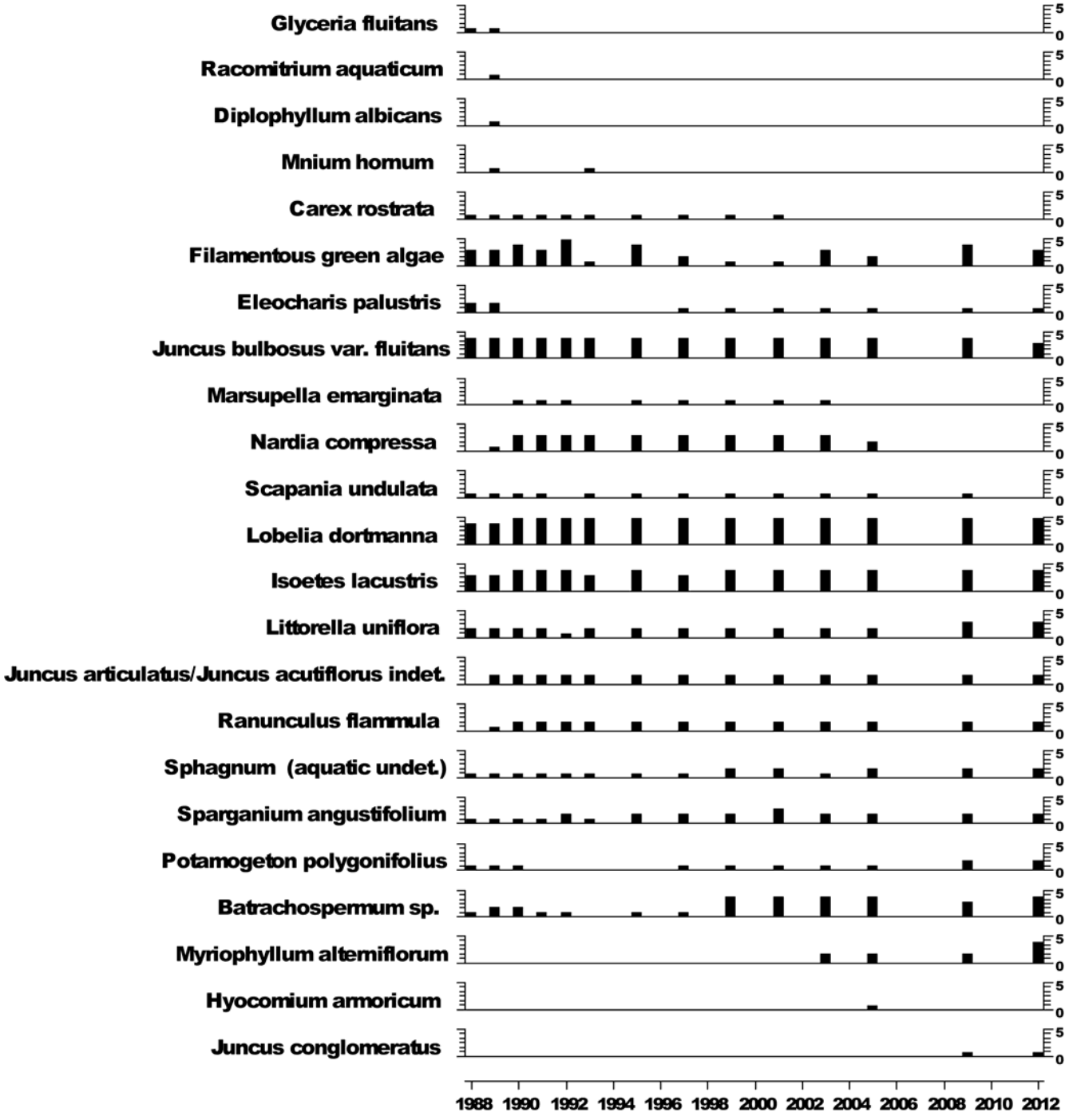


6.7.4.2. Summary statistics, Round Loch of Glenhead



6.7.5. Aquatic macrophyte data, Round Loch of Glenhead

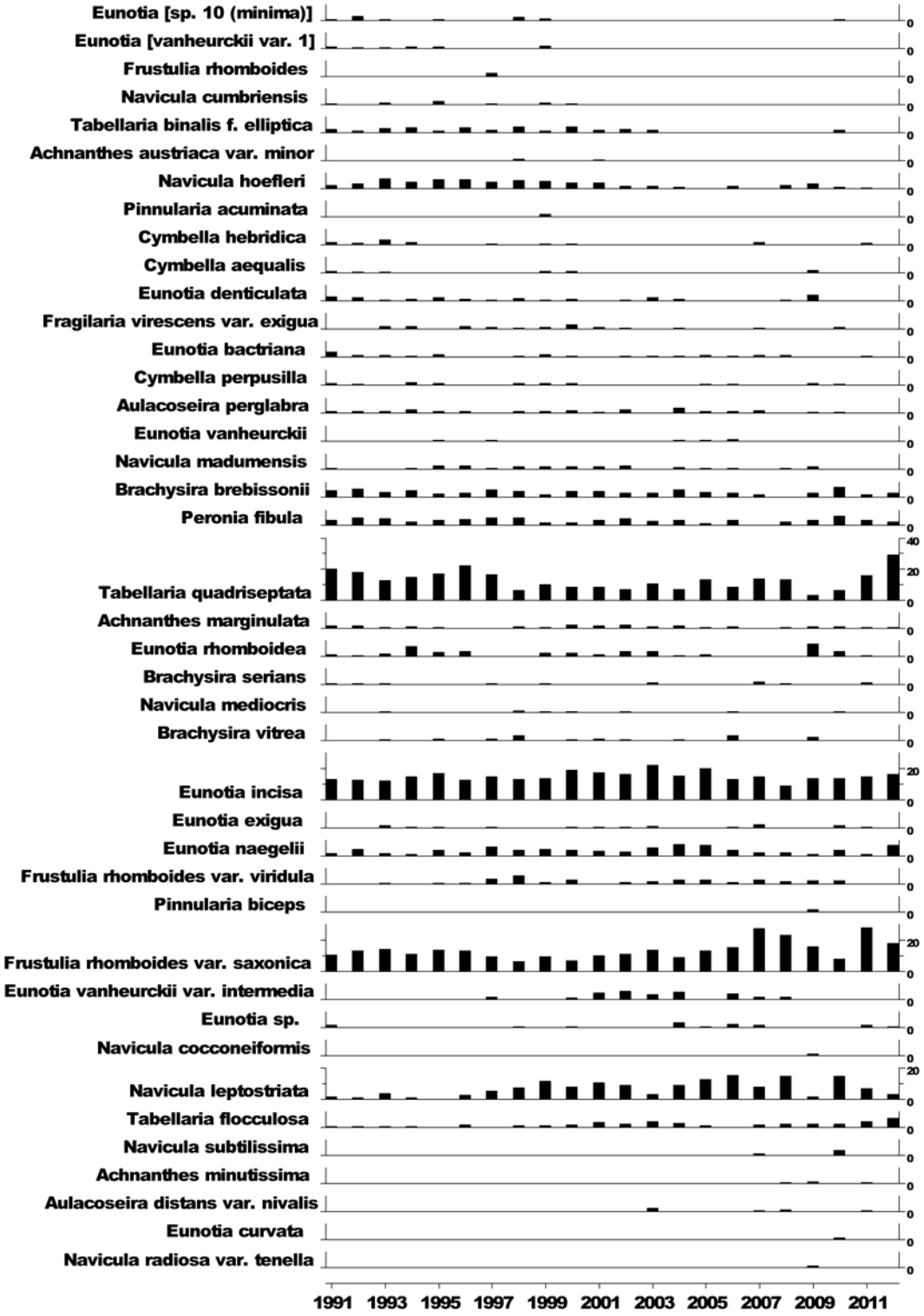
Species Scores (1-5)



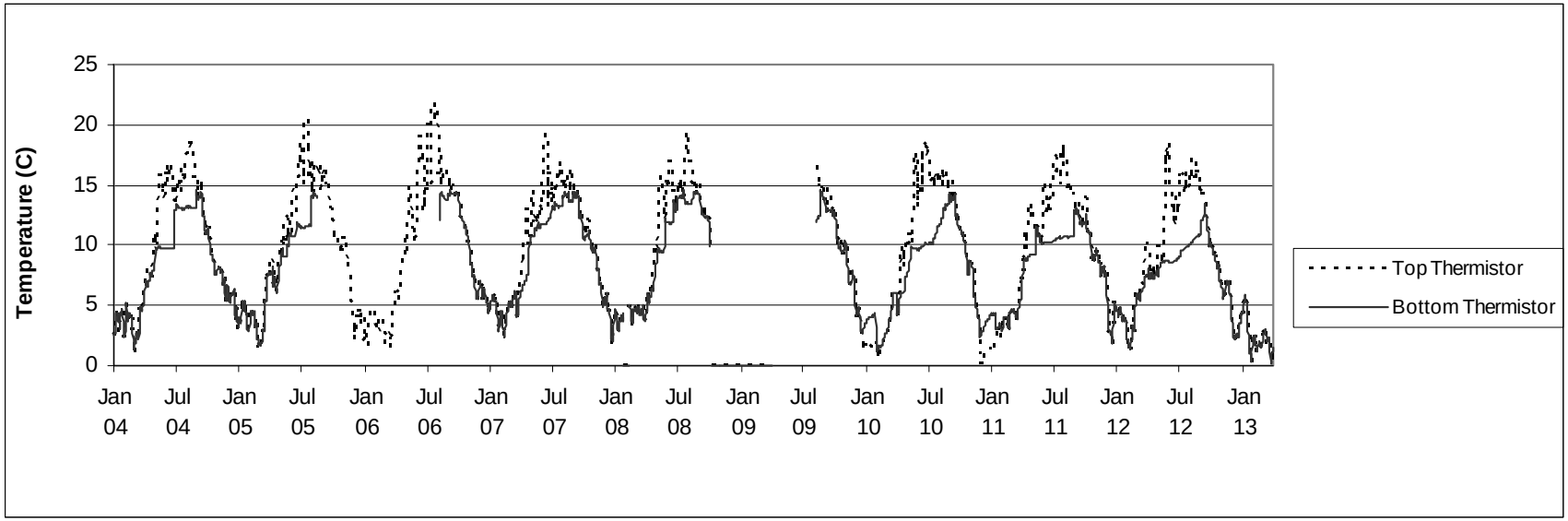
No survey in 2007 due to funding cuts
2012 Bryophyte IDs pending

6.7.6. Sediment trap data, Round Loch of Glenhead

Relative percentage frequency of diatom taxa

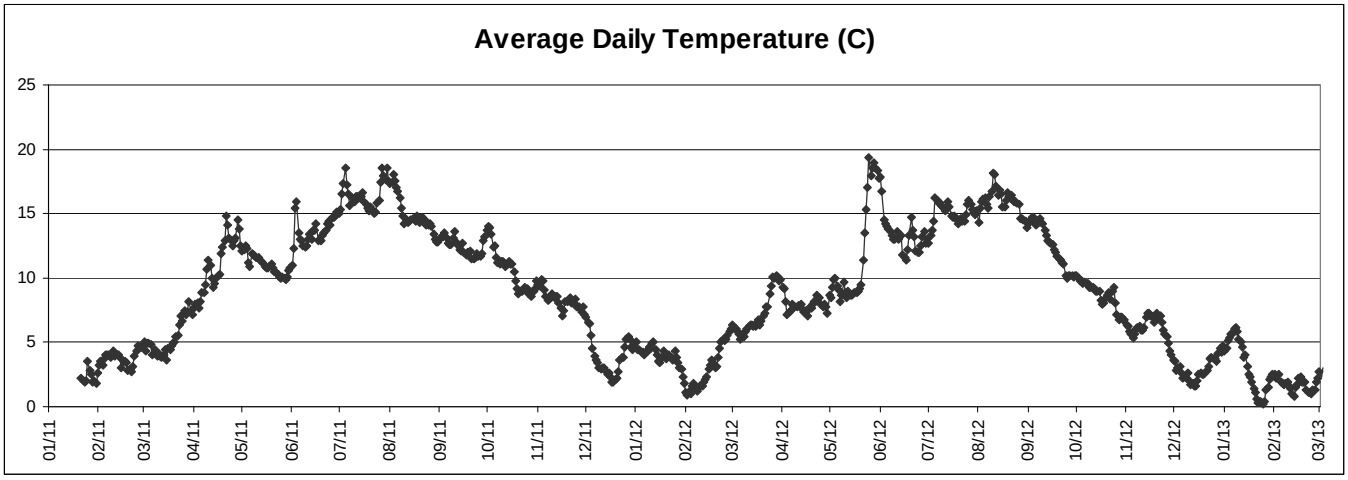


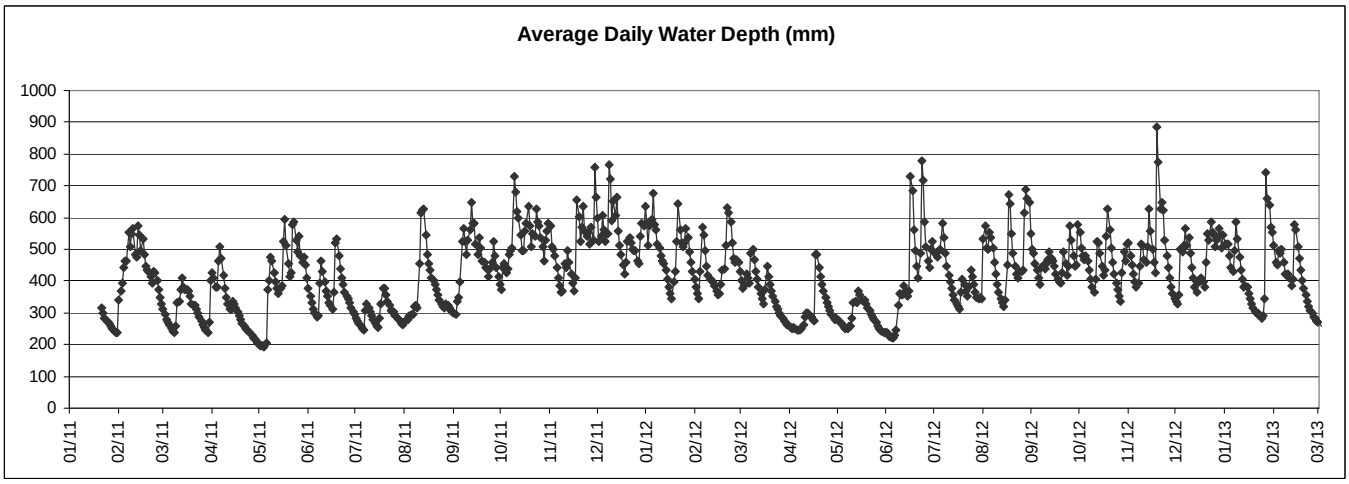
6.7.7. Thermistor data, Round Loch of Glenhead



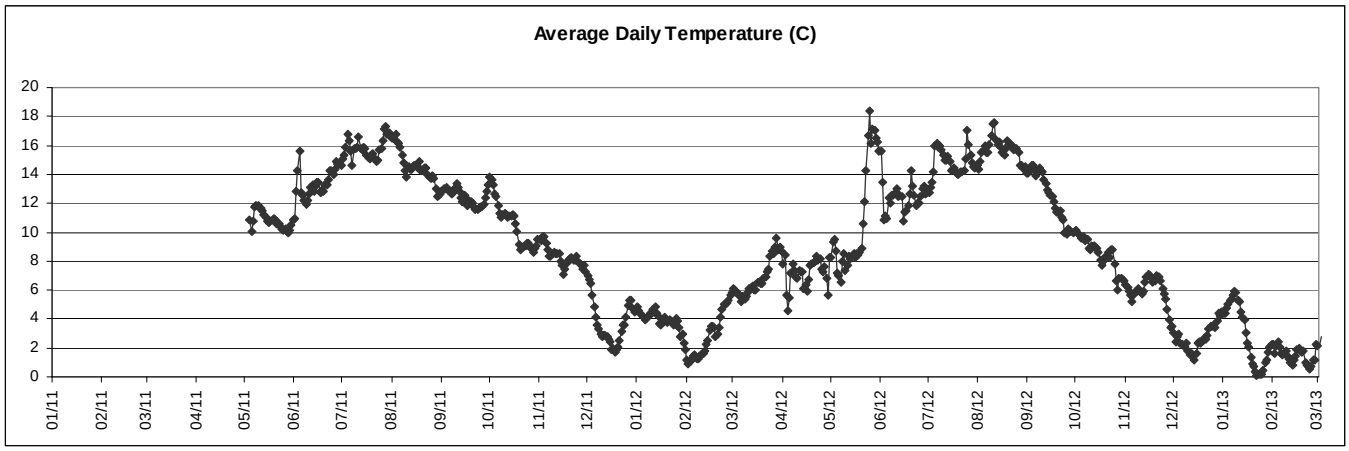
6.7.8. Automatic sensor data, Round Loch of Glenhead

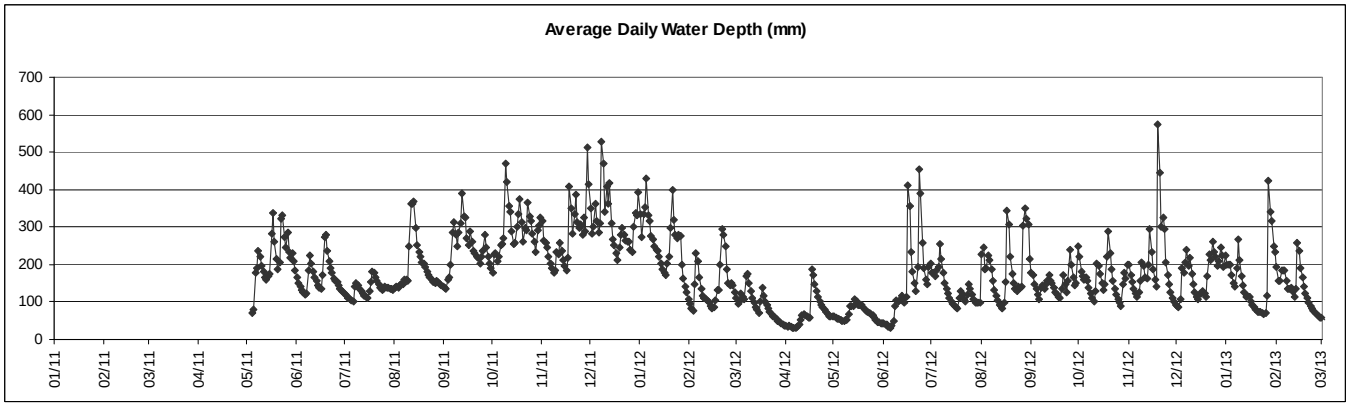
6.7.8.1. Lake sensor data, Round Loch of Glenhead

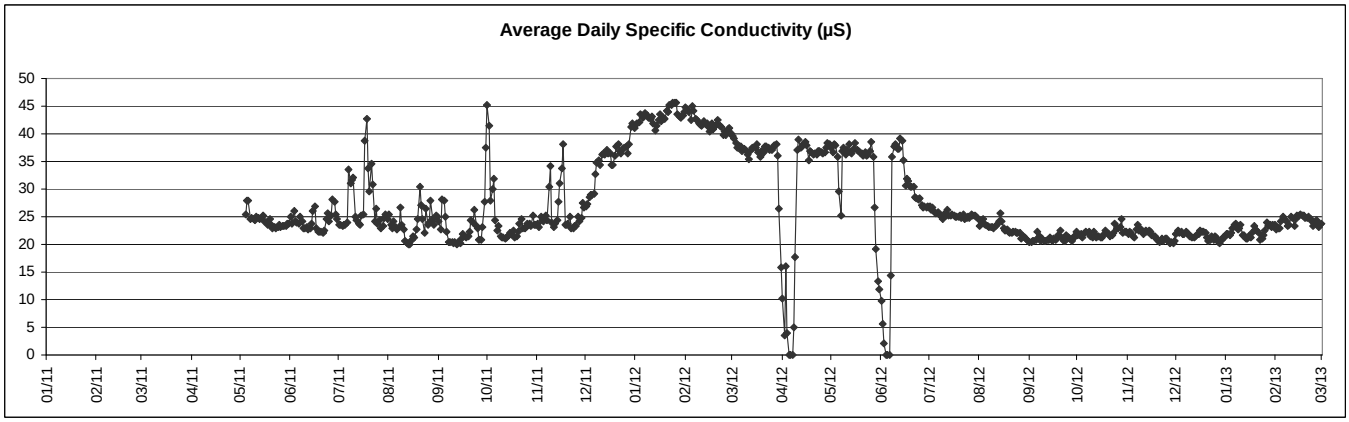




6.7.8.2. Outflow sensor data, Round Loch of Glenhead

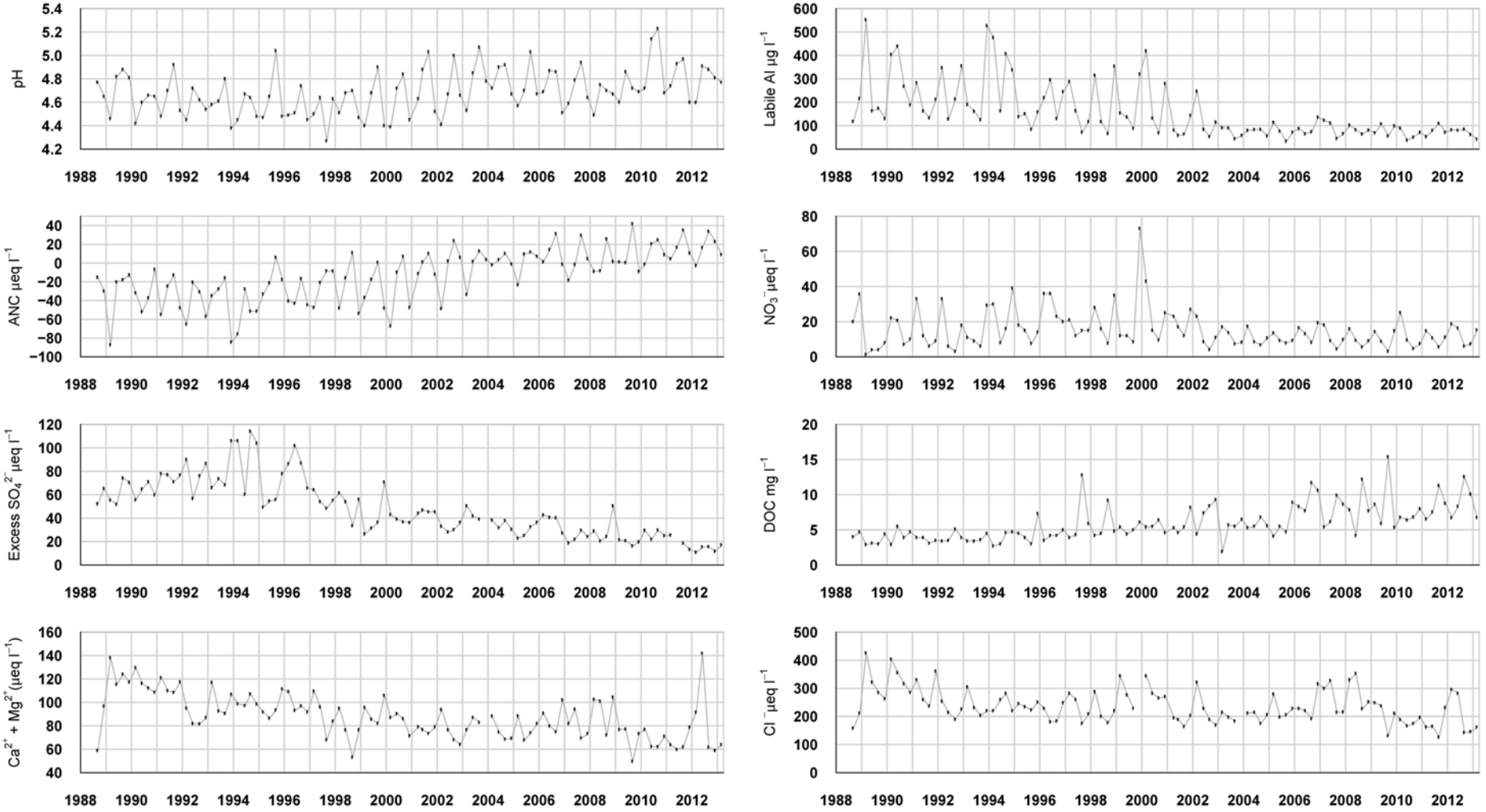






6.8. Loch Grannoch

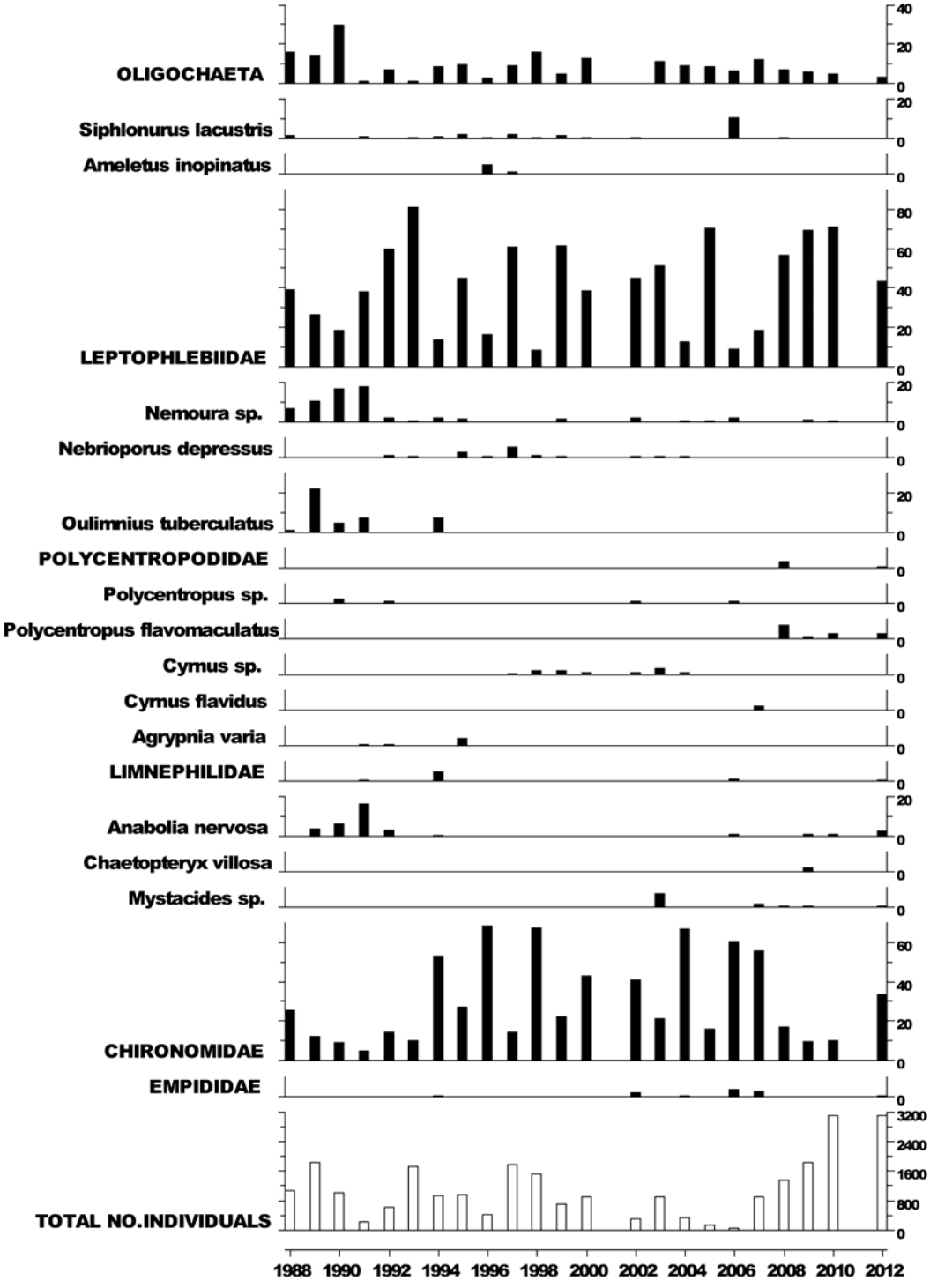
6.8.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	4.64	-34.33	50.92	55.53	237.51	4.82	310.95	241.85	281.54	98.11	68.59	13.64	3.81
12-13 mean	4.84	20.56	42.89	38.72	163.67	7.50	156.50	67.25	183.08	34.16	14.95	11.25	9.43
12-13 std dev	0.06	10.59	30.63	9.67	46.13	1.55	28.73	19.52	66.55	7.81	2.31	5.28	2.49

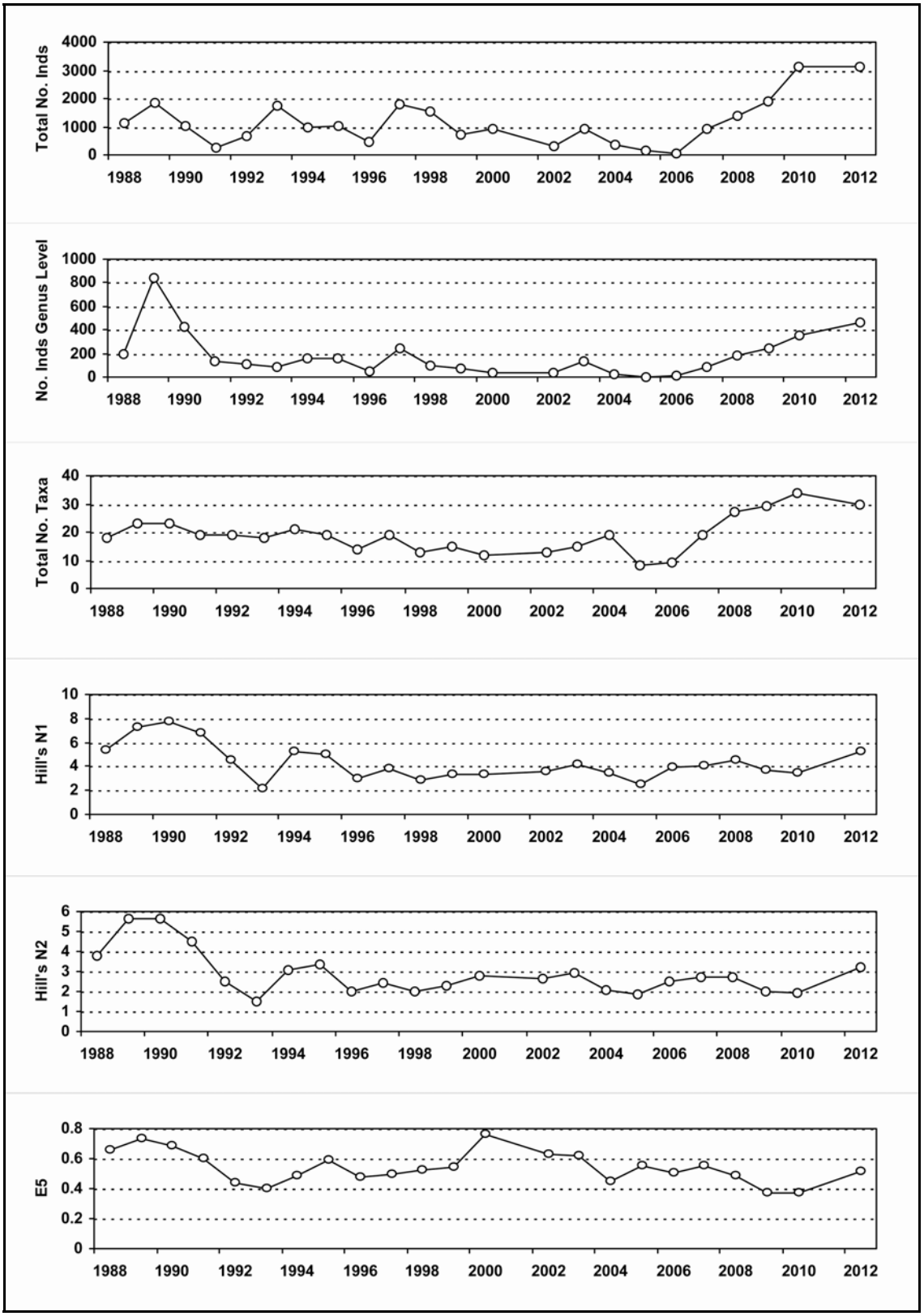
6.8.2. Macroinvertebrate data

6.8.2.1. Percentage abundance summary, Loch Grannoch



No sampling in 2001 due to Foot and Mouth restrictions. Not sampled in 2011.

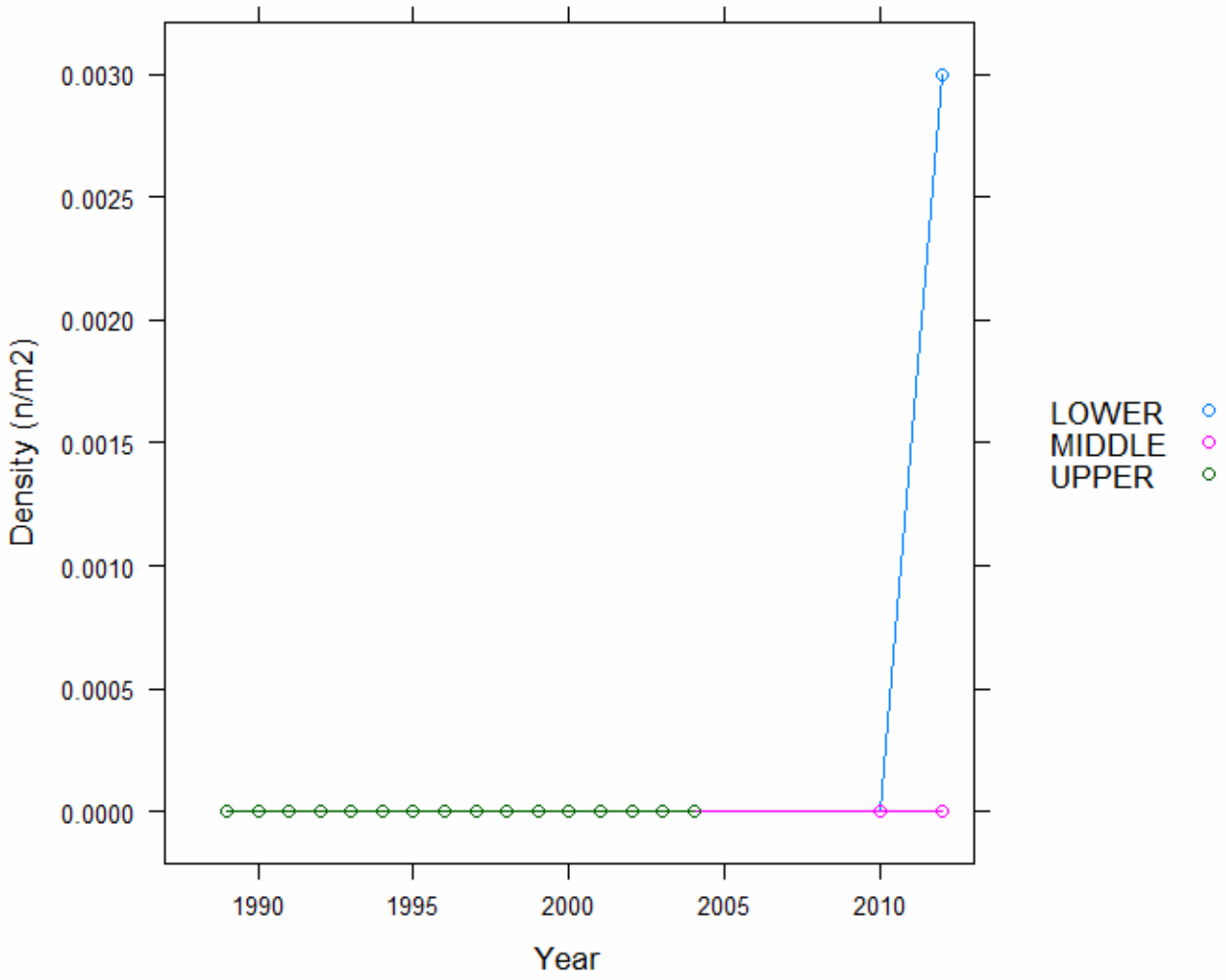
6.8.2.2. Summary statistics, Loch Grannoch



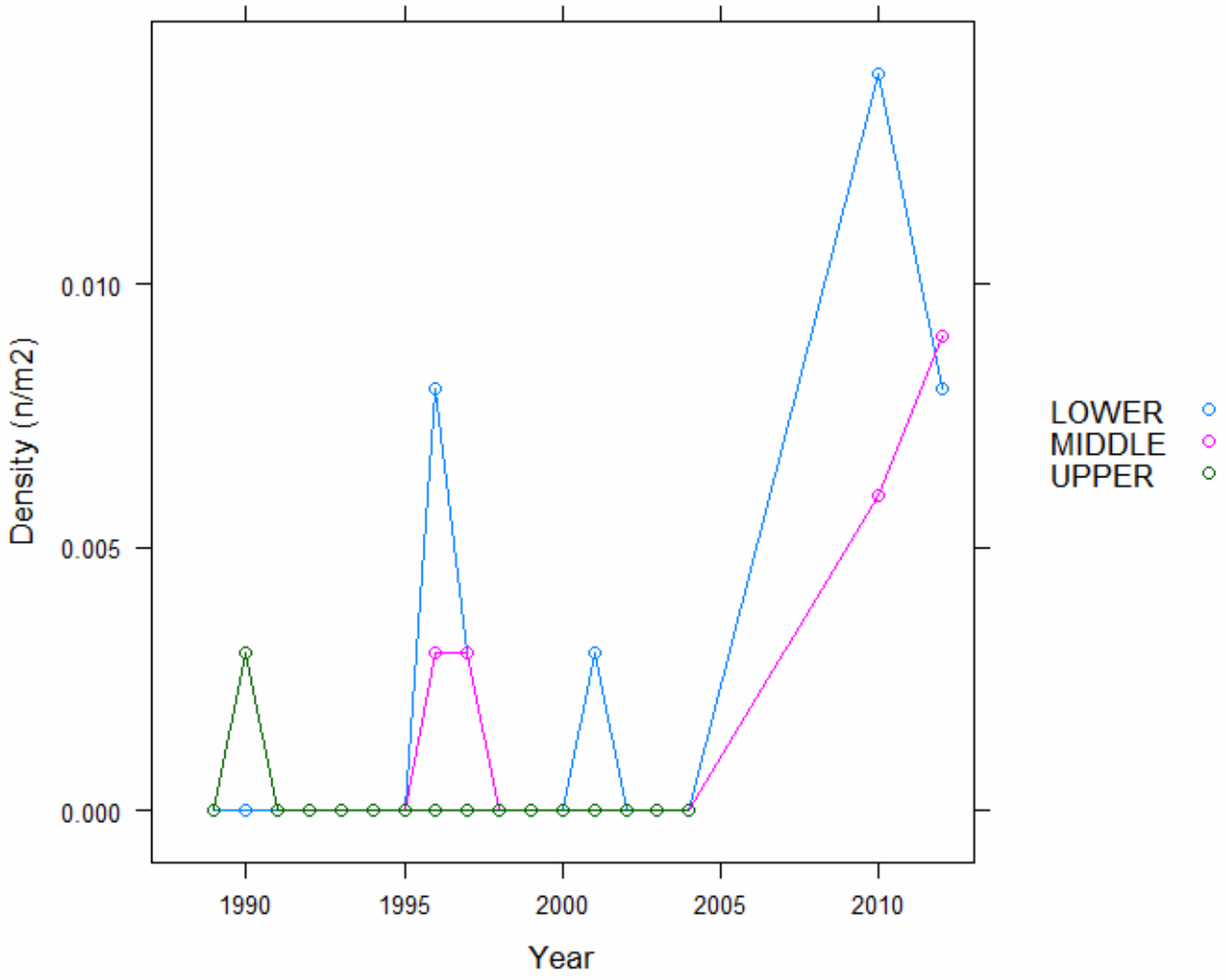
No sampling in 2001 due to Foot and Mouth restrictions. Not sampled in 2011.

6.8.3. Fish data (for outflow stream)

6.8.3.1. Summary of Trout fry densities (numbers m^{-2}), Loch Grannoch

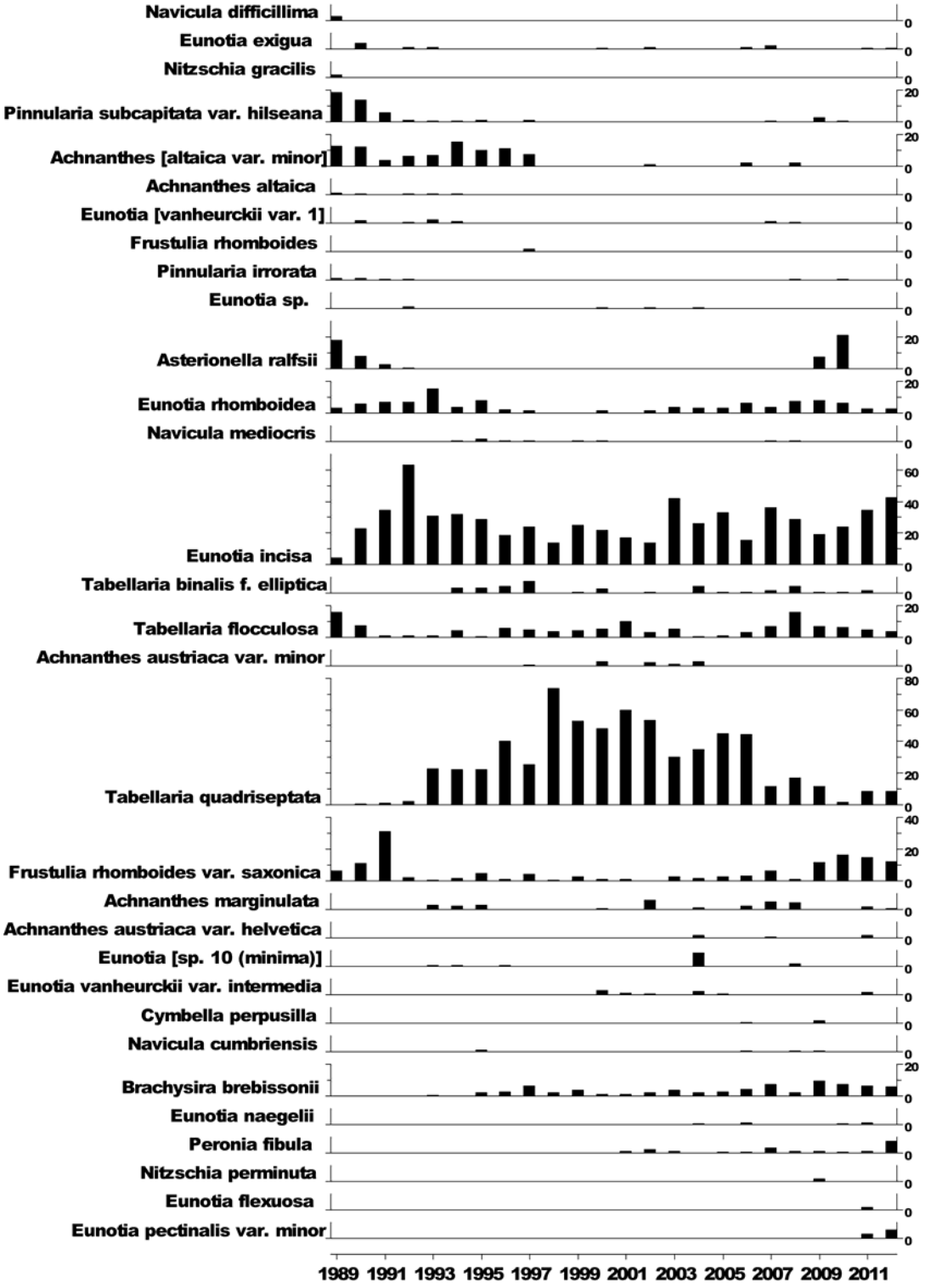


6.8.3.2. Summary of Trout parr densities (numbers m^{-2}), Loch Grannoch

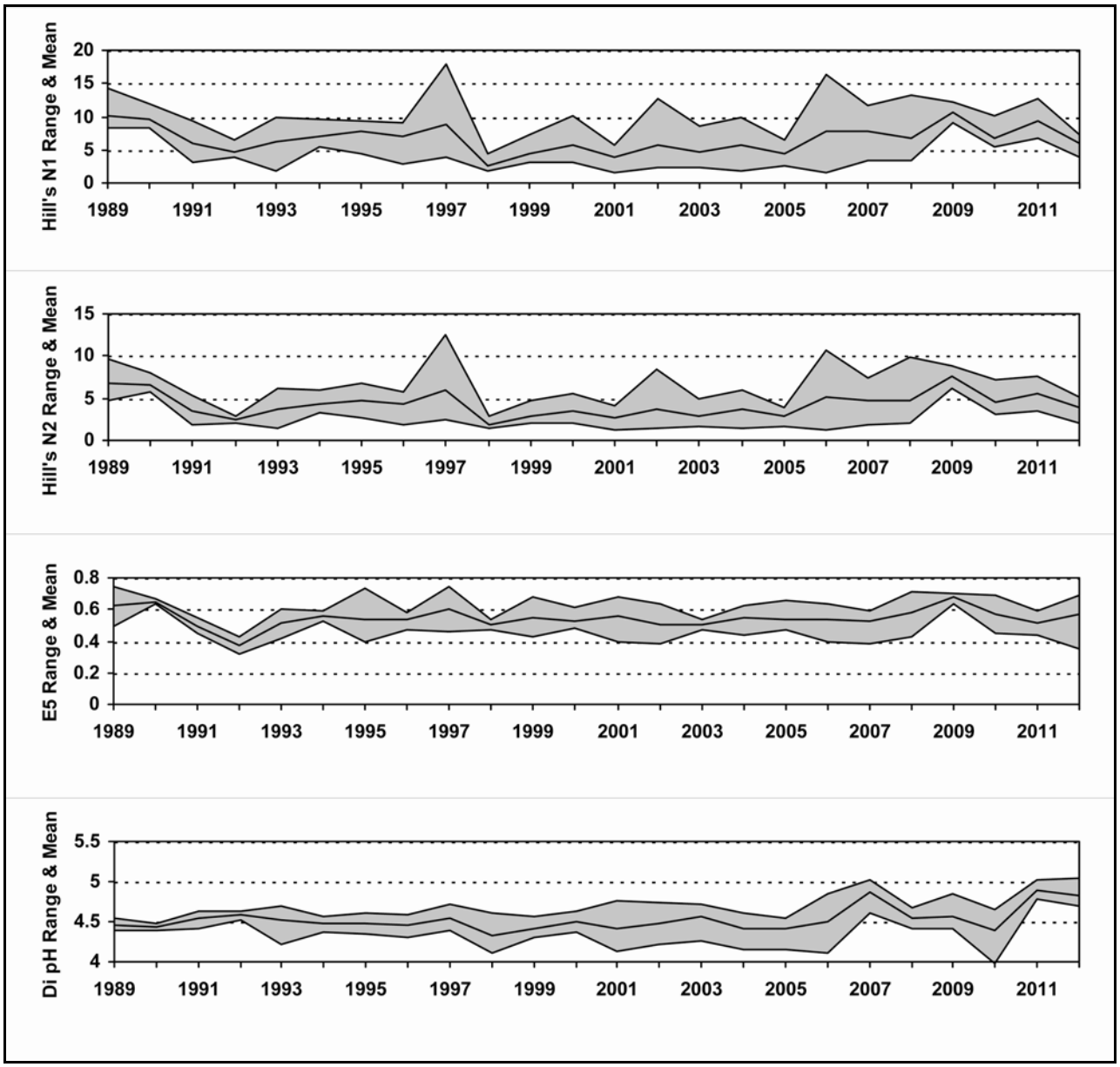


6.8.4. Epilithic diatom data

6.8.4.1. Percentage abundance summary, Loch Grannoch

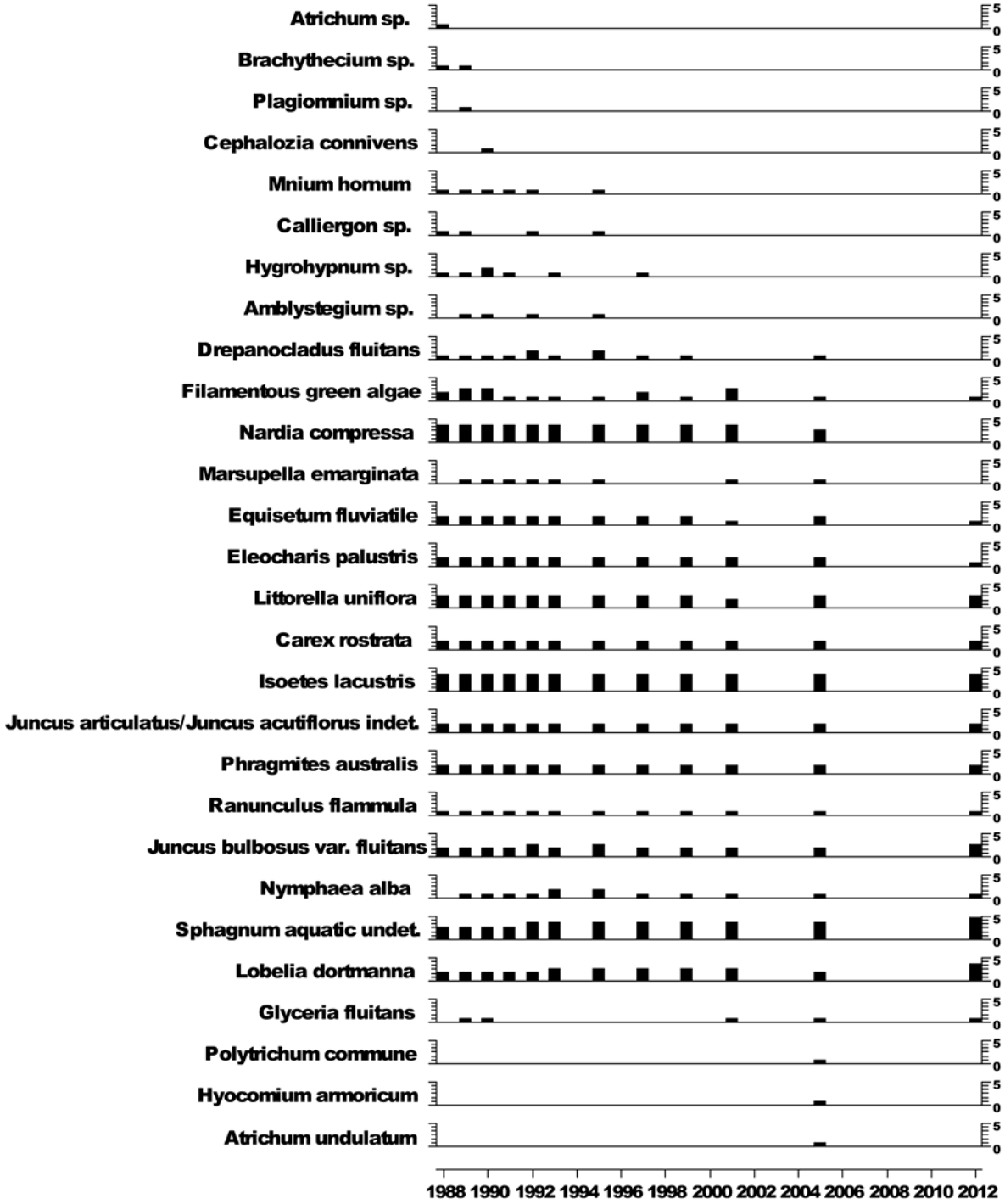


6.8.4.2. Summary statistics, Loch Grannoch



6.8.5. Aquatic macrophyte data, Loch Grannoch

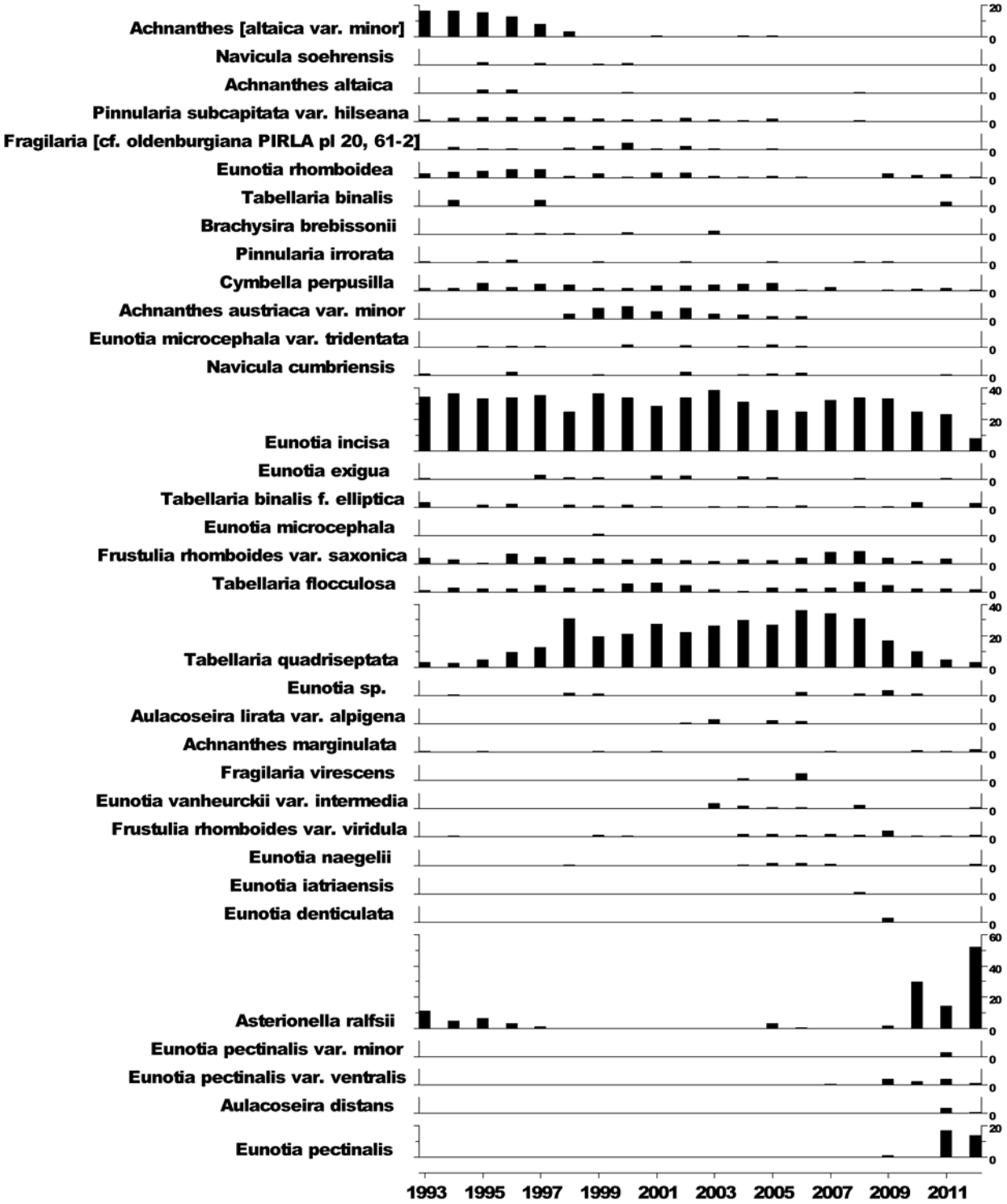
Species Scores (1-5)



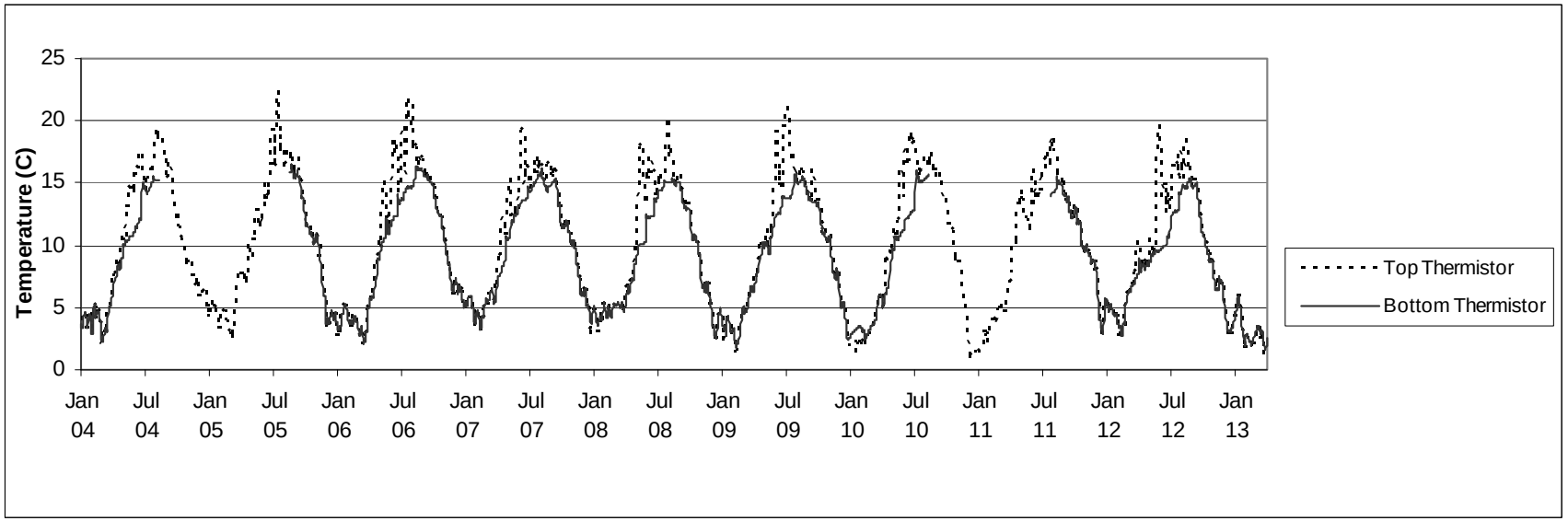
No surveys between 2007 and 2012 due to funding cuts
2012 Bryophyte IDs pending

6.8.6. Sediment trap data, Loch Grannoch

Relative percentage frequency of diatom taxa

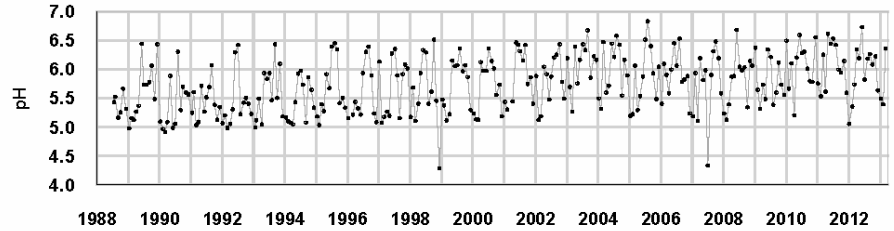


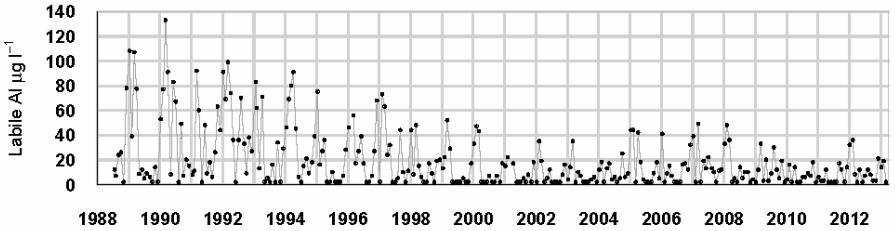
6.8.7. Thermistor data, Loch Grannoch

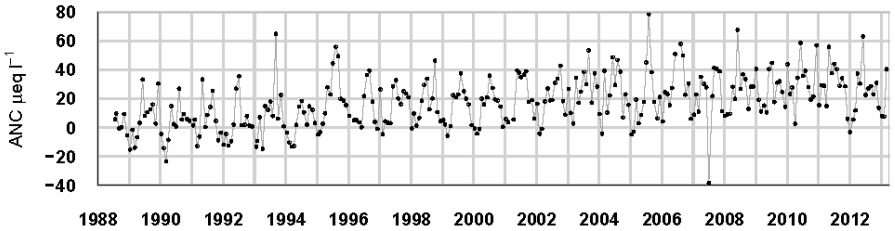


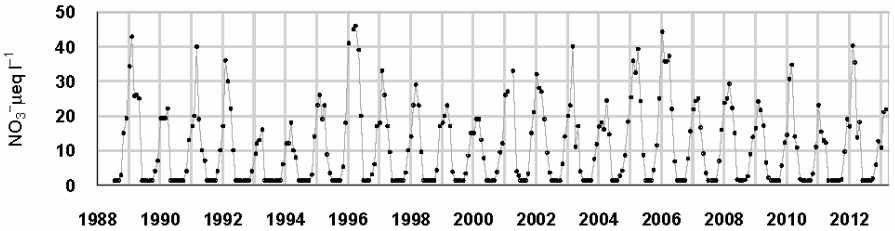
6.9. Dargall Lane

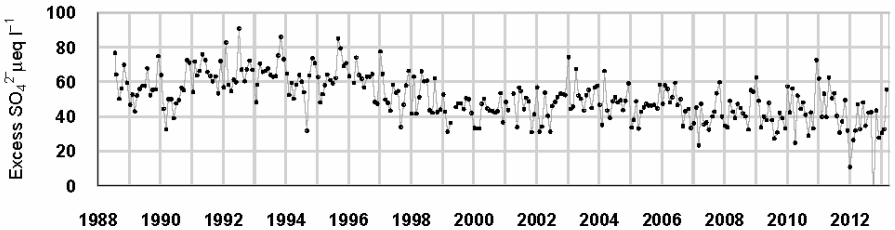
6.9.1. Spot sampled chemistry data

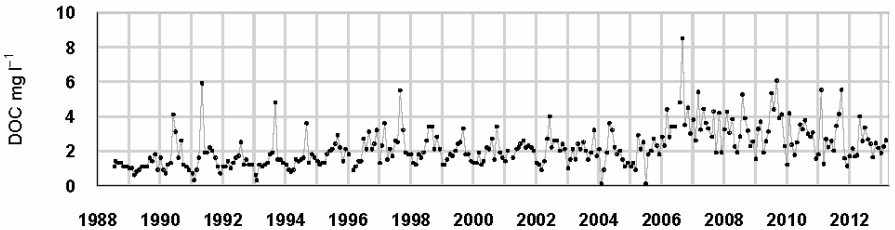


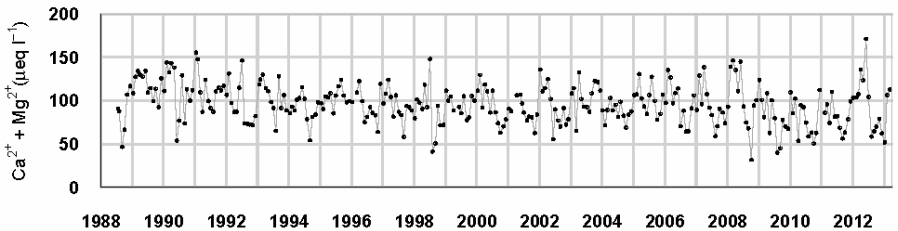


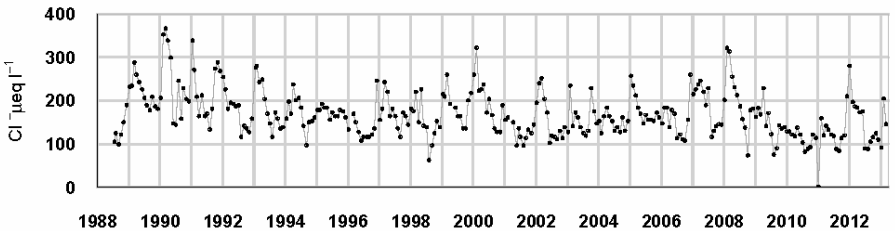








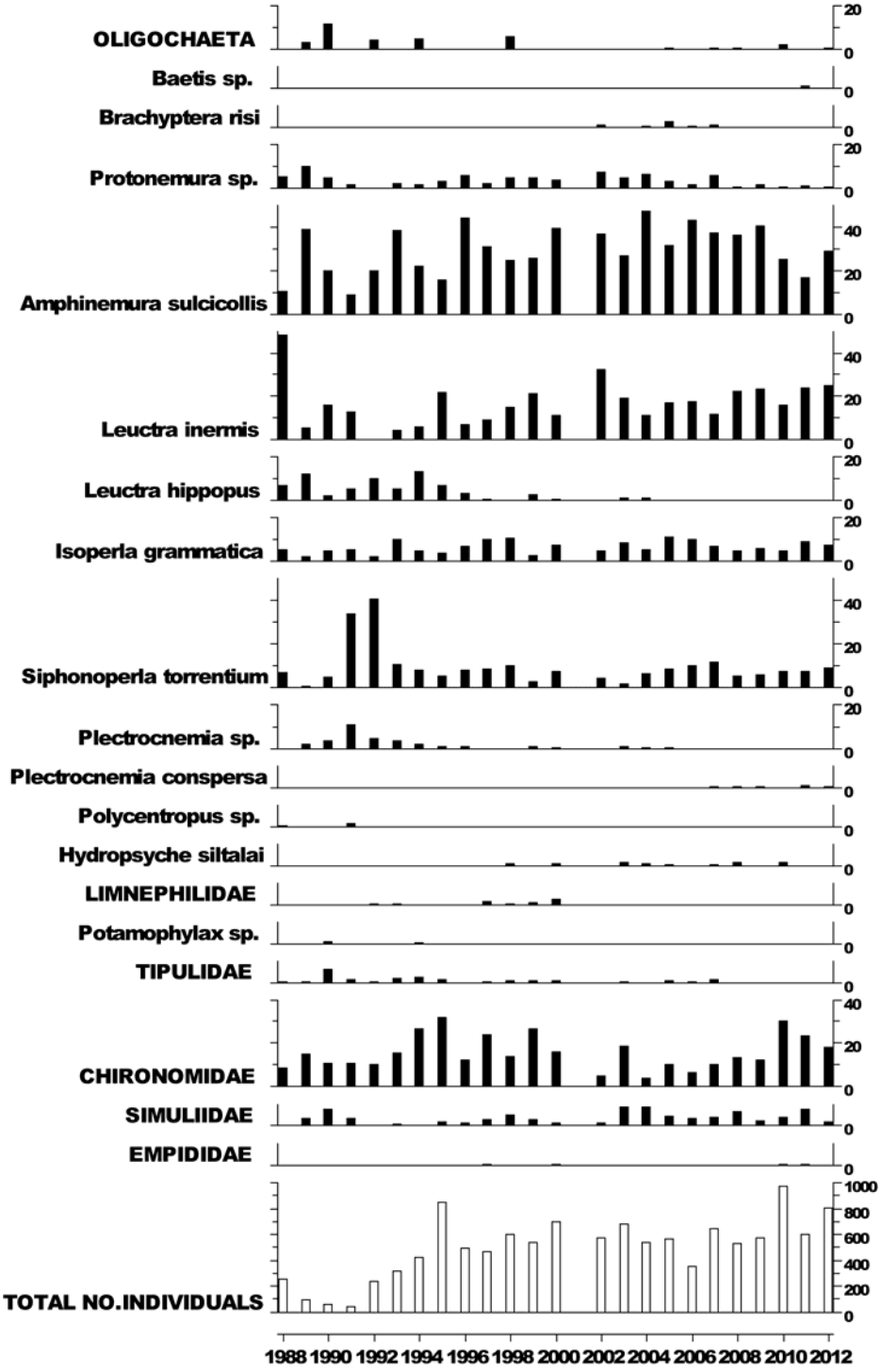




µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.44	3.42	51.60	55.79	182.12	9.10	54.45	39.18	208.14	82.31	60.49	10.47	1.40
12-13 mean	6.06	27.56	52.64	42.08	127.67	7.27	25.92	8.75	133.43	49.53	35.54	9.25	2.47
12-13 std dev	0.40	15.35	28.08	12.59	26.77	2.84	14.74	6.81	41.18	17.77	16.27	8.15	0.67

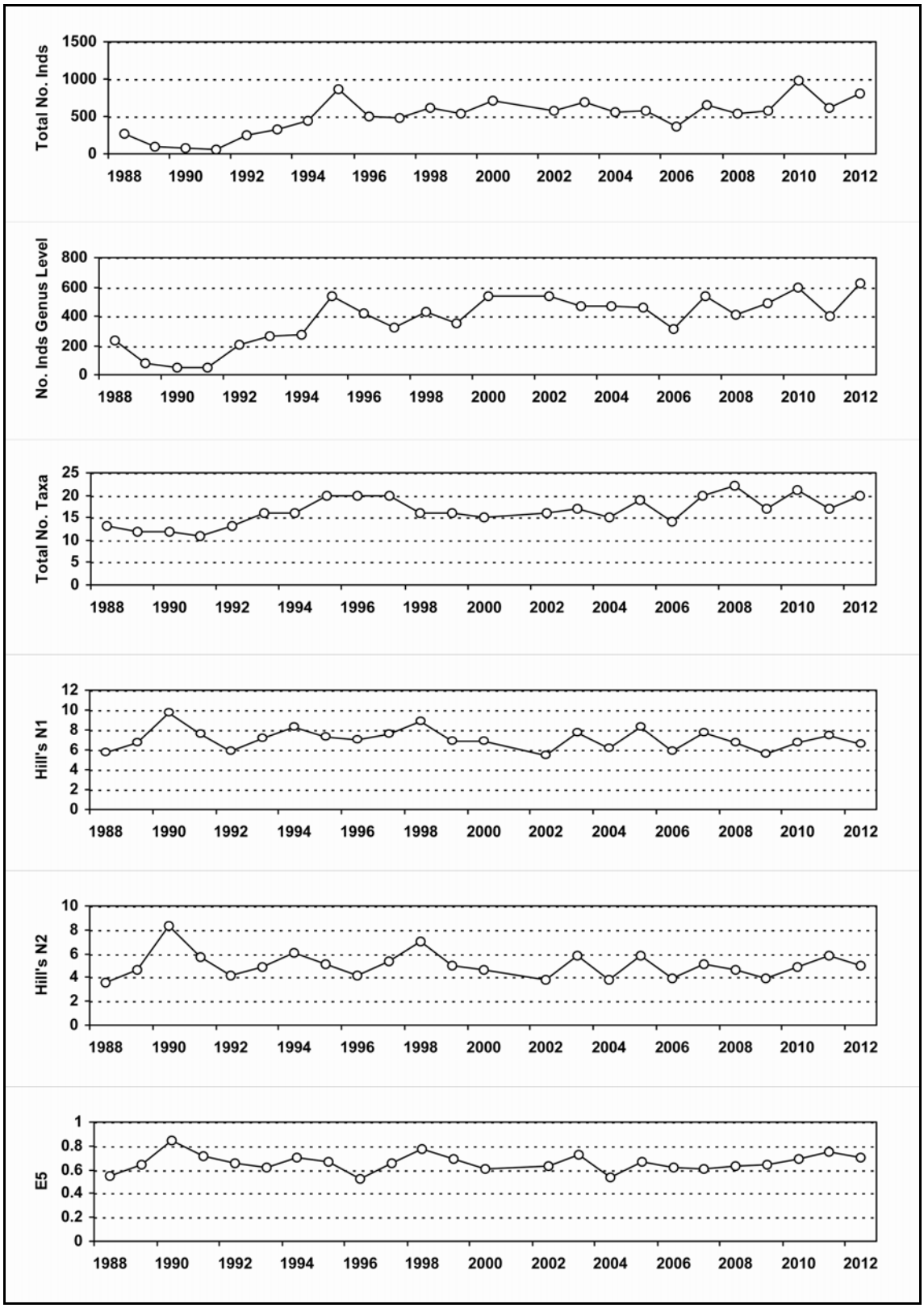
6.9.2. Macroinvertebrate data

6.9.2.1. Percentage abundance summary, Dargall Lane



No sampling in 2001 due to Foot and Mouth restrictions.

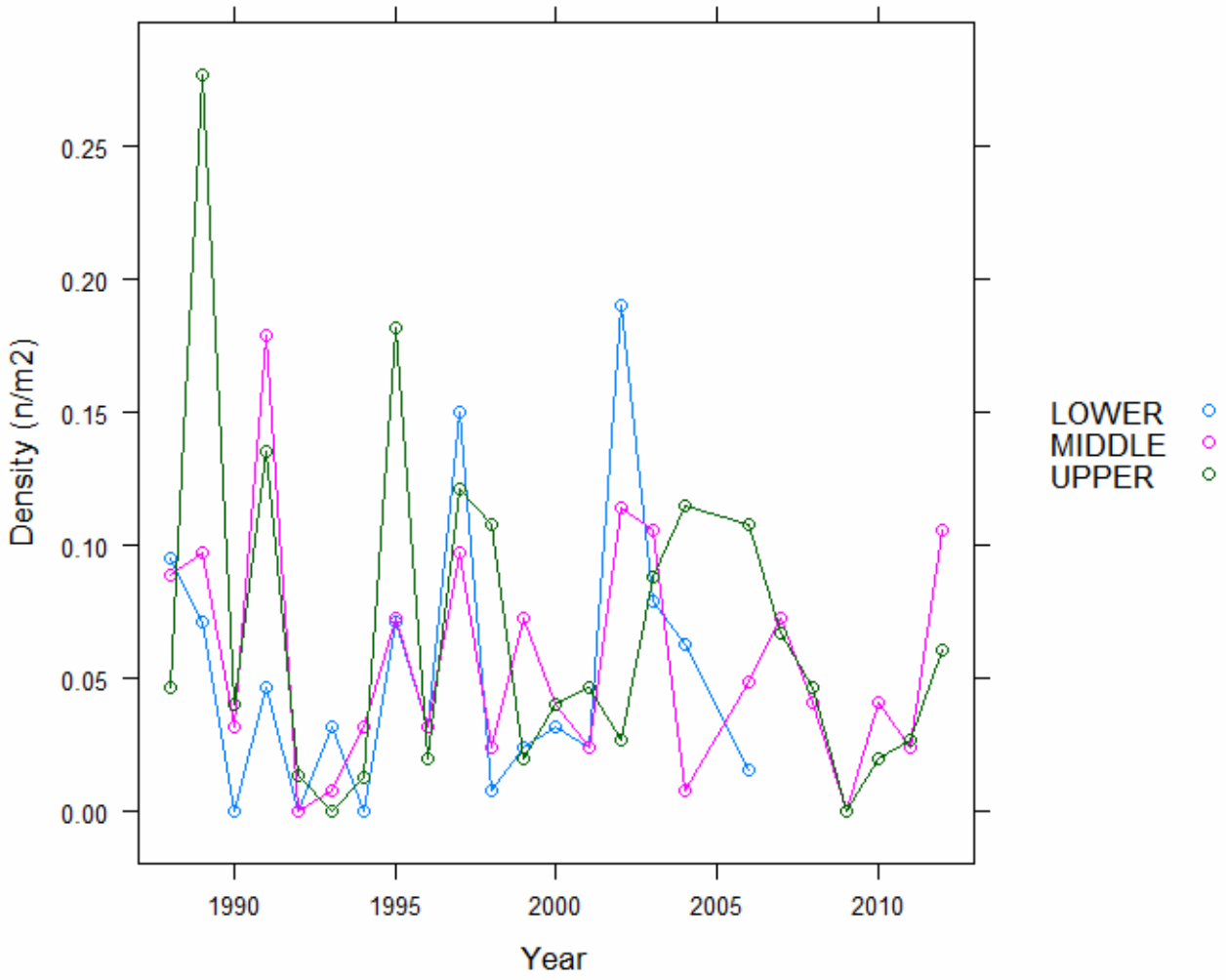
6.9.2.2. Summary statistics, Dargall Lane



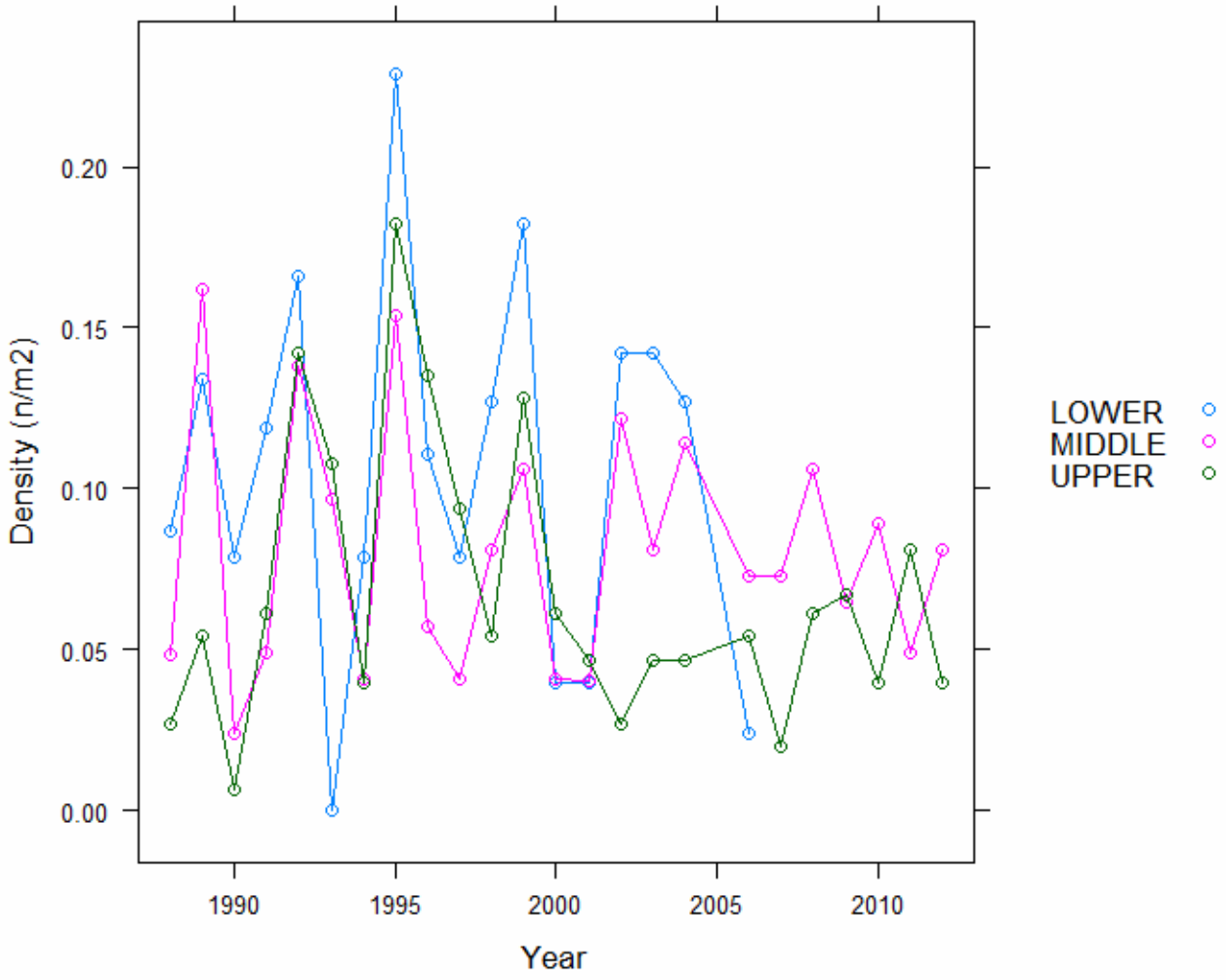
No sampling in 2001 due to Foot and Mouth restrictions.

