The United Kingdom Upland Waters Monitoring Network Data Report 2020-2021 (Year 33)

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Forest Research

The United Kingdom Upland Waters Monitoring Network Data Report 2020-2021 (Year 33)

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December 2022

Cover photograph: Blue Lough – Ewan Shilland

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1. Introduction

The UK Upland Waters Monitoring Network (UWMN) was established originally as the UK Acid Waters Monitoring Network (AWMN), specifically to assess the impact of air pollution emission controls on the chemical and biological status of acid-sensitive upland lakes and streams. The original network came into operation in 1988 and was renamed the UWMN in 2013. Together, the networks have provided fundamental evidence to a number of national and international air quality impact assessments, including Defra's Review of Transboundary Air Pollution (RoTAP, 2012). UK UWMN data are provided to the UNECE International Cooperative Programme for assessment and monitoring of the effects of air pollution on rivers and lakes (or ICP Waters), and form a central data resource for assessing the influence of air pollutants on surface water ecosystems within Defra's developing UKAPIENS project (see http://www.apis.ac.uk/).

Originally, the AWMN was managed by ENSIS Ltd out of the Environmental Change Research Centre, UCL, and was funded solely by the UK's Department of the Environment. In more recent years, the UWMN funding base has broadened to currently include Defra, Welsh Government, Natural Resources Wales, NatureScot, Forest Research and NERC (through National Capability support to UKCEH), in-kind support from organisations including SEPA and Marine Scotland, and crucial contributions to field sampling from a number of long-serving volunteers. In 2019, management of the UWMN was transferred to UKCEH.

During the first ten years of monitoring, biological and chemical data were summarised in annual printed reports, after which reporting was moved to the UWMN website (uwmn.uk). Annual reporting ceased due to funding limitations in 2016, but has been re-introduced in a revised format in 2022. In this report we provide graphs and summary data describing trends in the water chemistry, water temperature, and biological communities (diatoms and macroinvertebrates) in 24 UWMN sites. All sites are located in catchments where local disturbances, other than through forest management, are considered to be negligible, so that any long-term ecological changes are likely to be dominated by regional-scale pressures. These pressures include long-term reductions in the atmospheric deposition of acidic pollutants, the potential long-term accumulation of atmospherically deposited reactive nitrogen, and changes in climate linked to global climate change.

Detailed analysis of data has been presented in five interpretative reports: Patrick et al. (1995); Monteith and Evans (2000); Monteith (2005); Monteith and Shilland (2007); and, Kernan et al. (2010). The last four of these reports are also available on the uwmn website. A report to Defra summarising trends 30 year trends in water chemistry, epilithic diatoms and macroinvertebrate, funded by Defra, is due to be released imminently. The website also provides a full description of sampling methods and analytical procedures, together with site descriptions.

2. The Monitoring Network

The forerunner of the UWMN, i.e. the AWMN, was established by the UK Department of Environment in 1988 following the recommendations of the UK Acid Waters Review Group (AWRG, 1987). It was designed to assess the chemical and biological response of acidified lakes and streams in the UK to planned reductions in the emissions of acidic gasses to the atmosphere. The network was managed originally by ENSIS Ltd, at the Environmental Change Research Centre (ECRC-UCL), and involved a core scientific consortium including ECRC-UCL, the NERC Centre for Ecology & Hydrology (CEH), Queen Mary University of London (QMUL) and the Freshwater Fisheries Laboratory, Pitlochry, later to become part of Marine Scotland (MS).

Between 1988-2004, data collection and analyses at 20 of the UWMN sites were funded by the Air Quality Division at Defra (previously Department of the Environment), with two further sites in Northern Ireland 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 the Marine Scotland (MS) Freshwater Laboratory's contribution to the network. In 2001, Defra took over all funding of the network in Northern Ireland.

The central budget was gradually reduced from around 2007, and Defra funding ceased completely at the end of March 2016. Despite this, the UWMN consortium continued to maintain most water chemistry sampling and analysis, in addition to most biological sampling, by securing significant in-kind support from CEH, Marine Scotland Science (MSS) 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 still, Scottish Natural Heritage (SNH) (now NatureScot or NS), and the Scottish Environmental Protection Agency (SEPA), began providing financial and in-kind support respectively. Management of UWMN passed from ENSIS Ltd. to CEH (now UKCEH) in 2018.

As a consequence of the need to report on the impact of air pollution on ecosystems to the EU National Emissions Ceilings Directive (NECD), and more recently to the UK's National Emissions Ceilings Regulations, Defra re-engaged with UWMN in 2019. Over the course of 2020 and 2021 Defra funded the analysis of archived biological samples (epilithic diatoms, sediment trap diatoms and macroinvertebrates) that had accumulated since 2016. The sample backlog has now been largely eliminated, and the most up to date biological data are included in this report. The new data provided in this report, therefore, has been resourced either directly or in-kind by Defra, UKCEH, the ENSIS Trust Fund, UCL, Welsh Government, NRW, Forest Research, QMUL, NS, SEPA, MSS, DAERA and several private individual volunteers.

The UWMN 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.). Most sites are therefore highly vulnerable to the effects of acid deposition, and the majority of UWMN lakes were shown at the outset of monitoring (using palaeoecological analytical techniques) to have acidified over the preceding 1-2 centuries.

Most sites have been monitored on a regular basis since 1988, although some were initiated later, and there have also been a small number of interruptions in the record when sampling was not possible. 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). The Nant y Gronwen (site 18) was removed from the network in 1991 due to access issues and was replaced by a nearby moorland stream, Afon Gwy. Water abstraction and damming by a local fish farm resulted in the loss, in 2001, of Loch Coire nan Arr (Site 1) in far northwest Scotland, originally deemed a low deposition control site. This was replaced by the nearby Loch Coire Fionnaraich (Site 23). Danby Beck was then added to the network in 2011 to provide some coverage of the heavily acidified North York Moors area. To increase representation of less acid sensitive upland systems that would still be expected to vulnerable to the effects of nitrogen deposition and climate change, the more alkaline site Baddoch Burn, long monitored by Marine Scotland, was added to the network in 2013.

All sites have been monitored chemically and biologically according to methodologies described on the methods section of the UWMN website (uwmn.uk). Water samples are collected monthly at stream sites and quarterly at lake sites. Epilithic diatoms and benthic macroinvertebrates are sampled annually in the summer and spring respectively. Aquatic macrophytes are surveyed between June and September, annually at UWMN streams and on a 2-3 yearly basis at UWMN lakes. Up to 2014, all UWMN streams and the outflows of UWMN lakes were electro-fished annually in the autumn, but this monitoring ceased due to funding cuts and has not been resumed.

In addition to the annual surveys, sediment cores were taken from all UWMN lakes during the first five years of monitoring. These were dated radiometrically 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, (and also for trace metals and the flux of carbonaceous particles subject to availability of resources), allowing direct comparisons to be made with the historical (sediment core) record. Temperature data have been collected since around 2013 from thermistors attached at multiple depths to ropes in deep water locations in UWMN lakes and at single submerged locations in UWMN streams.

All chemical, physical and biological data are stored in the UWMN database managed by UKCEH, MSS and UCL. Summary data are available for non-commercial purposes on request. Further information on the UWMN, including site descriptions and photographs, is available via the internet at the address: uwmn.uk.

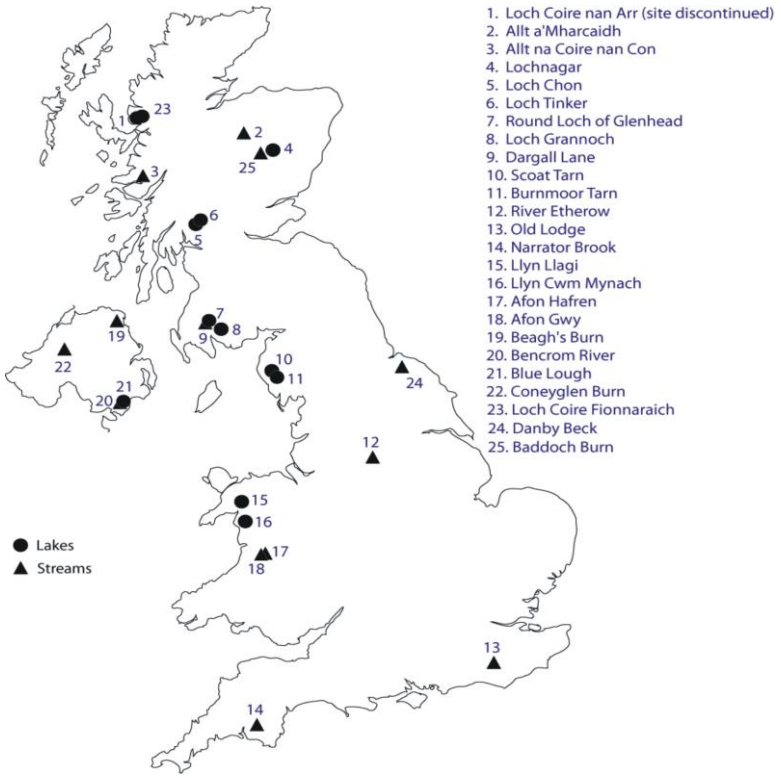

Figure 3.1 UWMN Site Map

Table 3.1 UWMN site characteristics

Site	Grid Ref.	Type	Alt. range (m)	Geology	Soils	Catch. area (ha)	Forest area (ha)	Lake area (ha)	Lake max depth (m)
1. Loch Coire nan Arr	NG 808422	Lake	125 – 896	Sandstone	Podzol, gley, peat	897	-	14	12
2. Allt a' Mharcaidh	NH 881045	Stream	325 – 1111	Granite	Podzol, peat	998	<1	-	-
3. Allt na Coire nan Con	NM 793688	Stream	10 – 756	Schist, gneiss	Peaty gley	790	48	-	-
4. Lochnagar	NO 252859	Lake	785 – 1155	Granite	Alpine podzol	92	-	10	27
5. Loch Chon	NN 421051	Lake	96 – 600	Schist, grits	Podzol, gley	1,470	56	106	25
6. Loch Tinker	NN 445068	Lake	418 – 703	Schist, grits	Peat	112	-	11	10
7. Round Loch of Glenhead	NX 450804	Lake	298 – 531	Granite	Peat, peaty podzol	95	-	13	14
8. Loch Grannoch	NX 542700	Lake	214 – 601	Granite	Gley, podzol, peat	1,290	70	111	21
9. Dargall Lane	NX 449786	Stream	225 – 716	Shale, greywackes	Peaty podzol	210	-	-	-
10. Scoat Tarn	NY 159104	Lake	602 – 841	Volcanics	Peaty ranker	95	-	4	20
11. Burnmoor Tarn	NY 184044	Lake	252 – 602	Volcanics, granite	Ranker, podzol, peat	226	-	24	13
12. River Etherow	SK 116996	Stream	280 – 633	Millstone grit	Peat	1,300	<1	-	-
13. Old Lodge	TQ 456294	Stream	94 – 198	Sandstone	Brown podzol, gley	240	3	-	-
14. Narrator Brook	SX 568692	Stream	225 – 456	Granite	Podzols	475	<1	-	-
15. Llyn Llagi	SH 649483	Lake	380 – 678	Slate, shale, dolerite	Peaty podzol, peat	157	-	5	17
16. Llyn Cwm Mynach	SH 678238	Lake	285 – 680	Cambrian sedimentary	Rankers, peat	152	55	6	11
17. Afon Hafren	SN 844876	Stream	355 – 690	Shale, gritstone	Peaty podzol, peat	358	50	-	-
18. Afon Gwy	SN 842854	Stream	440 – 730	Shale, gritstone	Peaty podzol, peat	210	<1	-	-
19. Beagh's Burn	D 173297	Stream	150 – 397	Schist	Peat	273	<1	-	-
20. Bencrom River	J 304250	Stream	140 – 700	Granite	Peat	298	-	-	-
21. Blue Lough	J 327252	Lake	340 – 703	Granite	Peat	42	-	2	5
22. Coneyglen Burn	H 641884	Stream	230 – 562	Schist	Peat	1,410	15	-	-
23. Loch Coire Fionnaraich	NG 945498	Lake	236 – 933	Sandstone, quartzite	Peat, peaty podsols	550	-	9	14
24. Danby Beck	NZ 692 024	Stream	299 – 432	Sandstone, siltstone and mudstone	Peat	77	<1		
25. Baddoch Burn	NO 120804	Stream	415 - 975	Socach Quartzite and Schists	Peat, rankers, podzol	2,260	-	-	-

3. Data Formats

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

Section 1: Water chemistry
Summary table for key chemical determinands, including medians and standard deviations for historical 5-year periods, and the most recent April - March sampling year. The normal number of observations per year is 4 for lakes and 12 for streams.

Section 2: Aquatic 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 from the time series plots. Annual macroinvertebrate summary statistics include: a) total number of taxa recorded; b) Hill's N1 diversity index - the exponent of Shannon's Index and a measure of the number of abundant species in a sample (Hill, 1973); c) Hill's N2 diversity index- the reciprocal of Simpson's Index and a measure of the number of very abundant species in a sample (Hill, 1973); and, d) E5 - a measure of evenness based on the ratio (Hills N1): (Hill's N2). As a single species becomes more and more dominant, E5 tends towards zero. Seperate macroinvertebrate acidity indicators are applied to the UWMN lakes and streams - the lake acidification macroinvertebrate metric (LAMM) for lake sites (WFD-UKTAG, 2008) and the acid waters indicator community index (AWICsp) for stream sites (Murphy et al., 2013). LAMM assigns a sensitivity score to each taxon and then calculates an abundance-weighted average for all scored taxon captured in a sample. Similarly, AWICsp assigns a sensitivity score to each of 48 stream macroinvertebrate taxa with the final AWICsp index value being the average for all scored taxa captured in a sample. LAMM and AWICsp scores were calculated for each lake and stream site in each year from the pooled list of taxa from replicate kick samples.

Section 3: Epilithic diatoms
Time series of annual mean percentage frequency (based on the amalgamation of species counts from 3-4 replicates). Some taxa occurring at consistently very low abundances are omitted. Annual epilithic diatom summary statistics include a) The Hill's N1 and b) Hill's N2 diversity and c) E5 metrics (both determined as above); and the Diatom Acidification Metric or DAM score (based on Juggins et al., 2016). The DAM score is calibrated so that communities considered to show no influence of acidification should return a score of close to 100, whereas communities indicative of highly acidic waters will return a score closer to zero.

Section 4: Aquatic macrophytes
For lakes: relative abundance of each species determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant. For streams: total cover of each species estimated for 5 m sections of a 50 m survey stretch. Data presented here are the mean of the species cover estimates for all sections.

Section 5: Water temperature
Water temperatures recorded using submersible thermistor loggers at an hourly frequency. For lakes: plots represent daily mean temperatures recorded by thermistors across a range of depths in a deep water location. Further information, data visualisations and access to raw data are available at https://data.marine.gov.scot/dataset/previous-versions-daily-temperature-data-uk-upland-water-monitoring-network-ukuwmn-standing. For streams: plots represent monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month. Further information, data visualisations and access to raw data are available at https://data.marine.gov.scot/dataset/previous-versions-uk-upland-water-monitoring-network-rivers-summary-data.

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5. Site Data

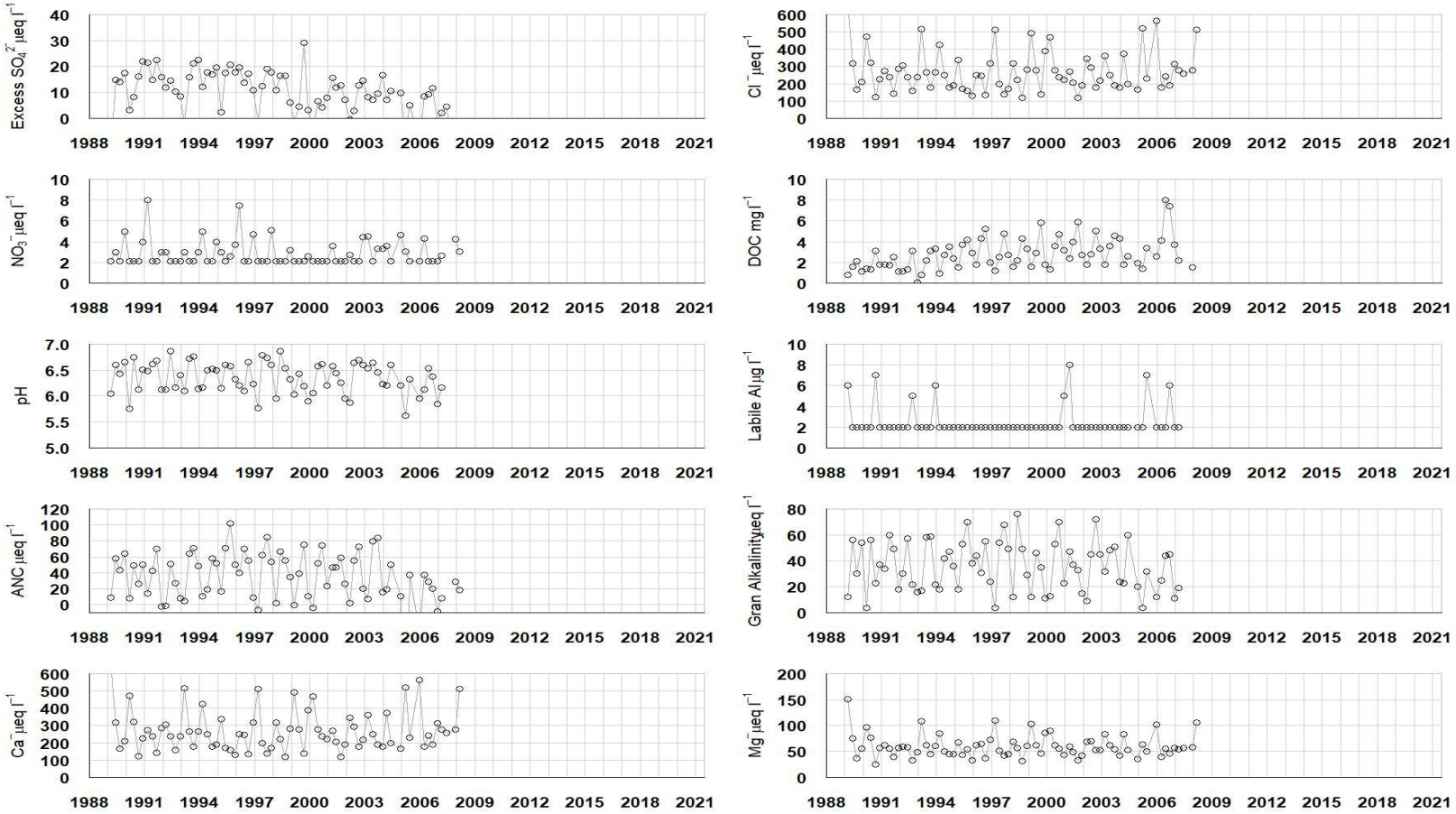
5.1. Loch Coire nan Arr

5.1.1. Loch Coire nan Arr site characteristics

Grid Reference	NG 808422
Lake altitude	125 m
Maximum altitude	750 m
Maximum depth	12.0 m
Mean depth	4.8 m
Volume	8.2×10^5 m^3
Lake area	11.6 ha
Catchment area	909 ha
Catchment area (excl.lake)	897 ha
Catchment:Lake ratio	78.4
Catchment geology	Torridonian sandstone
Catchment soils	Peat
Catchment vegetation	Moorland – 99% Conifers <1%
Mean annual runoff	2838 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	20.7 – 14.6
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.9 – 2.5
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.3 – 2.9
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.4 – 5.0

5.1.2. Loch Coire nan Arr water chemistry

5.1.2.1. Water chemistry time series



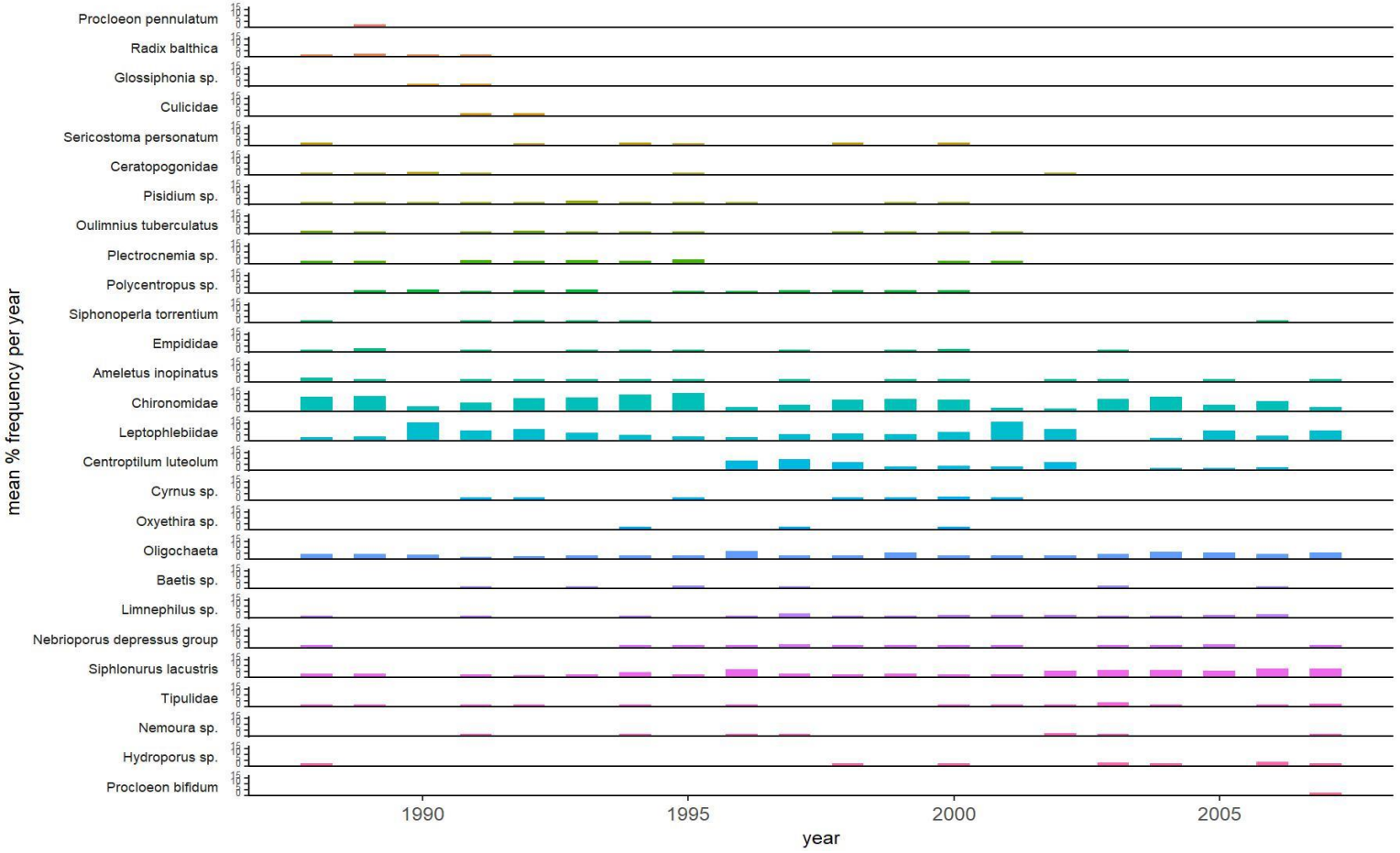
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.1.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	42.70	7.85	37.49	6.96	34.37	6.90	31.24	10.46	N/A	N/A	N/A	N/A	N/A	N/A
non-marine sulphate (μeq L^{-1})	14.84	9.21	16.74	5.98	7.64	7.53	4.83	13.07	N/A	N/A	N/A	N/A	N/A	N/A
nitrate (μeq L^{-1})	2.14	1.42	2.14	1.47	2.14	0.78	2.64	0.94	N/A	N/A	N/A	N/A	N/A	N/A
chloride (μeq L^{-1})	252.48	133.42	211.57	103.38	245.43	101.36	266.87	134.65	N/A	N/A	N/A	N/A	N/A	N/A
calcium (μeq L^{-1})	44.41	13.08	40.92	7.51	46.41	9.45	35.43	8.30	N/A	N/A	N/A	N/A	N/A	N/A
magnesium (μeq L^{-1})	57.99	28.66	53.06	18.61	57.99	18.25	56.35	21.13	N/A	N/A	N/A	N/A	N/A	N/A
sodium (μeq L^{-1})	224.02	88.11	202.27	65.26	228.38	65.88	223.59	80.74	N/A	N/A	N/A	N/A	N/A	N/A
potassium (μeq L^{-1})	8.44	3.42	7.42	1.94	7.93	2.49	6.39	2.67	N/A	N/A	N/A	N/A	N/A	N/A
pH	6.46	0.31	6.50	0.29	6.44	0.27	6.20	0.29	N/A	N/A	N/A	N/A	N/A	N/A
Gran alkalinity (μeq L^{-1})	32.00	18.70	43.00	19.62	36.00	18.82	23.00	16.94	N/A	N/A	N/A	N/A	N/A	N/A
labile aluminium (μg L^{-1})	2.00	1.67	2.00	0.00	2.00	1.47	2.00	1.83	N/A	N/A	N/A	N/A	N/A	N/A
conductivity (μS cm^{-1})	38.00	15.69	35.00	10.96	40.00	11.23	38.00	16.40	N/A	N/A	N/A	N/A	N/A	N/A
Dissolved Organic Carbon (mg L^{-1})	1.65	0.89	2.70	1.24	3.25	1.38	2.60	2.19	N/A	N/A	N/A	N/A	N/A	N/A
Acid Neutralising Capacity (μS cm^{-1})	42.74	25.25	53.09	29.03	42.96	29.22	19.65	75.24	N/A	N/A	N/A	N/A	N/A	N/A

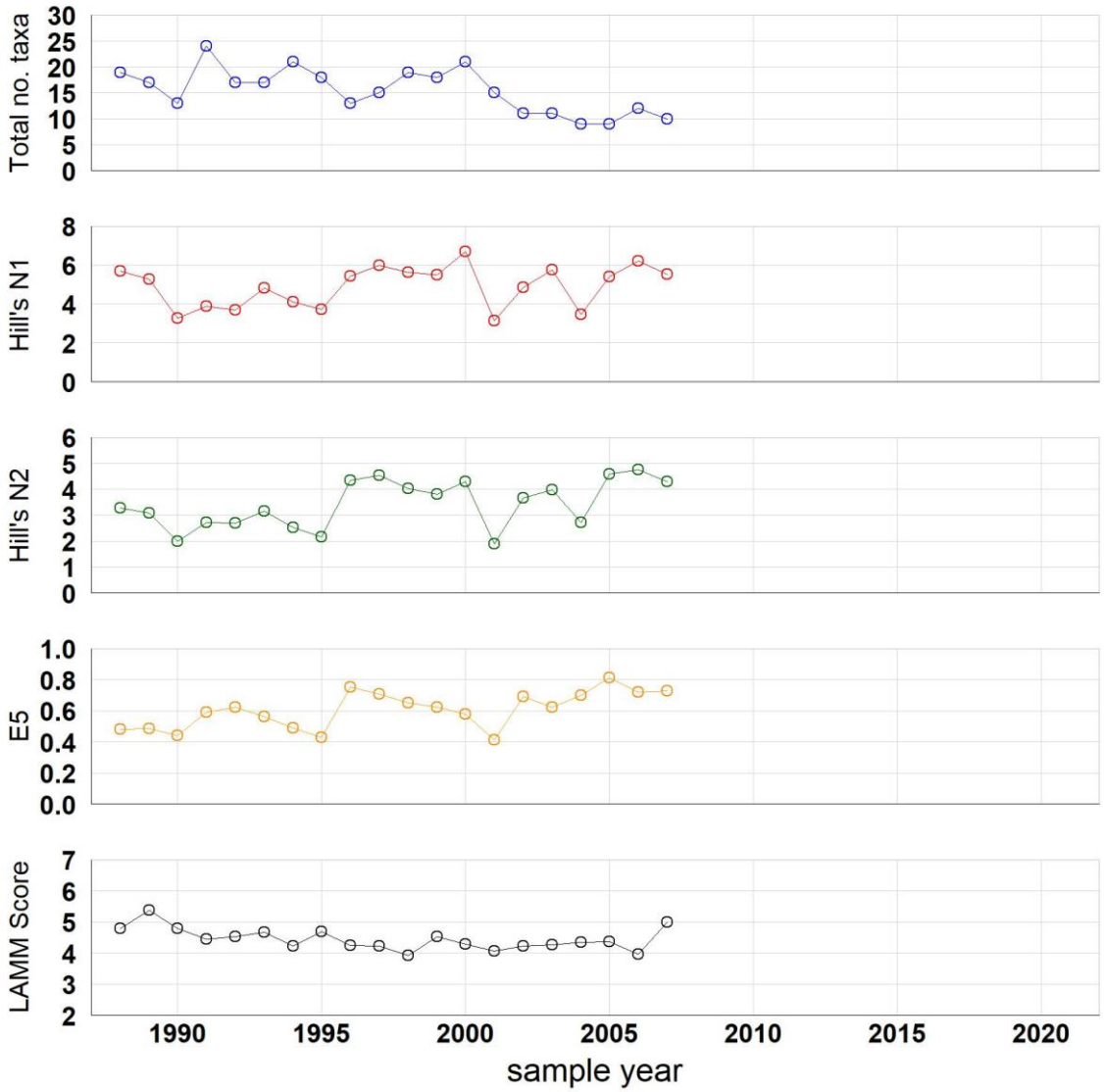
5.1.3. Loch Coire nan Arr macroinvertebrates