6.9.3. Fish data

6.9.3.1. Summary of Trout fry densities (numbers m^{-2}), Dargall Lane

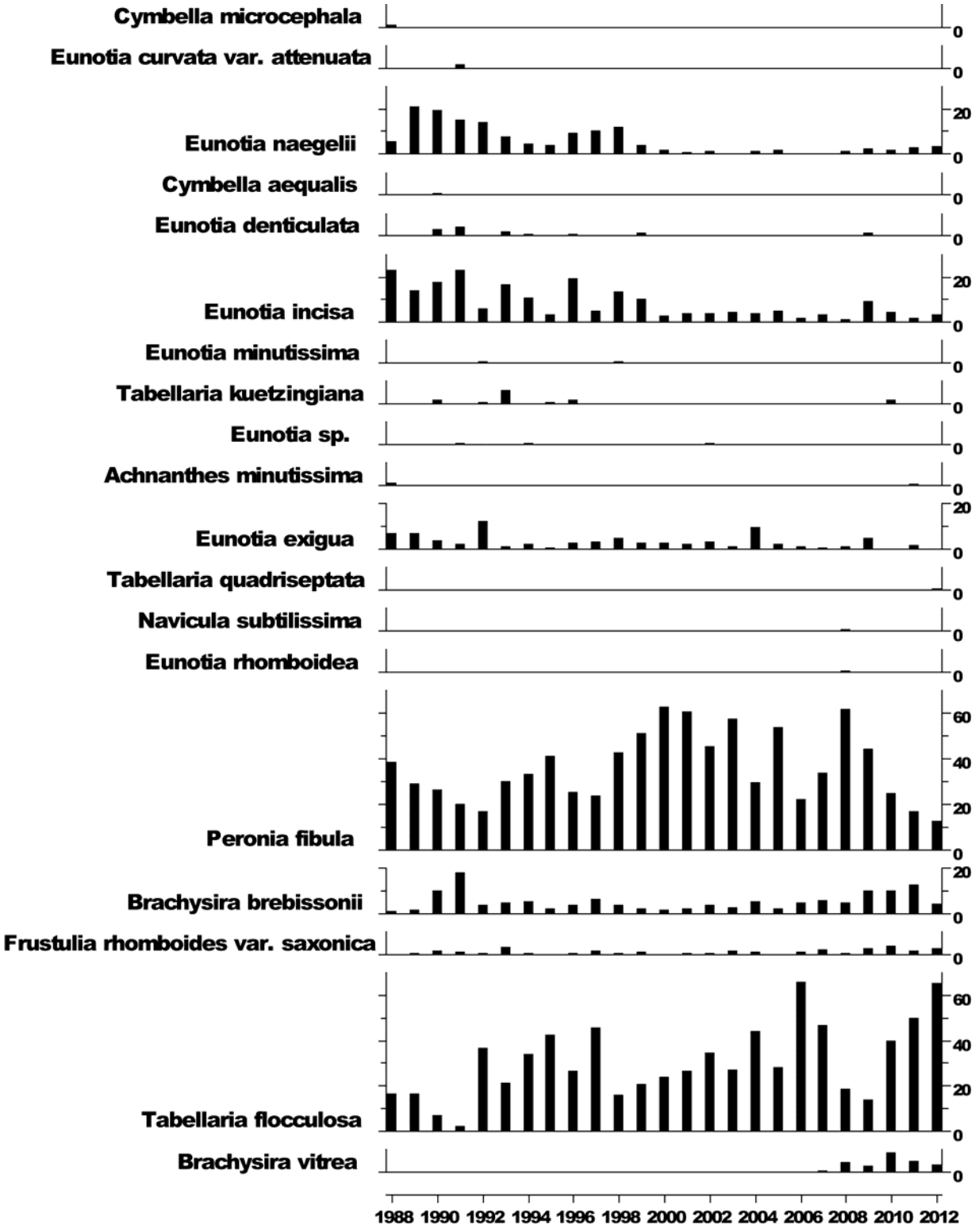


6.9.3.2. Summary of Trout parr densities (numbers m^{-2}), Dargall Lane

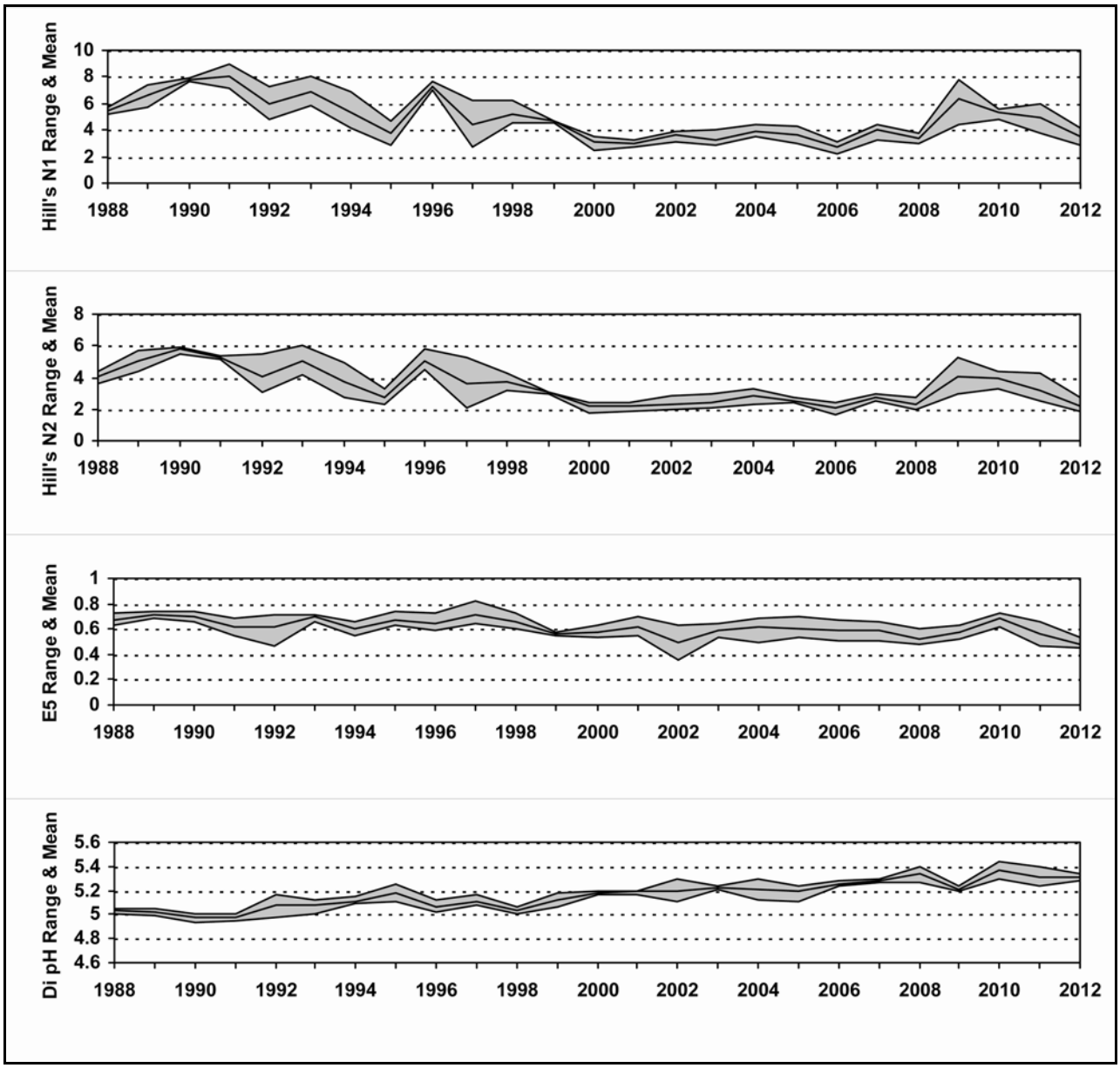


6.9.4. Epilithic diatom data

6.9.4.1. Percentage abundance summary, Dargall Lane

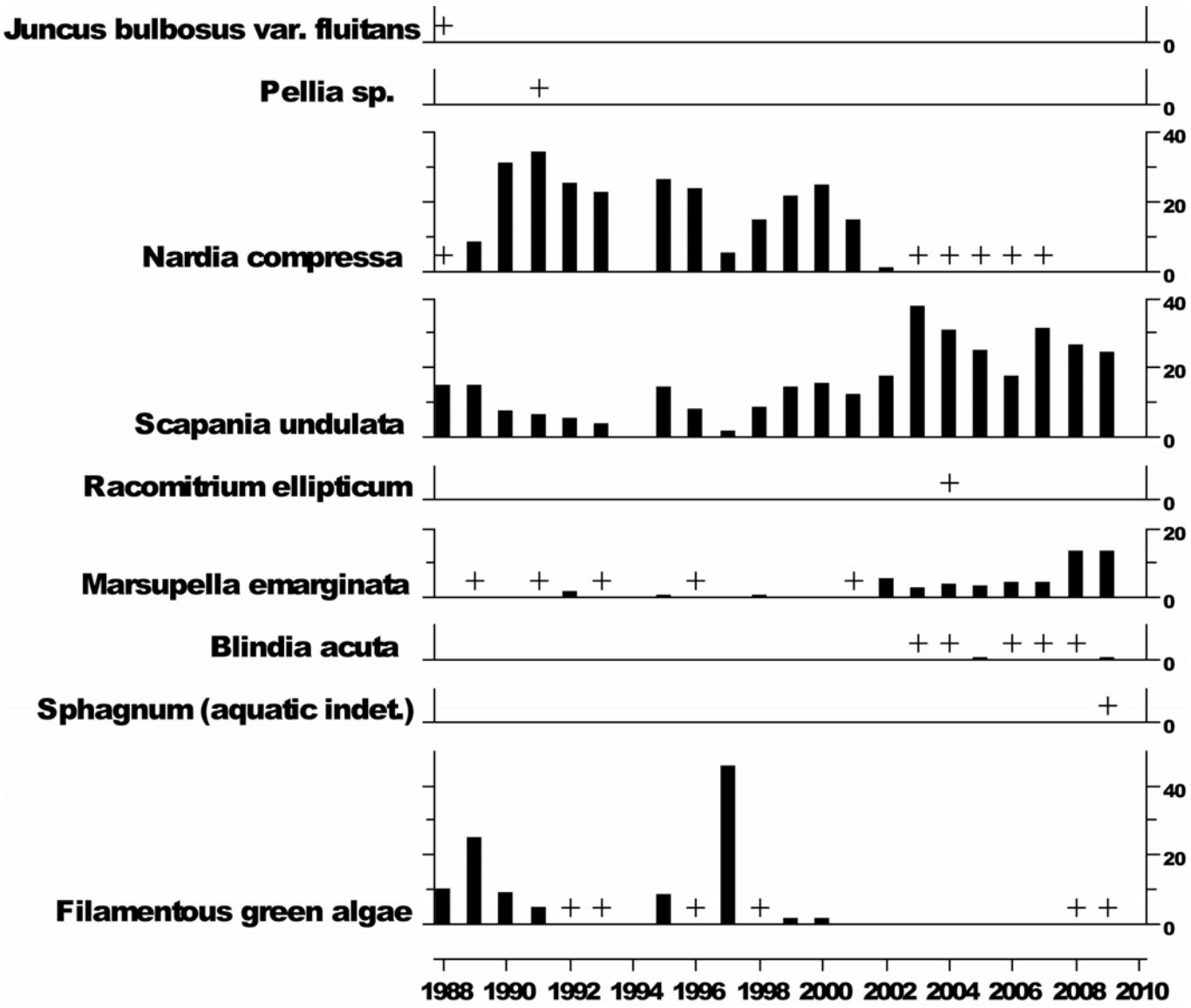


6.9.4.2. Summary statistics, Dargall Lane



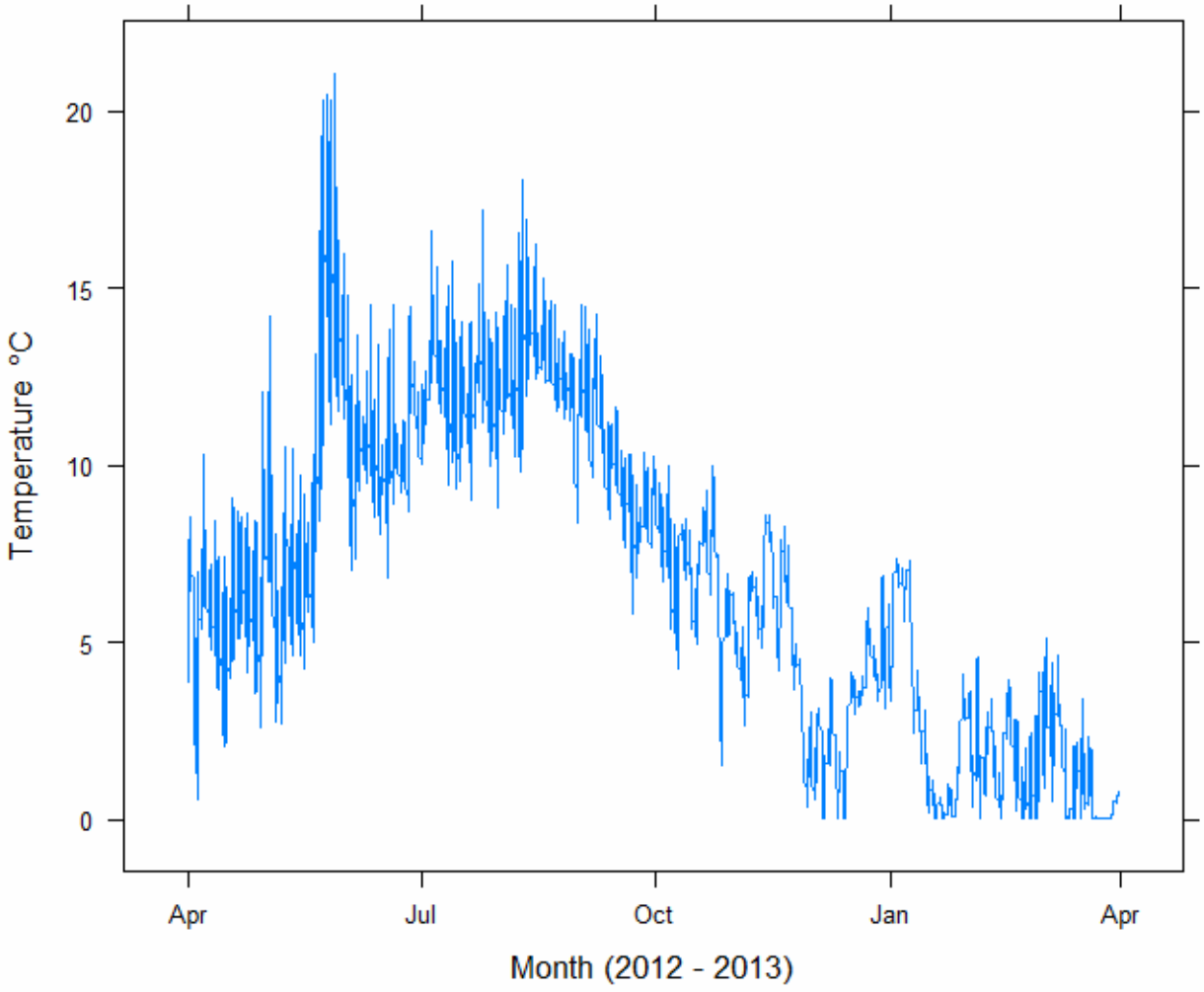
6.9.5. Aquatic macrophyte data, Dargall Lane

Percentage Species Cover



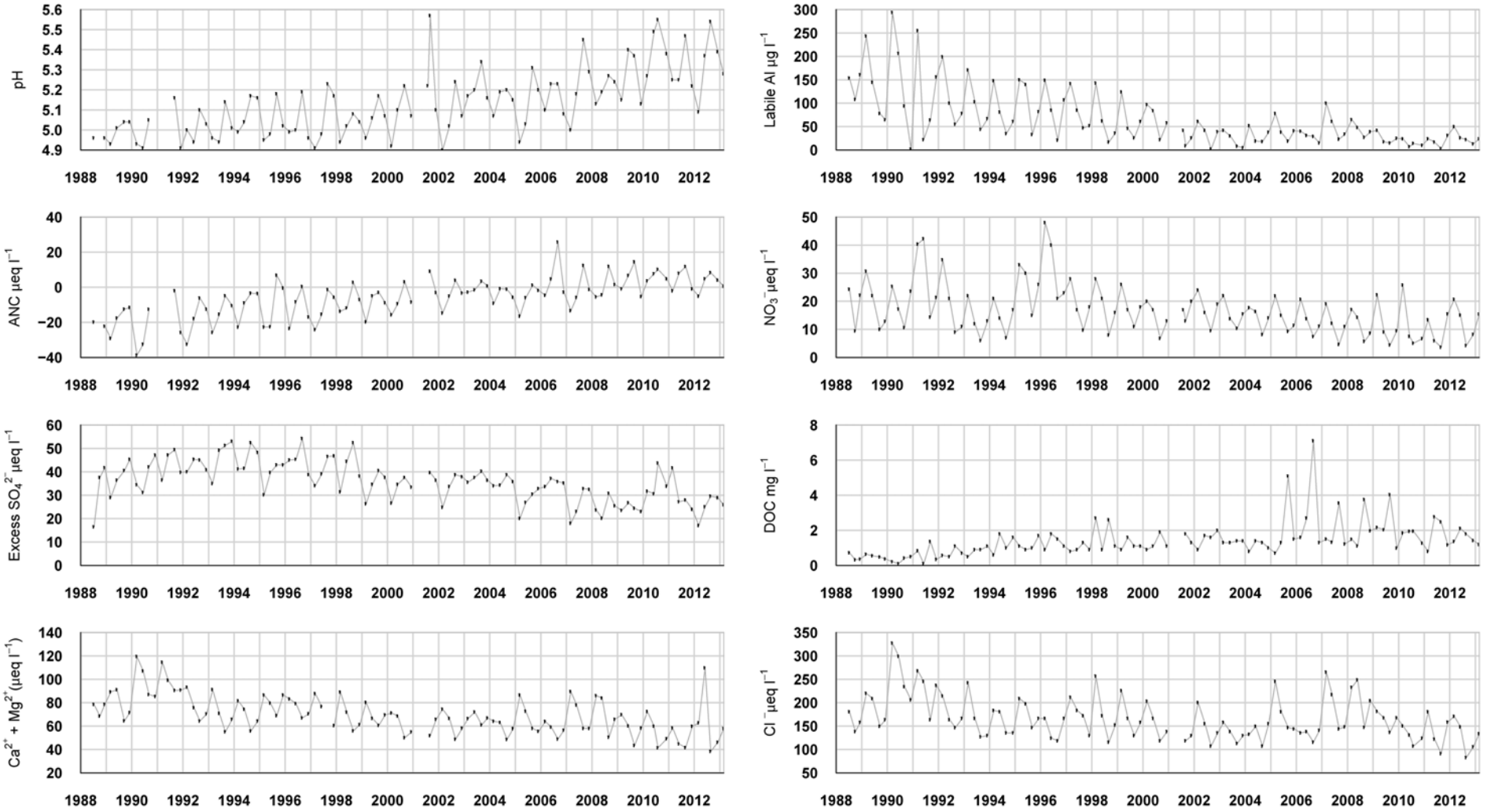
\+ Represents <1% abundance
No survey in 2010 due to spate conditions

6.9.6. Thermistor data, Dargall Lane



6.10. Scoat Tarn

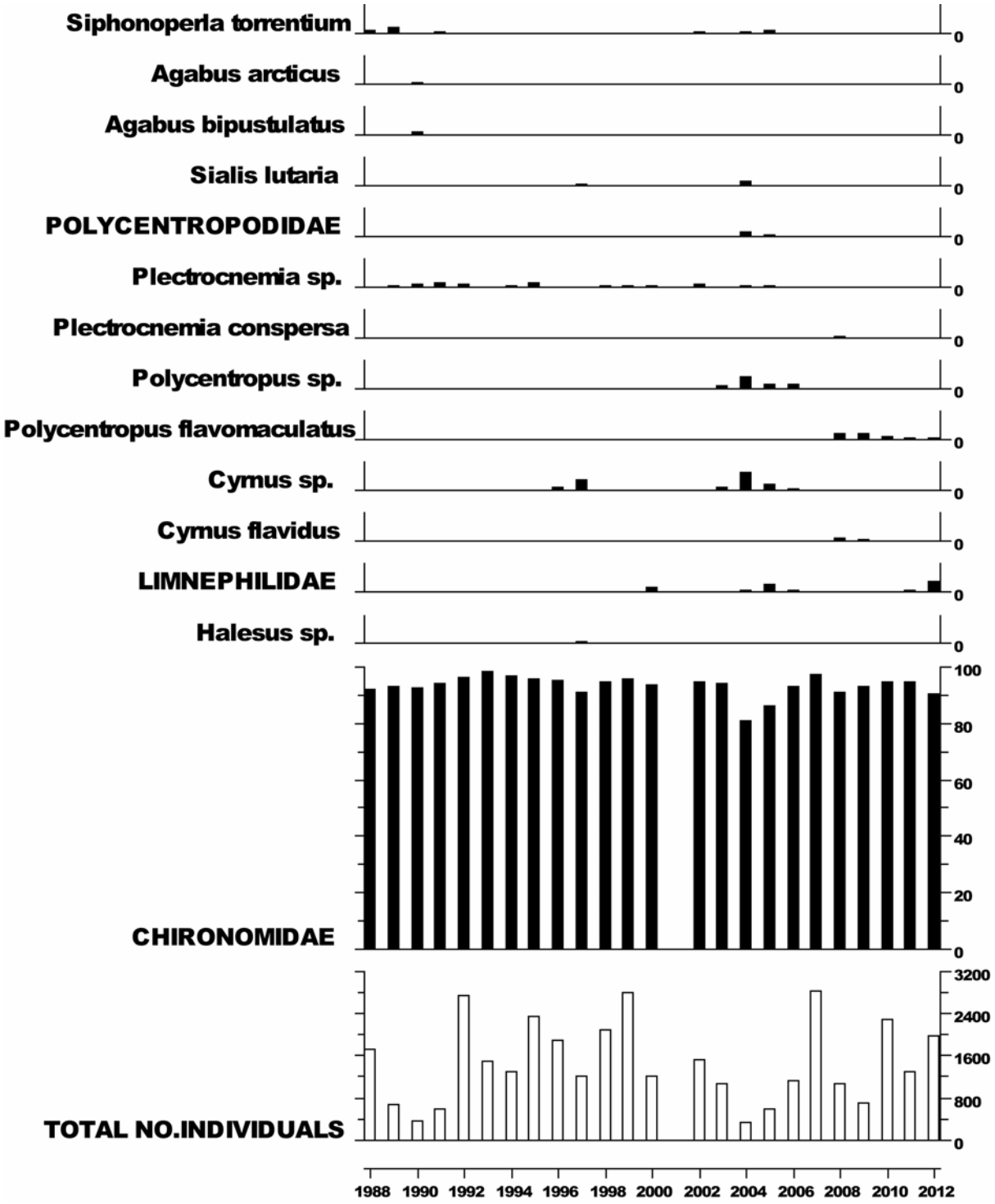
6.10.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO$_4$ $^{2-}$	xSO$_4$ $^{2-}$	NO$_3$ $^{-}$	**DOC
Mean 1st 5 yrs	4.99	-19.68	35.24	50.53	177.11	7.97	143.08	131.06	204.72	61.00	39.53	20.78	0.55
12-13 mean	5.40	4.44	31.72	31.30	108.97	4.39	29.00	21.25	117.64	39.70	27.37	10.73	1.63
12-13 std dev	0.11	3.16	27.52	6.76	19.04	1.07	3.74	5.74	29.26	1.02	2.22	5.47	0.41

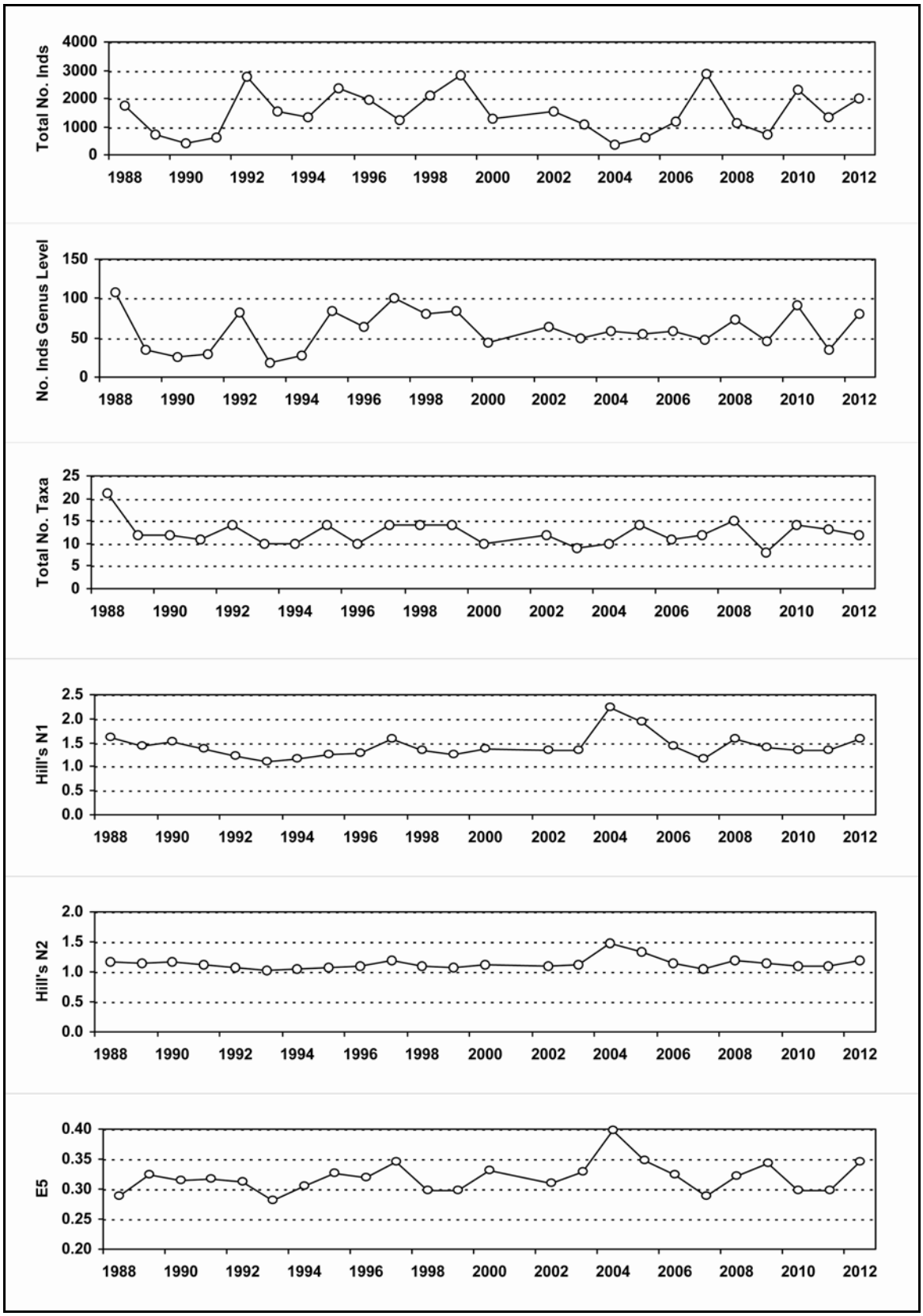
6.10.2. Macroinvertebrate data

6.10.2.1. Percentage abundance summary, Scoat Tarn



No sampling in 2001 due to Foot and Mouth restrictions.

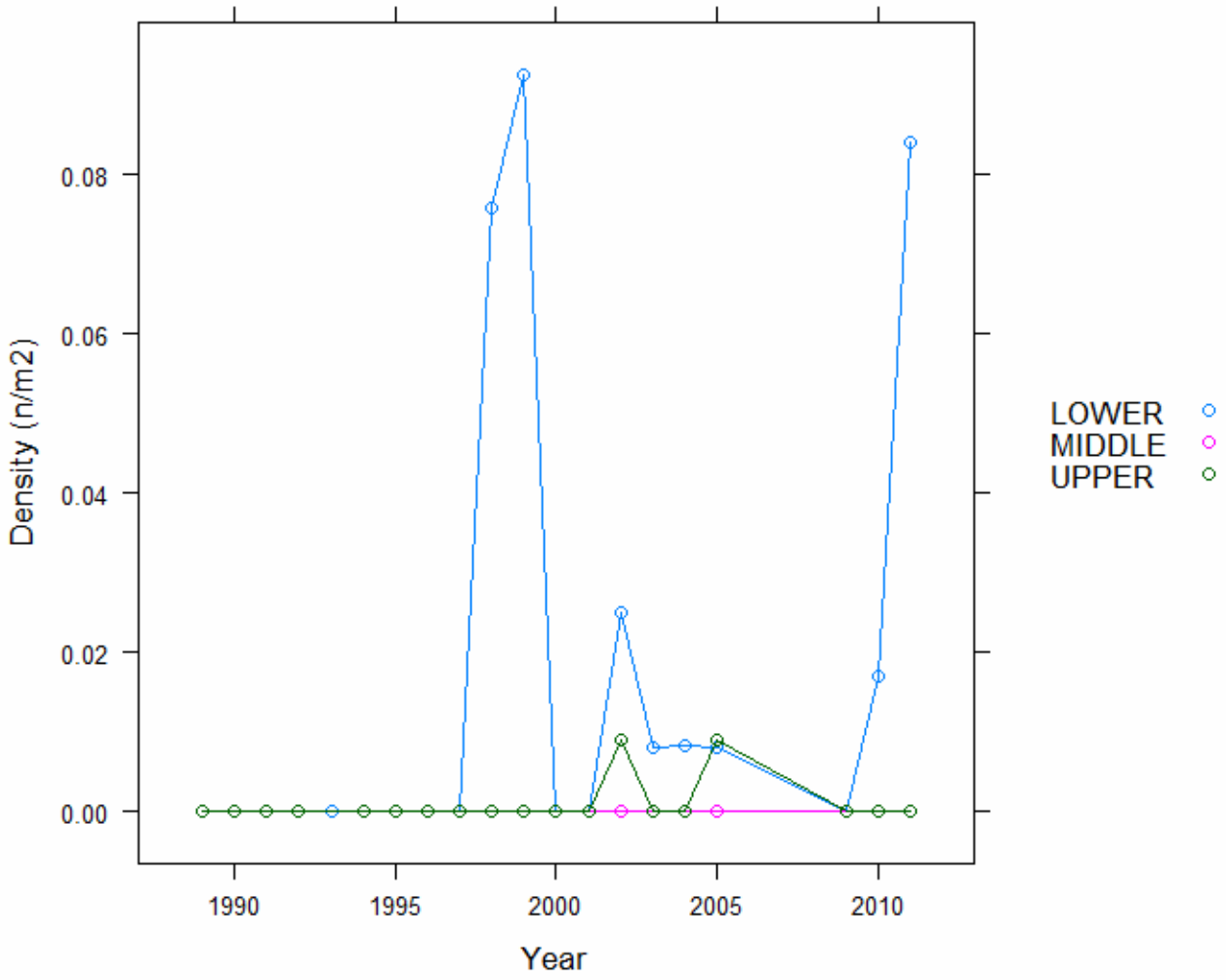
6.10.2.2. Summary statistics, Scoat Tarn



No sampling in 2001 due to Foot and Mouth restrictions.

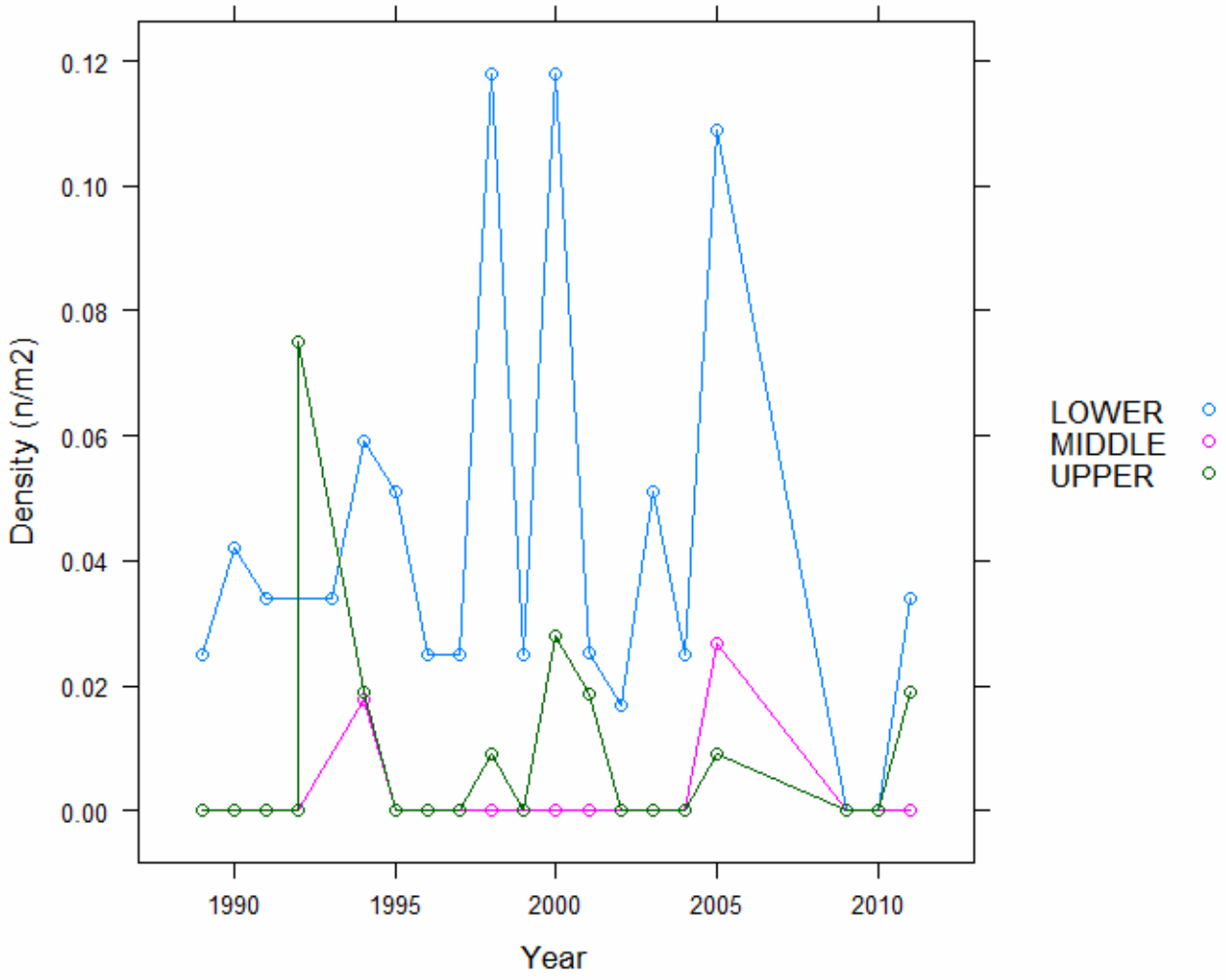
6.10.3. Fish data (for outflow stream)

6.10.3.1. Summary of Trout fry densities (numbers m^{-2}), Scoat Tarn



Fishing equipment problems in 2009.

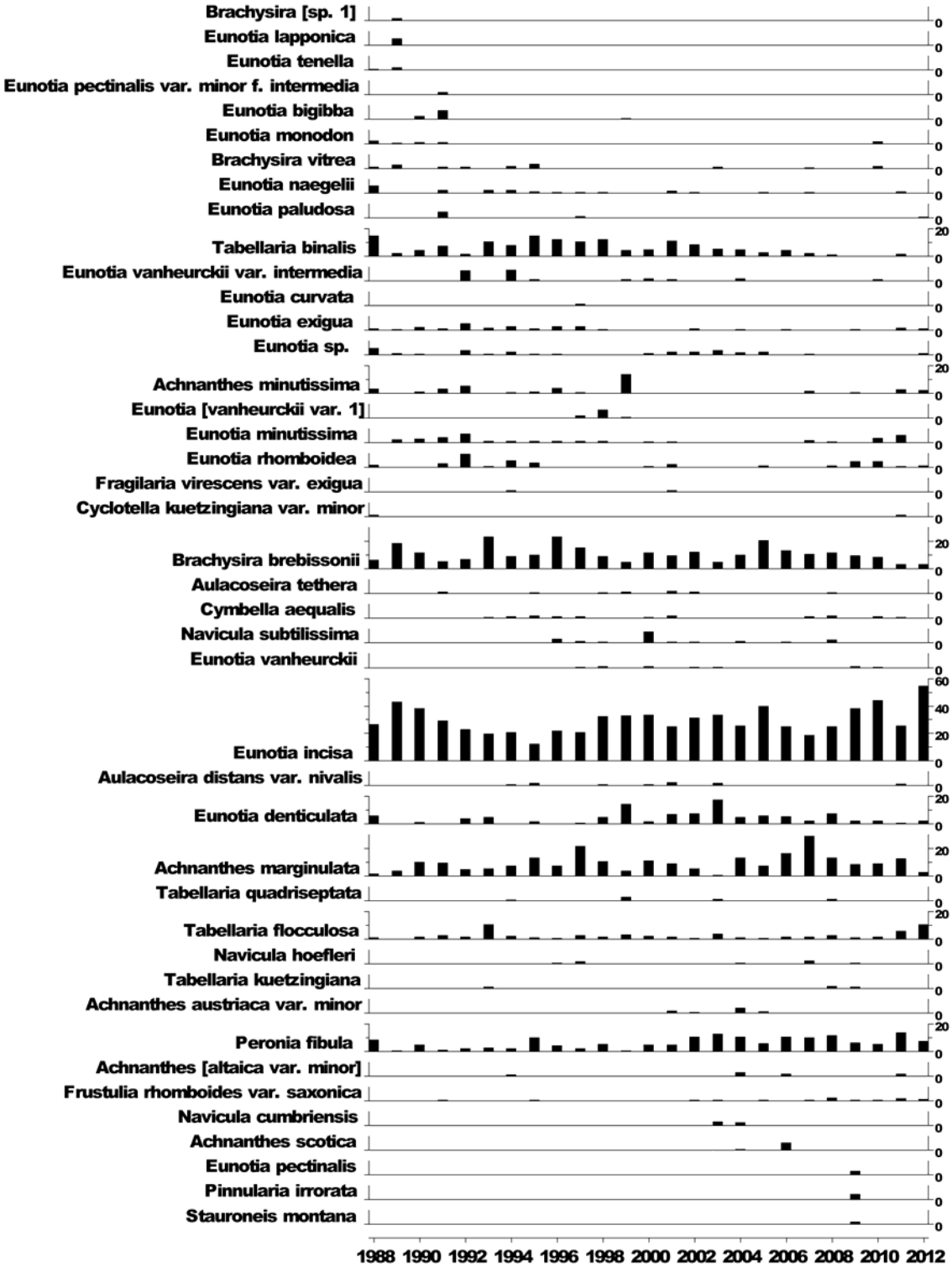
6.10.3.2. Summary of Trout parr densities (numbers m^{-2}), Scoat Tarn



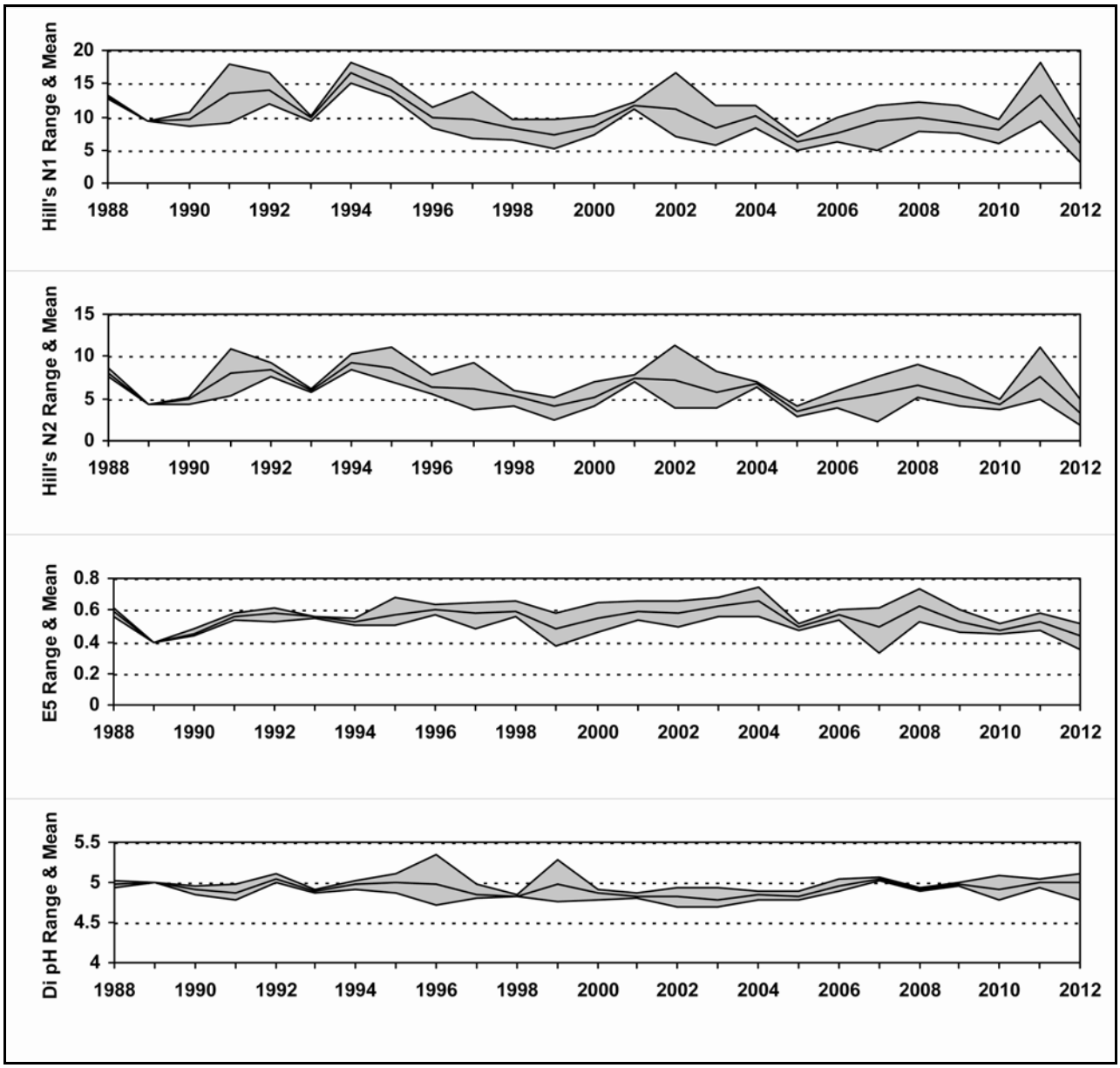
Fishing equipment problems in 2009.

6.10.4. Epilithic diatom data

6.10.4.1. Percentage abundance summary, Scoat Tarn

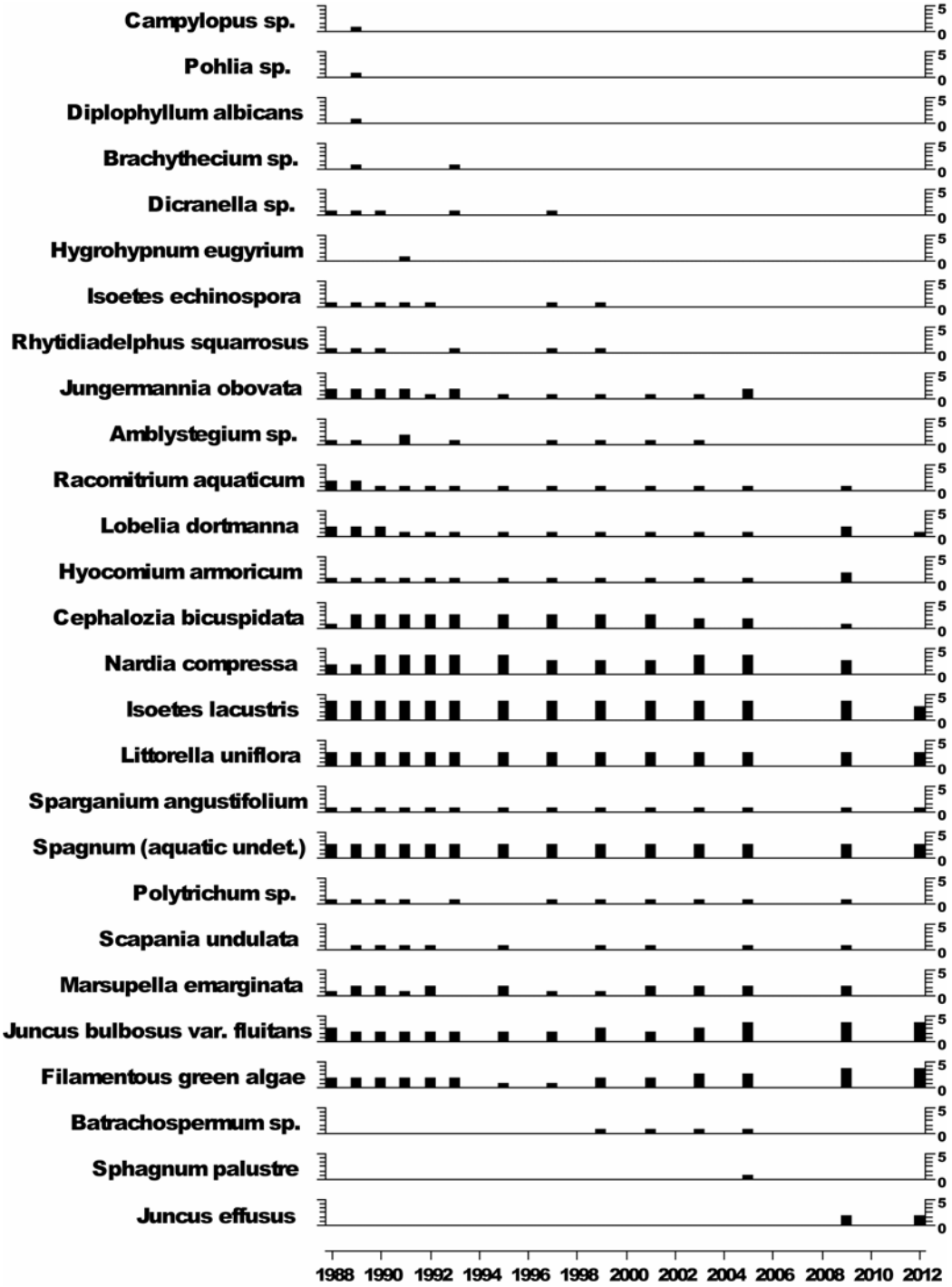


6.10.4.2. Summary statistics, Scoat Tarn



6.10.5. Aquatic macrophyte data, Scoat Tarn

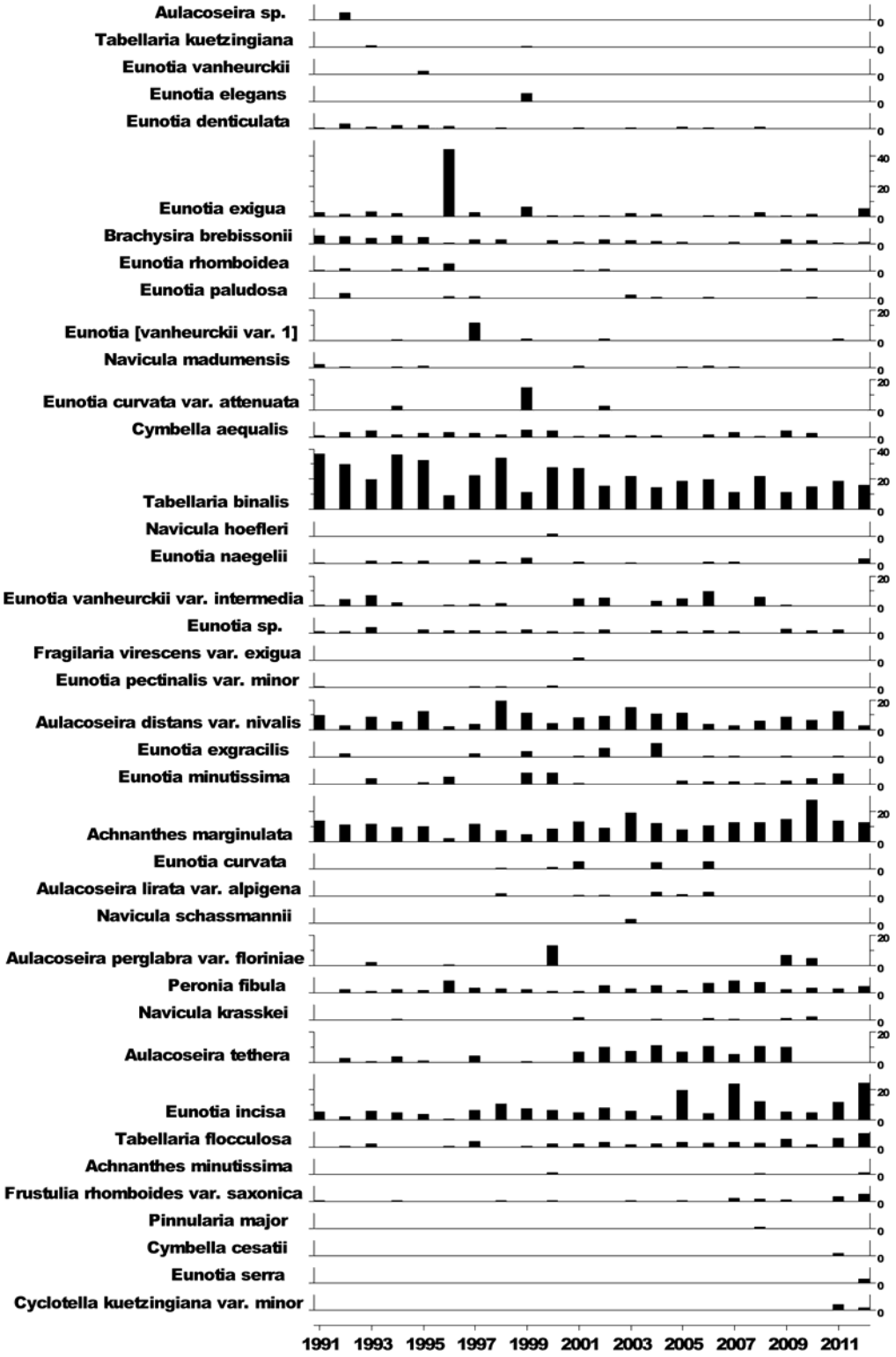
Species Scores (1-5)



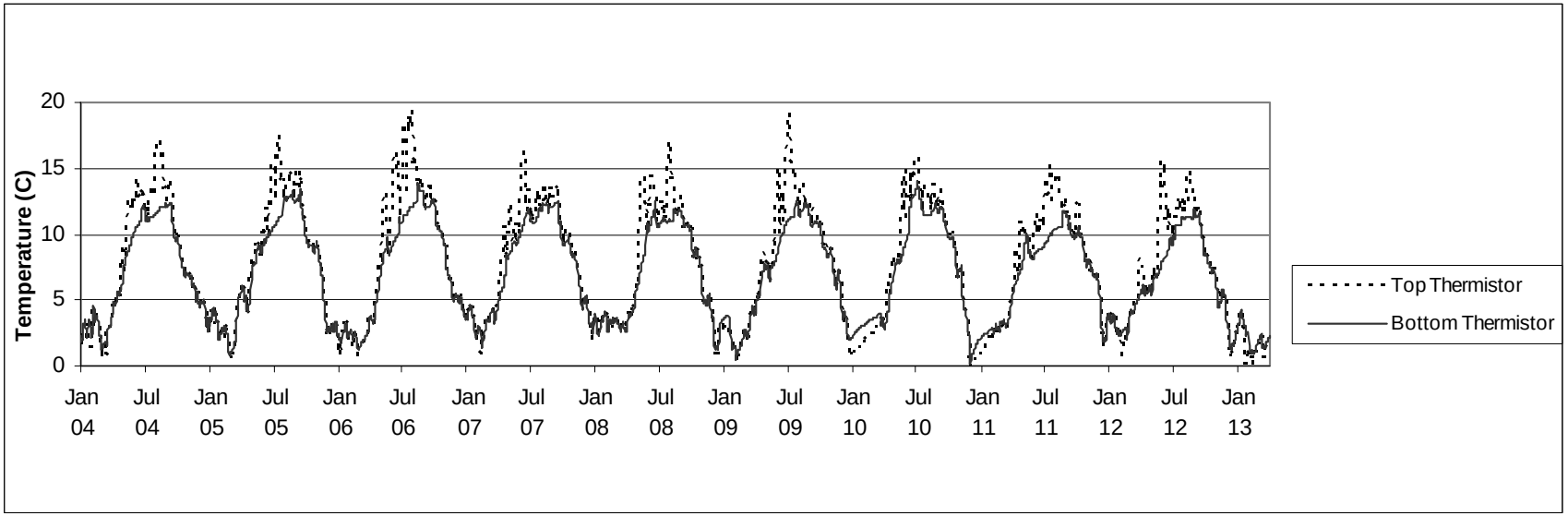
No survey in 2007 due to funding cuts
2012 Bryophyte IDs pending

6.10.6. Sediment trap data, Scoat Tarn

Relative percentage frequency of diatom taxa

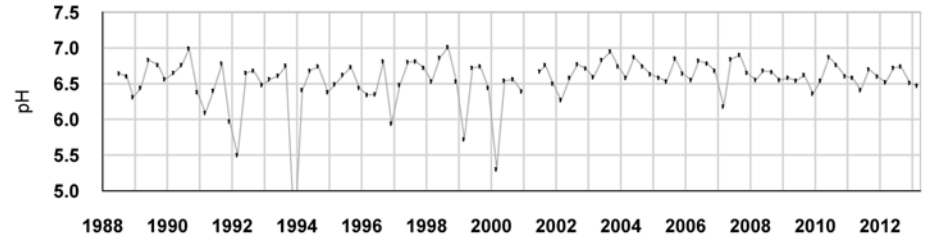


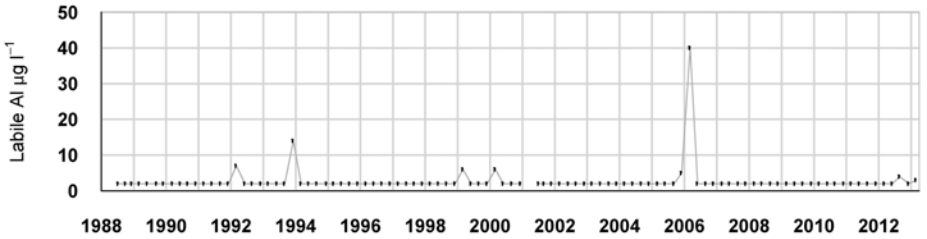
6.10.7. Thermistor data, Scoat Tarn

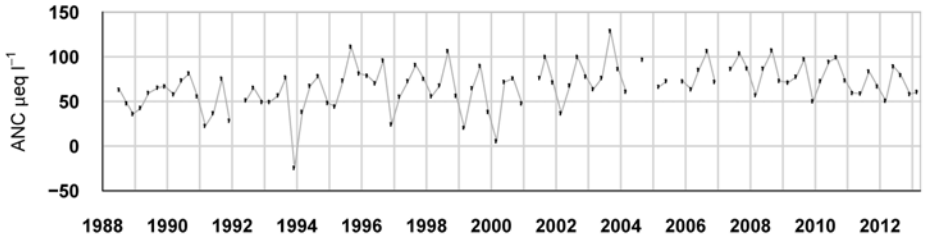


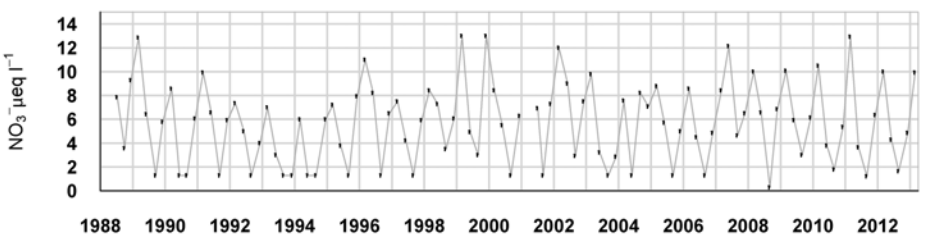
6.11. Burnmoor Tarn

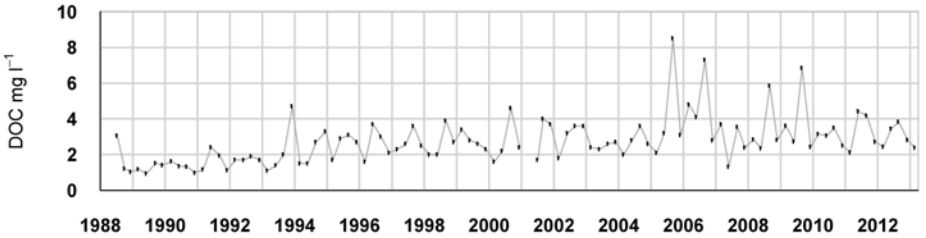
6.11.1. Spot sampled chemistry data

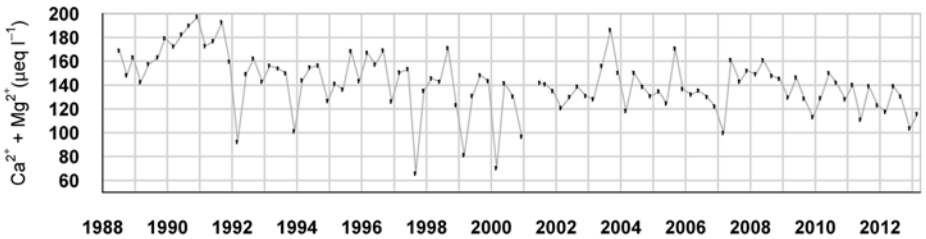


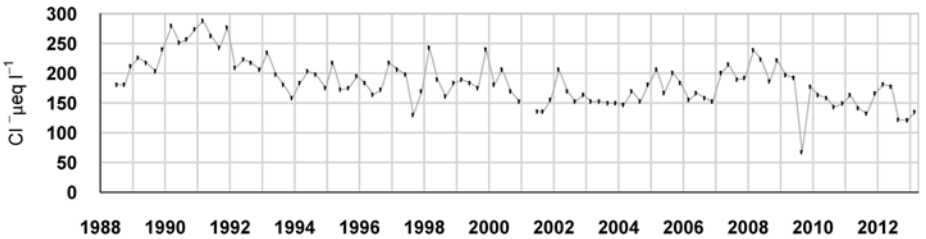








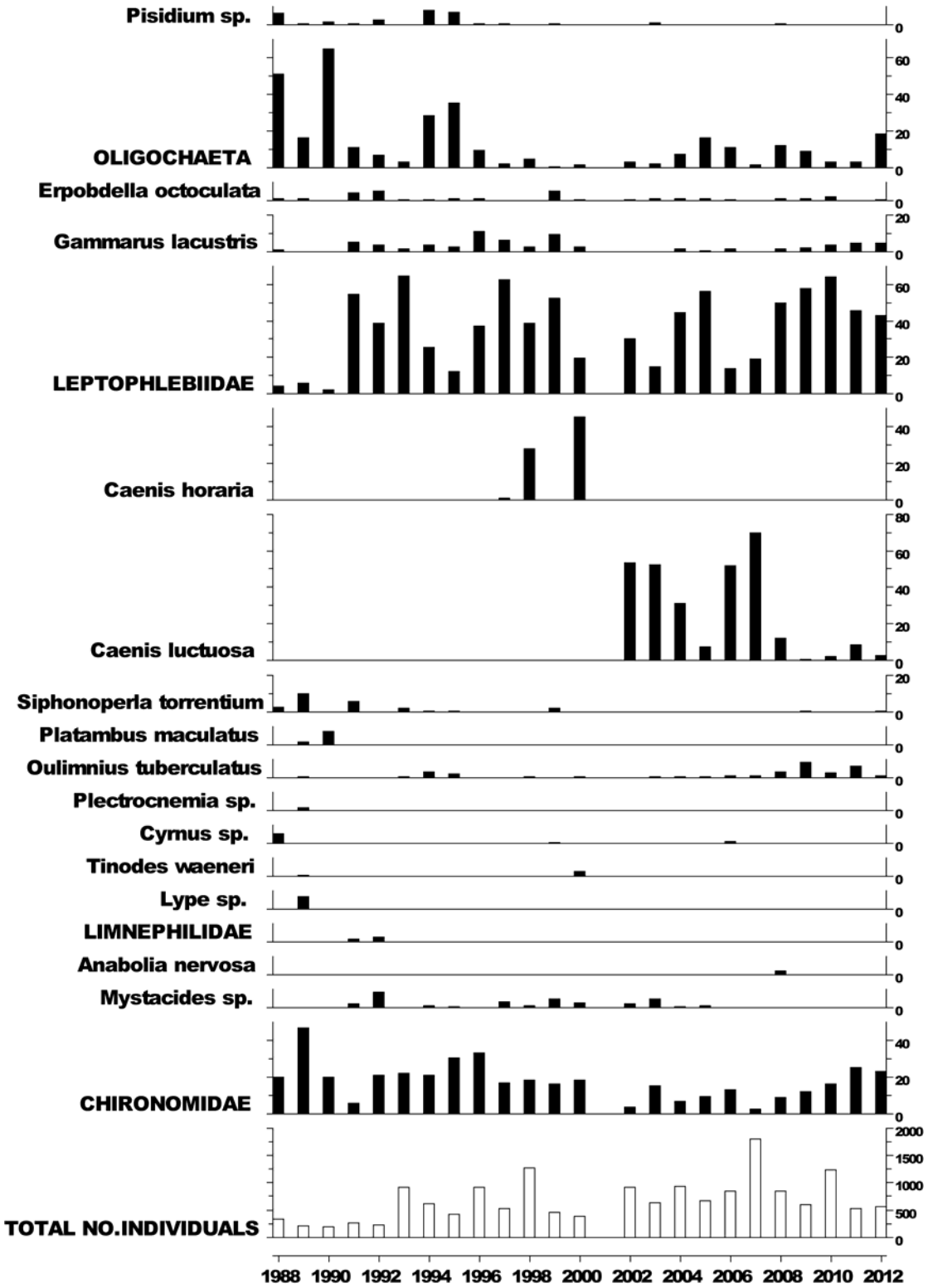




µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	*Soluble Al	*Labile Al	Cl^{-}	$*SO_4^{2-}$	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	6.51	54.24	95.45	67.49	207.56	8.90	7.34	2.24	232.13	81.53	57.20	5.51	1.51
12-13 mean	6.61	71.88	70.90	51.21	140.20	5.13	10.00	2.75	138.67	98.09	83.56	5.18	3.12
12-13 std dev	0.14	14.97	9.92	5.93	16.66	2.35	3.27	0.96	26.48	19.53	17.62	3.46	0.65

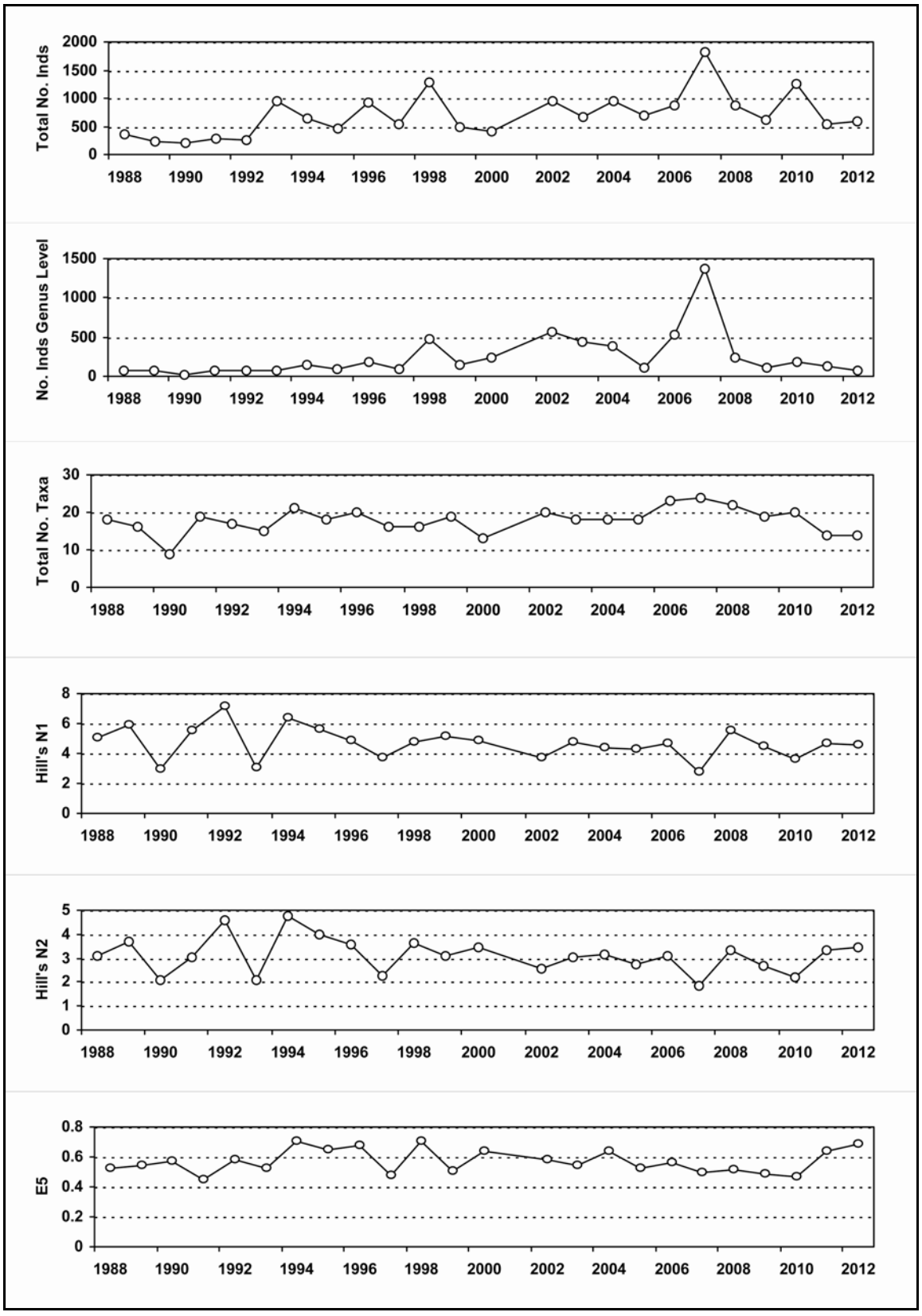
6.11.2. Macroinvertebrate data

6.11.2.1. Percentage abundance summary, Burnmoor Tarn



No sampling in 2001 due to Foot and Mouth restrictions.

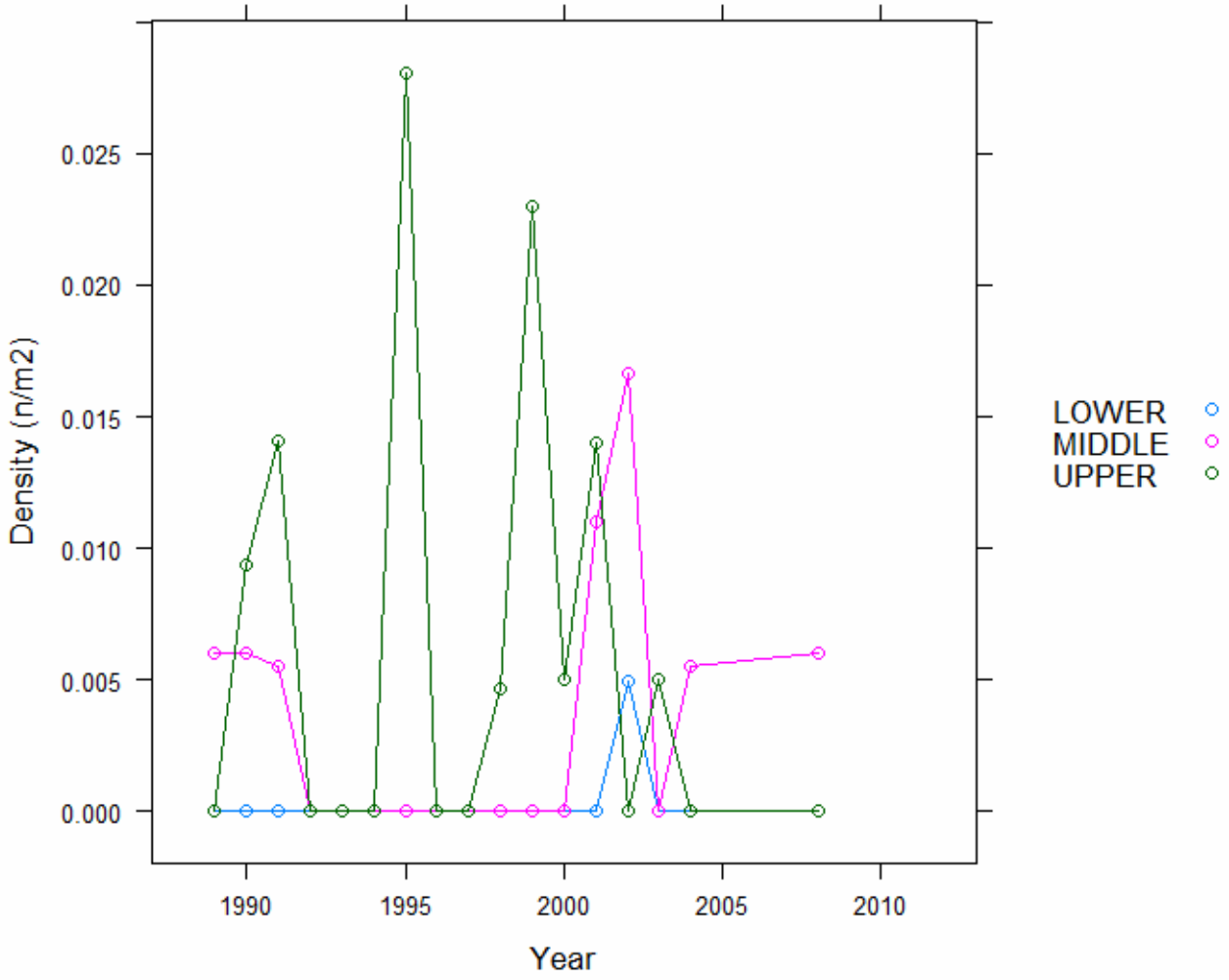
6.11.2.2. Summary statistics, Burnmoor Tarn



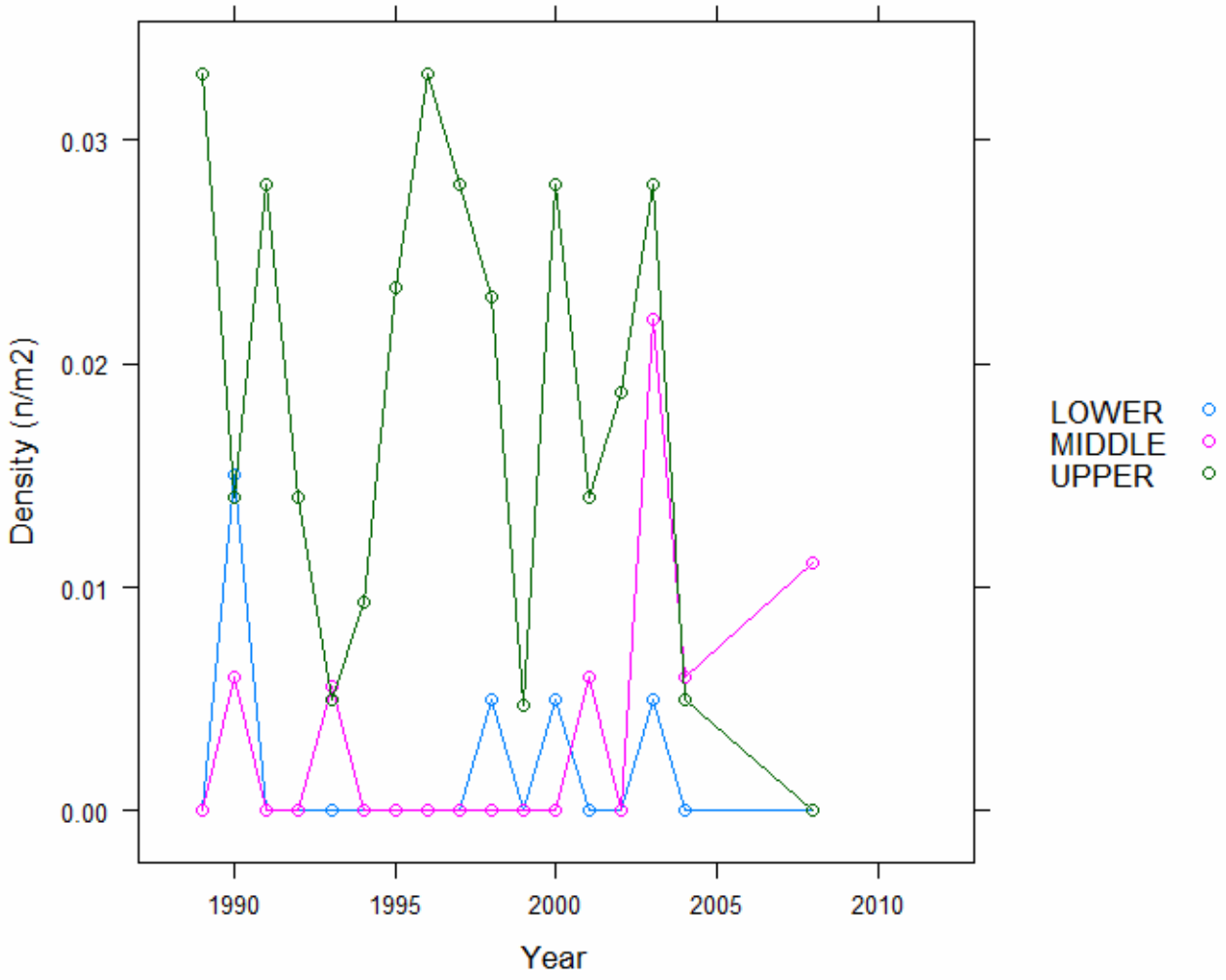
No sampling in 2001 due to Foot and Mouth restrictions.

6.11.3. Fish data (for outflow stream)

6.11.3.1. Summary of Trout fry densities (numbers m^{-2}), Burnmoor Tarn

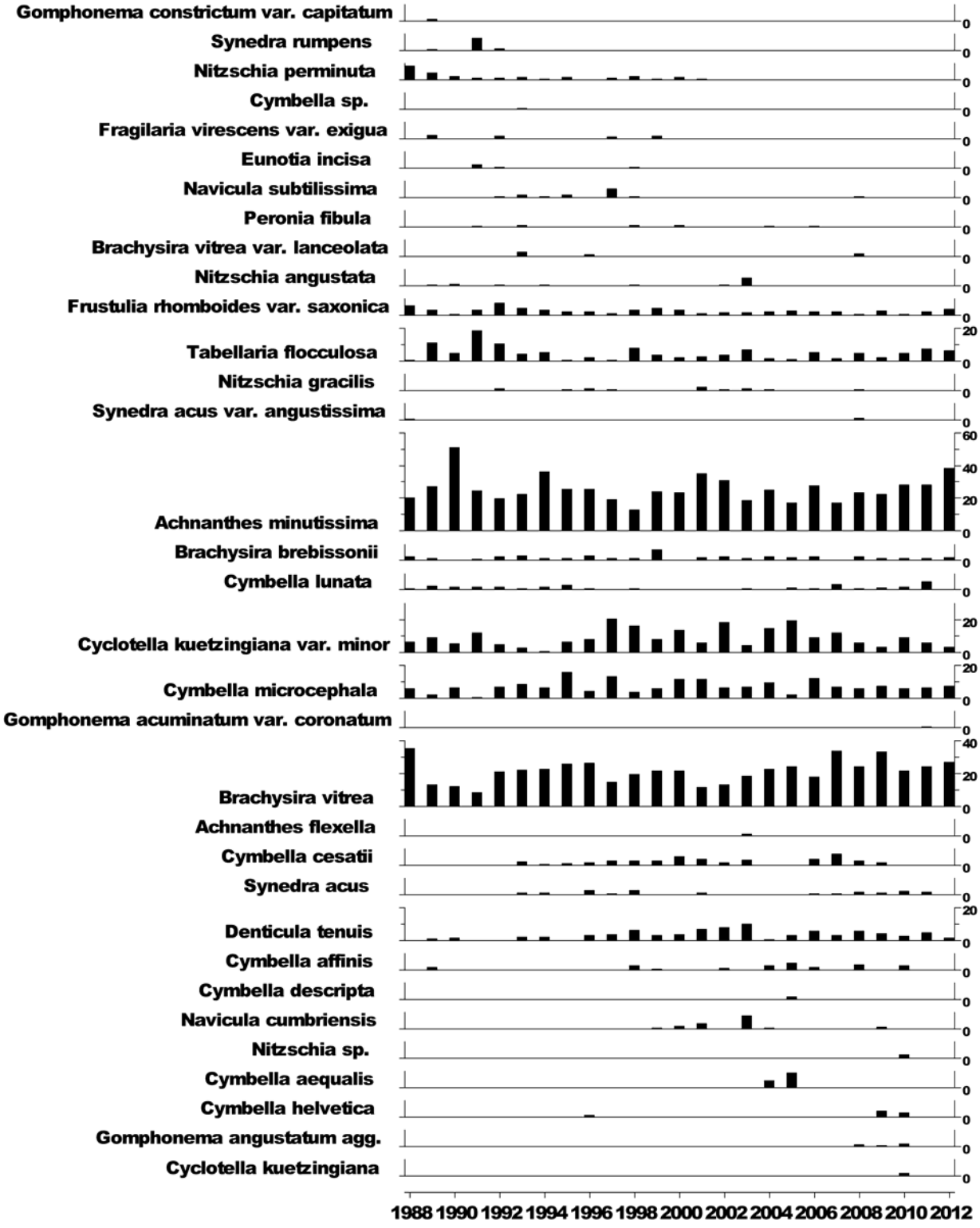


6.11.3.2. Summary of Trout parr densities (numbers m^{-2}), Burnmoor Tarn

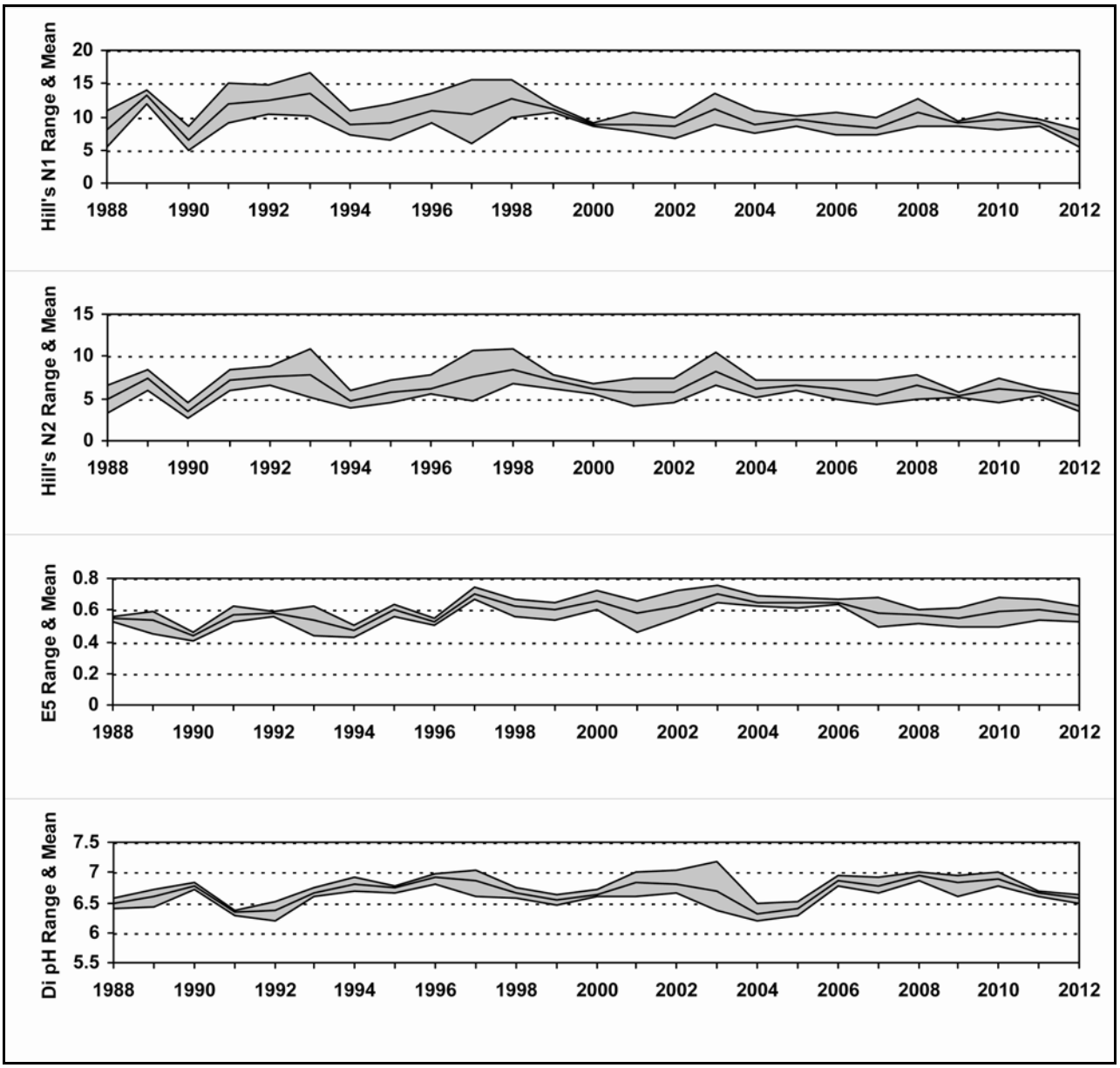


6.11.4. Epilithic diatom data

6.11.4.1. Percentage abundance summary, Burnmoor Tarn

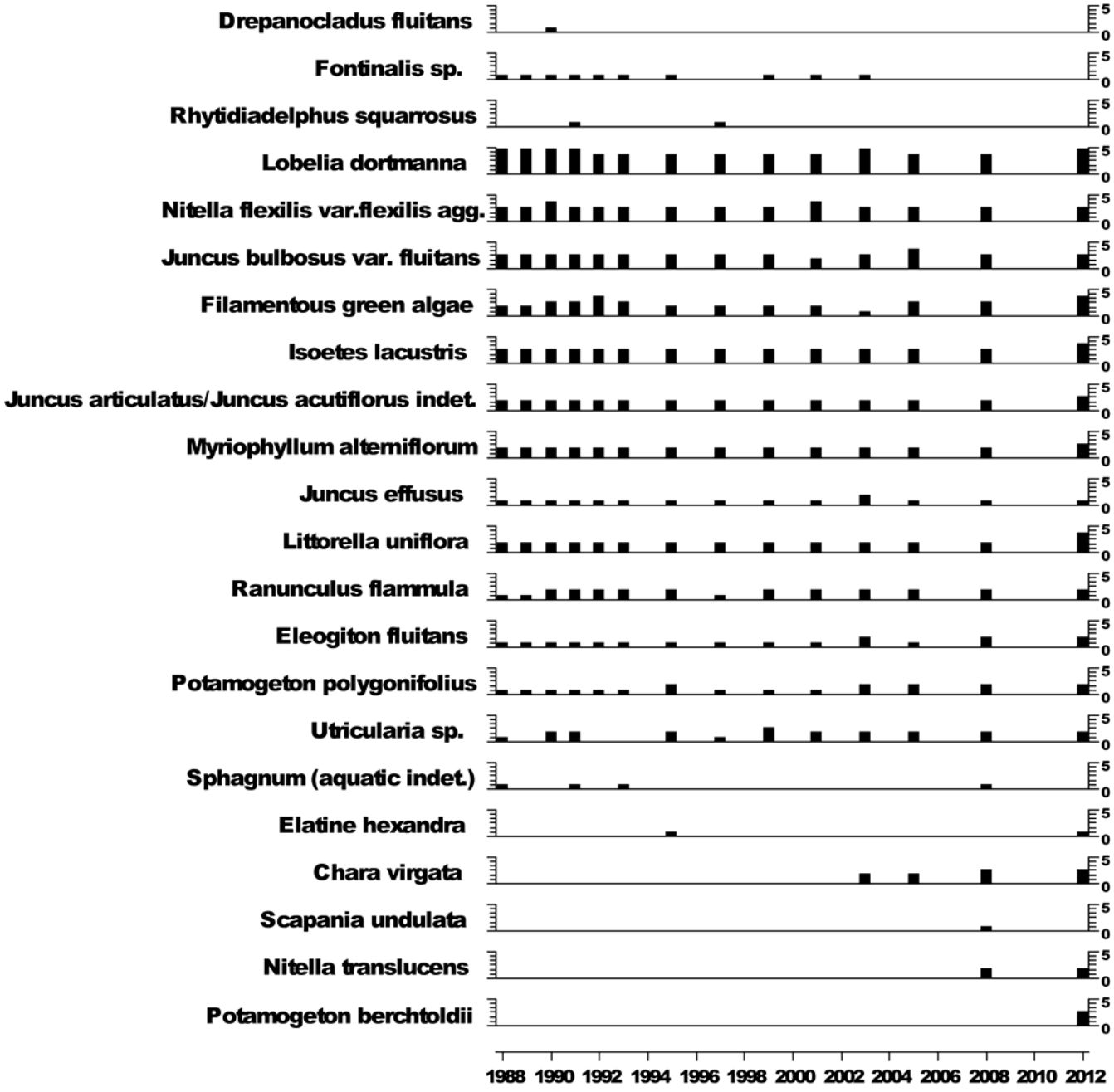


6.11.4.2. Summary statistics, Burnmoor Tarn



6.11.5. Aquatic macrophyte data, Burnmoor Tarn

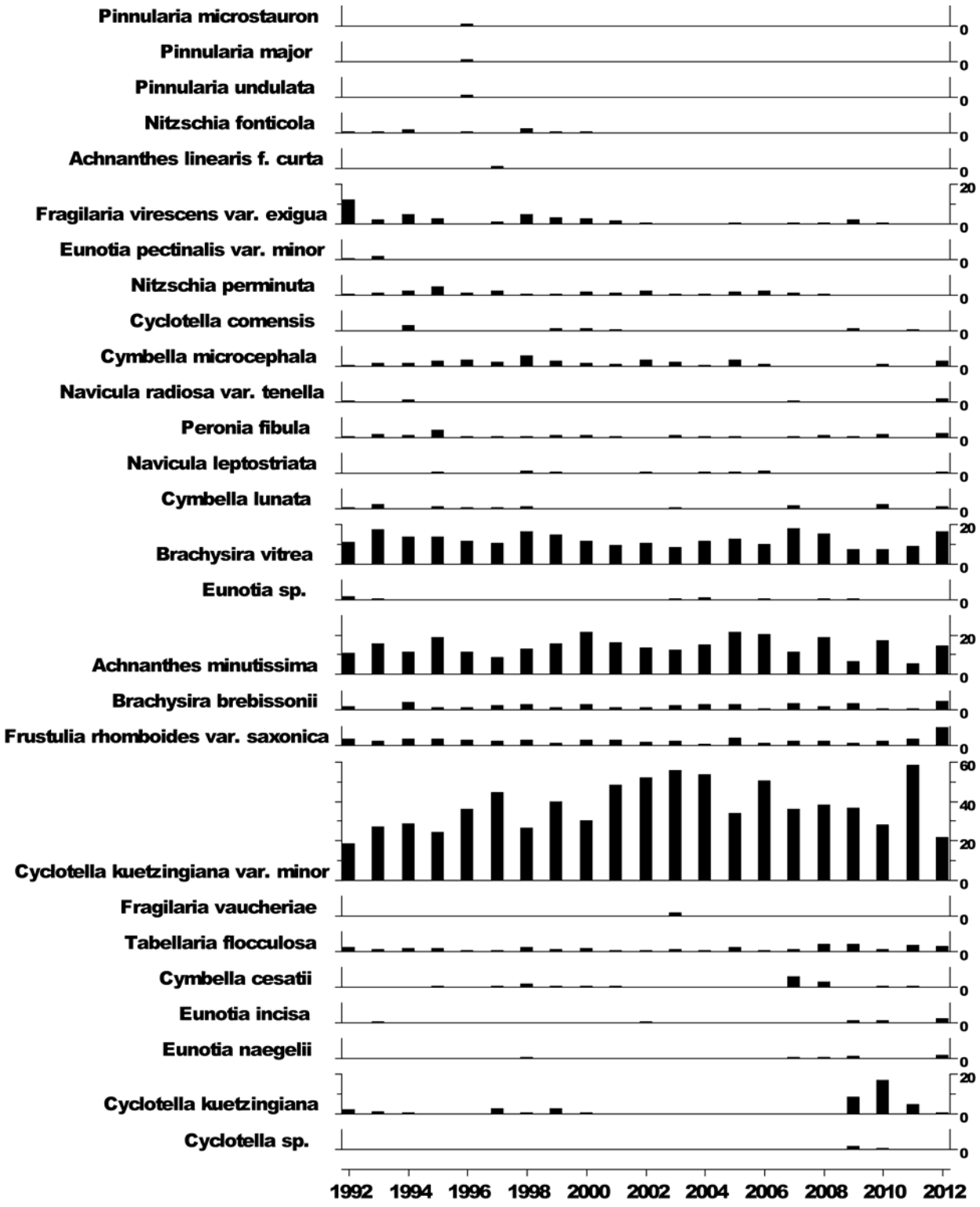
Species Scores (1-5)



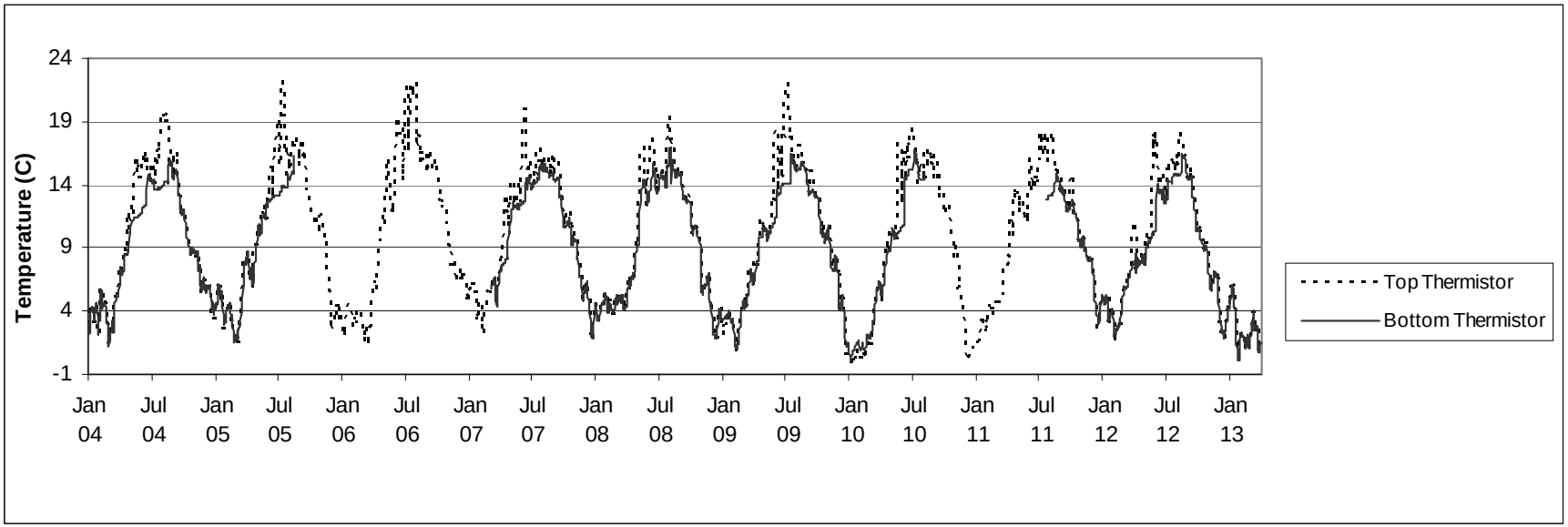
No survey in 2007 due to funding cuts
2012 Bryophyte IDs pending

6.11.6. Sediment trap data, Burnmoor Tarn

Relative percentage frequency of diatom taxa



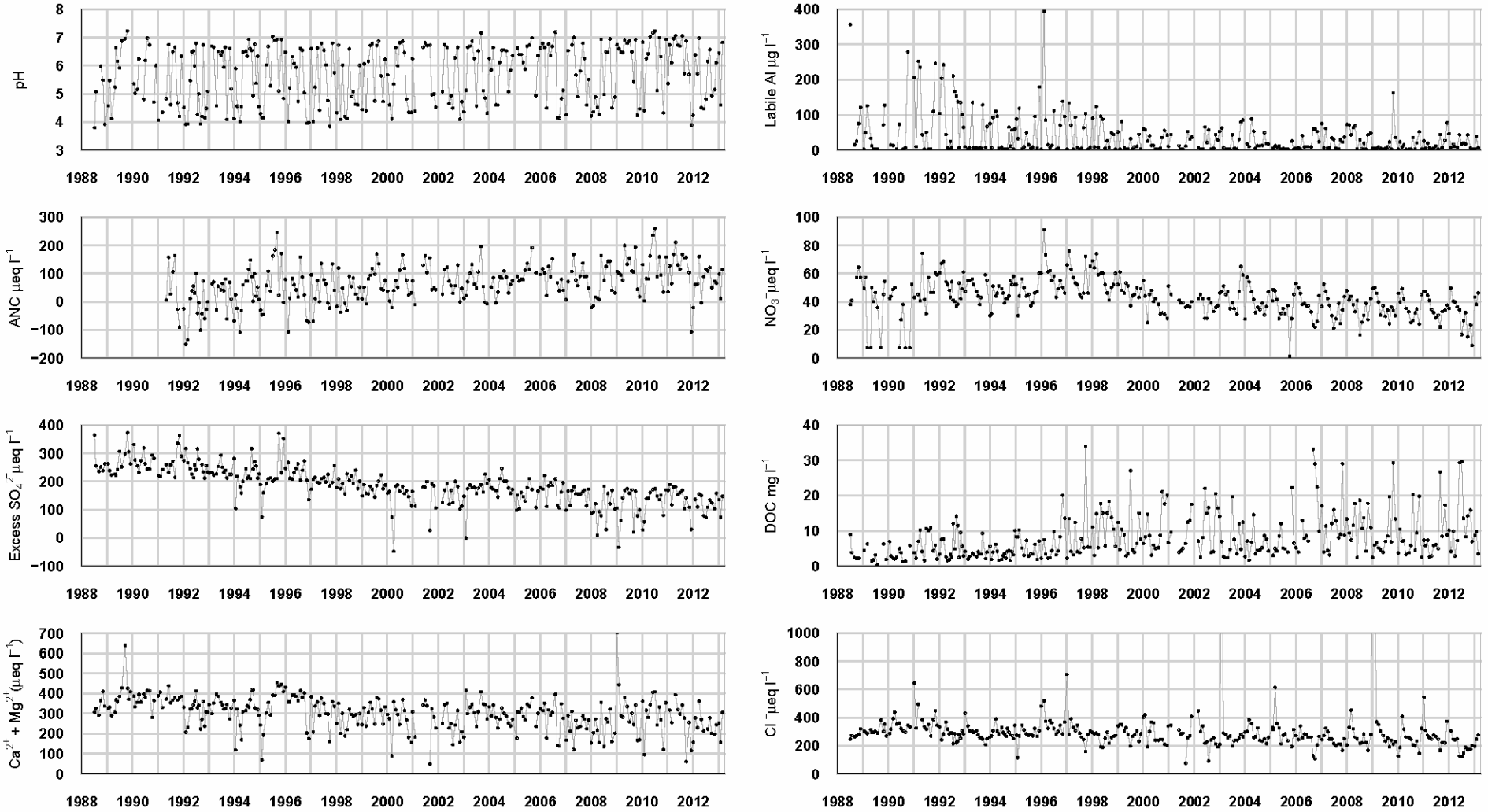
6.11.7. Thermistor data, Burnmoor Tarn



Thermistor Buoy dragged by ice in winter 2007 into shallower water. Replaced in original position 06/08/08.

6.12. River Etherow

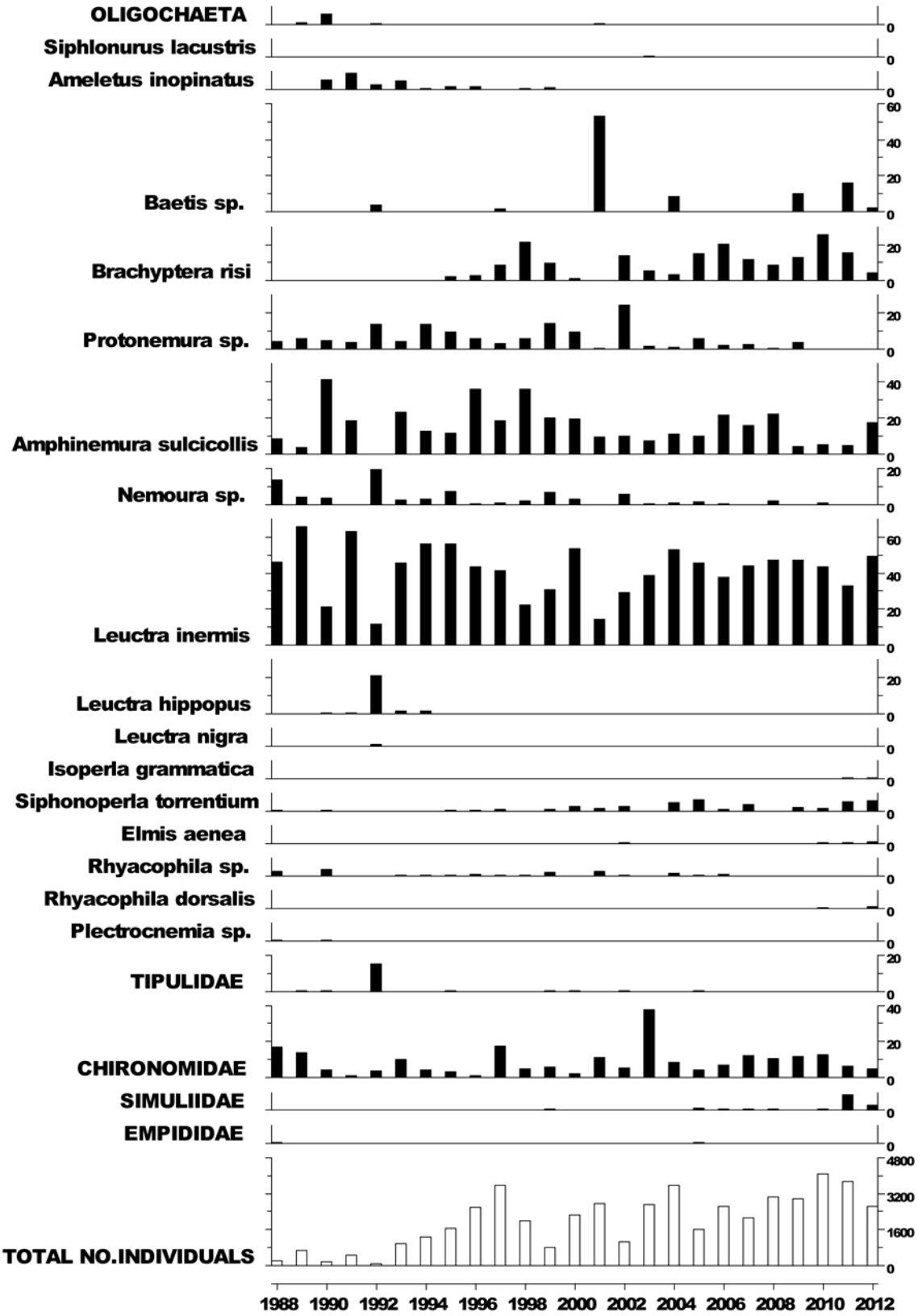
6.12.1. Spot sampled chemistry data



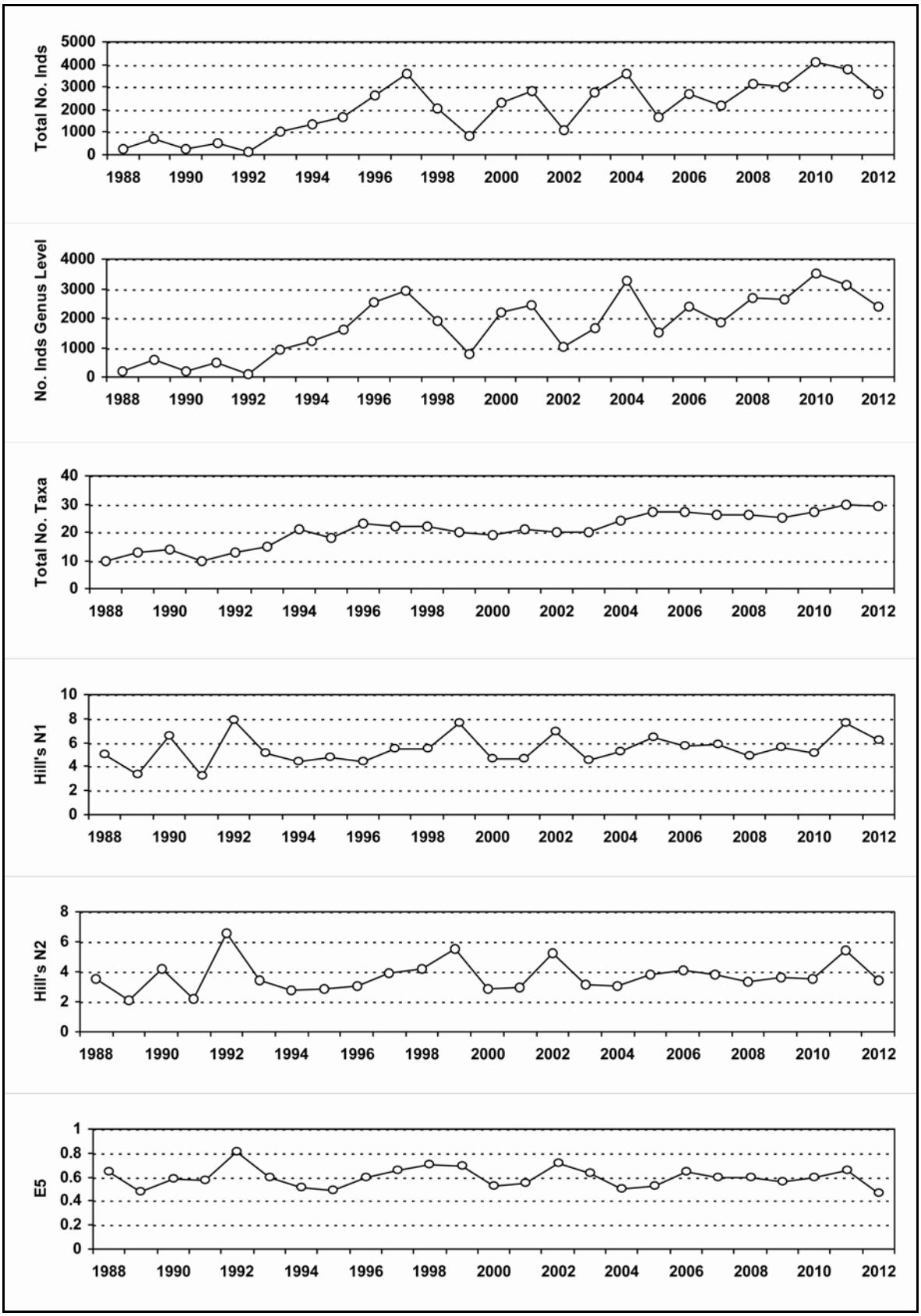
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4 $^{2-}$	xSO_4 $^{2-}$	NO_3 $^{-}$	**DOC
Mean 1st 5 yrs	5.44	7.84	180.29	173.15	303.50	19.99	150.94	80.09	319.24	295.30	261.65	44.77	4.57
12-13 mean	5.67	78.69	125.32	114.95	227.13	14.71	101.75	18.19	205.57	141.23	119.67	32.74	10.99
12-13 std dev	0.99	53.06	30.15	28.62	42.77	3.26	61.85	15.57	56.04	33.61	30.15	11.67	8.22

6.12.2. Macroinvertebrate data

6.12.2.1. Percentage abundance summary, River Etherow



6.12.2.2. Summary statistics, River Etherow

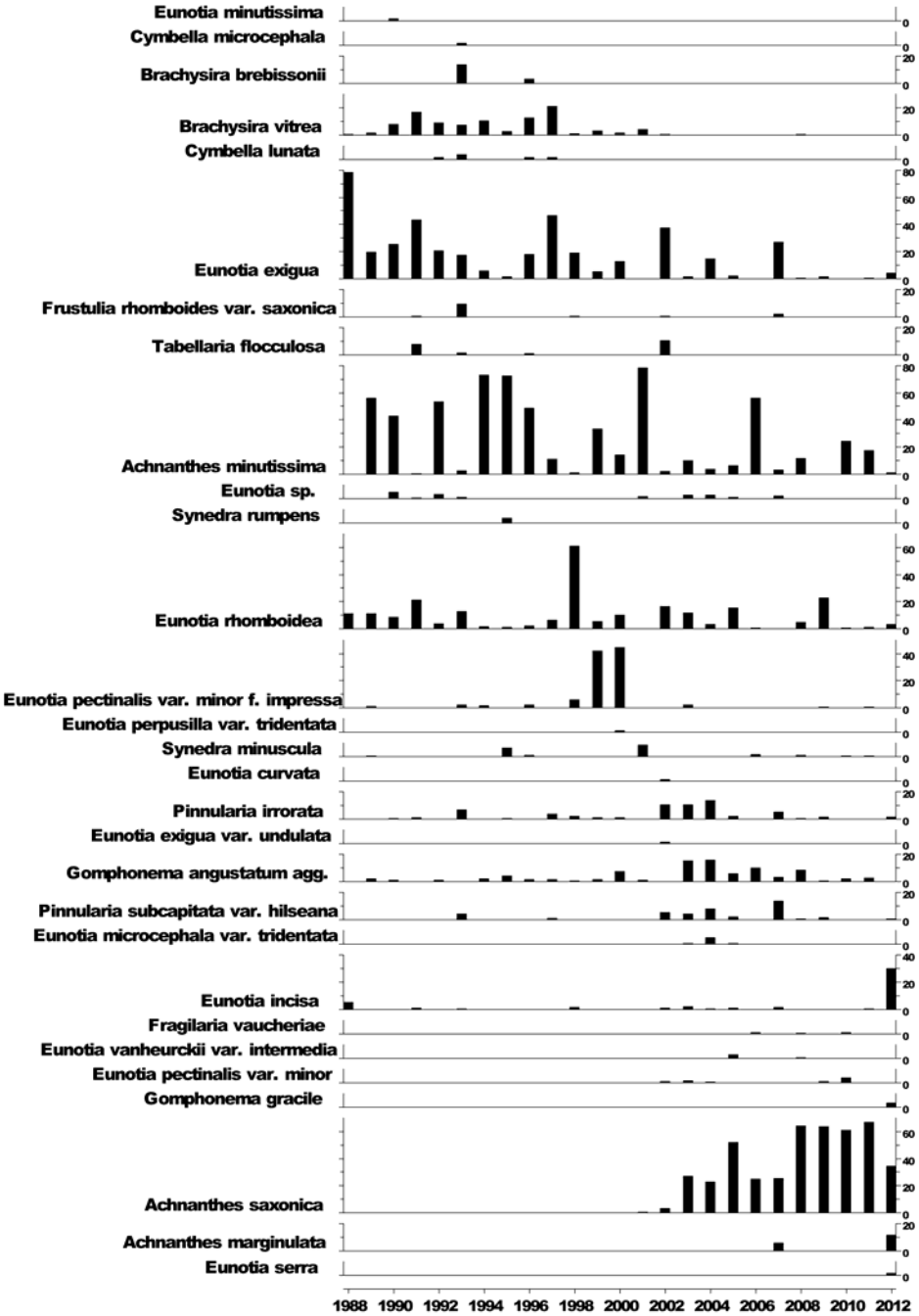


6.12.3. Fish data

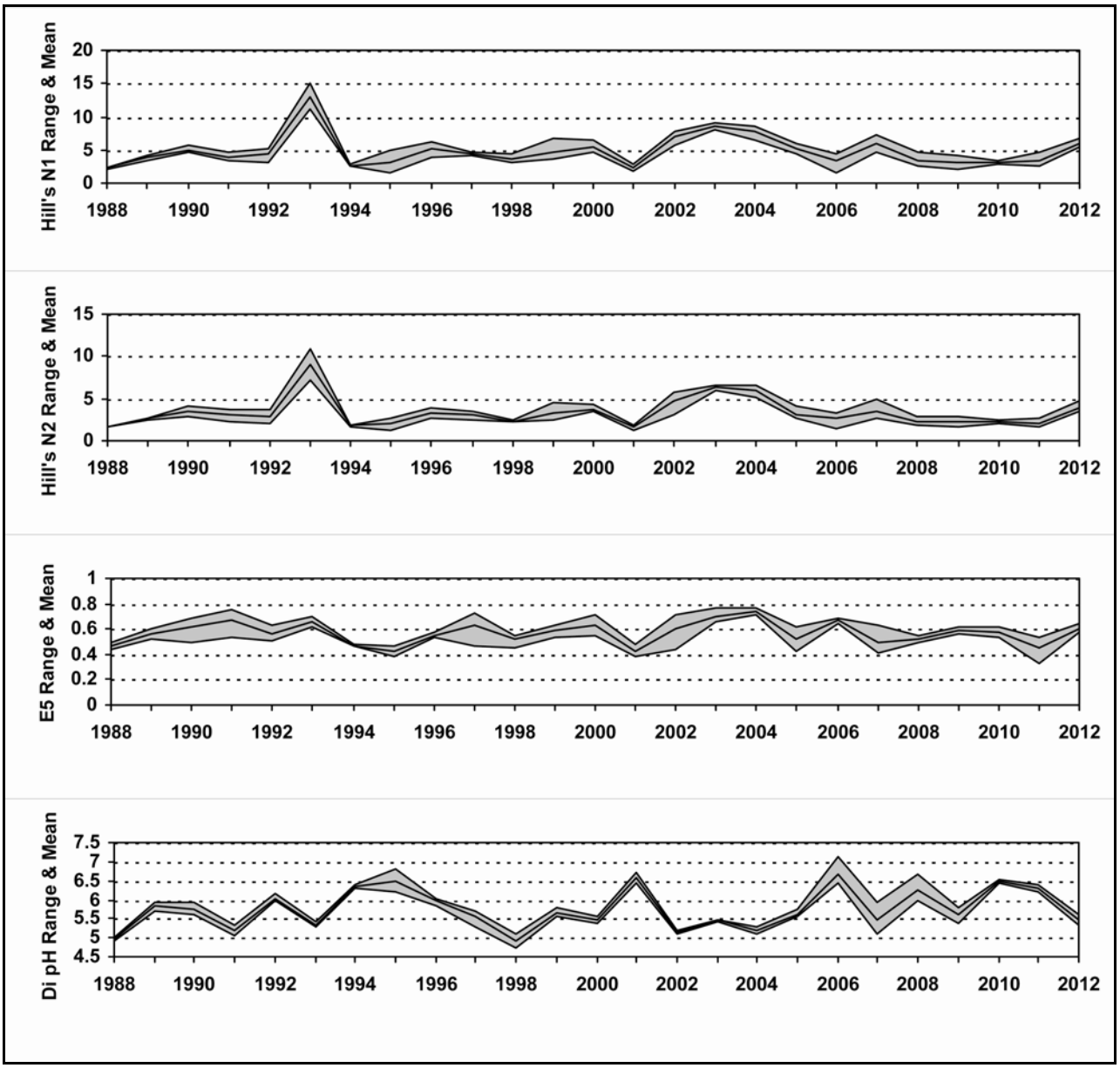
No fish are present in this reach of the river.

6.12.4. Epilithic diatom data

6.12.4.1. Percentage abundance summary, River Etherow

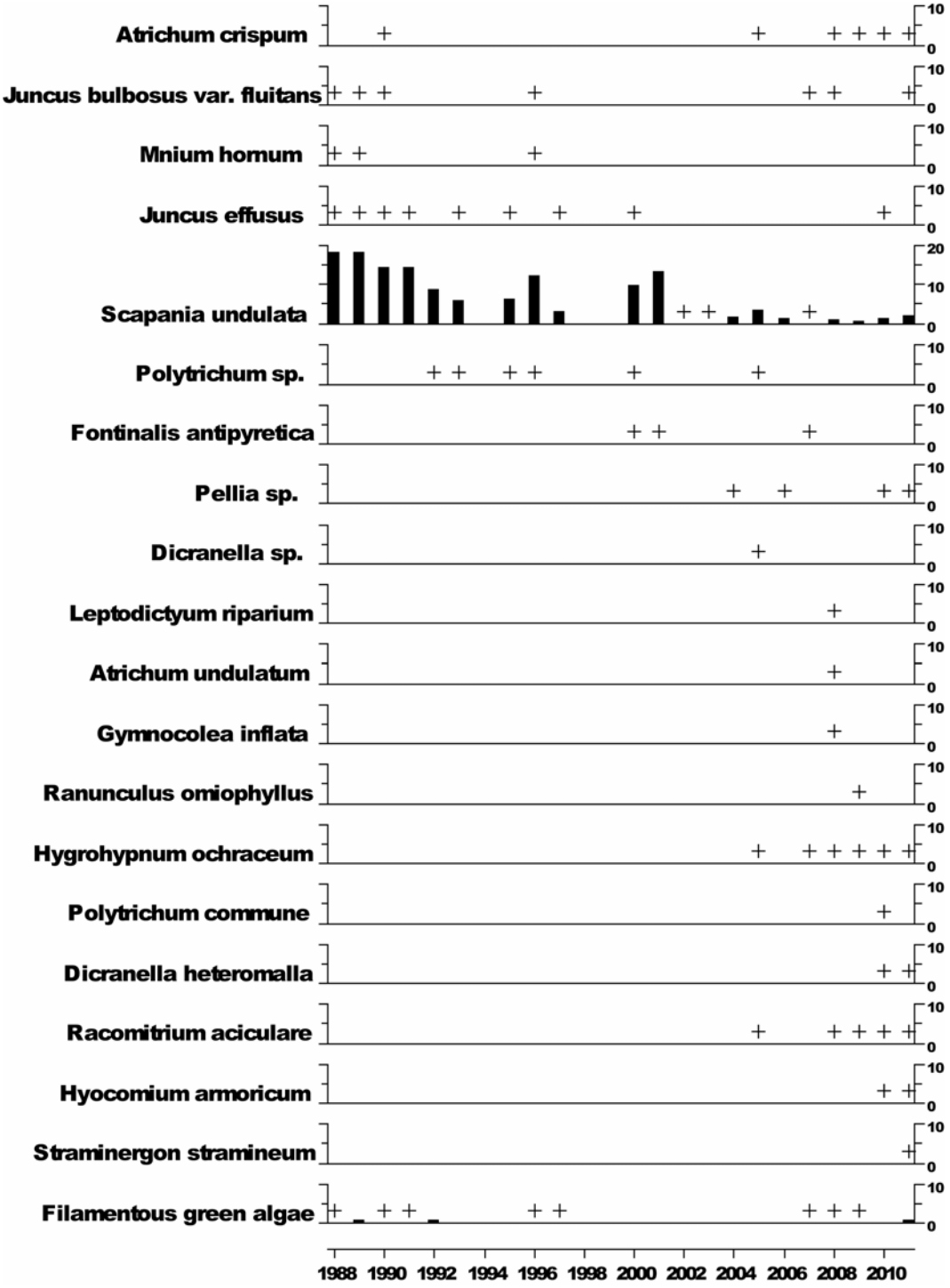


6.12.4.2. Summary statistics, River Etherow



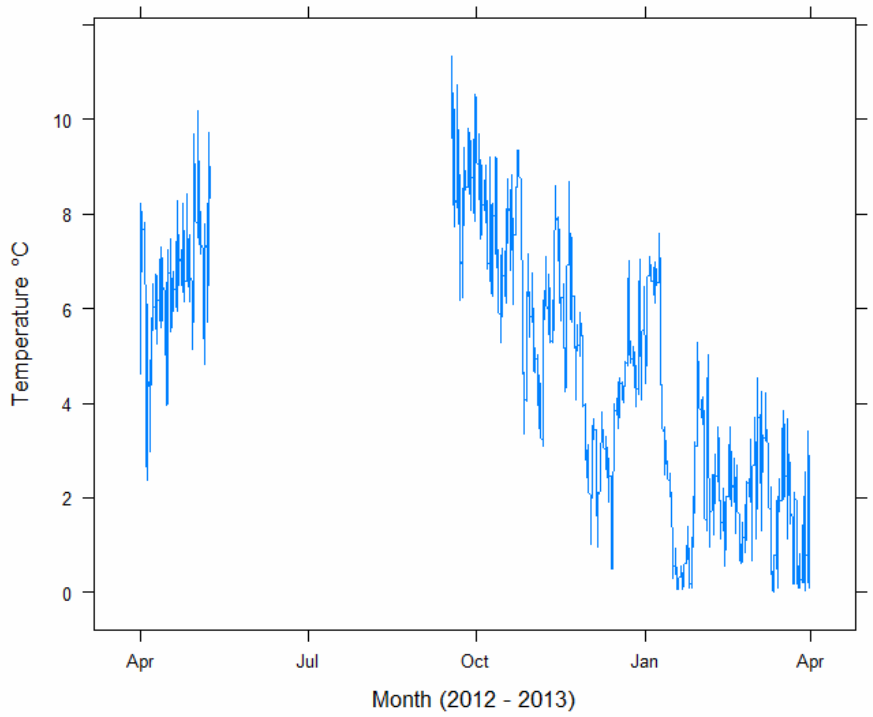
6.12.5. Aquatic macrophyte data, River Etherow

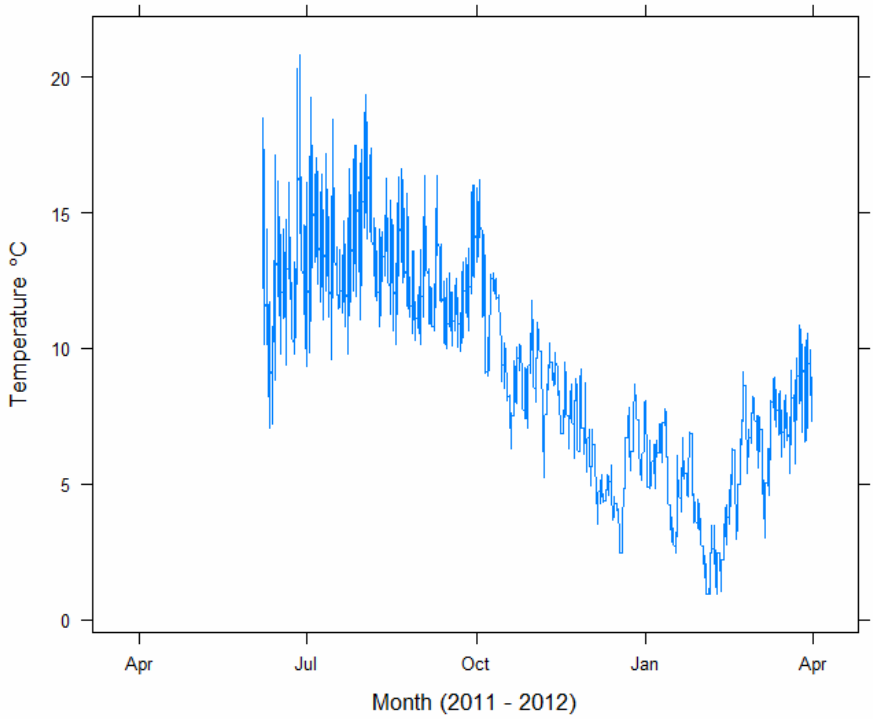
Percentage Species Cover



+ Represents <0.9% abundance

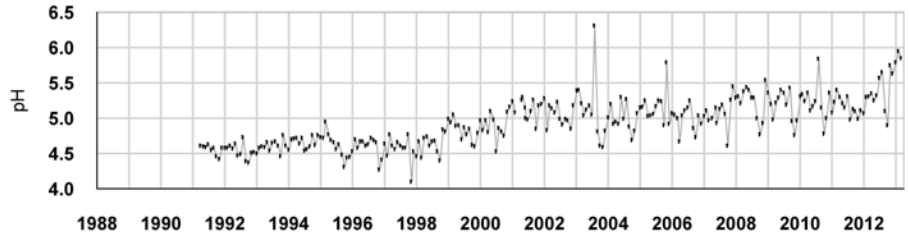
6.12.6. Thermistor data, River Etherow

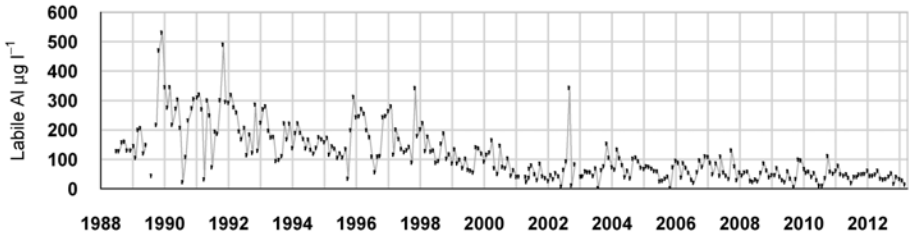


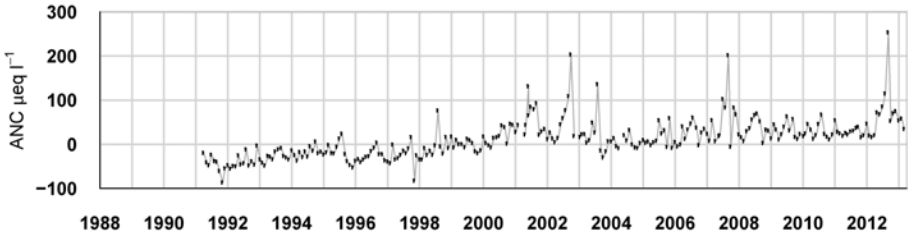


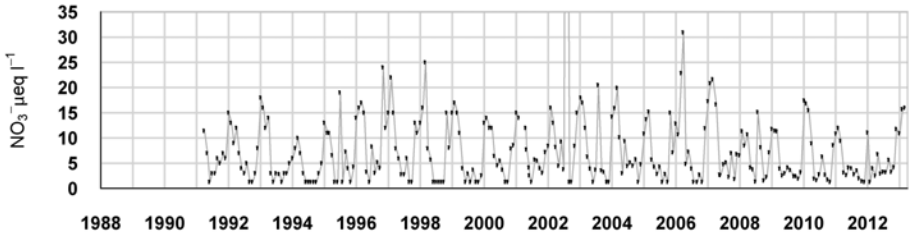
6.13. Old Lodge

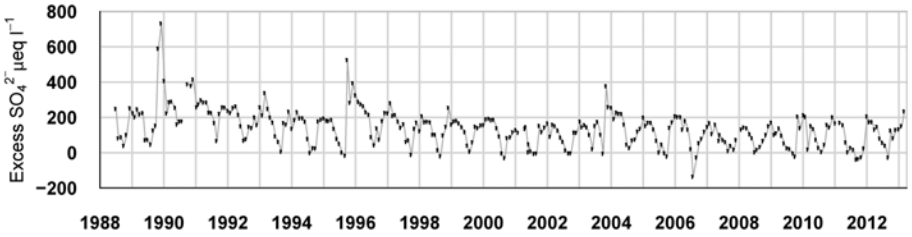
6.13.1. Spot sampled chemistry data

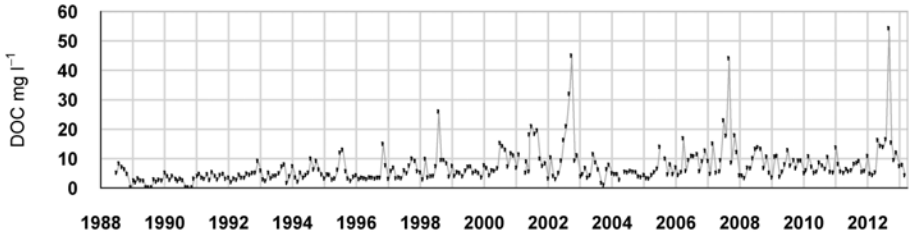


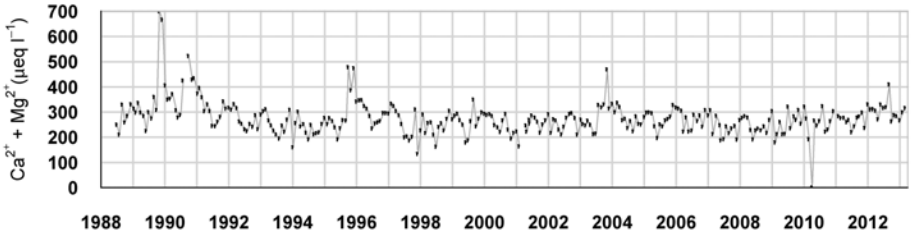


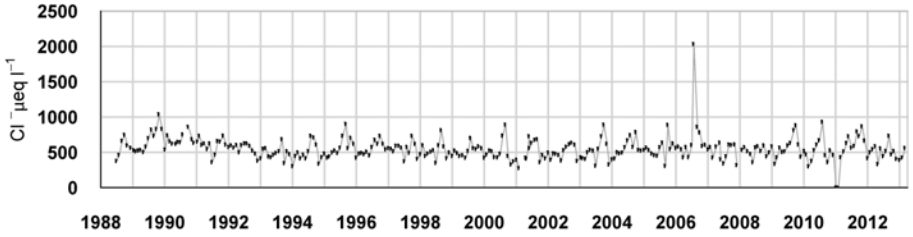








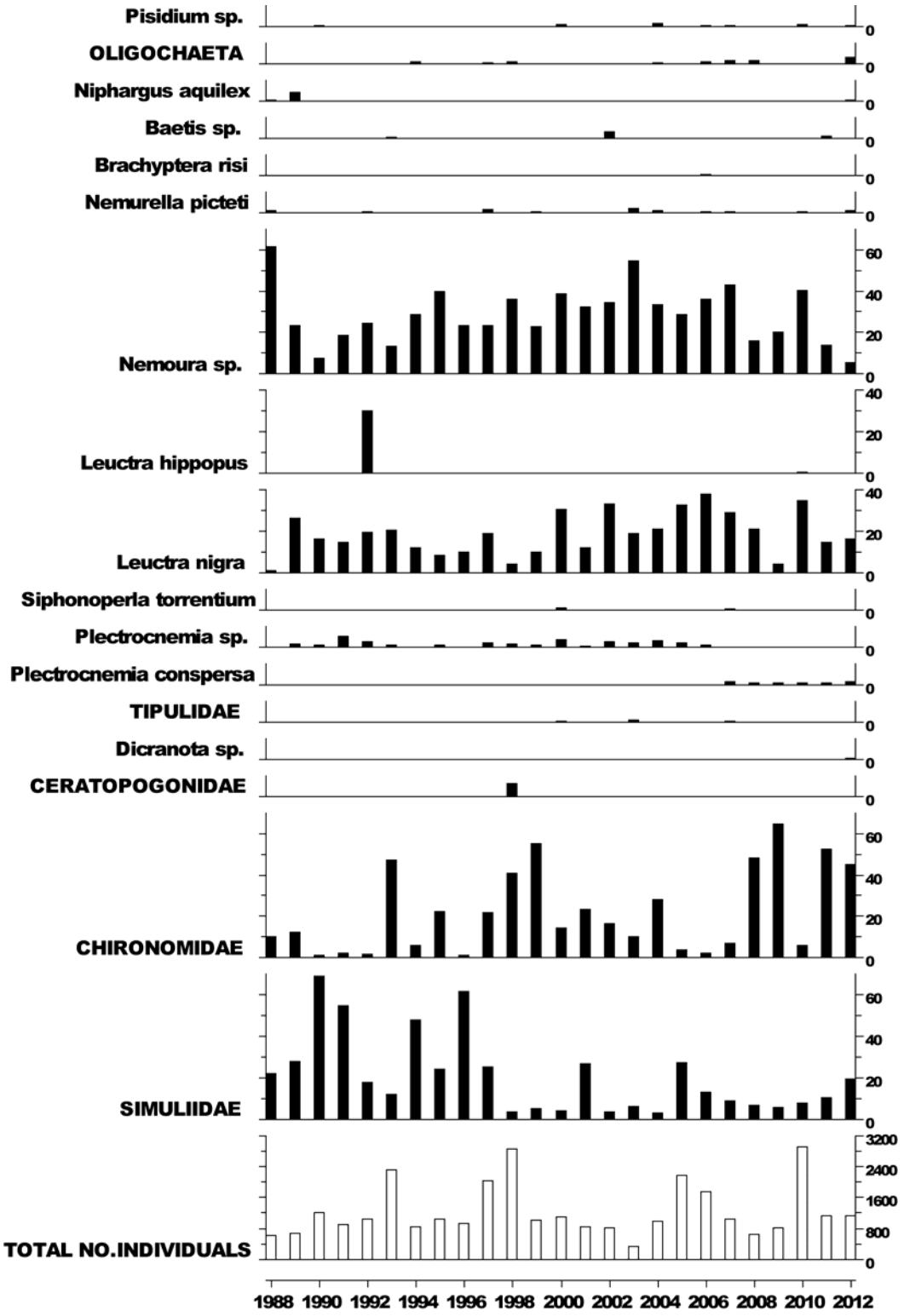




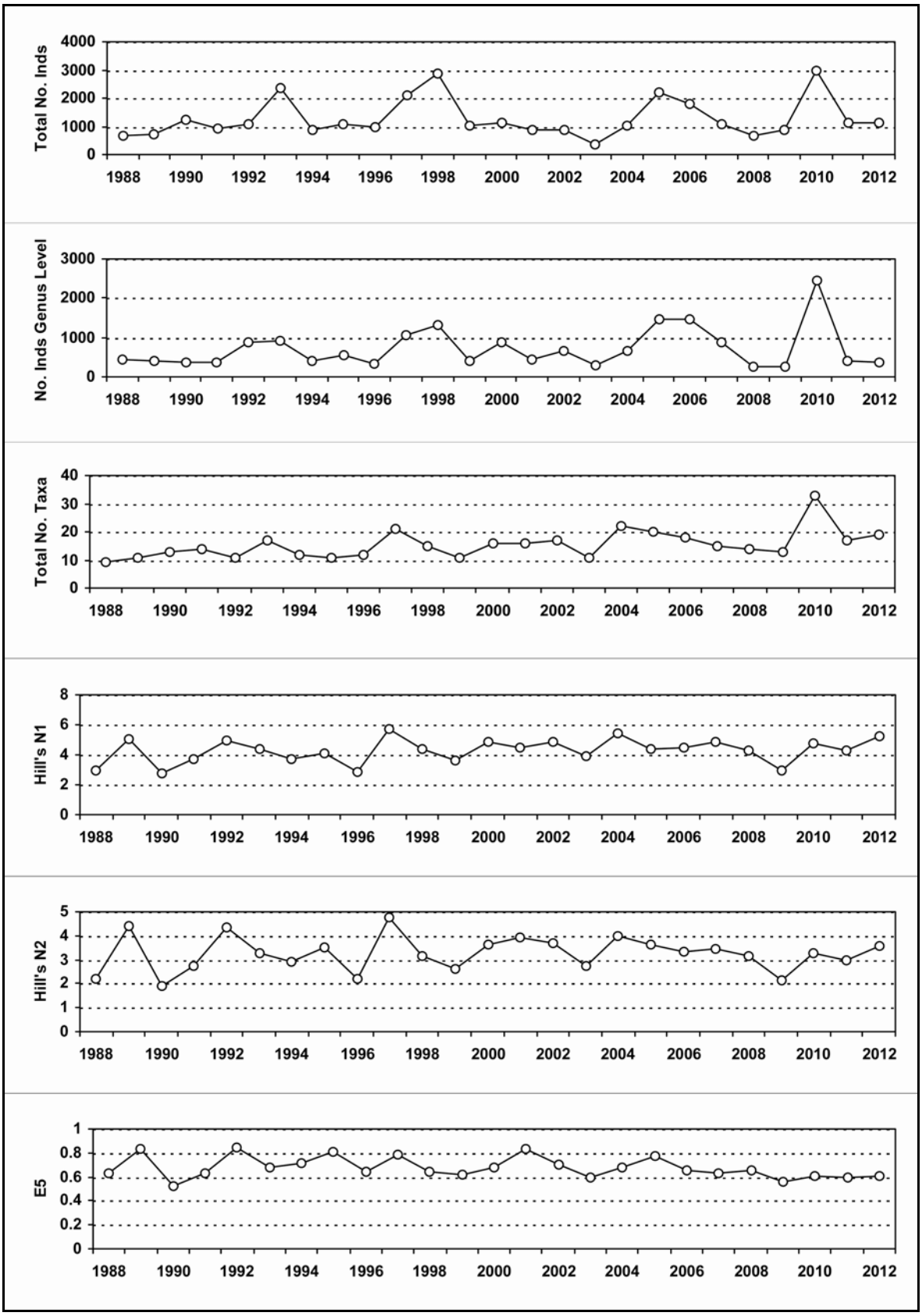
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	4.55	-40.41	165.28	154.17	485.80	21.85	266.19	221.03	606.47	287.31	223.72	7.24	3.50
12-13 mean	5.51	79.82	186.54	119.07	402.96	25.72	171.17	36.00	495.79	157.94	105.95	7.19	14.77
12-13 std dev	0.32	59.73	20.22	25.69	69.90	11.24	127.50	13.56	107.47	61.75	66.33	5.07	13.16

6.13.2. Macroinvertebrate data

6.13.2.1. Percentage abundance summary, Old Lodge

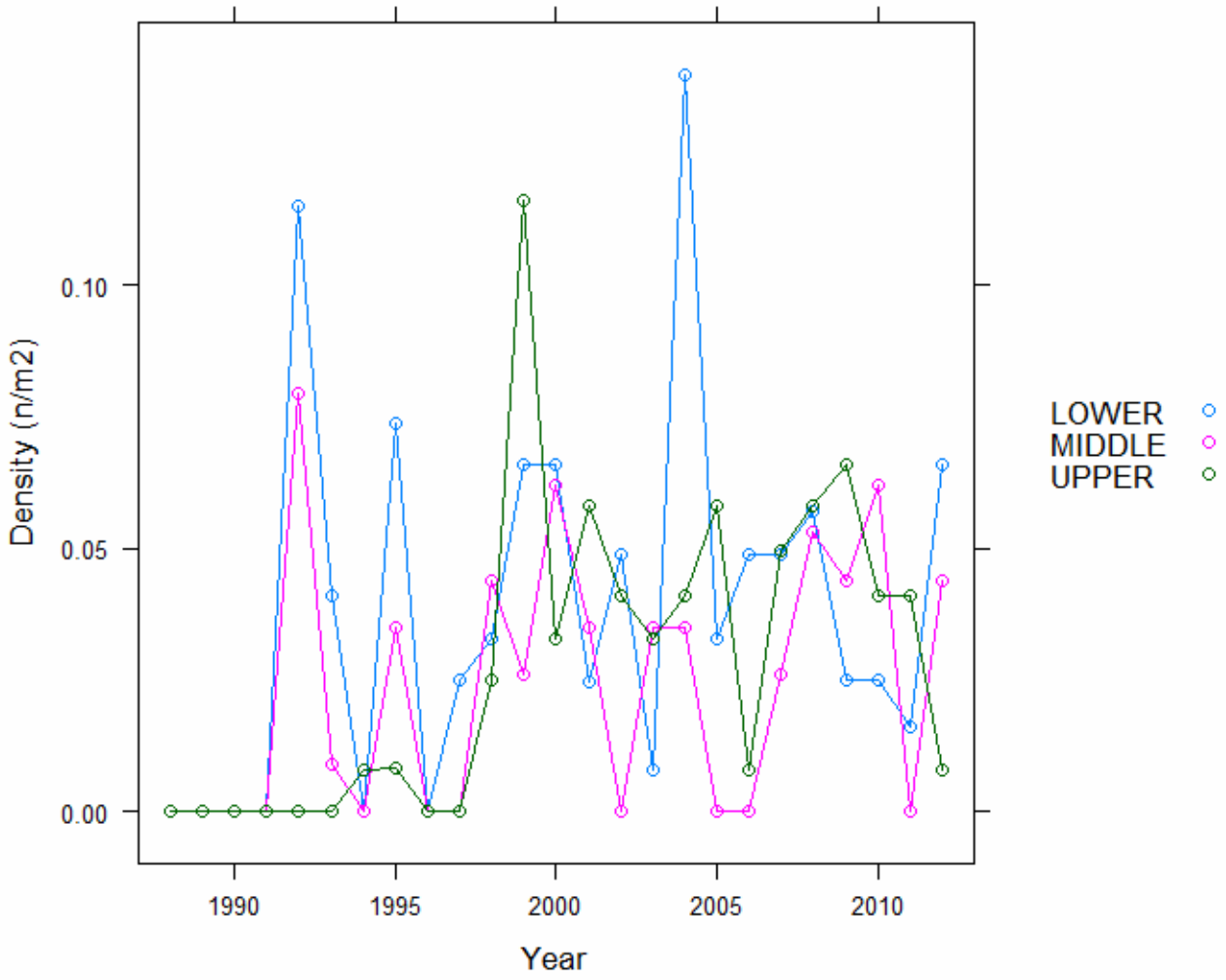


6.13.2.2. Summary statistics, Old Lodge

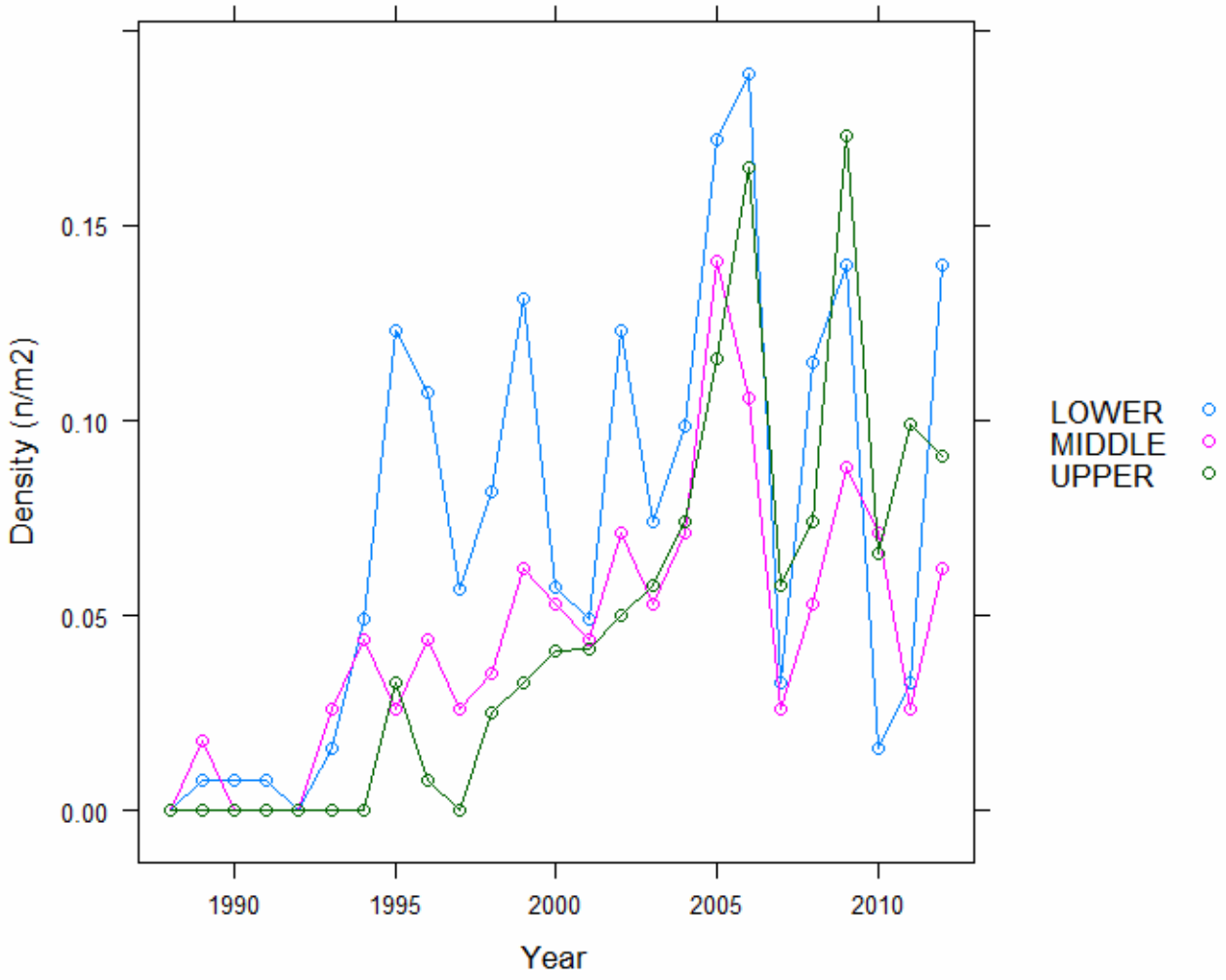


6.13.3. Fish data

6.13.3.1. Summary of Trout fry densities (numbers m^{-2}), Old Lodge

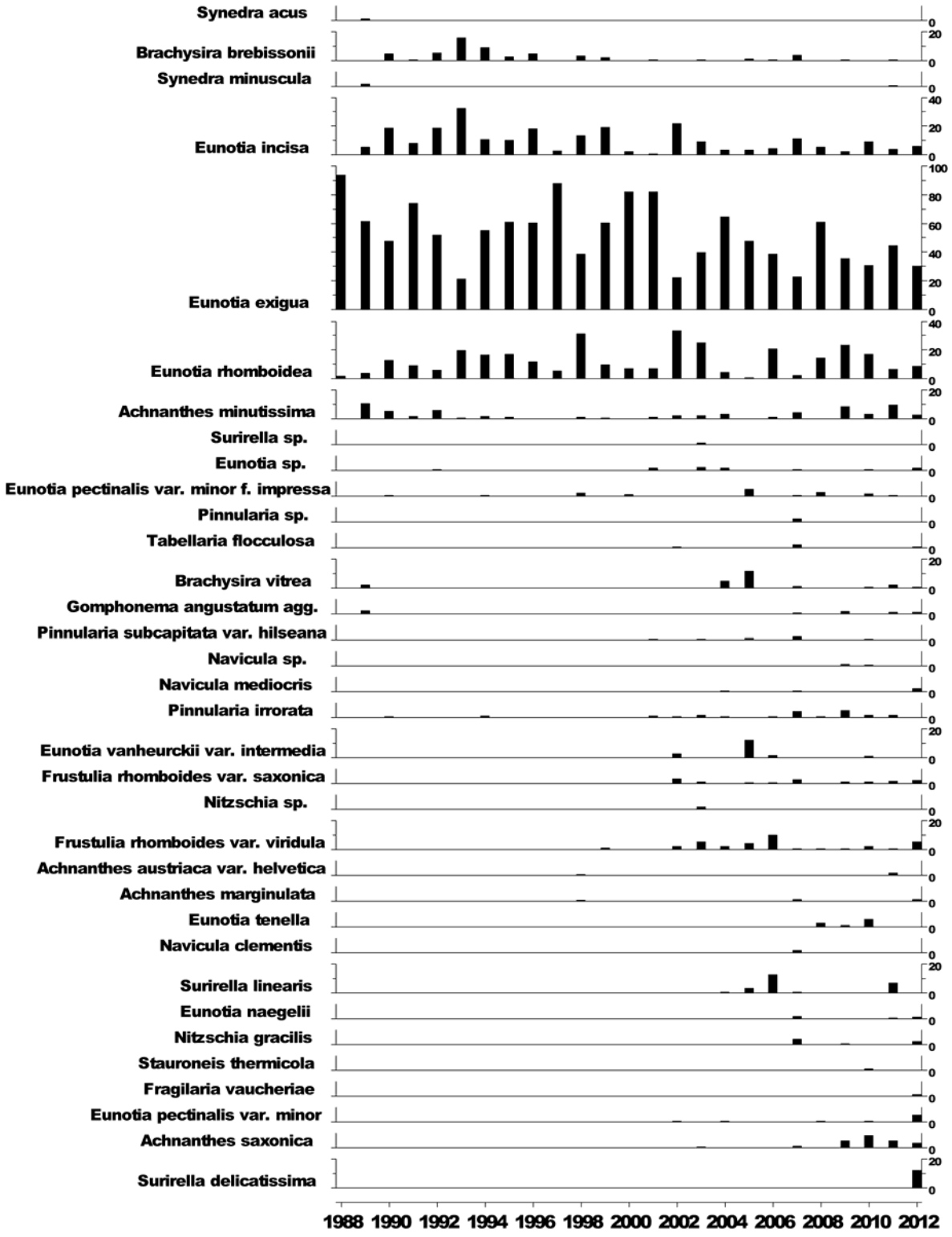


6.13.3.2. Summary of Trout parr densities (numbers m^{-2}), Old Lodge

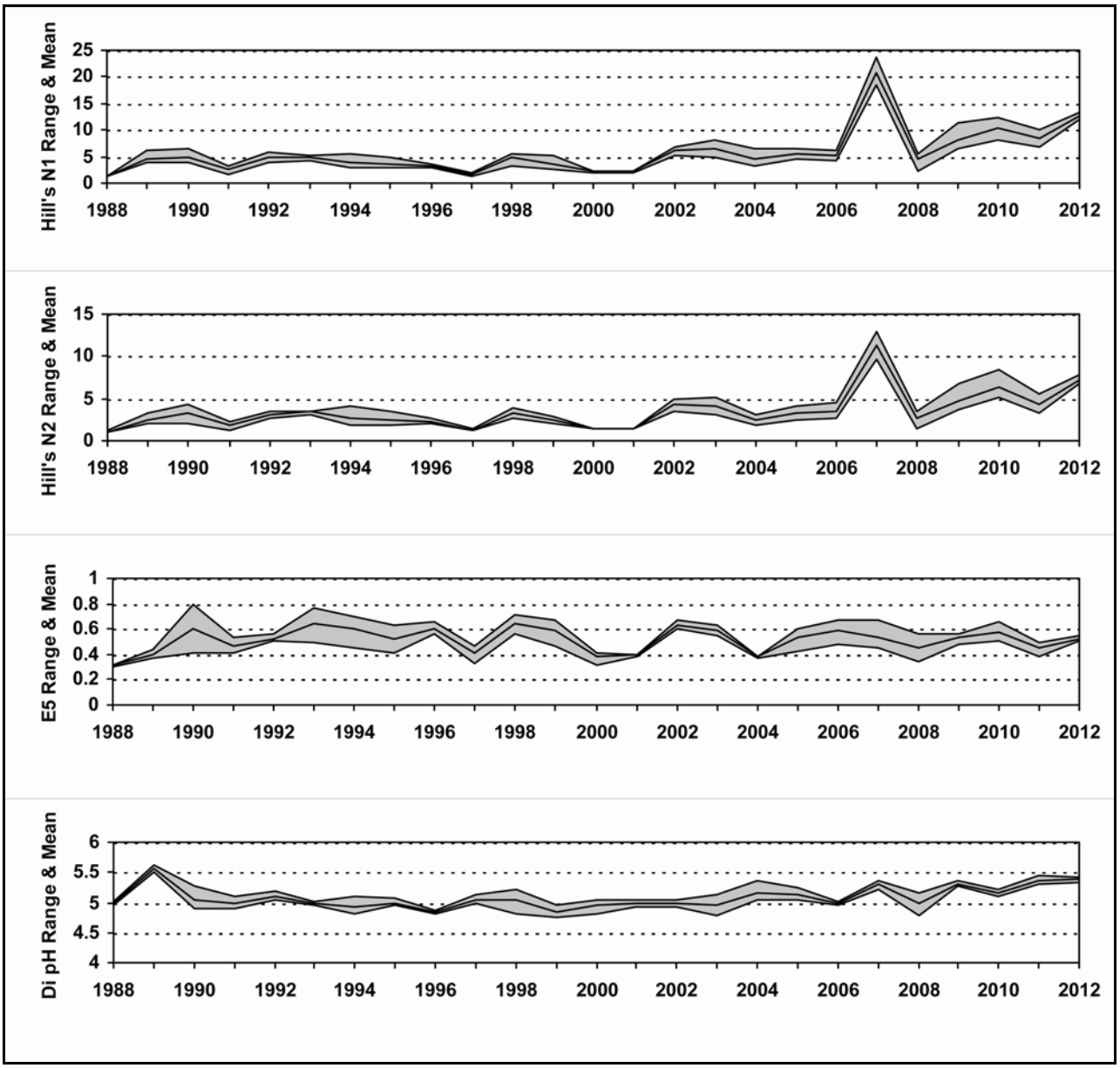


6.13.4. Epilithic diatom data

6.13.4.1. Percentage abundance summary, Old Lodge

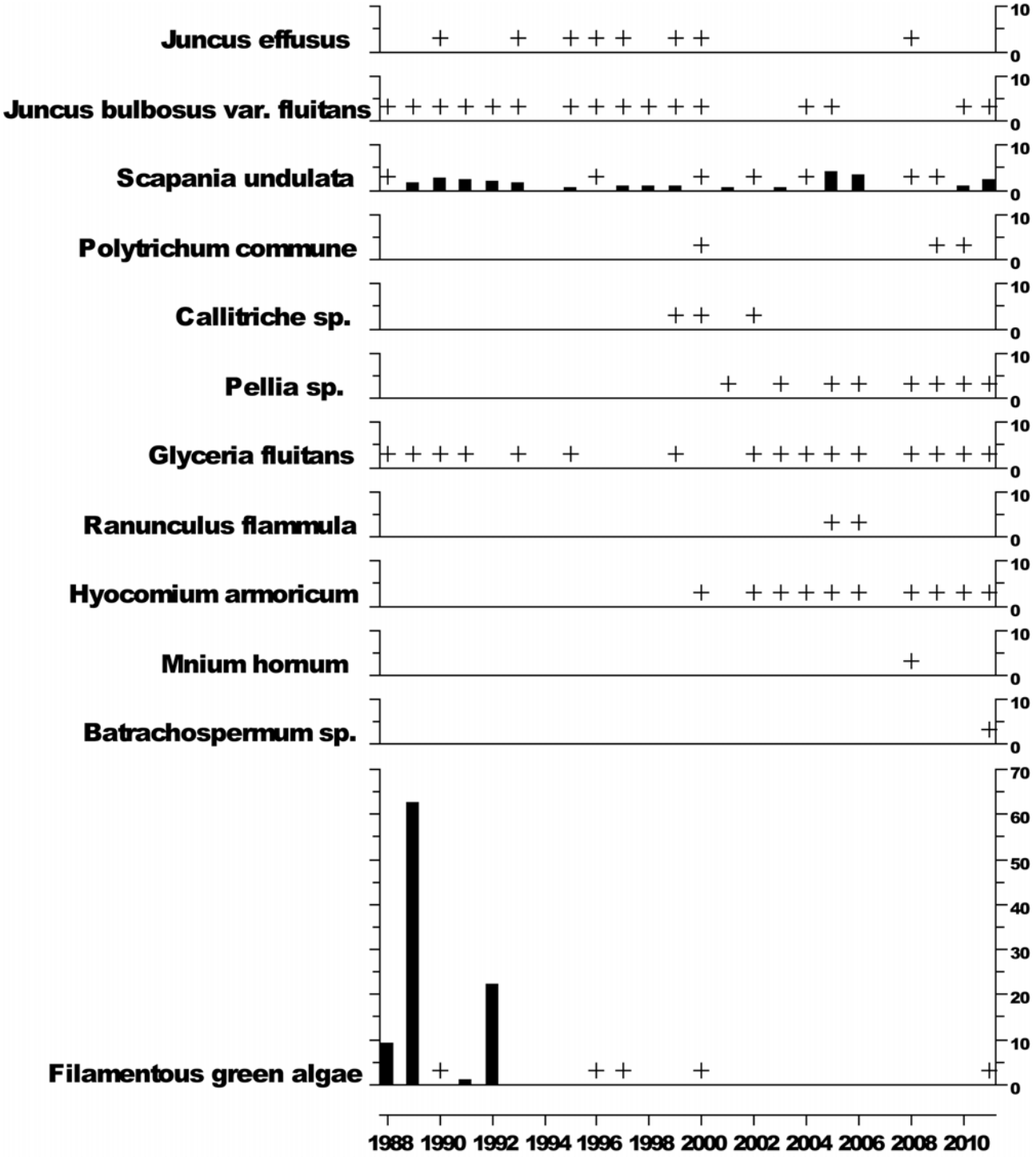


6.13.4.2. Summary statistics, Old Lodge



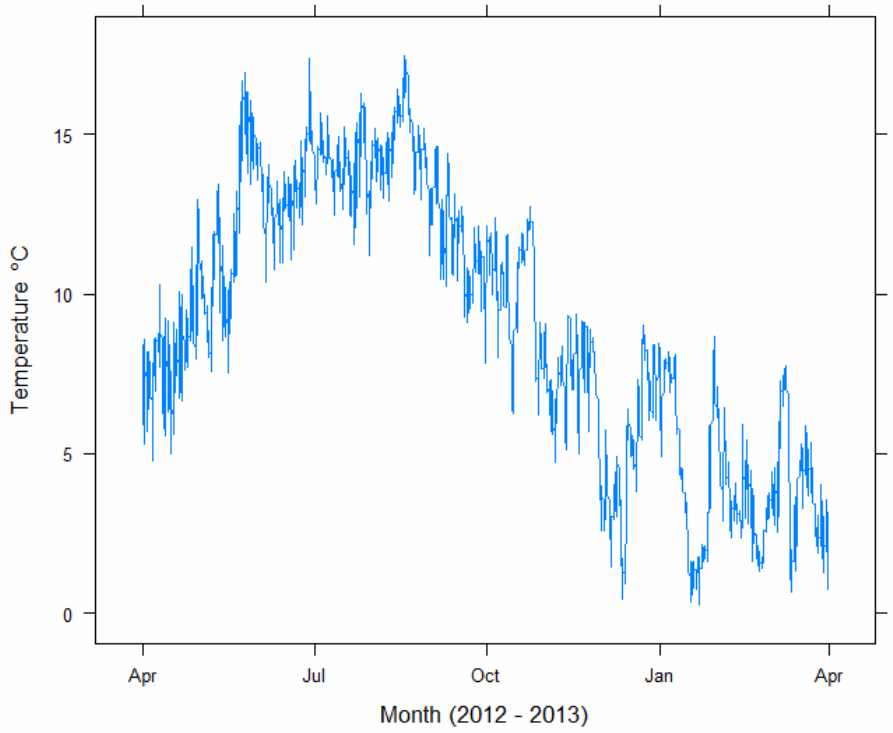
6.13.5. Aquatic macrophyte data, Old Lodge

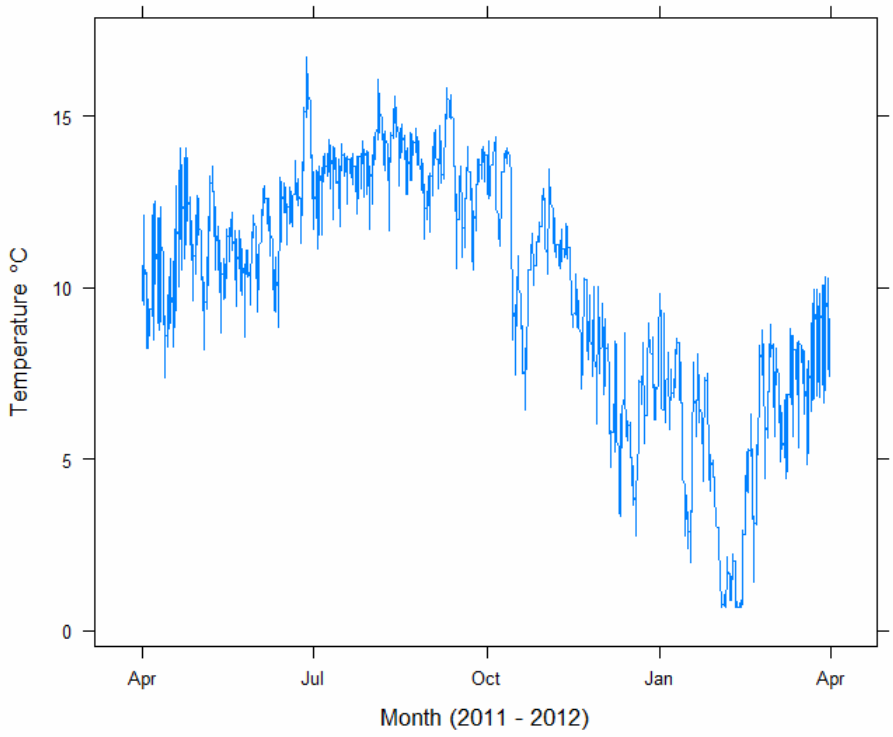
Percentage Species Cover



\+ Represents <0.9% abundance

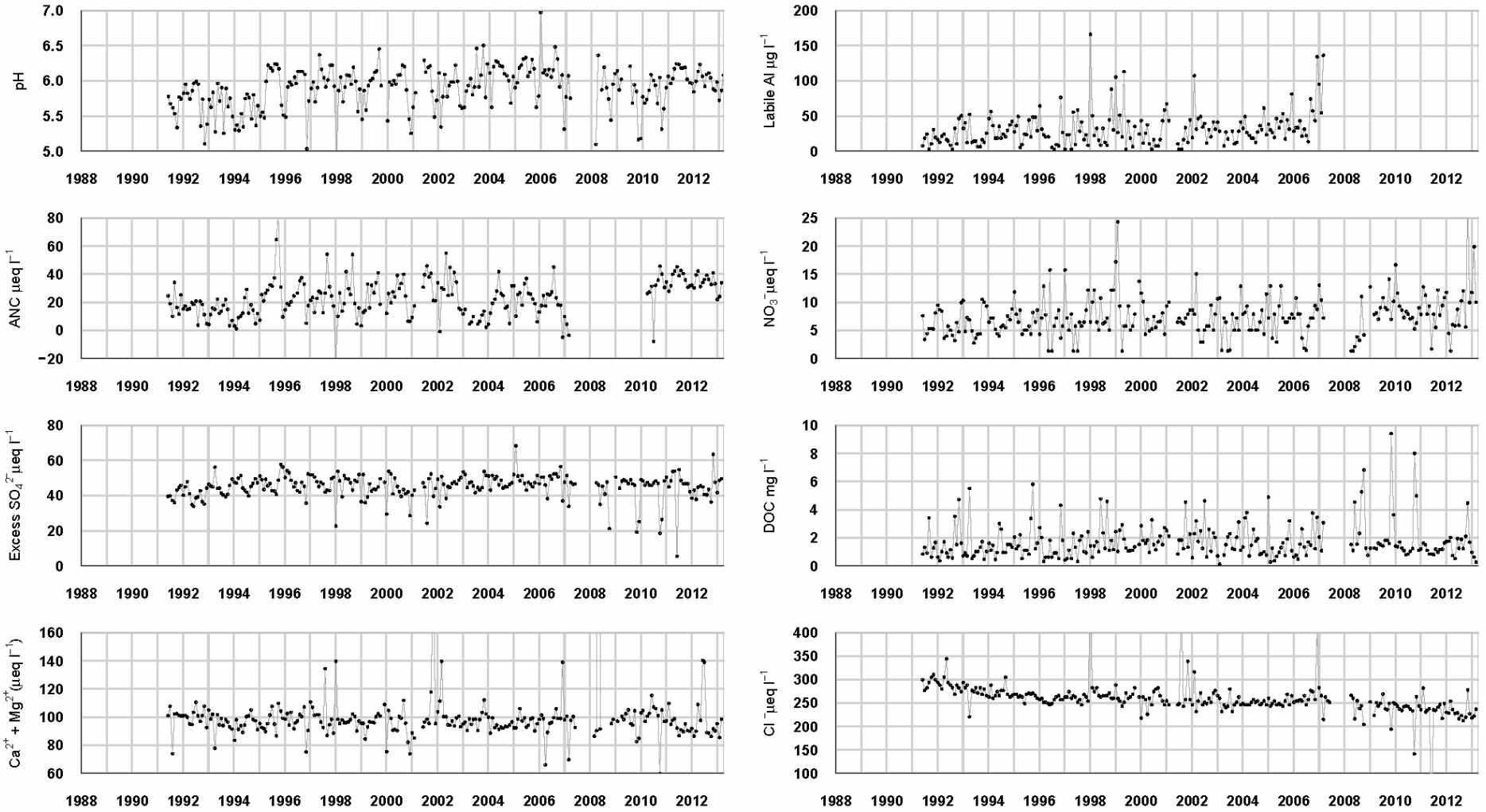
6.13.6. Thermistor data, Old Lodge





6.14. Narrator Brook

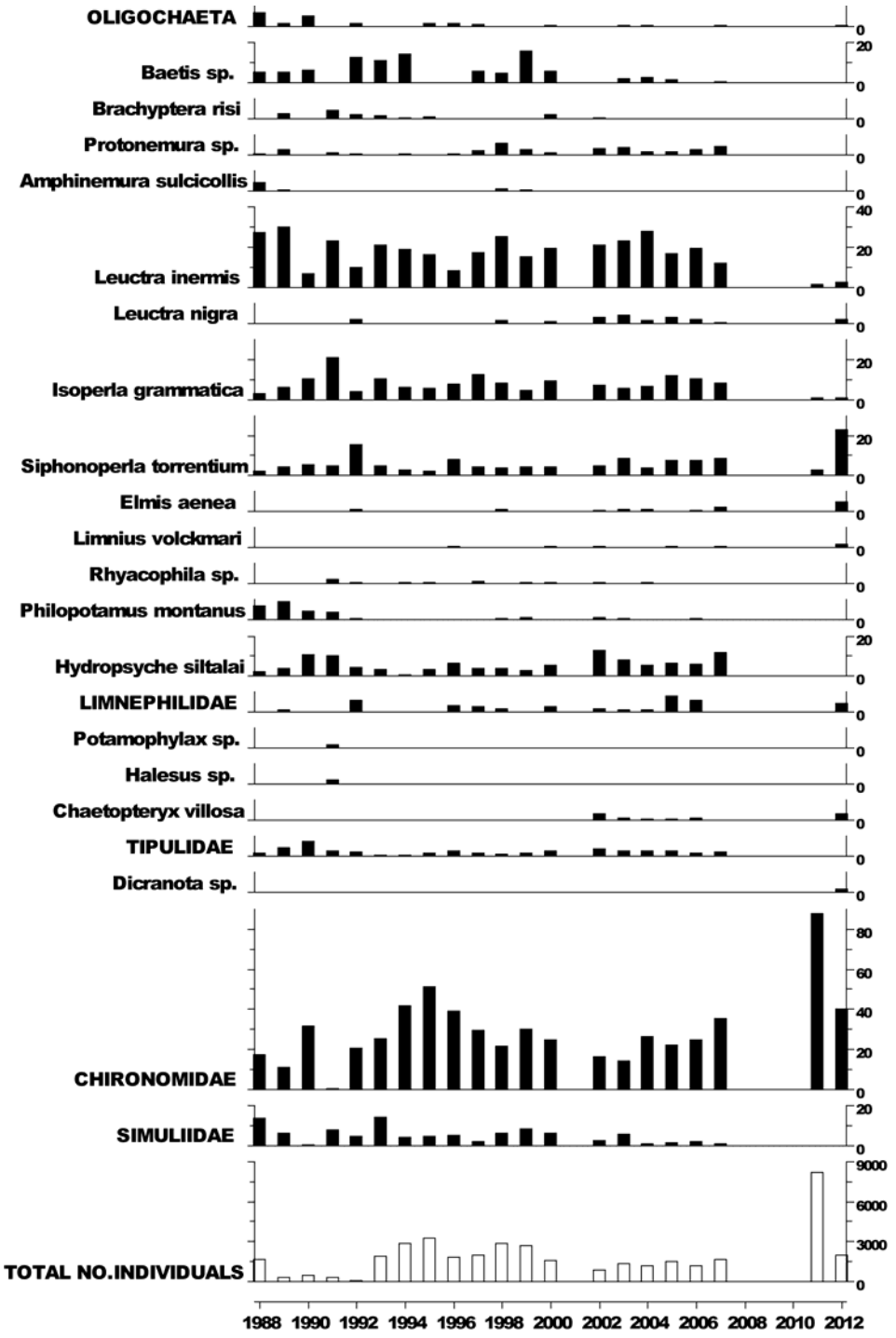
6.14.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	*Soluble Al	*Labile Al	Cl^{-}	$*SO_4^{2-}$	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.71	18.50	33.70	63.69	254.66	19.47	56.46	25.12	276.12	73.58	44.62	6.42	1.50
12-13 mean	5.99	33.68	40.83	59.91	220.98	19.62			228.38	69.45	45.50	11.28	1.46
12-13 std dev	0.14	6.11	19.94	3.21	11.52	3.74			17.12	8.44	6.82	7.04	1.12

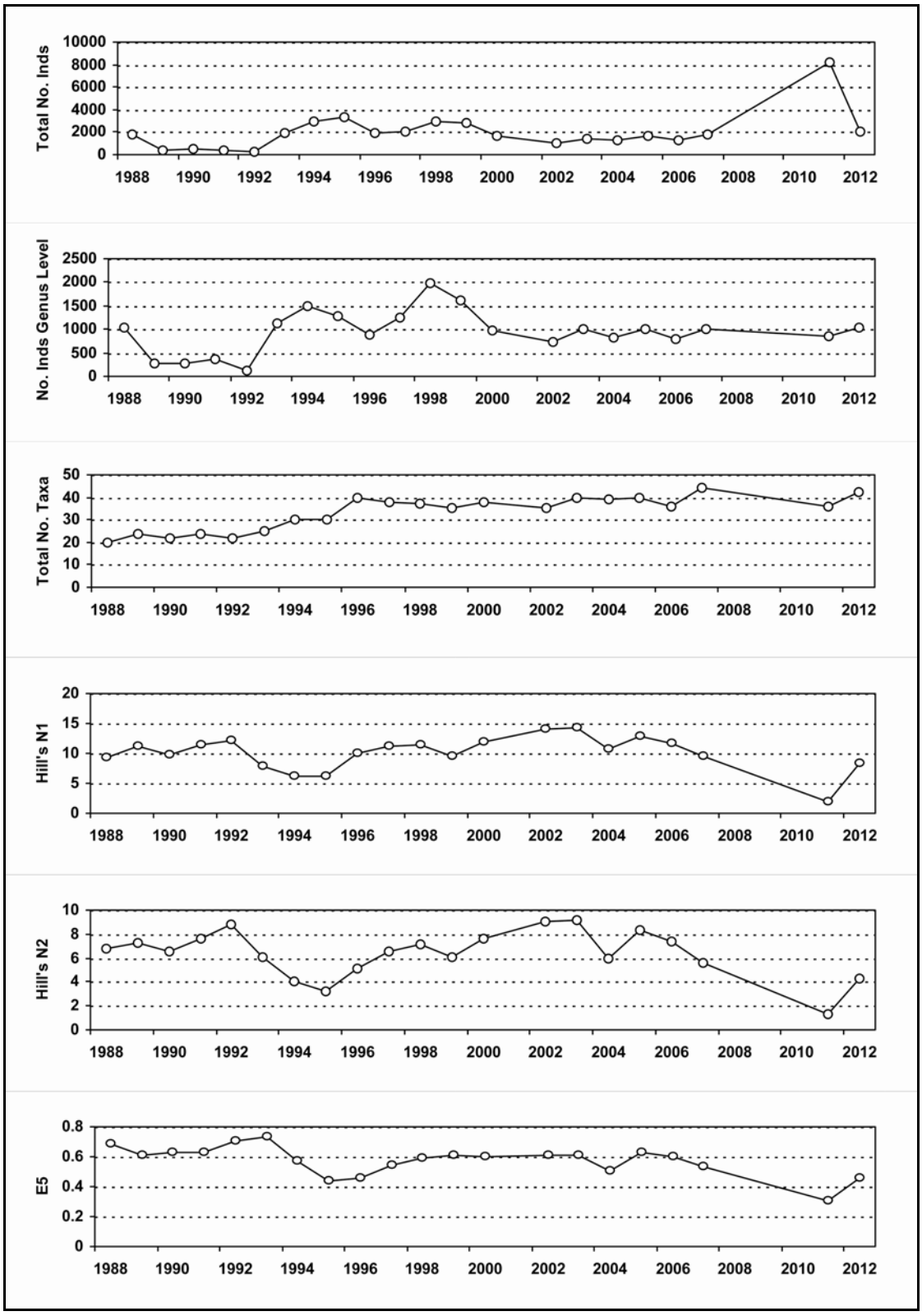
6.14.2. Macroinvertebrate data

6.14.2.1. Percentage abundance summary, Narrator Brook



No sampling in 2001 due to Foot and Mouth restrictions.
No analysis between 2007 and 2011 due to funding cuts.