5.1.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

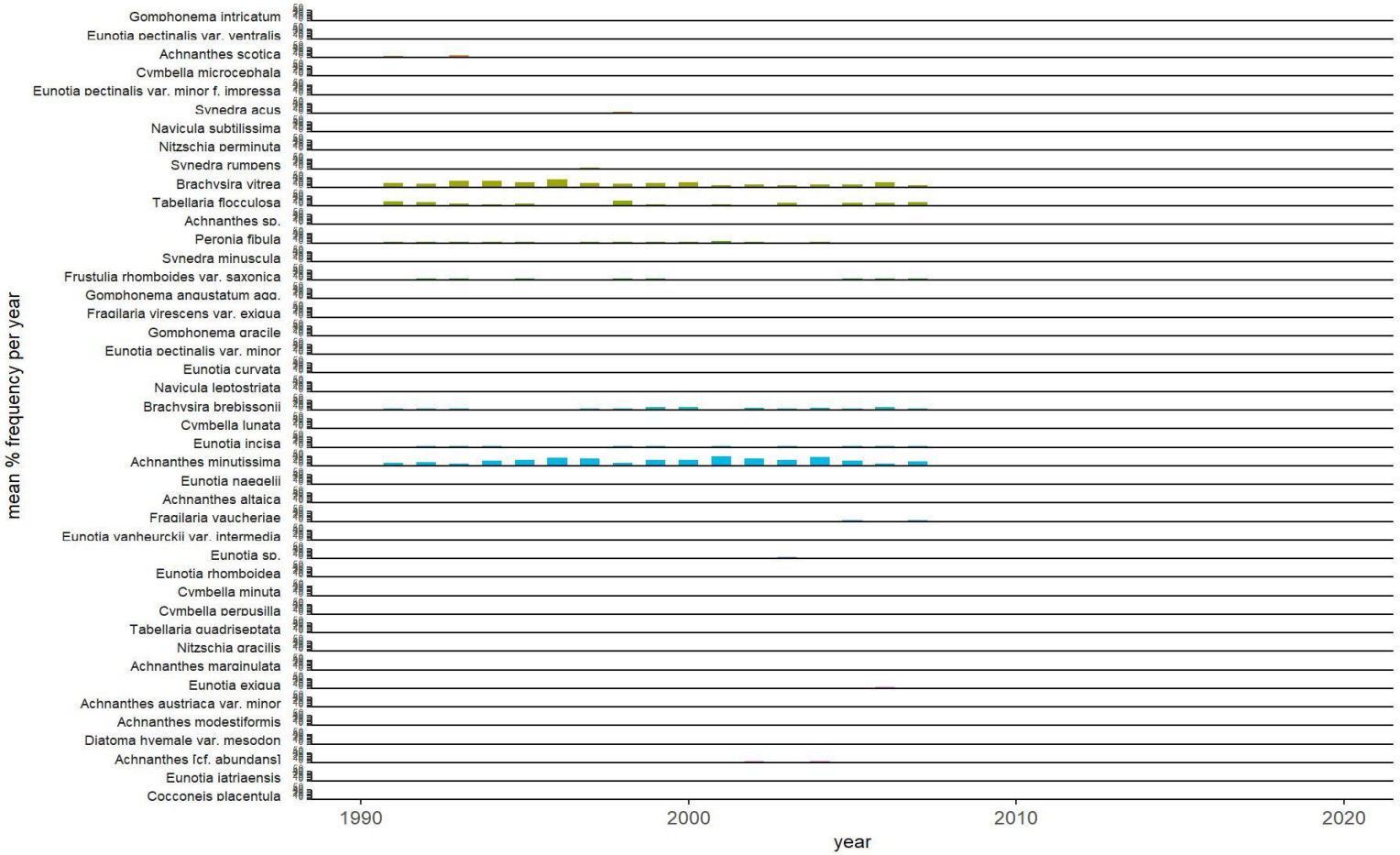
5.1.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

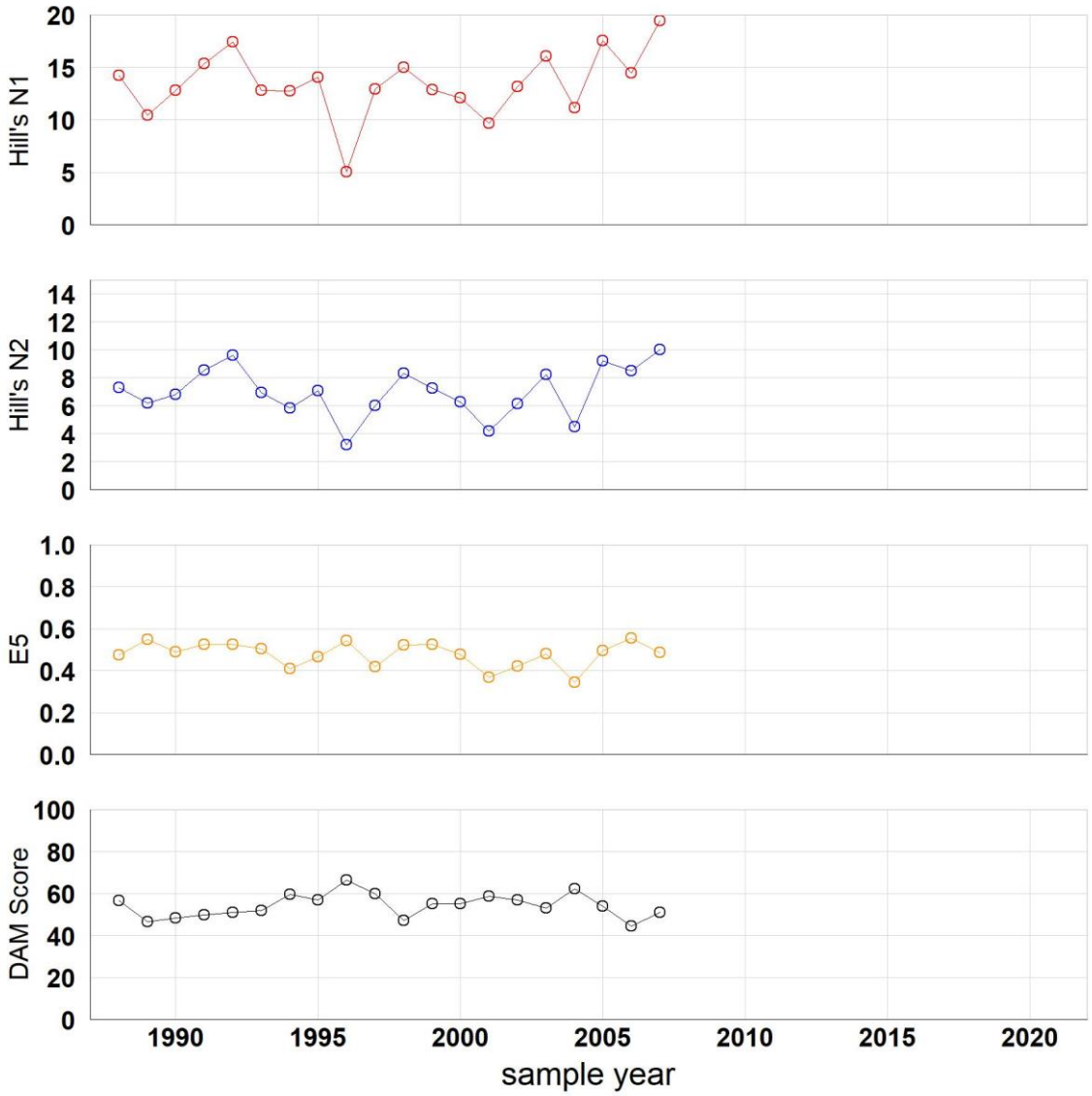
5.1.4. Loch Coire Nan Arr epilithic diatoms

5.1.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

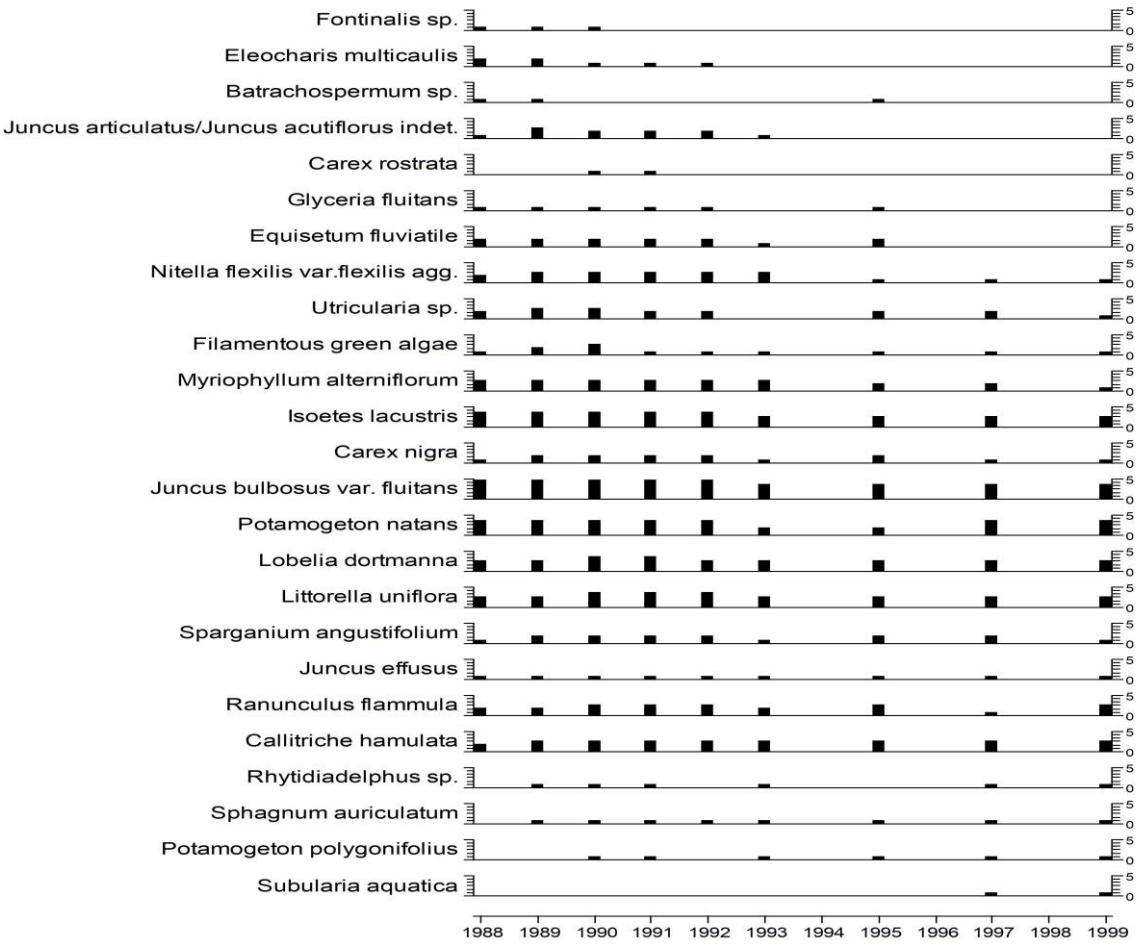
5.1.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.1.5. Loch Coire Nan Arr aquatic macrophytes

5.1.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

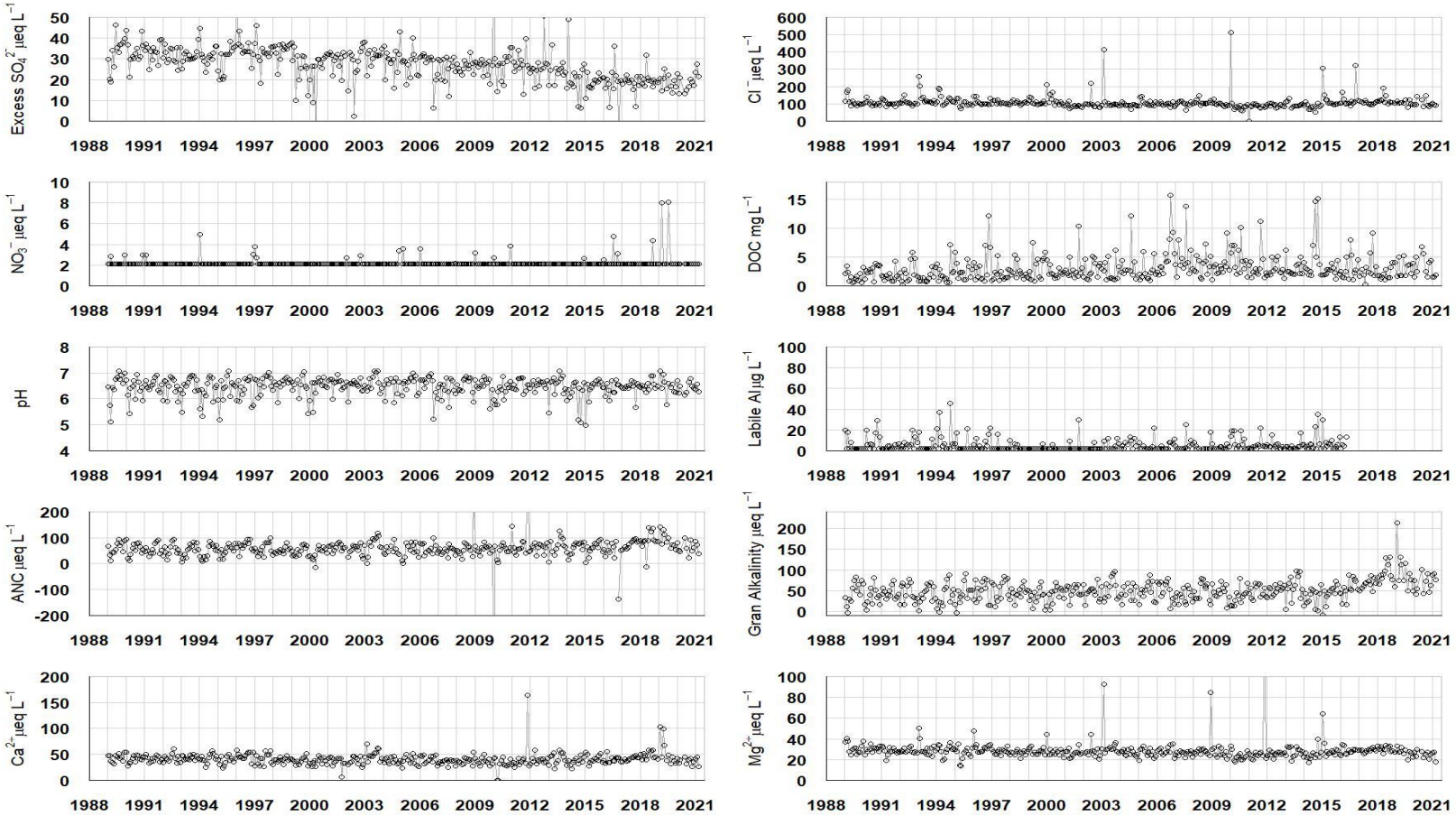
5.2. Allt a'Mharcaidh

5.2.1. Allt a'Mharcaidh site characteristics

Grid Reference	NM 881045
Catchment area	998 ha
Minimum catchment altitude	325 m
Maximum catchment altitude	1111m
Catchment geology	Granite
Catchment soils	Alpine & peaty podsols, blanket peat
Catchment vegetation	Moorland c. 94% Conifer woodland c. 4%
Mean annual runoff	773 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	12.6 – 7.6
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.2 – 2.6
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	4.7 – 3.9
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	6.8 – 5.6

5.2.2. Allt a'Mharcaidh water chemistry

5.2.2.1. Water chemistry time series



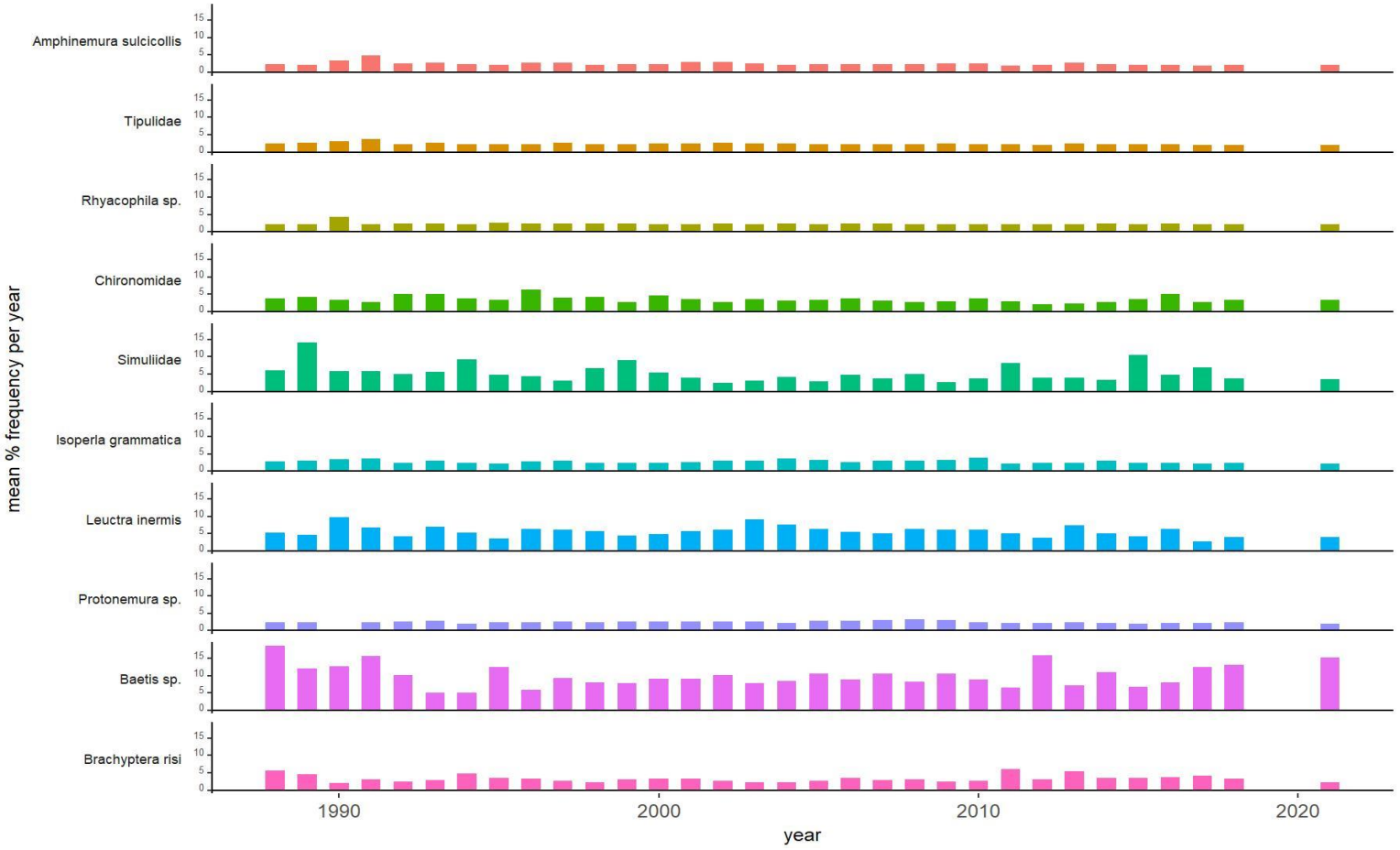
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.2.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	44.78	5.05	43.74	6.98	41.66	8.02	39.16	6.44	36.12	21.16	30.06	6.93	29.87	4.28
non-marine sulphate (μeq L^{-1})	33.18	5.35	33.05	6.37	30.22	8.51	28.59	6.08	26.68	15.67	19.21	6.65	18.99	4.42
nitrate (μeq L^{-1})	2.14	0.21	2.14	0.44	2.14	0.12	2.14	0.30	2.14	0.27	2.14	1.07	2.14	0.00
chloride (μeq L^{-1})	104.38	28.89	104.38	20.40	98.73	48.27	99.02	14.66	91.40	57.72	104.66	40.27	94.22	20.91
calcium (μeq L^{-1})	42.66	6.39	42.41	8.75	39.42	10.02	37.57	6.92	36.88	19.46	41.77	12.83	39.67	7.32
magnesium (μeq L^{-1})	28.79	4.80	27.97	5.14	27.97	9.51	27.15	8.10	25.50	17.52	27.89	5.81	25.50	3.33
sodium (μeq L^{-1})	134.85	17.91	139.20	16.63	130.50	32.02	121.80	30.78	123.76	23.13	133.70	22.21	127.02	17.30
potassium (μeq L^{-1})	6.78	2.53	5.88	1.52	5.63	0.95	5.40	1.21	5.61	2.02	7.42	4.42	6.72	6.19
pH	6.52	0.40	6.54	0.42	6.60	0.33	6.61	0.36	6.53	0.32	6.48	0.38	6.41	0.20
Gran alkalinity (μeq L^{-1})	40.00	21.40	48.00	23.70	47.00	20.20	45.00	20.46	49.81	20.42	60.00	34.79	75.80	20.50
labile aluminium (μg L^{-1})	2.00	6.14	2.00	8.55	2.00	4.26	2.00	5.03	4.00	4.98	6.00	8.34	N/A	N/A
conductivity (μS cm^{-1})	23.00	3.36	24.00	3.40	22.00	2.92	23.50	2.28	21.65	2.74	24.40	4.83	23.40	3.28
Dissolved Organic Carbon (mg L^{-1})	1.70	1.23	2.00	2.03	2.30	1.81	3.13	3.01	2.90	2.08	2.52	2.61	2.55	1.96
Acid Neutralising Capacity (μS cm^{-1})	53.13	23.00	54.39	21.87	59.23	25.29	51.46	41.31	62.20	94.57	74.42	38.74	63.03	25.54

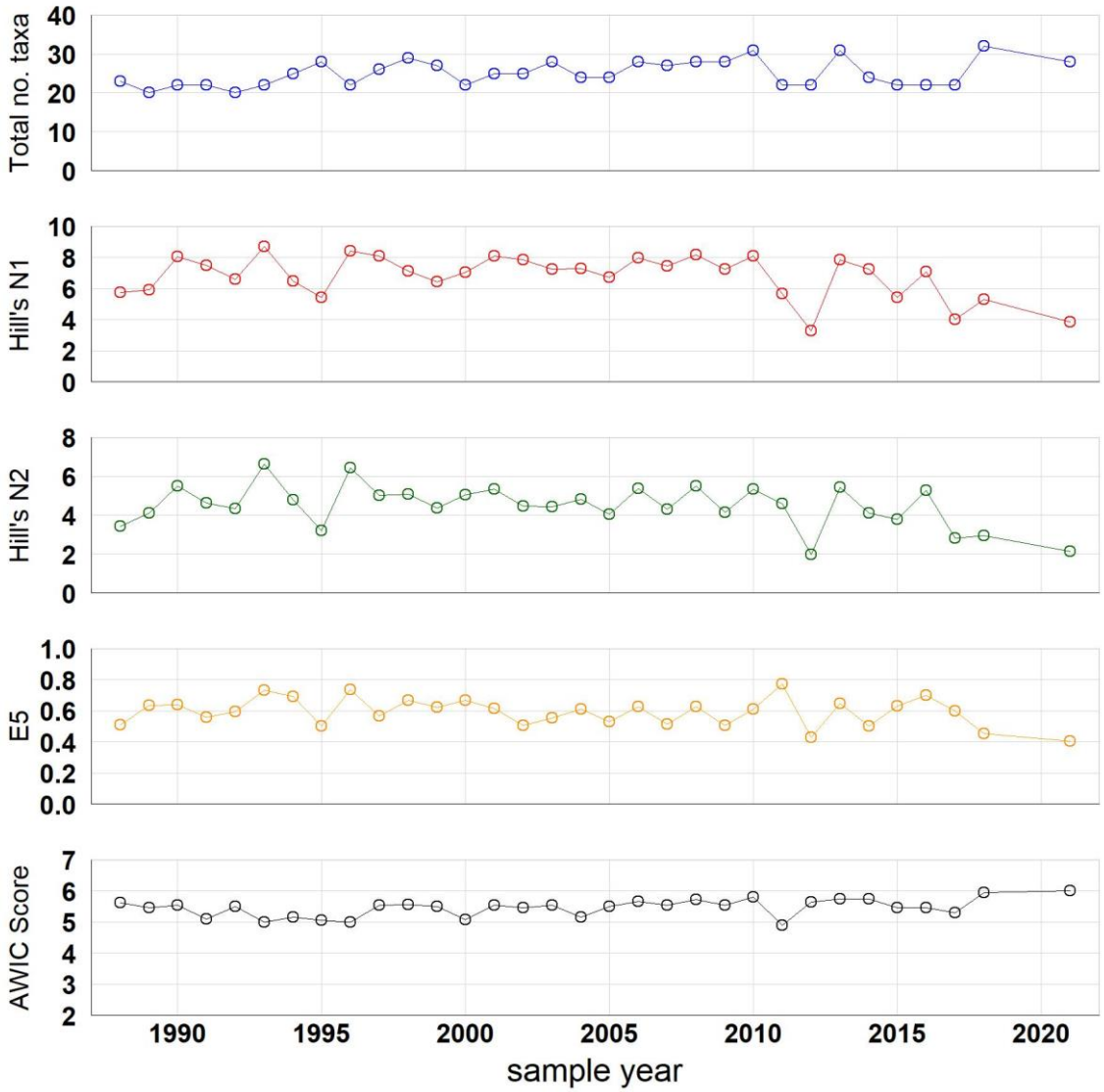
5.2.3. Allt a'Mharcaidh macroinvertebrates

5.2.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

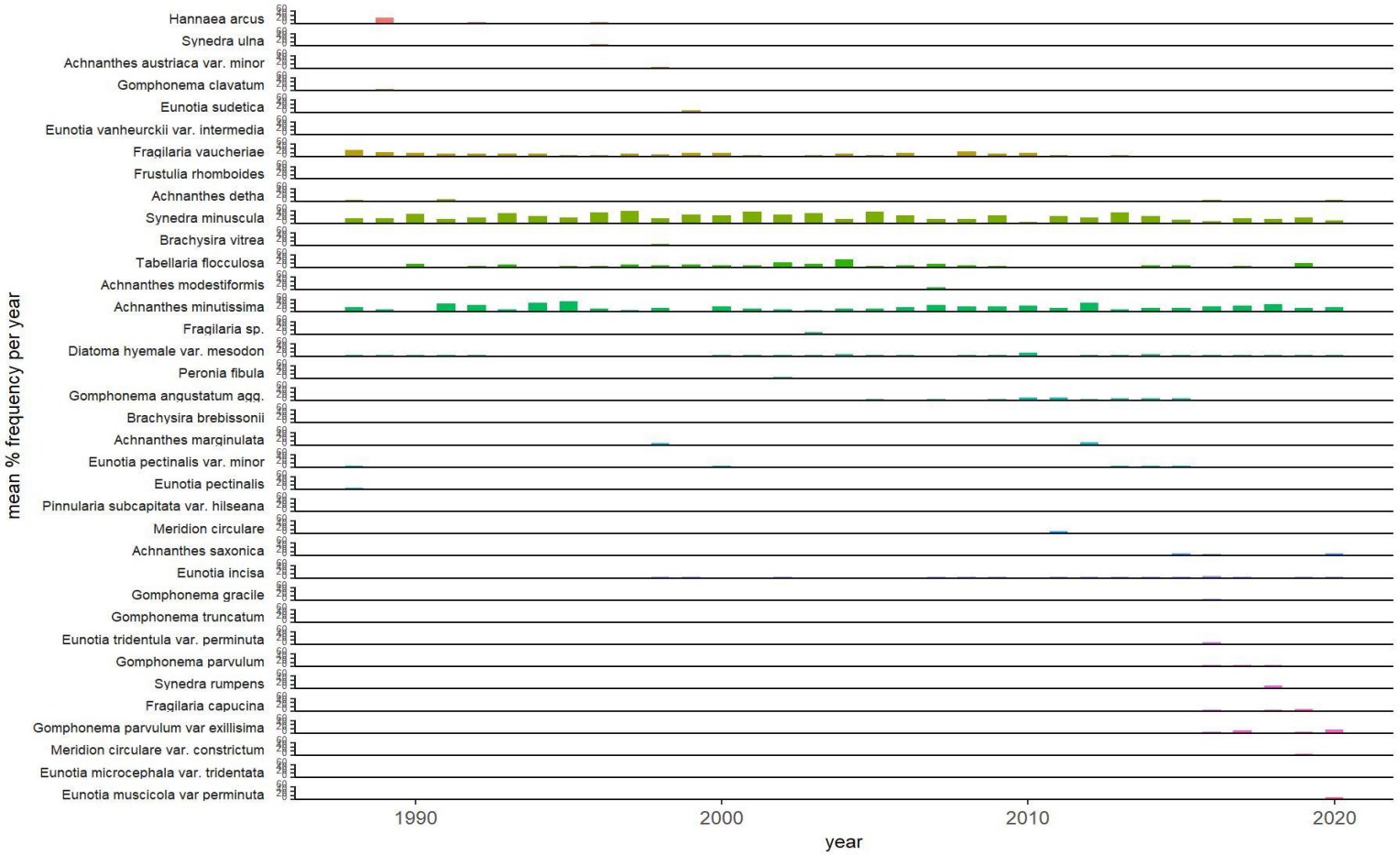
5.2.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

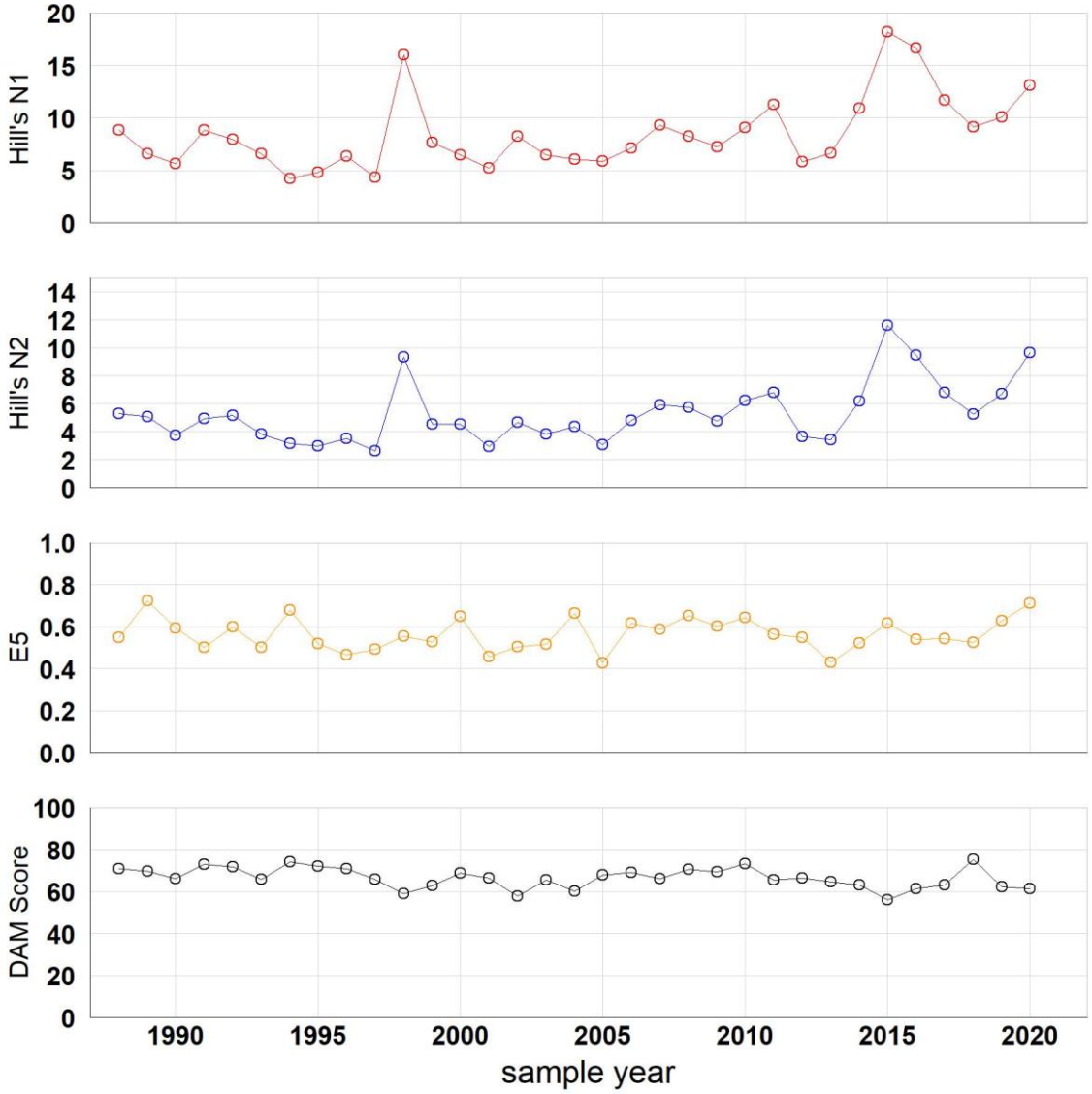
5.2.4. Allt a'Mharcaidh epilithic diatoms