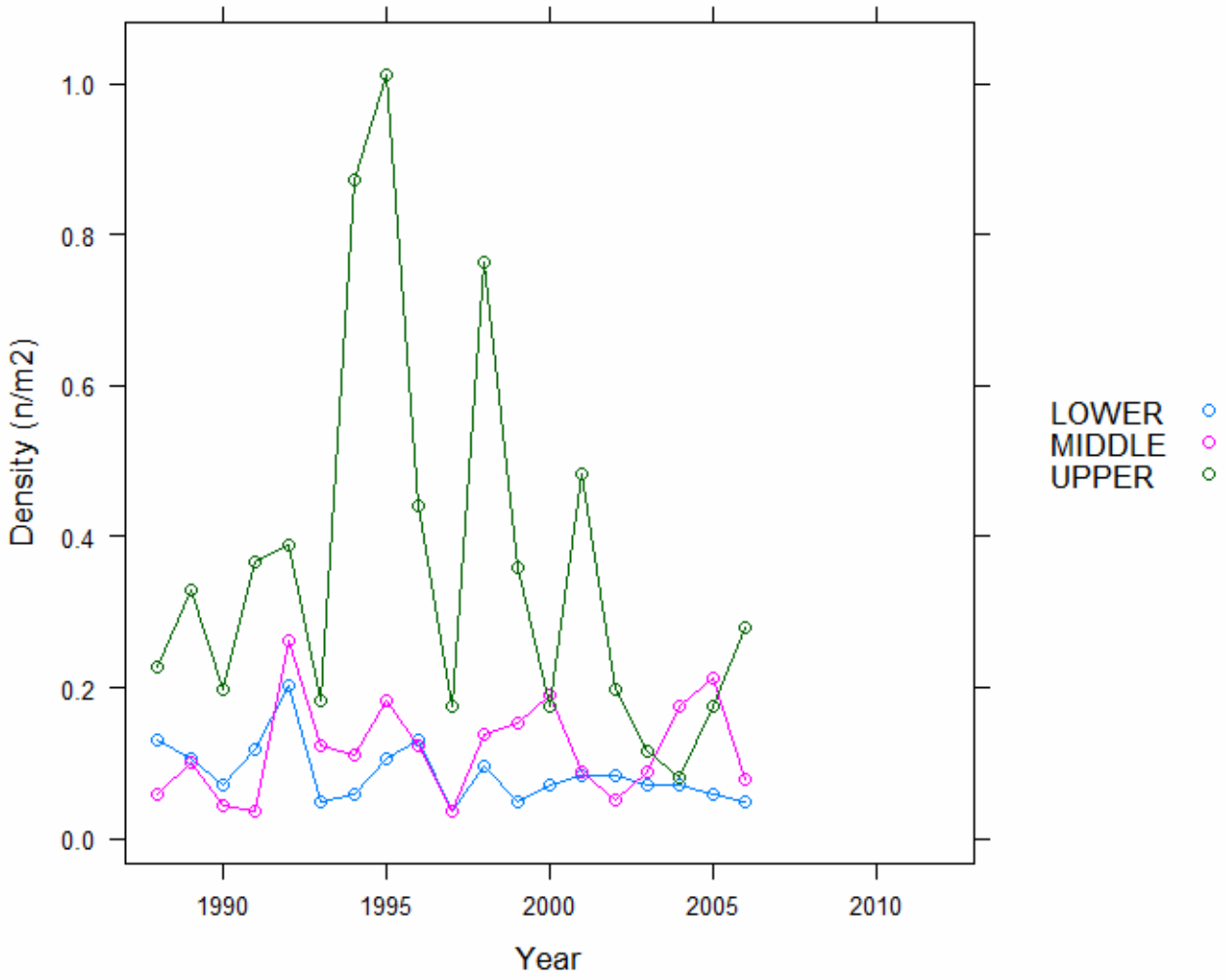
6.14.2.2. Summary statistics, Narrator Brook



No sampling in 2001 due to Foot and Mouth restrictions.
No analysis between 2007 and 2011 due to funding cuts.

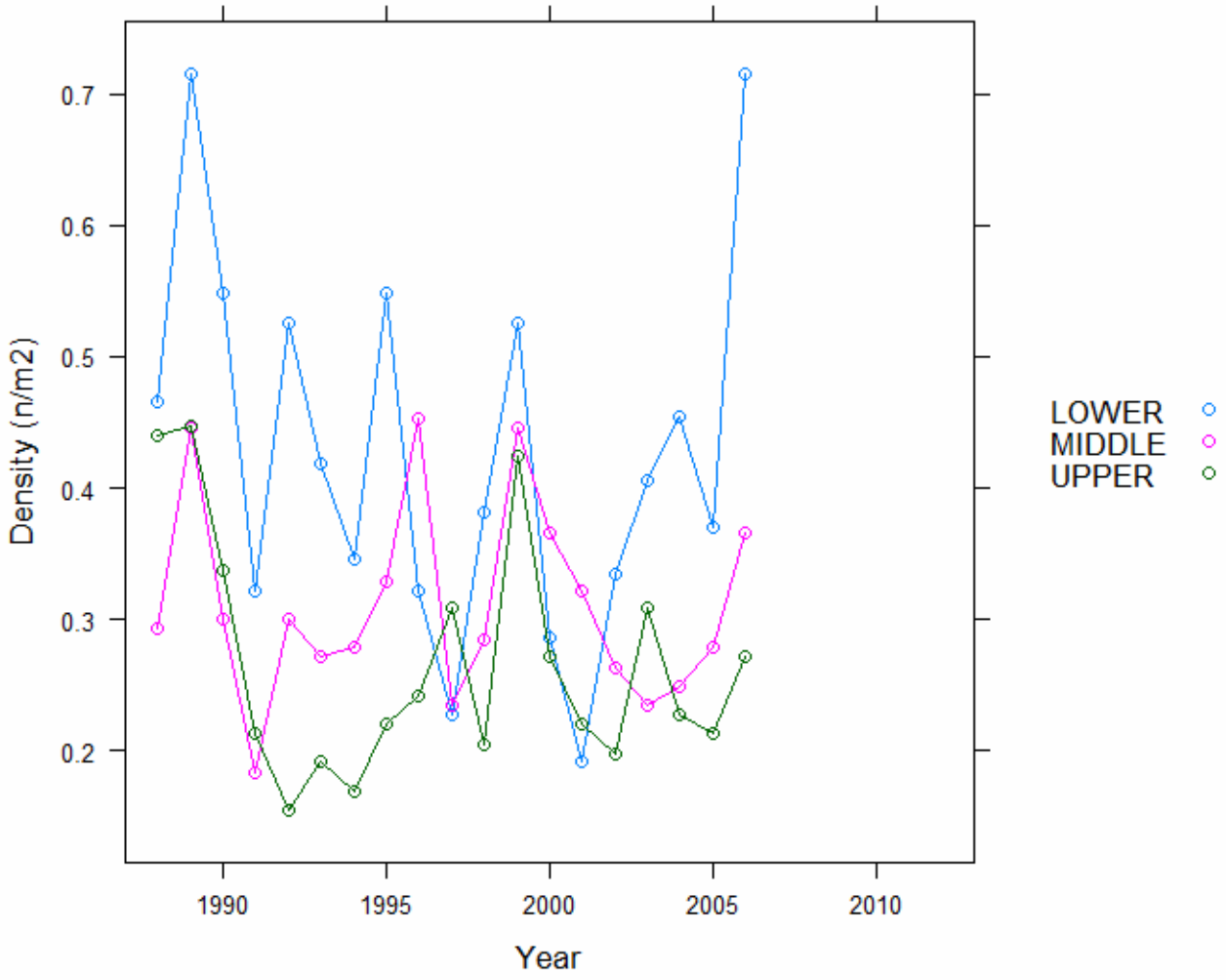
6.14.3. Fish data

6.14.3.1. Summary of Trout fry densities (numbers m^{-2}), Narrator Brook



No analysis after 2006 due to funding cuts.

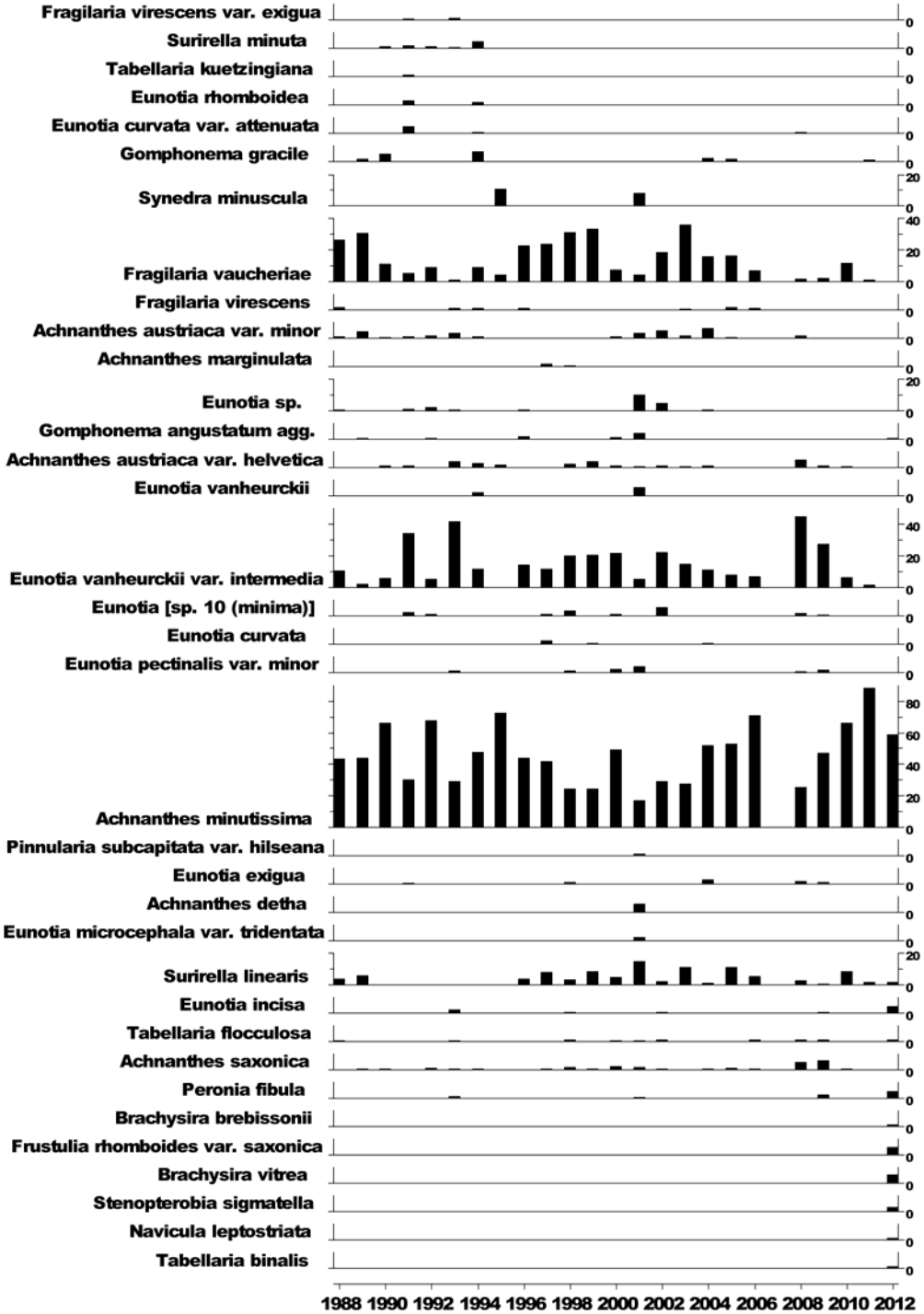
6.14.3.2. Summary of Trout parr densities (numbers m^{-2}), Narrator Brook



No analysis after 2006 due to funding cuts.

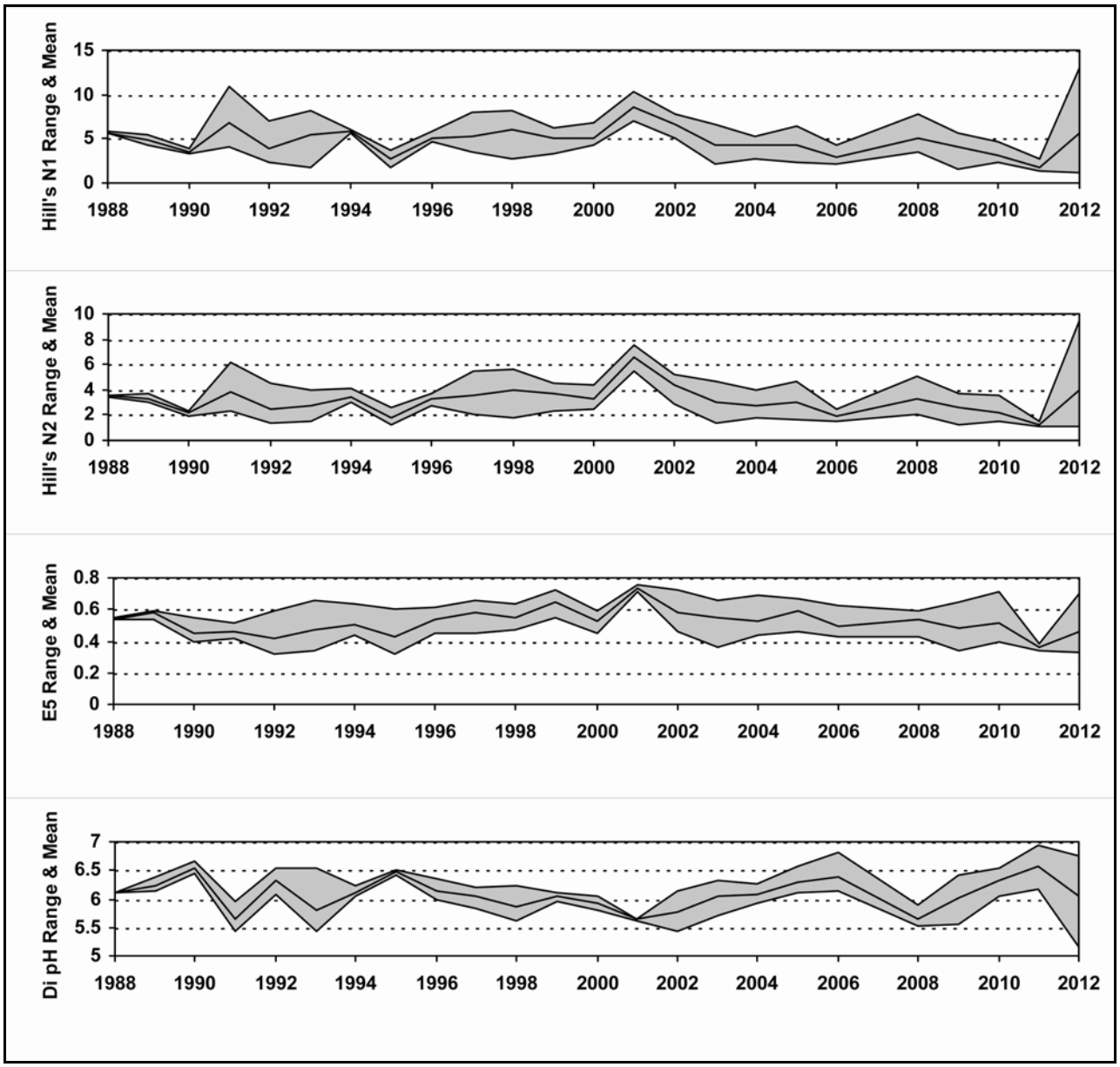
6.14.4. Epilithic diatom data

6.14.4.1. Percentage abundance summary, Narrator Brook



No diatom sampling in 2007 due to funding cuts.

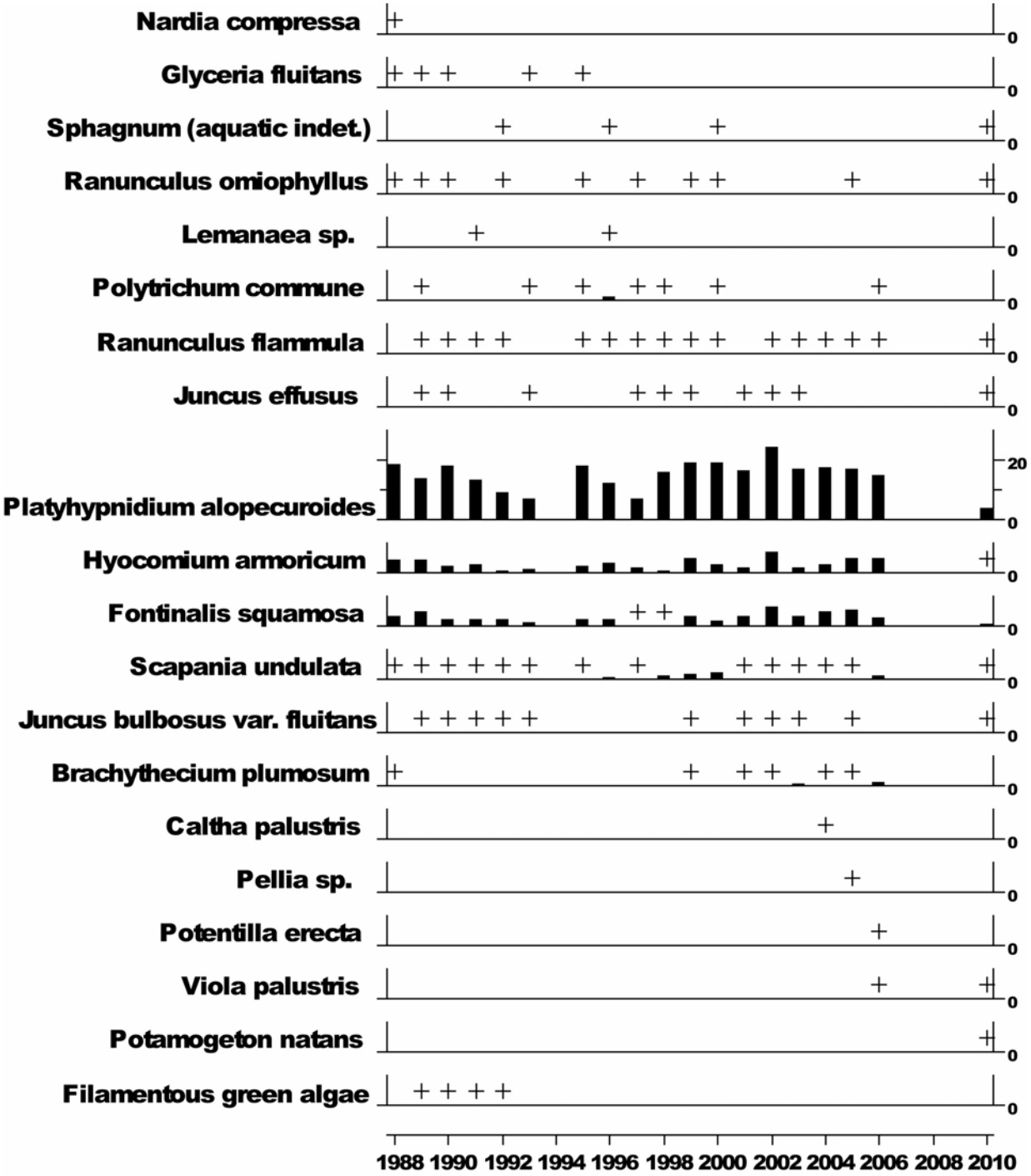
6.14.4.2. Summary statistics, Narrator Brook



No diatom sampling in 2007 due to funding cuts.

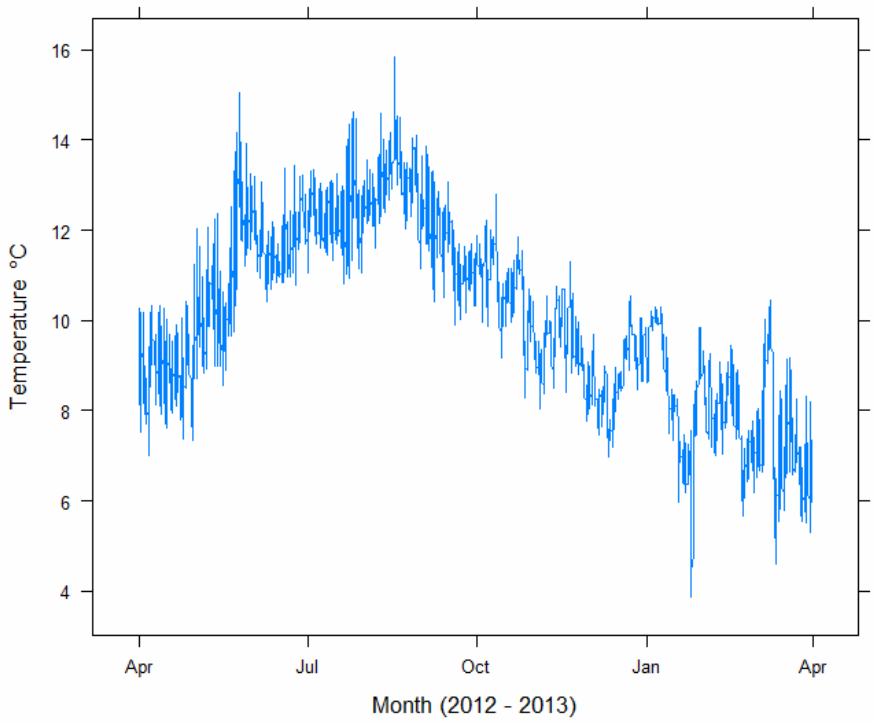
6.14.5. Aquatic macrophyte data, Narrator Brook

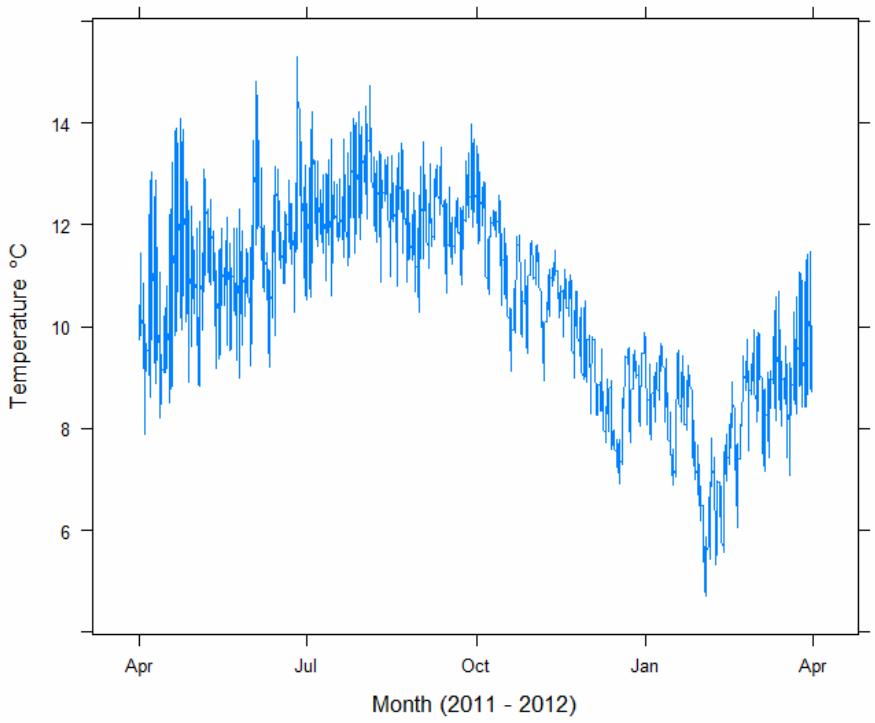
Percentage Species Cover



\+ Represents <0.5% abundance
No macrophyte sampling in 2007, 2008 or 2009 due to funding cuts.

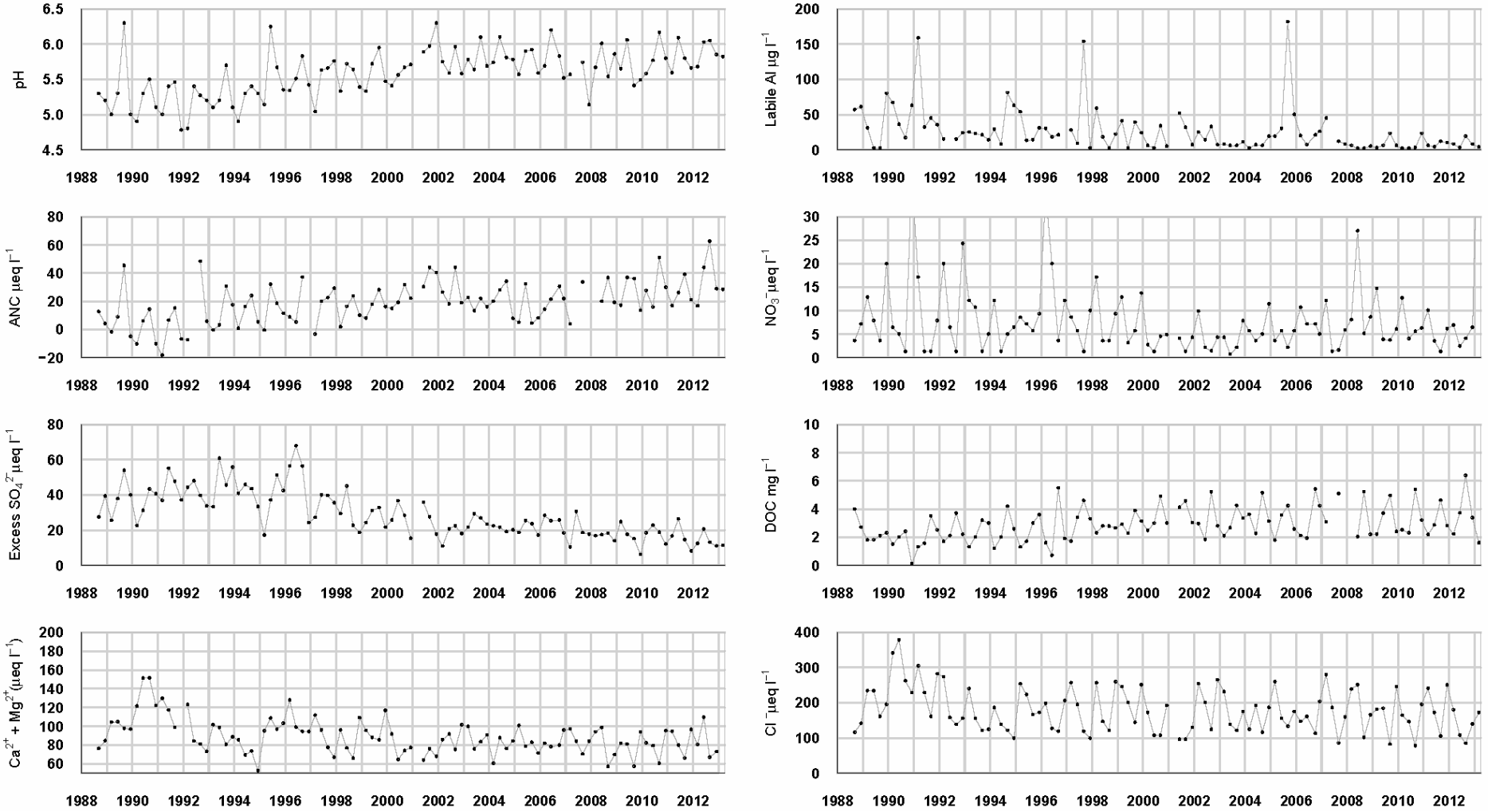
6.14.6. Thermistor data, Narrator Brook





6.15. Llyn Llagi

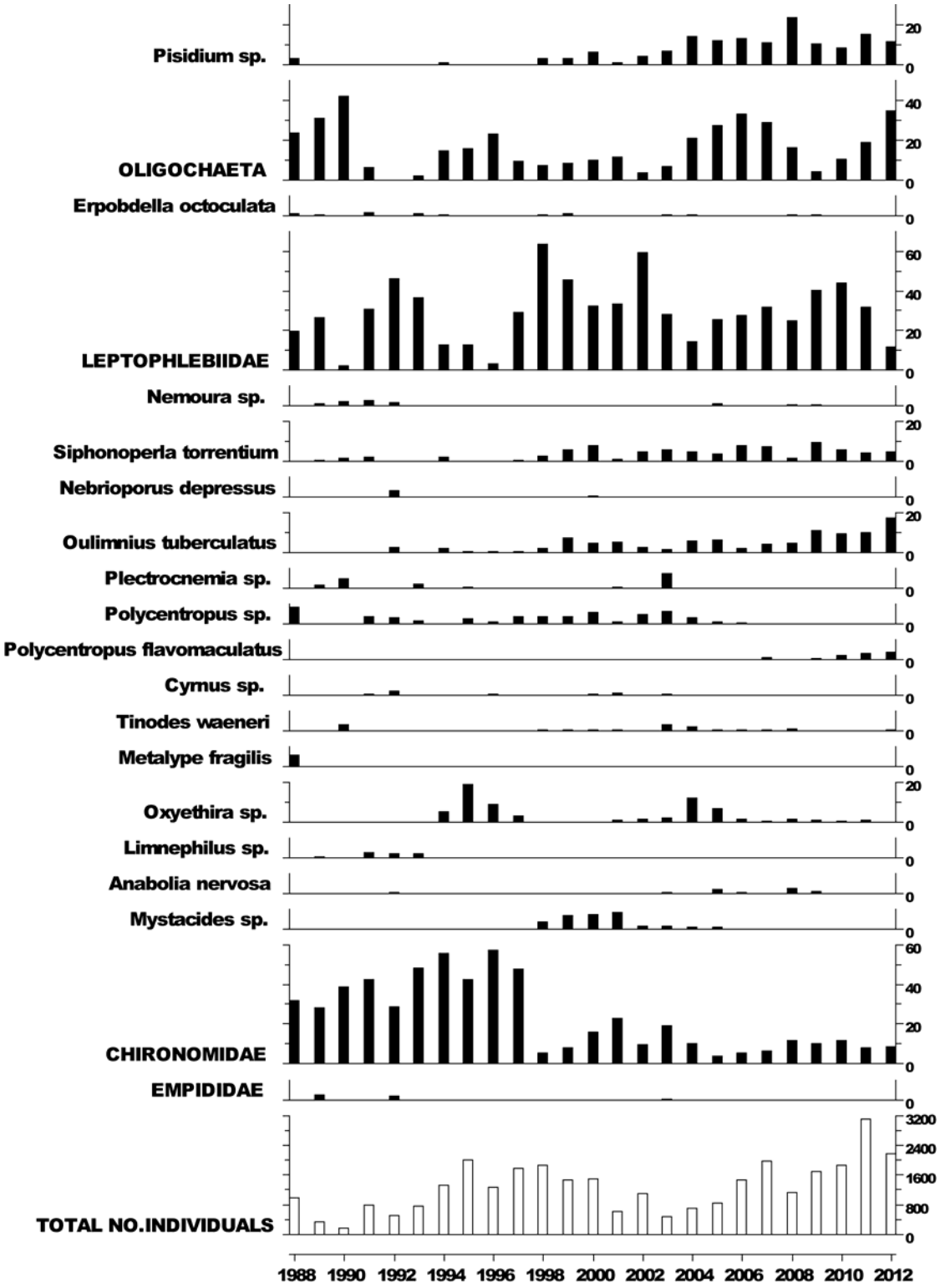
6.15.1. Spot sampled chemistry data



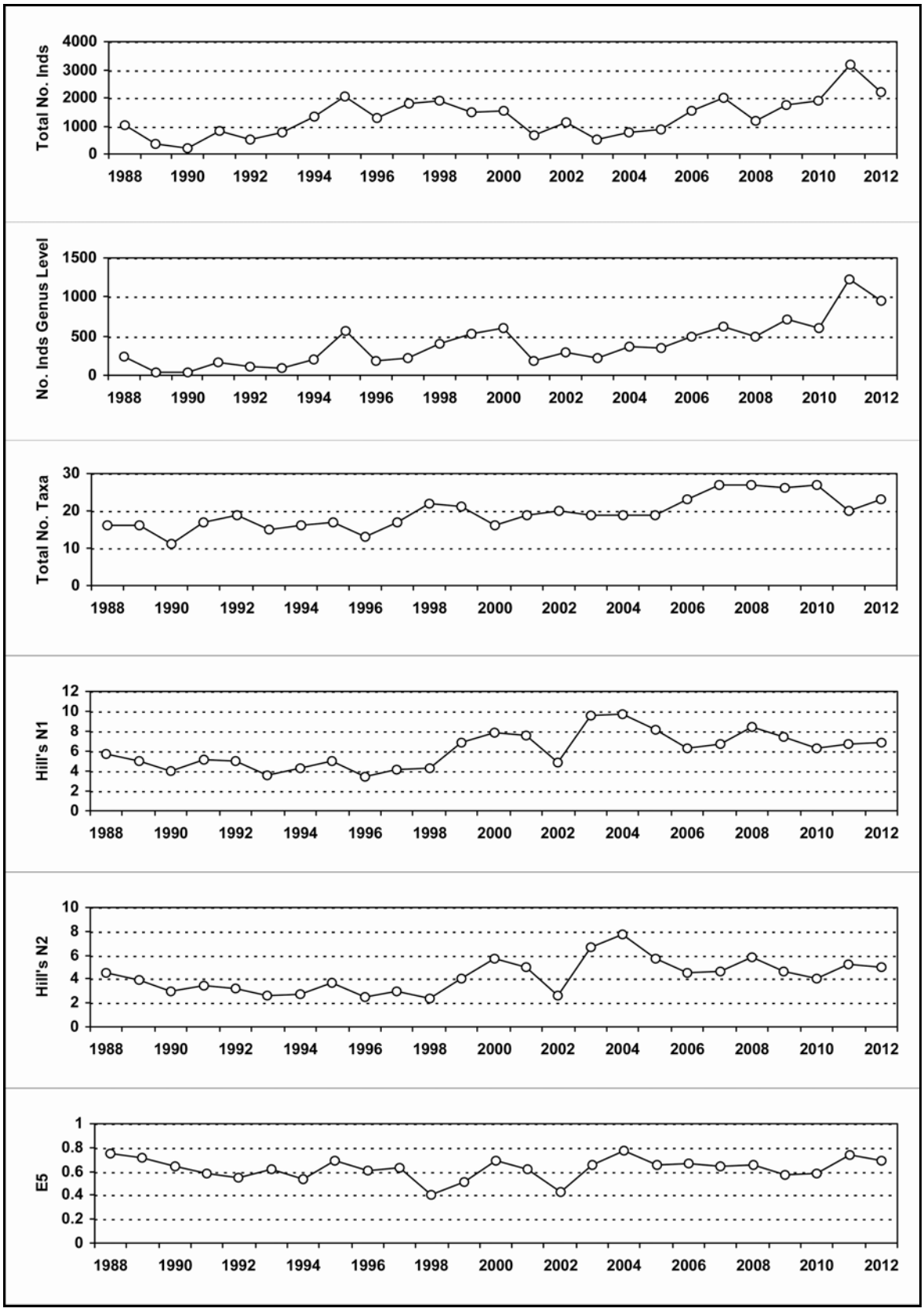
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4 $^{2-}$	xSO_4 $^{2-}$	NO_3 $^{-}$	**DOC
Mean 1st 5 yrs	5.23	5.71	56.70	49.69	185.75	3.54	75.37	41.61	219.33	62.91	39.91	10.44	2.13
12-13 mean	5.94	40.95	52.99	30.02	104.55	3.17	30.25	8.50	125.75	27.17	13.98	17.77	3.77
12-13 std dev	0.12	16.18	25.84	4.02	14.00	1.05	12.61	7.33	38.09	4.38	4.50	26.97	1.97

6.15.2. Macroinvertebrate data

6.15.2.1. Percentage abundance summary, Llyn Llagi

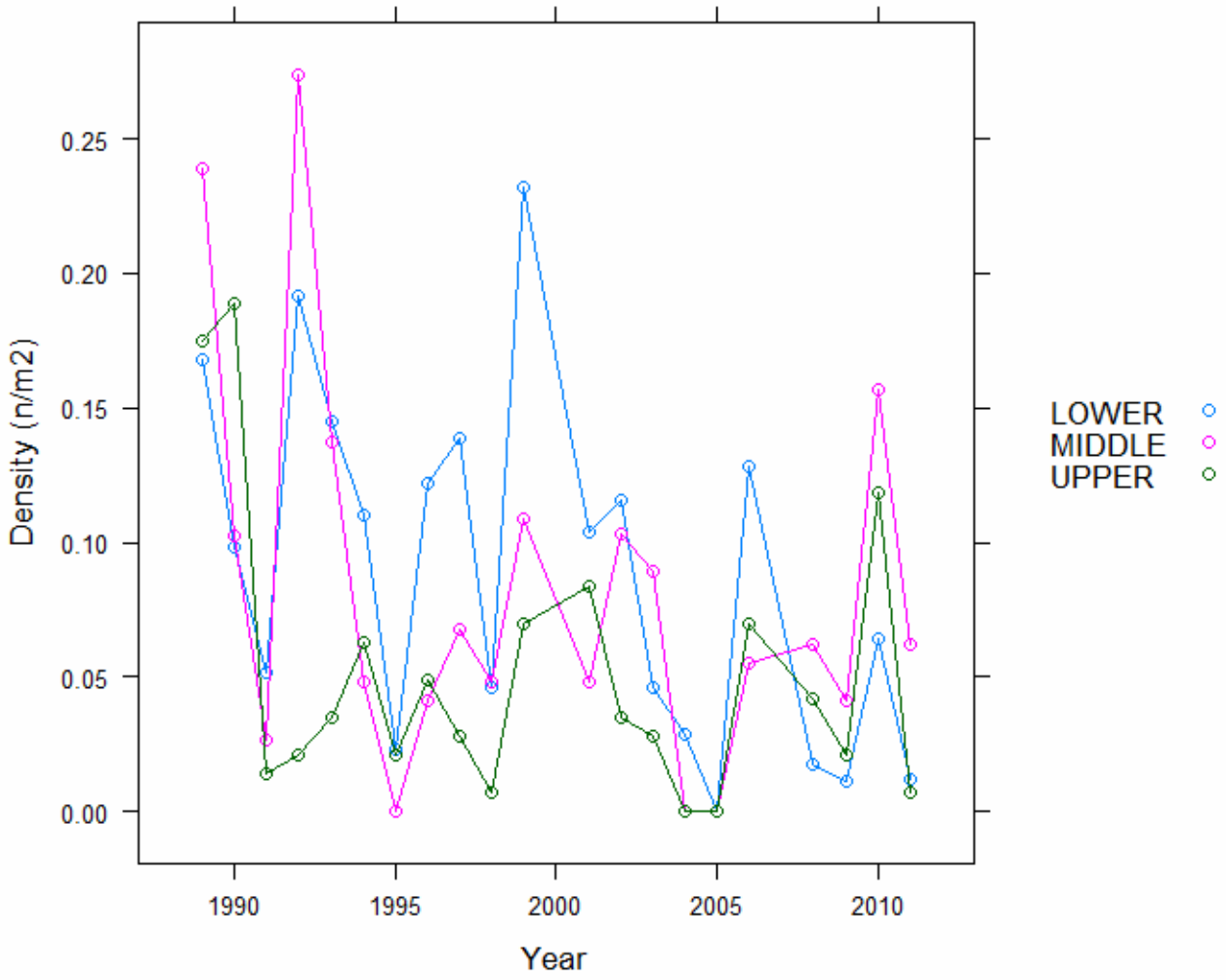


6.15.2.2. Summary statistics, Llyn Llagi

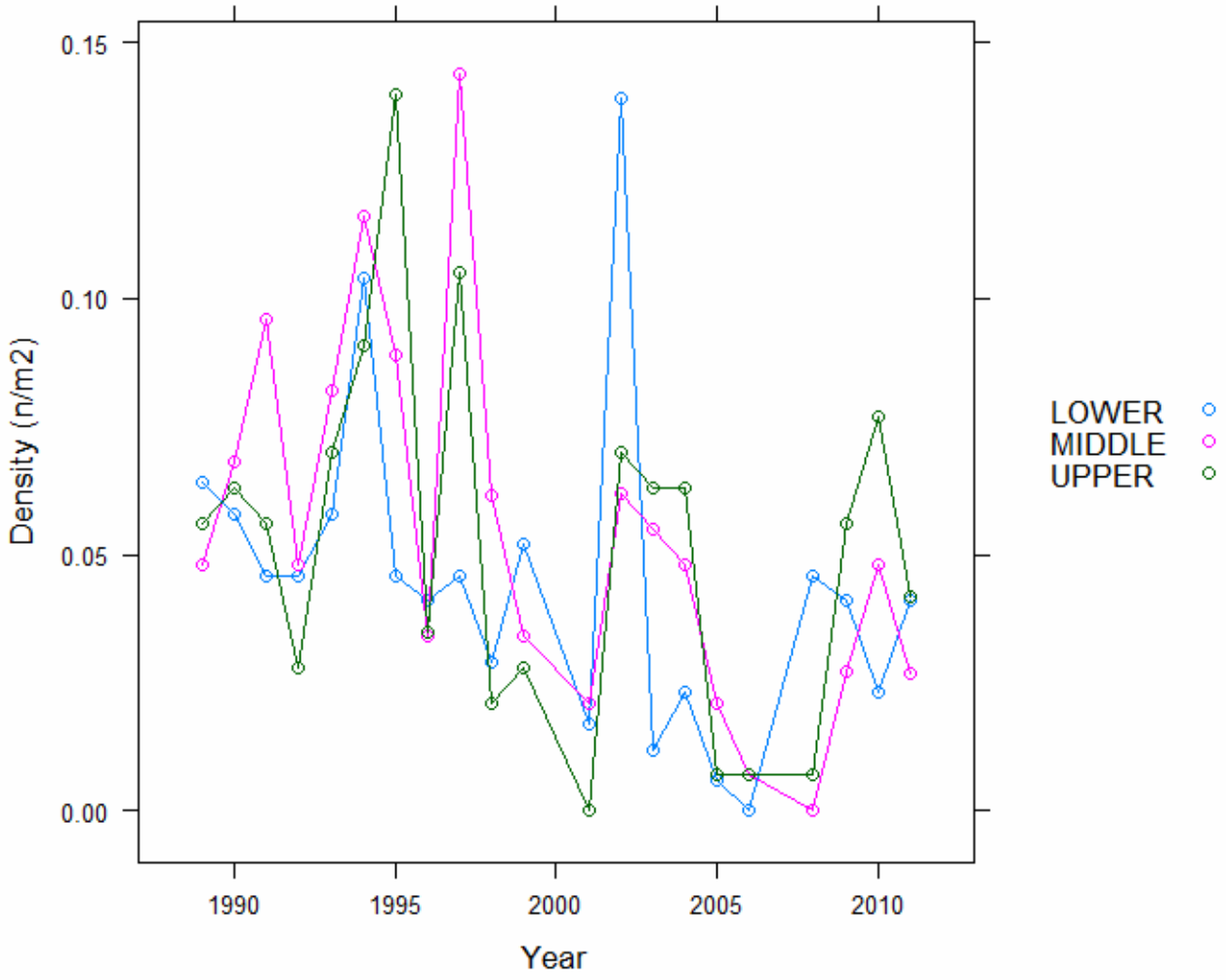


6.15.3. Fish data (for outflow stream)

6.15.3.1. Summary of Trout fry densities (numbers m^{-2}), Llyn Llagi

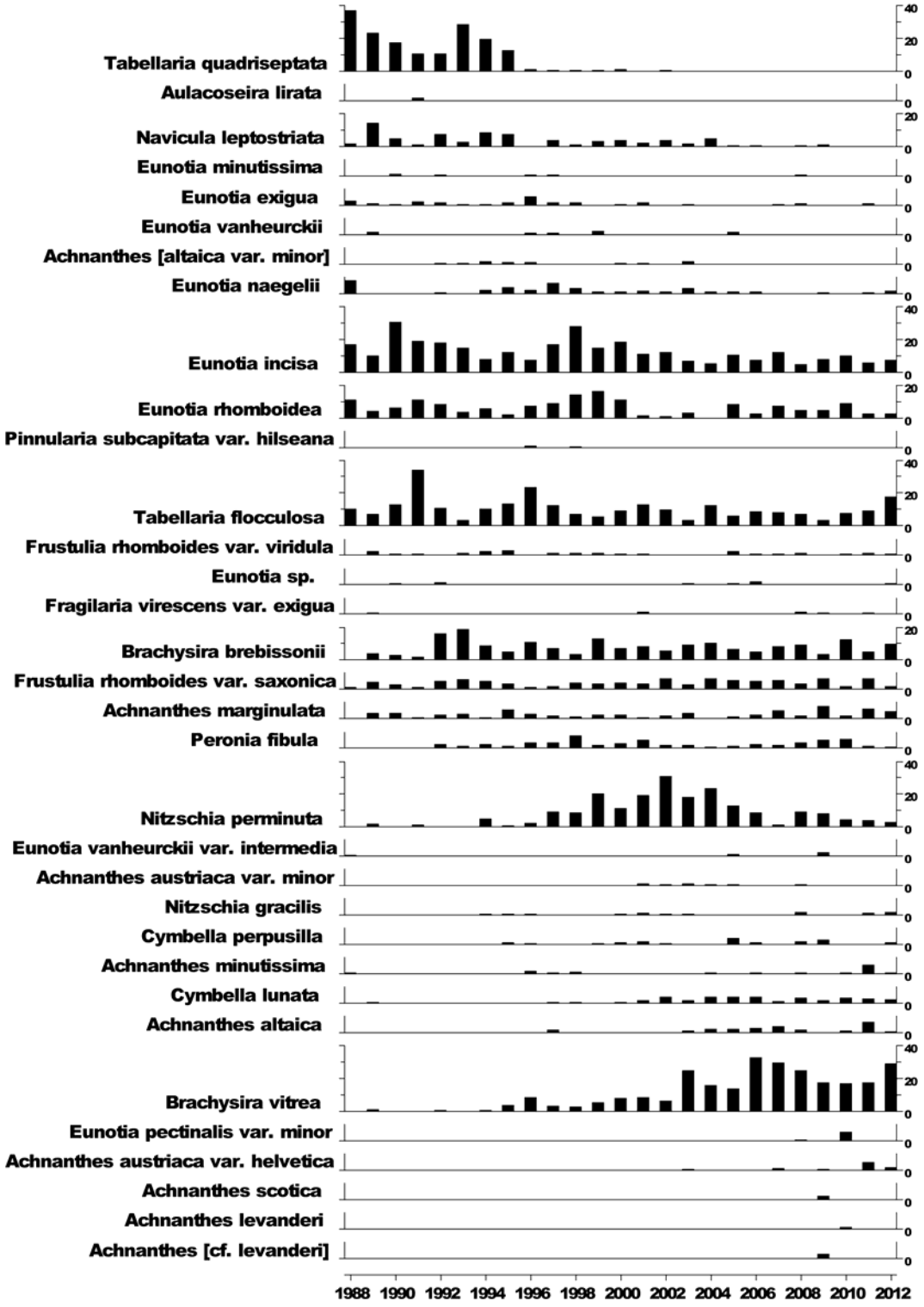


6.15.3.2. Summary of Trout parr densities (numbers m^{-2}), Llyn Llagi

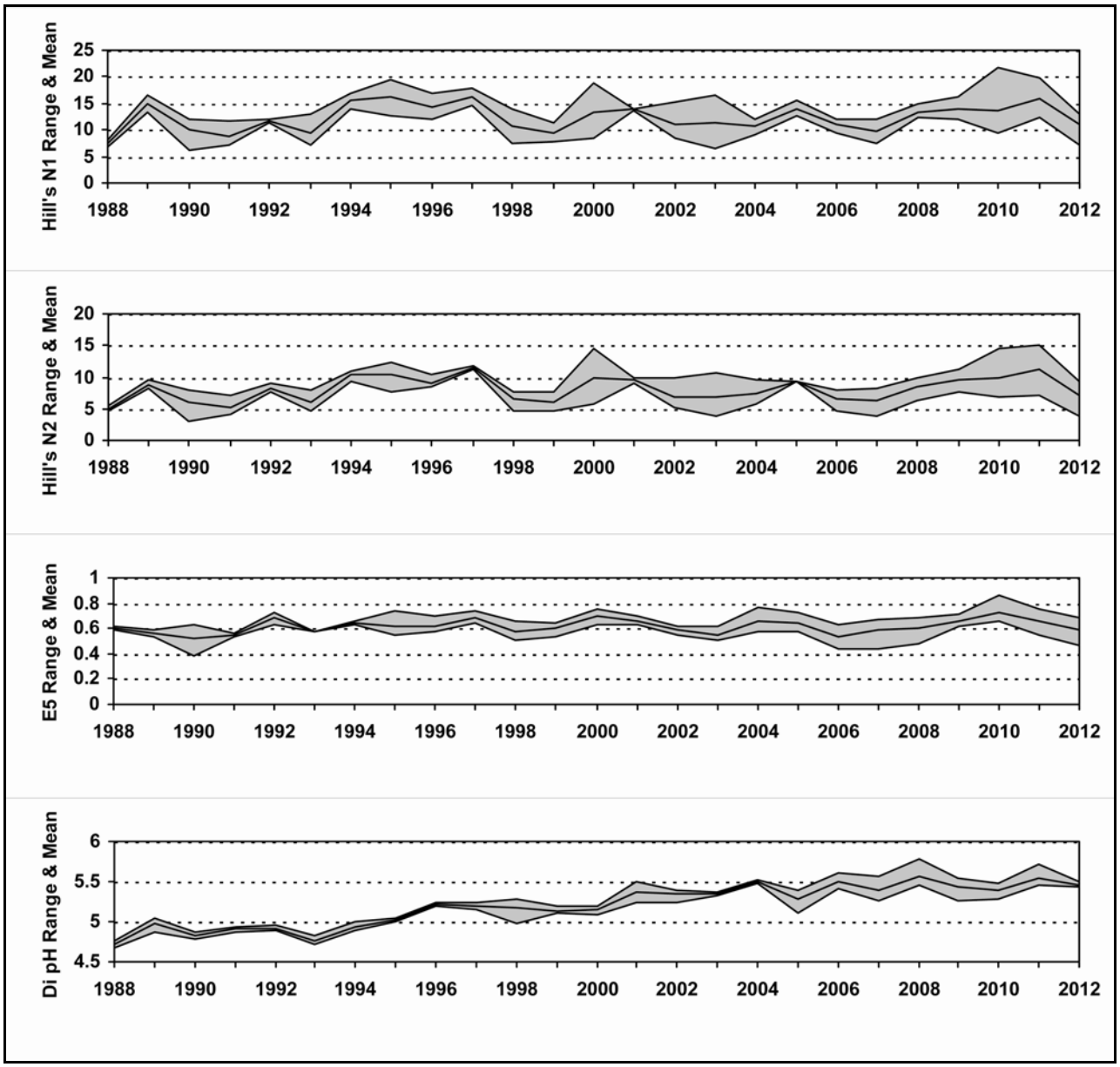


6.15.4. Epilithic diatom data

6.15.4.1. Percentage abundance summary, Llyn Llagi

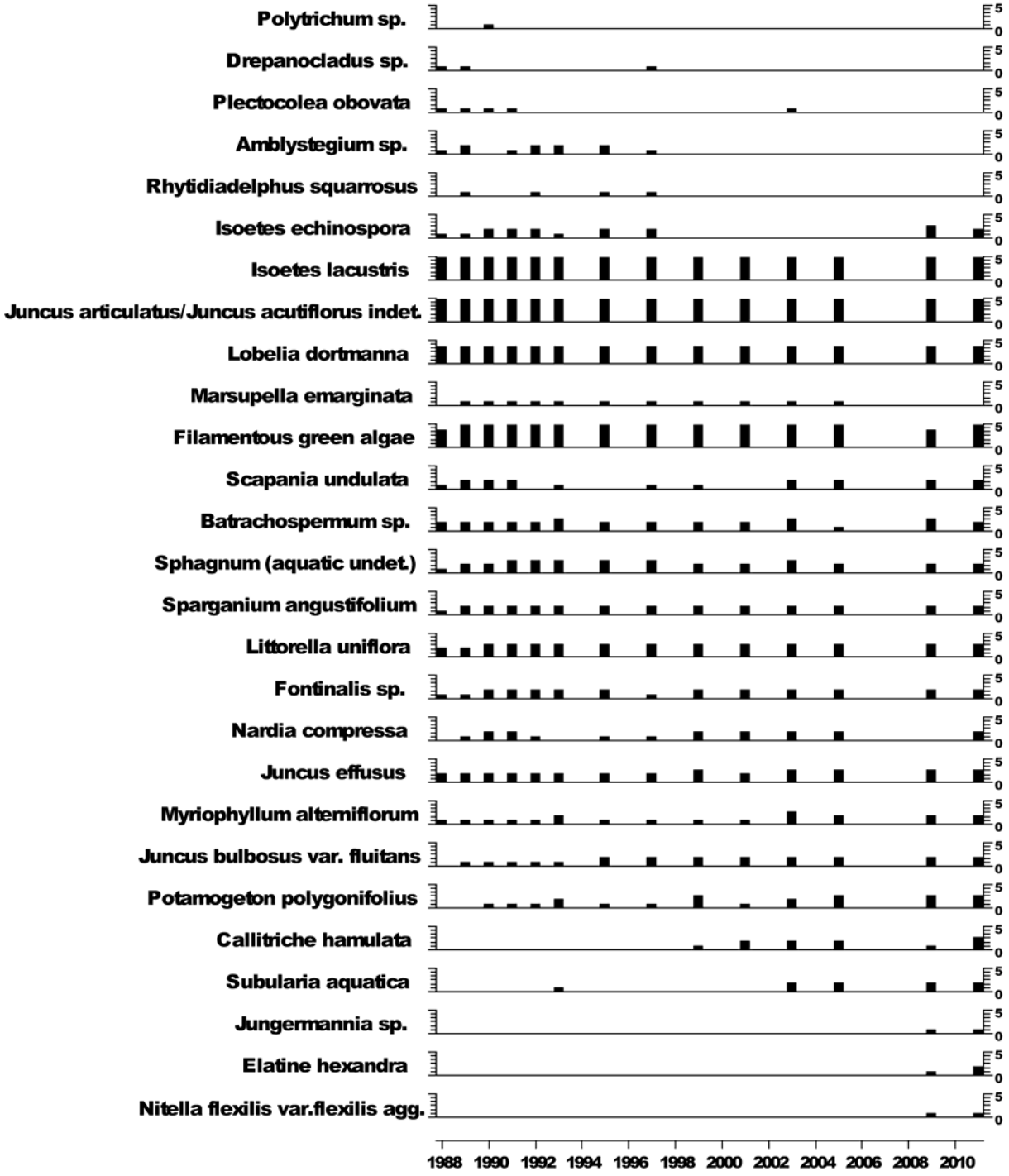


6.15.4.2. Summary statistics, Llyn Llagi



6.15.5. Aquatic macrophyte data, Llyn Llagi

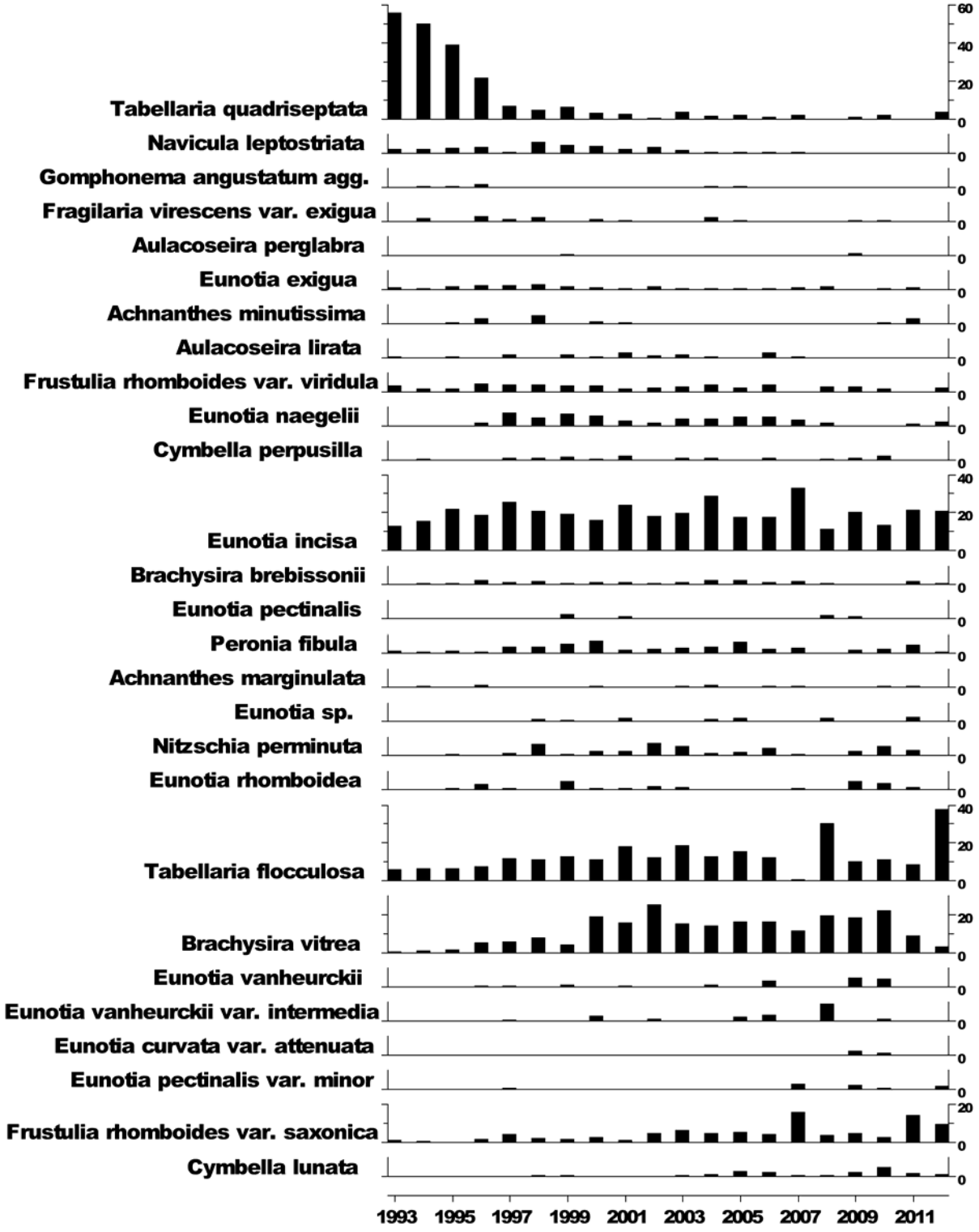
Species Scores (1-5)



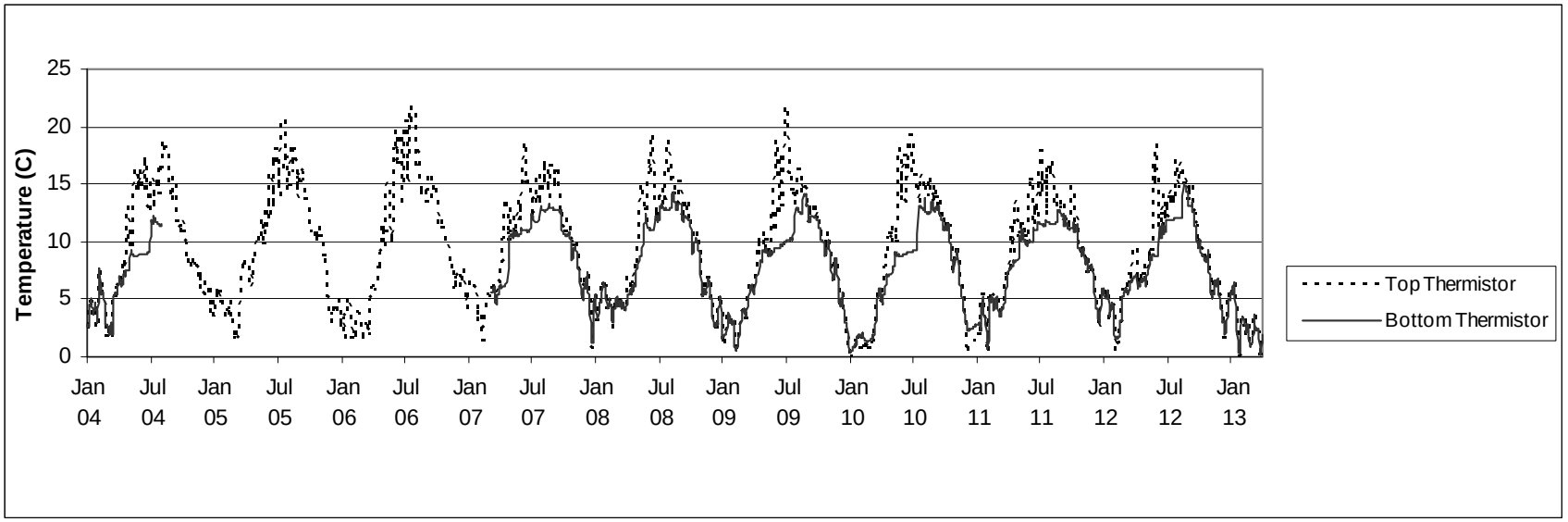
No survey in 2007 due to funding cuts

6.15.6. Sediment trap data, Llyn Llagi

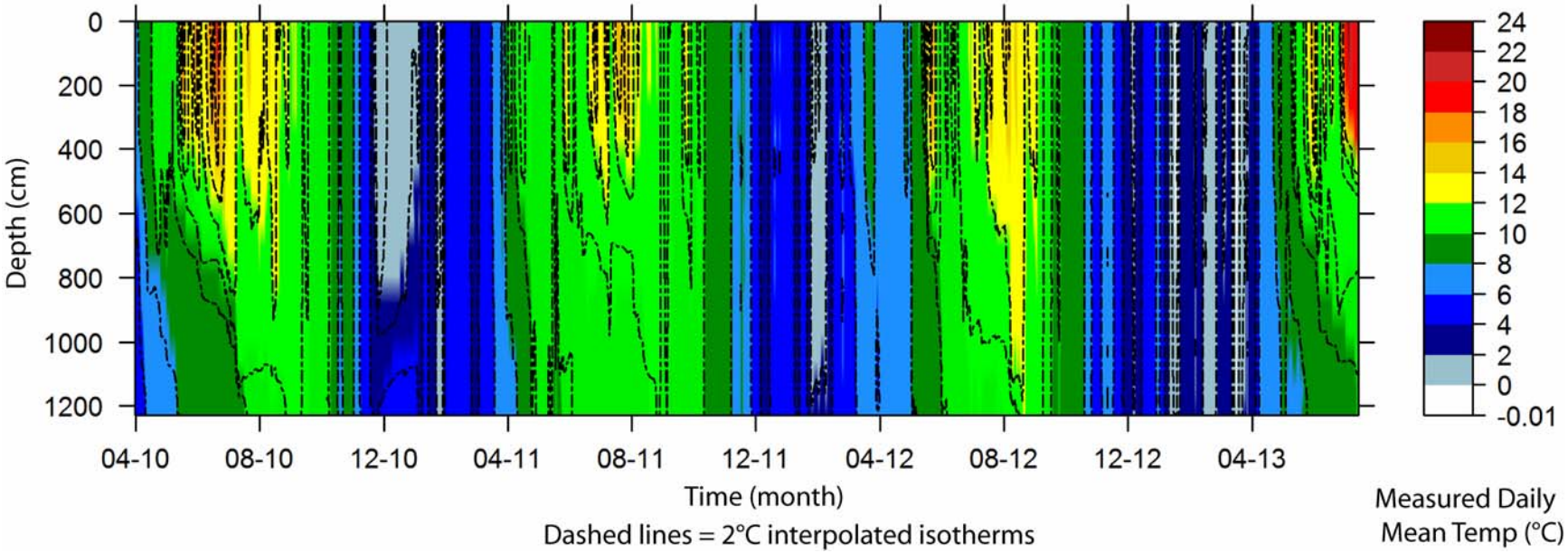
Relative percentage frequency of diatom taxa



6.15.7. Sediment trap thermistor data, Llyn Llagi

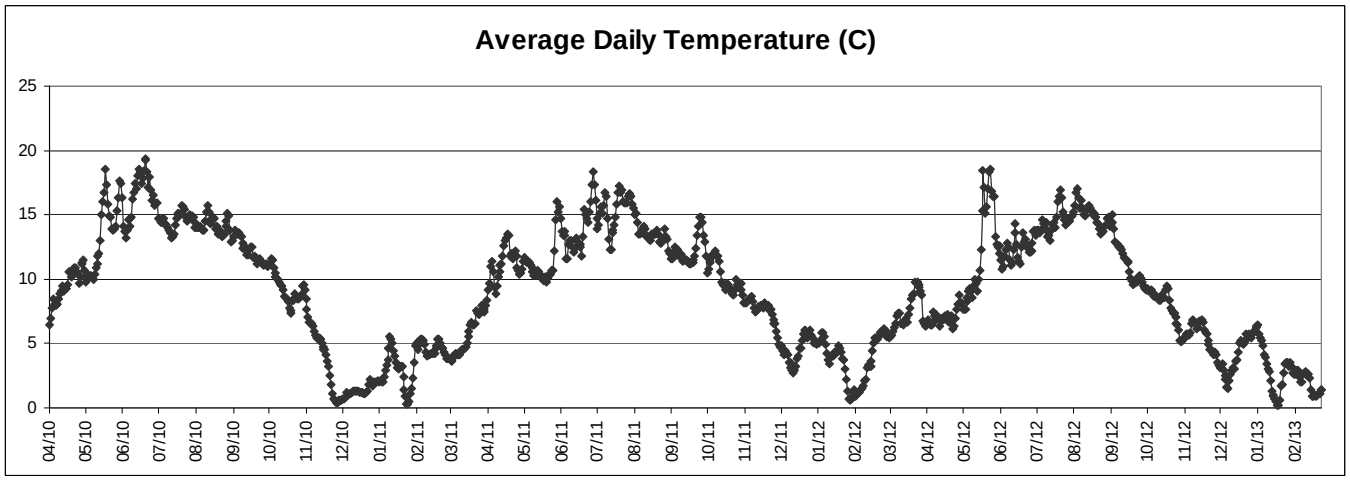


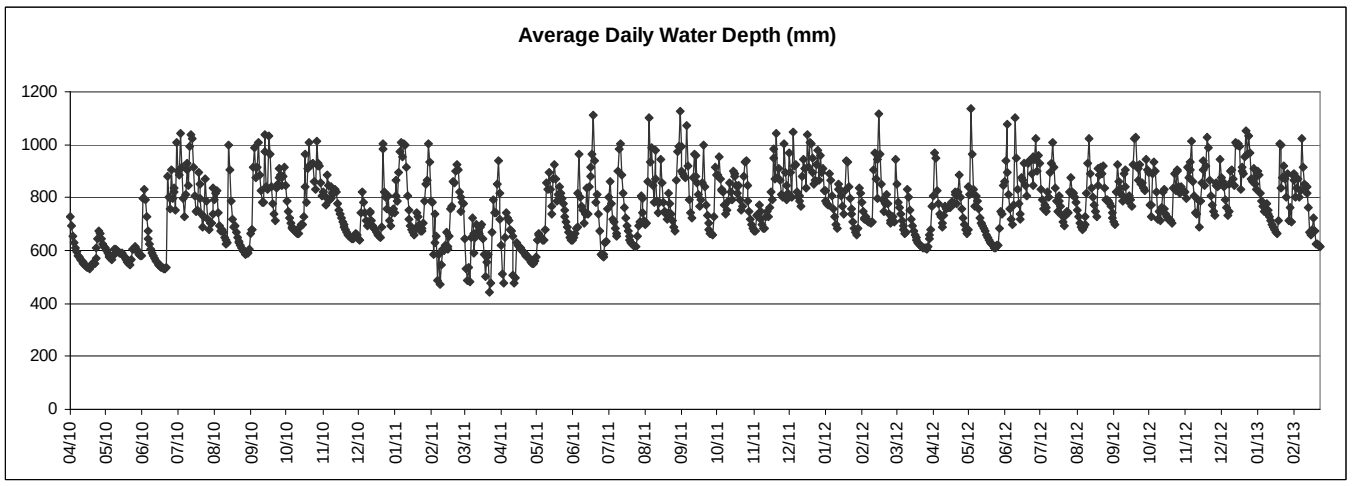
6.15.8. Thermistor chain data, Llyn Llagi



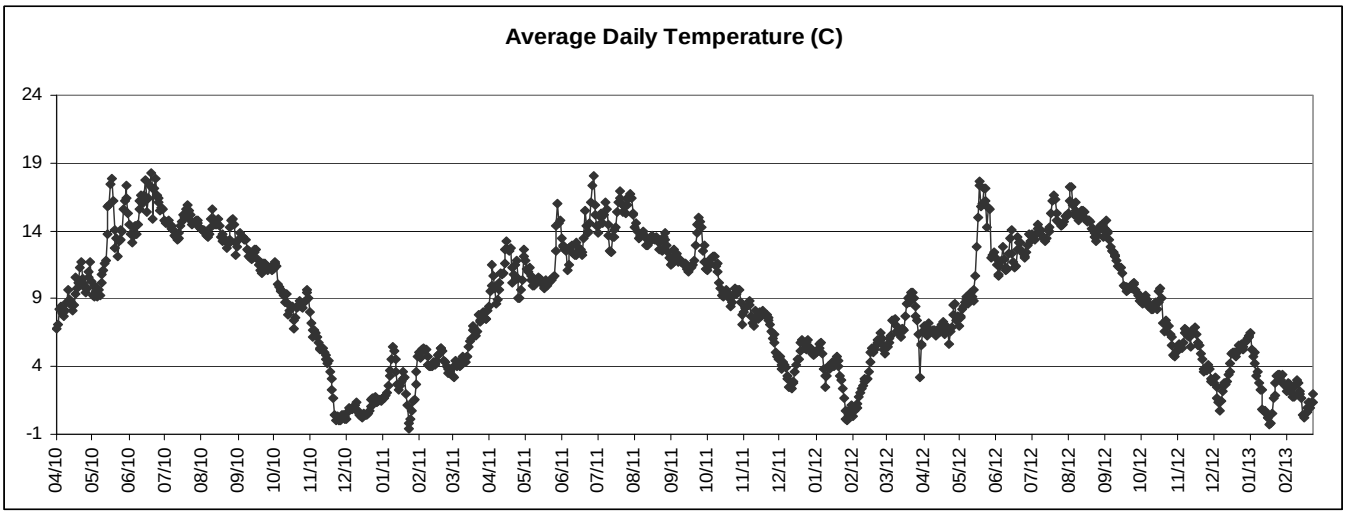
6.15.9. Automatic sensor data, Llyn Llagi

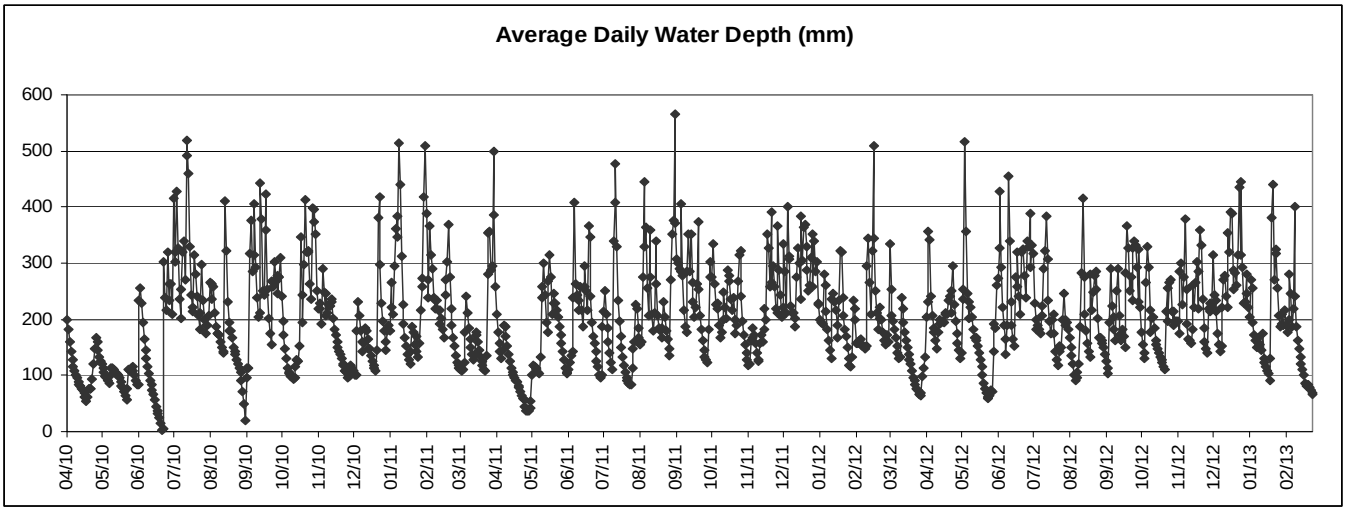
6.15.9.1. Lake sensor data, Llyn Llagi

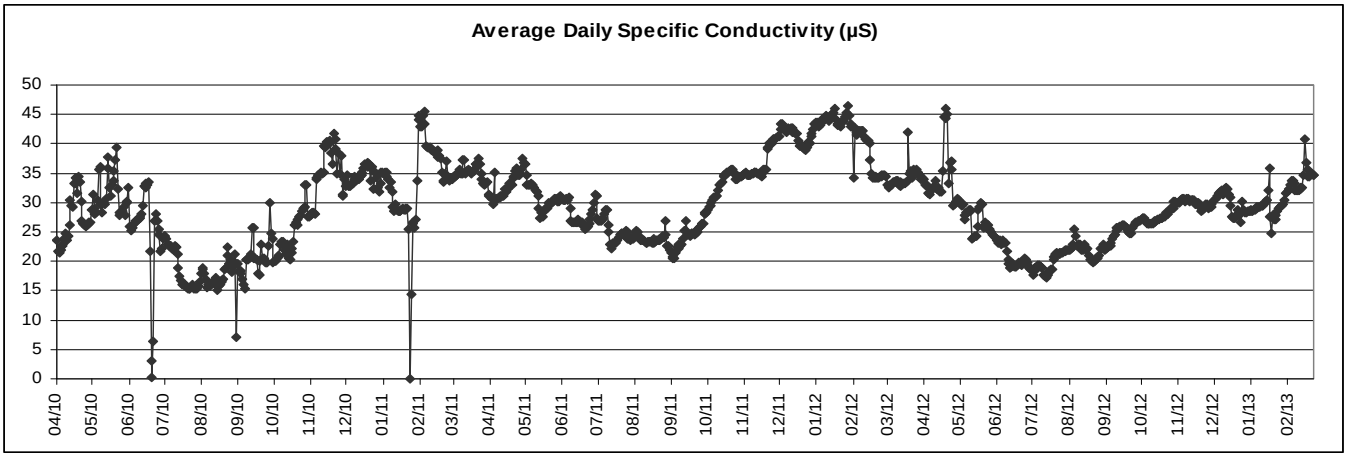




6.15.9.2. Outflow sensor data, Llyn Llagi

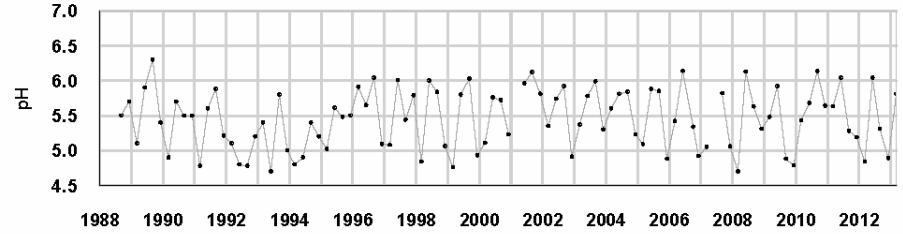


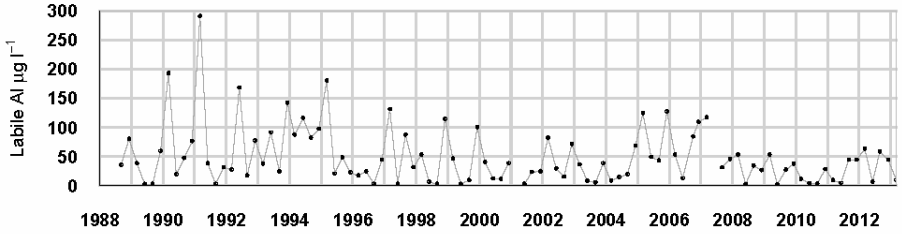


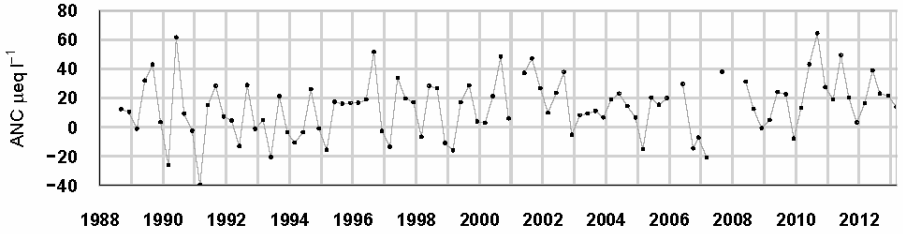


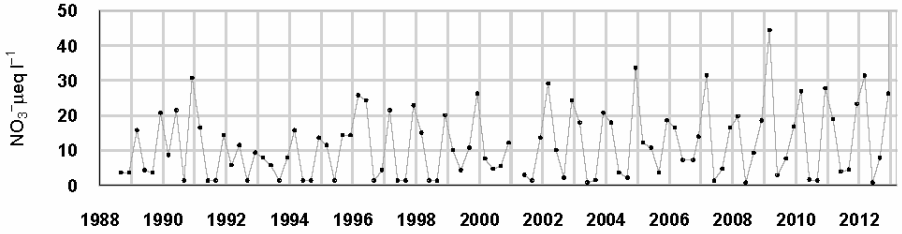
6.16. Llyn Cwm Mynach

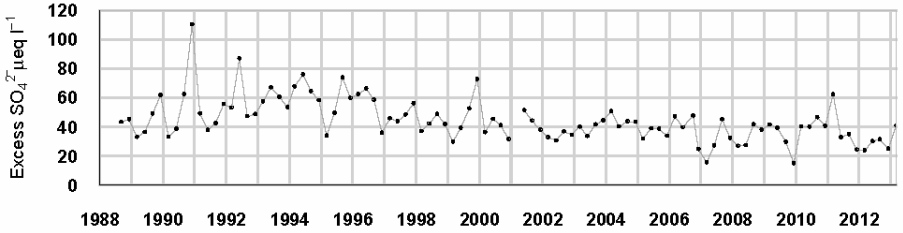
6.16.1. Spot sampled chemistry data

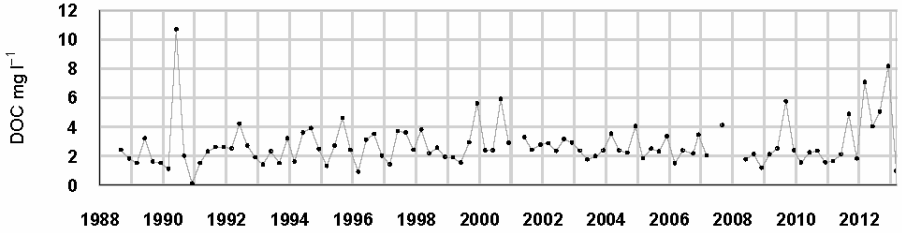


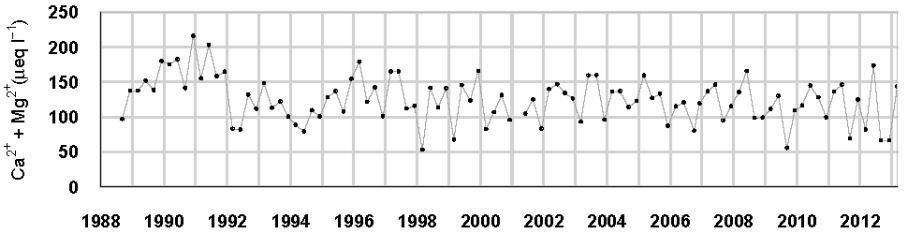


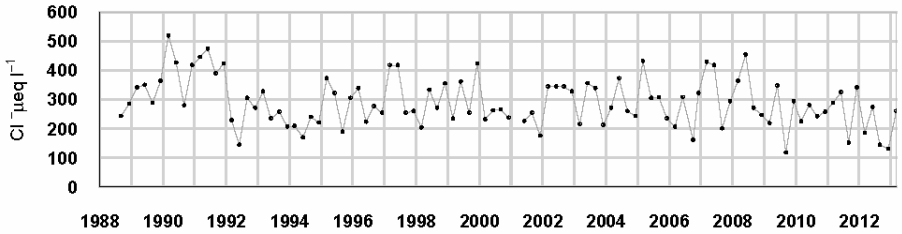








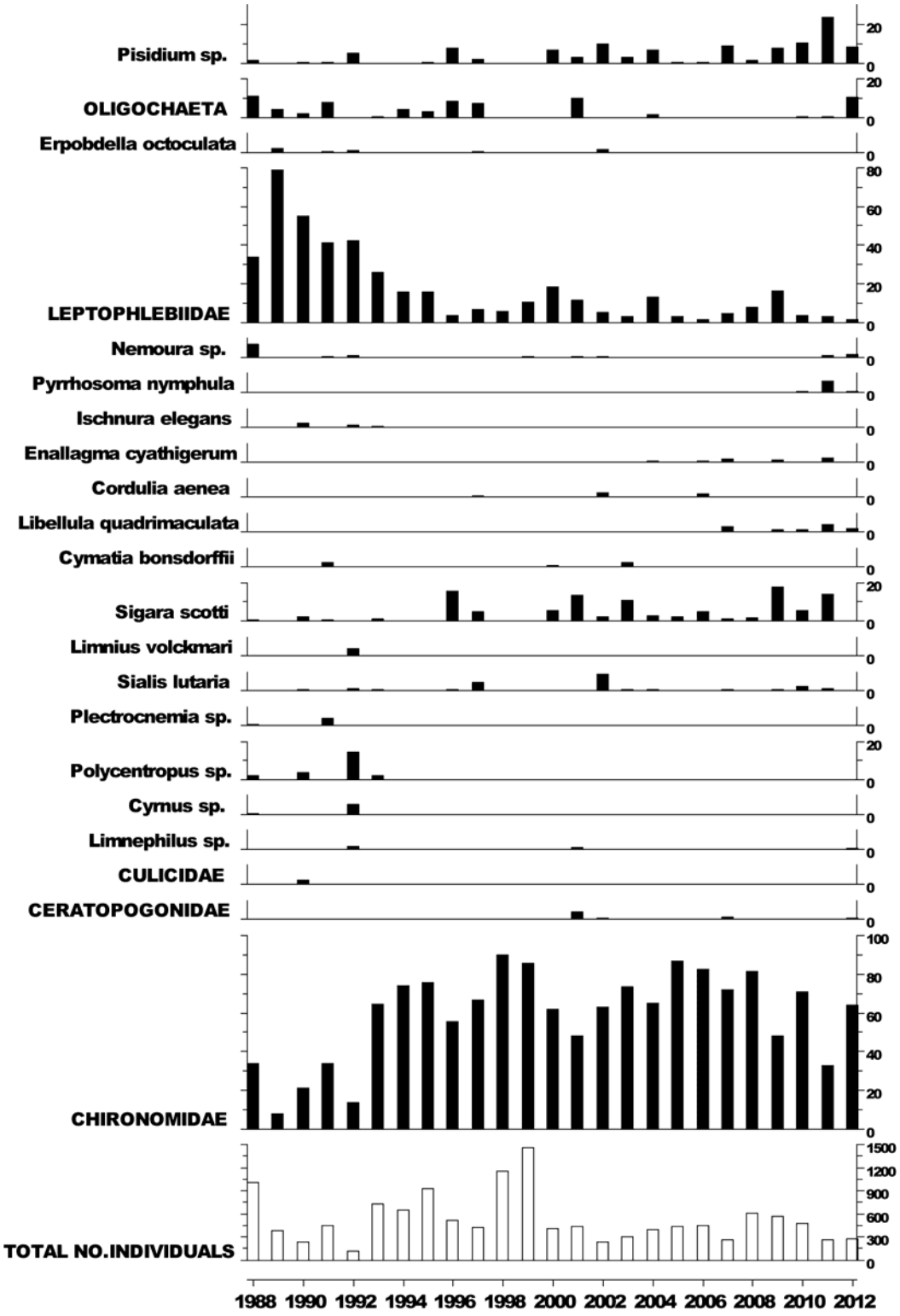




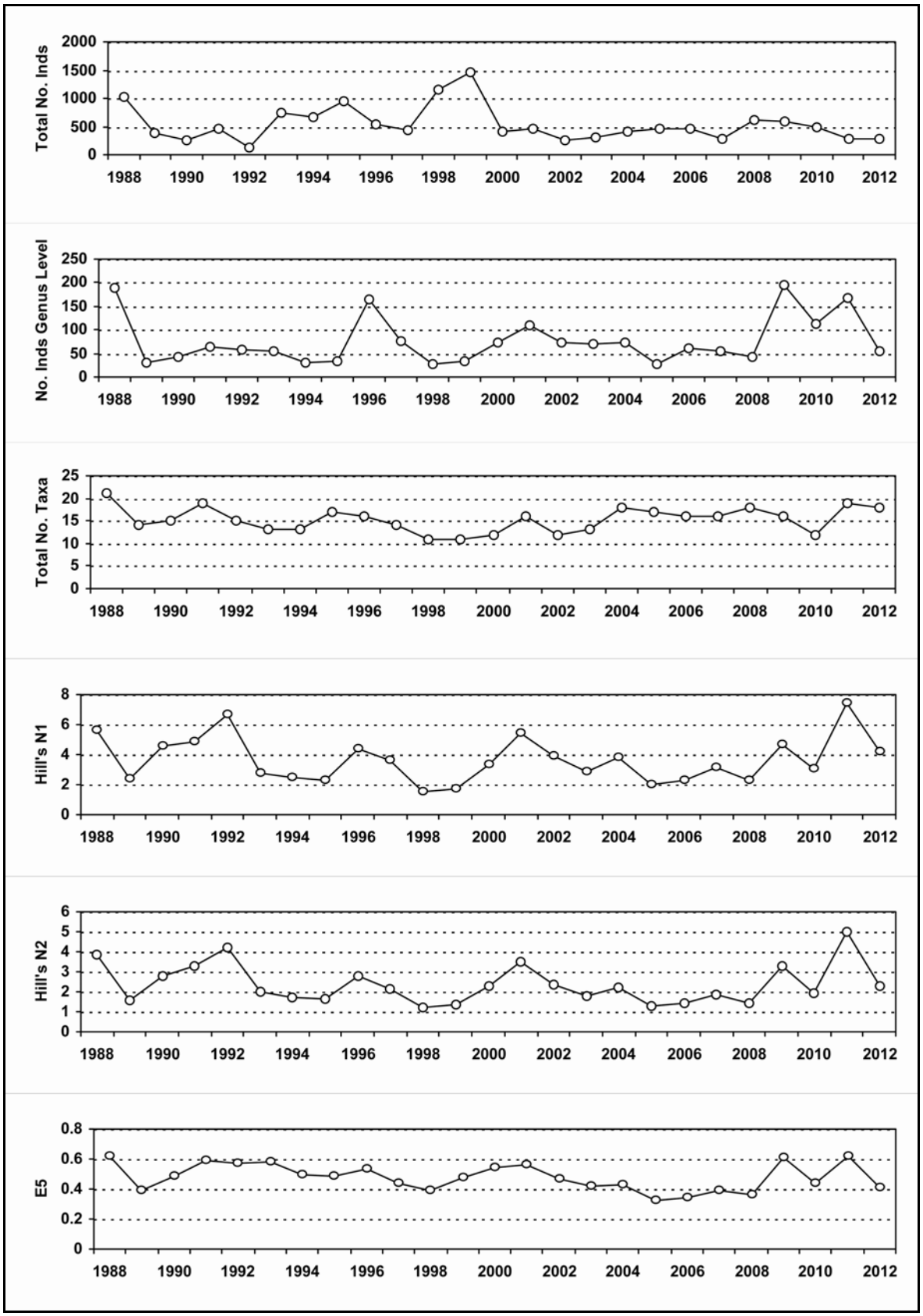
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	*Soluble Al	*Labile Al	Cl^{-}	$*SO_4^{2-}$	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.35	7.68	77.79	67.45	291.02	3.36	110.75	66.58	337.67	88.32	52.91	9.40	2.50
12-13 mean	5.51	24.30	64.88	47.48	193.68	4.63	111.50	29.25	201.77	52.96	31.80	102.07	4.54
12-13 std dev	0.52	10.54	41.19	16.63	61.32	1.66	90.97	25.79	75.24	13.09	6.68	181.32	2.97

6.16.2. Macroinvertebrate data

6.16.2.1. Percentage abundance summary, Llyn Cwm Mynach

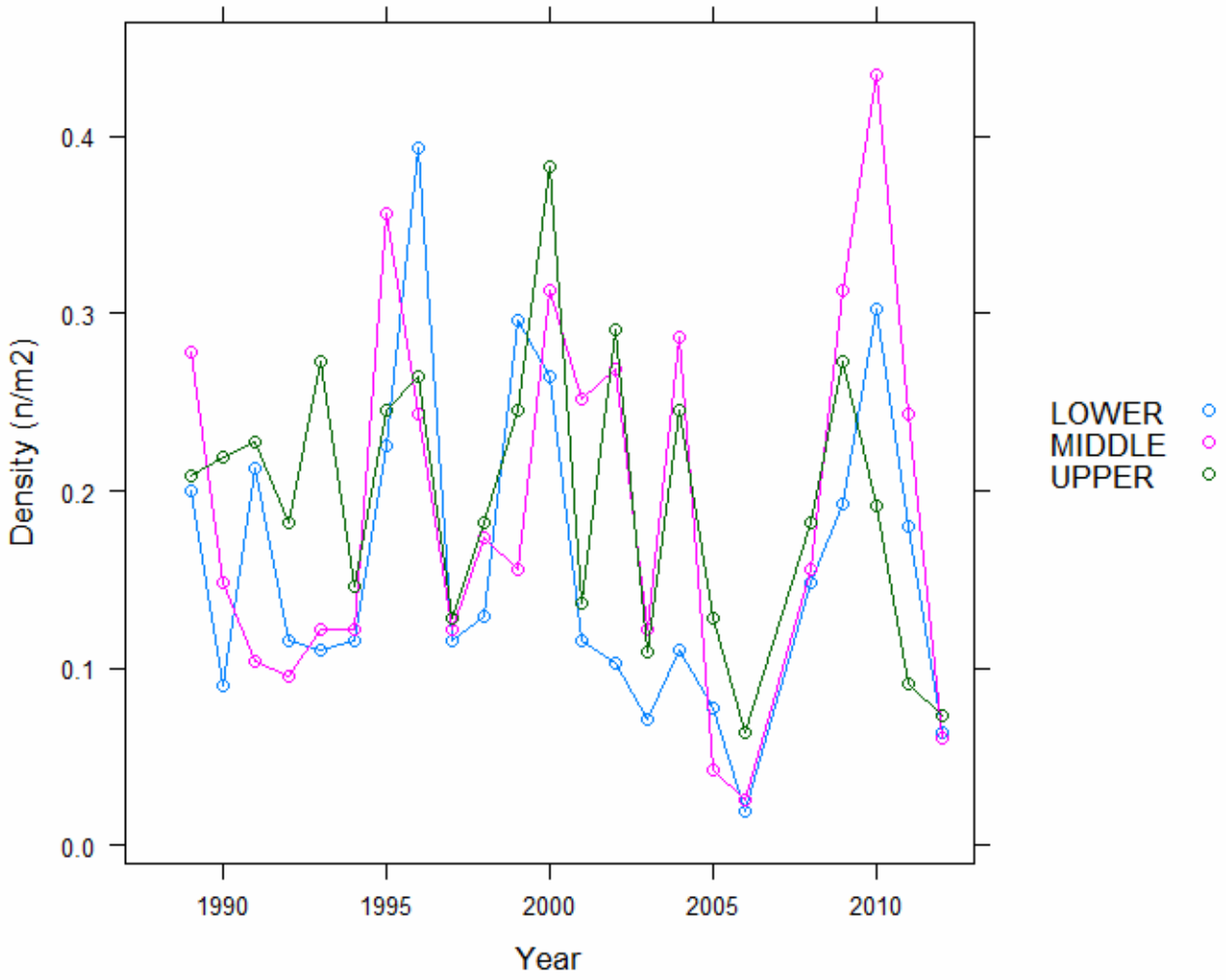


6.16.2.2. Summary statistics, Llyn Cwm Mynach

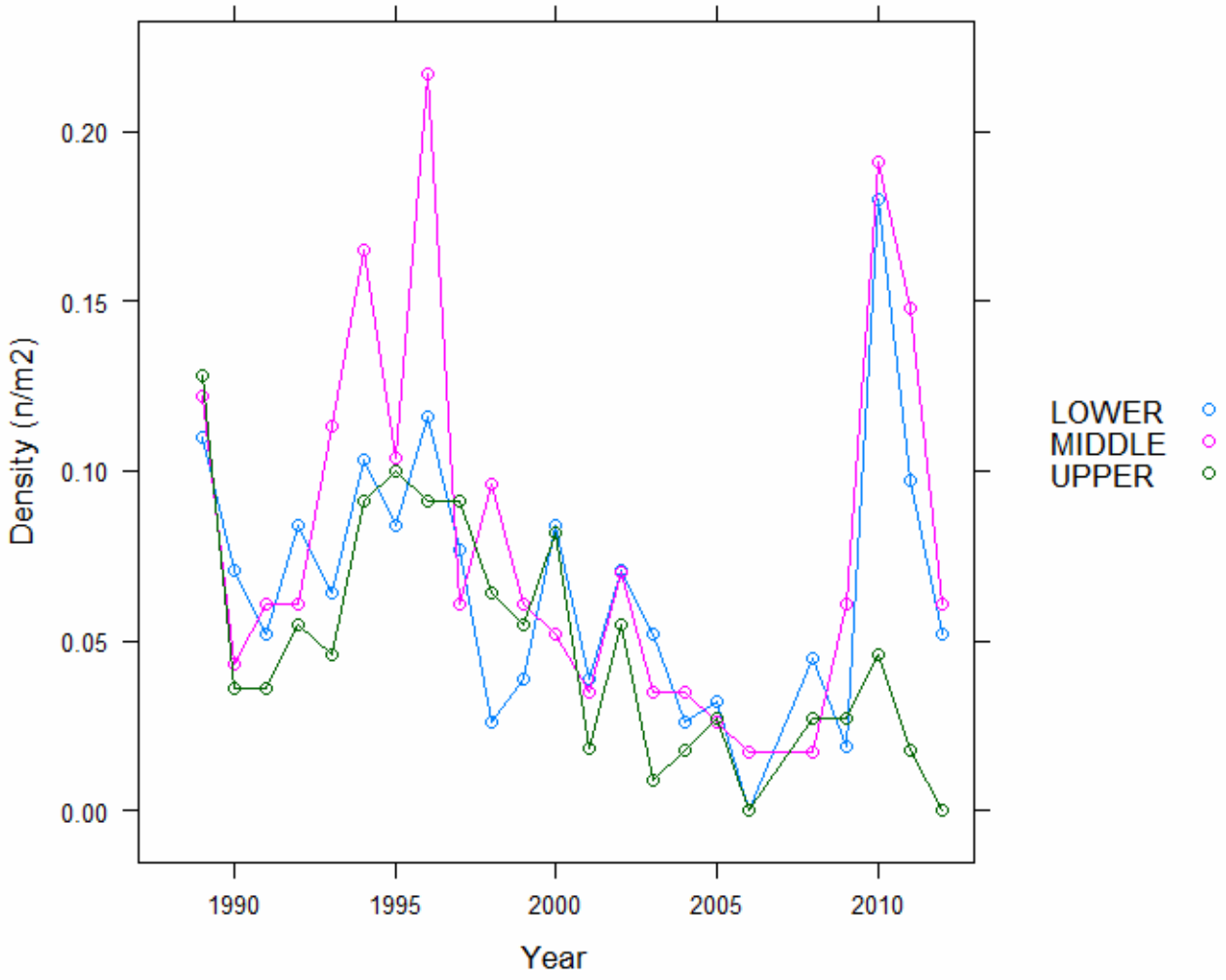


6.16.3. Fish data (for outflow stream)

6.16.3.1. Summary of Trout fry densities (numbers m^{-2}), Llyn Cwm Mynach

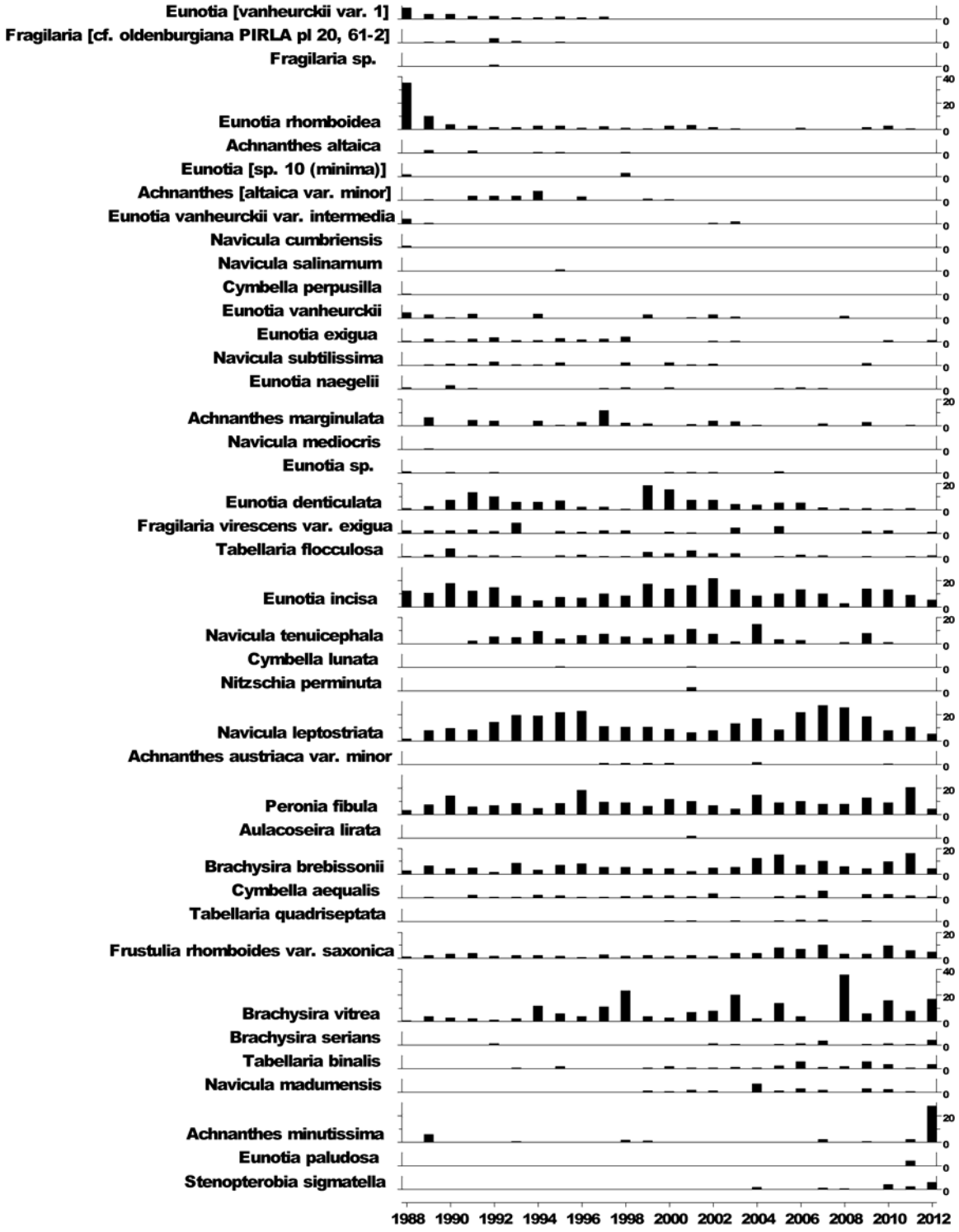


6.16.3.2. Summary of Trout parr densities (numbers m^{-2}), Llyn Cwm Mynach

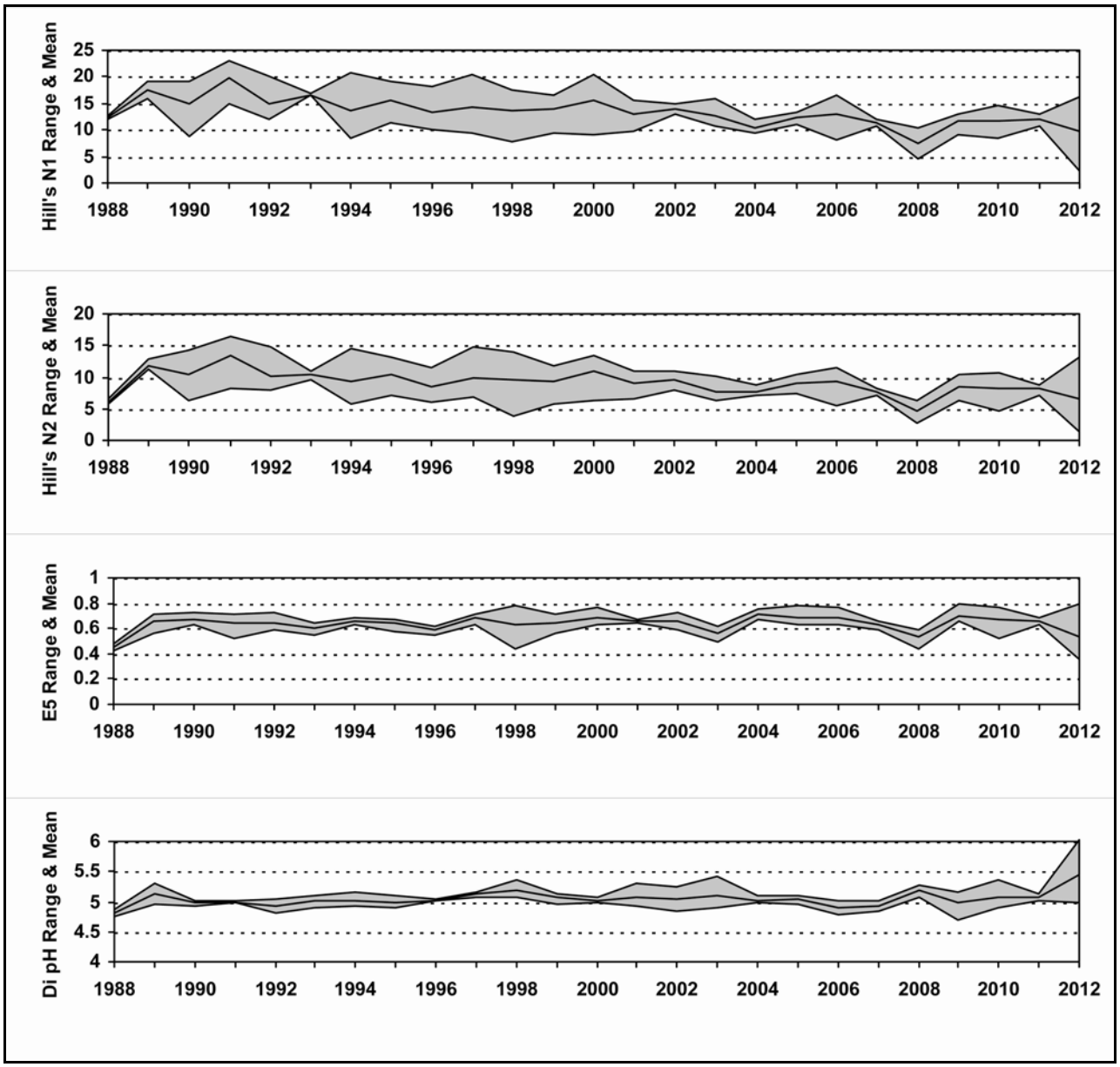


6.16.4. Epilithic diatom data

6.16.4.1. Percentage abundance summary, Llyn Cwm Mynach

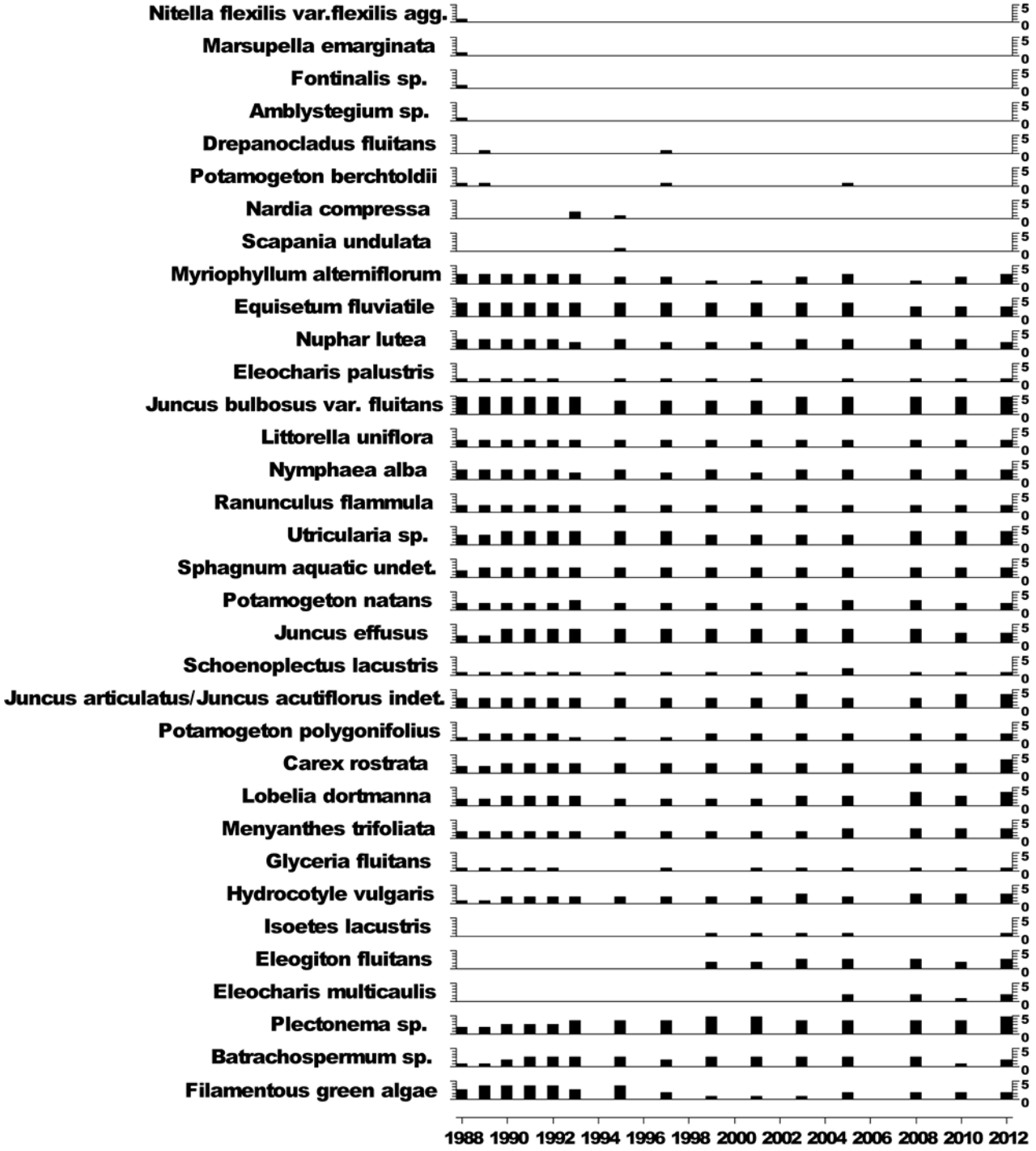


6.16.4.2. Summary statistics, Llyn Cwm Mynach



6.16.5. Aquatic macrophyte data, Llyn Cwm Mynach

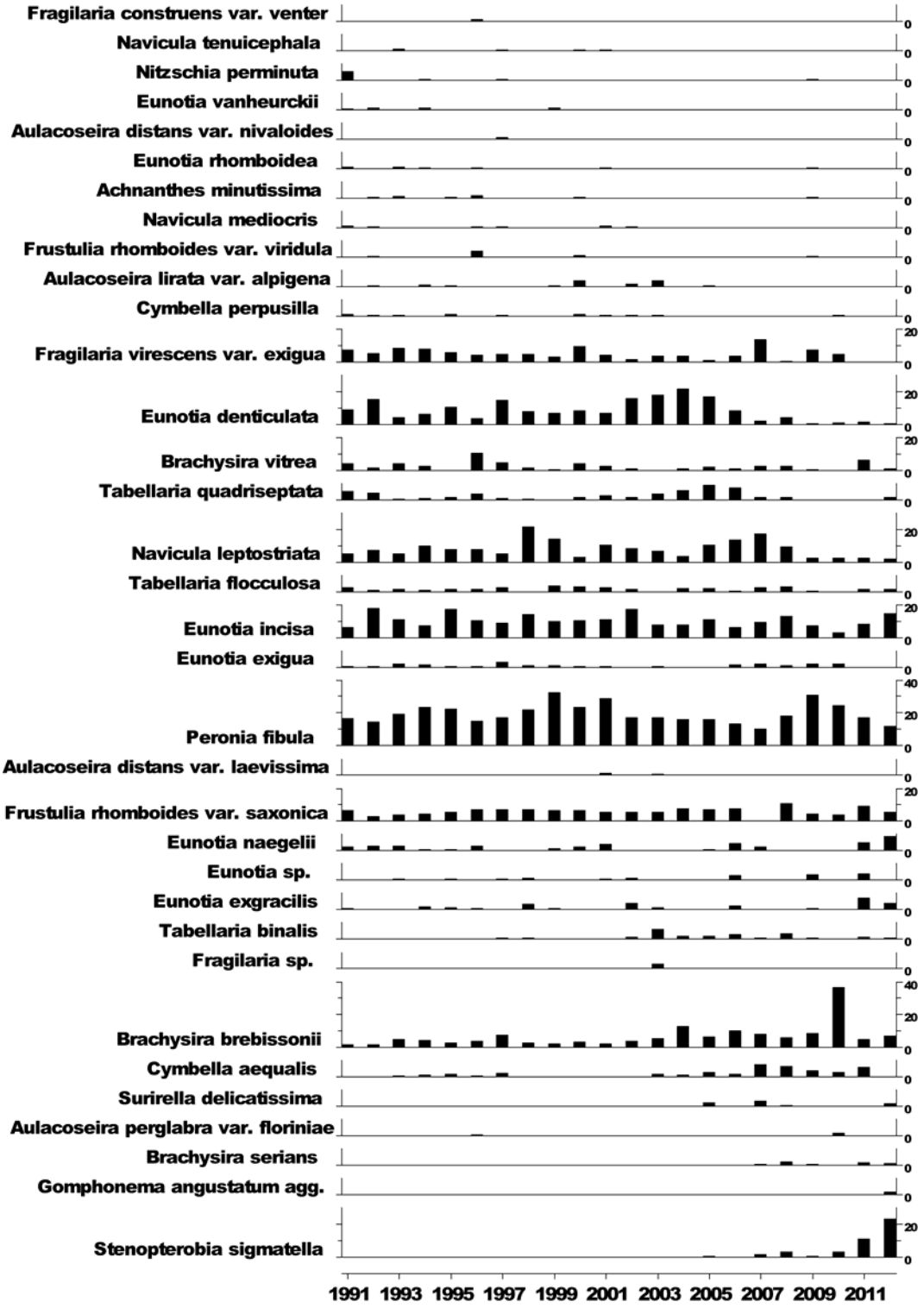
Species Scores (1-5)



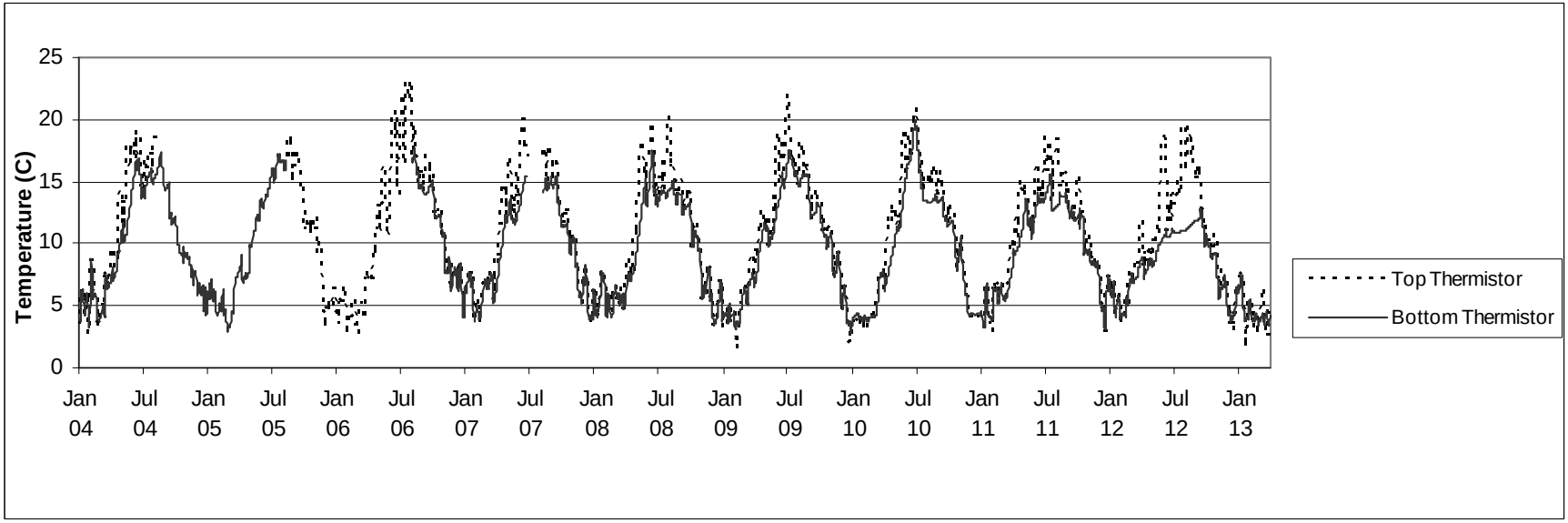
No survey in 2007 due to funding cuts

6.16.6. Sediment trap data, Llyn Cwm Mynach

Relative percentage frequency of diatom taxa

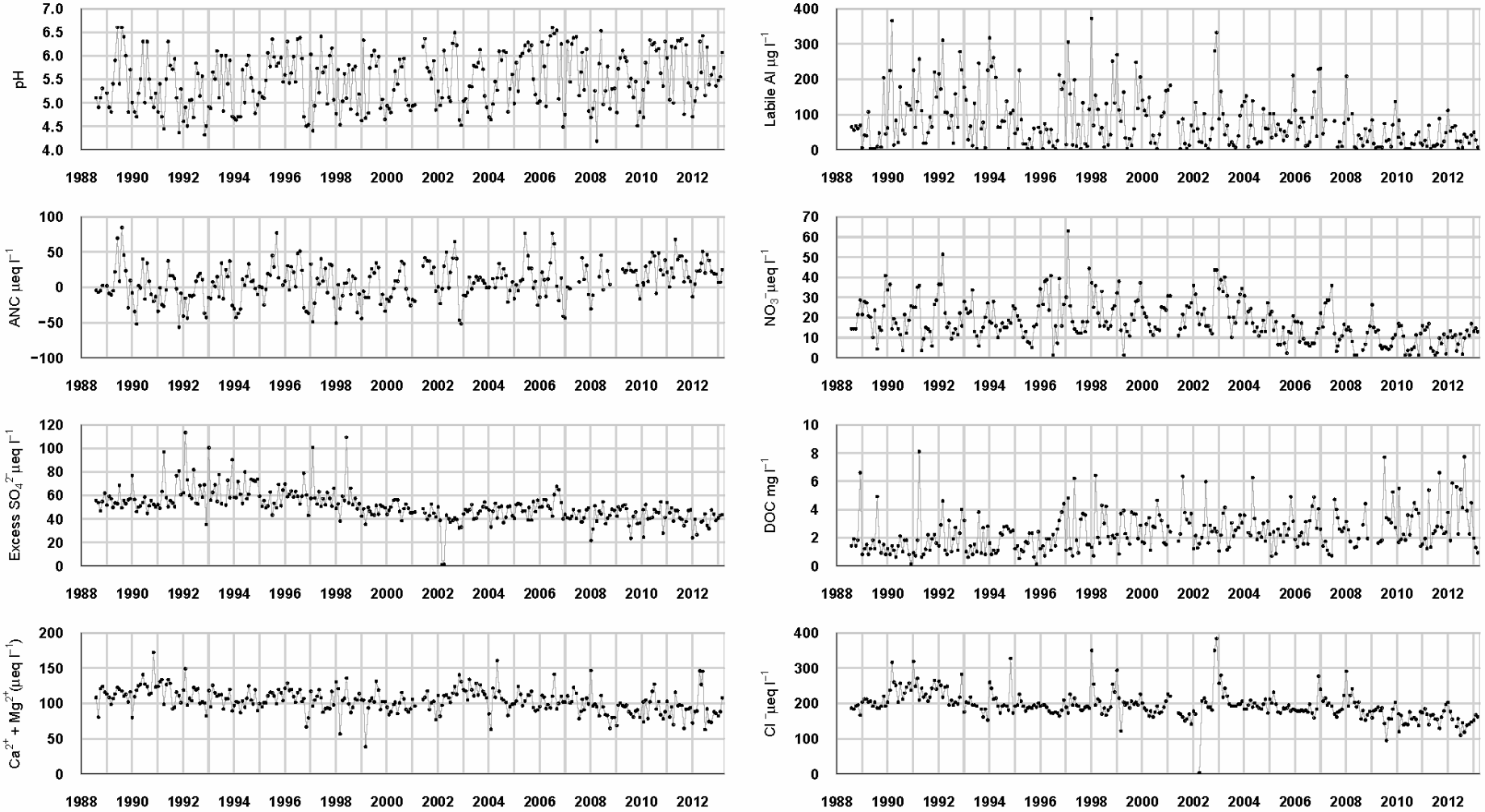


6.16.7. Thermistor data, Llyn Cwm Mynach



6.17. Afon Hafren

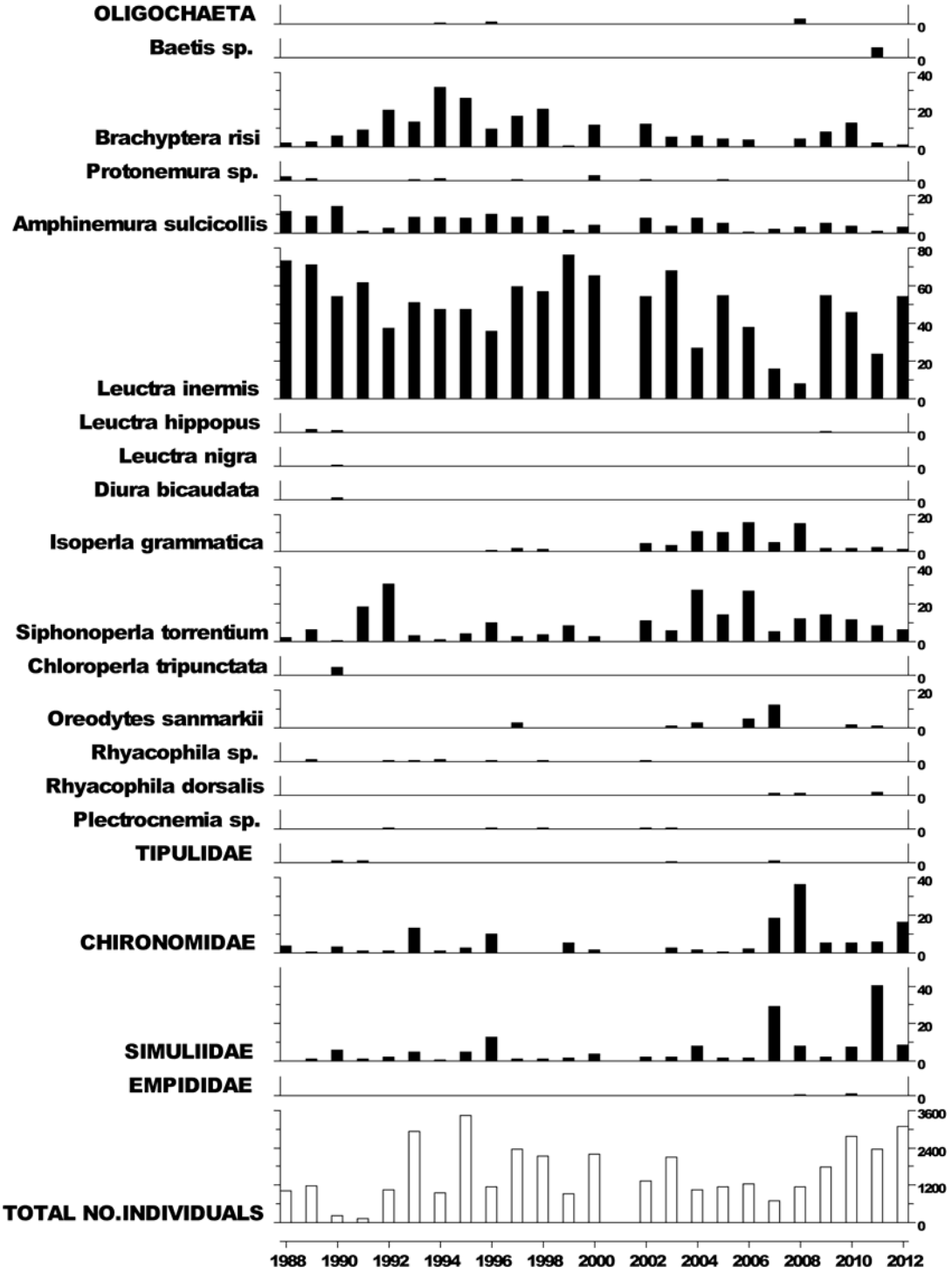
6.17.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.29	-2.40	47.91	66.41	200.39	3.16	170.00	101.71	221.09	82.97	59.79	20.58	1.76
12-13 mean	5.74	25.78	45.34	52.18	144.89	3.59	95.92	28.50	142.28	55.08	40.16	10.52	3.62
12-13 std dev	0.41	13.90	25.41	6.72	14.18	1.00	51.74	19.39	17.49	5.38	4.75	4.51	2.11

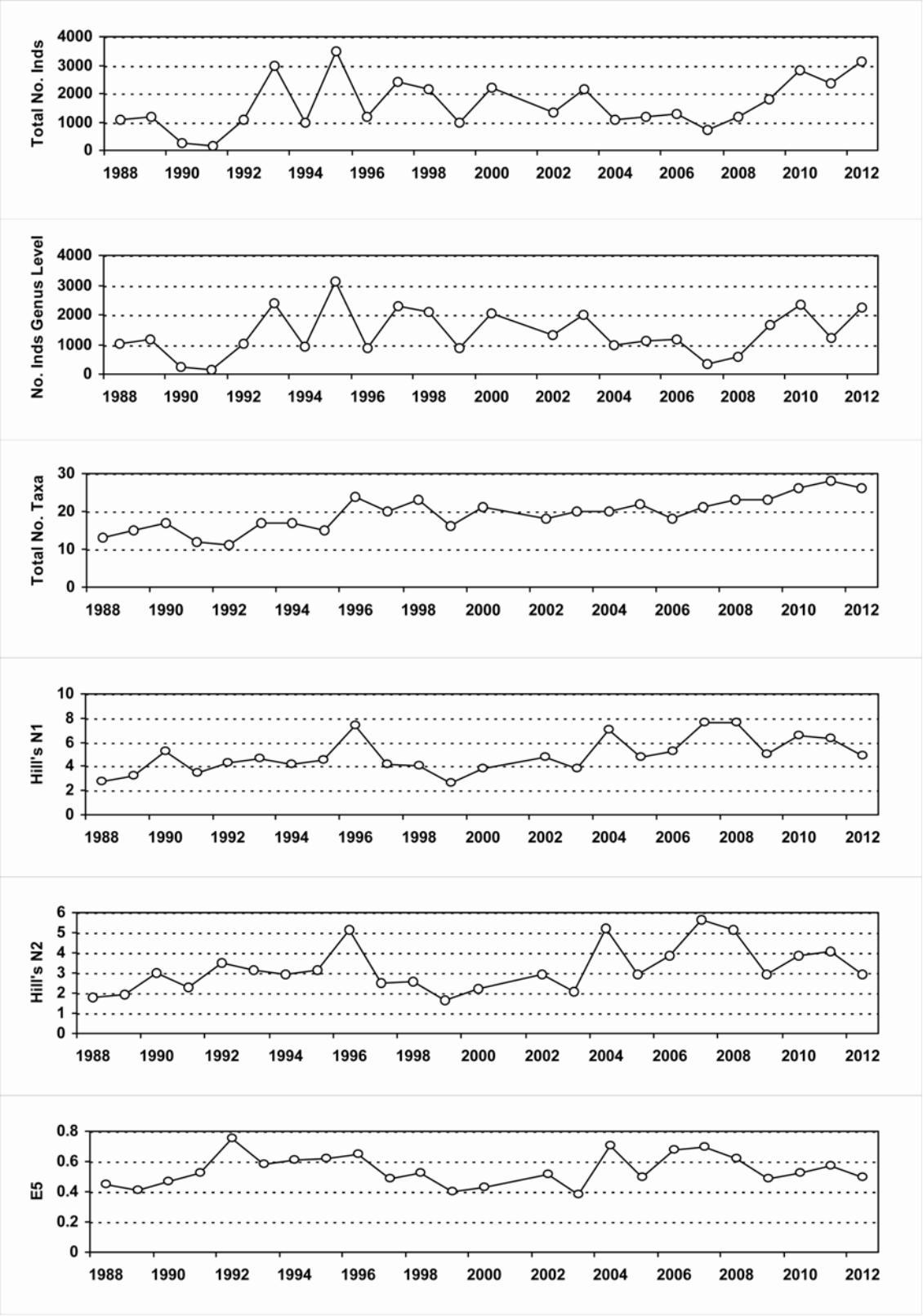
6.17.2. Macroinvertebrate data

6.17.2.1. Percentage abundance summary, Afon Hafren



No sampling in 2001 due to Foot and Mouth restrictions.

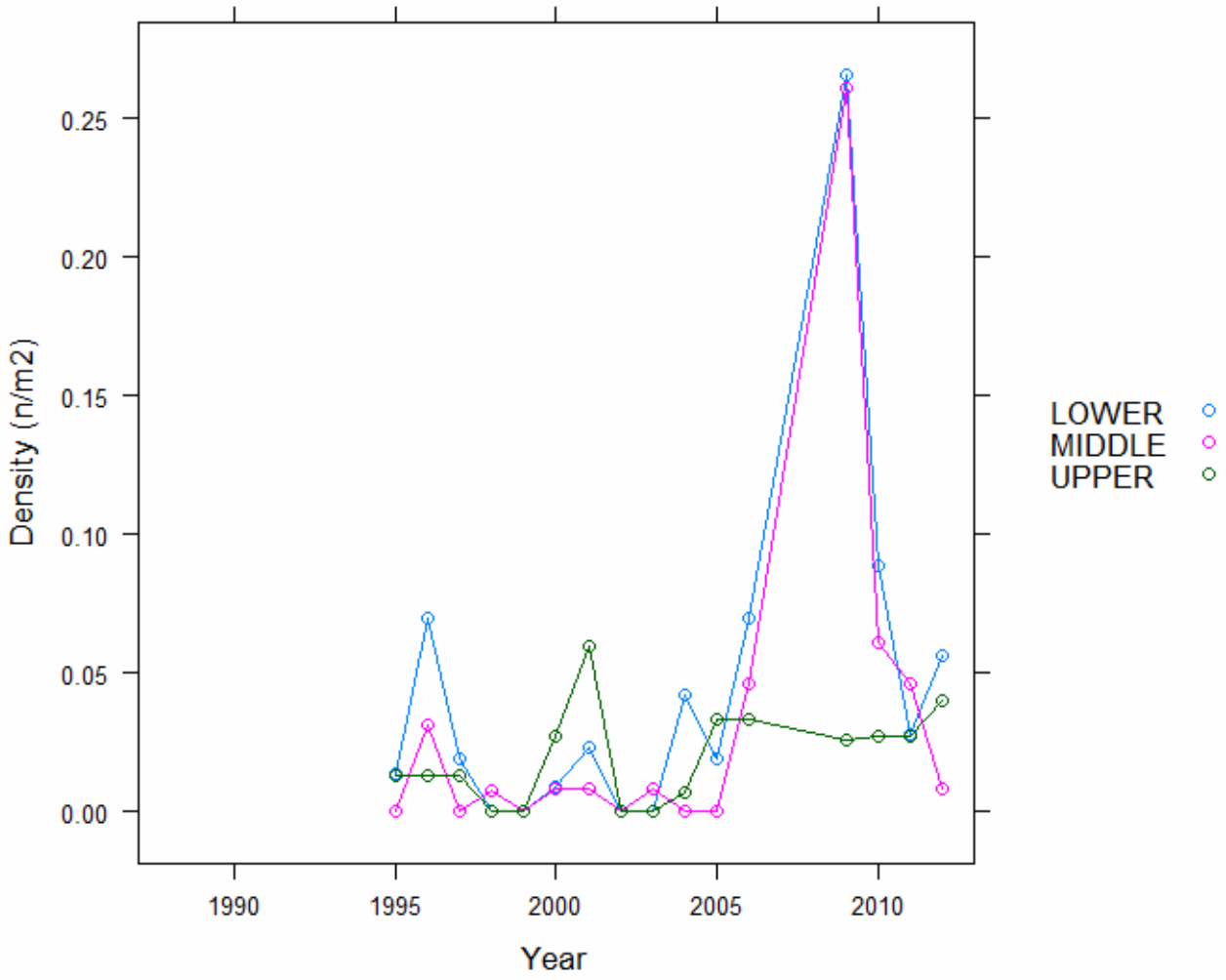
6.17.2.2. Summary statistics, Afon Hafren



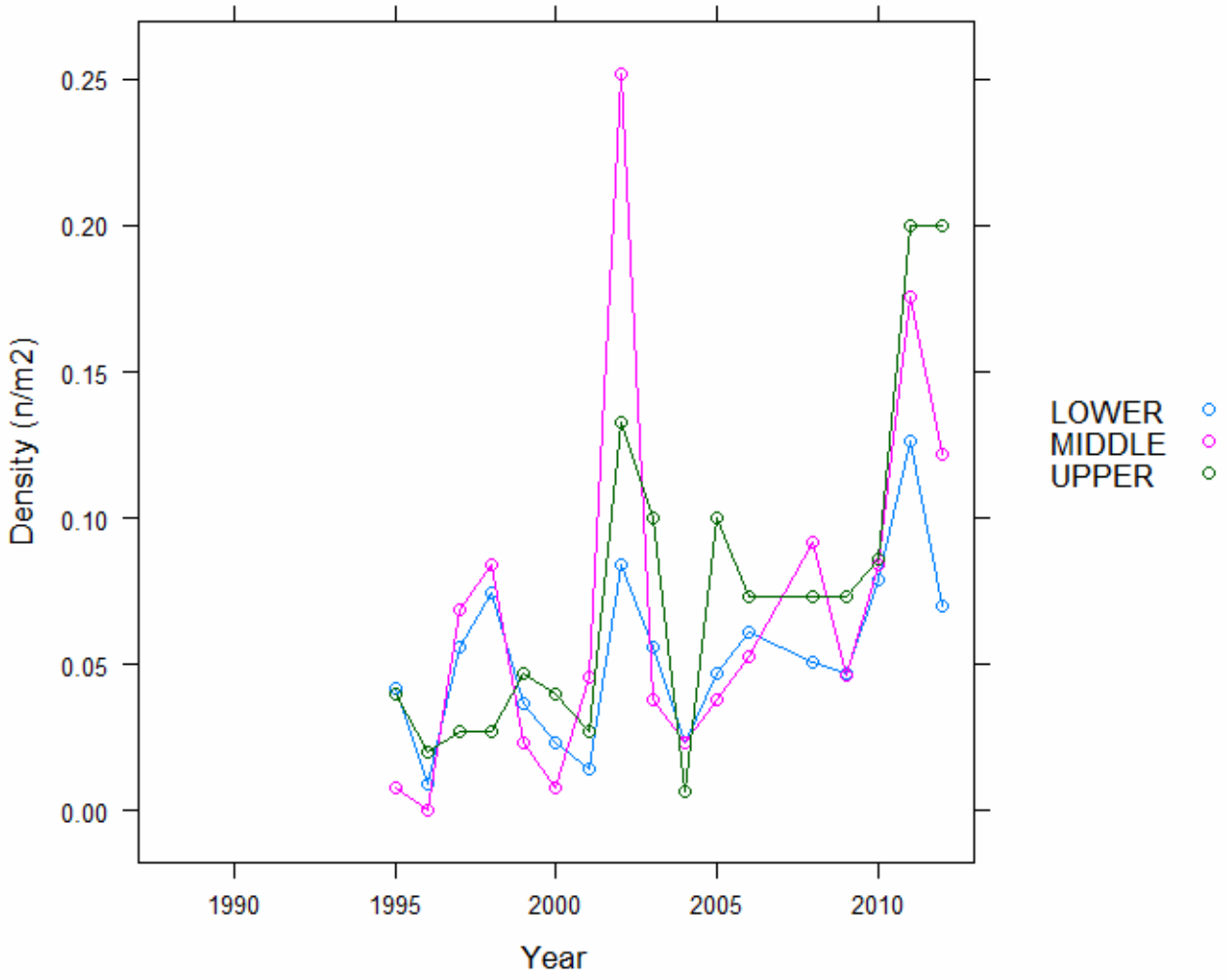
No sampling in 2001 due to Foot and Mouth restrictions.

6.17.3. Fish data

6.17.3.1. Summary of Trout fry densities (numbers m^{-2}), Afon Hafren

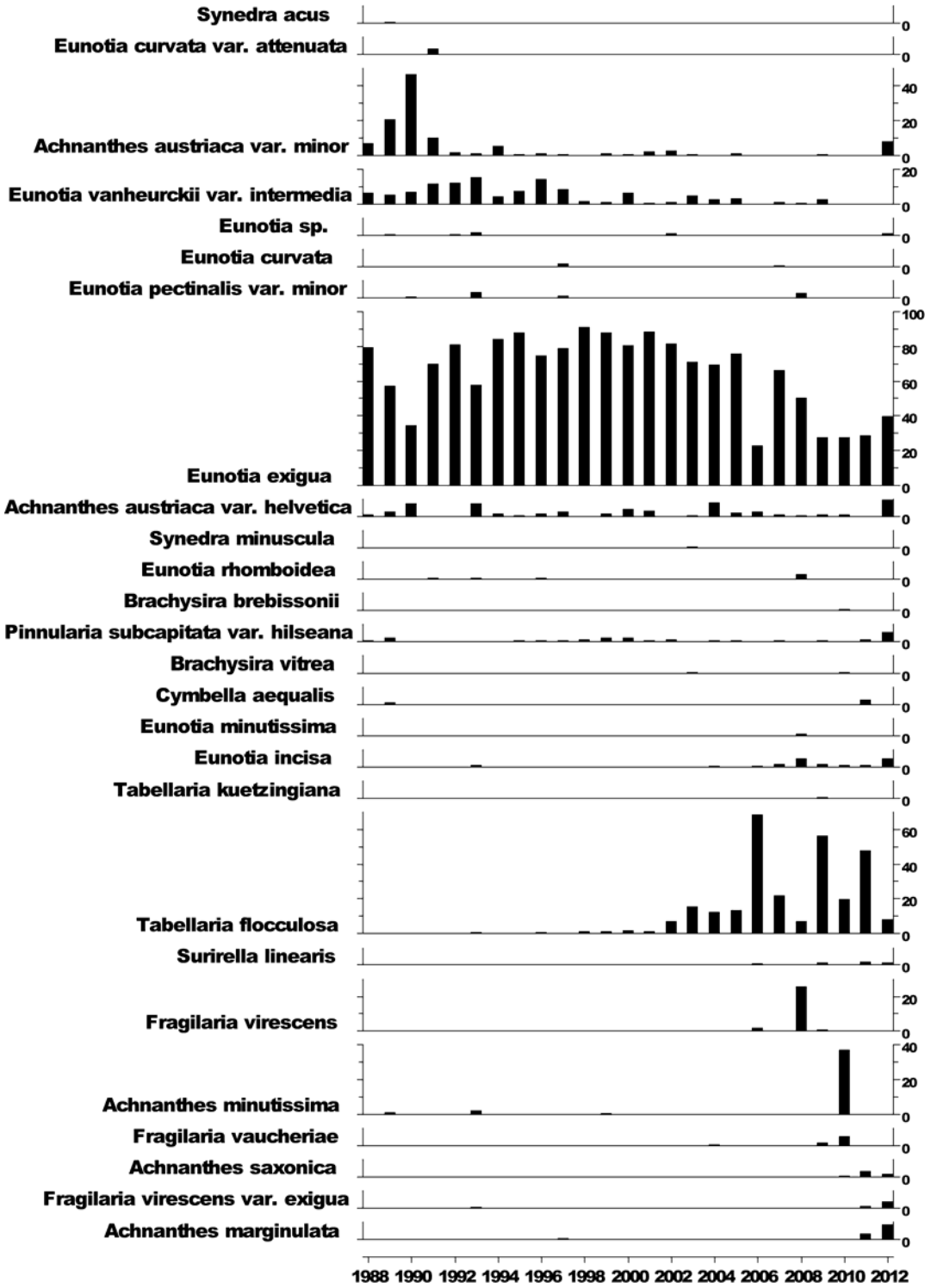


6.17.3.2. Summary of Trout parr densities (numbers m^{-2}), Afon Hafren

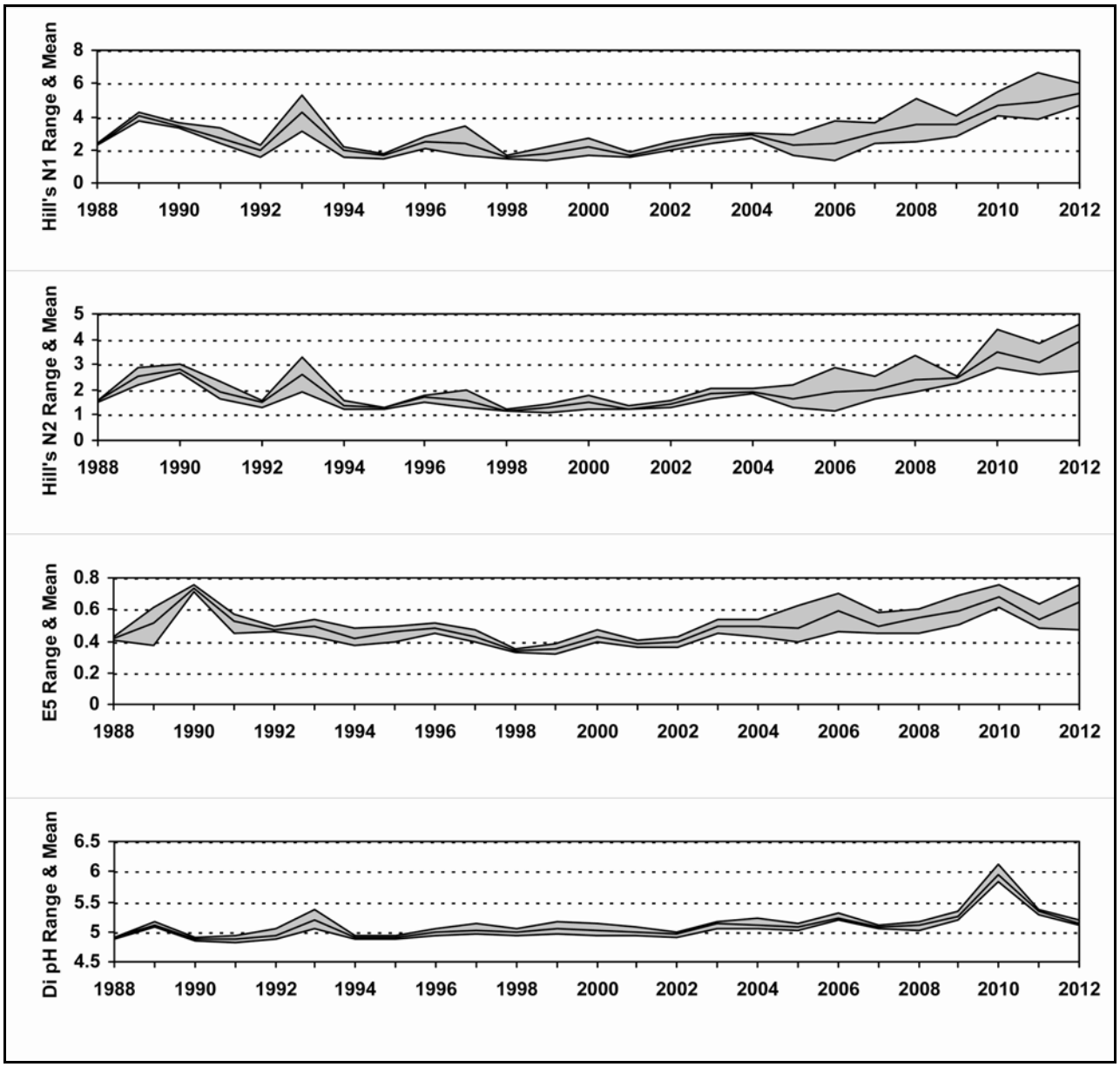


6.17.4. Epilithic diatom data

6.17.4.1. Percentage abundance summary, Afon Hafren

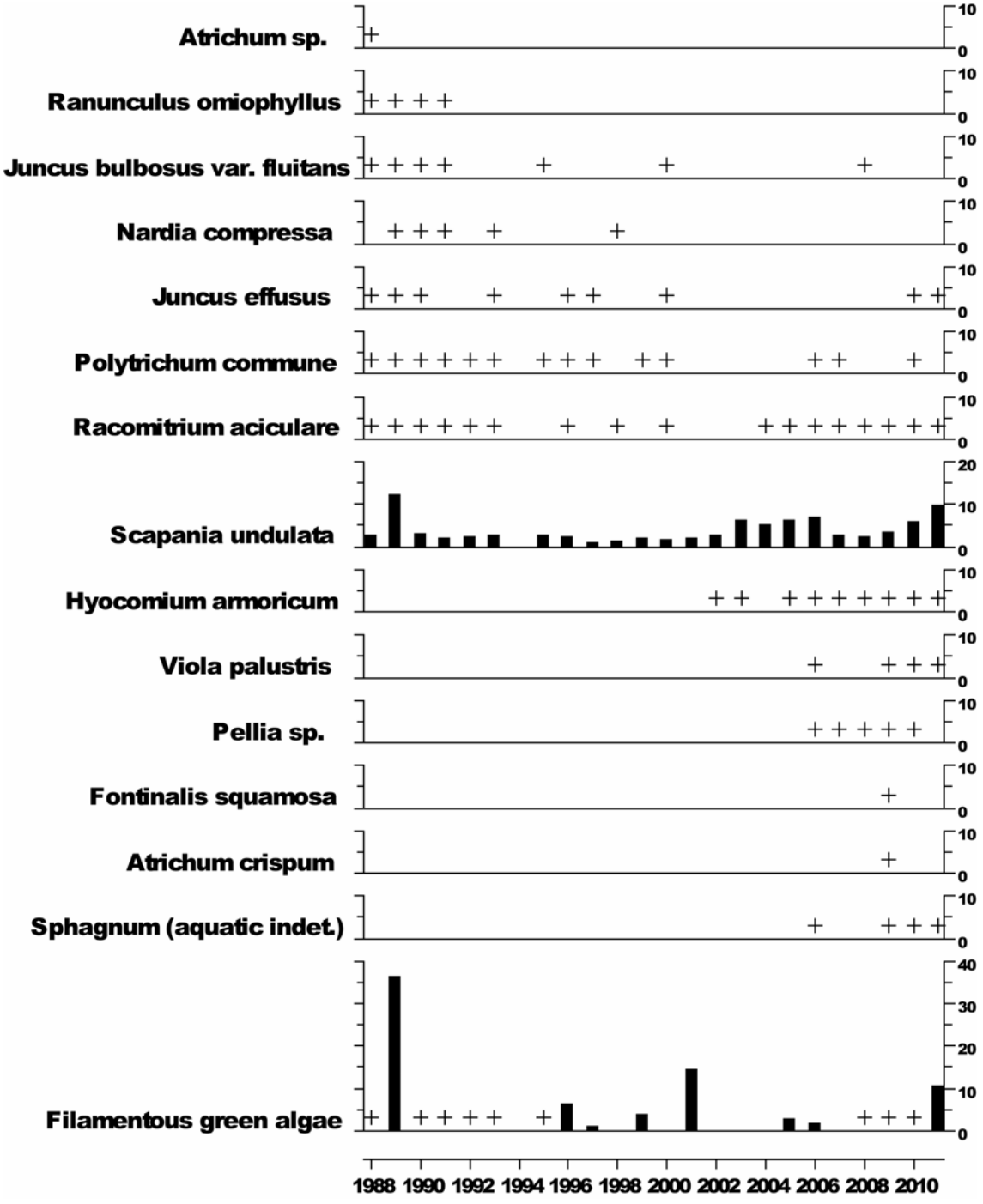


6.17.4.2. Summary statistics, Afon Hafren



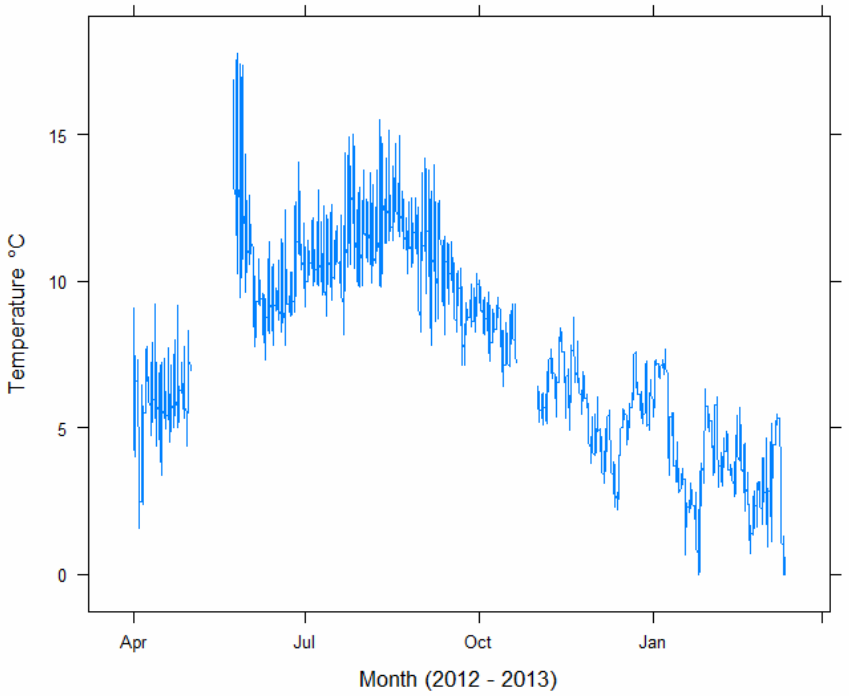
6.17.5. Aquatic macrophyte data, Afon Hafren

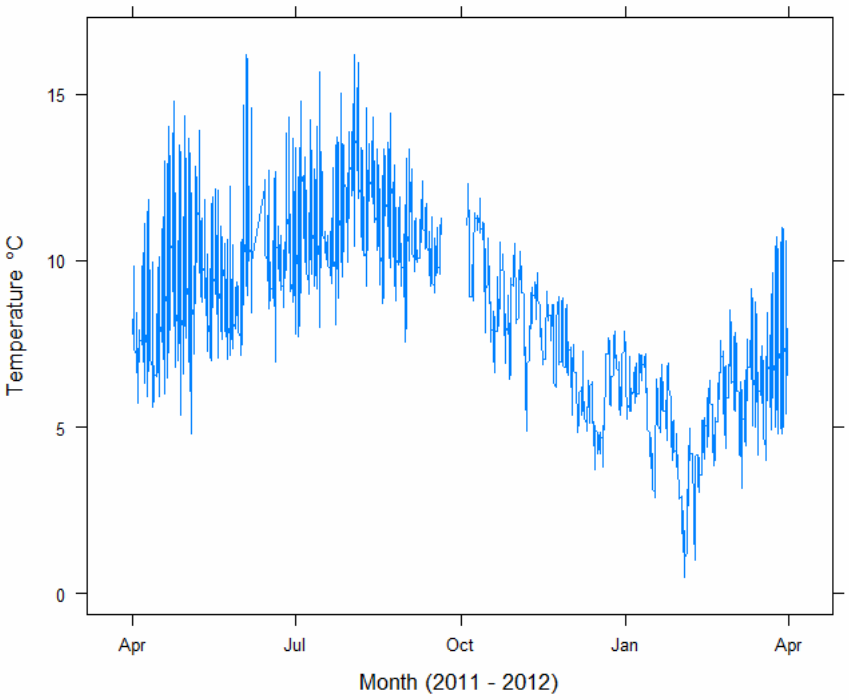
Percentage Species Cover



+ Represents <0.9% abundance

6.17.6. Thermistor data, Afon Hafren

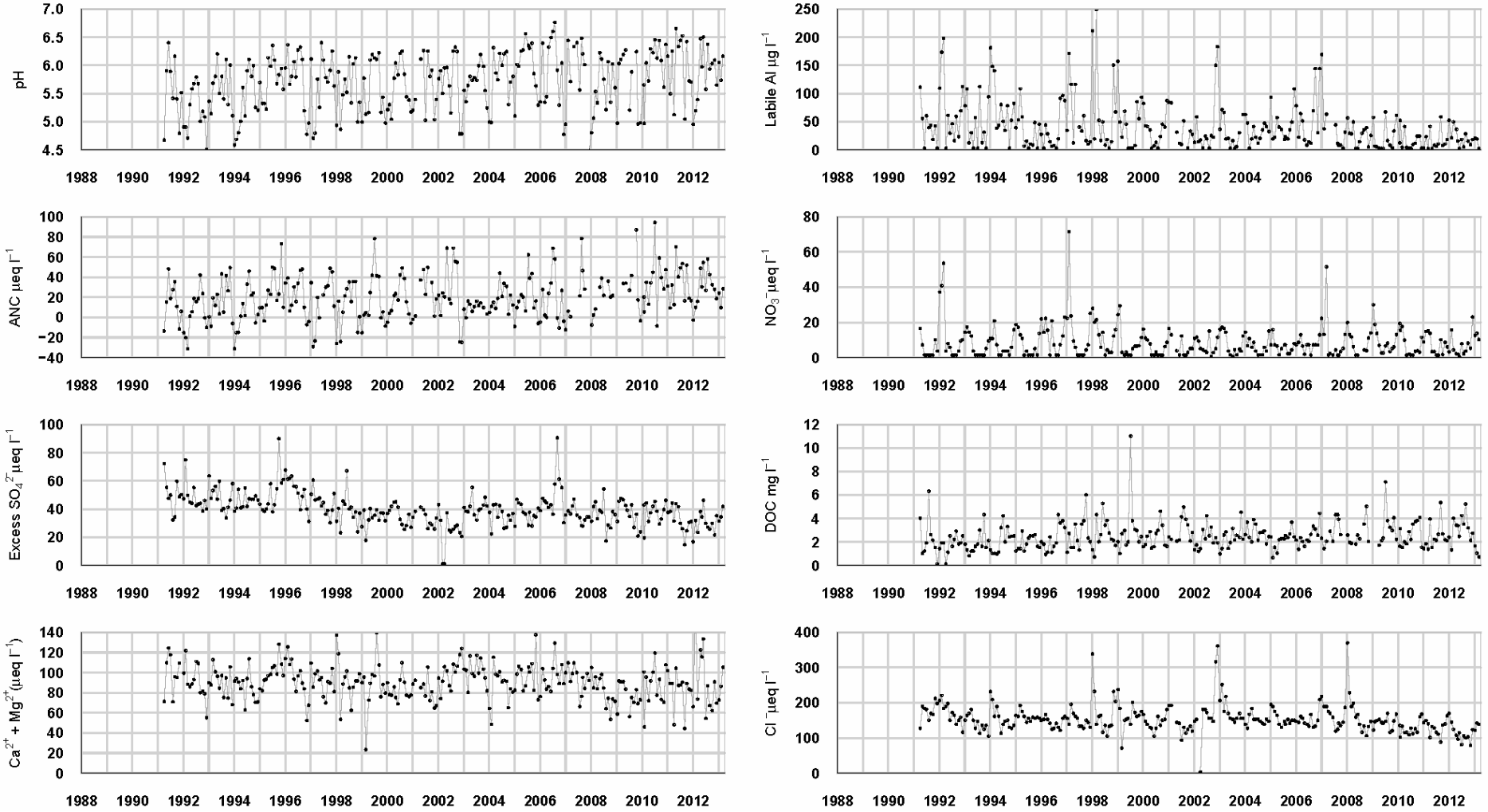




Gaps due to thermistor malfunction

6.18. Afon Gwy

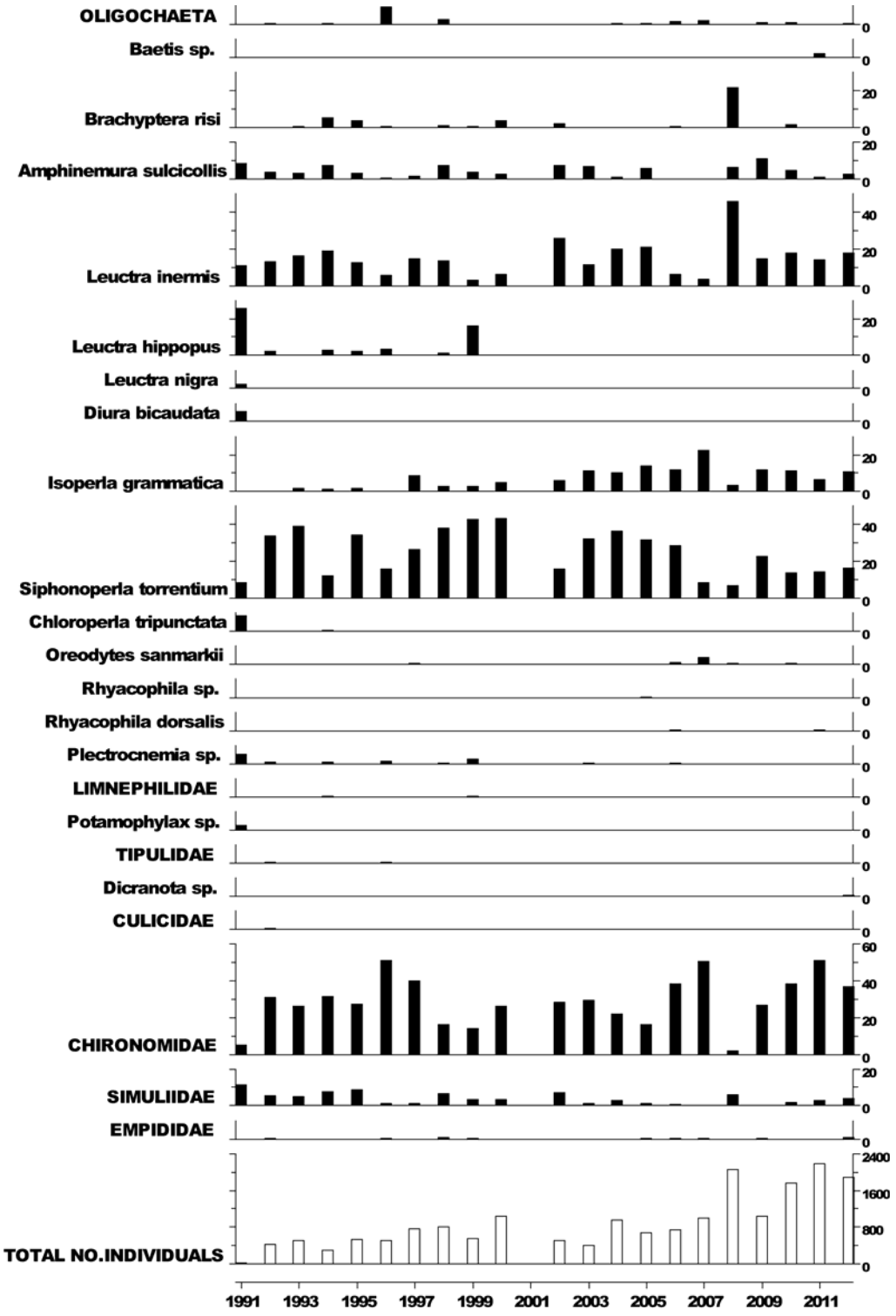
6.18.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	*Soluble Al	*Labile Al	Cl^{-}	$*SO_4^{2-}$	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.51	14.13	40.42	53.22	147.31	3.24	106.64	53.64	159.84	65.67	48.91	8.65	1.98
12-13 mean	6.04	33.34	44.05	44.71	114.26	2.53	50.75	15.33	108.87	44.32	32.89	7.52	2.79
12-13 std dev	0.30	14.60	24.11	7.57	14.34	1.32	25.46	10.55	19.86	8.36	6.96	6.56	1.30

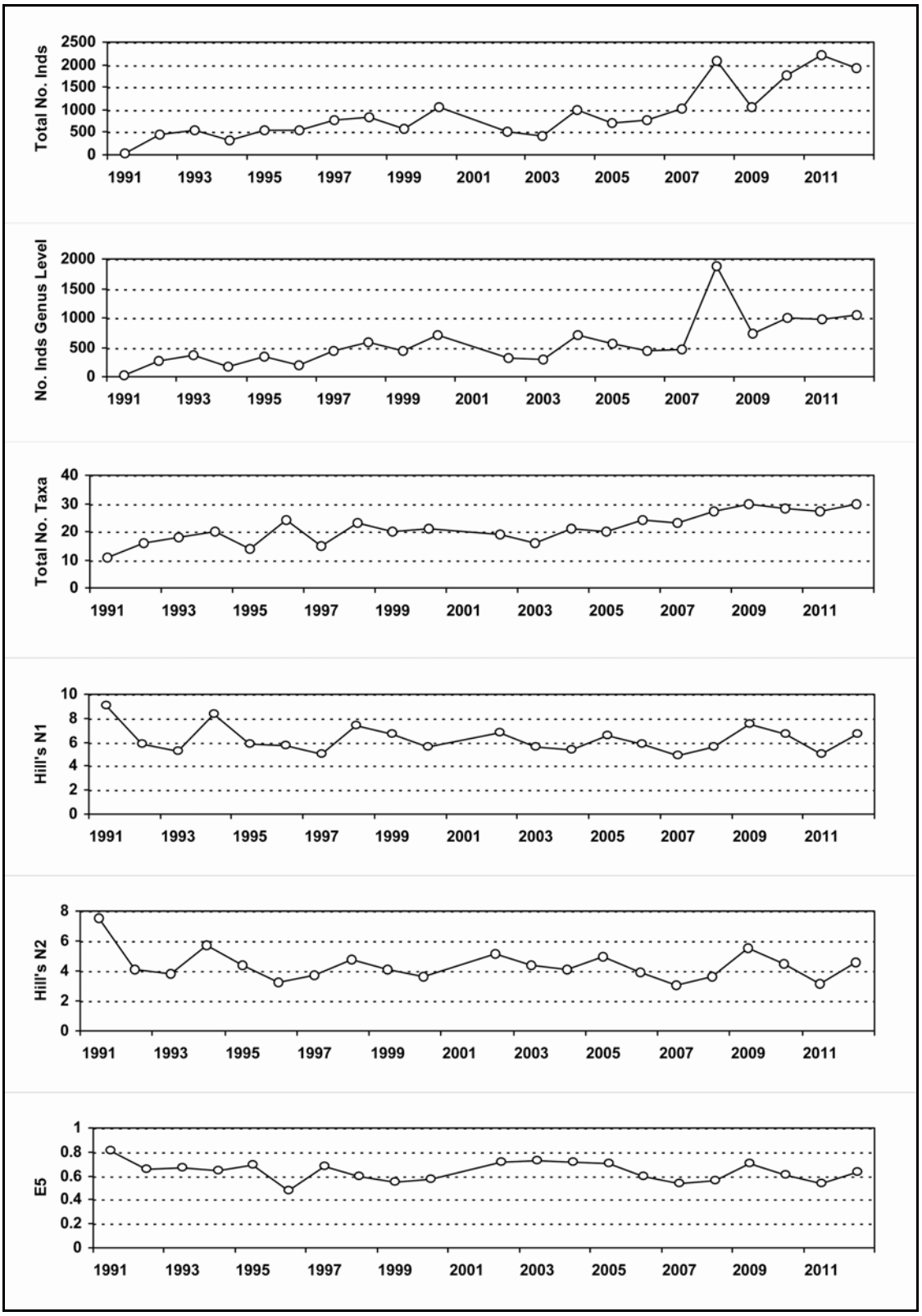
6.18.2. Macroinvertebrate data

6.18.2.1. Percentage abundance summary, Afon Gwy



No sampling in 2001 due to Foot and Mouth restrictions.