5.2.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

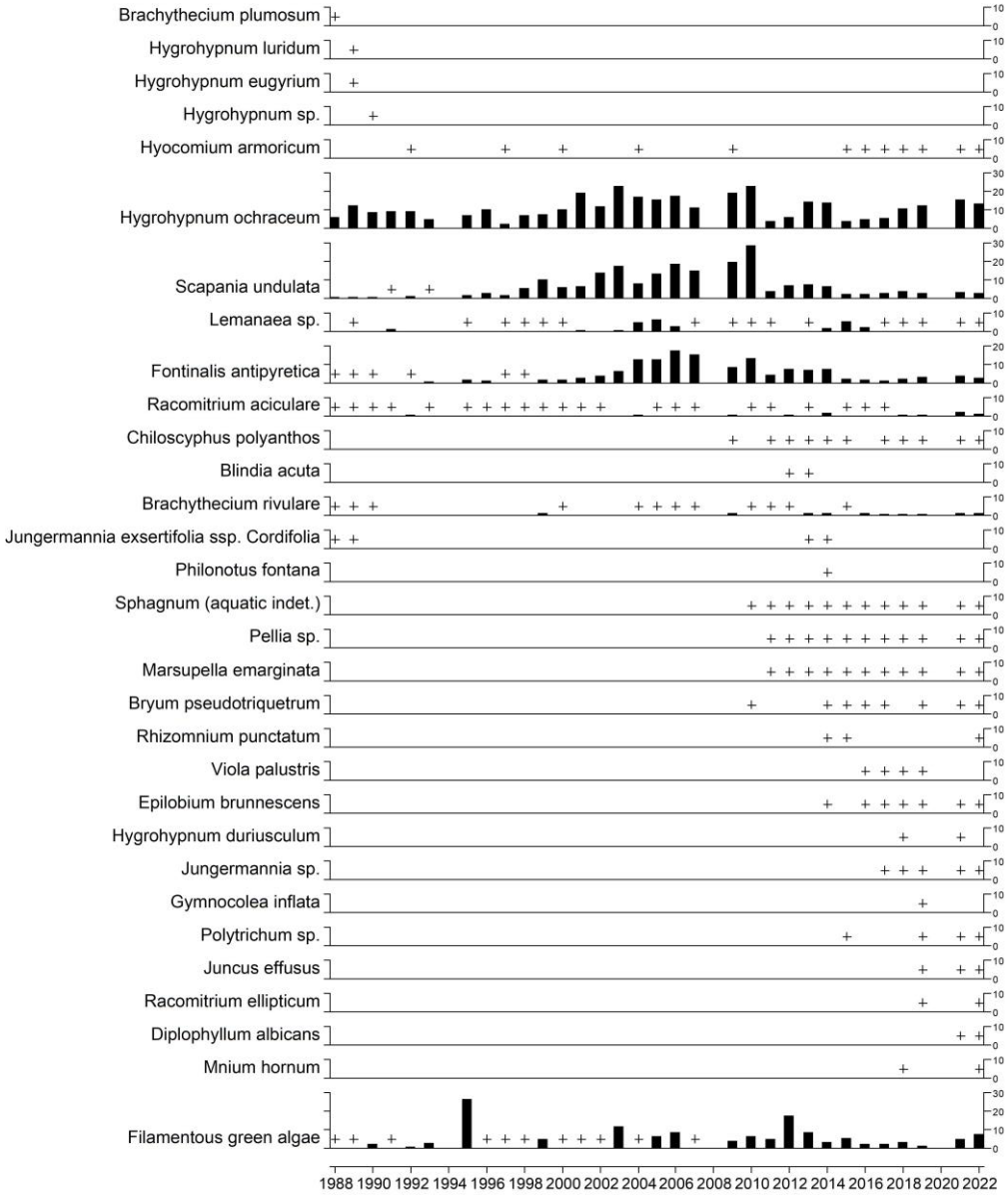
5.2.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.2.5. Allt a'Mharcaidh aquatic macrophytes

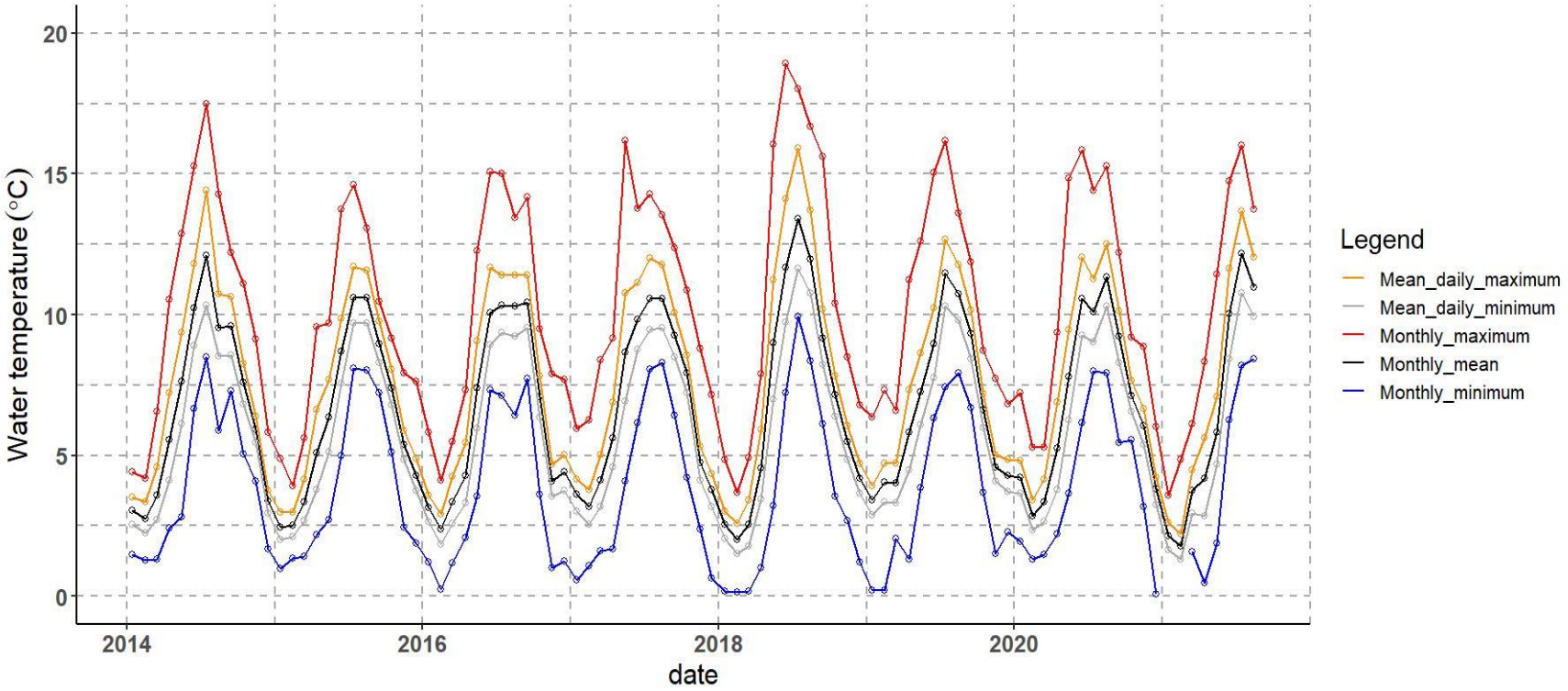
5.2.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.2.6. Allt a'Mharcaidh water temperature

Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

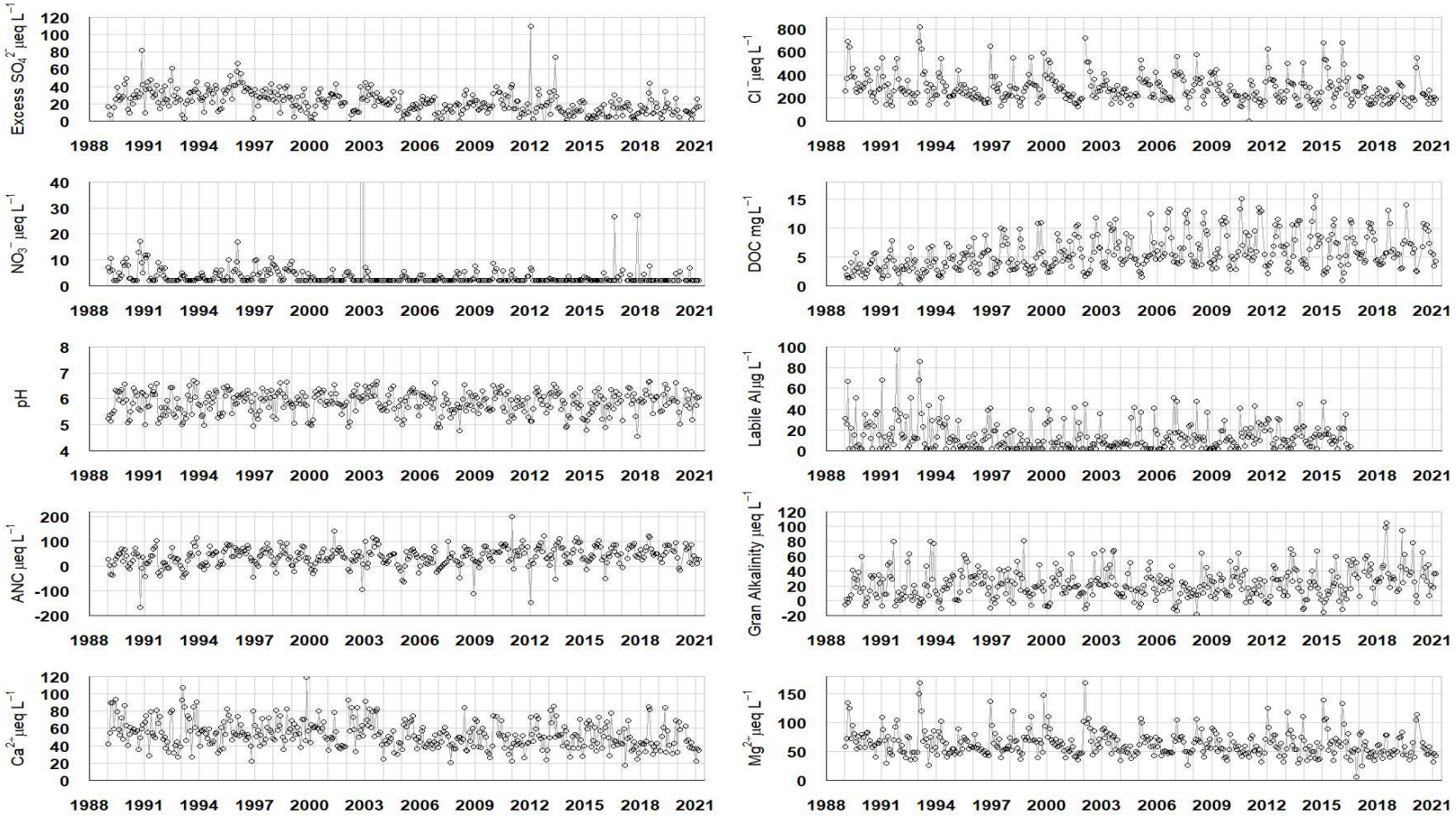
5.3. Allt na Coire nan Con

5.3.1. Allt na Coire nan Con site characteristics

Grid Reference	NM 793688
Catchment area	790 ha
Minimum catchment altitude	10 m
Maximum catchment altitude	756 m
Catchment geology	Schists and gneiss
Catchment soils	Peaty podsols,
Catchment vegetation	Conifers 42% Moorland 54%
Mean annual runoff	2262 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	29.2 – 19.0
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	16.4 – 3.6
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	17.6 – 5.1
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	23.9 – 7.7

5.3.2. Allt na Coire nan Con water chemistry

5.3.2.1. Water chemistry time series



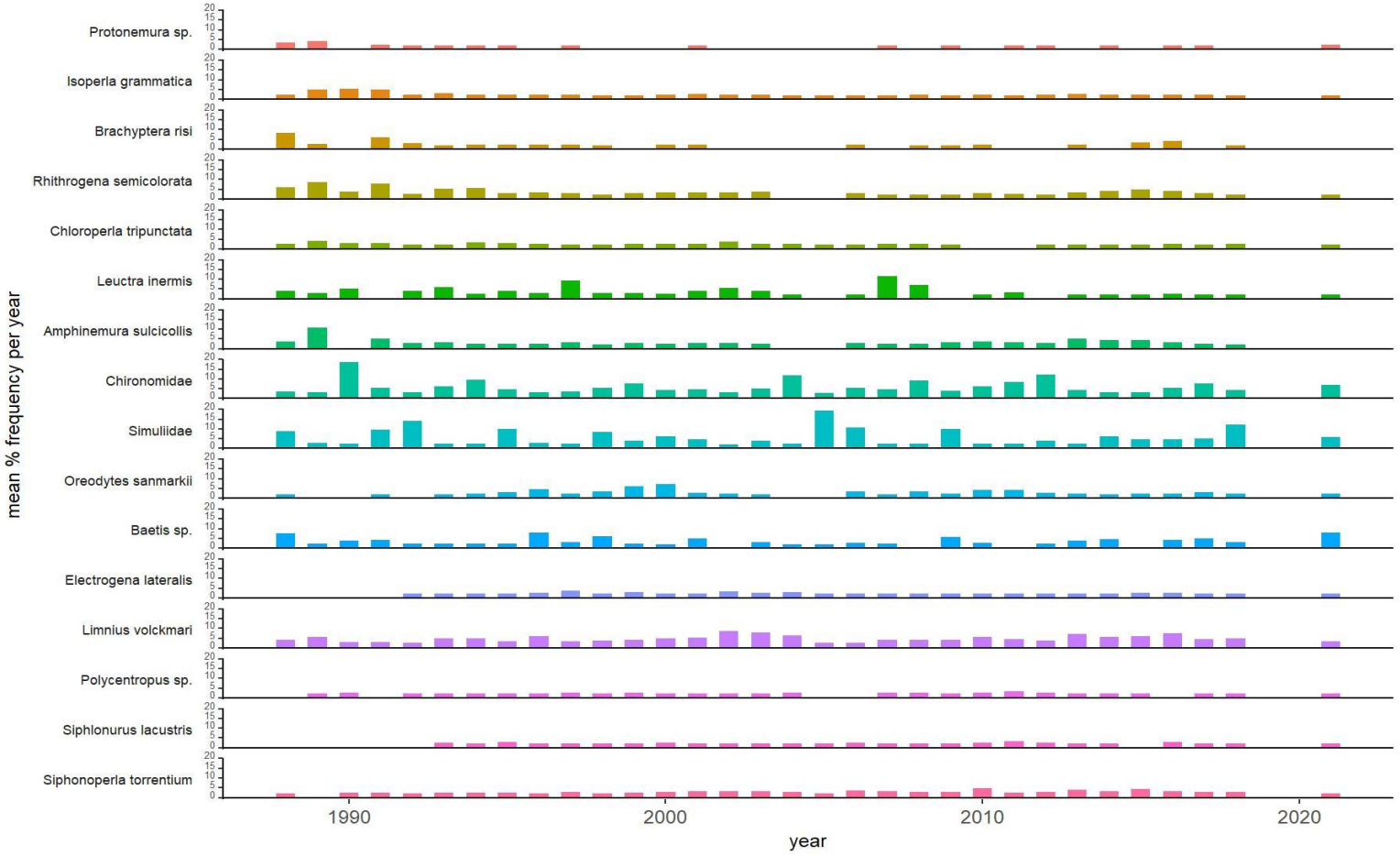
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.3.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	60.41	14.02	59.37	11.59	54.16	10.84	47.91	11.09	45.62	22.82	38.99	13.11	35.18	7.28
non-marine sulphate (μeq L^{-1})	27.93	15.23	32.61	11.60	23.21	11.51	18.17	10.16	17.41	17.73	11.18	9.04	11.74	6.19
nitrate (μeq L^{-1})	3.00	3.53	4.00	2.96	2.14	18.12	2.14	0.95	2.14	1.64	2.14	4.30	2.14	1.54
chloride (μeq L^{-1})	287.74	145.83	236.96	100.46	282.10	121.33	274.06	103.76	230.76	111.01	229.15	118.93	206.78	37.98
calcium (μeq L^{-1})	57.38	18.91	53.89	12.88	57.88	16.91	45.71	11.99	50.90	14.93	43.54	14.98	37.70	10.49
magnesium (μeq L^{-1})	68.28	27.46	56.35	18.59	67.86	24.99	58.40	17.16	56.47	20.45	52.65	22.71	47.34	9.46
sodium (μeq L^{-1})	267.52	87.18	232.72	61.36	265.35	71.64	239.25	67.49	234.90	66.96	225.55	82.16	188.36	33.00
potassium (μeq L^{-1})	8.95	3.38	7.80	3.08	6.90	3.58	8.31	2.52	7.89	2.40	7.43	2.80	5.05	1.45
pH	5.81	0.49	6.02	0.41	5.92	0.42	5.78	0.43	5.94	0.40	5.88	0.47	6.02	0.35
Gran alkalinity (μeq L^{-1})	12.50	22.46	23.50	18.51	20.00	18.96	16.00	16.55	25.00	17.54	27.90	25.26	34.40	16.62
labile aluminium (μg L^{-1})	15.00	21.88	8.00	11.28	6.00	11.81	8.00	13.08	12.00	10.97	13.00	9.80	N/A	N/A
conductivity (μS cm^{-1})	47.50	16.83	41.50	11.32	47.00	13.98	43.00	13.15	42.00	13.27	38.25	15.06	36.70	6.05
Dissolved Organic Carbon (mg L^{-1})	3.10	1.62	4.15	2.19	5.10	2.85	5.30	3.03	5.95	3.41	5.93	3.17	7.05	2.69
Acid Neutralising Capacity (μS cm^{-1})	25.20	44.74	47.41	32.07	36.64	39.75	26.84	37.90	55.82	46.95	52.61	32.59	35.15	31.89

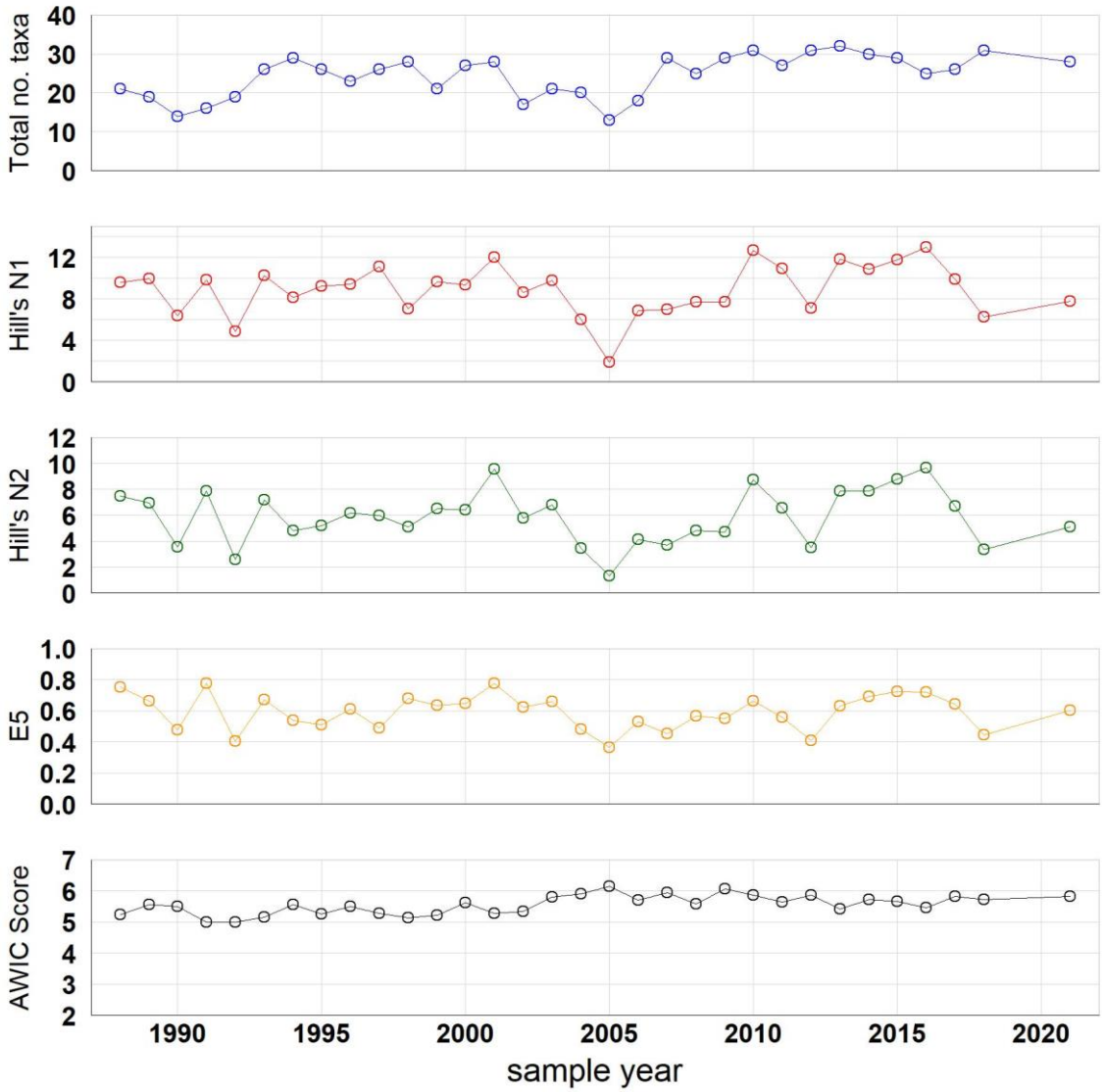
5.3.3. Allt na Coire nan Con macroinvertebrates

5.3.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

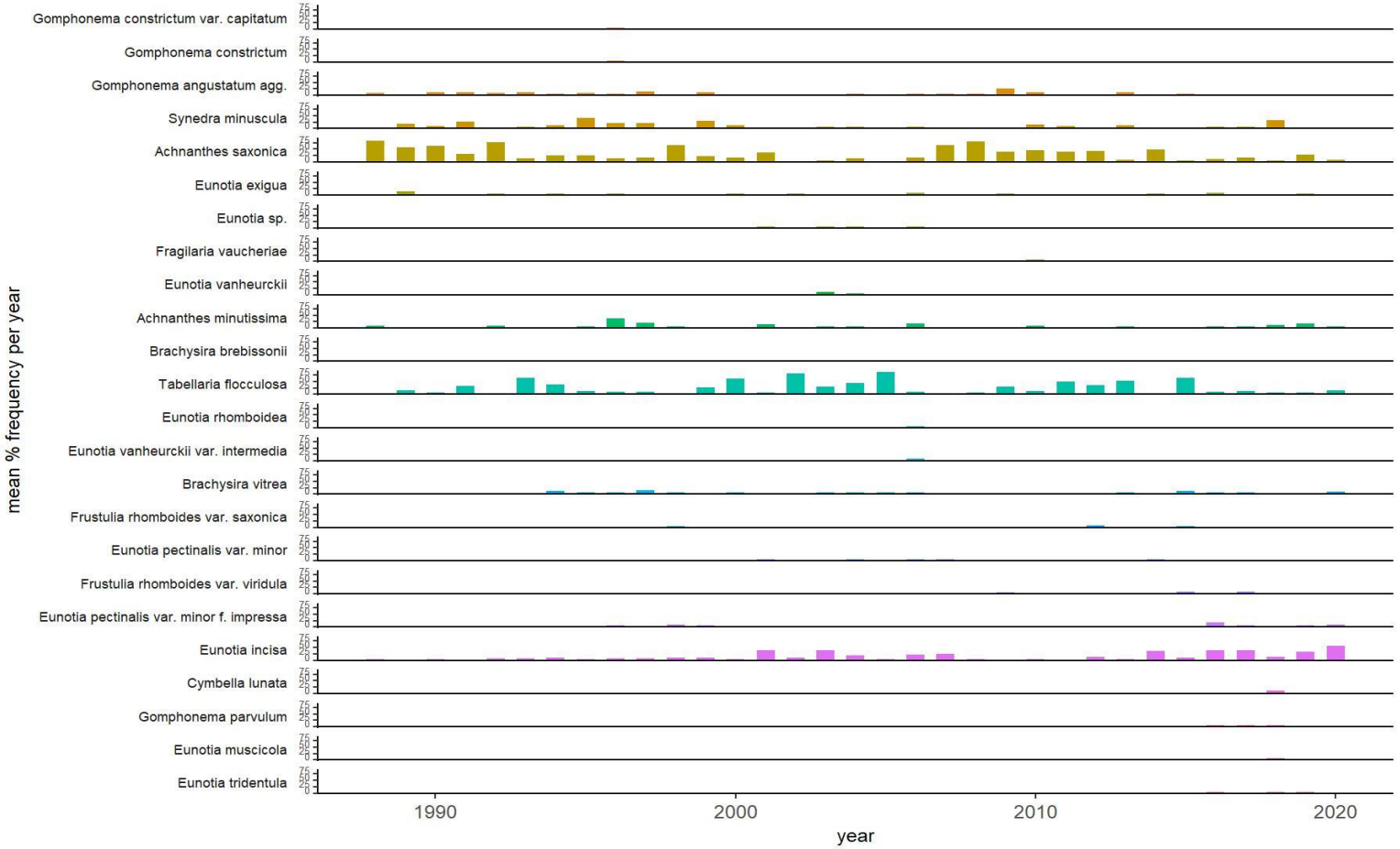
5.3.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

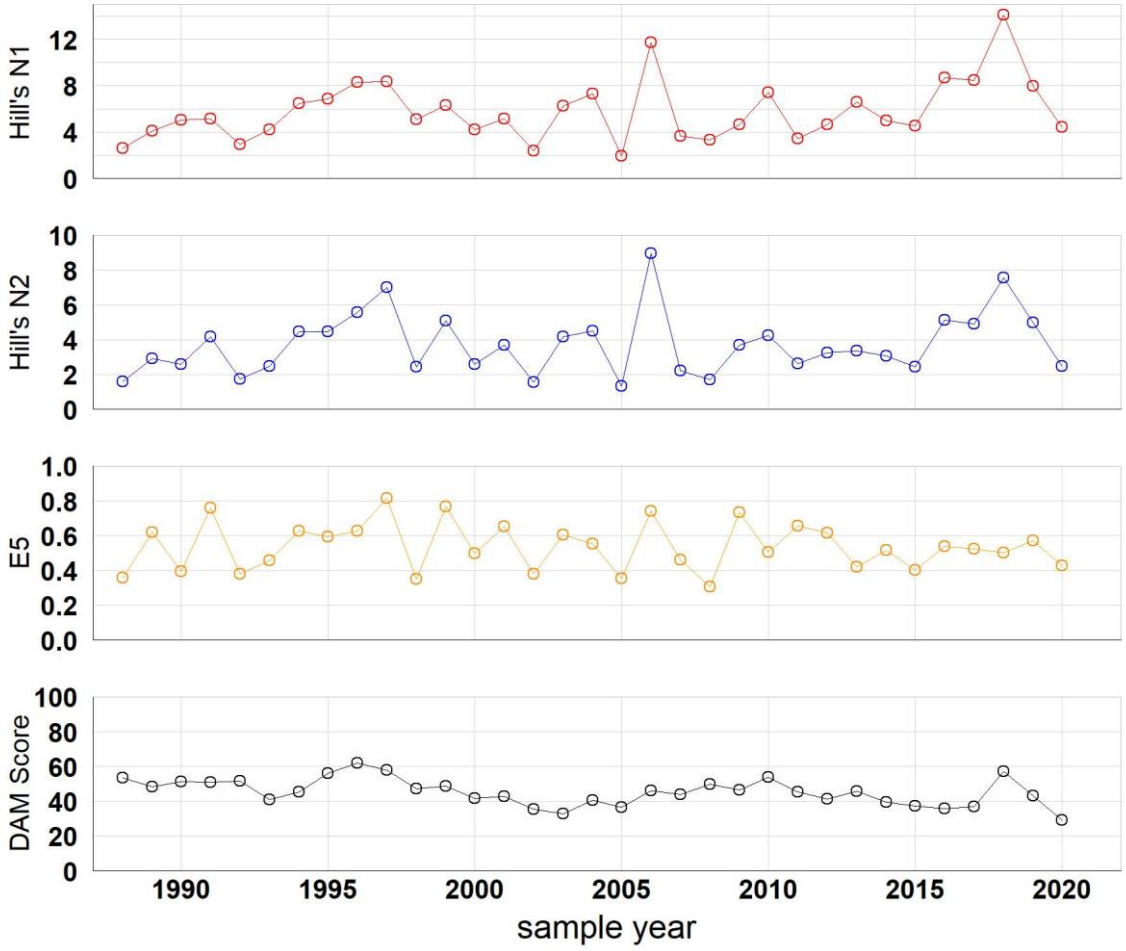
5.3.4. Allt na Coire nan Con epilithic diatoms