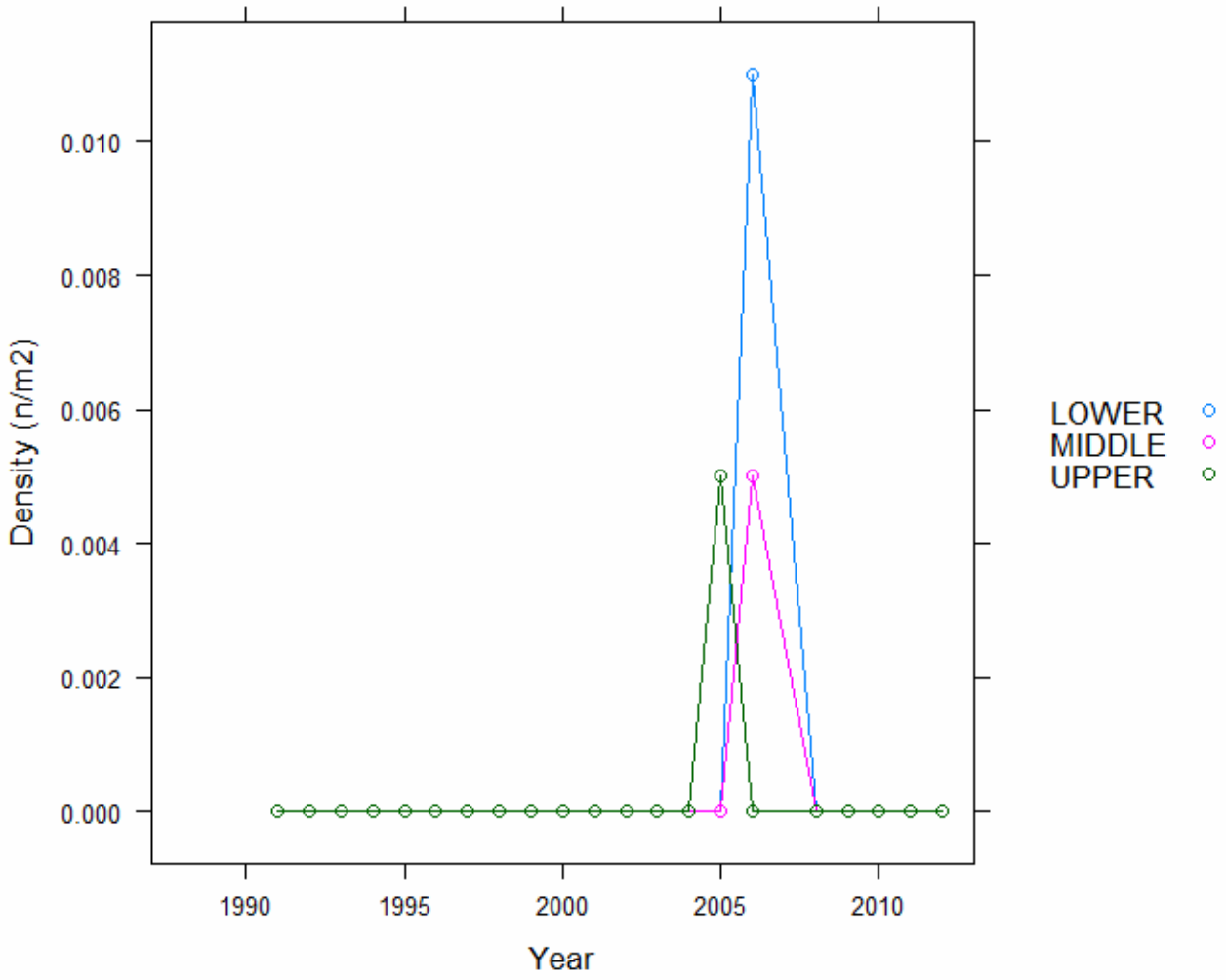
6.18.2.2. Summary statistics, Afon Gwy



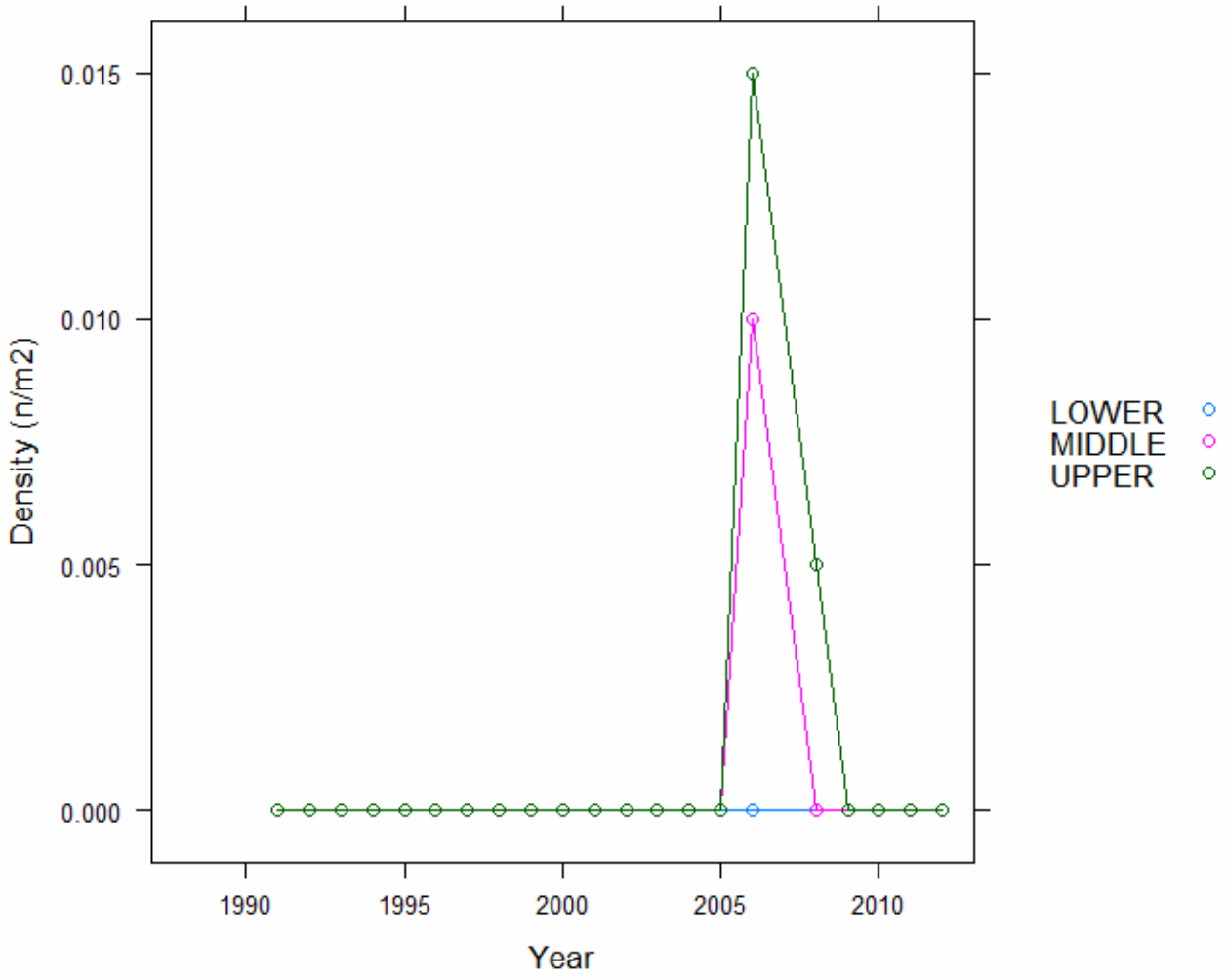
No sampling in 2001 due to Foot and Mouth restrictions.

6.18.3. Fish data

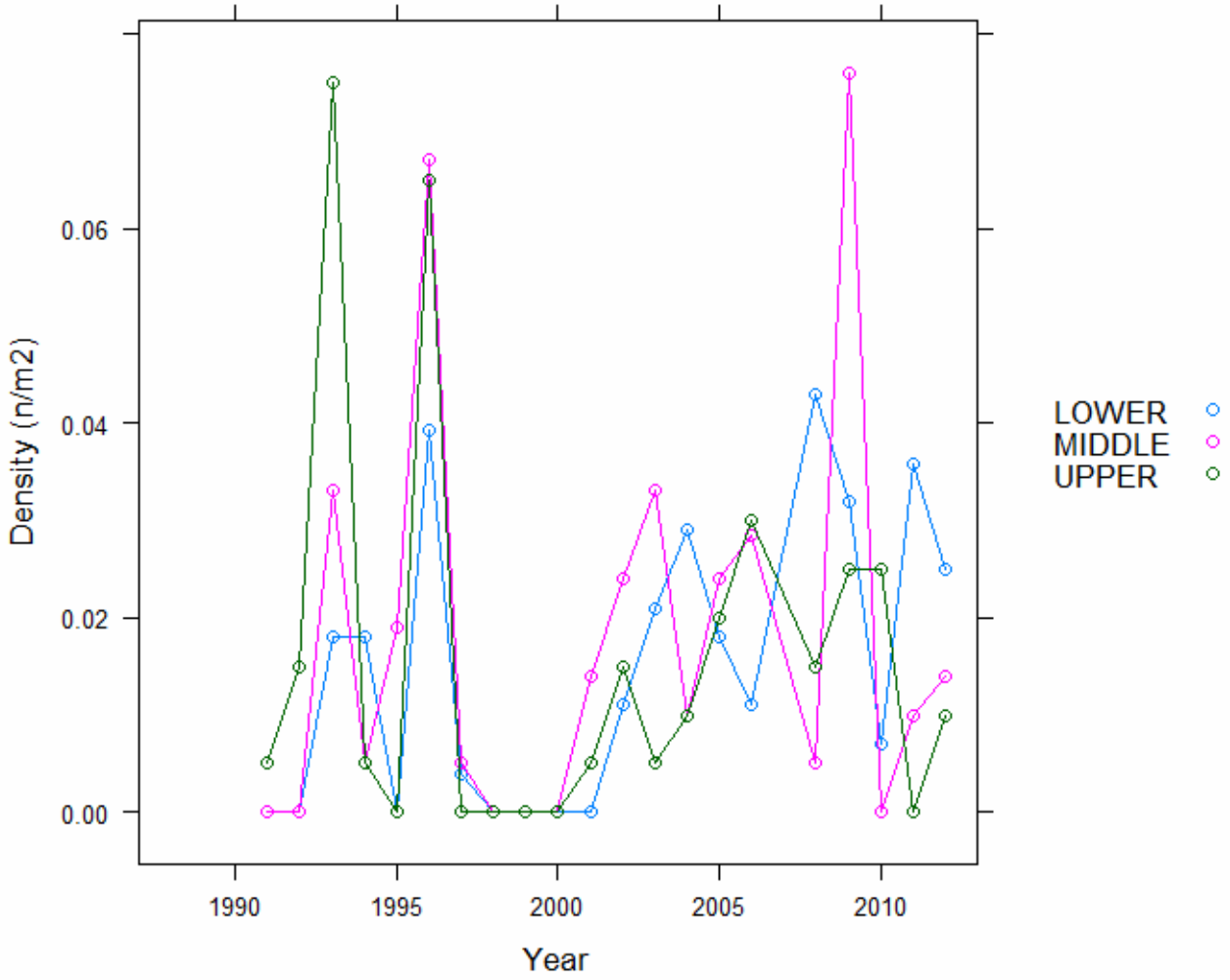
6.18.3.1. Summary of Salmon fry densities (numbers m^{-2}), Afon Gwy



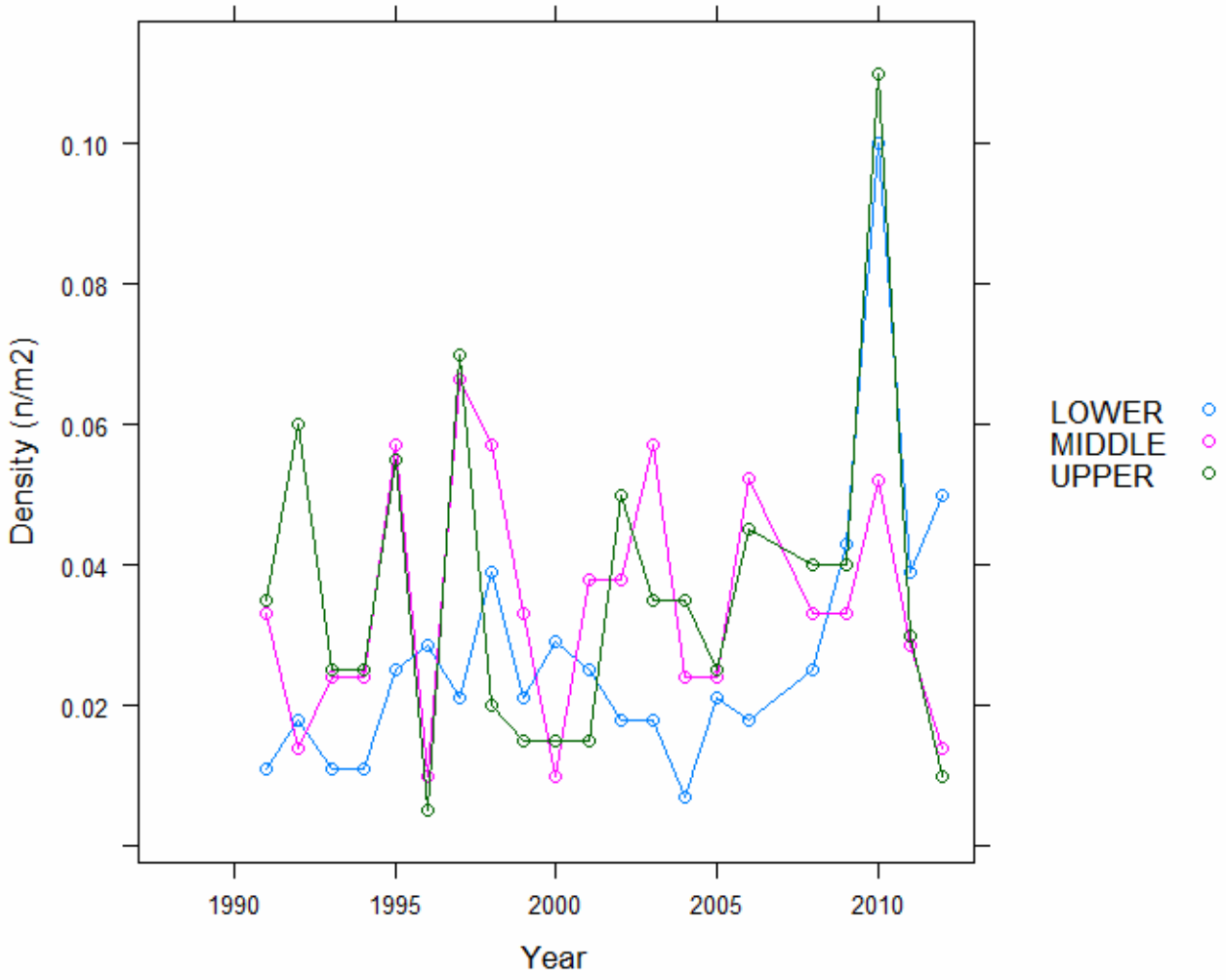
6.18.3.2. Summary of Salmon parr densities (numbers m^{-2}), Afon Gwy



6.18.3.3. Summary of Trout fry densities (numbers m^{-2}), Afon Gwy

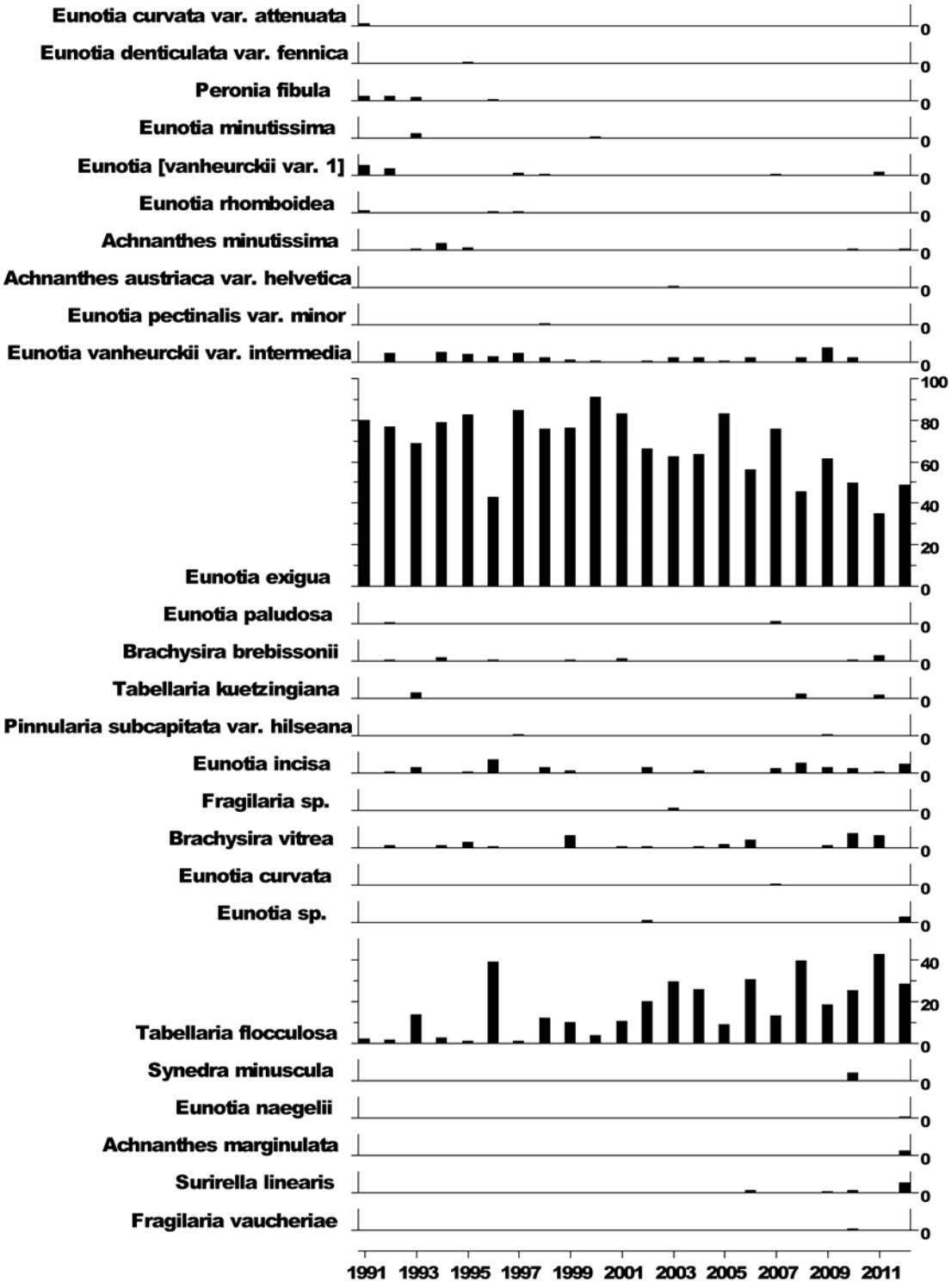


6.18.3.4. Summary of Trout parr densities (numbers m^{-2}), Afon Gwy

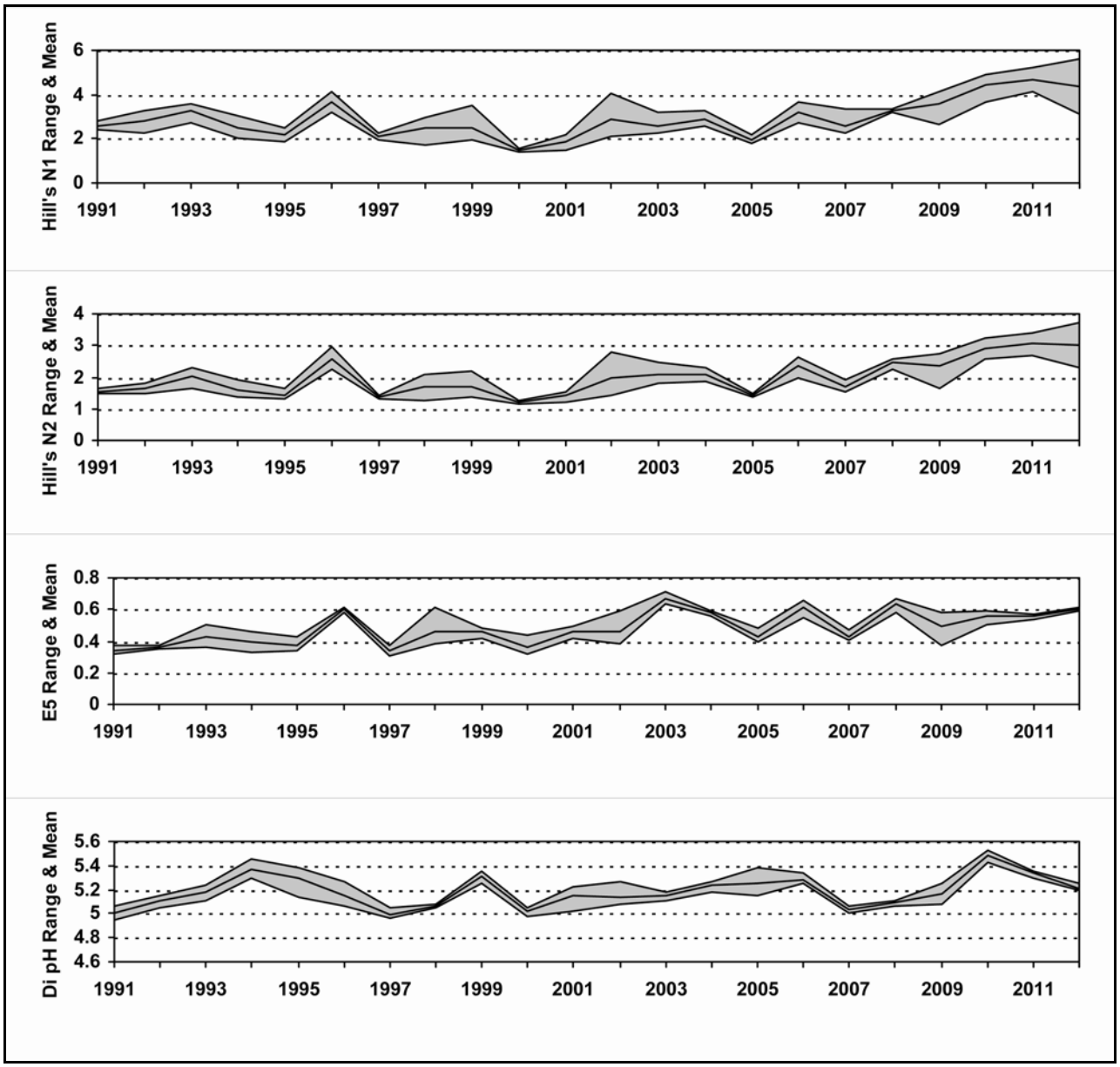


6.18.4. Epilithic diatom data

6.18.4.1. Percentage abundance summary, Afon Gwy

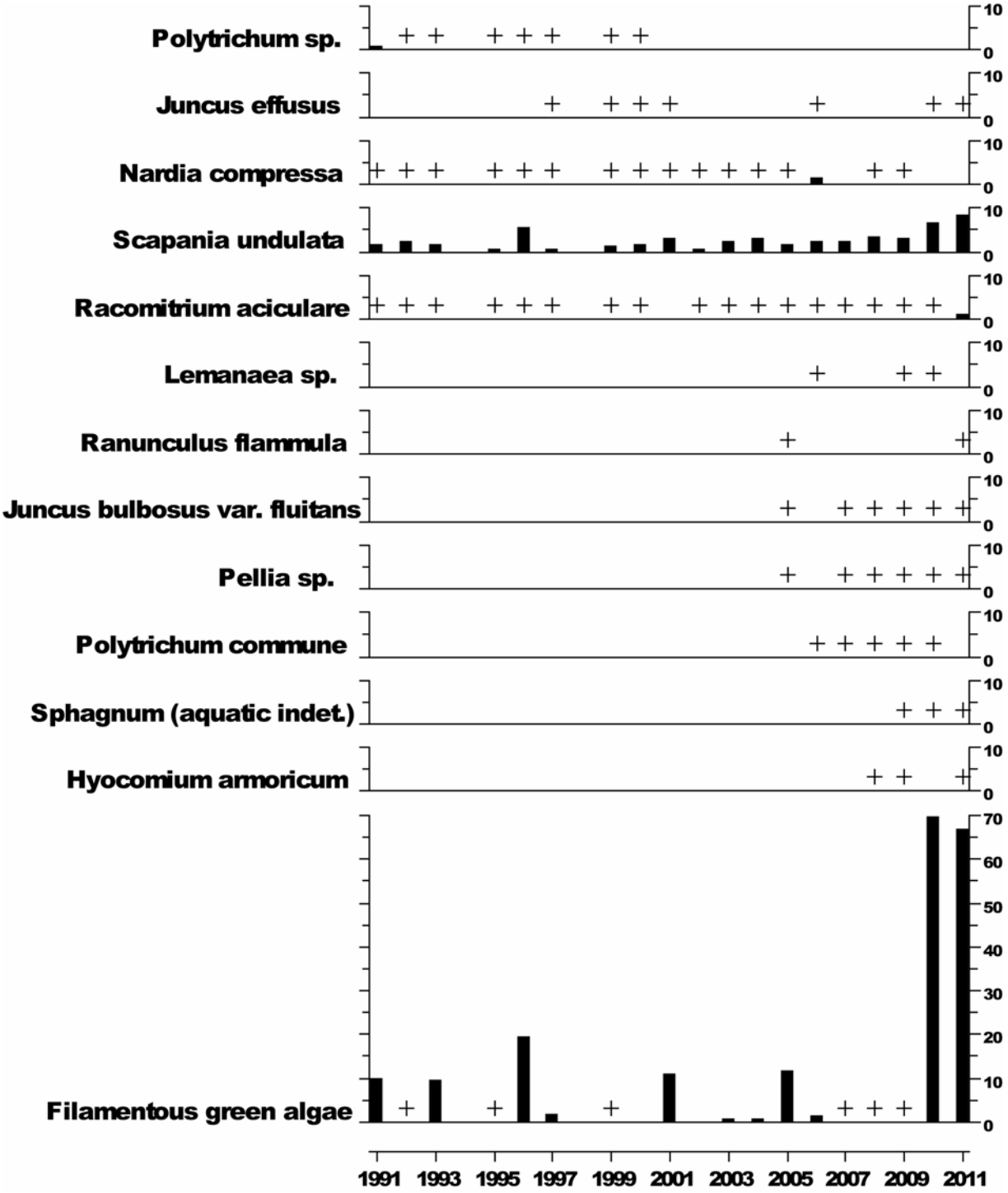


6.18.4.2. Summary statistics, Afon Gwy



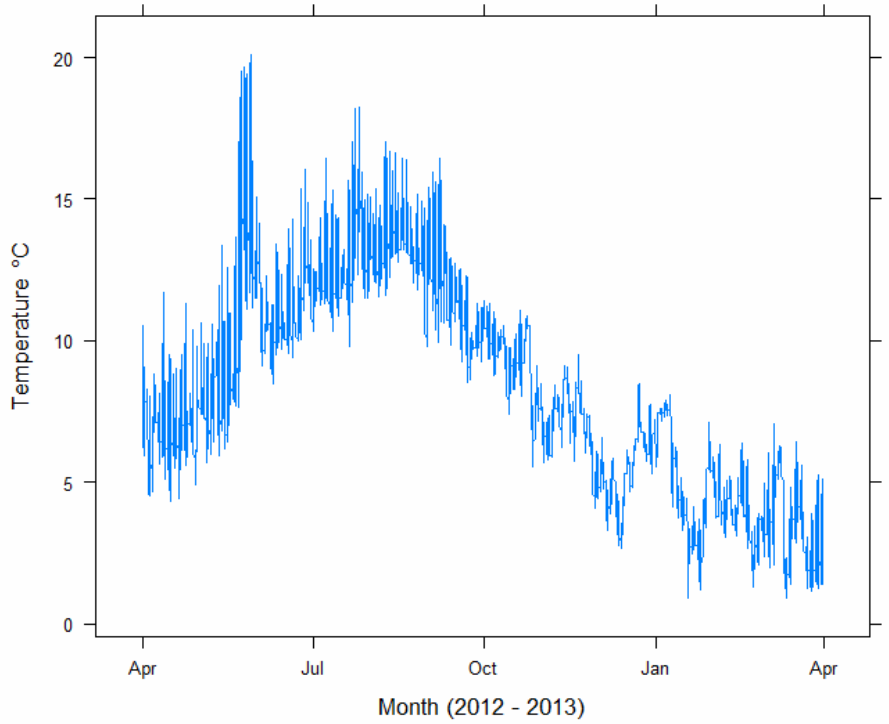
6.18.5. Aquatic macrophyte data, Afon Gwy

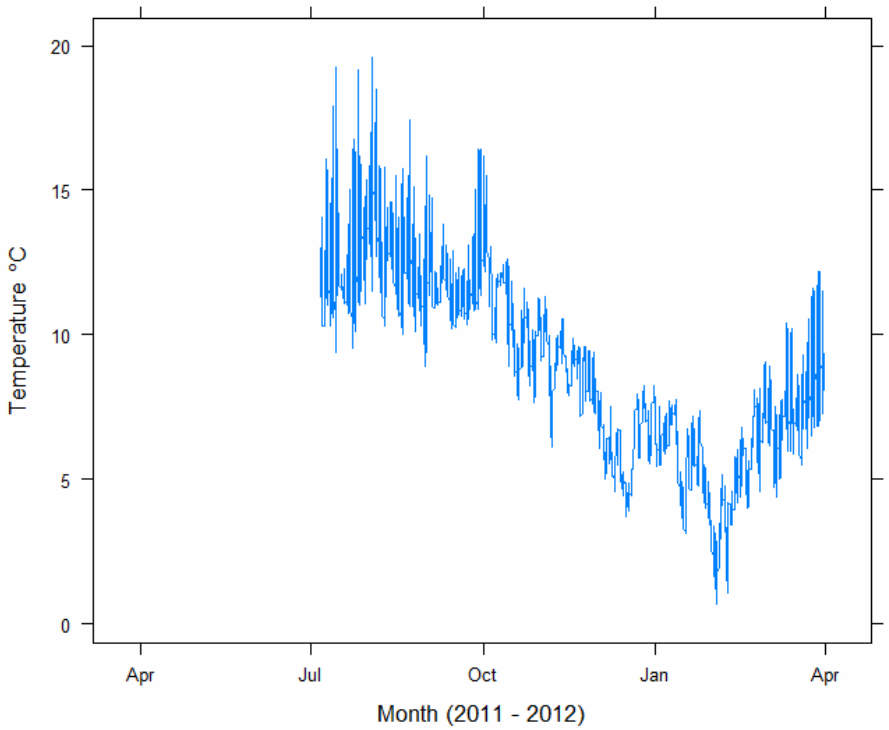
Percentage Species Cover



+ Represents <0.9% abundance

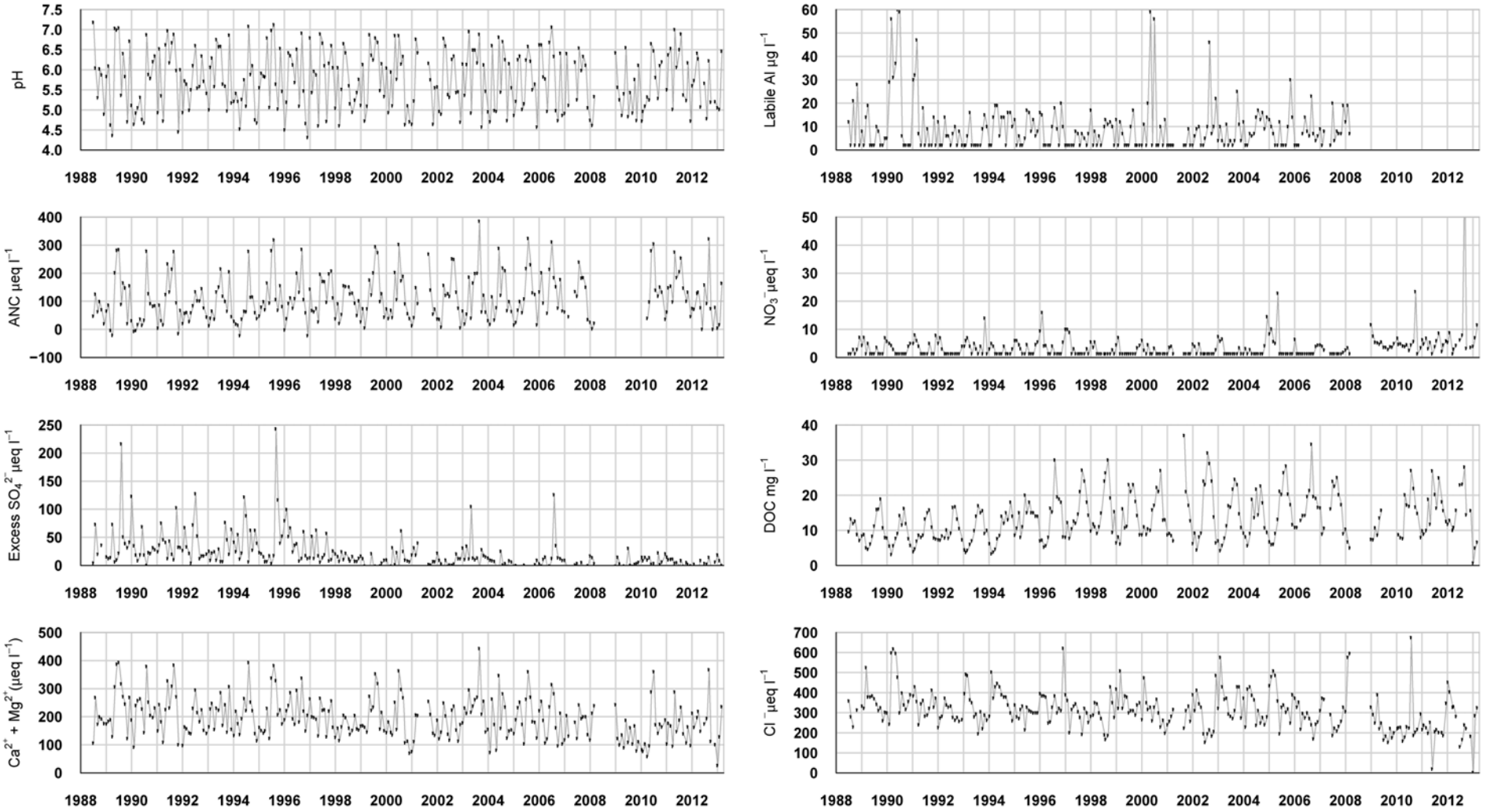
6.18.6. Thermistor data, Afon Gwy





6.19. Beaghs Burn

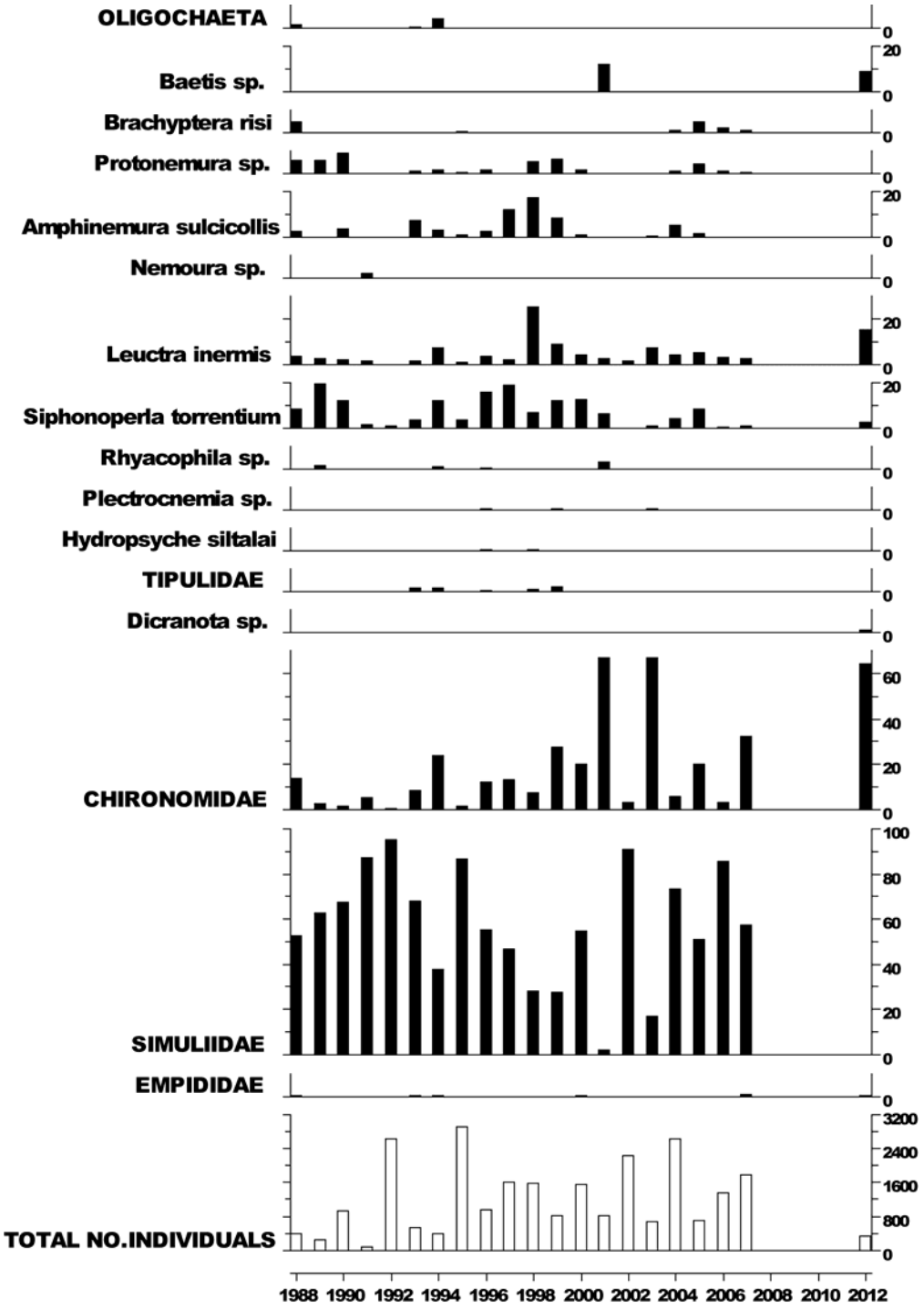
6.19.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO$_4$ $^{2-}$	xSO$_4$ $^{2-}$	NO$_3$ $^{-}$	**DOC
Mean 1st 5 yrs	5.78	86.90	102.79	111.92	306.64	11.26	56.68	11.90	351.24	73.01	36.66	3.09	9.31
12-13 mean	5.49	93.07	91.11	79.21	226.68	8.92			215.88	28.13	5.49	11.94	14.27
12-13 std dev	0.61	92.97	59.25	35.31	44.77	6.87			101.05	9.02	7.16	20.13	8.74

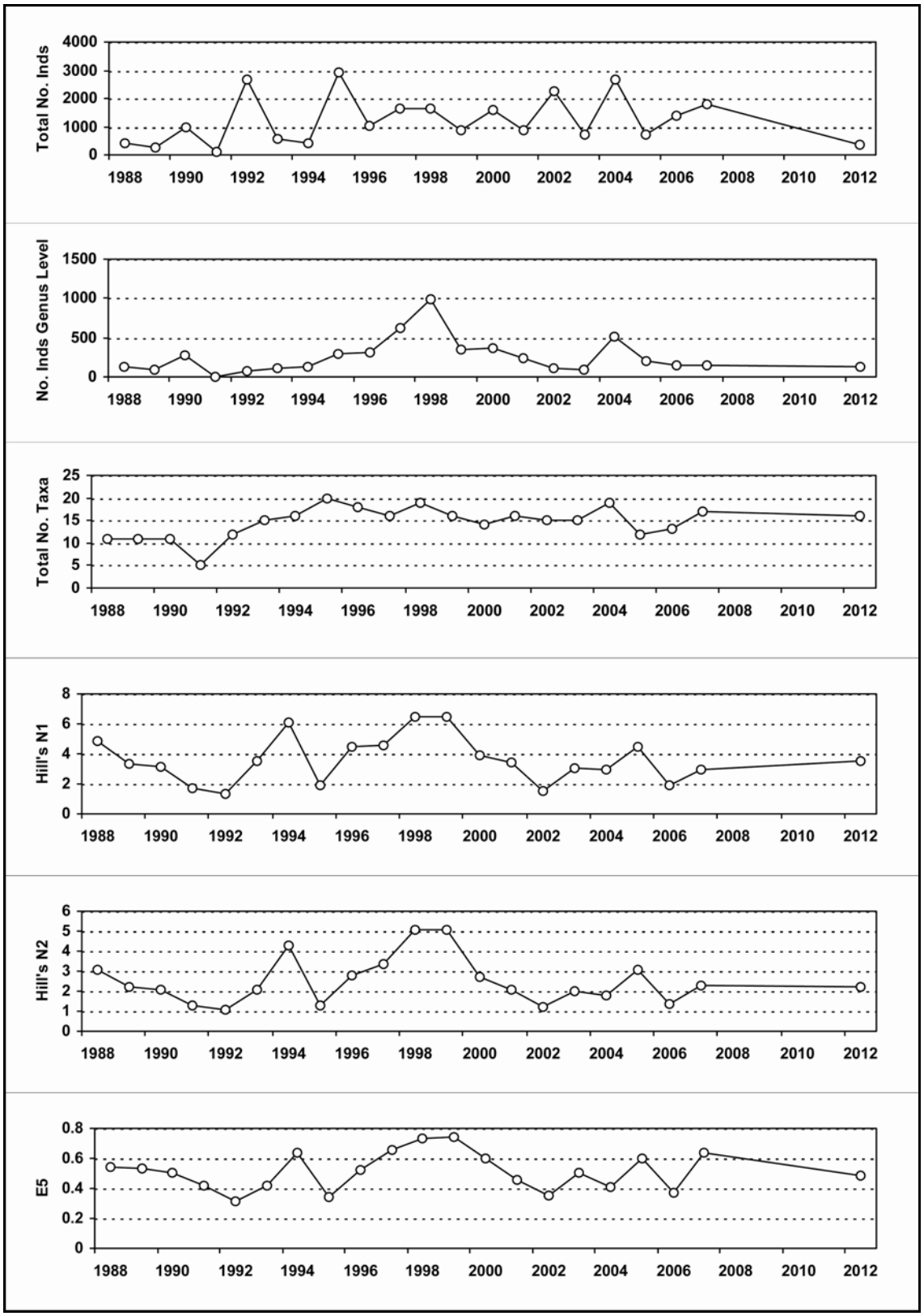
6.19.2. Macroinvertebrate data

6.19.2.1. Percentage abundance summary, Beaghs Burn



No analysis between 2007 and 2012 due to funding cuts.

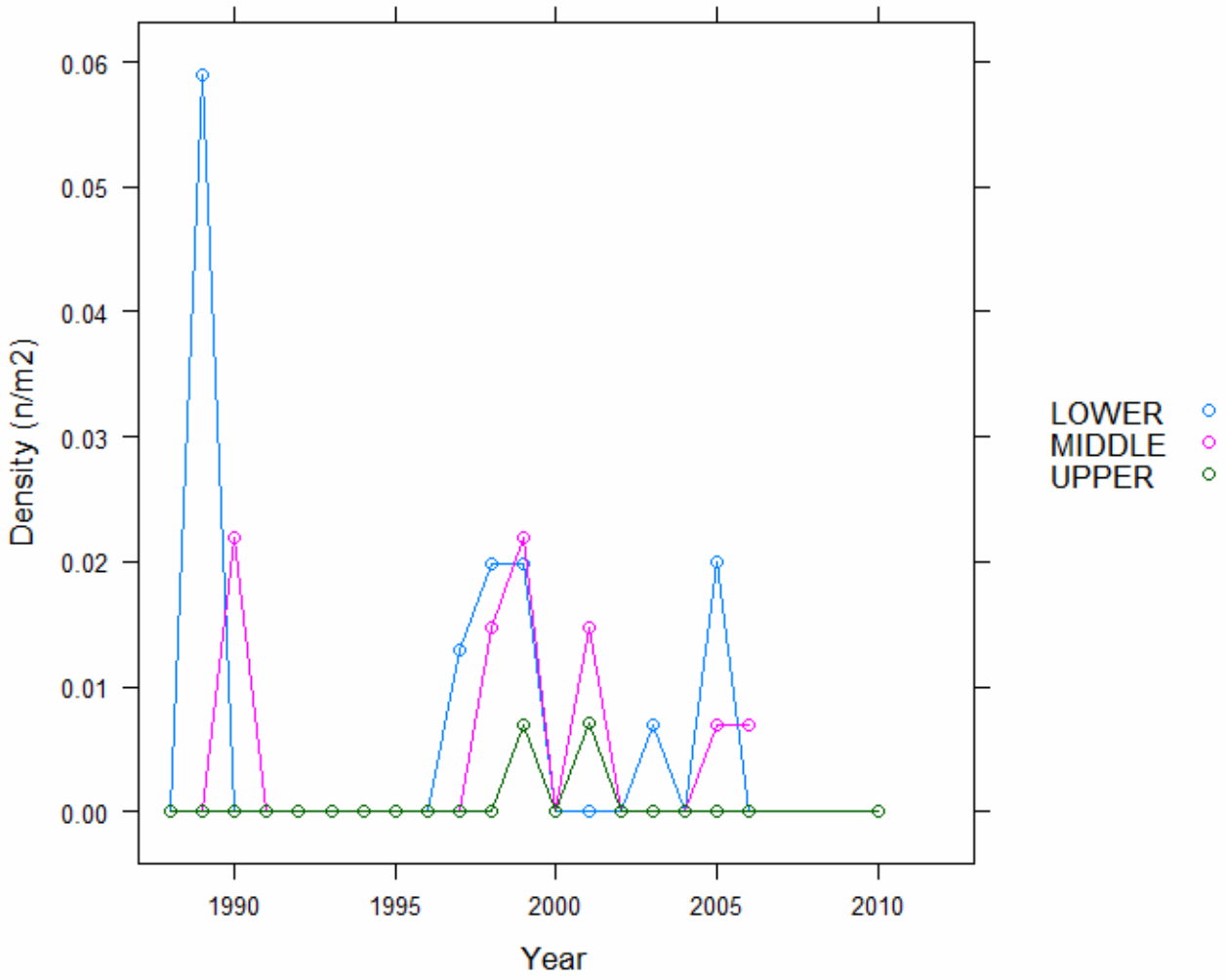
6.19.2.2. Summary statistics, Beaghs Burn



No analysis between 2007 and 2012 due to funding cuts.

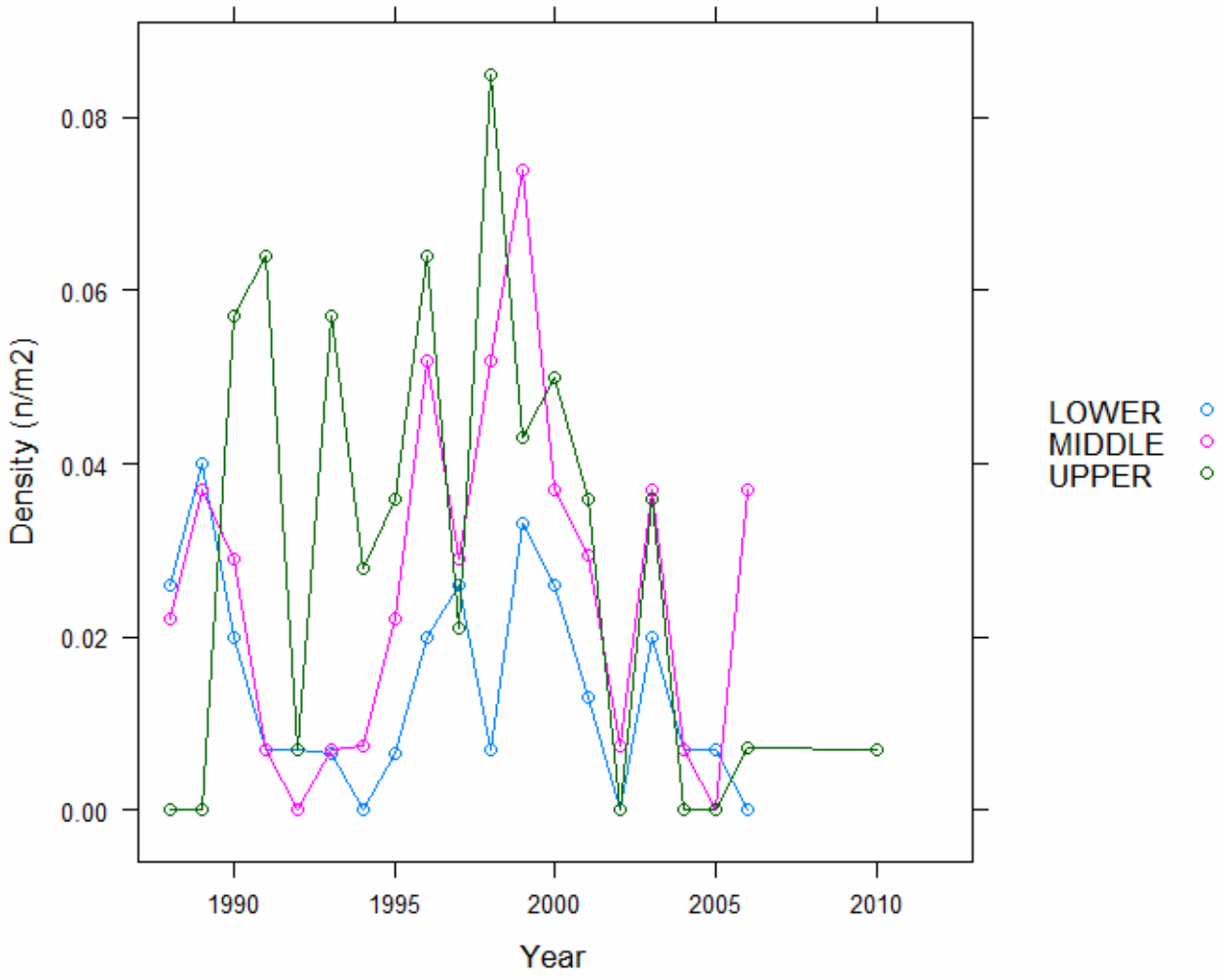
6.19.3. Fish data

6.19.3.1. Summary of Trout fry densities (numbers m^{-2}), Beaghs Burn



No analysis after 2006 due to funding cuts.

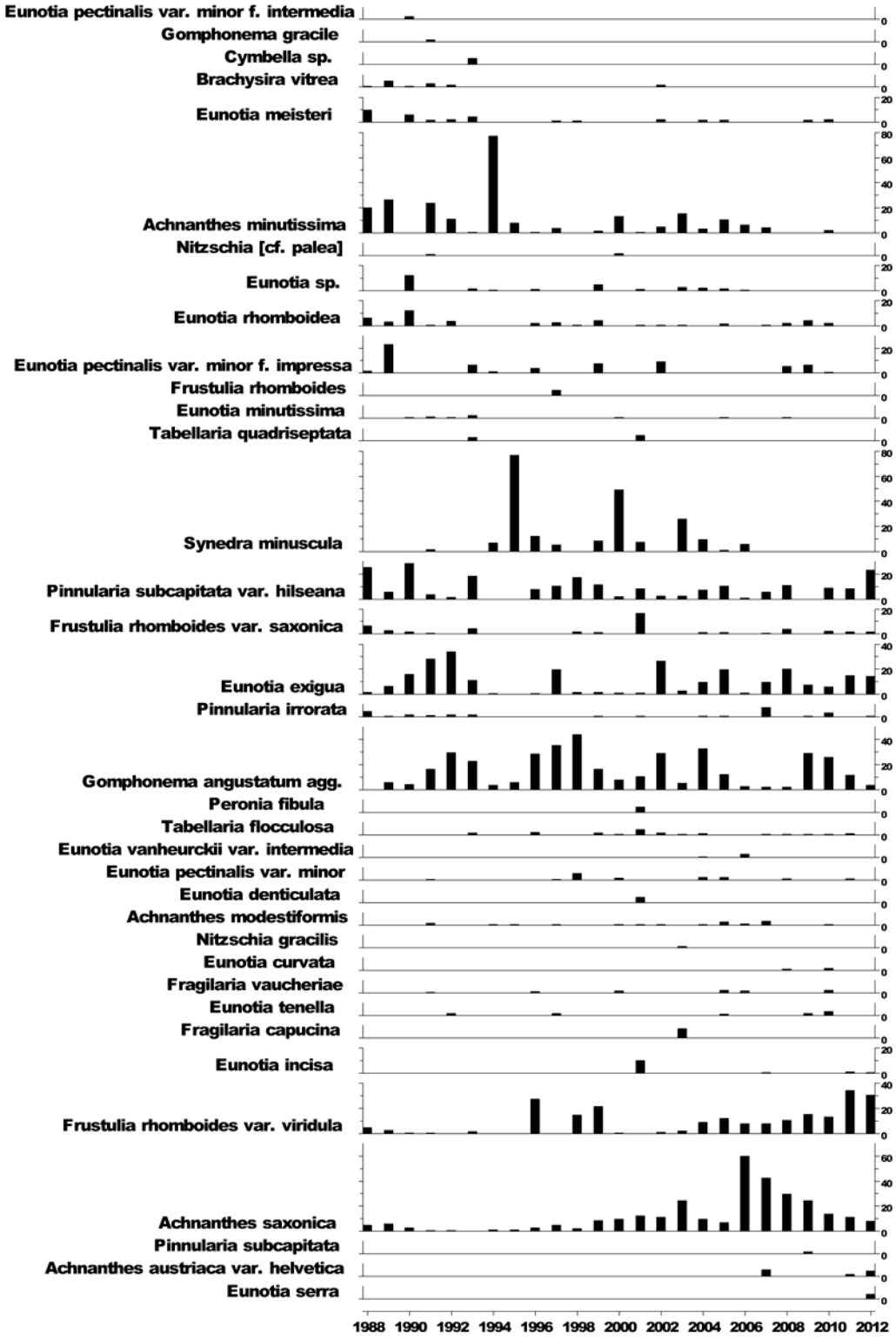
6.19.3.2. Summary of Trout parr densities (numbers m^{-2}), Beaghs Burn



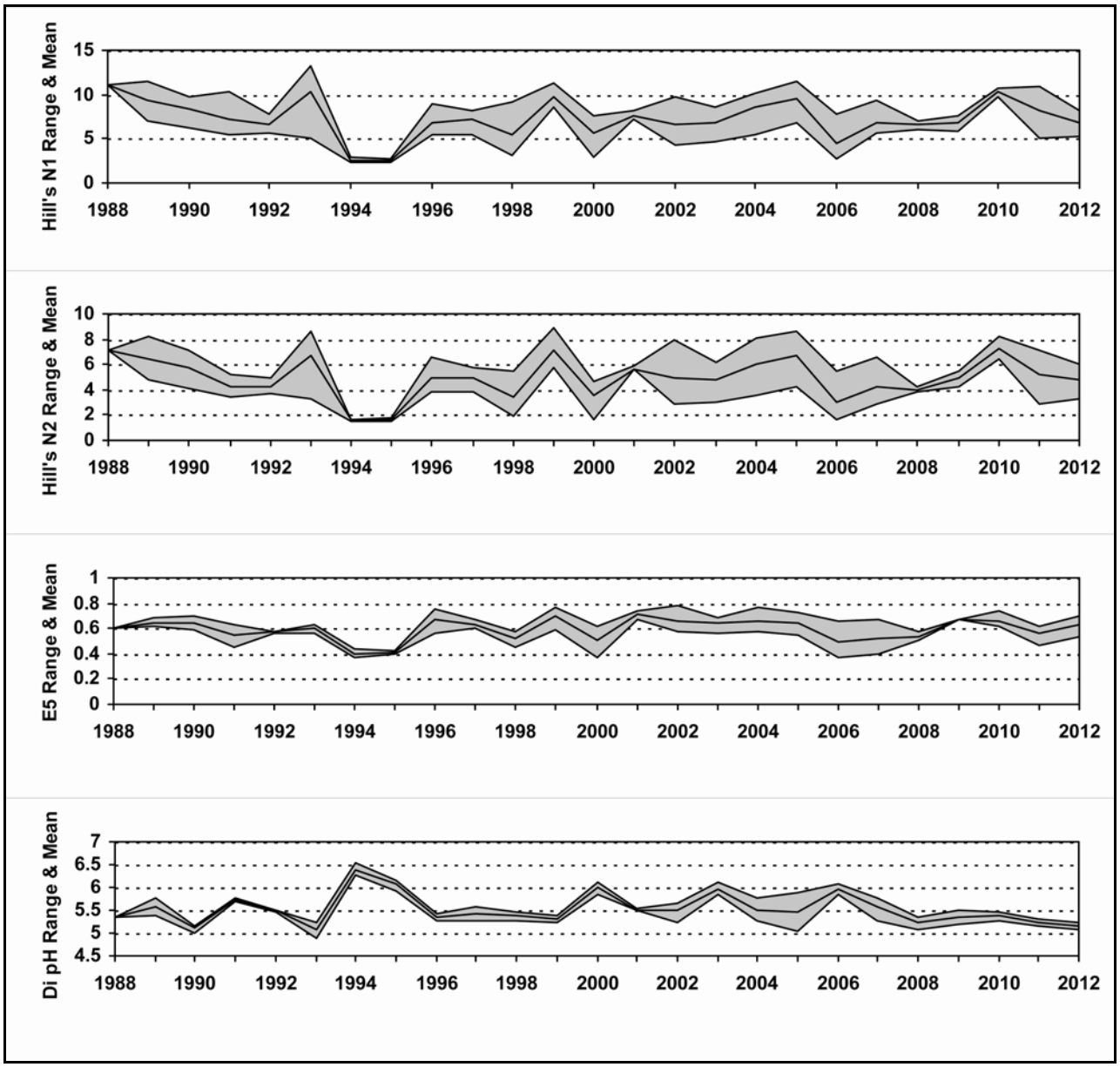
No analysis after 2006 due to funding cuts.

6.19.4. Epilithic diatom data

6.19.4.1. Percentage abundance summary, Beaghs Burn

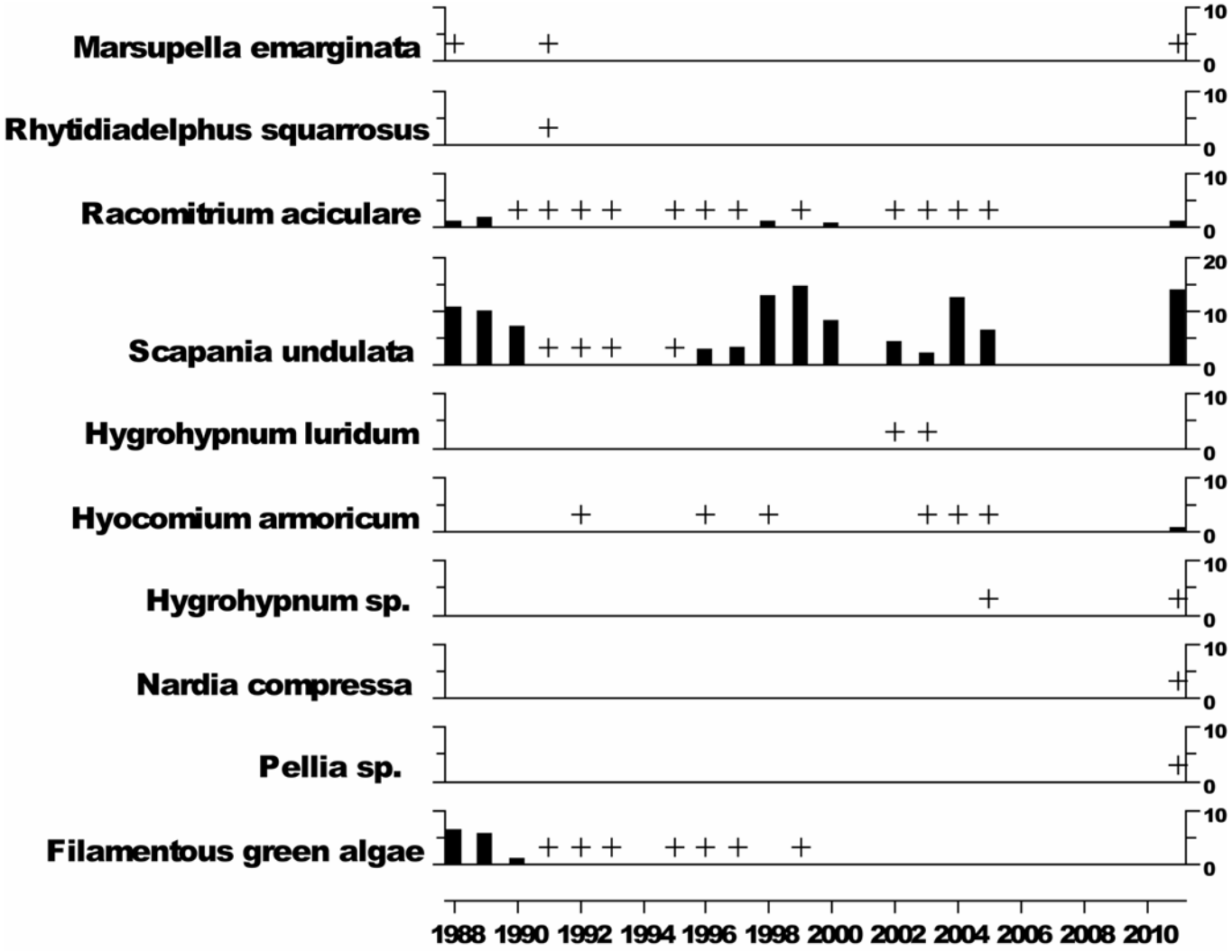


6.19.4.2. Summary statistics, Beaghs Burn



6.19.5. Aquatic macrophyte data, Beaghs Burn

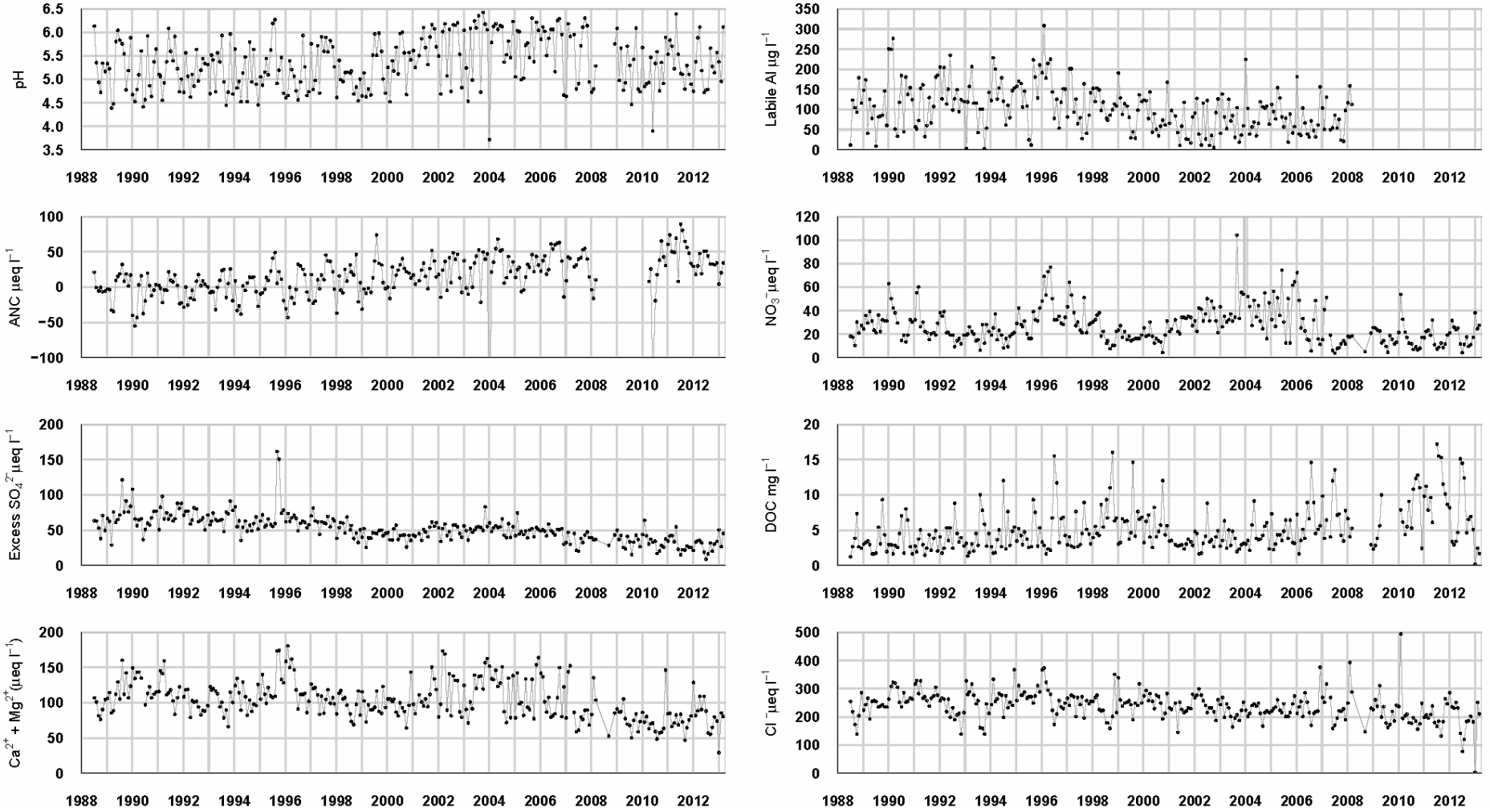
Percentage Species Cover



\+ Represents <0.9% abundance
No survey undertaken in 2006 due to spate conditions
No surveys in 2007-2010 due to funding cuts

6.20. Bencrom River

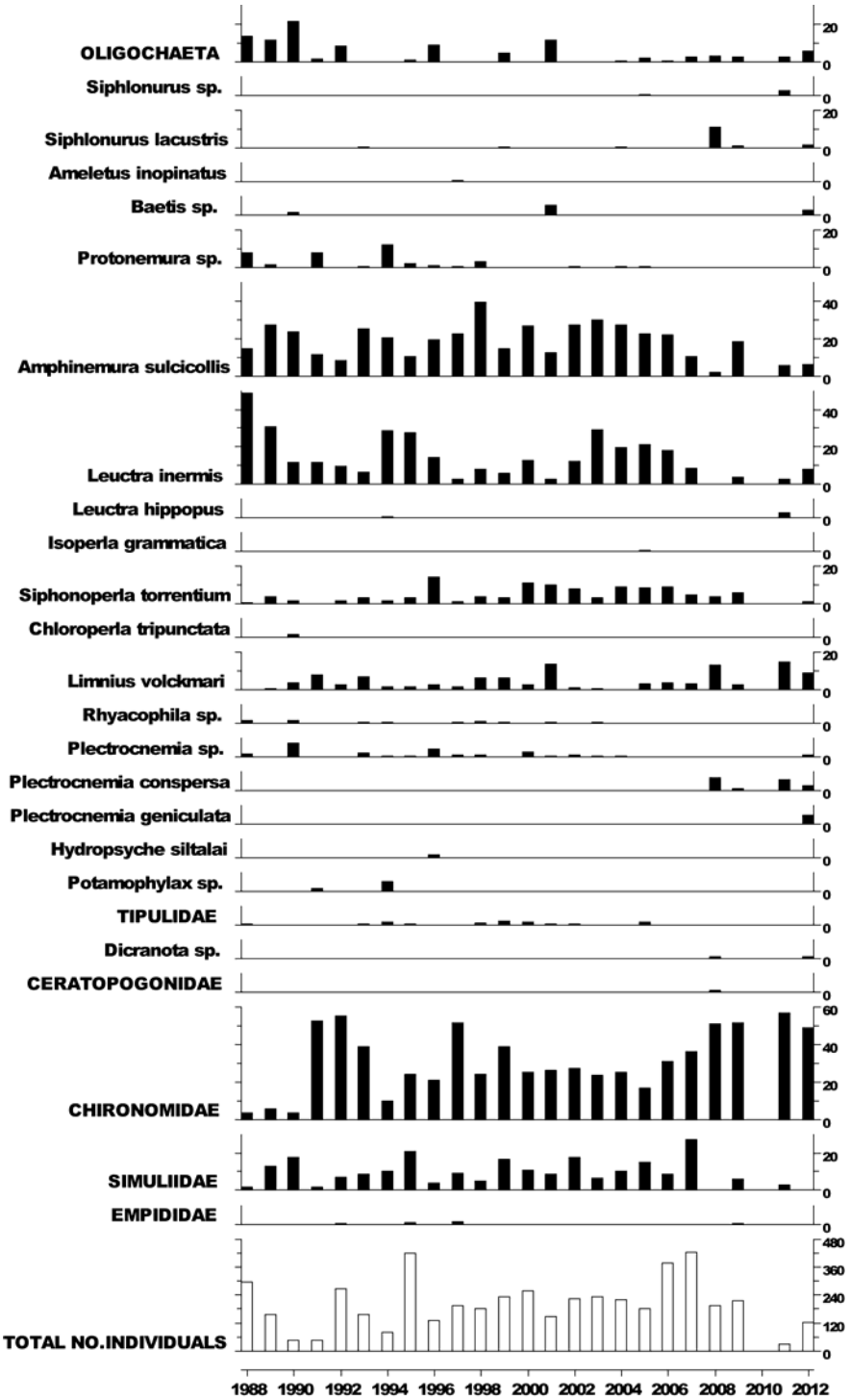
6.20.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	*Soluble Al	*Labile Al	Cl^{-}	$*SO_4^{2-}$	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.19	-4.33	52.12	61.26	260.56	11.73	199.34	121.10	254.18	94.94	68.28	26.65	3.42
12-13 mean	5.30	33.34	38.49	38.05	201.84	9.54			169.07	46.49	28.76	18.18	6.44
12-13 std dev	0.48	14.10	20.48	9.79	47.43	5.66			74.19	14.51	11.90	9.64	4.98

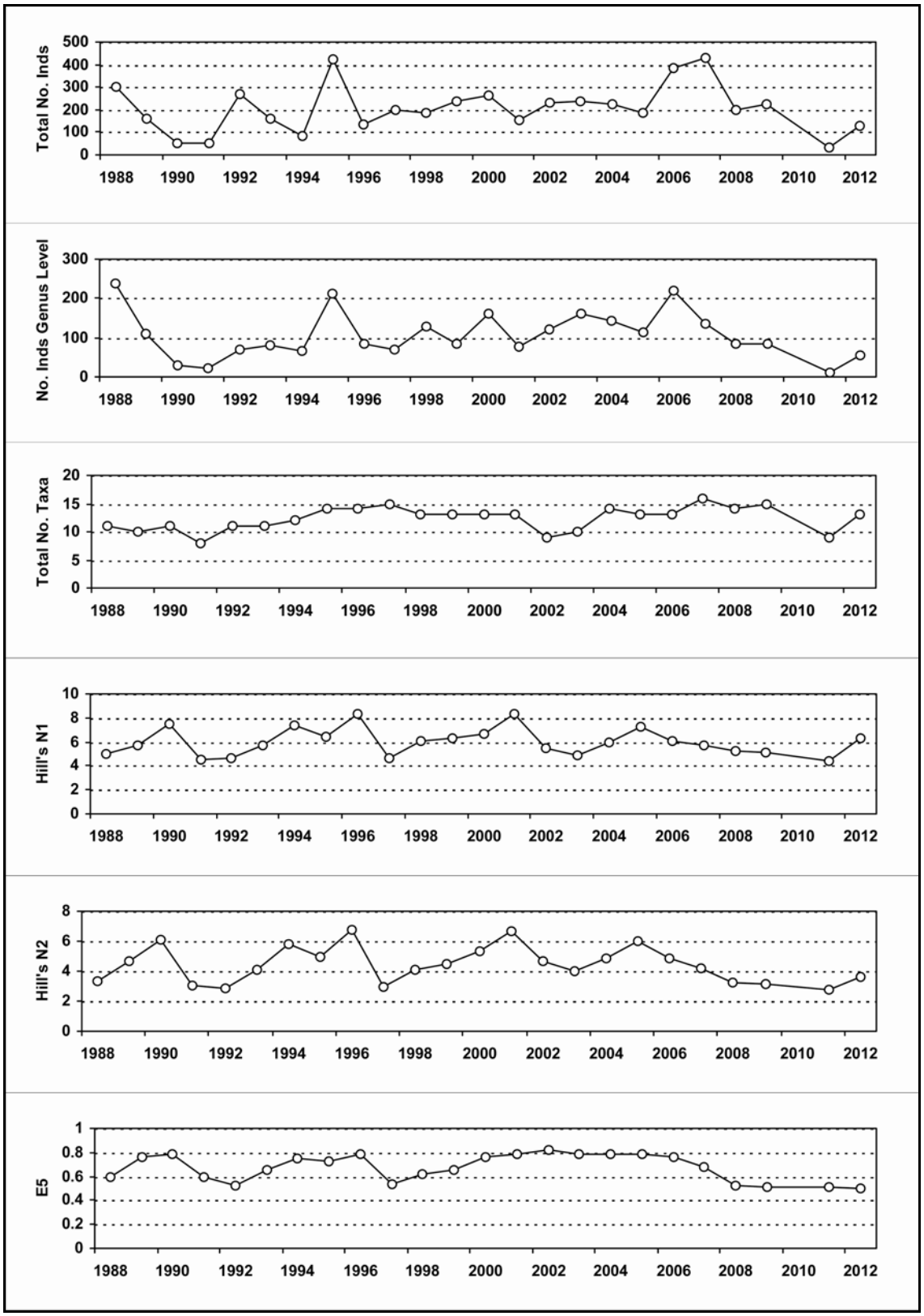
6.20.2. Macroinvertebrate data

6.20.2.1. Percentage abundance summary, Bencrom River



No samples collected in 2010.

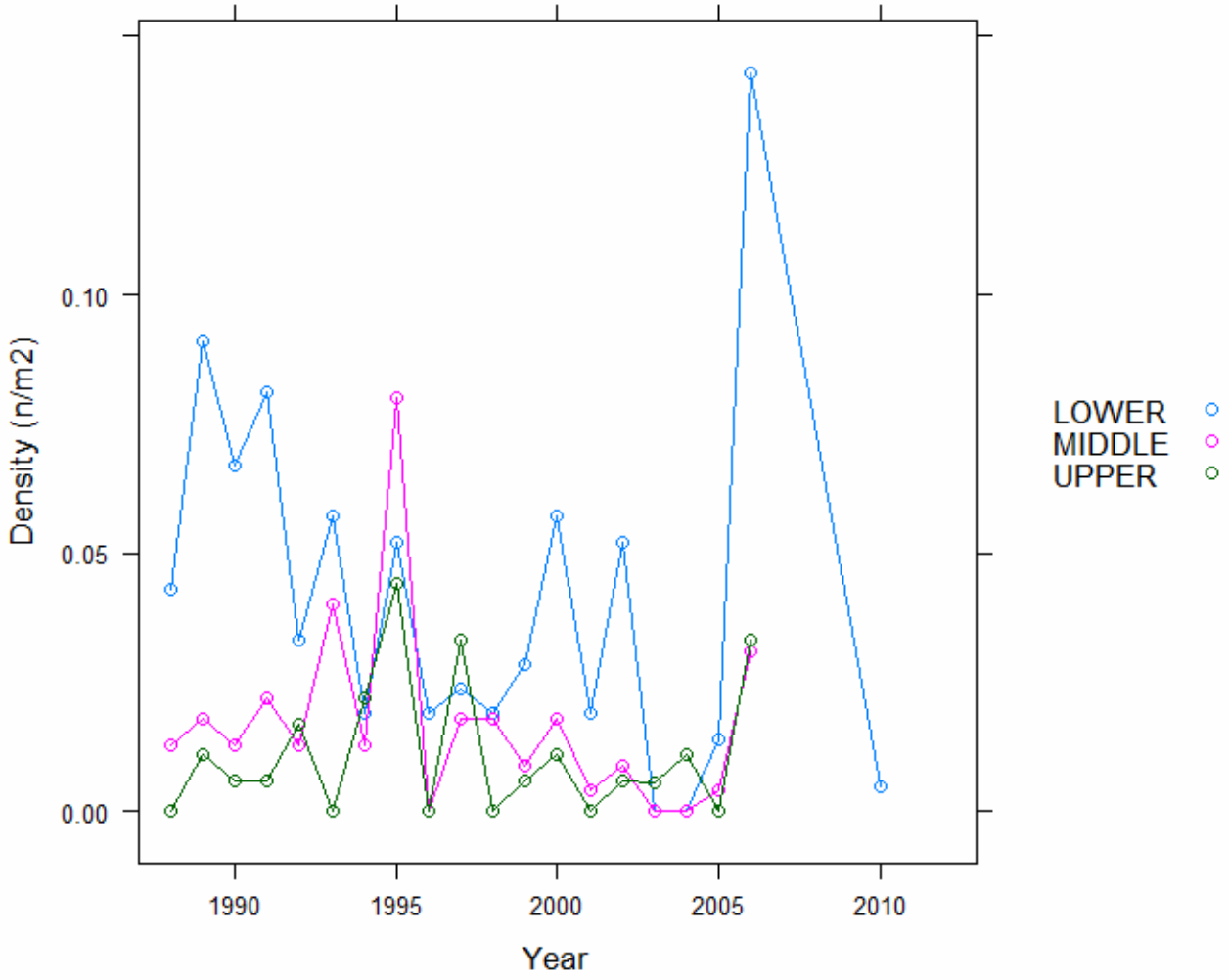
6.20.2.2. Summary statistics, Bencrom River



No samples collected in 2010.

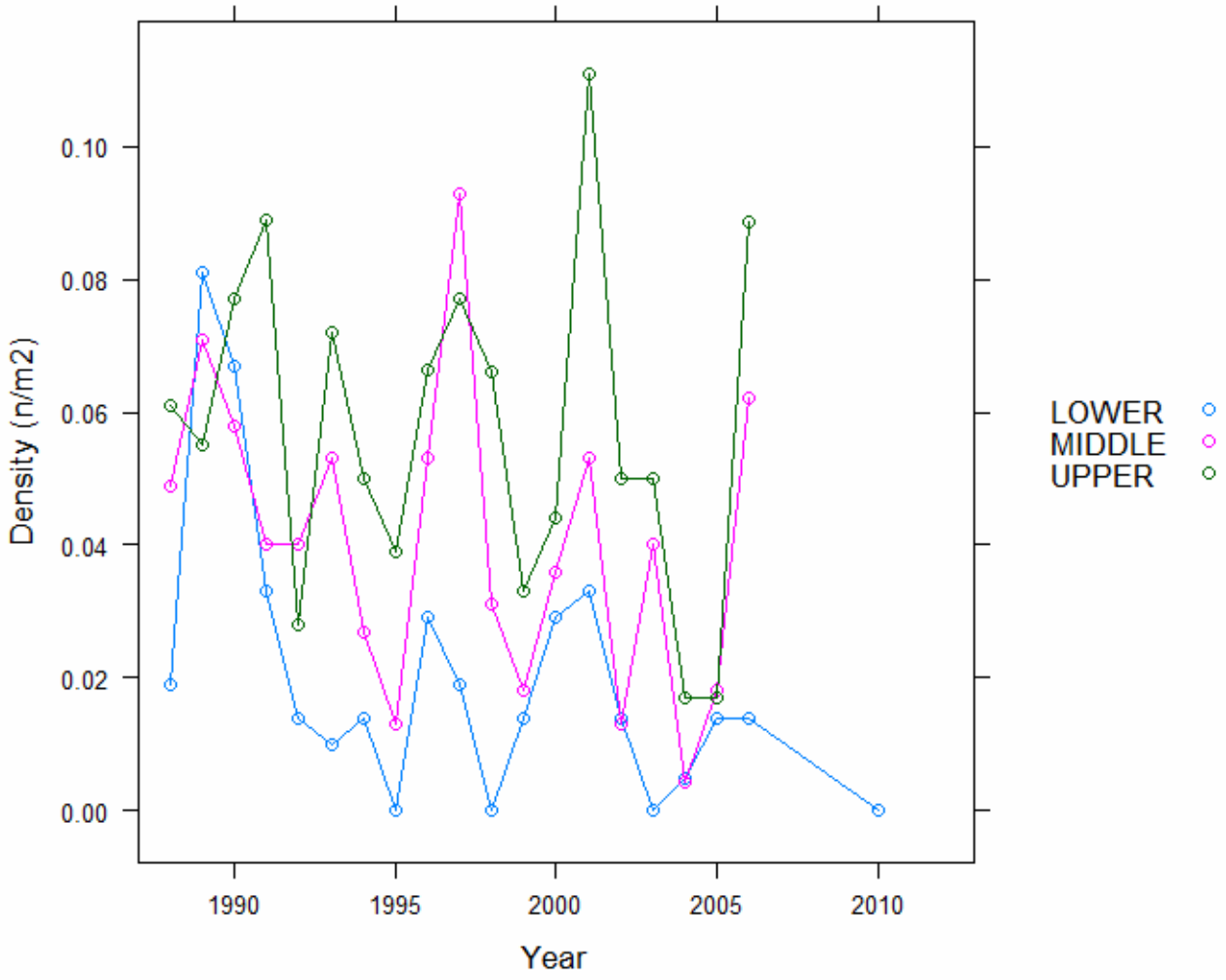
6.20.3. Fish data

6.20.3.1. Summary of Trout fry densities (numbers m^{-2}), Bencrom River



No analysis after 2006 due to funding cuts.

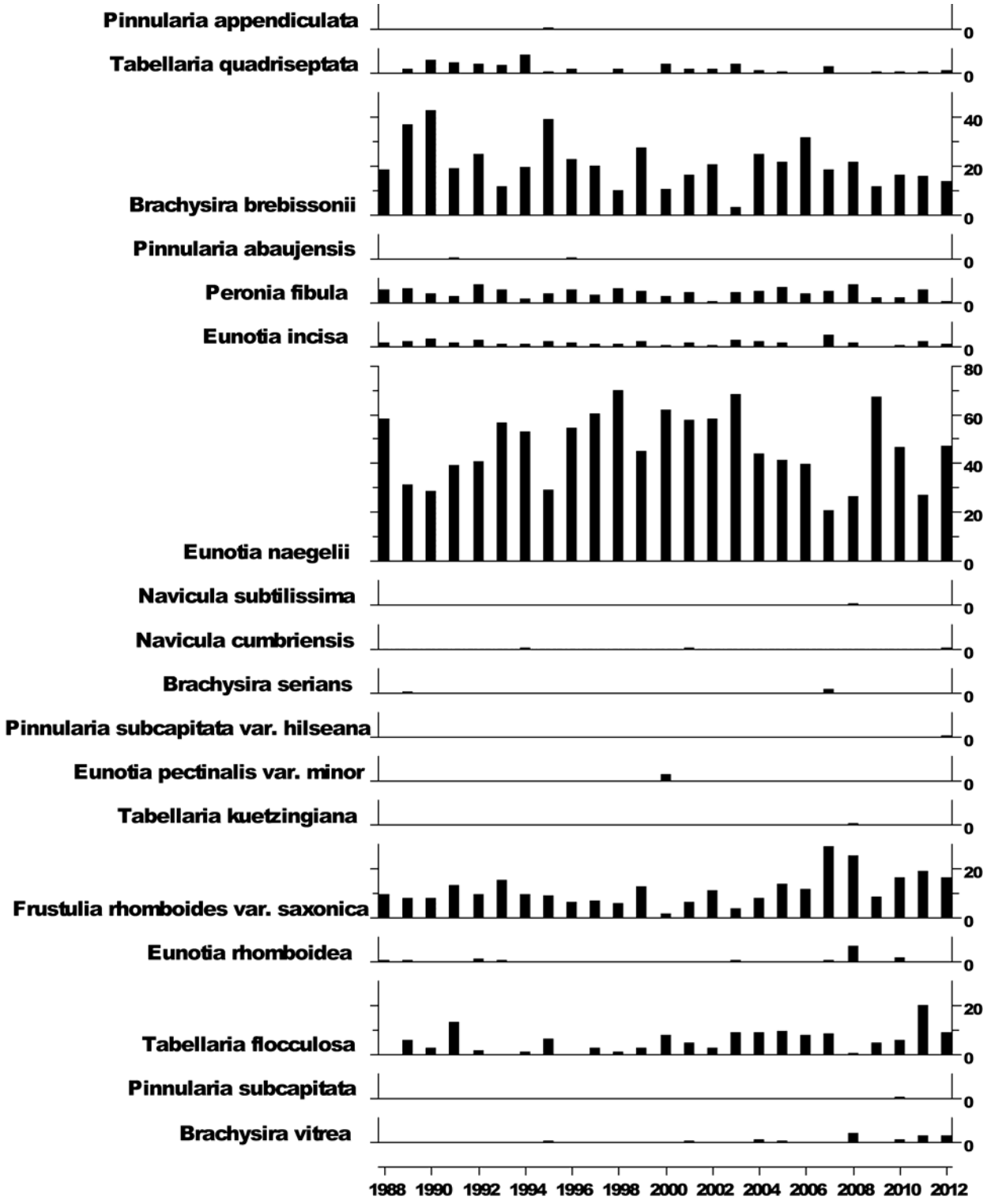
6.20.3.2. Summary of Trout parr densities (numbers m^{-2}), Bencrom River



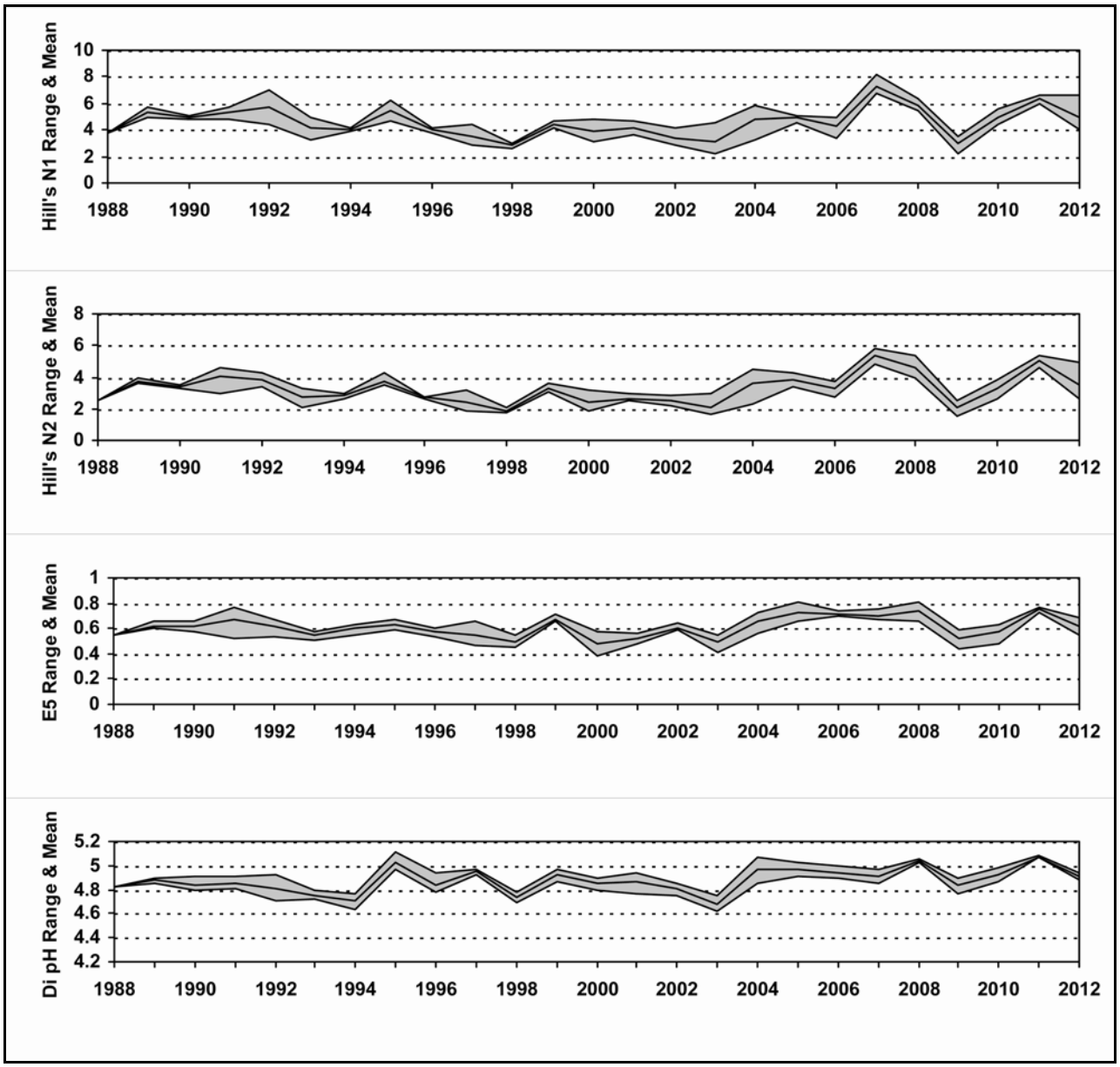
No analysis after 2006 due to funding cuts.

6.20.4. Epilithic diatom data

6.20.4.1. Percentage abundance summary, Bencrom River

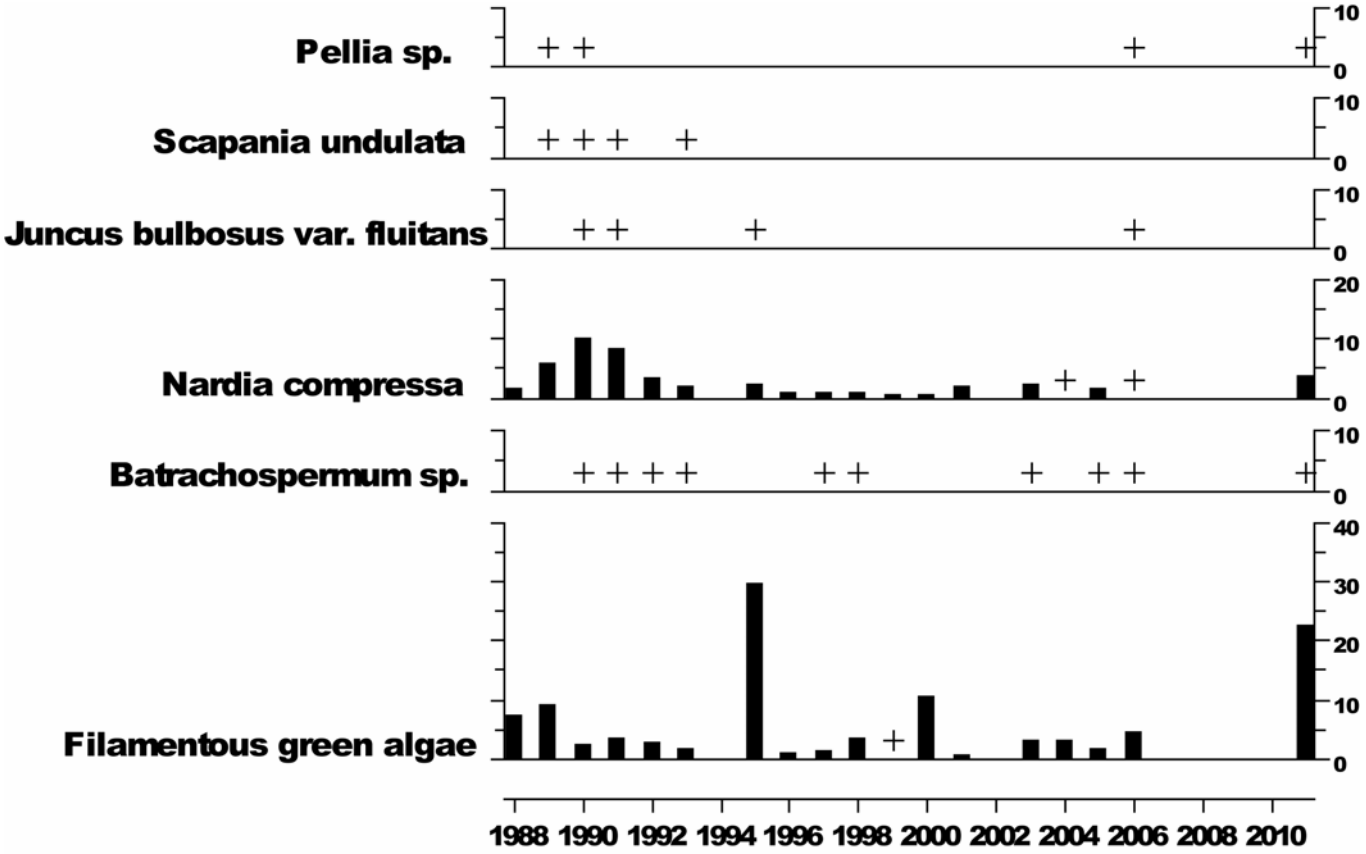


6.20.4.2. Summary statistics, Bencrom River



6.20.5. Aquatic macrophyte data, Bencrom River

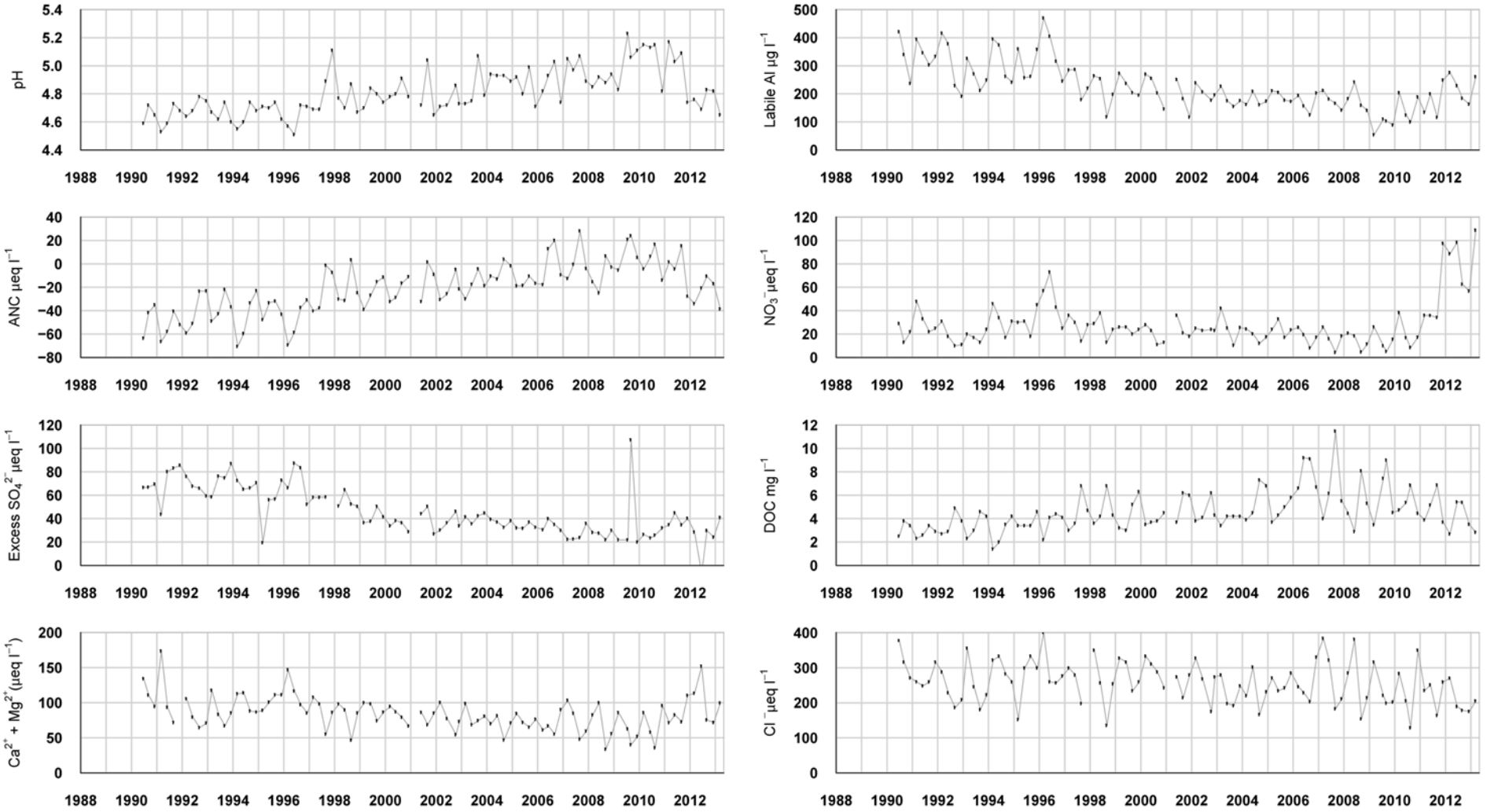
Percentage Species Cover



+ Represents <0.9% abundance
No survey undertaken in 2002 due to spate conditions
No surveys in 2007-2010 due to funding cuts

6.21. Blue Lough

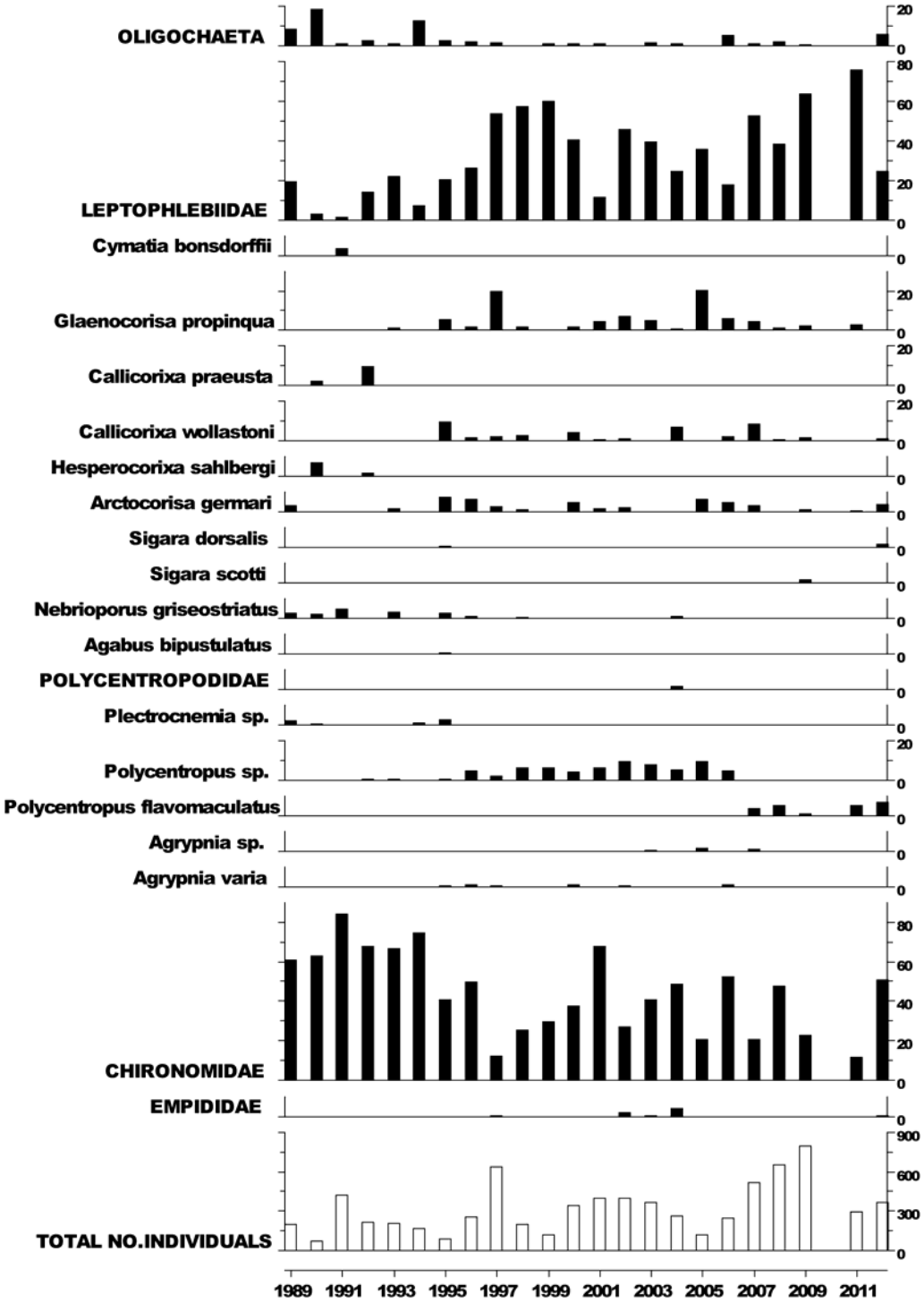
6.21.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO$_4$ $^{2-}$	xSO$_4$ $^{2-}$	NO$_3$ $^{-}$	**DOC
Mean 1st 5 yrs	4.66	-44.87	40.66	56.68	245.12	11.35	381.55	313.90	265.60	95.61	67.76	24.69	3.19
12-13 mean	4.75	-21.72	45.87	53.82	189.44	12.45	283.25	209.25	186.96	41.67	22.06	81.59	4.29
12-13 std dev	0.09	12.01	31.26	8.96	18.38	1.74	35.20	44.14	13.51	20.79	20.41	25.80	1.32

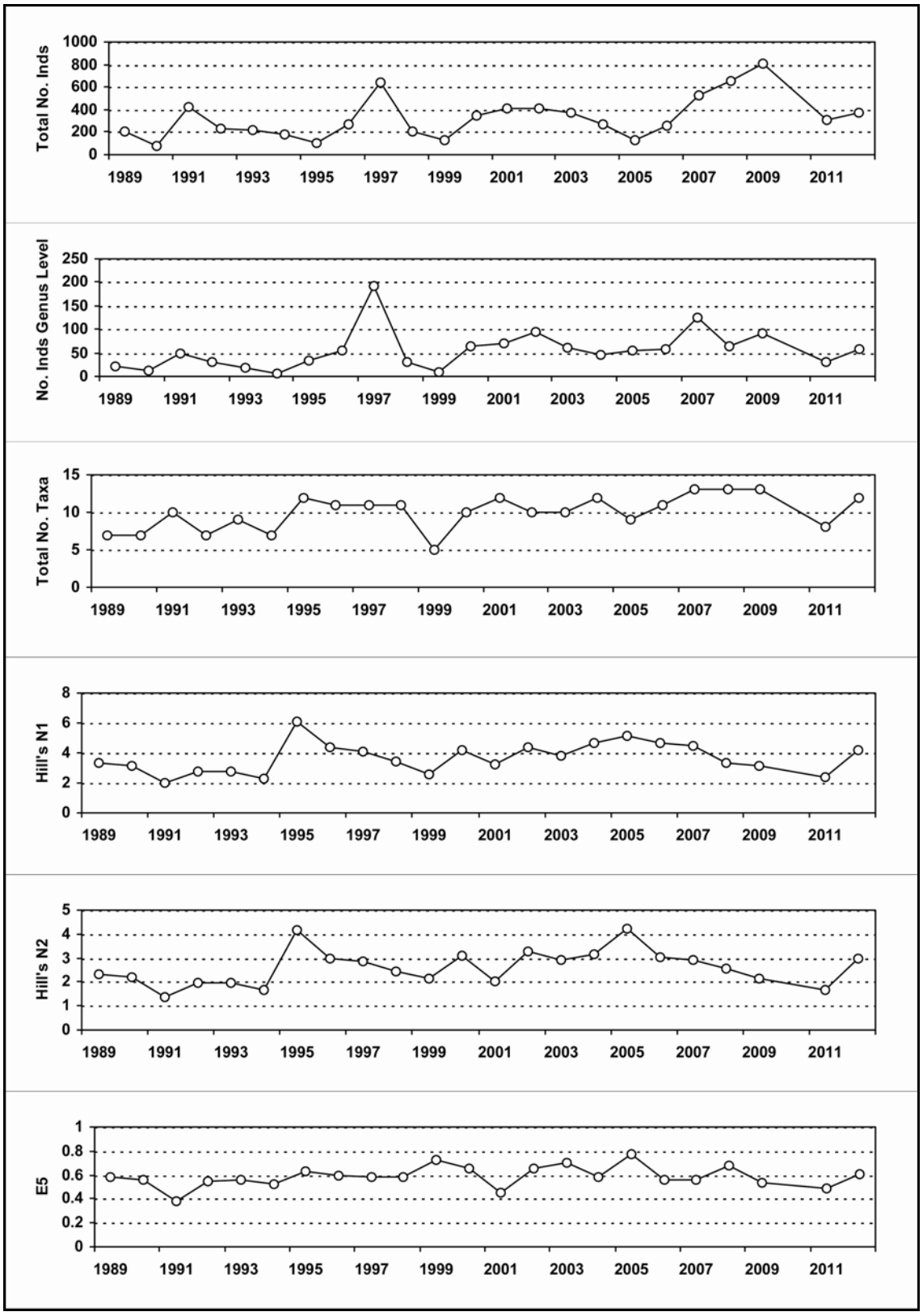
6.21.2. Macroinvertebrate data

6.21.2.1. Percentage abundance summary, Blue Lough



No samples collected in 2010

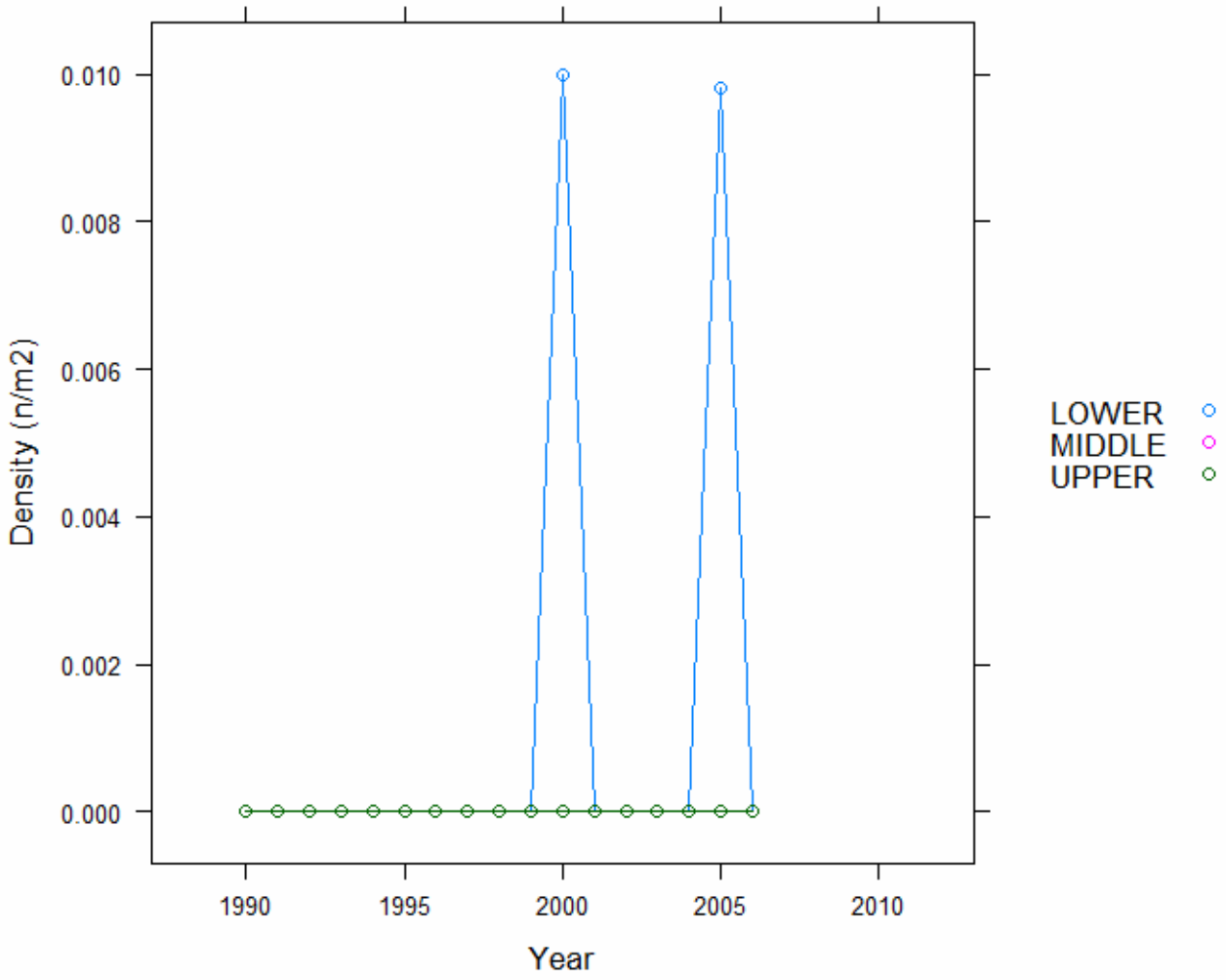
6.21.2.2. Summary statistics, Blue Lough



No samples collected in 2010.

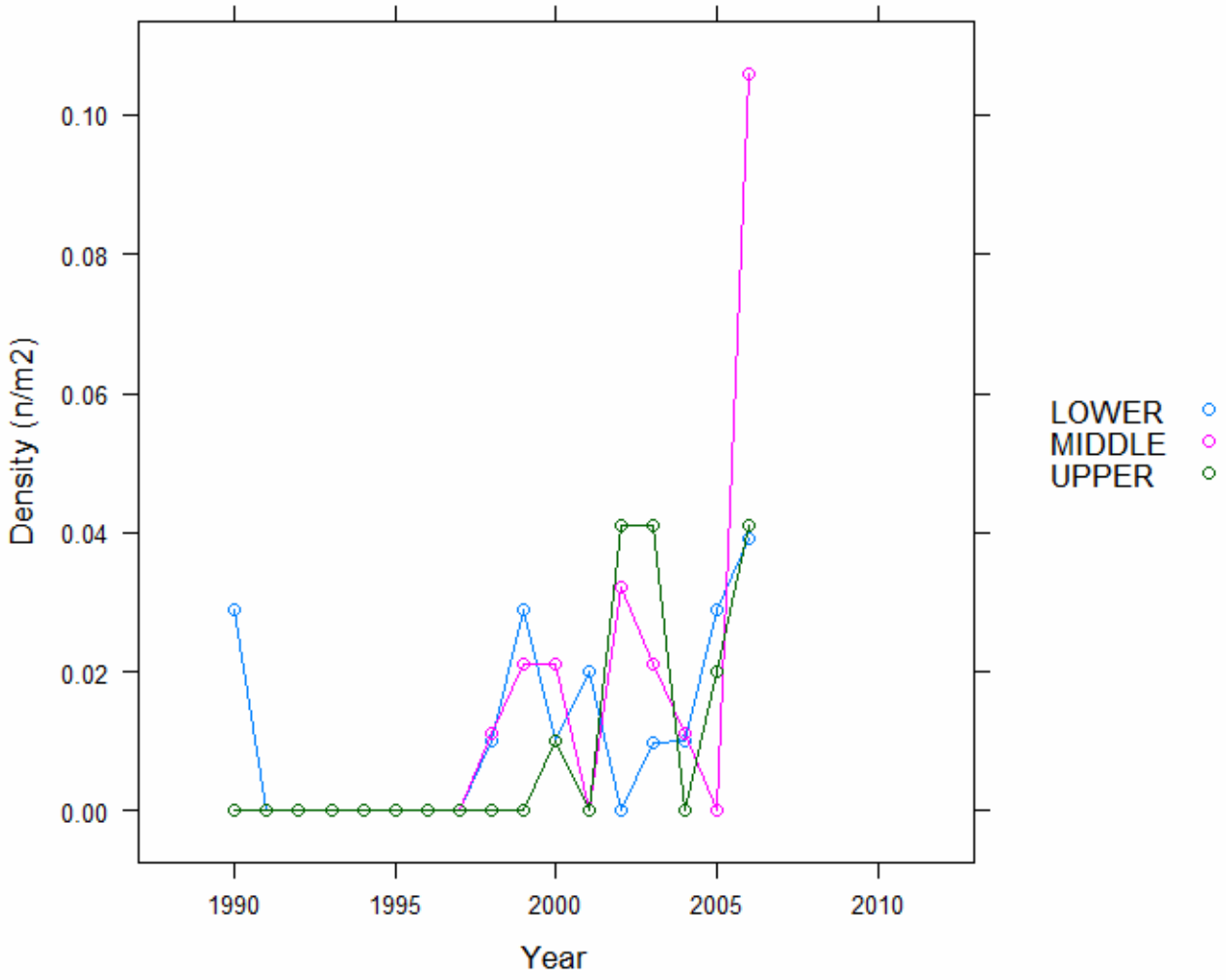
6.21.3. Fish data (for outflow stream)

6.21.3.1. Summary of Trout fry densities (numbers m^{-2}), Blue Lough



No analysis after 2006 due to funding cuts.

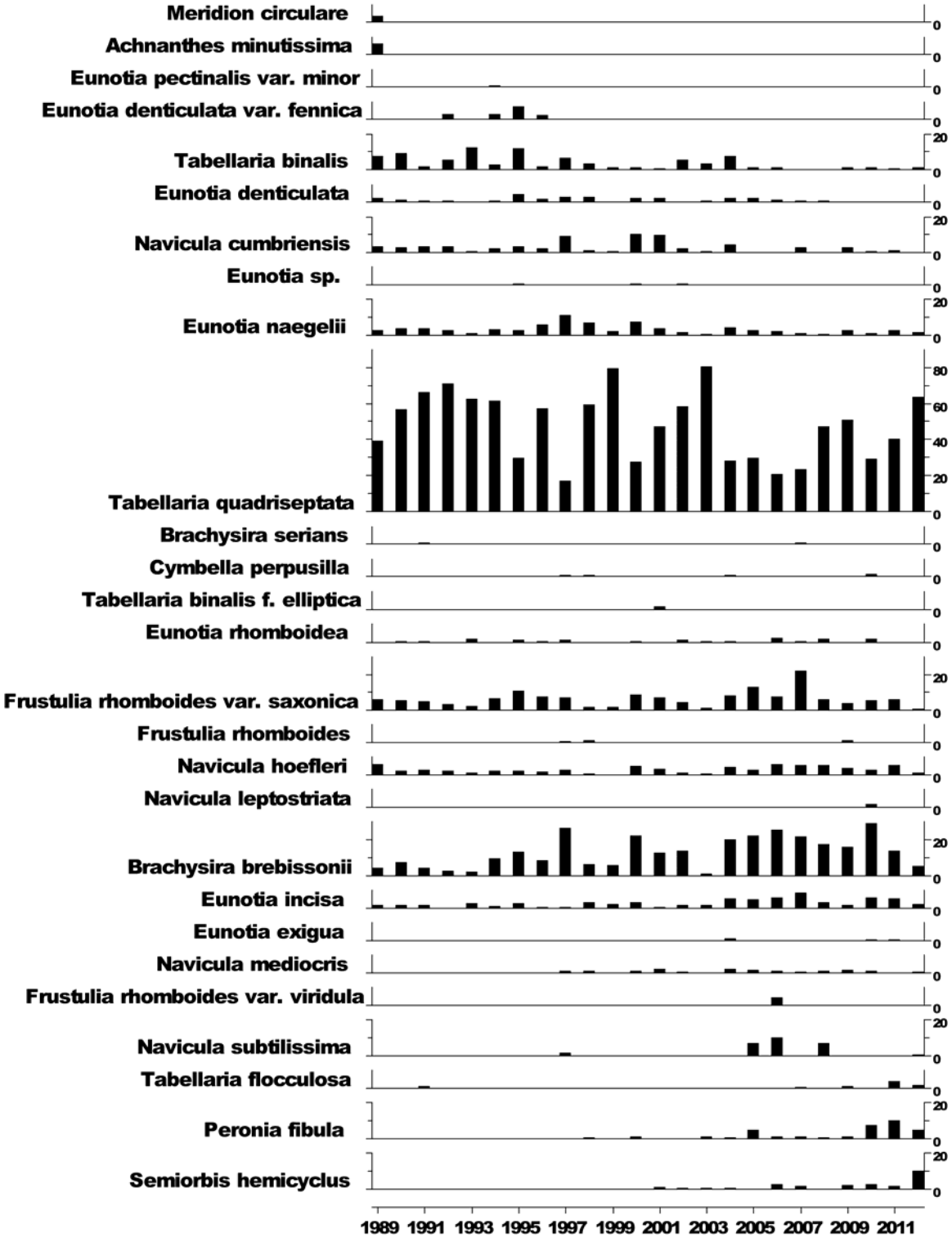
6.21.3.2. Summary of Trout parr densities (numbers m^{-2}), Blue Lough



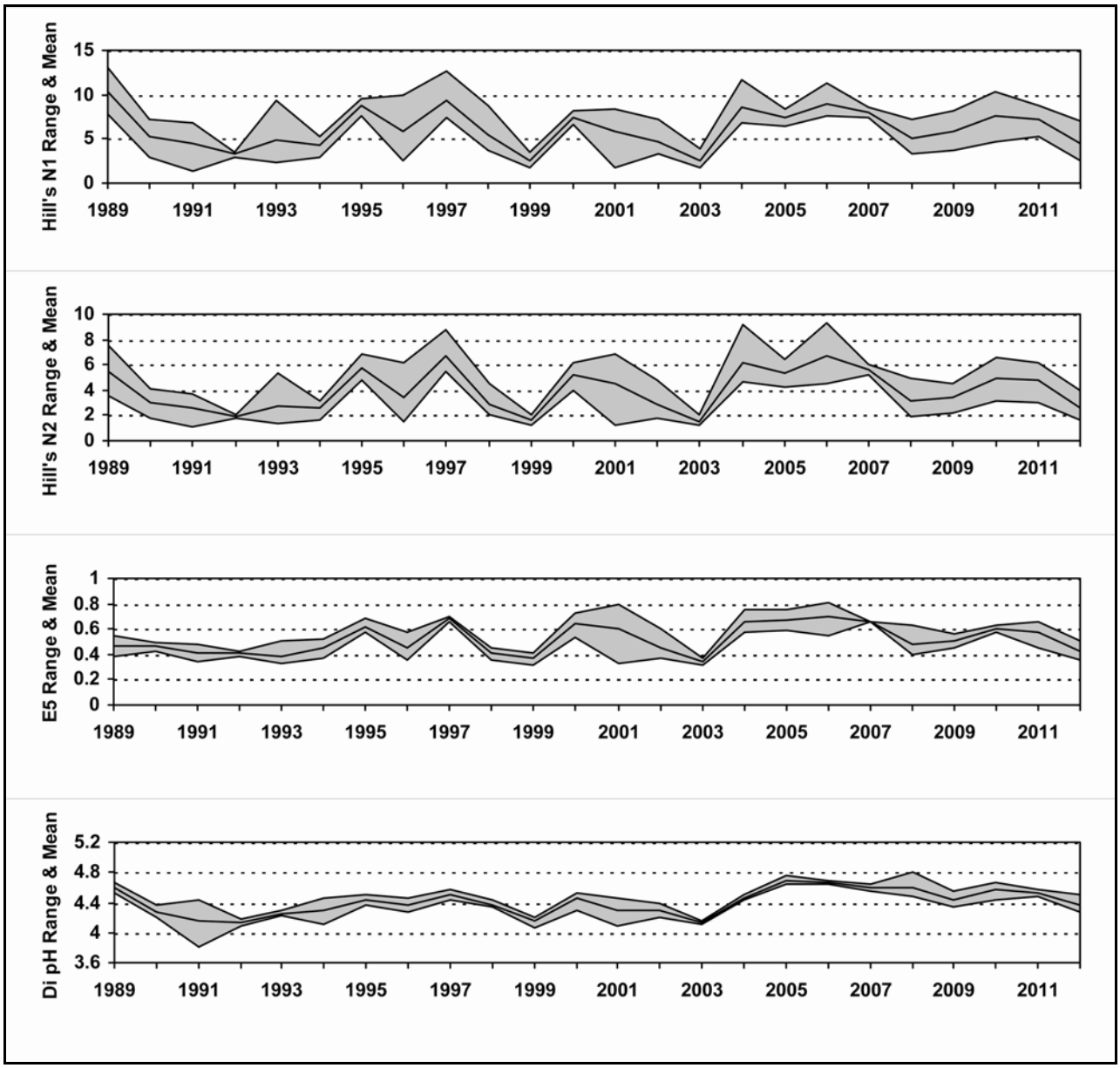
No analysis after 2006 due to funding cuts

6.21.4. Epilithic diatom data

6.21.4.1. Percentage abundance summary, Blue Lough

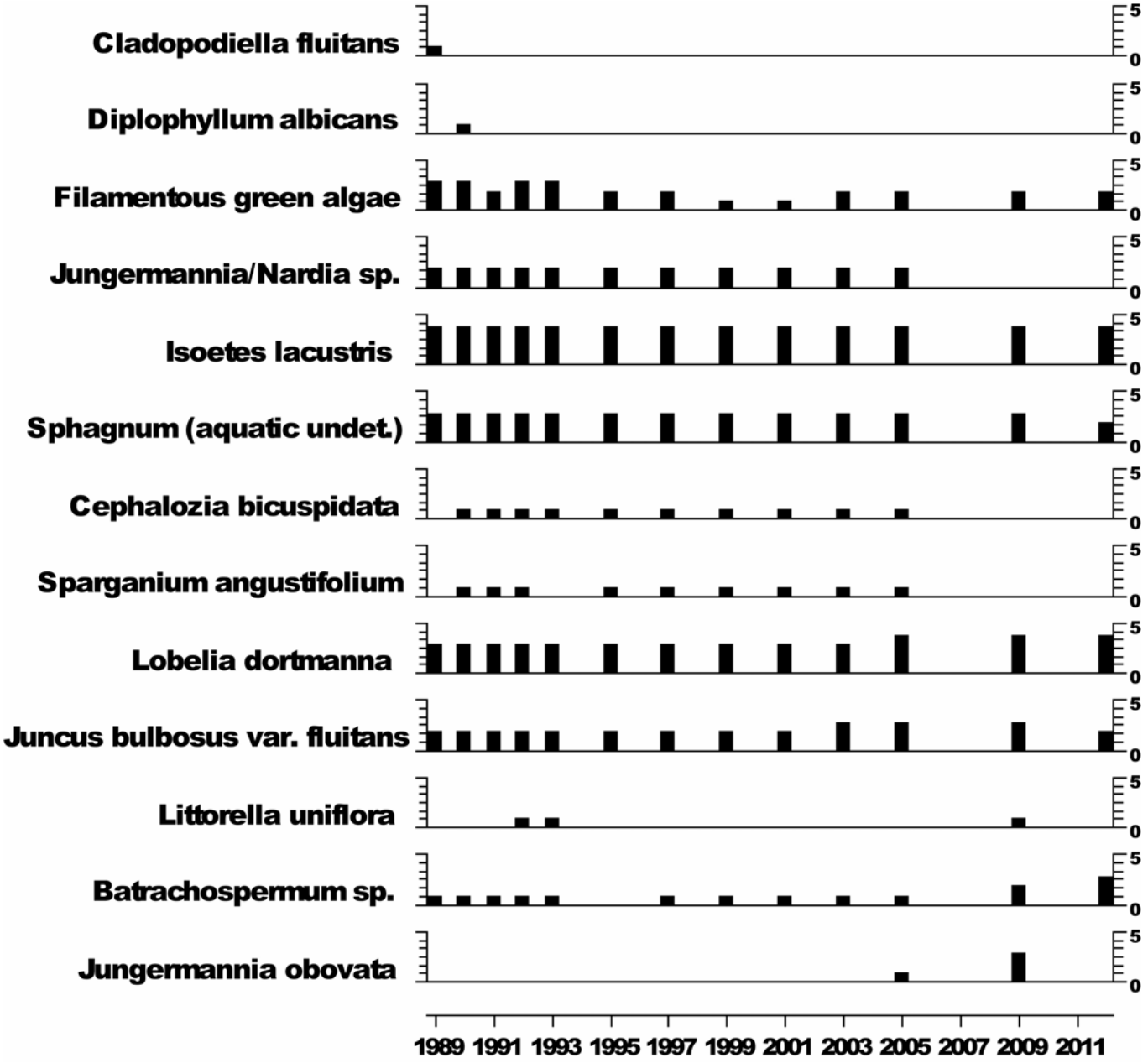


6.21.4.2. Summary statistics, Blue Lough



6.21.5. Aquatic macrophyte data, Blue Lough

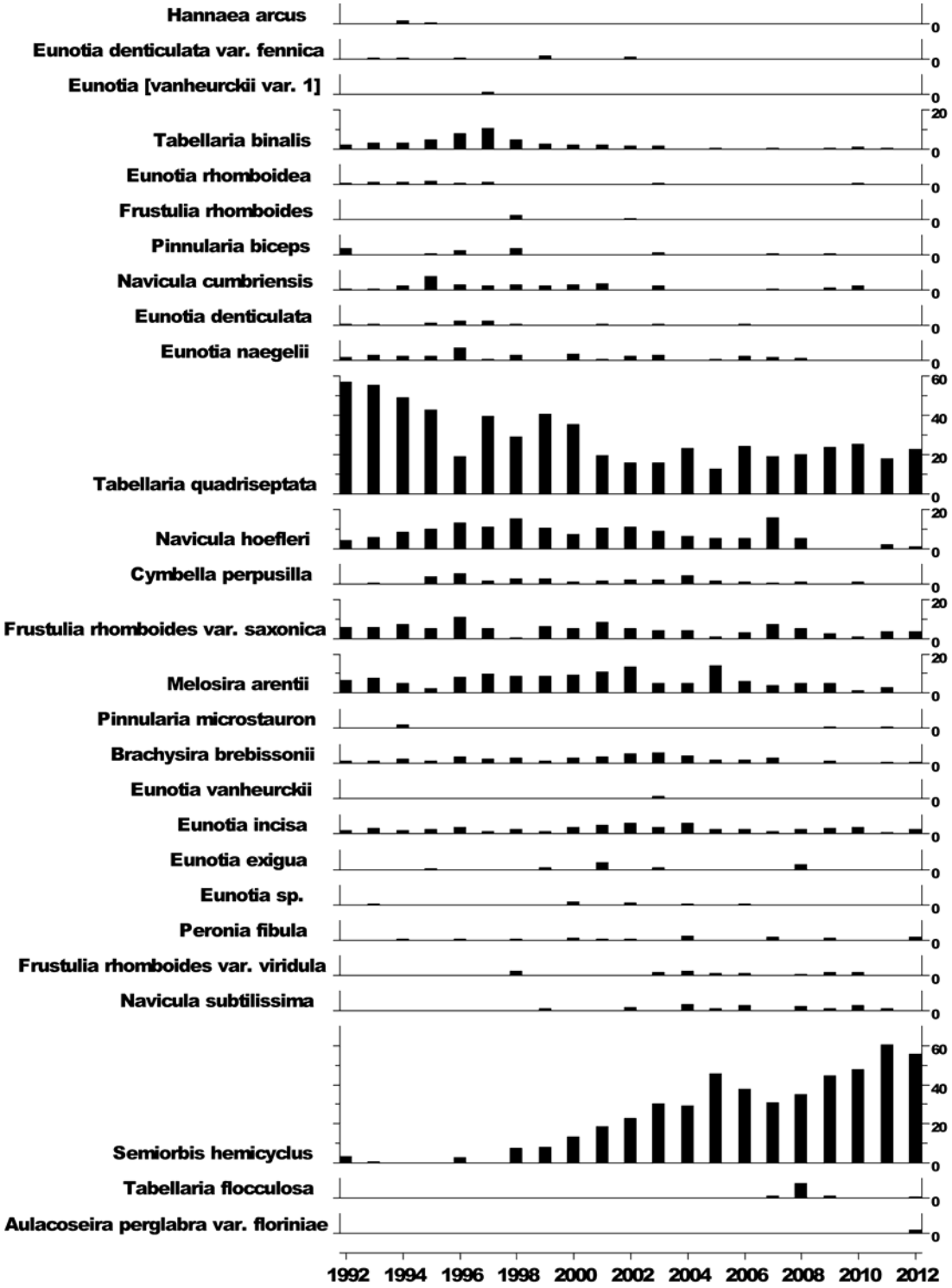
Species Scores (1-5)



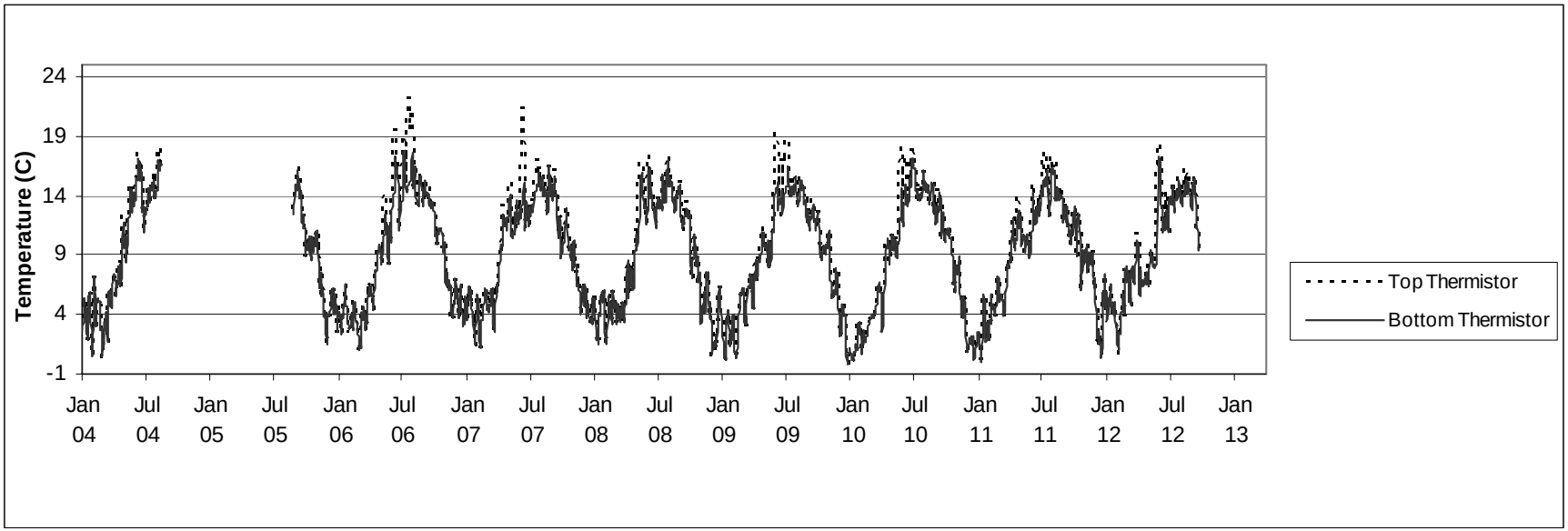
No survey in 2007 due to funding cuts
2012 Bryophyte IDs pending

6.21.6. Sediment trap data, Blue Lough

Relative percentage frequency of diatom taxa



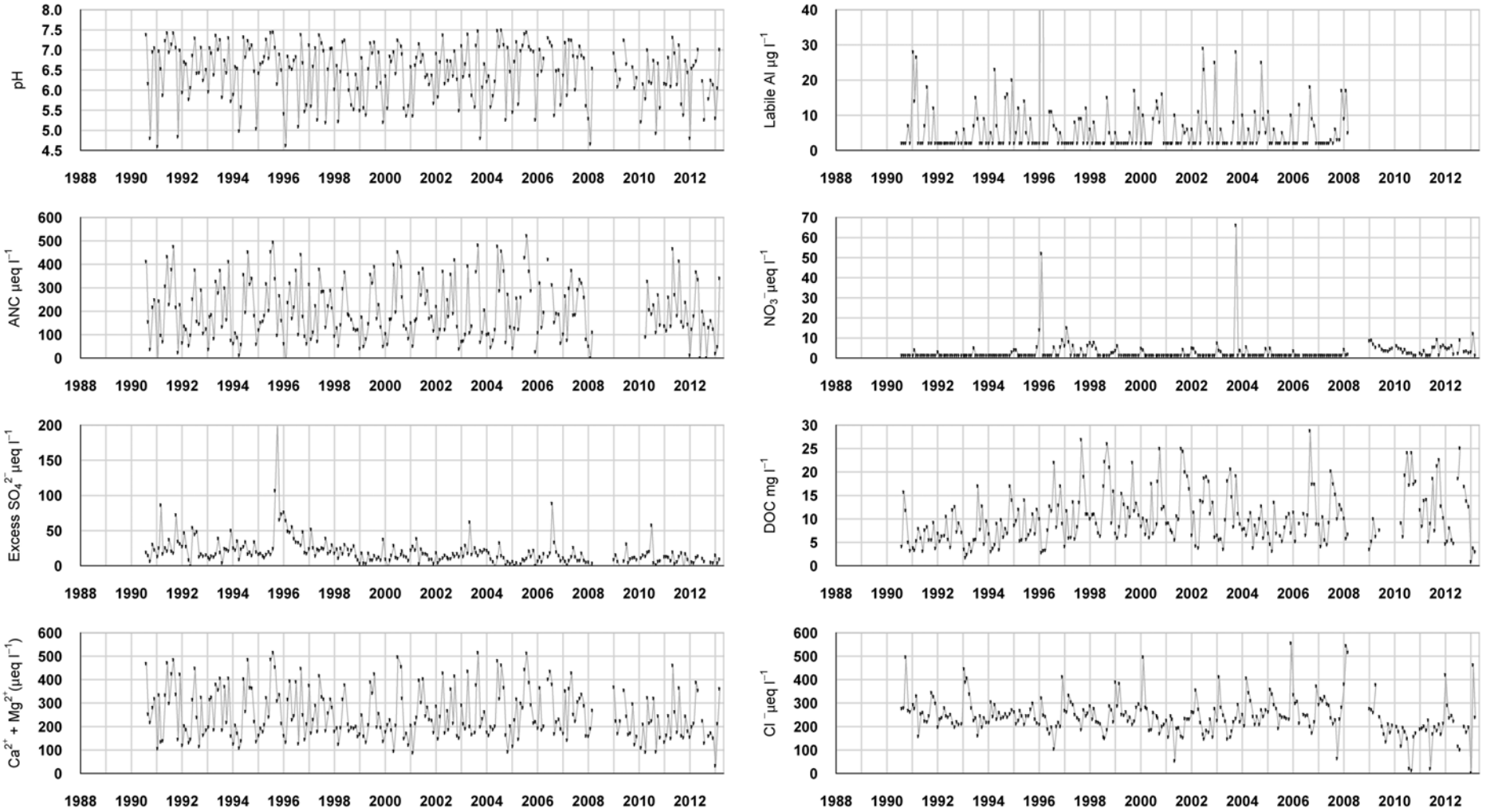
6.21.7. Thermistor data, Blue Lough



2004 and 2012 thermistors not recovered.

6.22. Coneyglen Burn

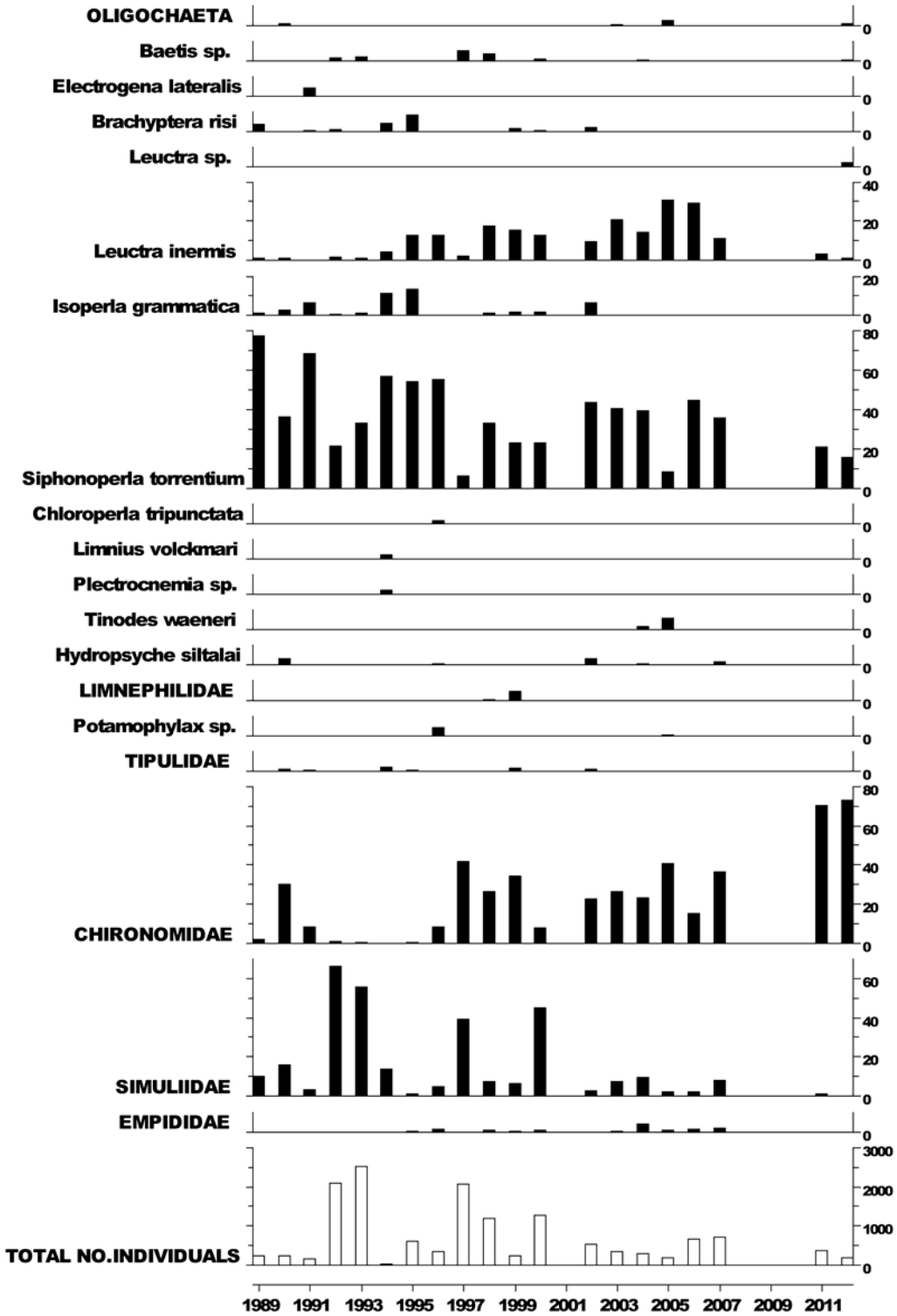
6.22.1. Spot sampled chemistry data



µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO_4^{2-}	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	6.56	200.18	149.03	118.02	240.70	8.84	35.35	5.99	260.57	51.31	23.99	1.54	7.20
12-13 mean	6.17	155.32	122.36	95.92	197.62	7.08			196.26	27.61	7.02	4.44	10.48
12-13 std dev	0.62	132.45	75.78	41.96	50.66	3.06			120.19	12.34	6.47	3.58	8.09

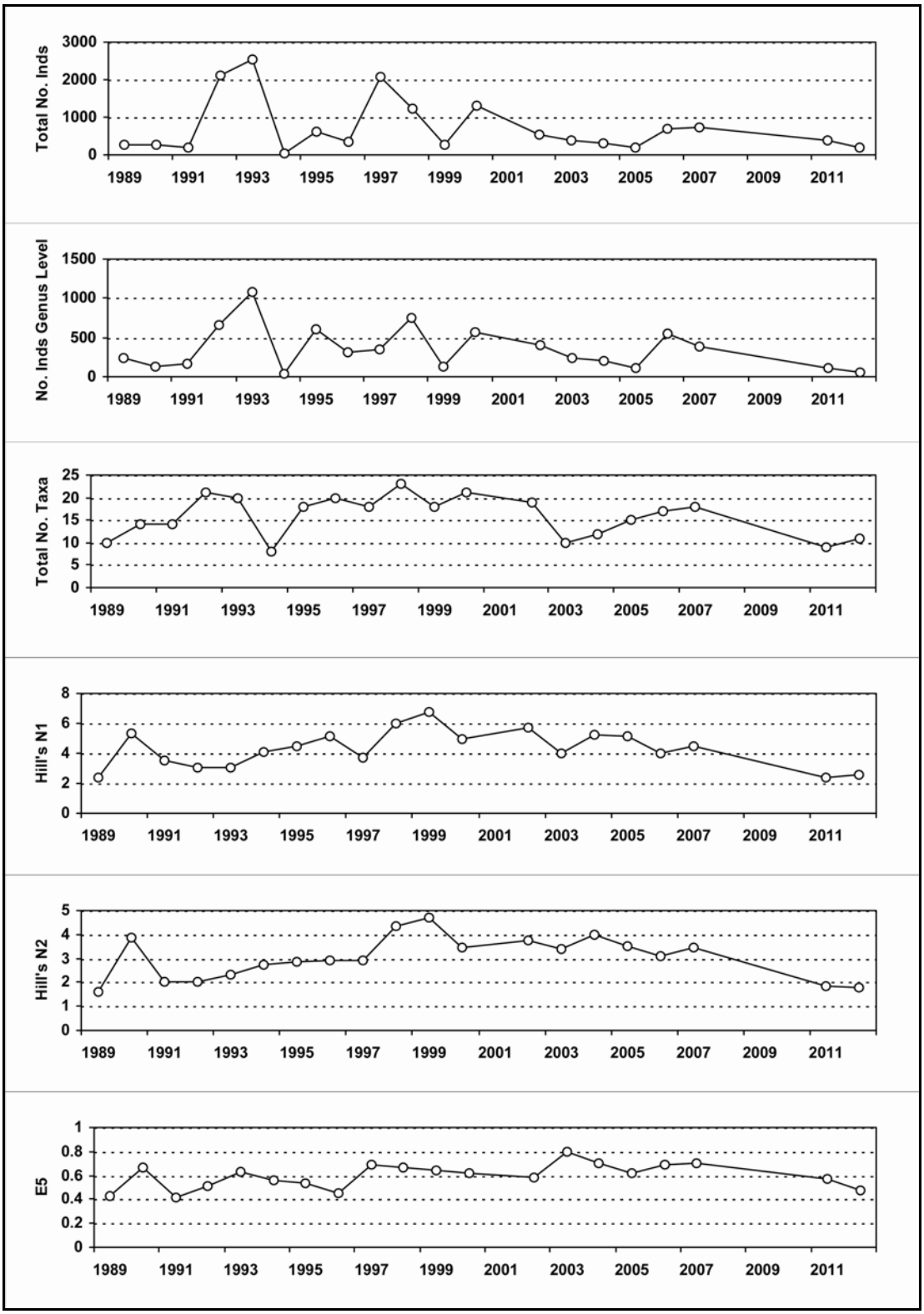
6.22.2. Macroinvertebrate data

6.22.2.1. Percentage abundance summary, Coneyglen Burn



No sampling in 2001 due to Foot and Mouth restrictions.
No analysis between 2007 and 2011 due to funding cuts.

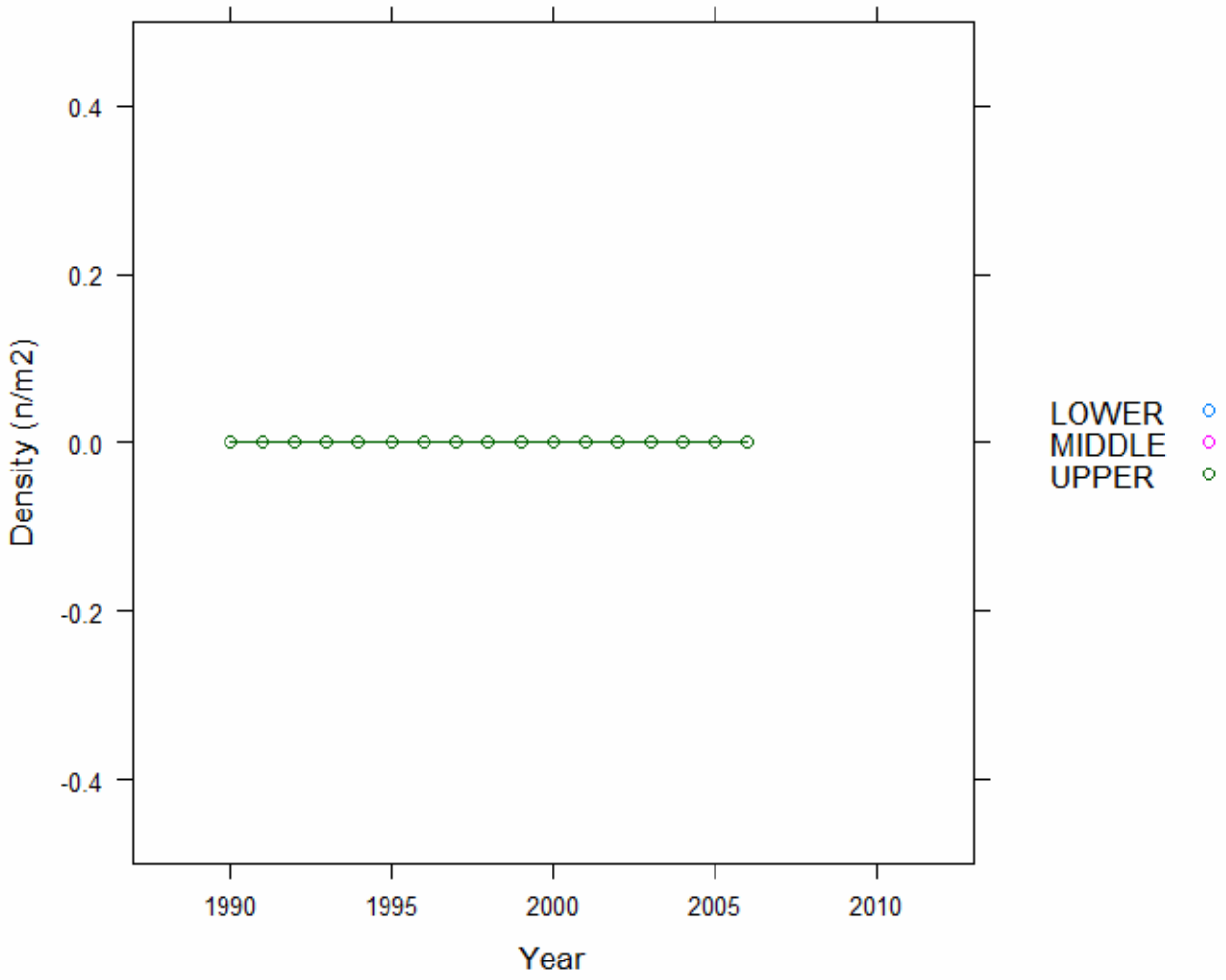
6.22.2.2. Summary statistics, Coneyglen Burn



No sampling in 2001 due to Foot and Mouth restrictions.
No analysis between 2007 and 2011 due to funding cuts.

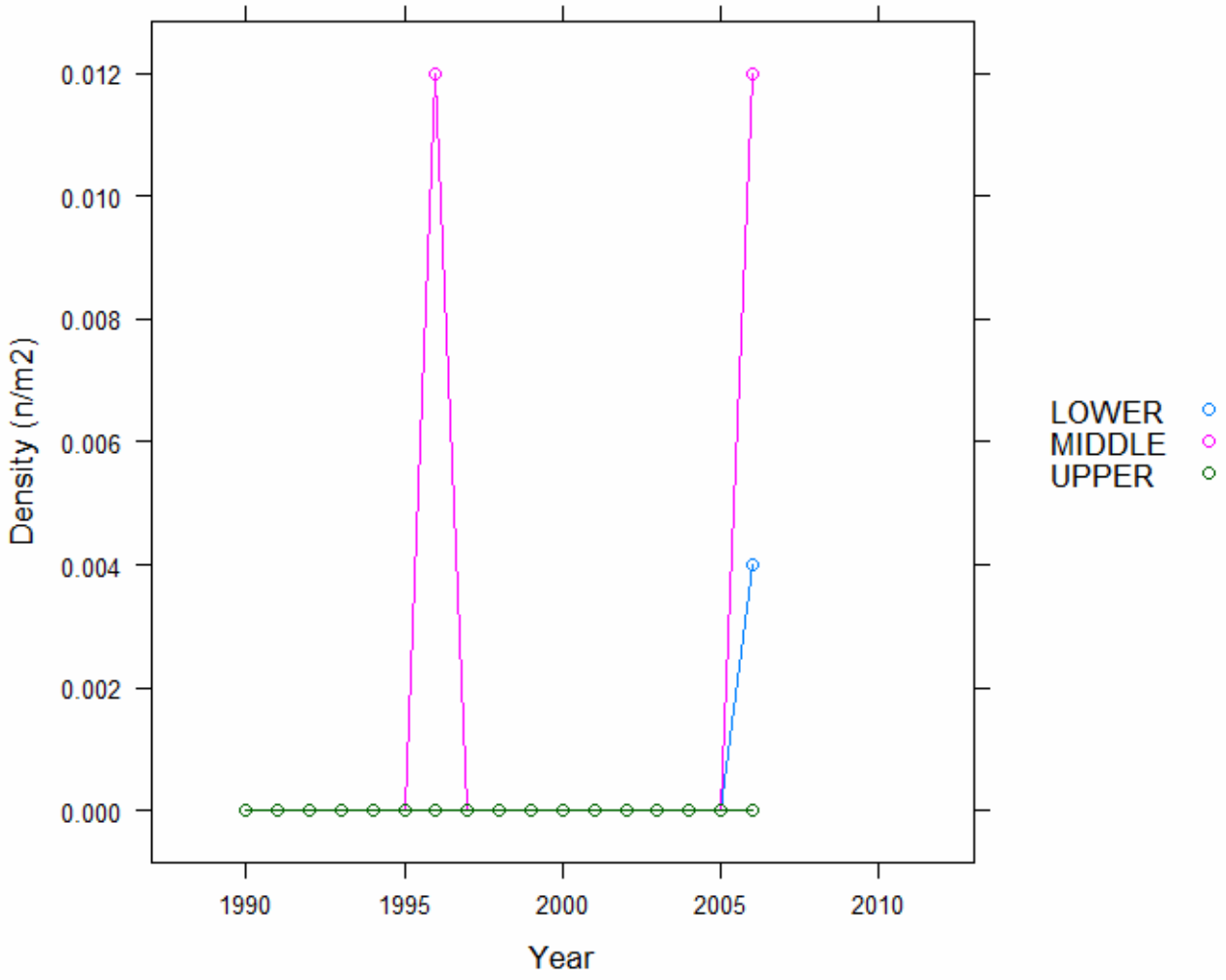
6.22.3. Fish data

6.22.3.1. Summary of Salmon fry densities (numbers m^{-2}), Coneyglen Burn



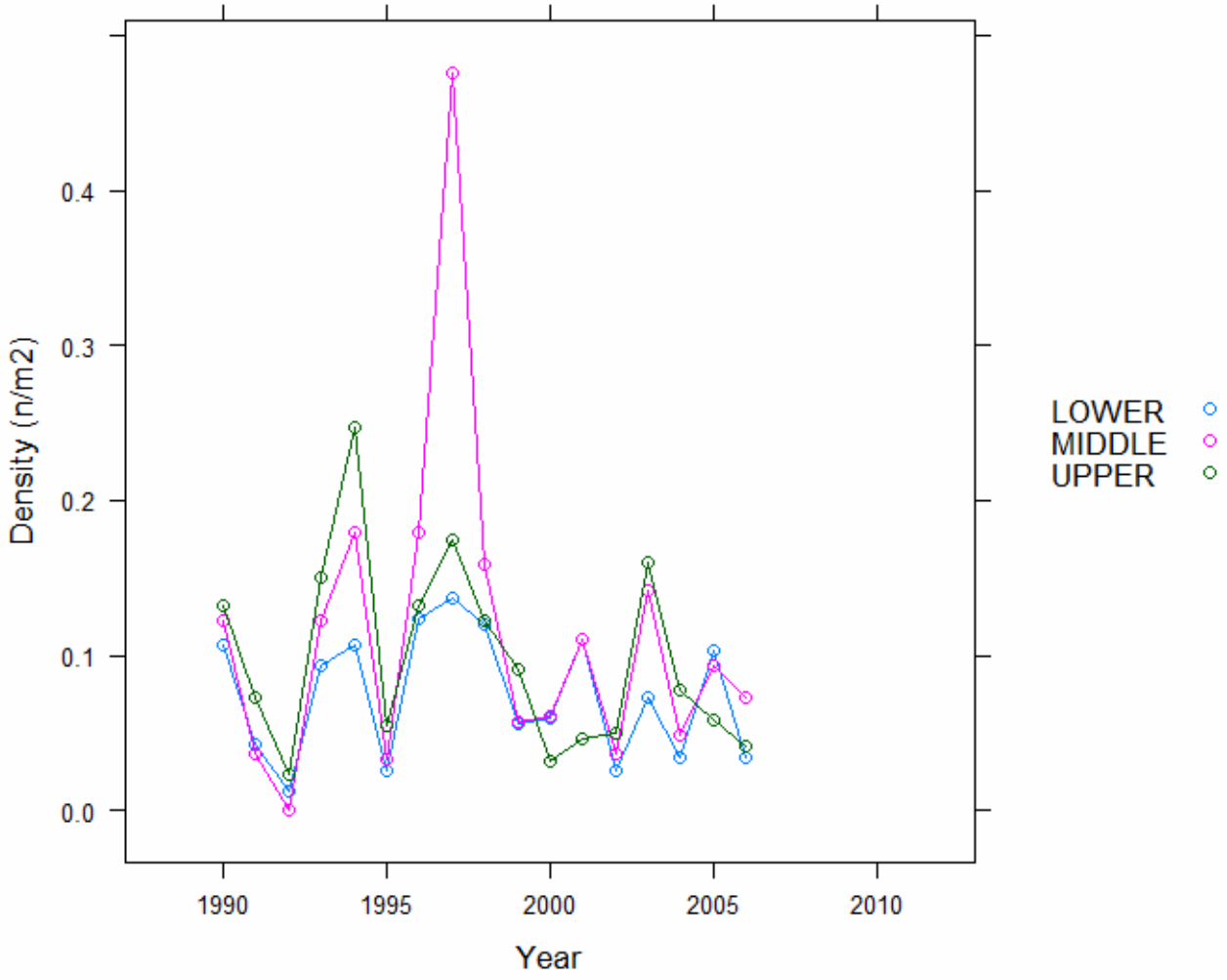
No analysis after 2006 due to funding cuts.

6.22.3.2. Summary of Salmon parr densities (numbers m^{-2}), Coneyglen Burn



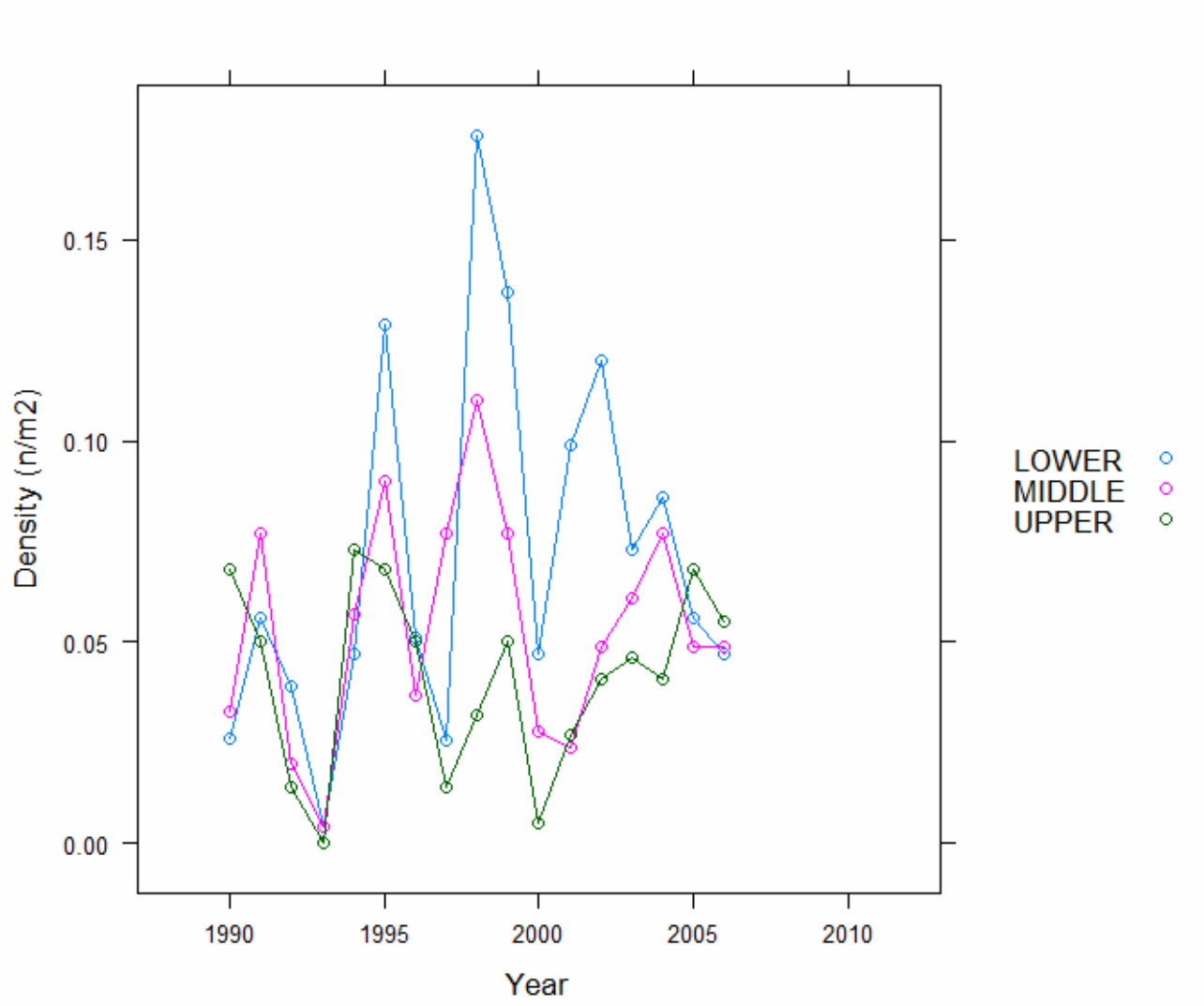
No analysis after 2006 due to funding cuts.

6.22.3.3. Summary of Trout fry densities (numbers m^{-2}), Coneyglen Burn



No analysis after 2006 due to funding cuts.