5.3.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

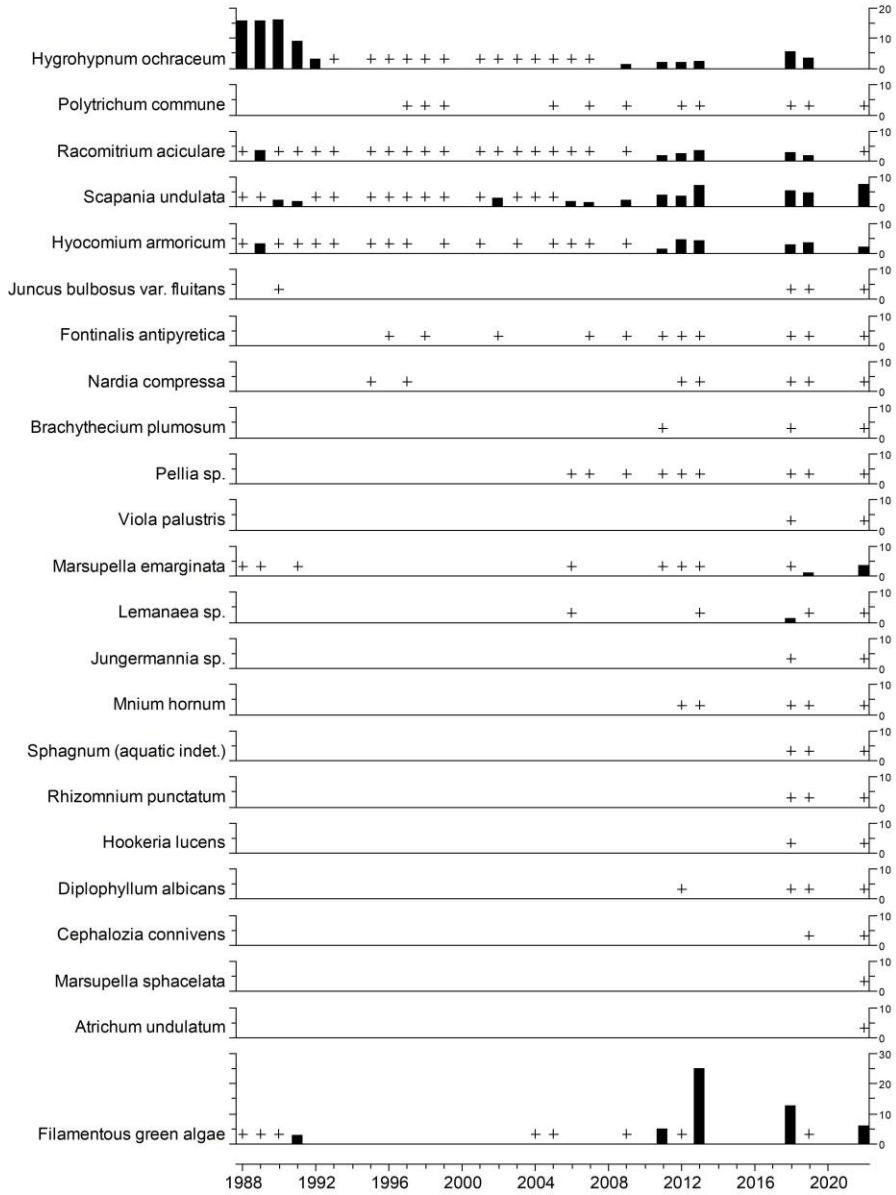
5.3.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.3.5. Allt na Coire nan Con aquatic macrophytes

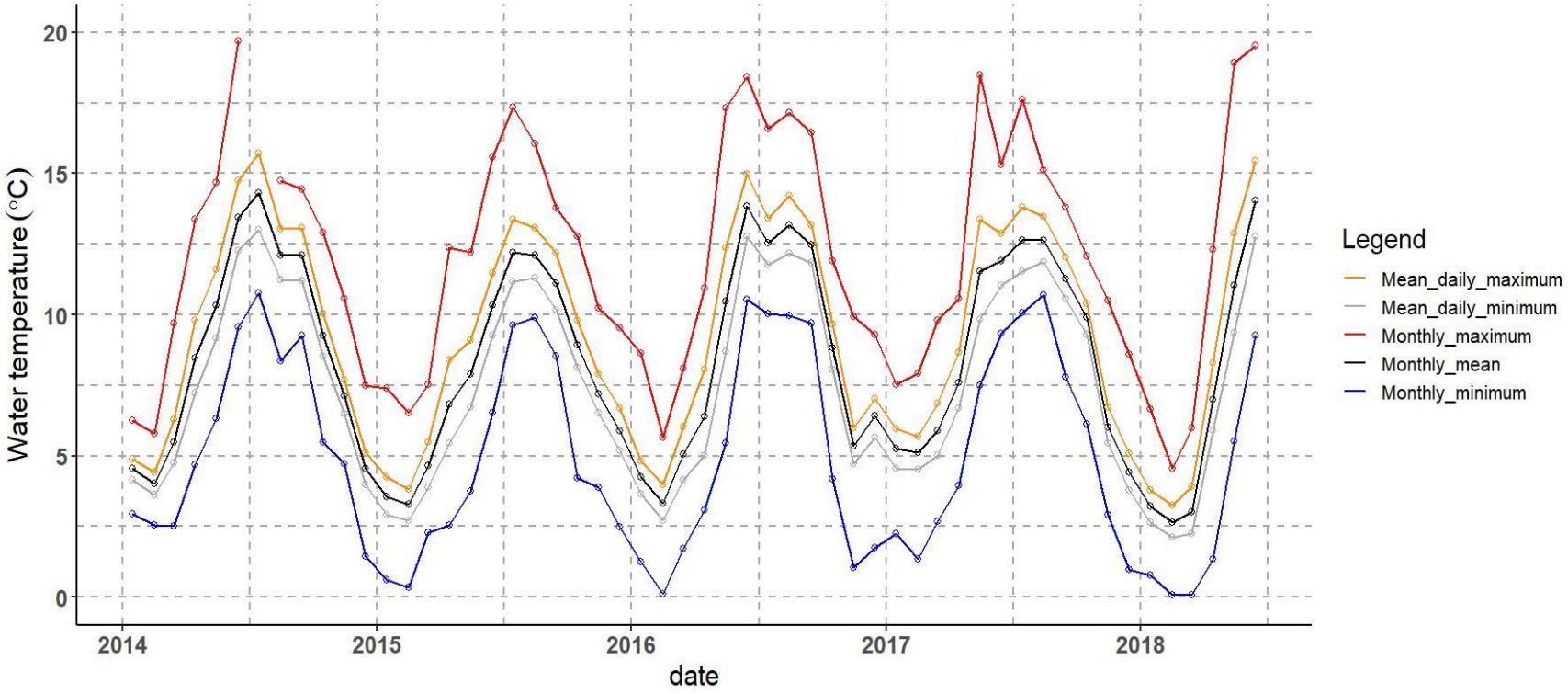
5.3.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.3.6. Allt na Coire nan Con water temperature

5.3.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

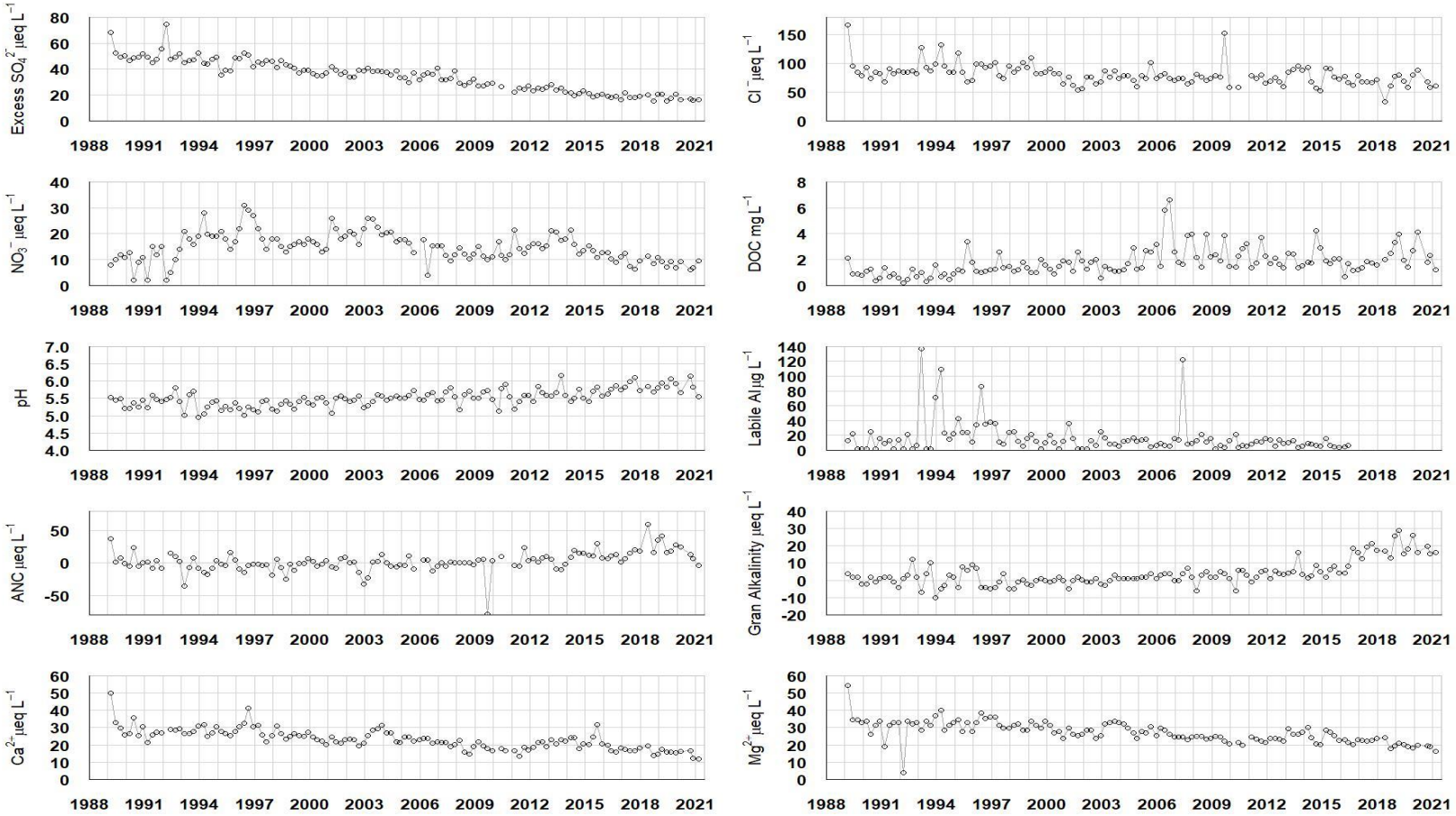
5.4. Lochnagar

5.4.1. Lochnagar site characteristics

Grid Reference	NO 252289
Lake altitude	785 m
Maximum altitude	1145 m
Maximum depth	26 m
Mean depth	8.4 m
Volume	8.2×10^5 m^3
Lake area	9.8 ha
Catchment area	108.5 ha
Catchment area (excl.lake)	91.9 ha
Catchment:Lake ratio	11
Catchment geology	Granite
Catchment soils	Peats
Catchment vegetation	Alpine - moorland
Mean annual runoff	1295 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	13.8 – 6.3
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	11.4 – 3.1
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	7.4 – 5.1
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	11.9 – 7.1

5.4.2. Lochnagar water chemistry

5.4.2.1. Water chemistry time series



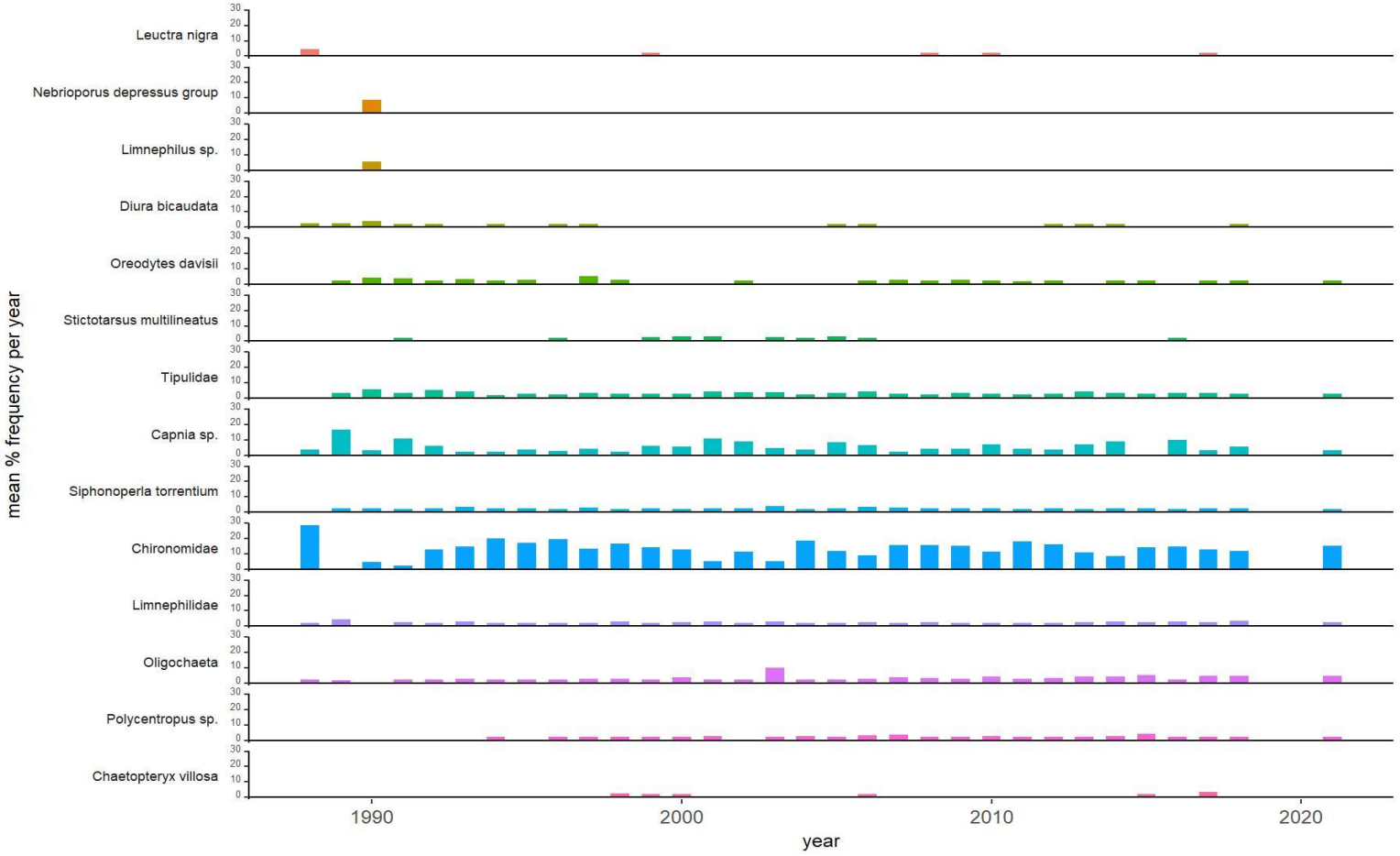
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.4.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	58.32	8.44	55.20	4.34	45.83	2.87	40.83	3.82	33.12	7.16	27.00	2.61	22.81	0.95
non-marine sulphate (μeq L^{-1})	49.38	7.38	45.11	4.23	38.05	2.27	33.43	3.60	25.49	1.99	19.89	2.06	16.53	0.47
nitrate (μeq L^{-1})	11.50	5.48	18.50	5.24	18.50	3.86	15.29	4.10	15.00	3.57	11.00	3.43	7.00	1.70
chloride (μeq L^{-1})	86.04	21.18	93.09	15.32	76.17	13.03	73.35	8.34	76.45	21.81	68.83	13.44	60.37	4.80
calcium (μeq L^{-1})	27.94	5.87	27.45	4.29	23.95	3.14	21.96	3.08	19.04	2.69	17.86	4.08	12.43	2.45
magnesium (μeq L^{-1})	32.90	9.00	31.67	3.57	29.20	3.35	25.34	2.60	23.77	2.43	22.62	3.13	19.17	1.70
sodium (μeq L^{-1})	91.35	20.15	91.35	11.40	82.65	10.97	78.30	6.66	77.65	7.38	74.30	14.28	61.33	7.55
potassium (μeq L^{-1})	7.16	3.93	5.88	1.56	4.73	0.65	4.60	1.19	4.95	2.84	5.32	1.22	3.43	0.95
pH	5.46	0.21	5.25	0.13	5.44	0.14	5.53	0.14	5.59	0.23	5.77	0.19	5.82	0.30
Gran alkalinity (μeq L^{-1})	2.00	4.95	-1.50	4.80	0.00	1.90	2.00	2.61	3.92	4.06	12.80	8.23	16.00	2.46
labile aluminium (μg L^{-1})	8.00	32.13	24.00	25.61	10.00	8.97	12.50	24.98	8.50	4.85	7.00	3.37	N/A	N/A
conductivity (μS cm^{-1})	21.50	5.87	22.00	3.09	19.00	1.91	19.00	1.28	16.85	1.87	15.50	1.80	13.80	0.46
Dissolved Organic Carbon (mg L^{-1})	0.85	0.47	1.20	0.66	1.40	0.48	2.41	1.49	2.01	0.76	1.85	0.86	1.79	0.55
Acid Neutralising Capacity (μS cm^{-1})	1.94	14.85	-3.43	9.53	0.05	10.86	0.18	5.28	3.20	21.48	15.84	13.01	7.09	8.82

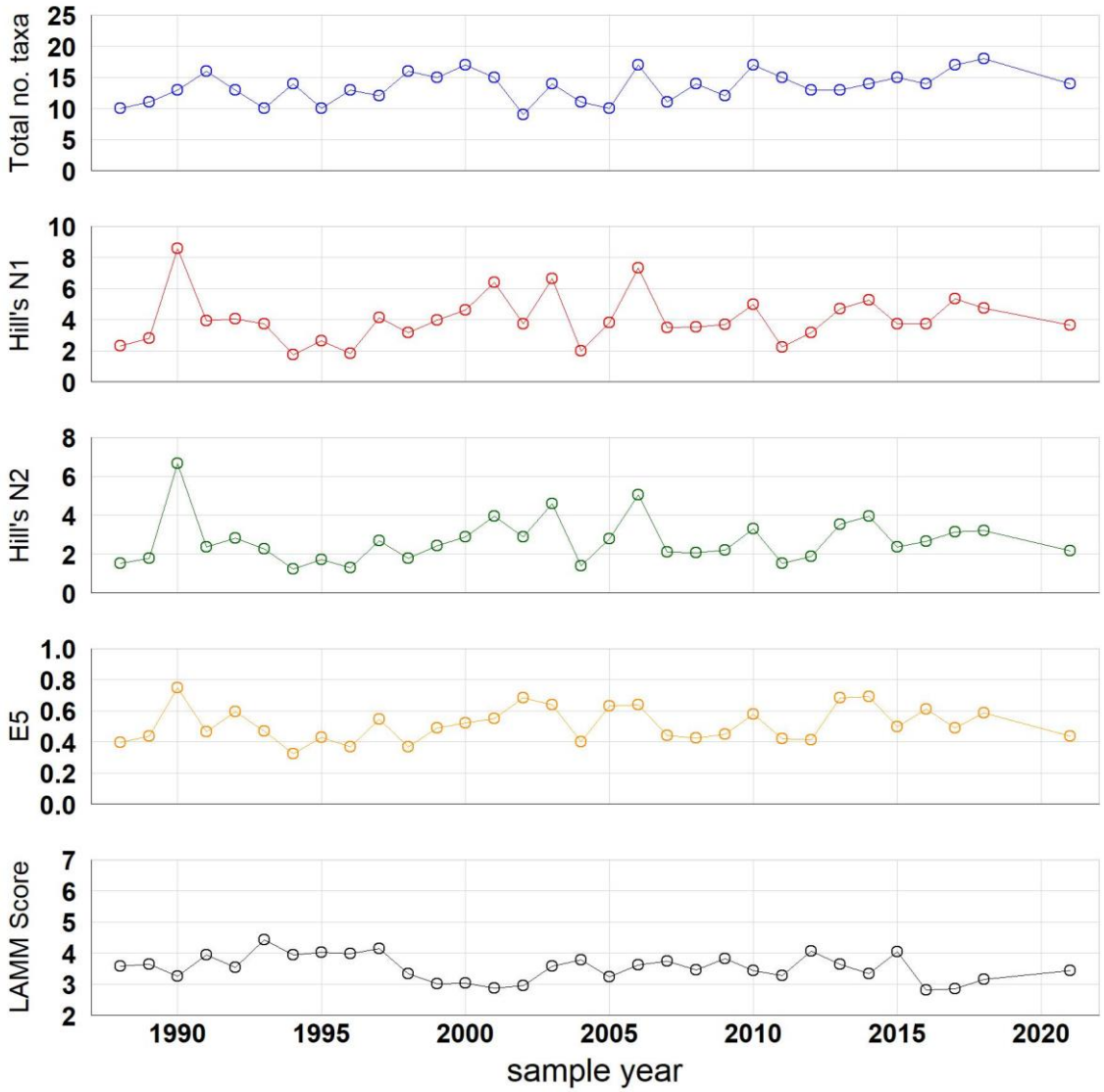
5.4.3. Lochnagar macroinvertebrates

5.4.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

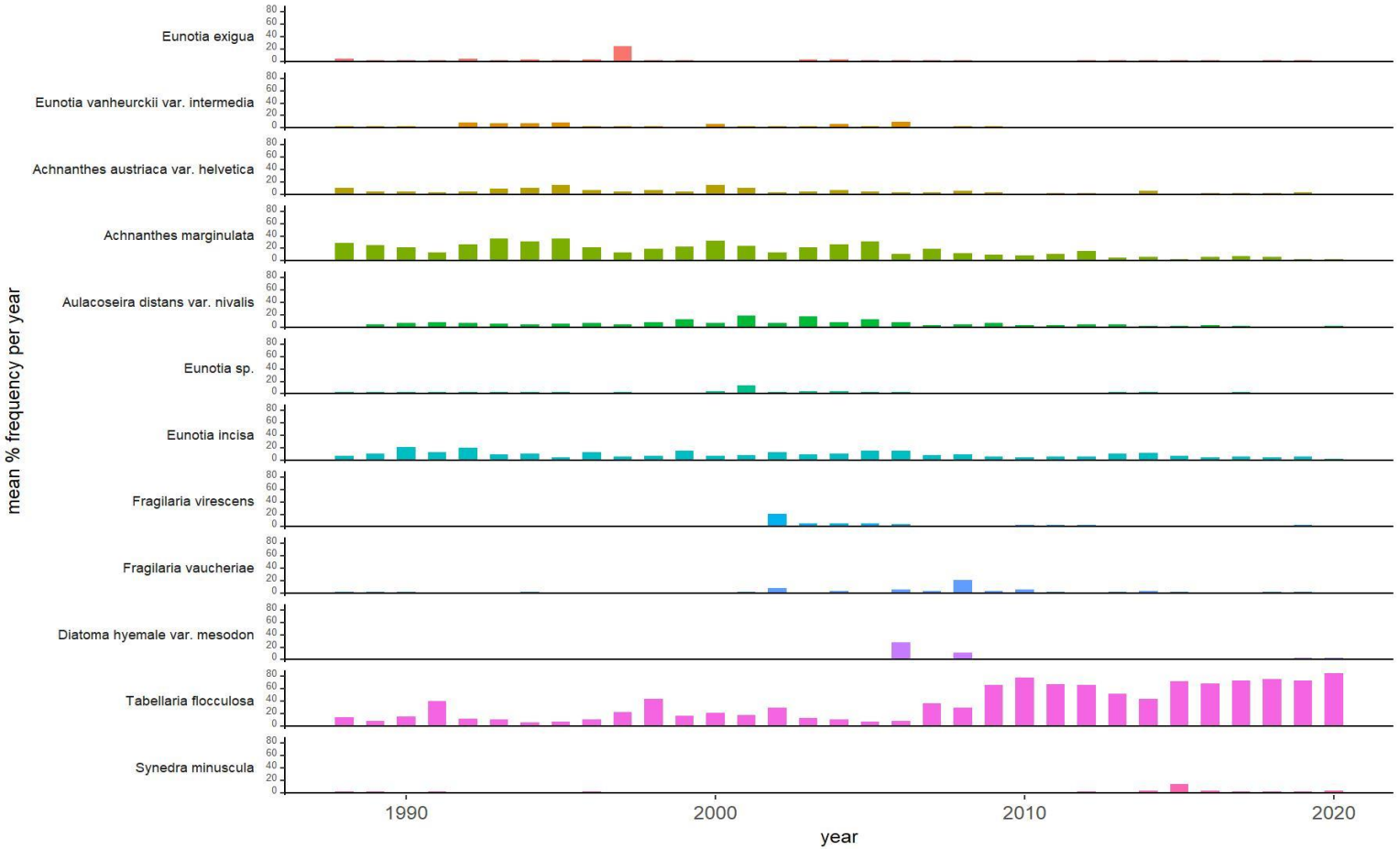
5.4.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

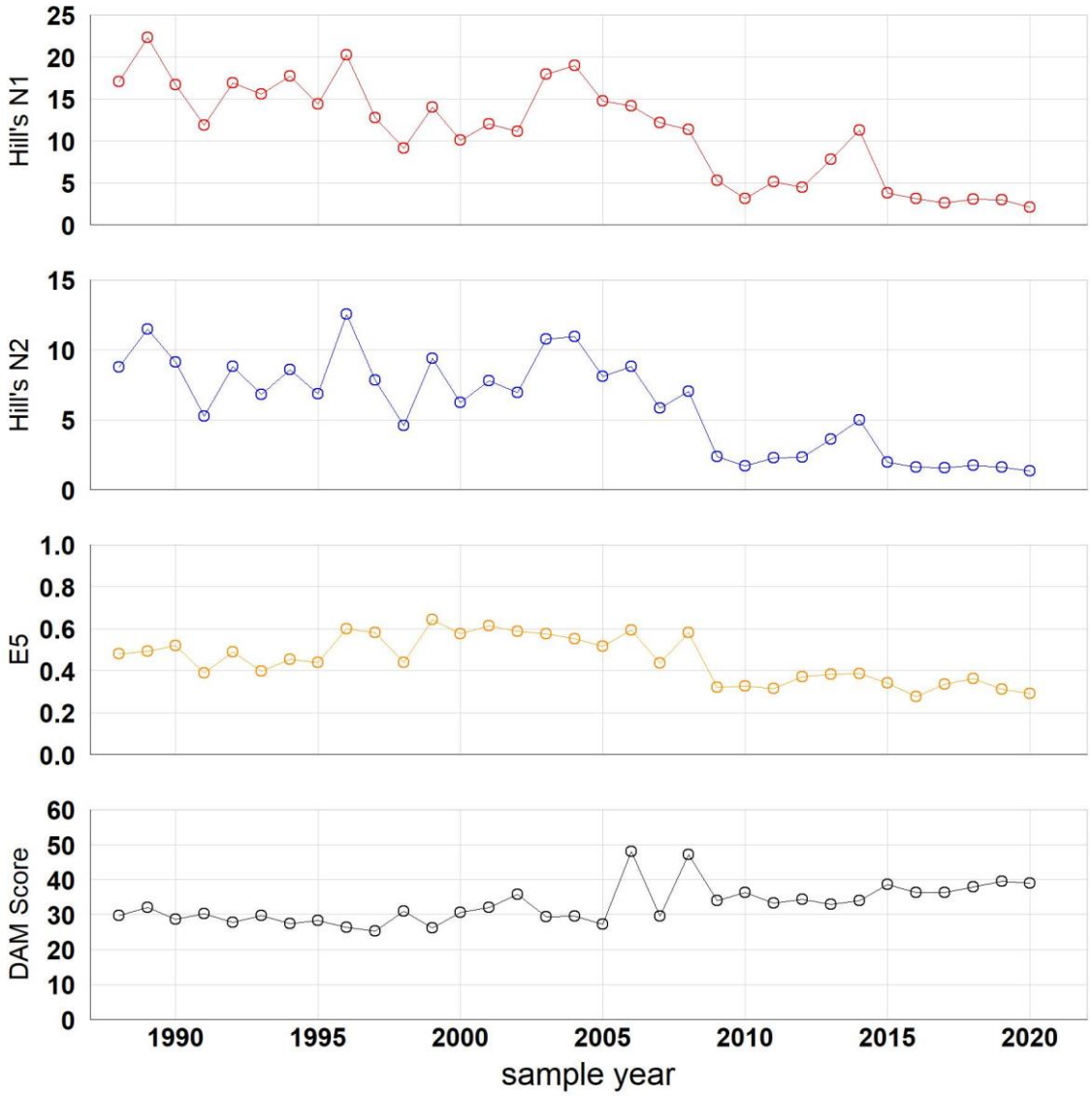
5.4.4. Lochnagar epilithic diatoms

5.4.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

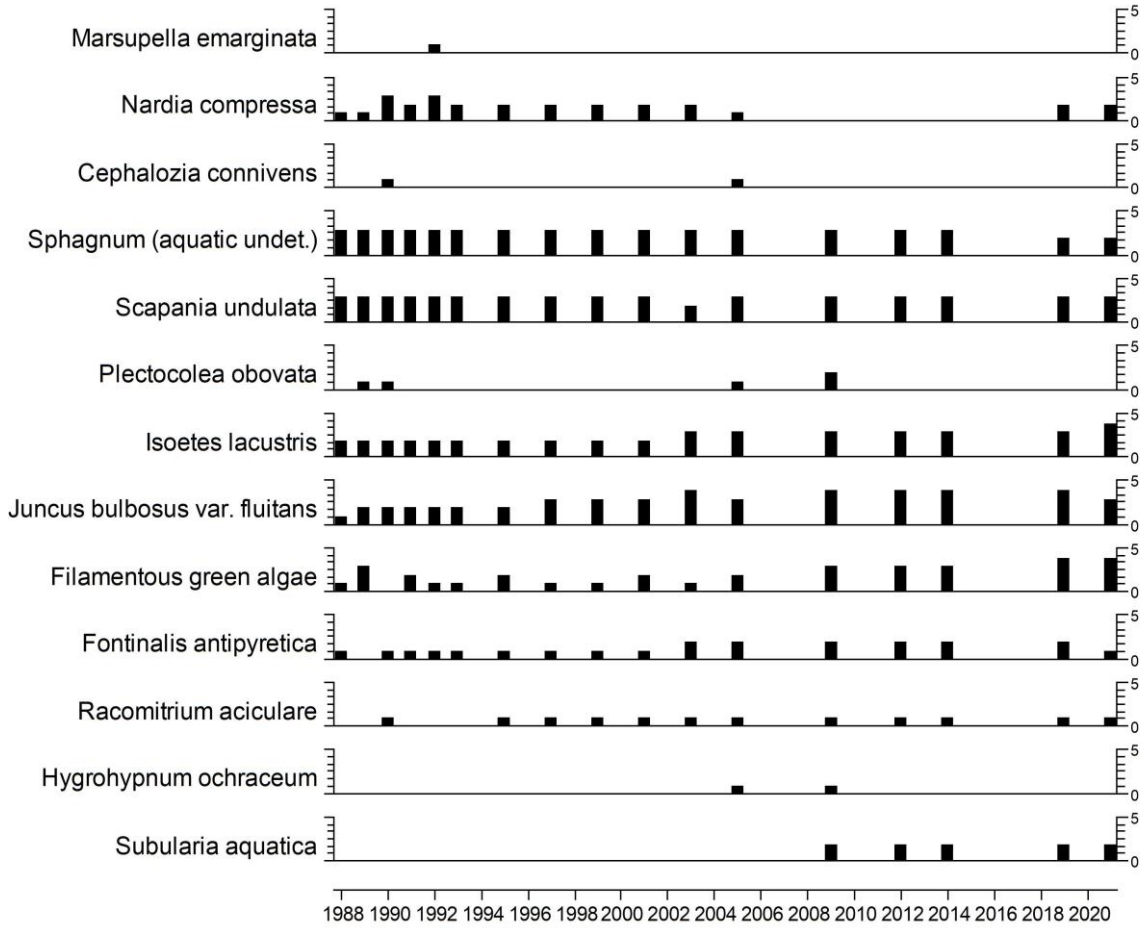
5.4.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.4.5. Lochnagar aquatic macrophytes

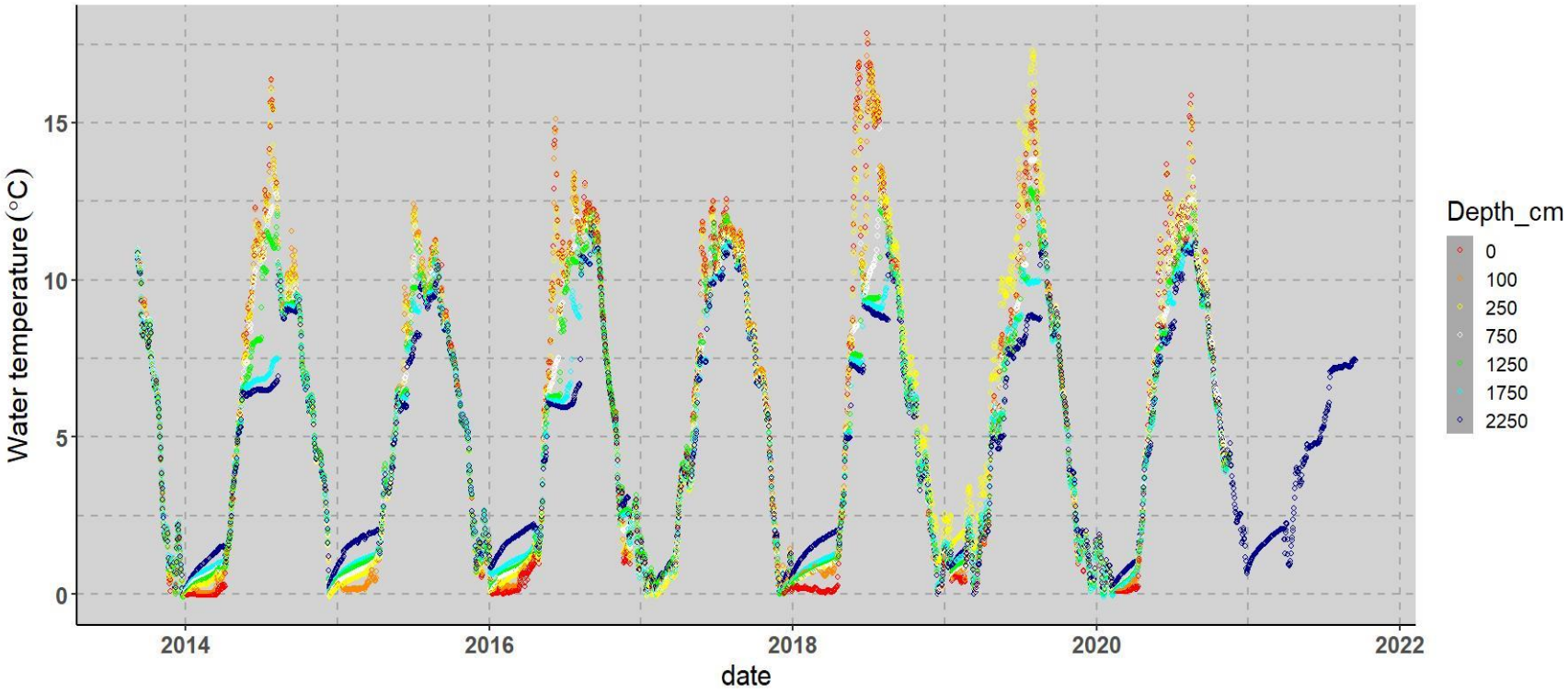
5.4.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.4.6. Lochnagar water temperature

5.4.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

5.5. Loch Chon

5.5.1. Loch Chon site characteristics

Grid Reference	NN 421051
Lake altitude	100 m
Maximum altitude	1145 m
Maximum depth	25 m
Mean depth	7.6 m
Volume	8.2×10^5 m^3
Lake area	100 ha
Catchment area	108.5 ha
Catchment area (excl.lake)	1570 ha
Catchment:Lake ratio	1.1
Catchment geology	Mica schist and grits
Catchment soils	Peaty gleys peaty podzols
Catchment vegetation	Conifers – 50% Moorland – 50%
Mean annual runoff	2179 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	26.3 – 13.0
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	18.9 – 4.0
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	14.3 – 6.5
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	30.1 – 11.0

5.5.2. Loch Chon water chemistry

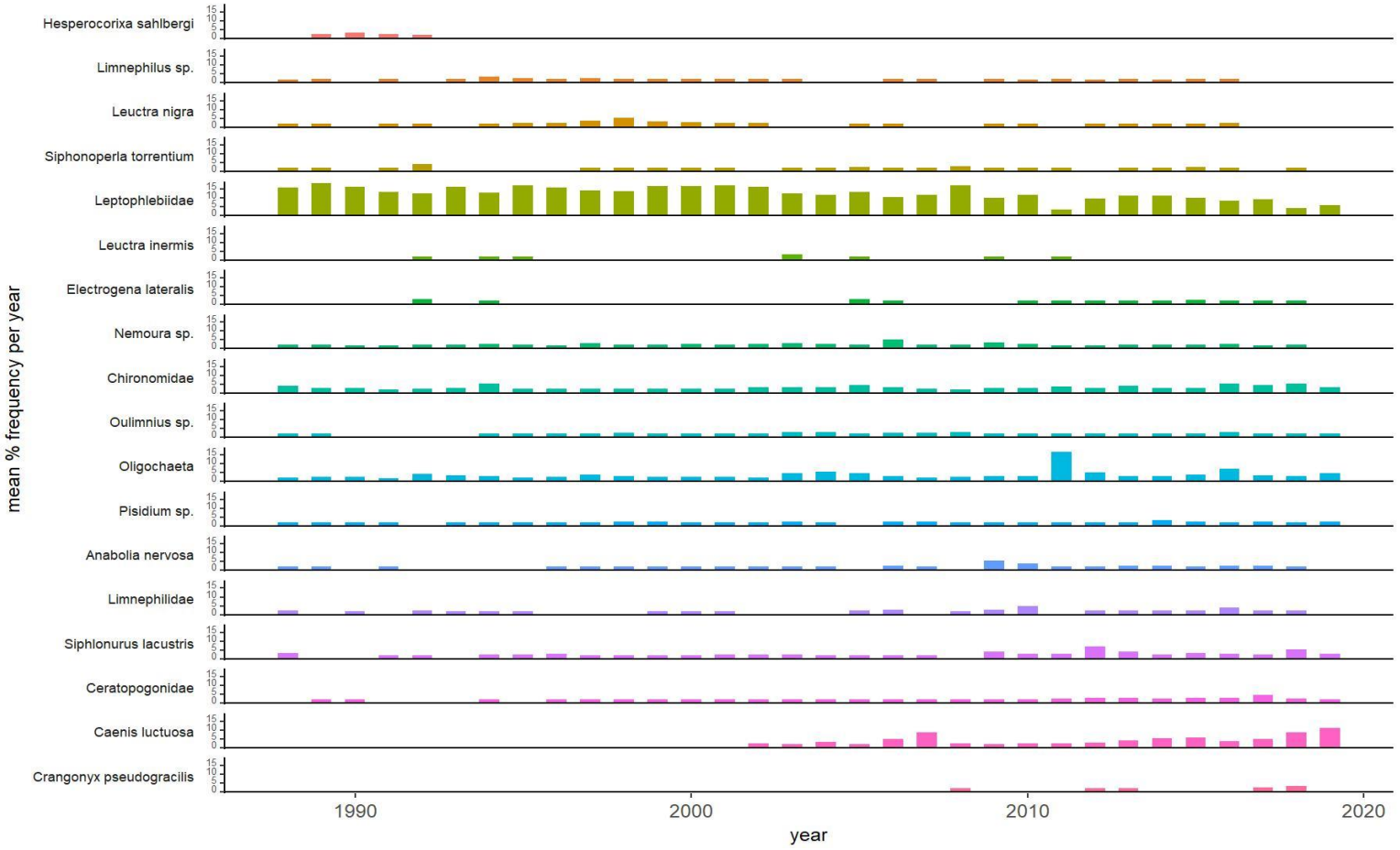
5.5.2.1. Water chemistry time series

5.5.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	74.99	7.53	67.70	10.99	56.24	4.30	49.05	4.20	41.37	4.56	34.62	5.46	29.18	2.66
non-marine sulphate (μeq L^{-1})	48.94	7.67	44.12	11.53	34.19	8.17	30.47	7.21	24.15	7.07	14.66	4.02	15.07	0.80
nitrate (μeq L^{-1})	10.00	2.97	14.00	5.02	13.50	4.03	14.11	4.01	7.36	2.28	6.29	2.70	5.43	2.13
chloride (μeq L^{-1})	238.37	57.68	205.93	42.99	174.90	57.73	175.75	41.64	158.96	41.62	165.59	62.93	135.69	33.15
calcium (μeq L^{-1})	77.59	9.11	75.85	8.13	75.35	7.14	74.10	4.15	70.36	6.30	68.81	7.19	61.88	14.68
magnesium (μeq L^{-1})	47.30	8.30	46.48	5.65	49.77	5.95	46.07	3.36	40.47	5.31	41.71	8.64	37.43	8.04
sodium (μeq L^{-1})	193.57	37.52	182.70	25.02	165.30	36.82	143.55	29.29	140.50	22.88	154.86	36.40	125.72	26.63
potassium (μeq L^{-1})	5.88	2.73	6.90	1.99	6.78	1.02	7.67	1.49	4.96	1.27	6.70	1.89	5.52	1.10
pH	5.51	0.28	5.72	0.29	5.95	0.26	5.96	0.20	6.05	0.20	6.09	0.20	6.15	0.08
Gran alkalinity (μeq L^{-1})	5.50	6.67	13.00	15.29	20.00	11.05	20.00	8.79	25.31	8.83	40.80	15.51	41.00	6.28
labile aluminium (μg L^{-1})	19.00	21.53	9.00	10.39	4.50	8.29	6.00	5.45	8.00	4.35	7.00	4.14	N/A	N/A
conductivity (μS cm^{-1})	40.50	7.09	38.00	5.02	35.00	4.74	34.00	3.93	30.50	4.37	33.40	6.75	27.70	5.54
Dissolved Organic Carbon (mg L^{-1})	2.70	0.86	3.90	1.33	4.90	1.19	5.66	1.94	5.50	1.25	5.06	1.96	6.16	1.14
Acid Neutralising Capacity (μS cm^{-1})	11.97	17.04	21.84	26.52	28.62	22.77	32.56	14.49	47.68	17.08	63.89	24.42	59.42	16.87

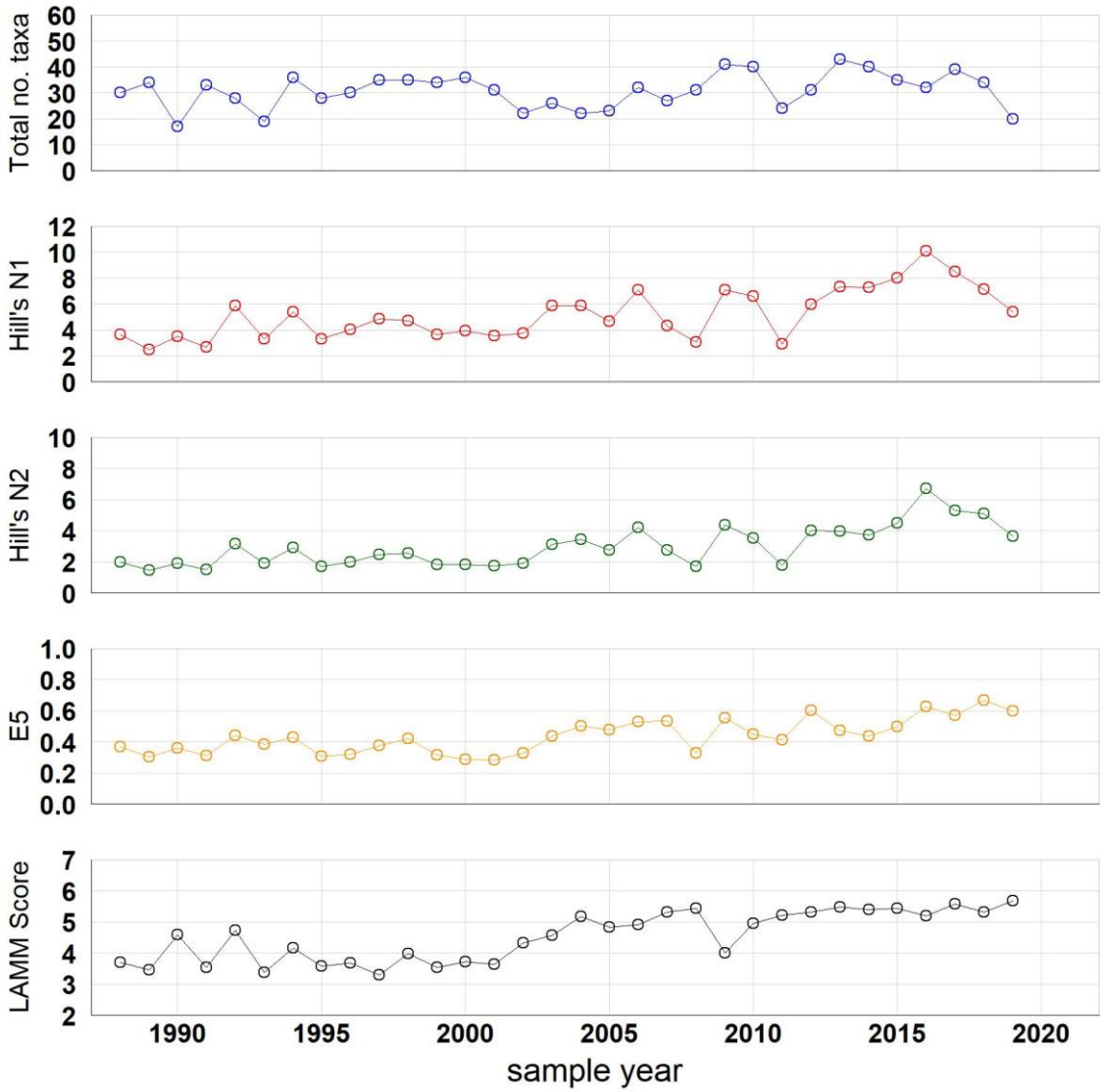
5.5.3. Loch Chon macroinvertebrates

5.5.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

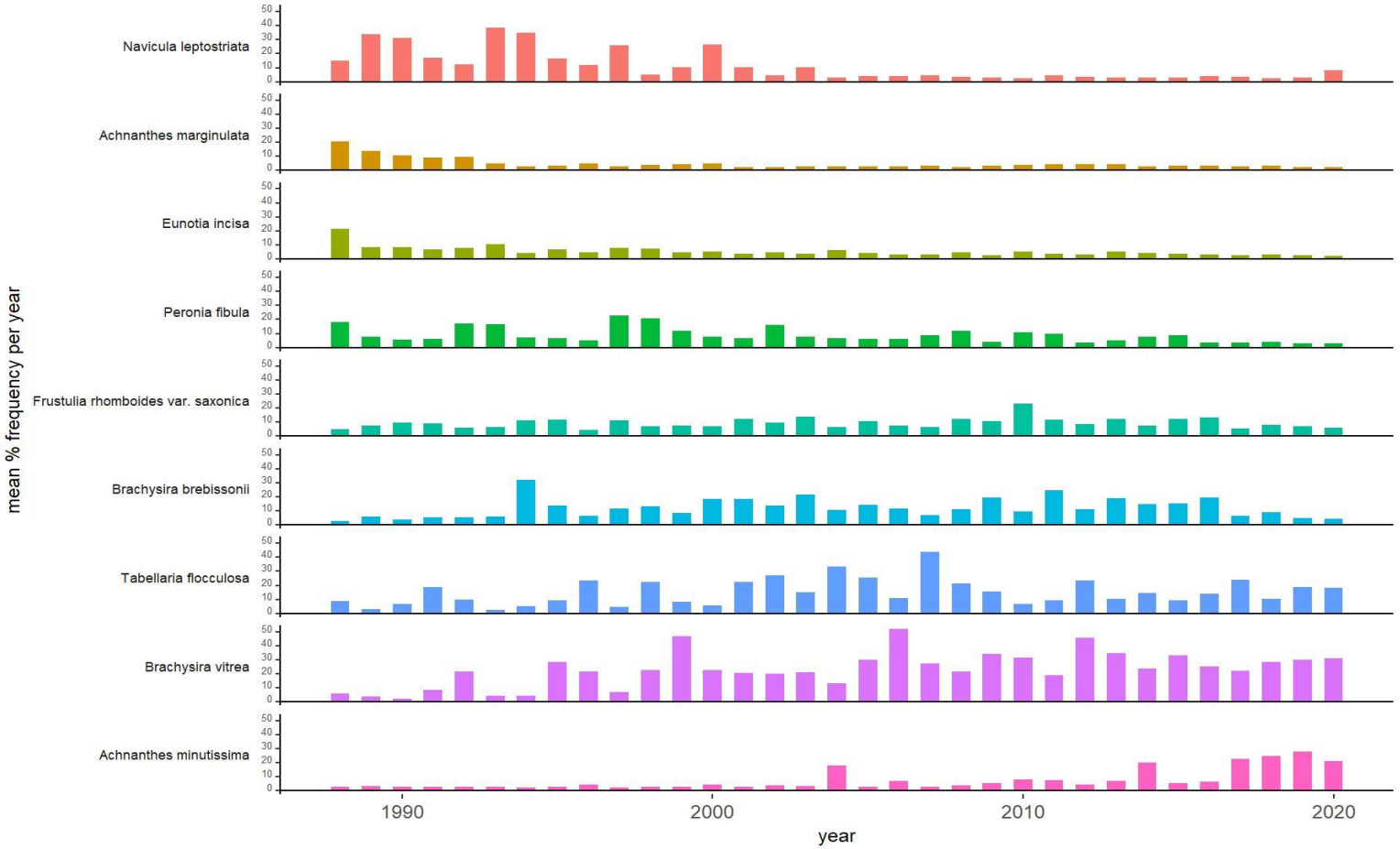
5.5.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

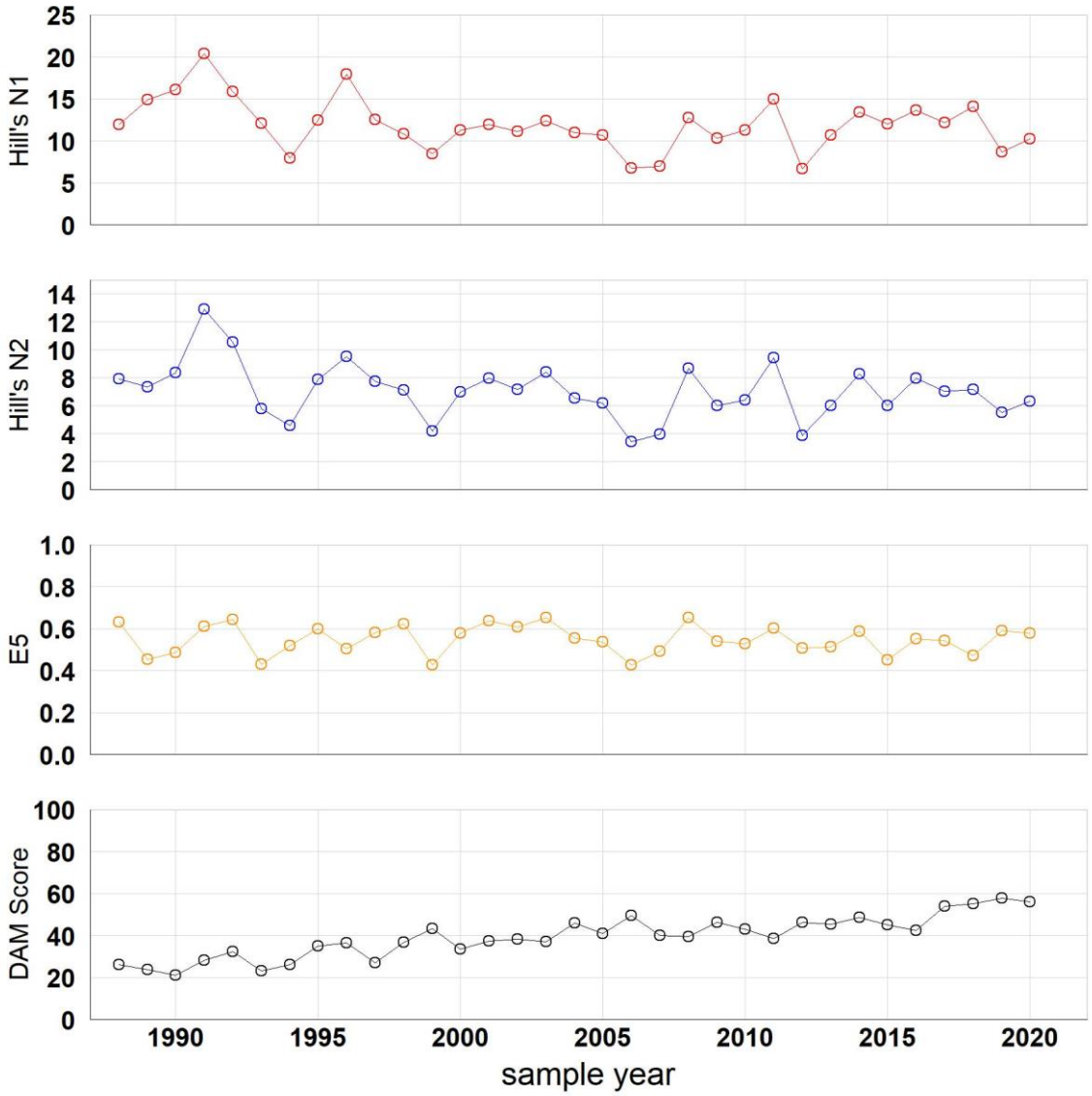
5.5.4. Loch Chon epilithic diatoms

5.5.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

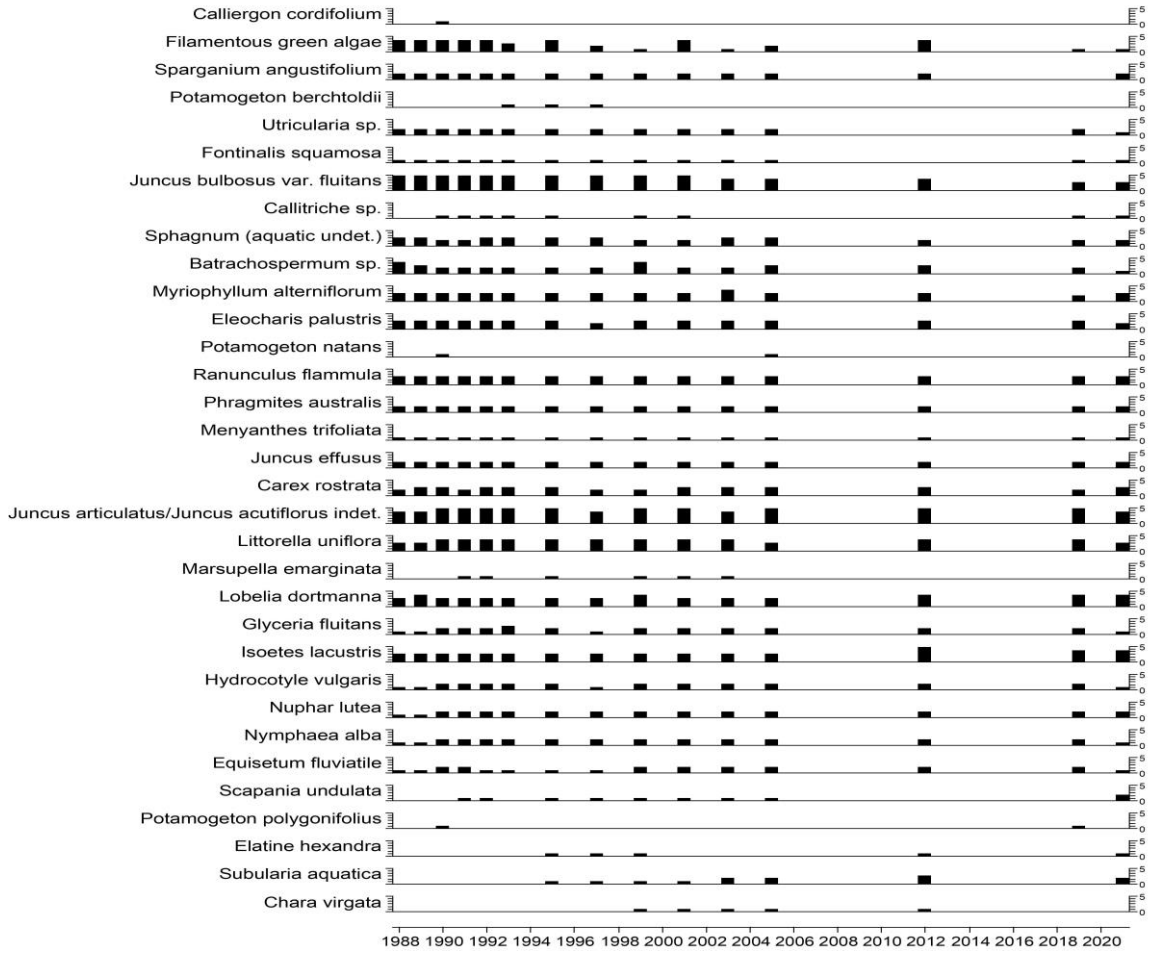
5.5.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.5.5. Loch Chon aquatic macrophytes

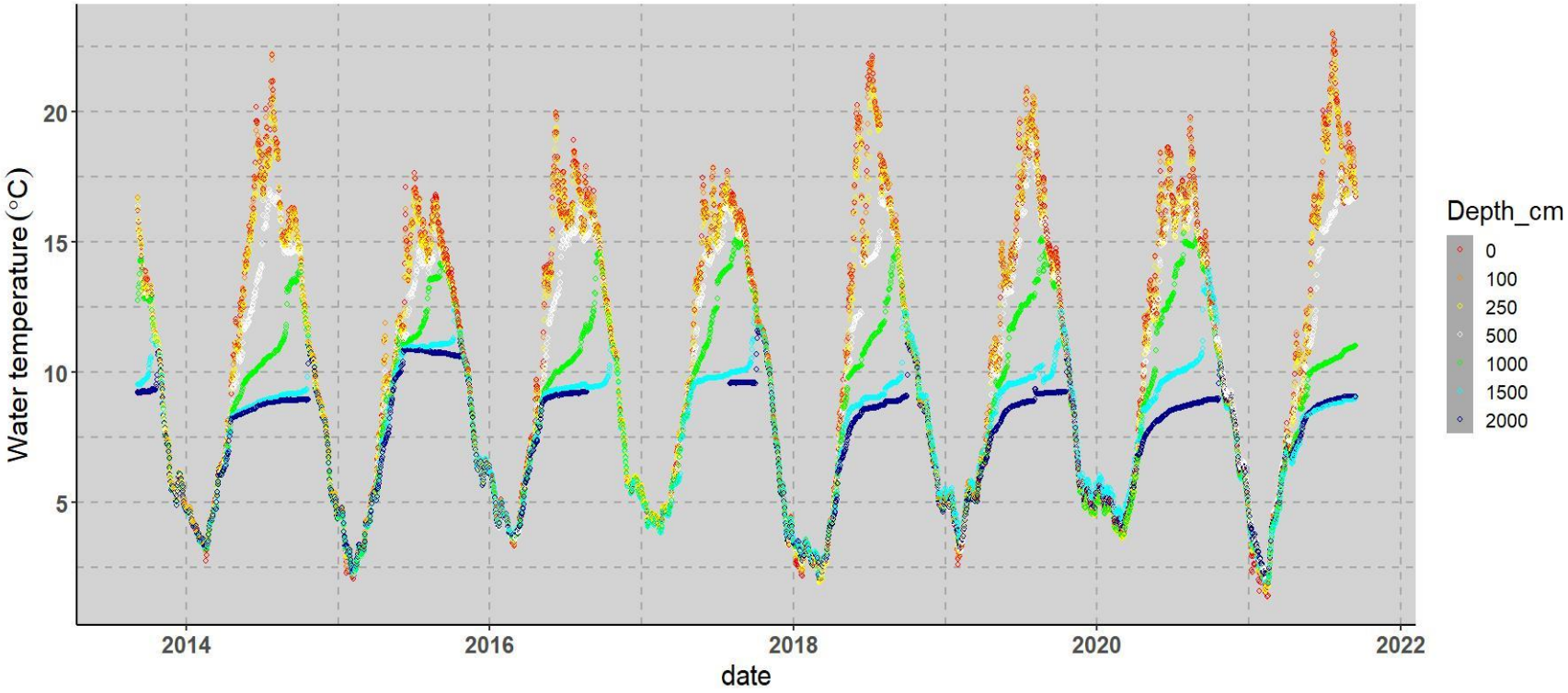
5.5.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.5.6. Loch Chon water temperature