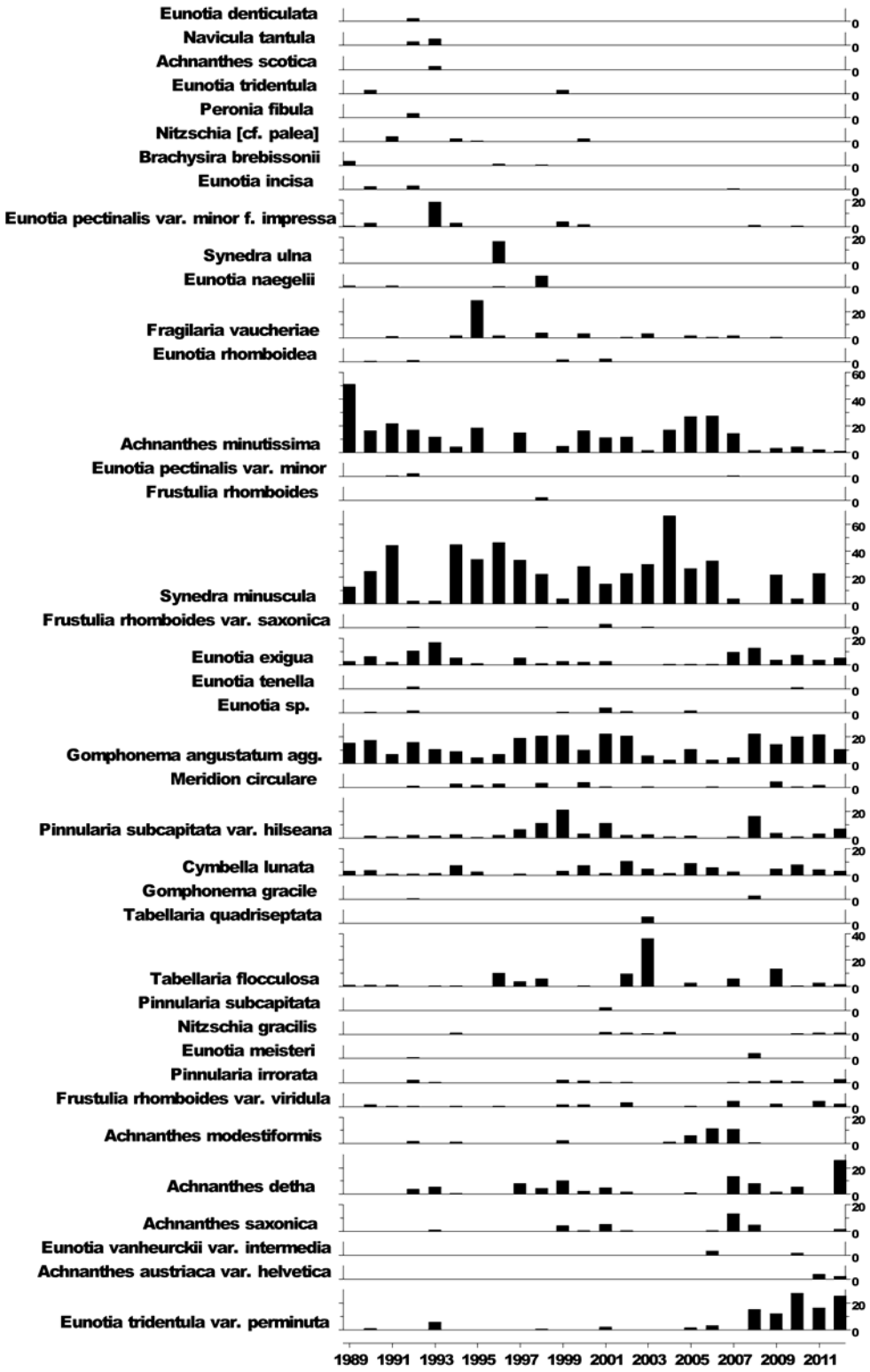
6.22.3.4. Summary of Trout parr densities (numbers m^{-2}), Coneyglen Burn



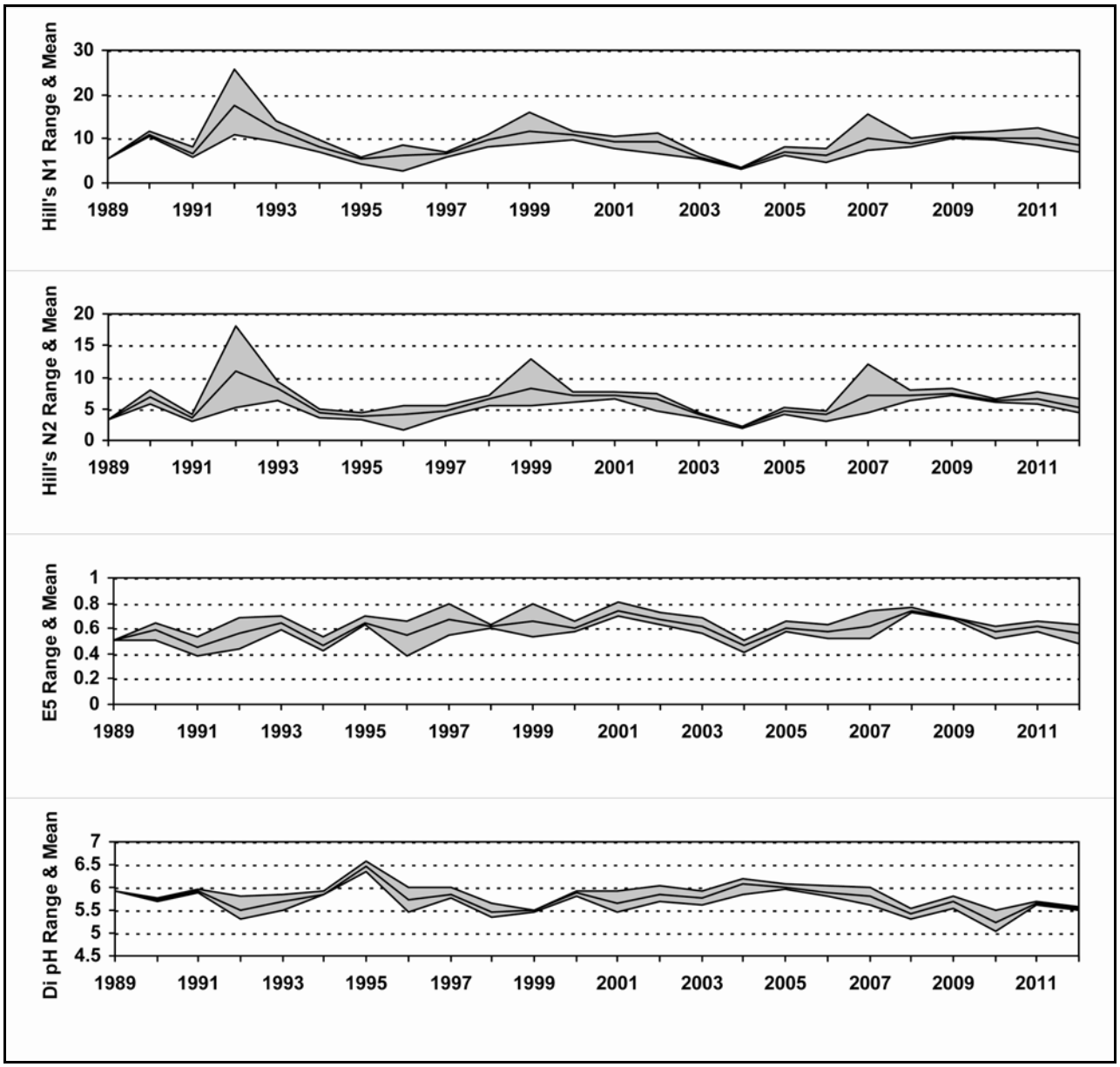
No analysis after 2006 due to funding cuts.

6.22.4. Epilithic diatom data

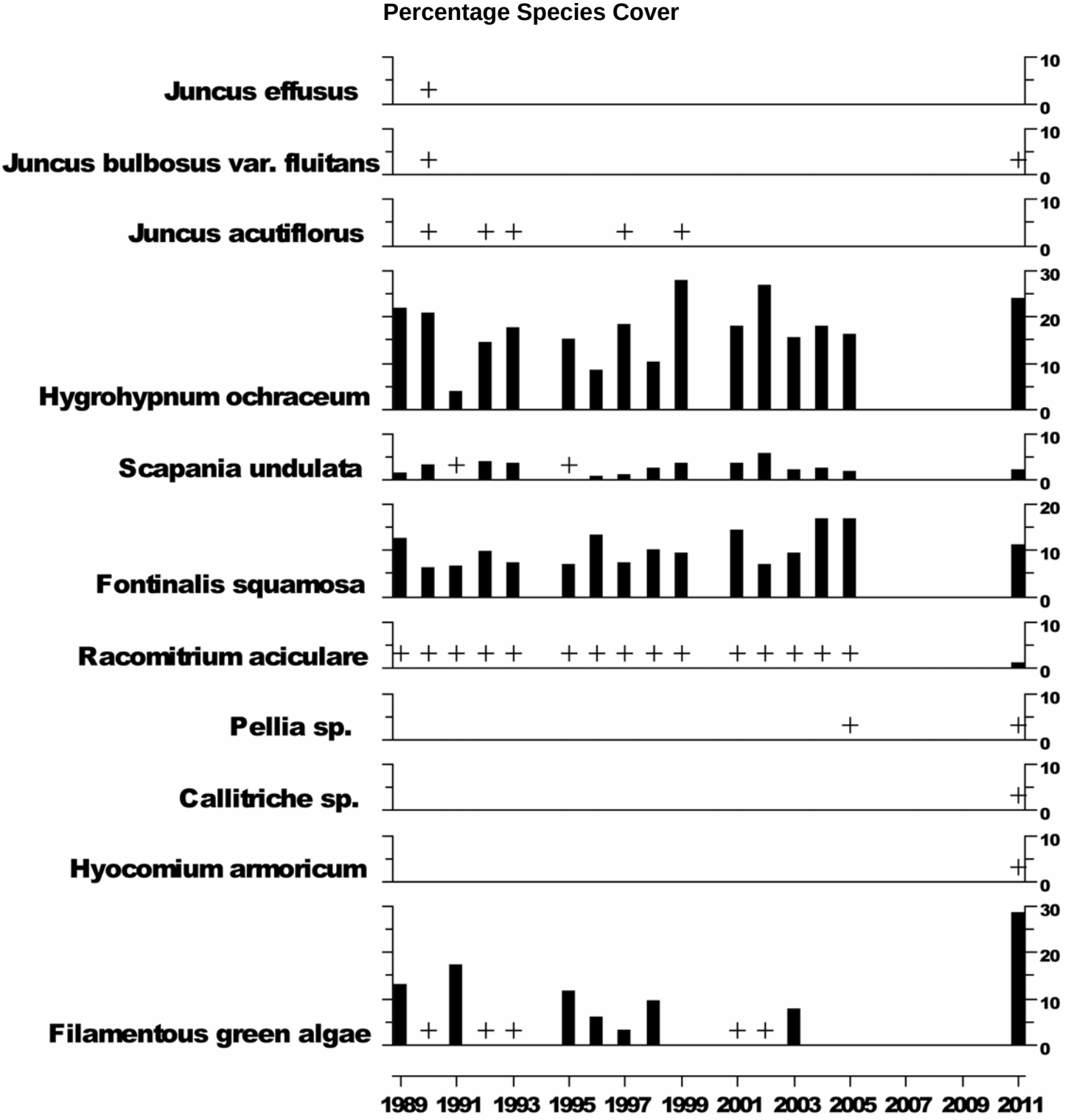
6.22.4.1. Percentage abundance summary, Coneyglen Burn



6.22.4.2. Summary statistics, Coneyglen Burn



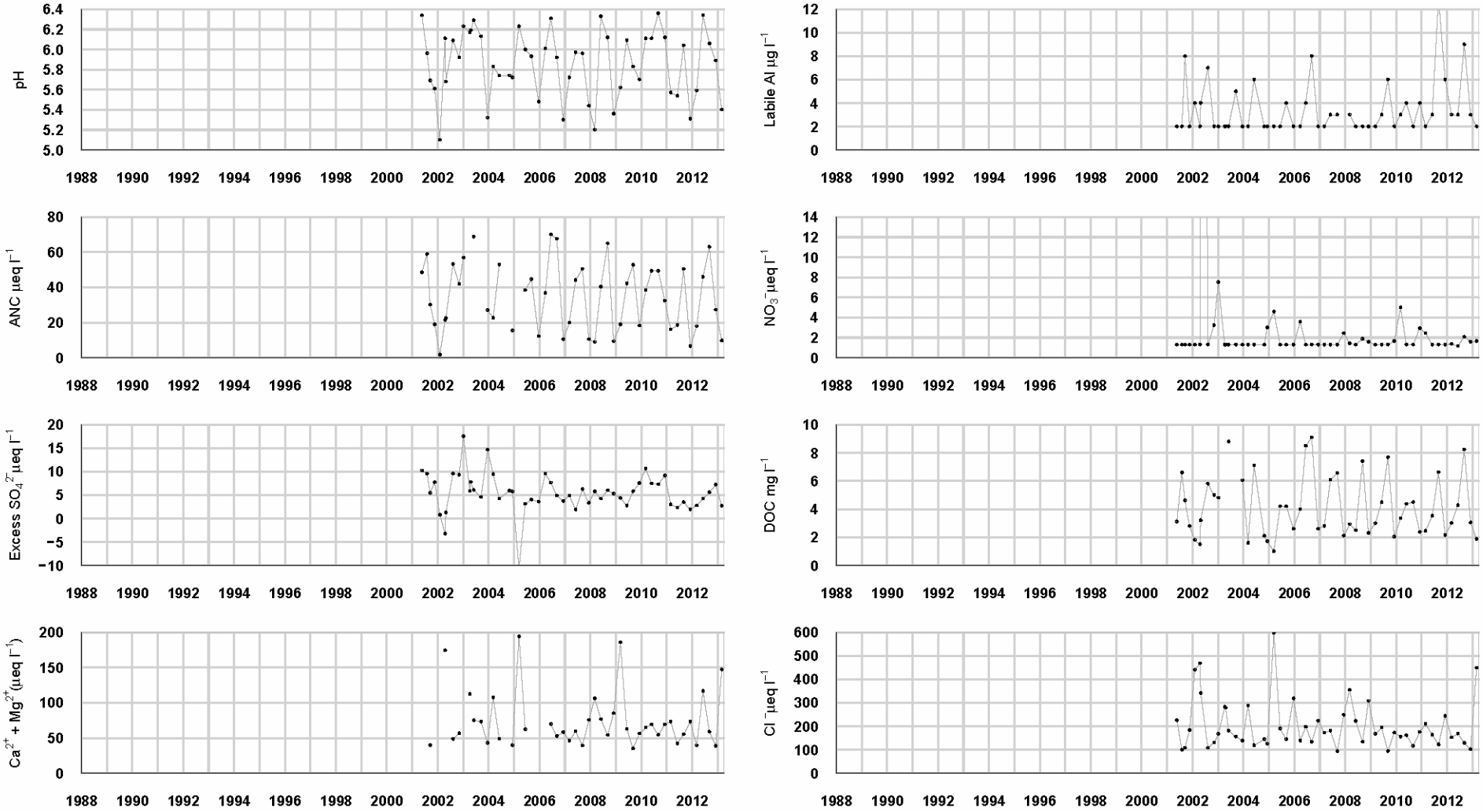
6.22.5. Aquatic macrophyte data, Coneyglen Burn



+ Represents <0.9% abundance
No survey undertaken in 2000 and 2006 due to spate conditions
No surveys in 2007-2010 due to funding cuts

6.23. Loch Coire Fionnaraich

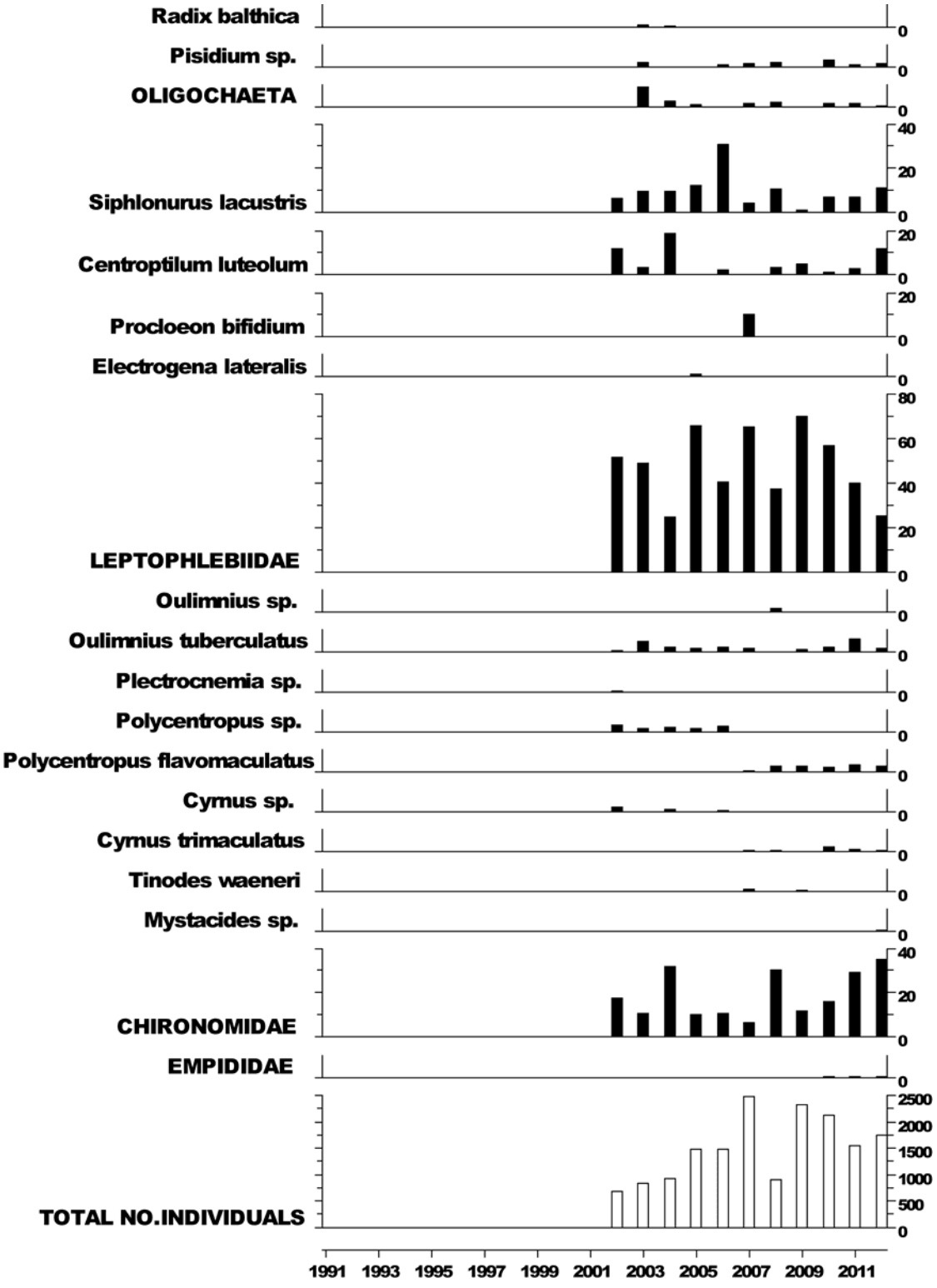
6.23.1. Spot sampled chemistry data



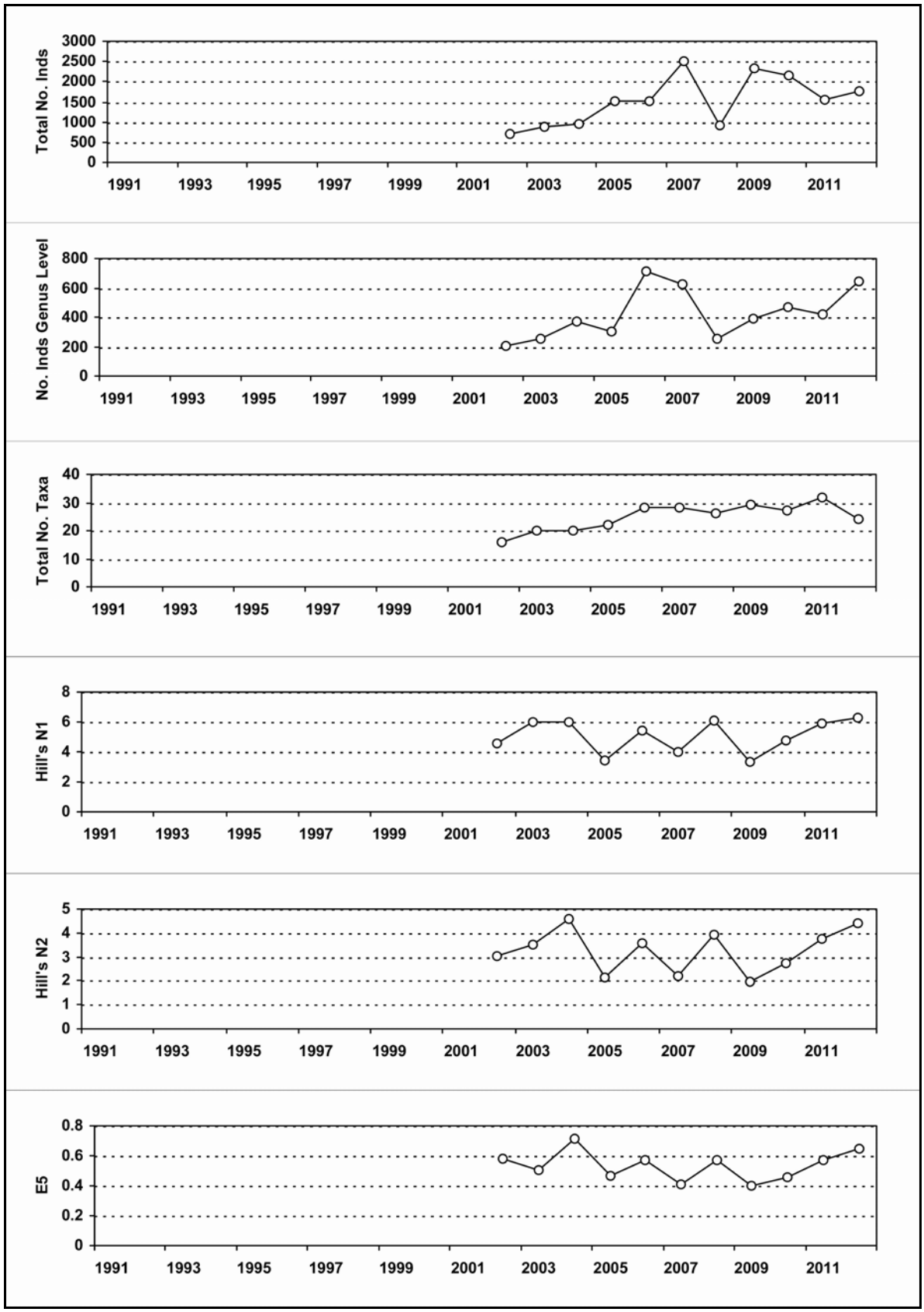
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	*Soluble Al	*Labile Al	Cl^{-}	$*SO_4^{2-}$	xSO_4^{2-}	NO_3^{-}	**DOC
Mean 1st 5 yrs	5.90	35.39	32.13	50.46	189.73	6.86	25.42	3.00	223.56	29.51	5.91	7.83	3.93
12-13 mean	5.92	36.44	41.19	49.05	181.72	6.31	28.00	4.25	211.72	27.14	4.93	1.61	4.35
12-13 std dev	0.39	23.06	27.00	36.54	96.56	2.30	33.12	3.20	160.23	15.16	1.92	0.38	2.76

6.23.2. Macroinvertebrate data

6.23.2.1. Percentage abundance summary, Loch Coire Fionnaraich

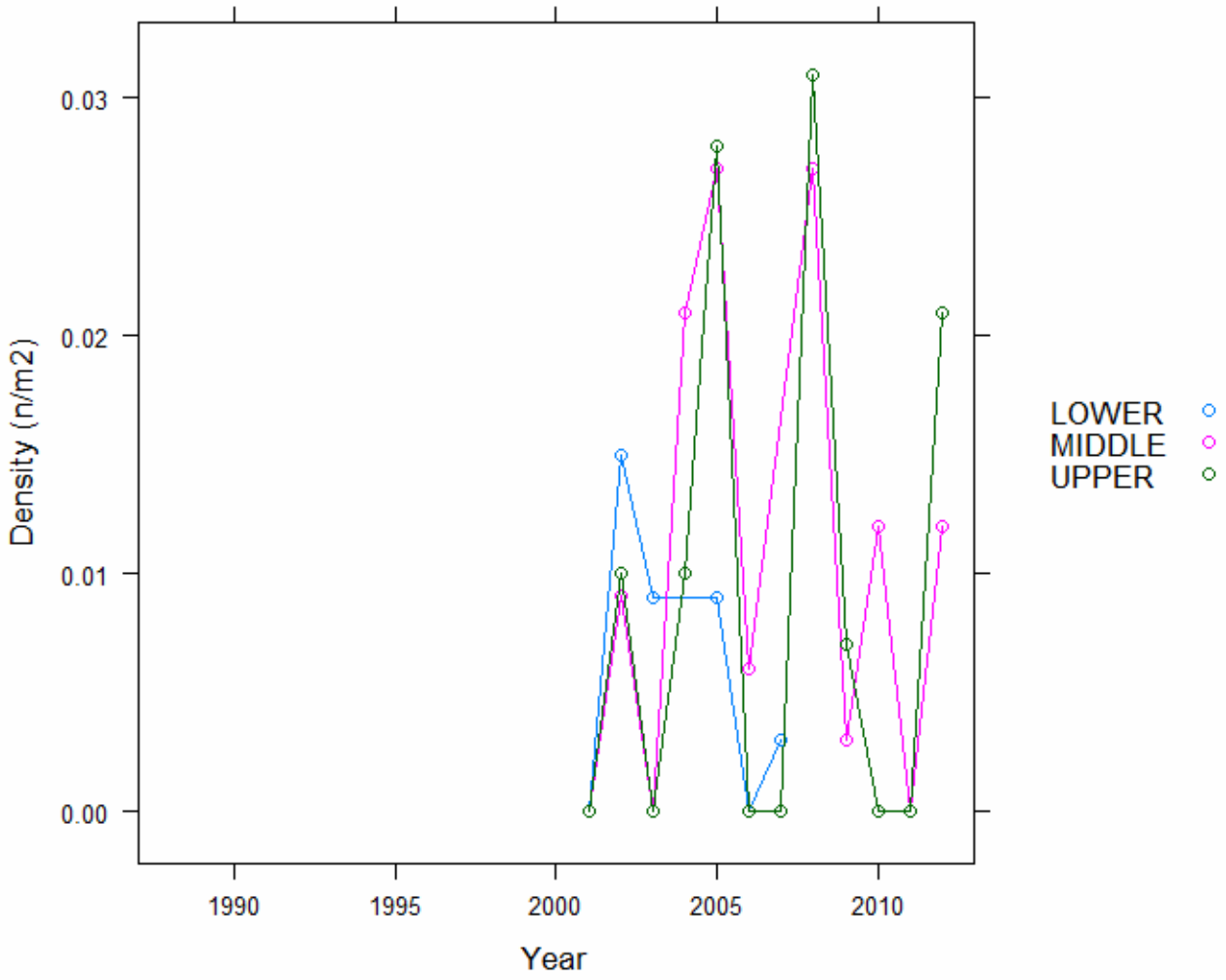


6.23.2.2. Summary statistics, Loch Coire Fionnaraich

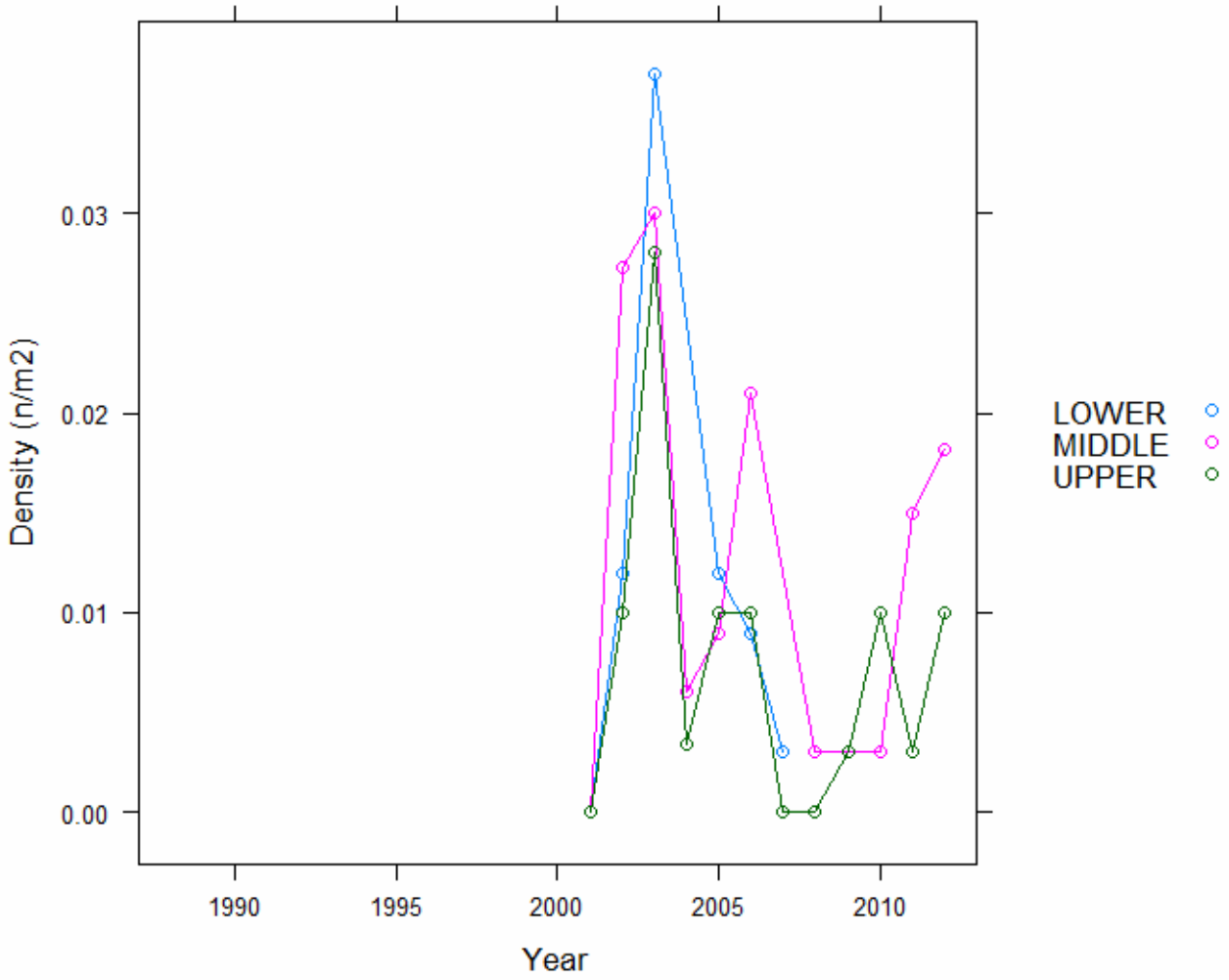


6.23.3. Fish data (for outflow stream)

6.23.3.1. Summary of Trout fry densities (numbers m^{-2}), Loch Coire Fionnaraich

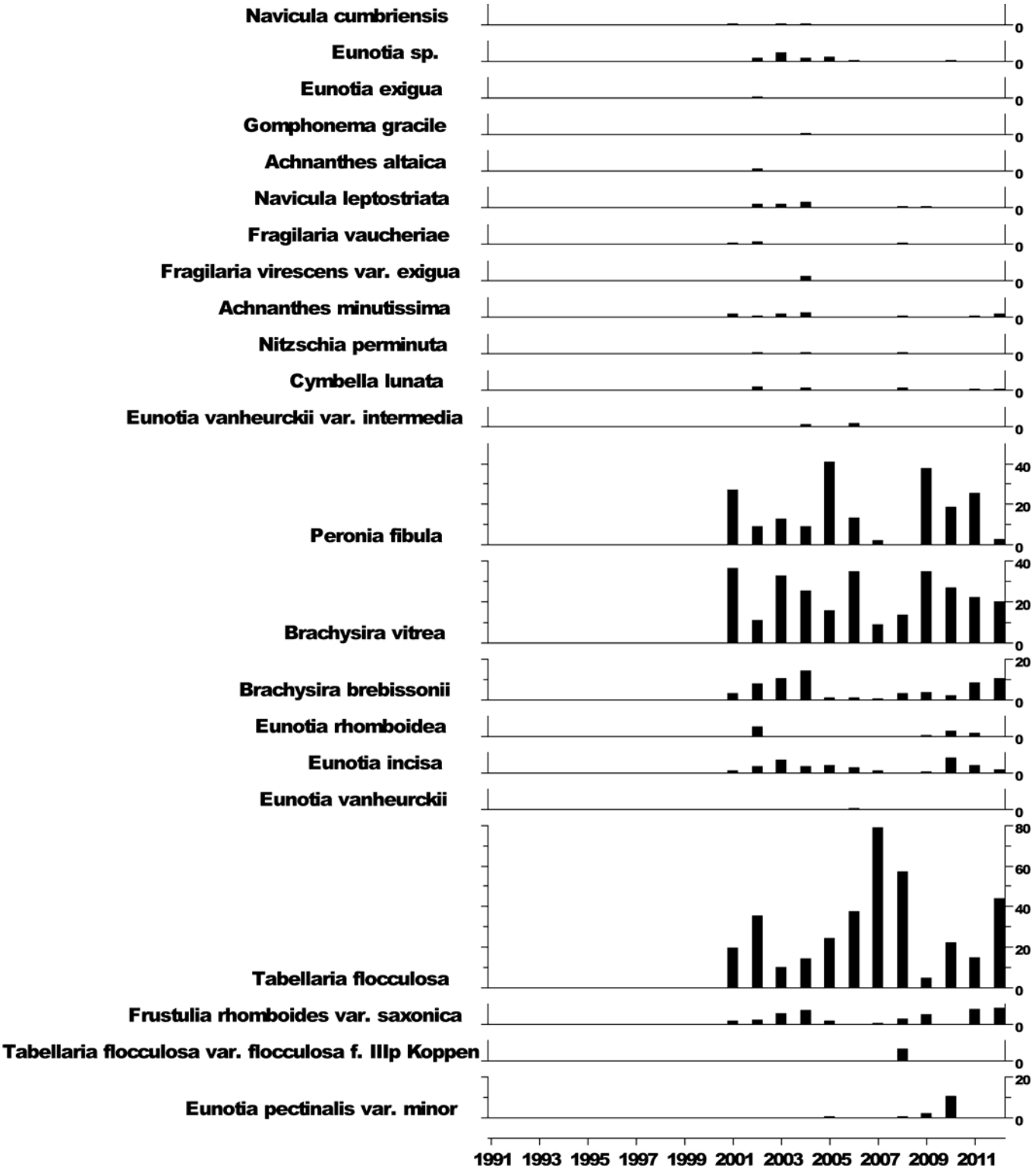


6.23.3.2. Summary of Trout parr densities (numbers m^{-2}), Loch Coire Fionnaraich

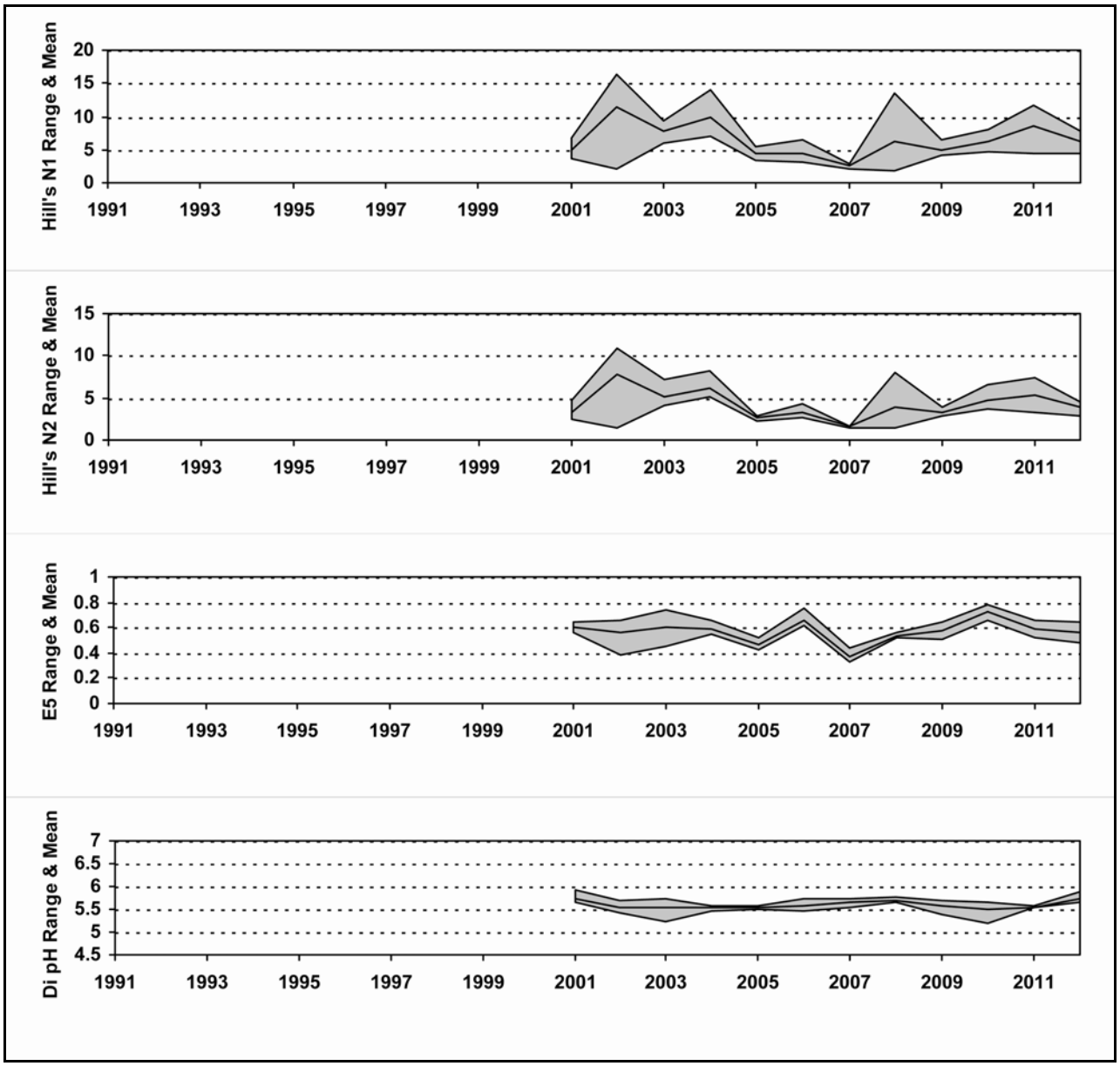


6.23.4. Epilithic diatom data

6.23.4.1. Percentage abundance summary, Loch Coire Fionnaraich

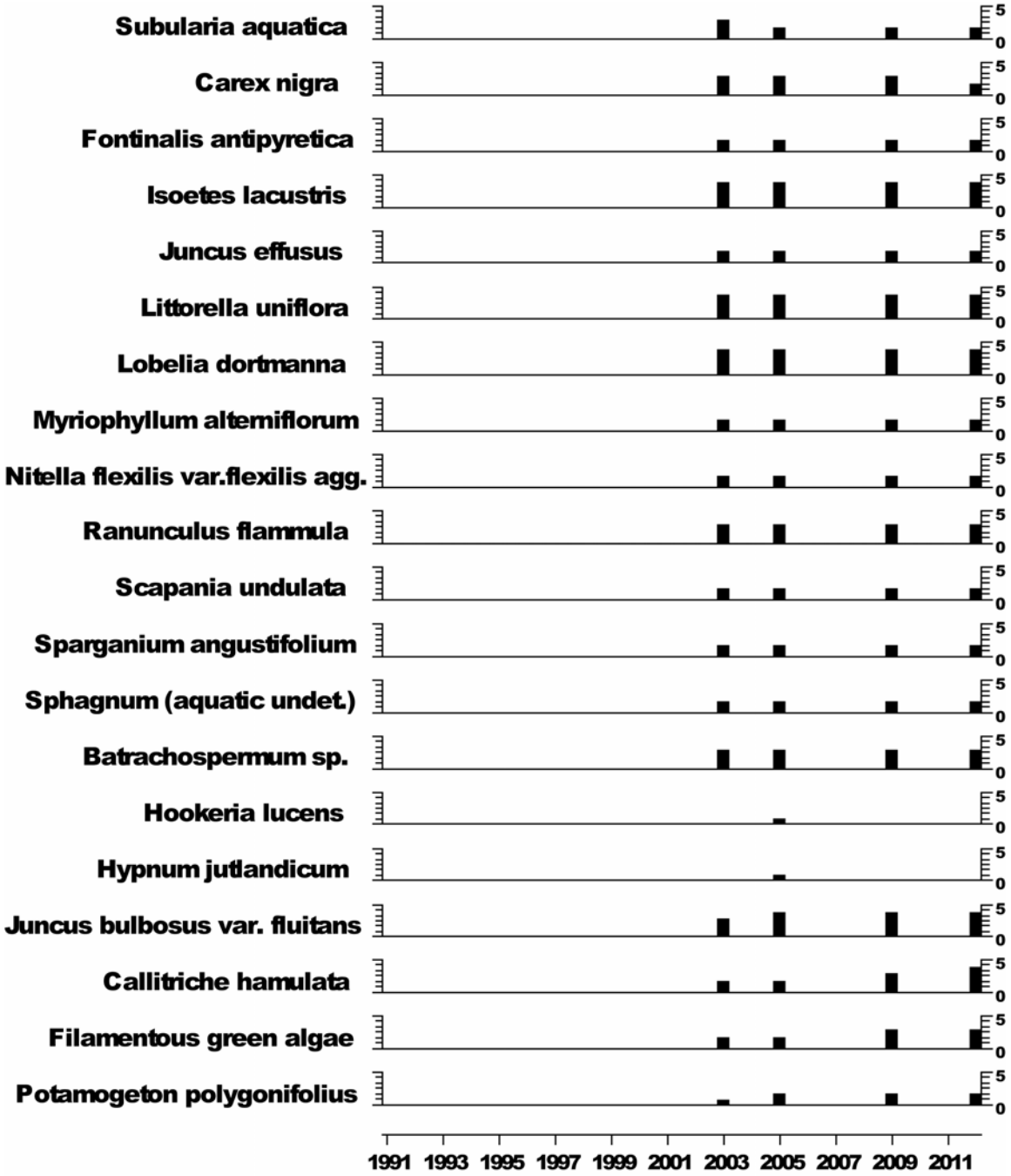


6.23.4.2. Summary statistics, Loch Coire Fionnaraich



6.23.5. Aquatic macrophyte data, Loch Coire Fionnaraich

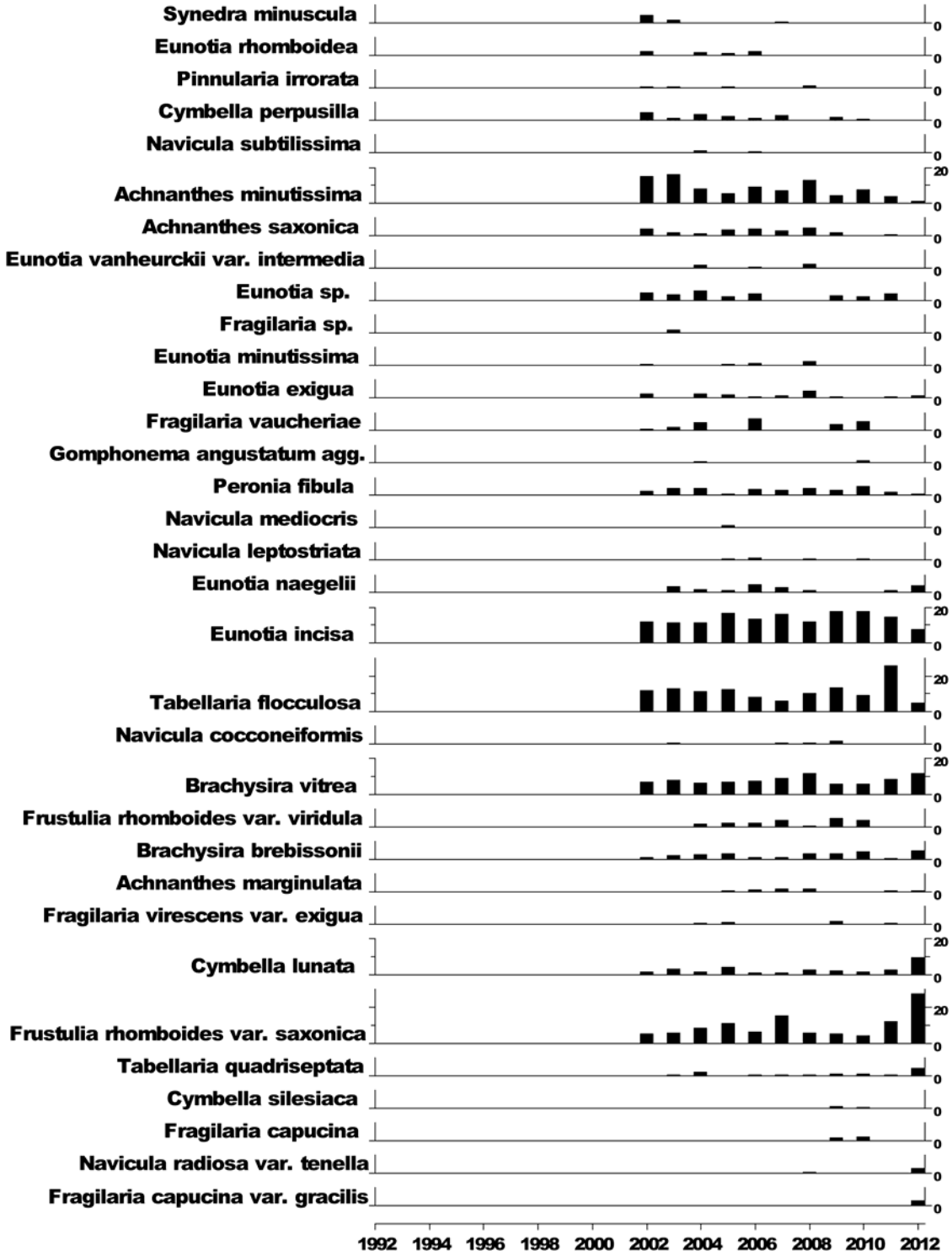
Species Scores (1-5)



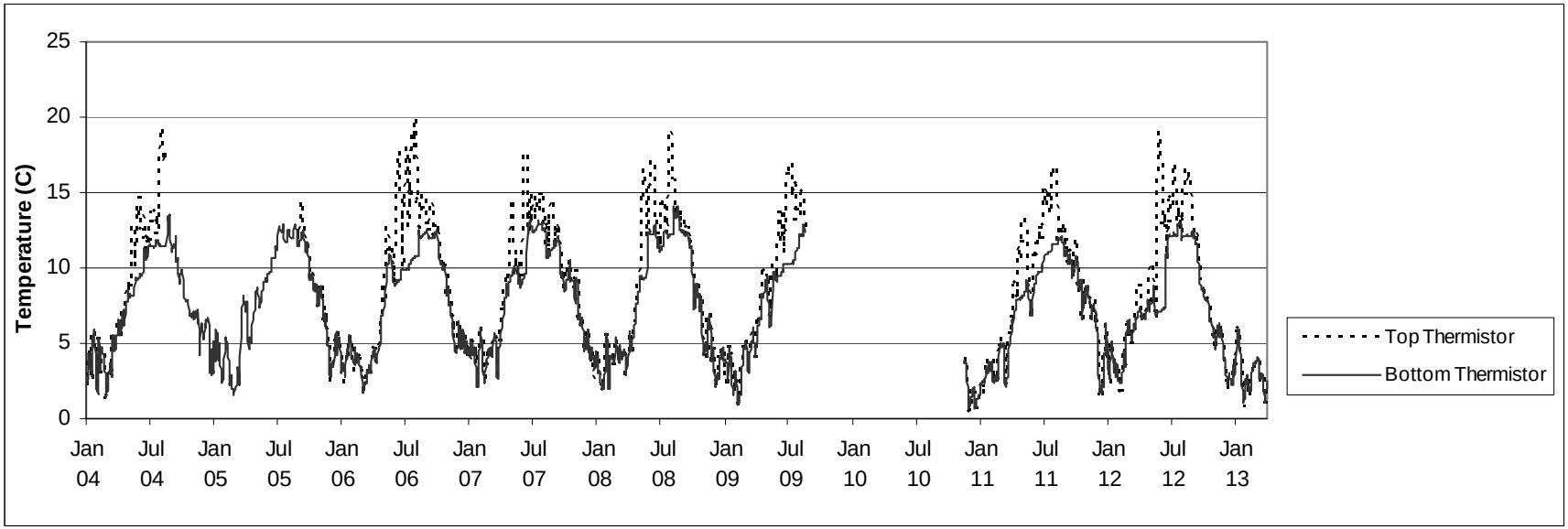
No survey in 2007 due to funding cuts
2012 Bryophyte IDs pending

6.23.6. Sediment trap data, Loch Coire Fionnaraich

Relative percentage frequency of diatom taxa



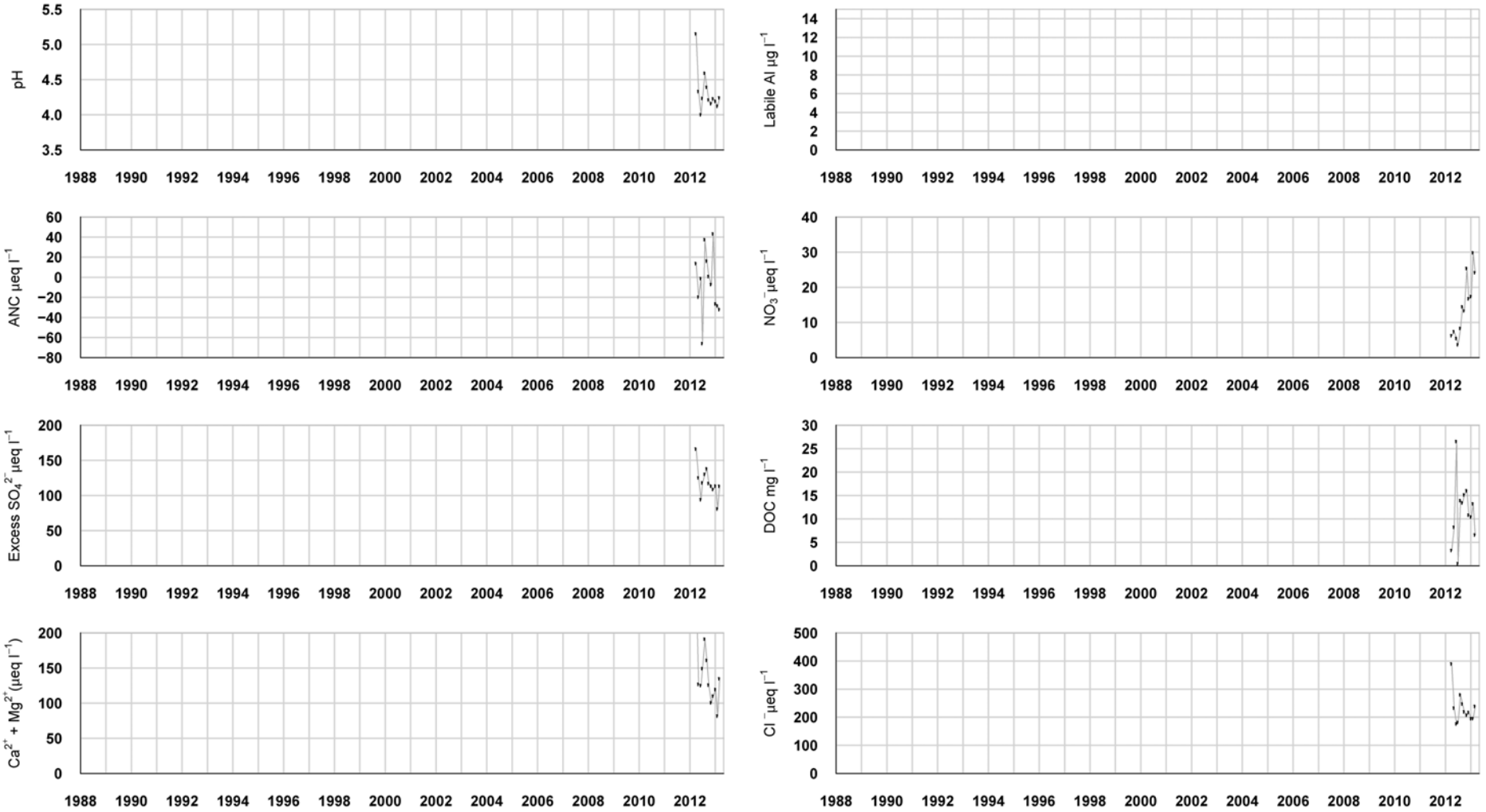
6.23.7. Thermistor data, Loch Coire Fionnaraich



2009/2010 thermistors not recovered.

6.24. Danby Beck

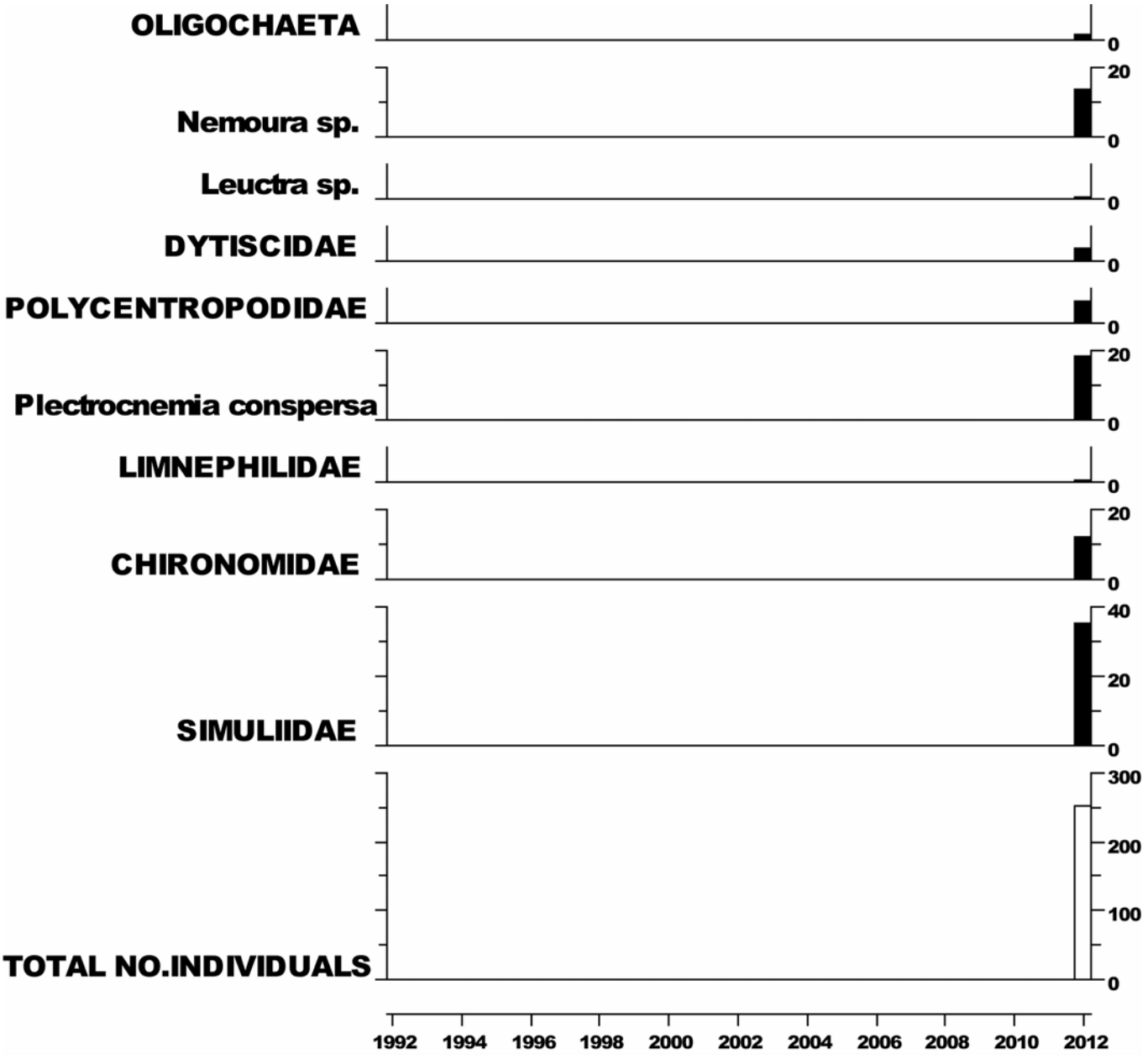
6.24.1. Spot sampled chemistry data



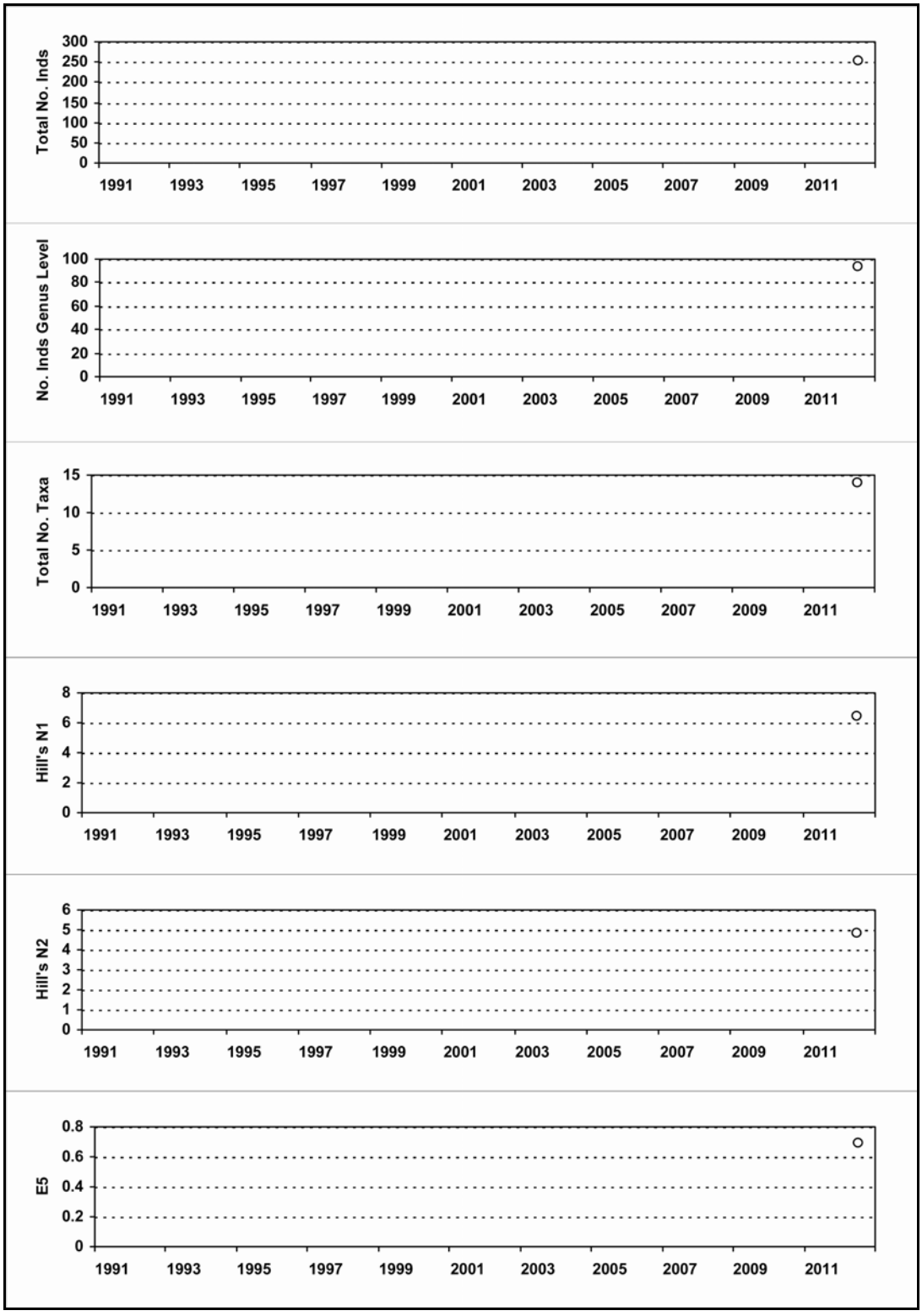
µeq l $^{-1}$, *µg l $^{-1}$, **mg l $^{-1}$	pH	ANC	Ca $^{2+}$	Mg $^{2+}$	Na $^{+}$	K $^{+}$	*Soluble Al	*Labile Al	Cl $^{-}$	*SO$_4$ $^{2-}$	xSO$_4$ $^{2-}$	NO$_3$ $^{-}$	**DOC
Mean 1st 5 yrs													
12-13 mean	4.32	-5.93	79.72	61.38	222.76	7.24			231.30	142.32	118.06	14.33	11.48
12-13 std dev	0.30	31.12	32.70	18.89	45.44	3.02			57.80	26.70	21.35	8.62	6.72

6.24.2. Macroinvertebrate data

6.24.2.1. Percentage abundance summary, Danby Beck



6.24.2.2. Summary statistics, Danby Beck



6.24.3. Fish data

It is envisioned that the biological monitoring stretch of Danby Beck is likely to be fishless, however funds are being sought to electrofish the stream in order to confirm this.

6.24.3.1. Summary of Trout fry densities (numbers m^{-2}), Danby Beck

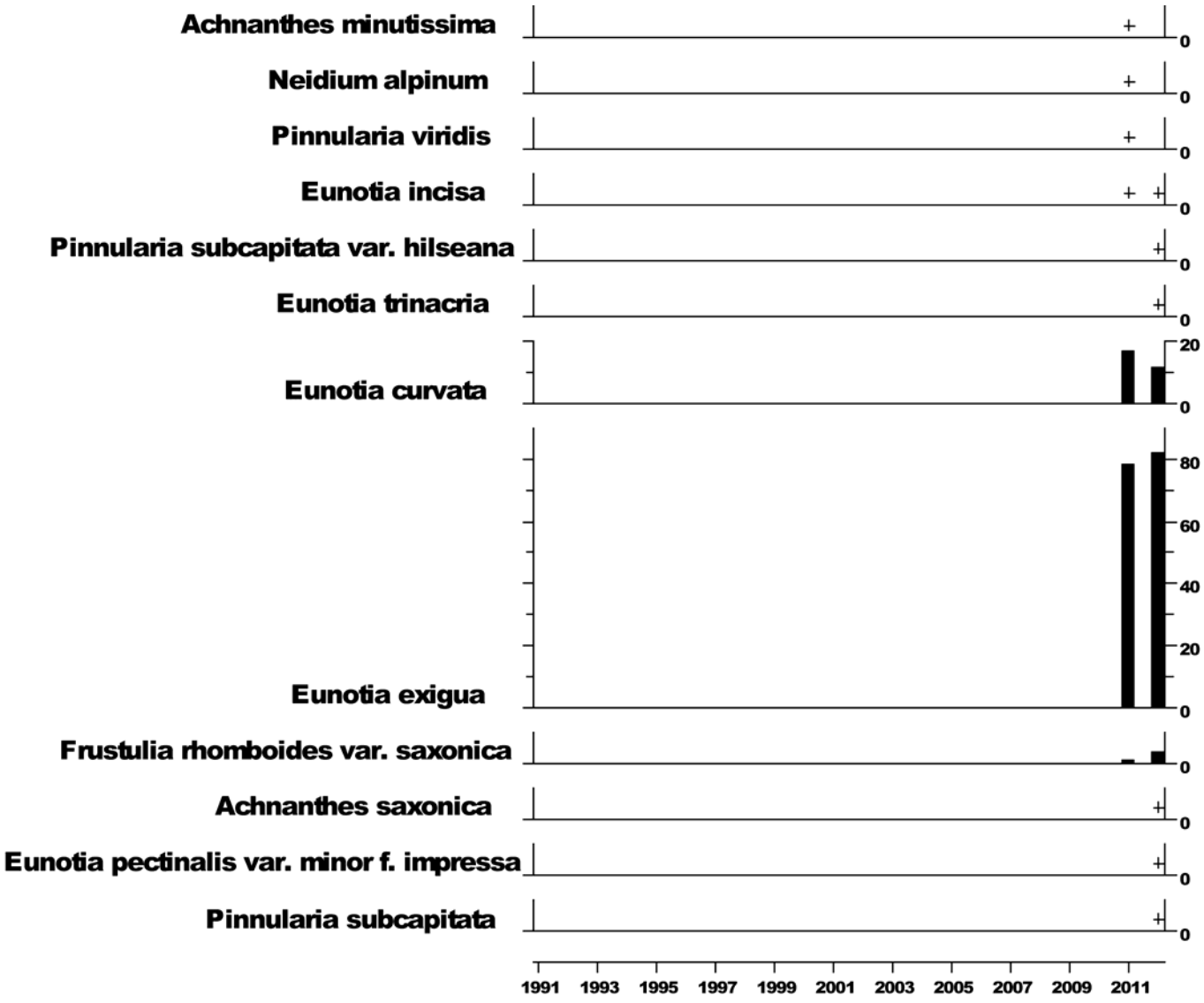
Not fished.

6.24.3.2. Summary of Trout parr densities (numbers m^{-2}), Danby Beck

Not fished.

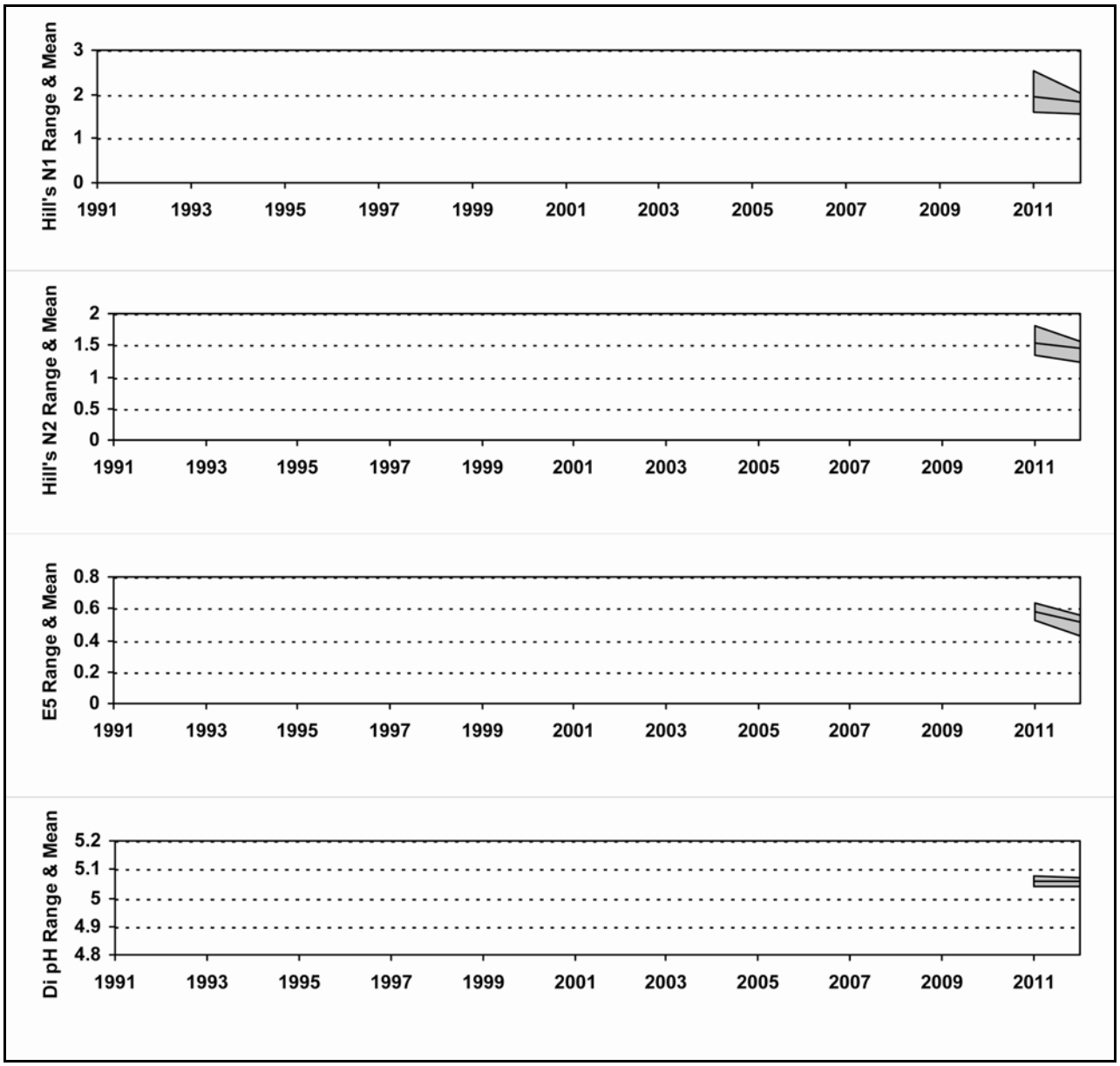
6.24.4. Epilithic diatom data

6.24.4.1. Percentage abundance summary, Danby Beck

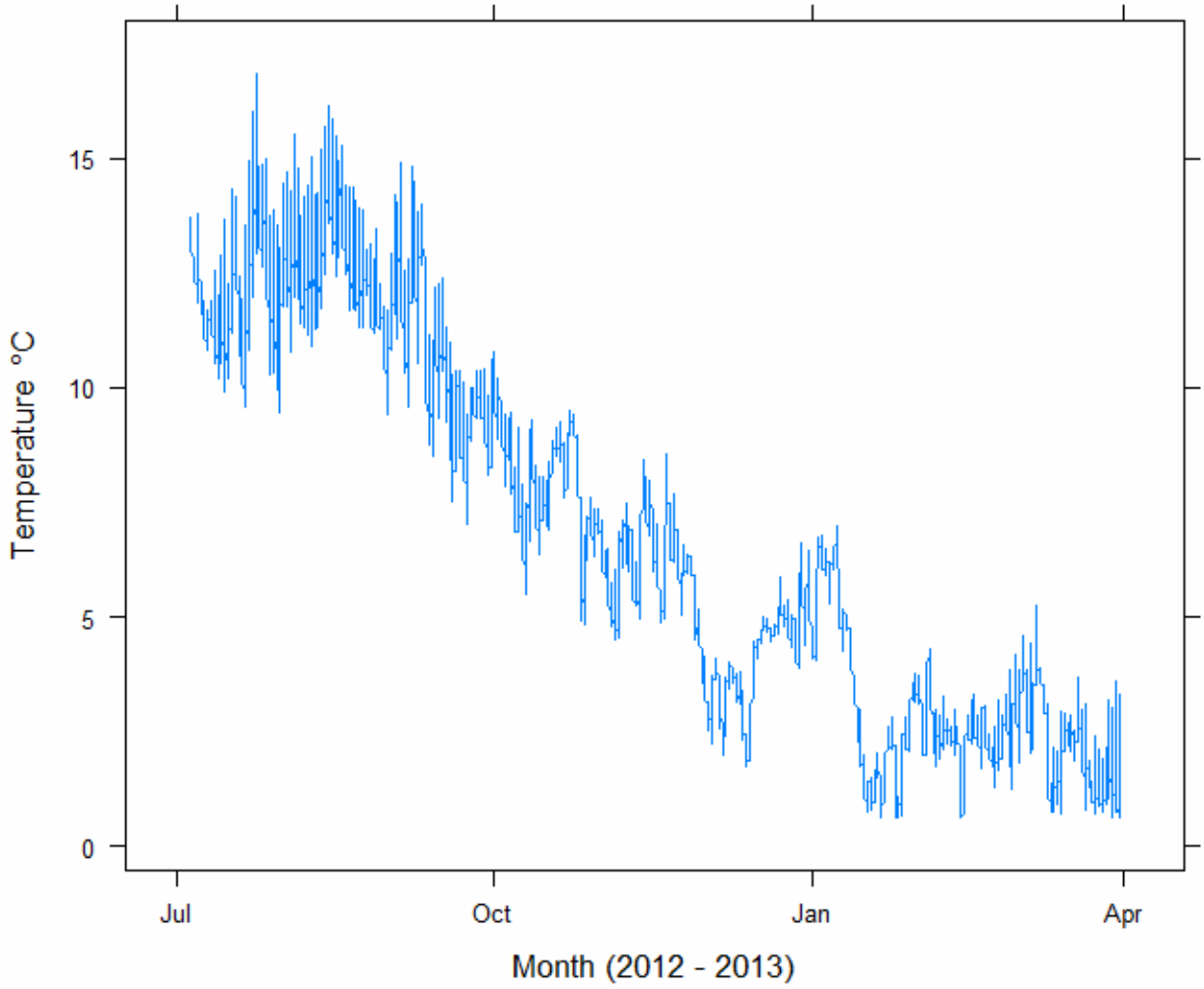


\+ represents <1%

6.24.4.2. Summary statistics, Danby Beck

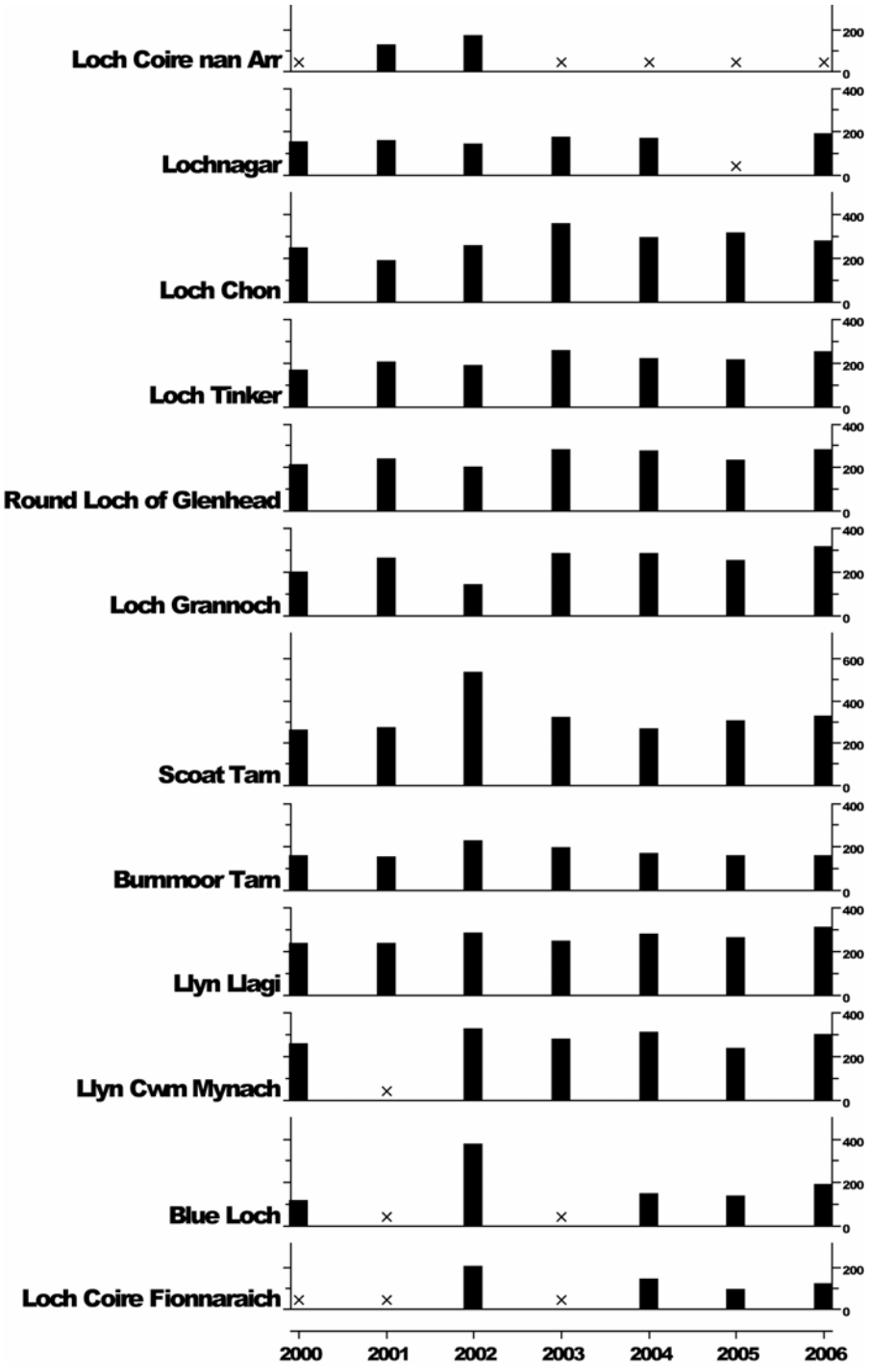


6.24.5. Thermistor data, Danby Beck



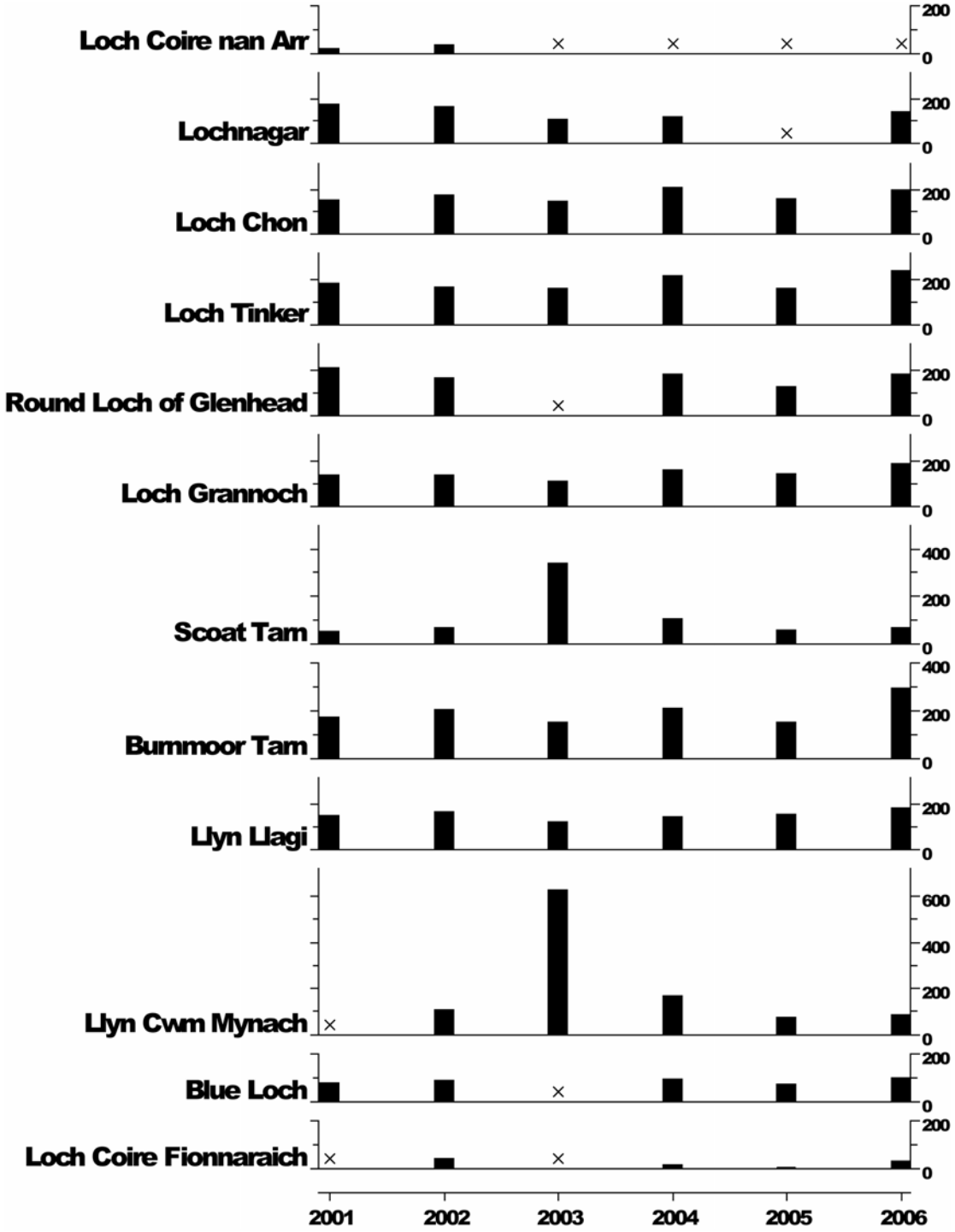
6.25. Sediment Trap Metals Data

6.25.1. Sediment Trap Mercury Concentrations (ng g^{-1})



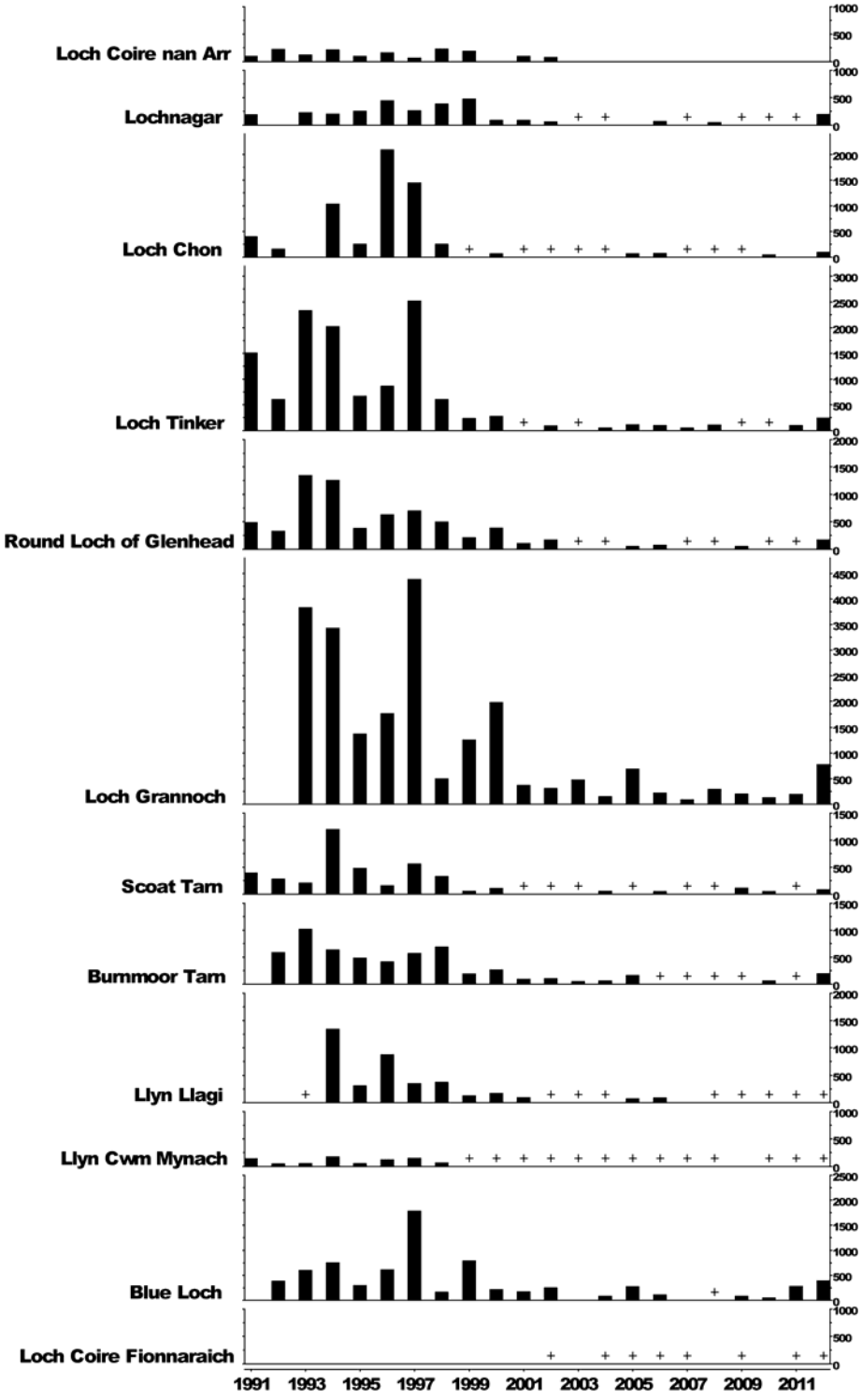
x = no sample
Funding withdrawn from 2007 onwards, samples archived

6.25.2. Sediment Trap Lead Concentrations (µg g^{-1})



x = no sample
Funding withdrawn from 2007 onwards, samples archived

6.26. Sediment Trap Carbonaceous Particle Flux (no. cm^{-2} yr^{-1})



+ represents < 50 cm^{-2} yr^{-1}