5.5.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

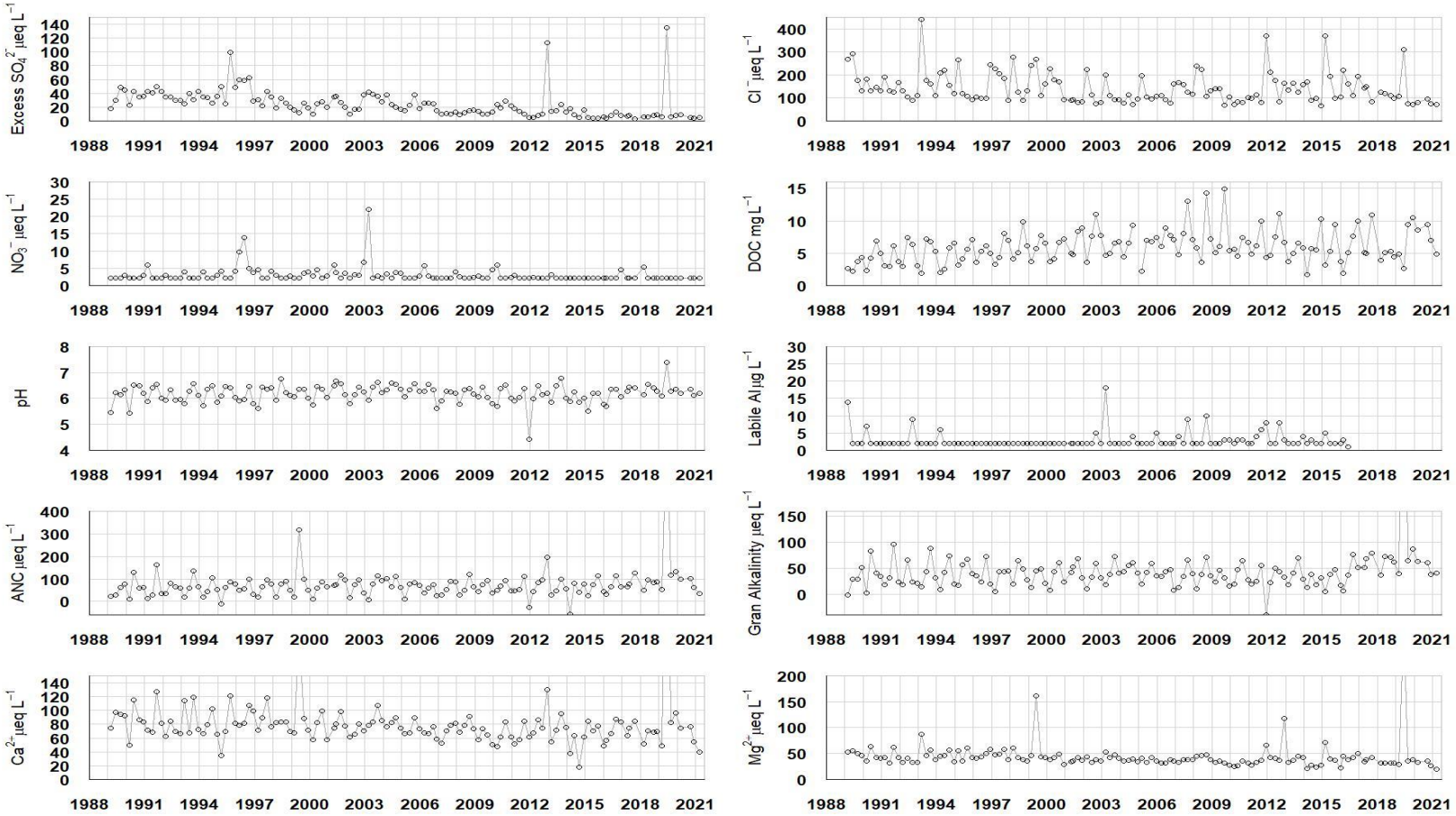
5.6. Loch Tinker

5.6.1. Loch Tinker site characteristics

Grid Reference	NN 445068
Lake altitude	420 m
Maximum altitude	705 m
Maximum depth	25 m
Mean depth	9.8 m
Volume	8.2×10^5 m^3
Lake area	11.3 ha
Catchment area	123.3 ha
Catchment area (excl.lake)	112 ha
Catchment:Lake ratio	10.9
Catchment geology	Mica schist and grits
Catchment soils	Blanket peats
Catchment vegetation	Moorland
Mean annual runoff	2179 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	23.9 – 12.1
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	17.0 – 3.6
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	10.3 – 5.5
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	22.8 – 9.8

5.6.2. Loch Tinker water chemistry

5.6.2.1. Water chemistry time series



NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.6.2.2. Water chemistry statistics

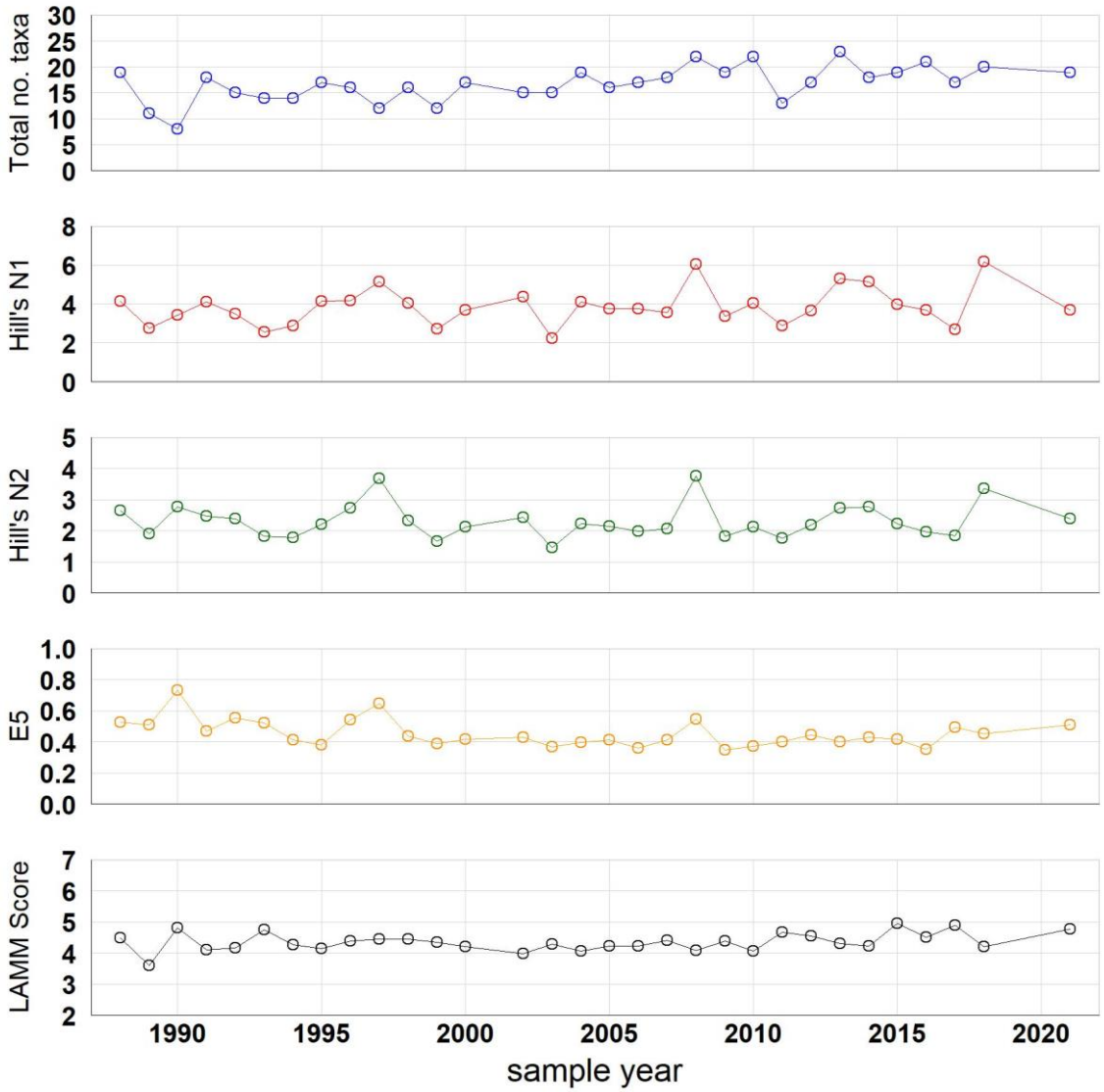
period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	54.16	8.78	54.16	17.99	38.54	8.85	32.29	6.51	28.06	23.73	19.68	31.14	12.50	1.68
non-marine sulphate (μeq L^{-1})	35.59	8.53	33.86	19.33	25.66	9.95	16.43	8.46	13.94	22.99	6.56	26.74	4.84	0.59
nitrate (μeq L^{-1})	2.14	0.95	3.00	2.95	2.89	4.39	2.14	0.94	2.14	1.00	2.14	0.81	2.14	0.00
chloride (μeq L^{-1})	139.64	81.58	126.94	64.16	110.02	63.05	111.43	47.75	119.75	68.07	110.30	75.50	73.91	13.73
calcium (μeq L^{-1})	82.33	20.83	81.34	19.71	79.34	32.36	74.10	10.02	66.12	19.17	69.86	102.07	54.89	18.48
magnesium (μeq L^{-1})	42.36	13.57	45.65	8.77	41.95	27.66	37.84	4.60	35.91	20.22	36.19	57.25	27.23	8.00
sodium (μeq L^{-1})	132.68	51.74	119.62	41.05	110.93	44.62	108.75	29.40	100.05	48.59	109.62	69.62	61.33	22.56
potassium (μeq L^{-1})	6.90	4.64	6.78	2.91	6.01	1.25	5.45	1.98	5.66	2.45	6.19	3.93	4.78	0.09
pH	6.18	0.33	6.18	0.31	6.31	0.27	6.30	0.26	6.05	0.48	6.24	0.37	6.19	0.13
Gran alkalinity (μeq L^{-1})	30.50	27.17	40.50	20.88	39.50	19.01	40.50	17.54	29.81	23.01	47.03	158.65	41.00	11.93
labile aluminium (μg L^{-1})	2.00	3.16	2.00	0.89	2.00	3.61	2.00	2.36	2.50	1.92	2.00	1.07	N/A	N/A
conductivity (μS cm^{-1})	30.50	8.96	29.50	5.85	26.00	4.23	26.50	4.65	23.30	10.02	24.60	23.82	17.10	3.93
Dissolved Organic Carbon (mg L^{-1})	3.95	1.83	5.20	1.95	6.60	1.98	7.09	2.86	5.93	2.67	5.14	2.83	6.97	2.30
Acid Neutralising Capacity (μS cm^{-1})	58.96	41.20	58.79	31.28	74.29	65.66	65.44	29.52	55.16	43.17	77.75	152.40	60.51	33.82

5.6.3. Loch Tinker macroinvertebrates

5.6.3.1. Time series of relative abundance

Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

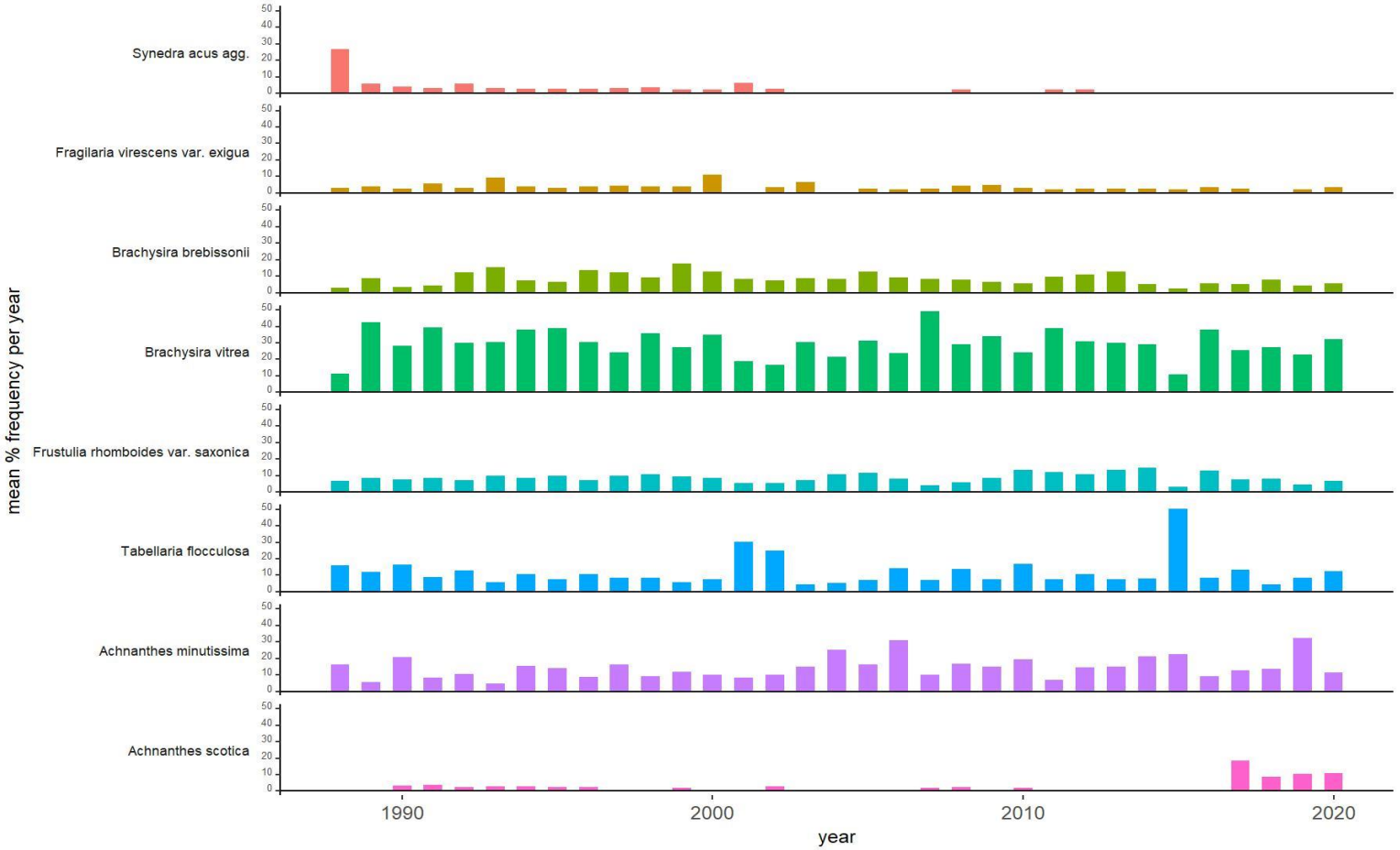
5.6.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

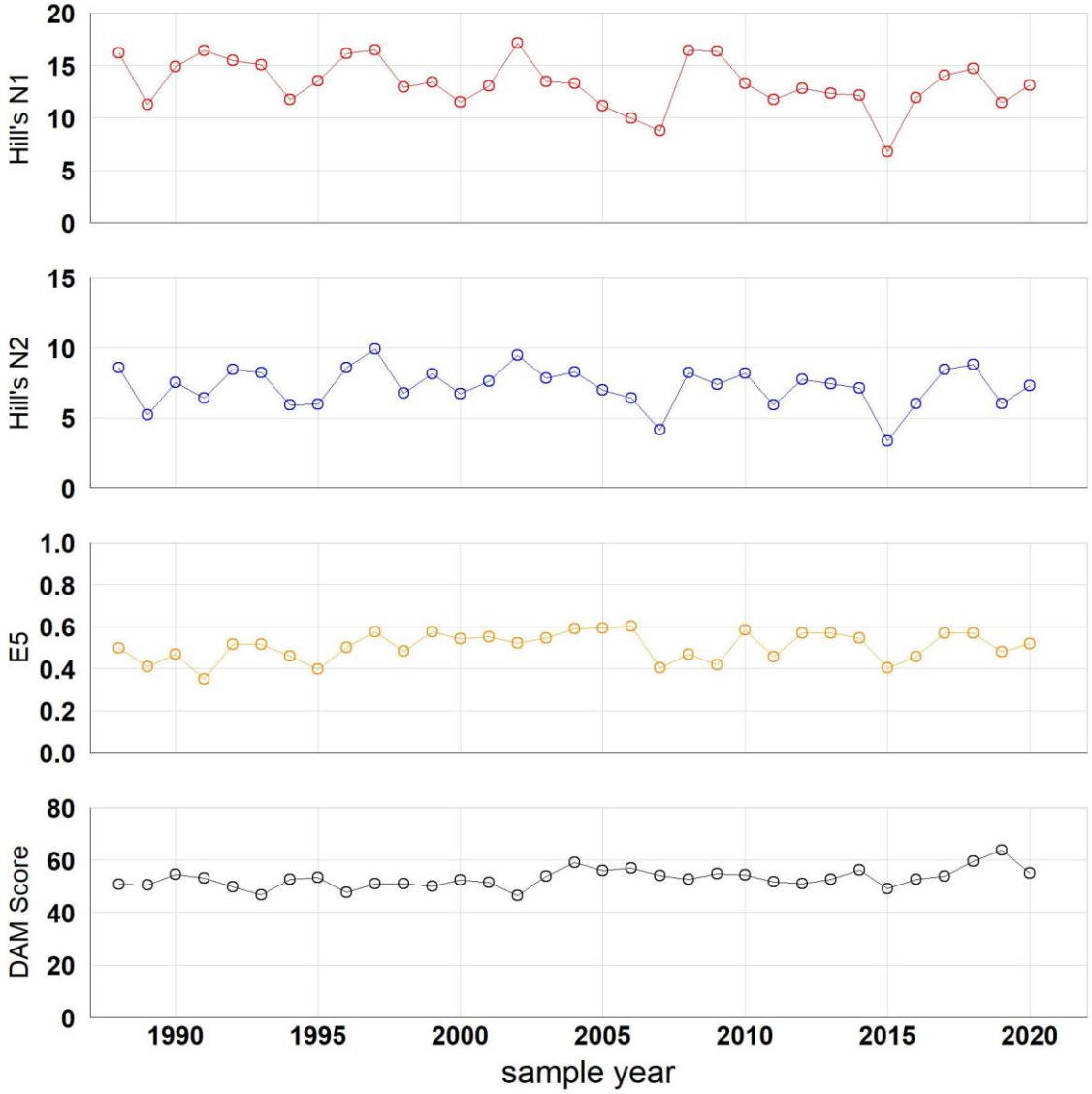
5.6.4. Loch Tinker epilithic diatoms

5.6.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

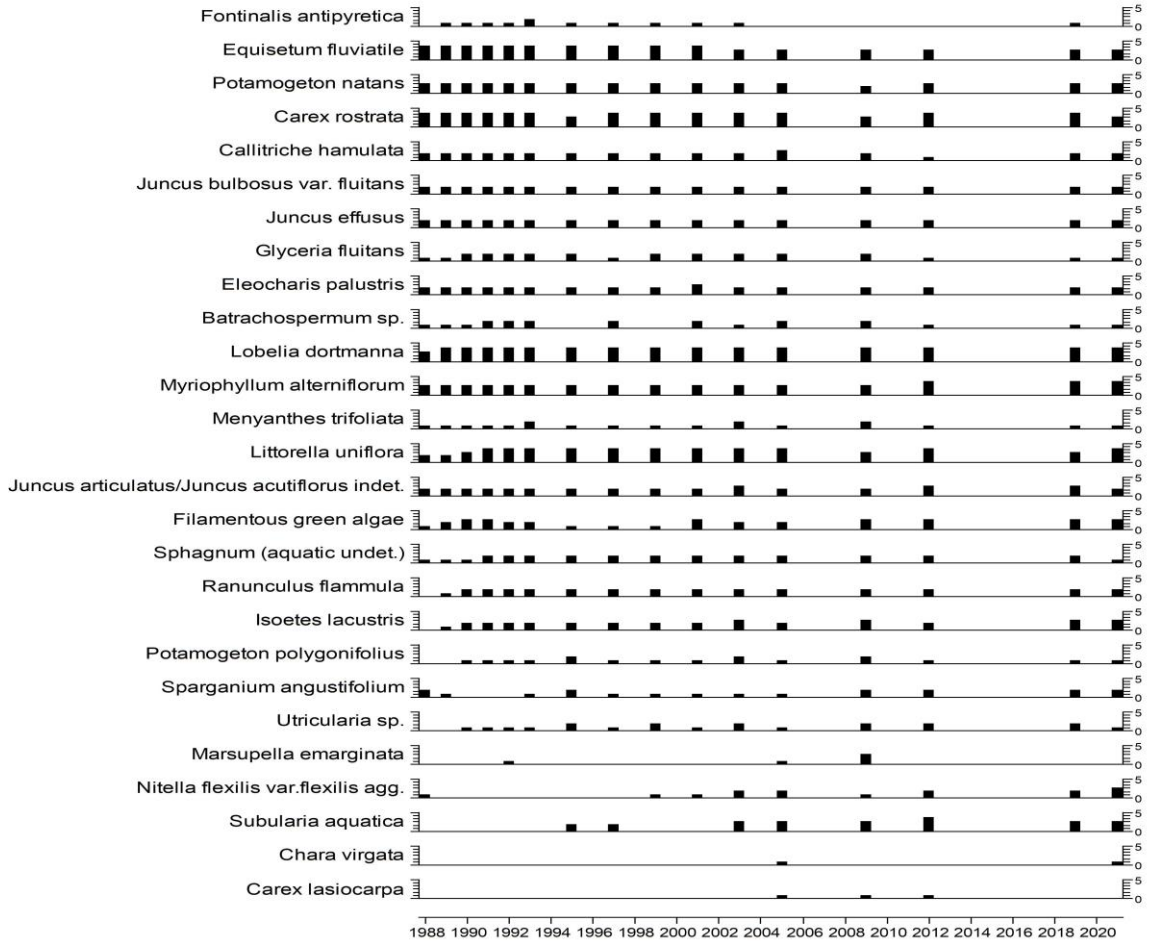
5.6.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.6.5. Loch Tinker aquatic macrophytes

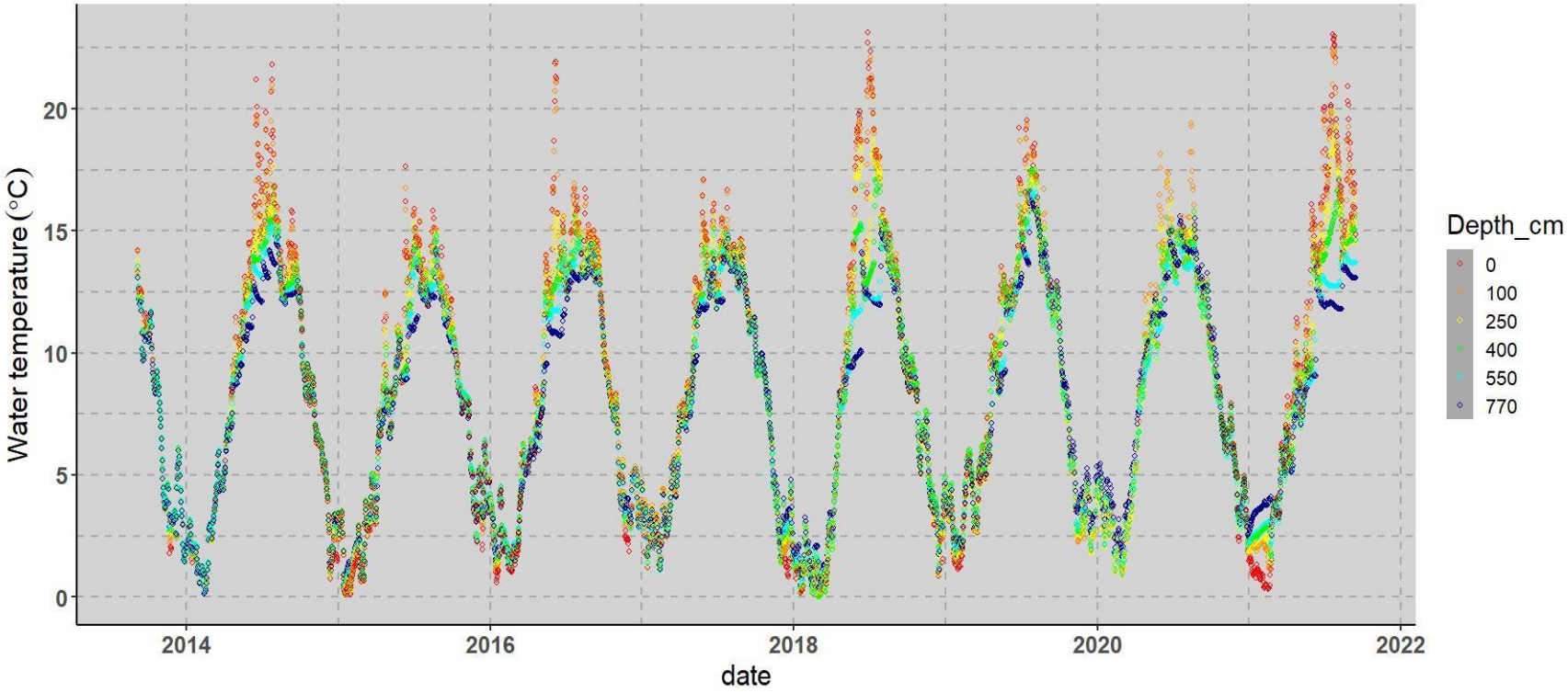
5.6.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.6.6. Loch Tinker water temperature

5.6.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

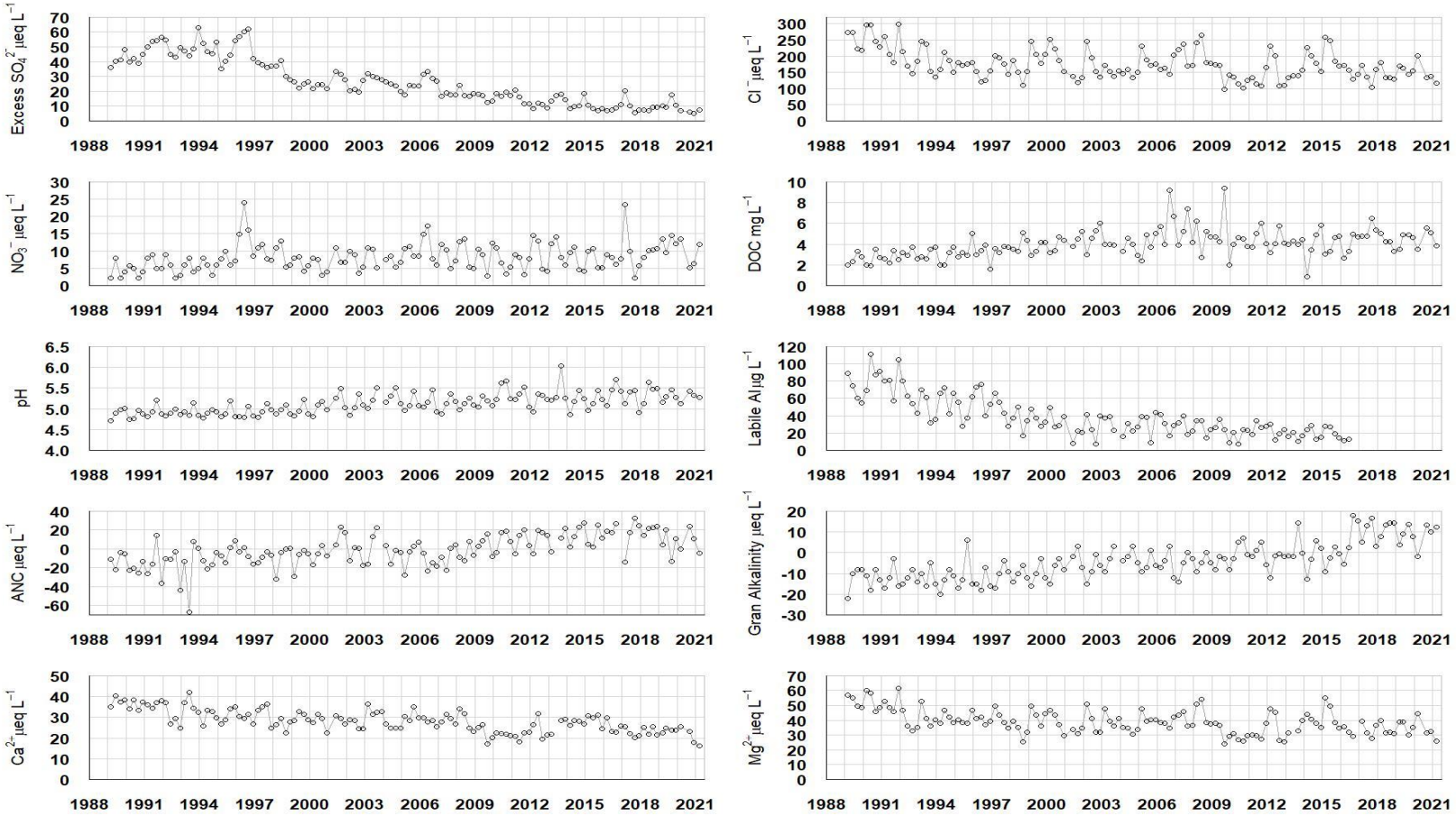
5.7. Round Loch of Glenhead

5.7.1. Round Loch of Glenhead site characteristics

Grid Reference	NX 450804
Lake altitude	295 m
Maximum altitude	525 m
Maximum depth	13.5 m
Mean depth	4.28 m
Volume	8.2×10^5 m^3
Lake area	12.5 ha
Catchment area	107.6 ha
Catchment area (excl.lake)	95.1 ha
Catchment:Lake ratio	8.6
Catchment geology	Tonalite, tonalite/granite
Catchment soils	Peat, peaty podsols
Catchment vegetation	Moorland
Mean annual runoff	2014 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	28.2 – 11.1
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	19.9 – 4.1
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	10.9 – 5.4
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	28.9 – 14.3

5.7.2. Round Loch of Glenhead water chemistry

5.7.2.1. Water chemistry time series



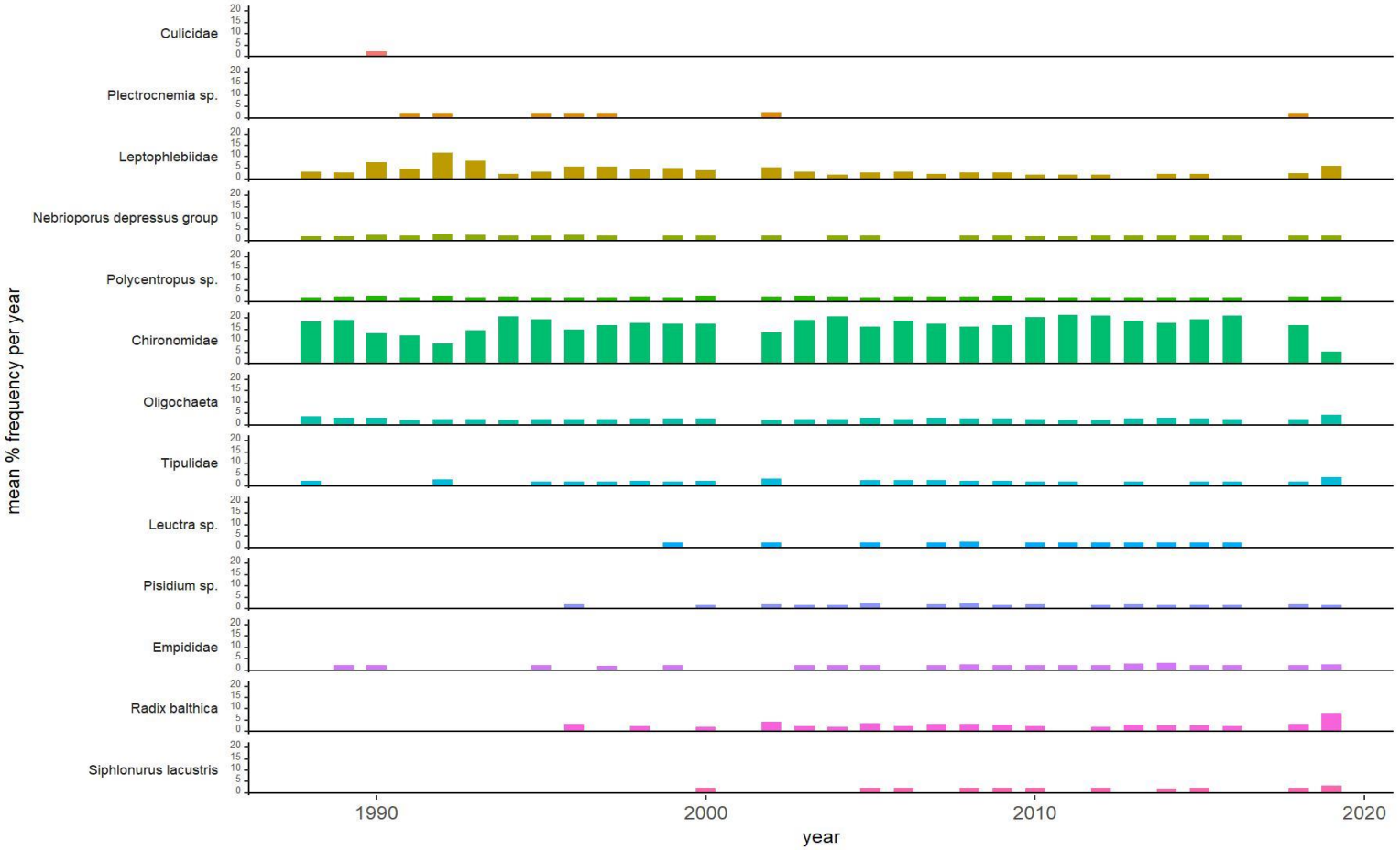
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.7.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	69.78	6.57	59.37	9.54	43.74	4.06	41.66	4.79	30.00	4.55	26.15	5.33	19.62	0.13
non-marine sulphate (μeq L^{-1})	46.18	6.82	41.44	9.72	26.49	4.15	23.59	5.08	15.18	3.61	9.25	3.73	5.87	1.10
nitrate (μeq L^{-1})	5.00	2.30	7.89	4.77	7.14	2.59	8.57	3.53	8.14	3.73	9.61	4.28	6.29	3.59
chloride (μeq L^{-1})	225.68	50.95	165.03	27.04	172.08	41.81	173.49	36.98	134.84	34.55	160.80	37.26	134.00	10.66
calcium (μeq L^{-1})	36.43	4.23	29.69	3.81	29.44	3.40	28.19	3.19	22.11	3.85	24.95	3.16	18.01	3.50
magnesium (μeq L^{-1})	48.53	8.56	39.07	5.35	39.48	6.57	38.58	6.05	30.11	6.72	35.87	6.46	31.51	3.56
sodium (μeq L^{-1})	193.57	35.30	152.25	18.43	143.55	30.84	146.59	27.78	113.97	27.68	147.03	27.41	118.32	13.90
potassium (μeq L^{-1})	7.93	2.91	7.42	1.74	7.16	1.75	7.80	1.90	6.21	1.71	6.67	1.38	5.47	0.58
pH	4.88	0.12	4.88	0.12	5.06	0.21	5.13	0.18	5.25	0.25	5.29	0.22	5.32	0.08
Gran alkalinity (μeq L^{-1})	-12.00	4.70	-12.50	5.92	-6.50	5.74	-5.00	4.56	-1.69	5.75	5.44	8.42	12.20	1.72
labile aluminium (μg L^{-1})	69.50	21.22	51.50	17.08	31.00	11.94	30.00	10.02	22.00	7.95	17.00	7.04	N/A	N/A
conductivity (μS cm^{-1})	39.50	6.56	34.00	3.90	28.00	6.59	31.50	5.56	23.80	5.49	29.20	5.03	24.10	1.38
Dissolved Organic Carbon (mg L^{-1})	2.75	0.58	3.35	0.89	4.10	0.83	4.64	1.67	4.19	1.43	4.68	1.17	5.07	0.89
Acid Neutralising Capacity (μS cm^{-1})	-13.28	18.43	-7.05	9.38	-3.15	14.41	-5.64	10.59	11.46	10.10	17.33	12.35	11.18	14.16

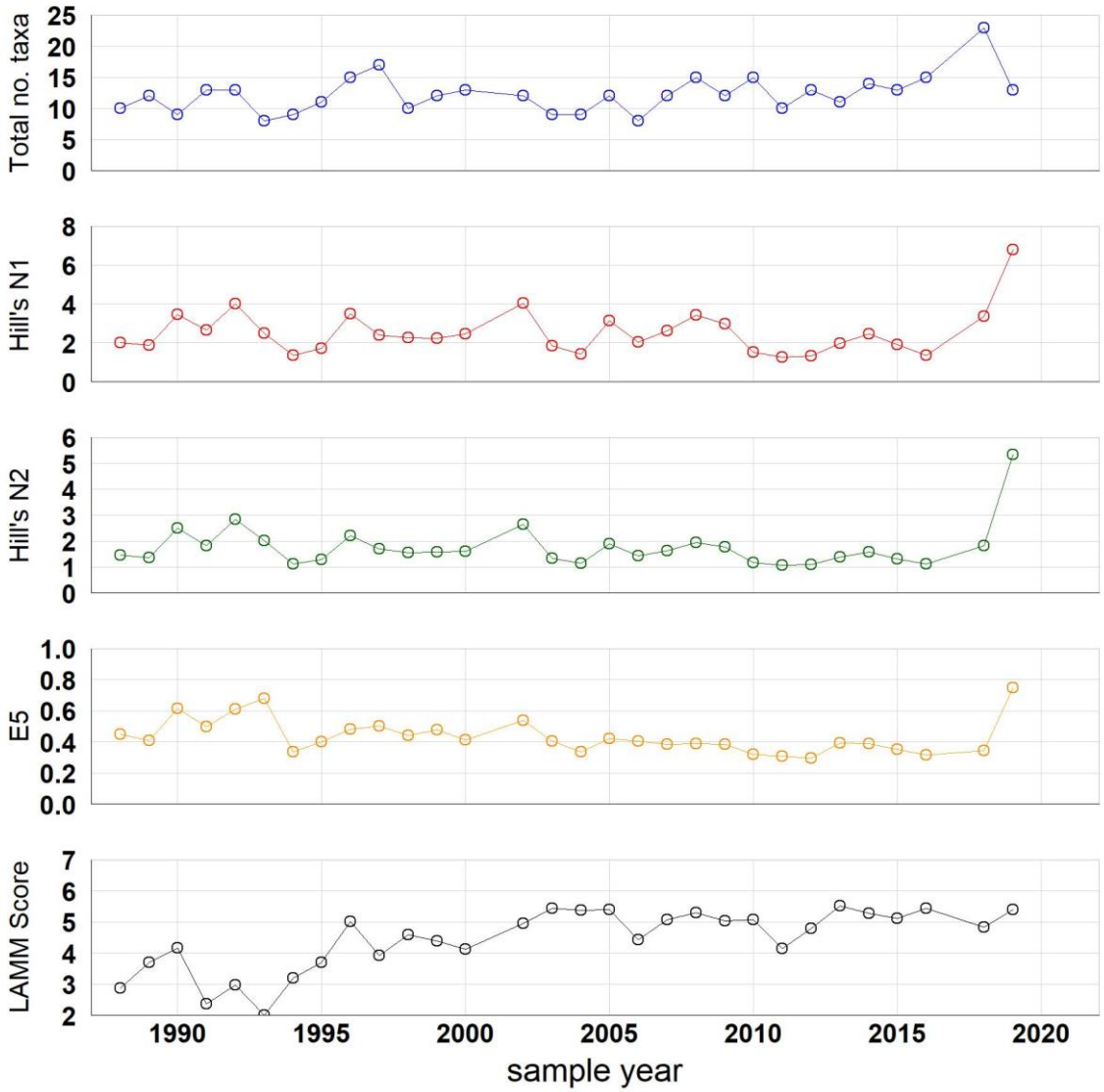
5.7.3. Round Loch of Glenhead macroinvertebrates

5.7.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

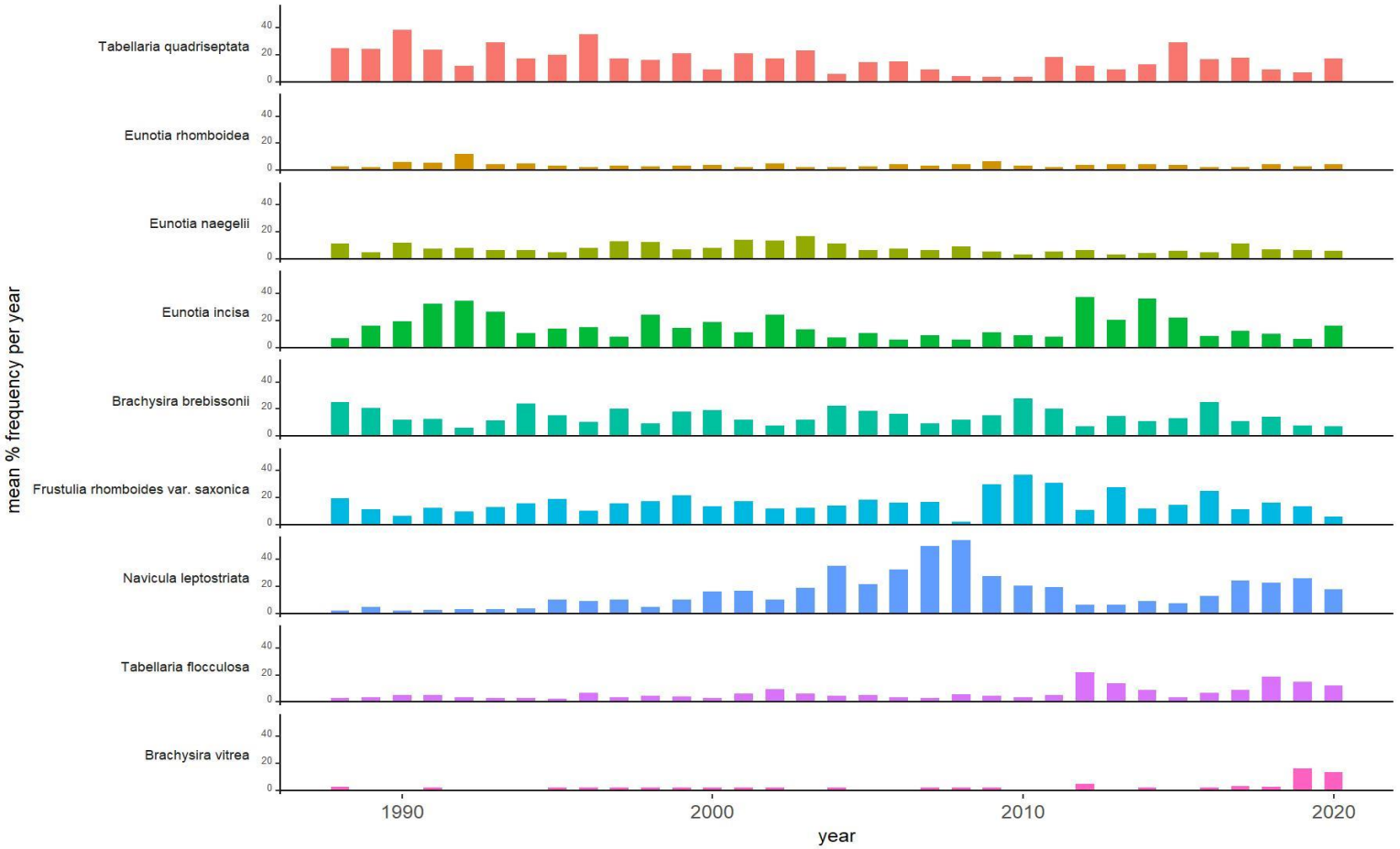
5.7.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

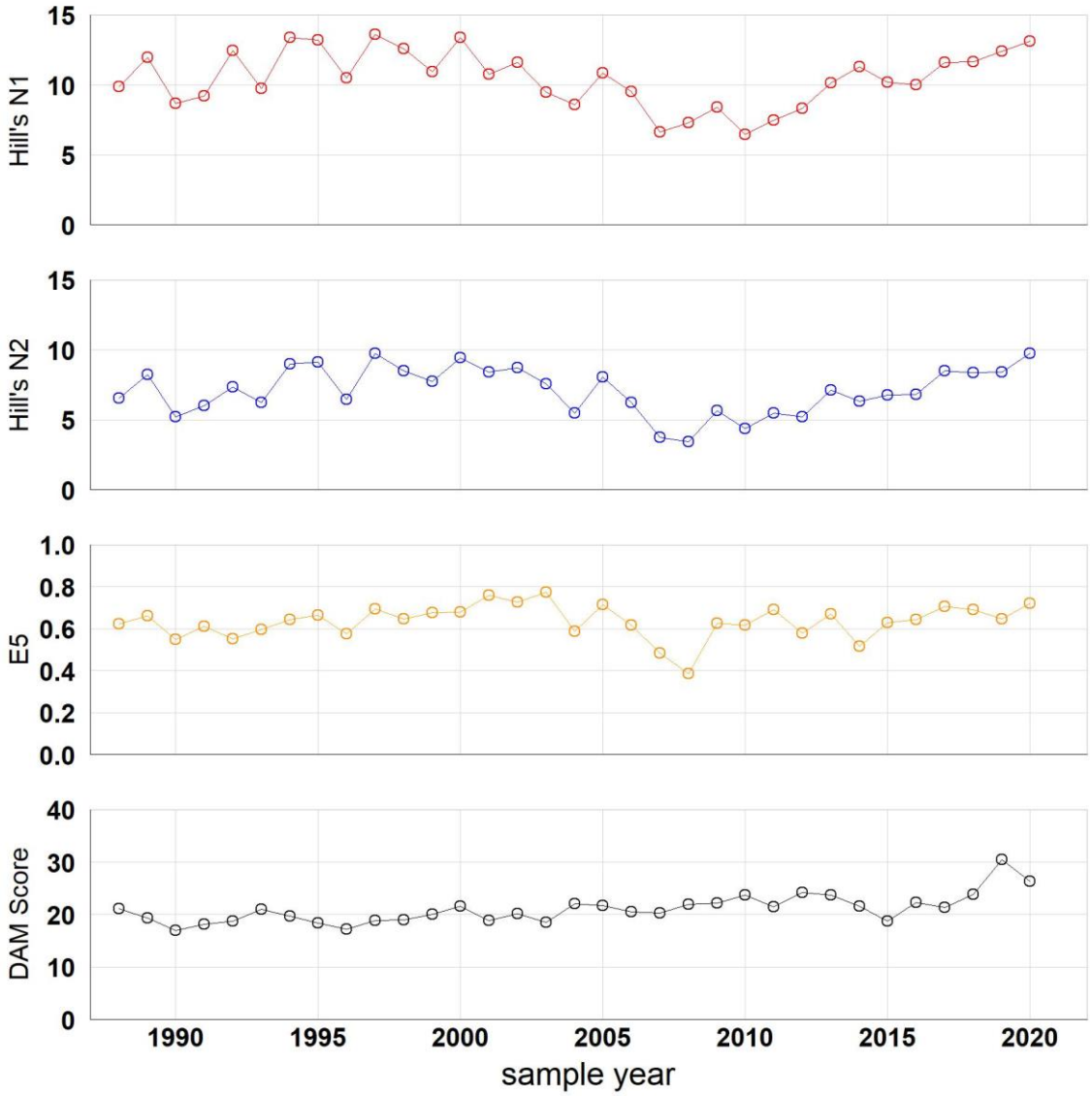
5.7.4. Round Loch of Glenhead epilithic diatoms

5.7.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

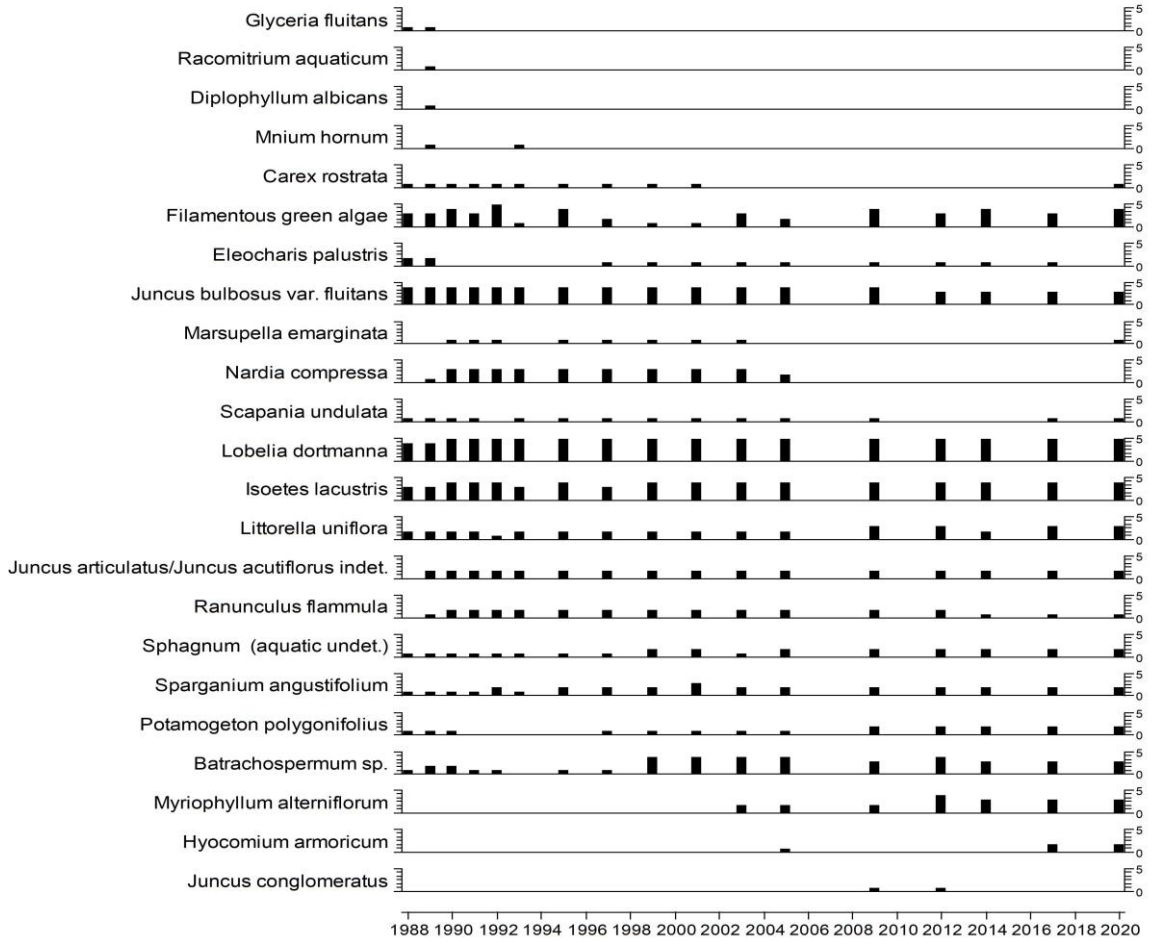
5.7.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.7.5. Round Loch of Glenhead aquatic macrophytes

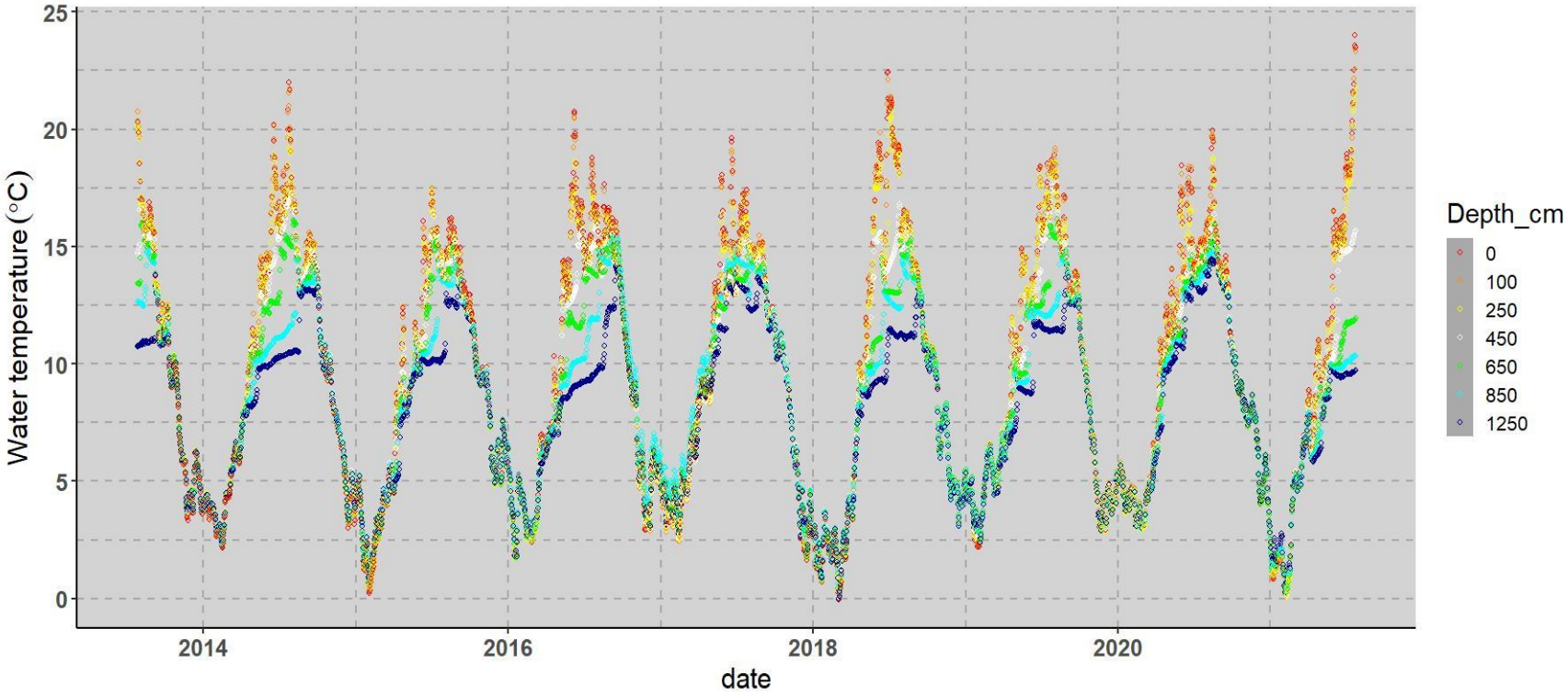
5.7.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.7.6. Round Loch of Glenhead water temperature

5.7.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

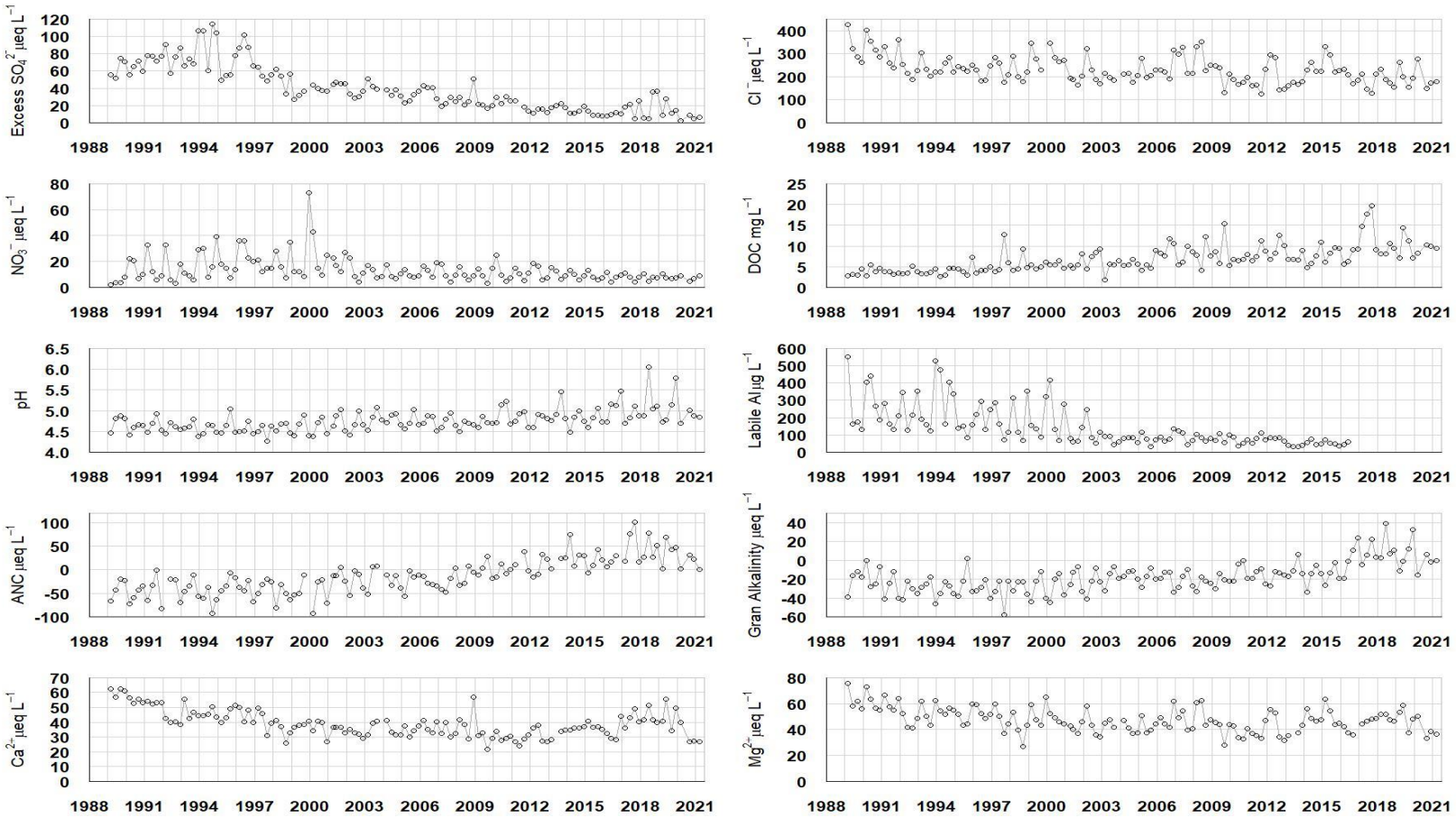
5.8. Loch Grannoch

5.8.1. Loch Grannoch site characteristics

Grid Reference	NX 542700
Lake altitude	210 m
Maximum altitude	585 m
Maximum depth	20.5 m
Mean depth	6.4 m
Volume	8.2×10^5 m^3
Lake area	114.3 ha
Catchment area	1401.3 ha
Catchment area (excl.lake)	1287 ha
Catchment:Lake ratio	12.3
Catchment geology	Granite
Catchment soils	Peats, peaty podsols, peaty gleys, skeletal soils
Catchment vegetation	Conifers – 70% Moorland – 30%
Mean annual runoff	2050 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	29.0 – 12.2
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	20.7 – 4.8
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	14.8 – 7.4
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	39.0 – 18.1

5.8.2. Loch Grannoch water chemistry

5.8.2.1. Water chemistry time series



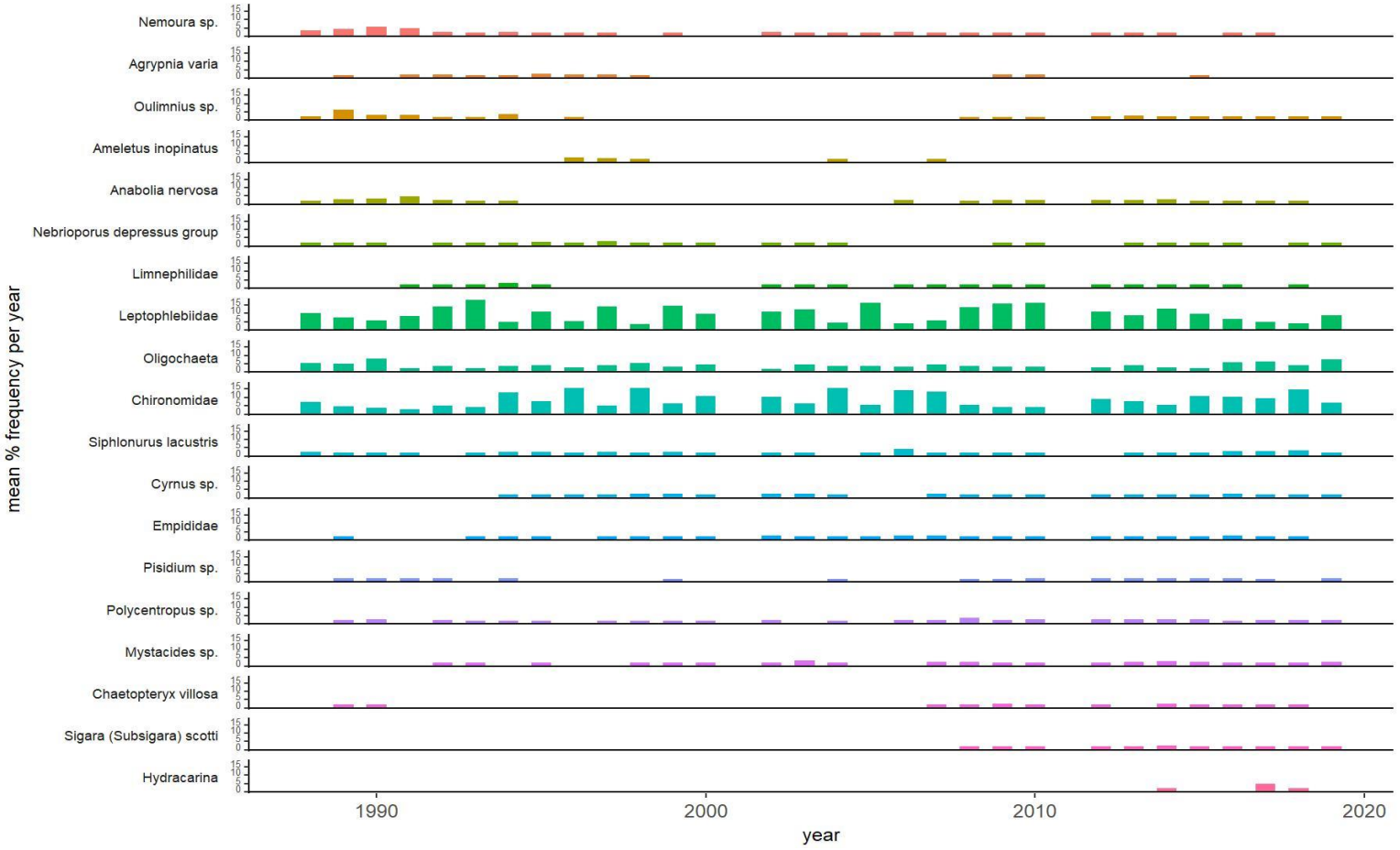
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.8.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	98.94	11.58	89.57	23.43	64.57	7.06	56.24	7.51	39.37	6.64	35.24	8.90	24.12	0.75
non-marine sulphate (μeq L^{-1})	71.23	13.06	61.11	22.78	38.12	6.80	30.22	8.52	19.94	5.37	11.17	8.99	6.04	1.83
nitrate (μeq L^{-1})	9.00	9.91	17.00	10.07	12.86	15.67	9.32	4.34	10.11	5.42	7.96	2.51	7.14	2.08
chloride (μeq L^{-1})	273.64	67.01	225.68	35.25	221.45	58.55	223.56	52.89	175.47	47.64	210.87	47.04	174.34	14.98
calcium (μeq L^{-1})	53.39	7.62	43.16	6.89	36.43	4.03	34.93	6.40	29.34	4.14	38.42	6.70	27.10	0.20
magnesium (μeq L^{-1})	57.17	9.39	51.82	8.41	45.24	7.92	44.42	8.05	37.84	7.35	47.79	6.62	36.44	2.48
sodium (μeq L^{-1})	234.90	39.70	204.45	26.34	200.10	42.95	196.62	37.30	159.65	32.24	194.66	30.62	145.29	7.09
potassium (μeq L^{-1})	5.37	2.69	4.60	2.20	5.63	1.07	5.54	3.31	6.83	1.93	7.25	2.56	4.27	0.41
pH	4.62	0.16	4.51	0.16	4.67	0.22	4.70	0.15	4.81	0.22	4.88	0.36	4.87	0.09
Gran alkalinity (μeq L^{-1})	-25.00	12.63	-30.50	11.47	-22.00	12.68	-18.50	7.65	-14.77	8.92	-1.12	18.02	0.00	4.28
labile aluminium (μg L^{-1})	201.00	134.89	163.00	118.58	90.50	101.80	80.50	25.56	70.50	24.16	51.00	12.09	N/A	N/A
conductivity (μS cm^{-1})	52.50	11.63	52.00	7.11	43.00	10.68	45.00	7.47	34.45	7.51	38.50	8.94	34.00	1.91
Dissolved Organic Carbon (mg L^{-1})	3.55	0.73	4.40	2.36	5.45	1.65	7.25	2.43	7.19	2.49	9.15	3.73	9.97	0.40
Acid Neutralising Capacity (μS cm^{-1})	-42.96	23.10	-40.87	22.37	-23.04	28.66	-23.12	17.22	2.63	18.04	28.94	28.25	22.19	15.38

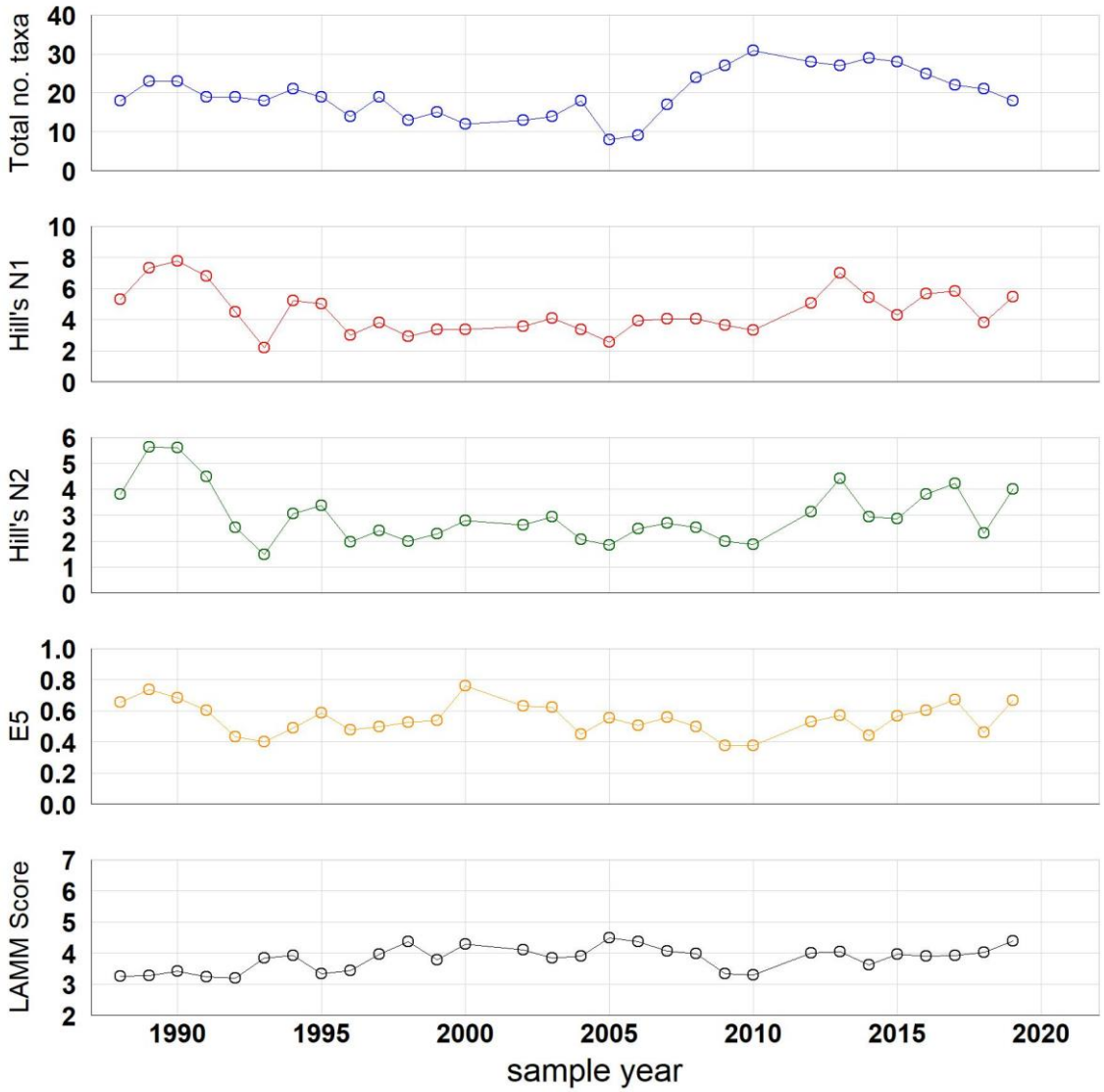
5.8.3. Loch Grannoch macroinvertebrates

5.8.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

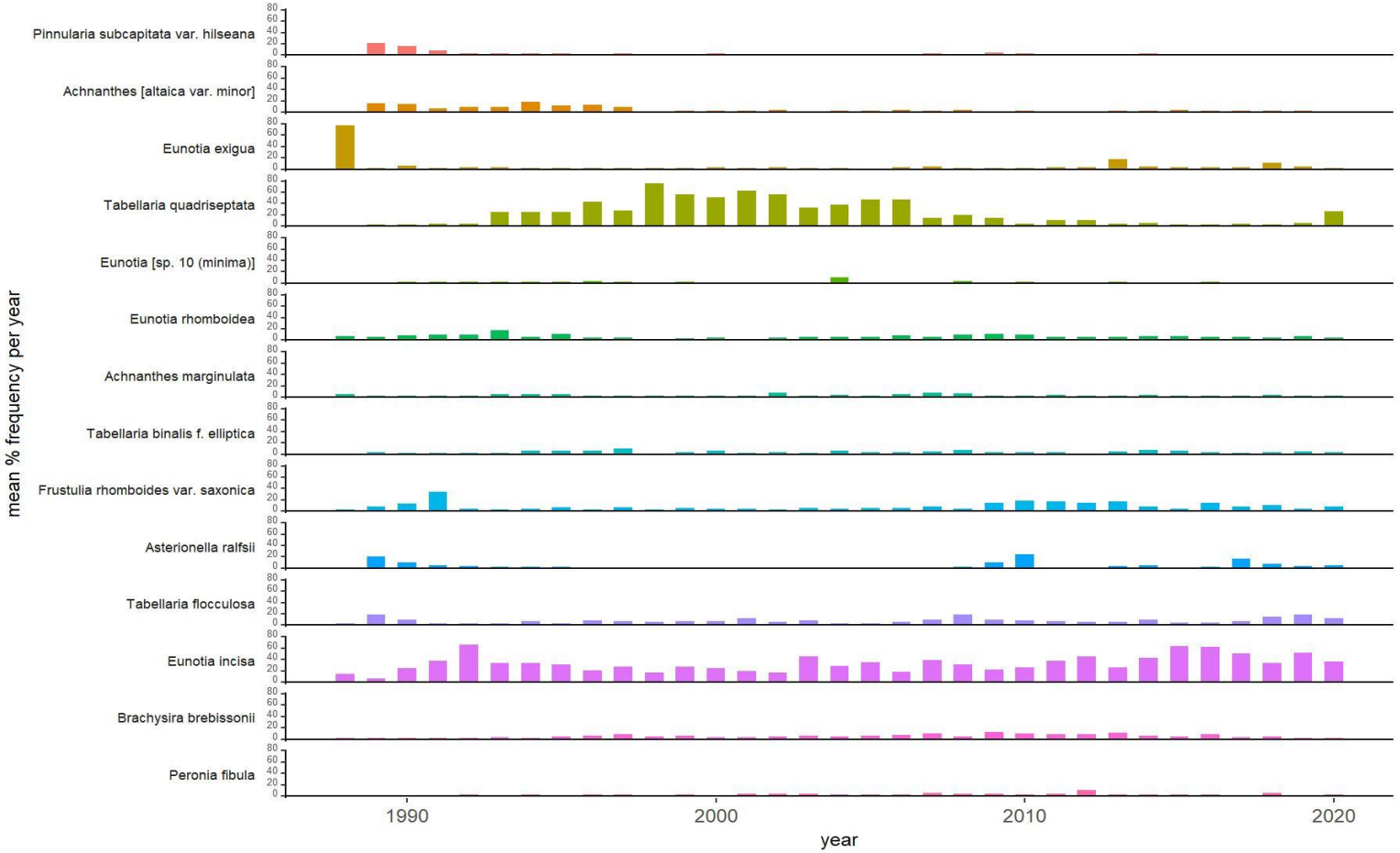
5.8.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

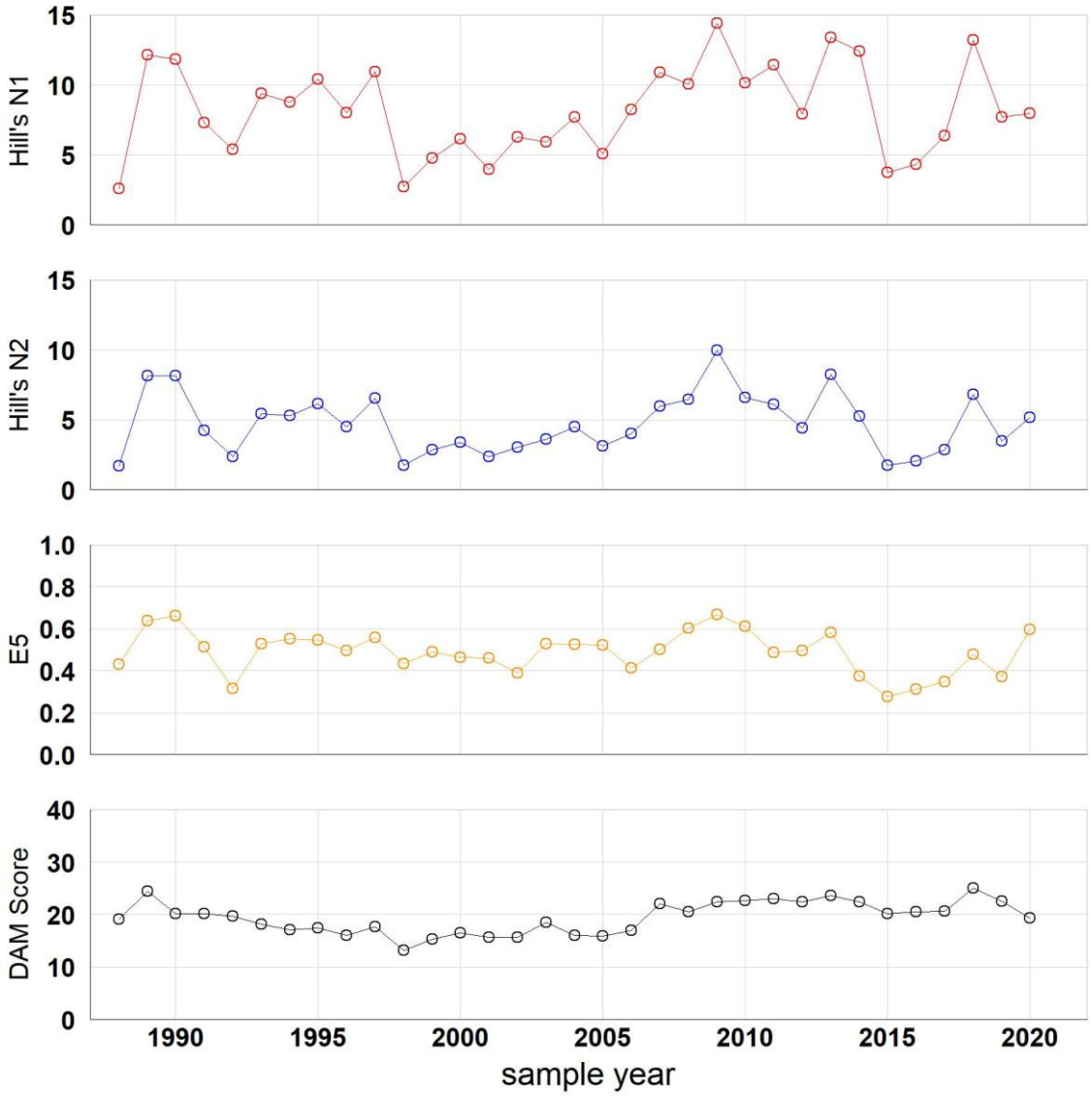
5.8.4. Loch Grannoch epilithic diatoms

5.8.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

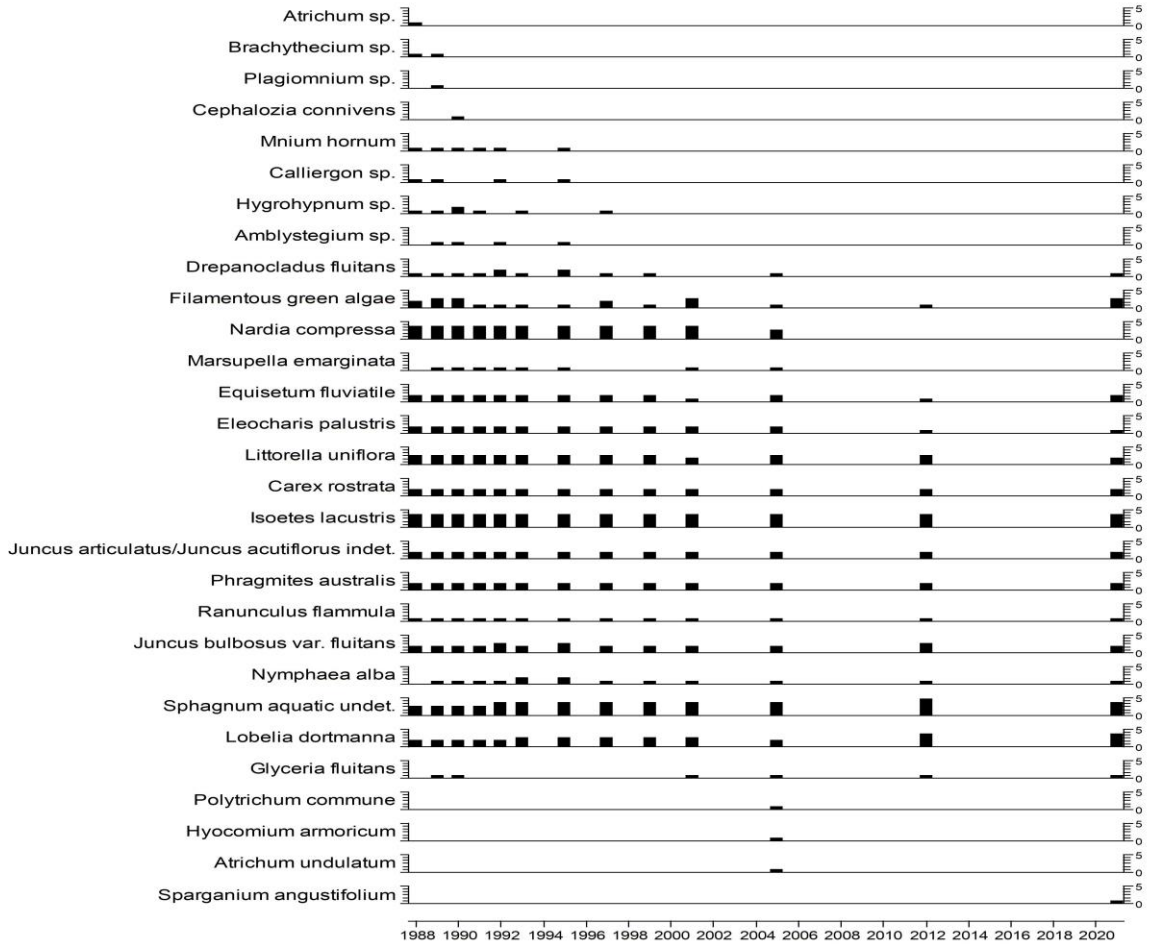
5.8.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.8.5. Loch Grannoch aquatic macrophytes

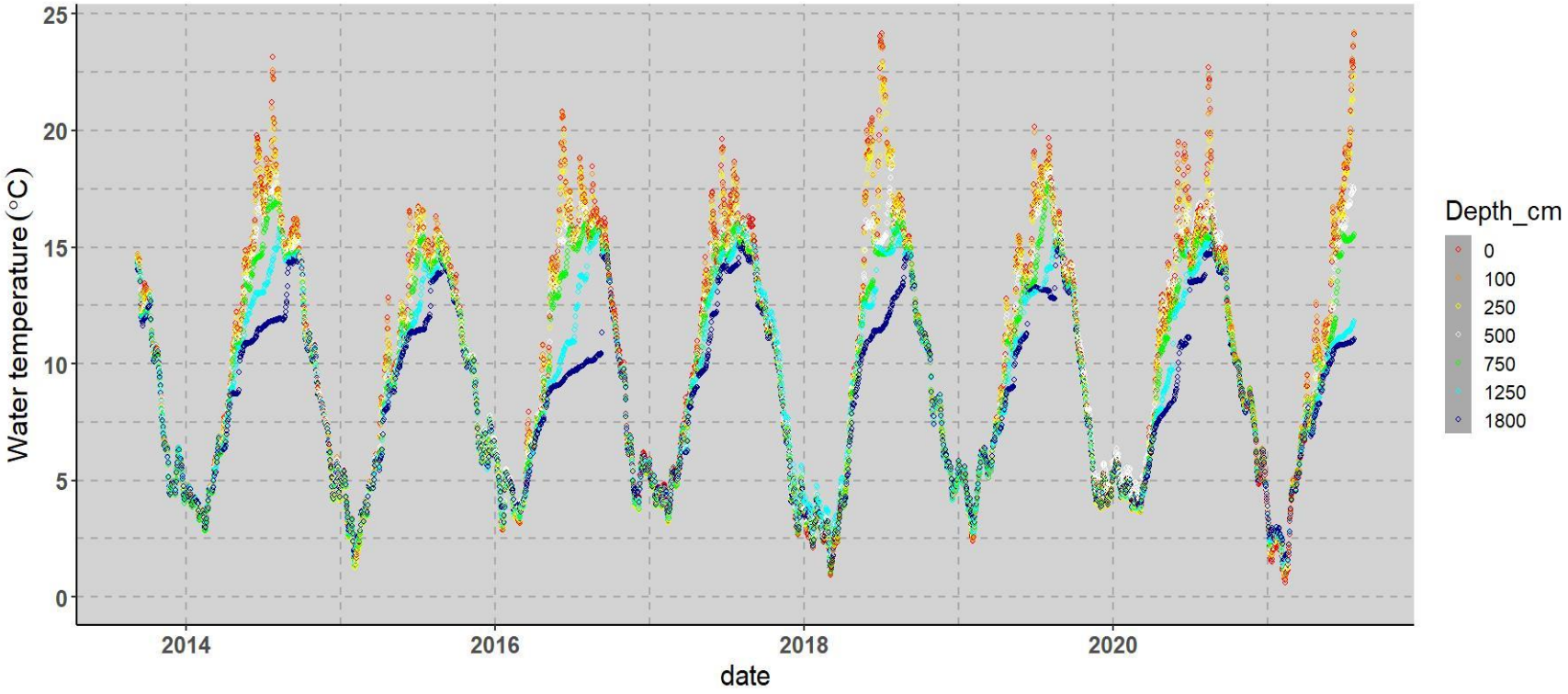
5.8.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.8.6. Loch Grannoch water temperature

5.8.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

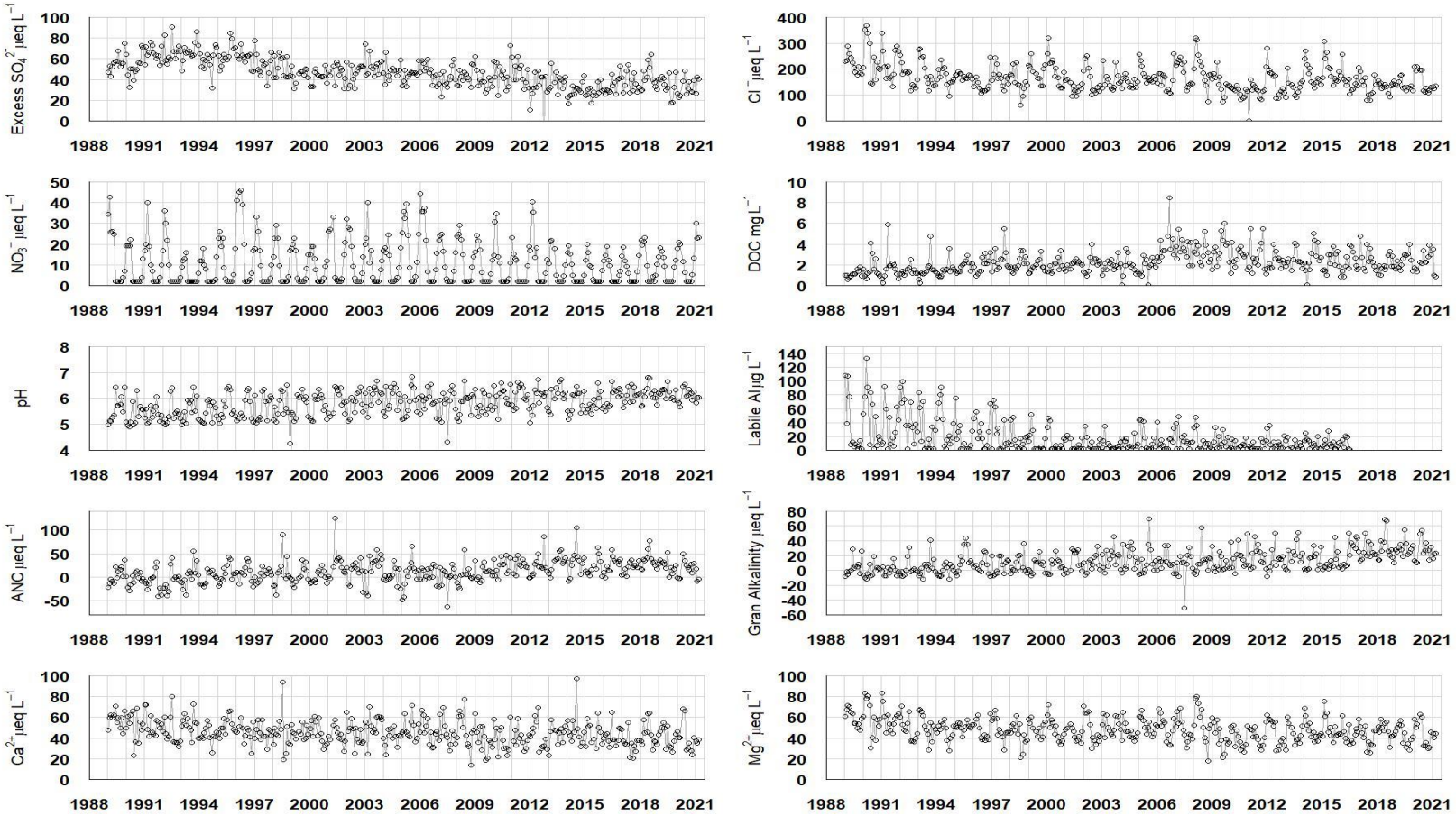
5.9. Dargall Lane Burn

5.9.1. Dargall Lane Burn site characteristics

Grid Reference	NX 449786
Catchment area	210 ha
Minimum catchment altitude	225 m
Maximum catchment altitude	716 m
Catchment geology	Greywackes, shales, mudstones, black shale
Catchment soils	Podsols, peaty gleys, blanket peat
Catchment vegetation	moorland
Mean annual runoff	2156 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	26.5 – 13.1
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	18.7 – 4.8
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	10.1 – 6.3
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	26.7 – 16.5

5.9.2. Dargall Lane Burn water chemistry

5.9.2.1. Water chemistry time series



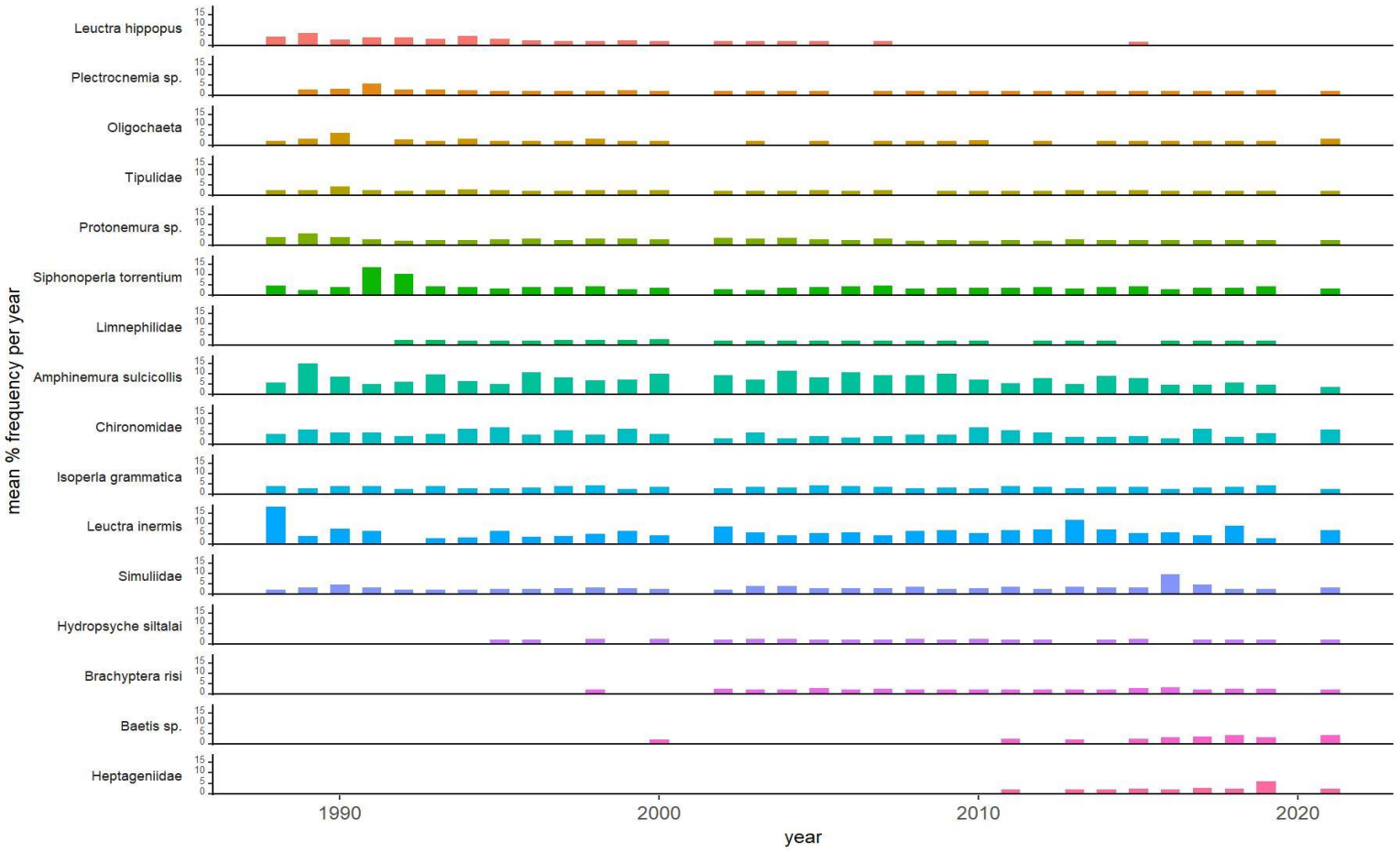
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.9.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	81.24	9.90	74.99	11.74	64.57	8.53	62.49	8.66	53.12	12.91	48.57	9.13	51.05	9.78
non-marine sulphate (μeq L^{-1})	62.12	11.09	59.47	10.89	46.68	8.84	45.21	8.37	40.02	12.85	32.11	9.80	37.71	7.43
nitrate (μeq L^{-1})	4.00	11.01	8.00	12.00	7.71	9.93	10.25	12.08	5.86	9.75	5.64	6.48	6.21	10.15
chloride (μeq L^{-1})	200.29	60.67	163.62	36.95	157.98	49.45	163.62	49.21	124.41	43.55	147.09	43.81	128.36	30.45
calcium (μeq L^{-1})	53.39	11.82	45.41	11.52	45.66	10.06	44.41	12.20	39.27	11.83	39.97	12.14	35.33	14.84
magnesium (μeq L^{-1})	54.70	12.82	48.53	9.35	48.12	10.07	49.52	12.07	40.55	10.66	45.04	9.69	40.72	11.33
sodium (μeq L^{-1})	180.53	37.46	152.25	24.97	147.90	29.05	147.90	32.44	126.78	26.17	144.64	27.51	119.62	22.72
potassium (μeq L^{-1})	9.33	3.94	8.44	2.80	8.82	3.41	8.31	3.11	8.32	2.82	8.44	2.78	8.72	3.05
pH	5.39	0.43	5.43	0.49	5.91	0.44	5.90	0.48	6.10	0.42	6.08	0.36	6.11	0.22
Gran alkalinity (μeq L^{-1})	0.00	10.59	5.00	12.32	9.00	11.75	10.00	17.27	14.00	14.57	21.70	15.74	26.80	12.62
labile aluminium (μg L^{-1})	28.00	34.99	17.00	23.92	4.00	12.47	10.00	13.67	6.00	8.57	8.00	7.36	N/A	N/A
conductivity (μS cm^{-1})	36.00	8.23	32.00	5.37	31.00	6.64	33.00	7.30	27.00	6.02	29.25	5.57	28.00	5.72
Dissolved Organic Carbon (mg L^{-1})	1.20	0.96	1.80	0.86	2.00	0.62	2.80	1.40	2.55	1.15	2.16	0.99	2.26	0.98
Acid Neutralising Capacity (μS cm^{-1})	-3.27	20.50	6.17	20.34	13.06	26.47	3.37	21.58	22.15	18.86	25.45	19.10	21.26	17.06

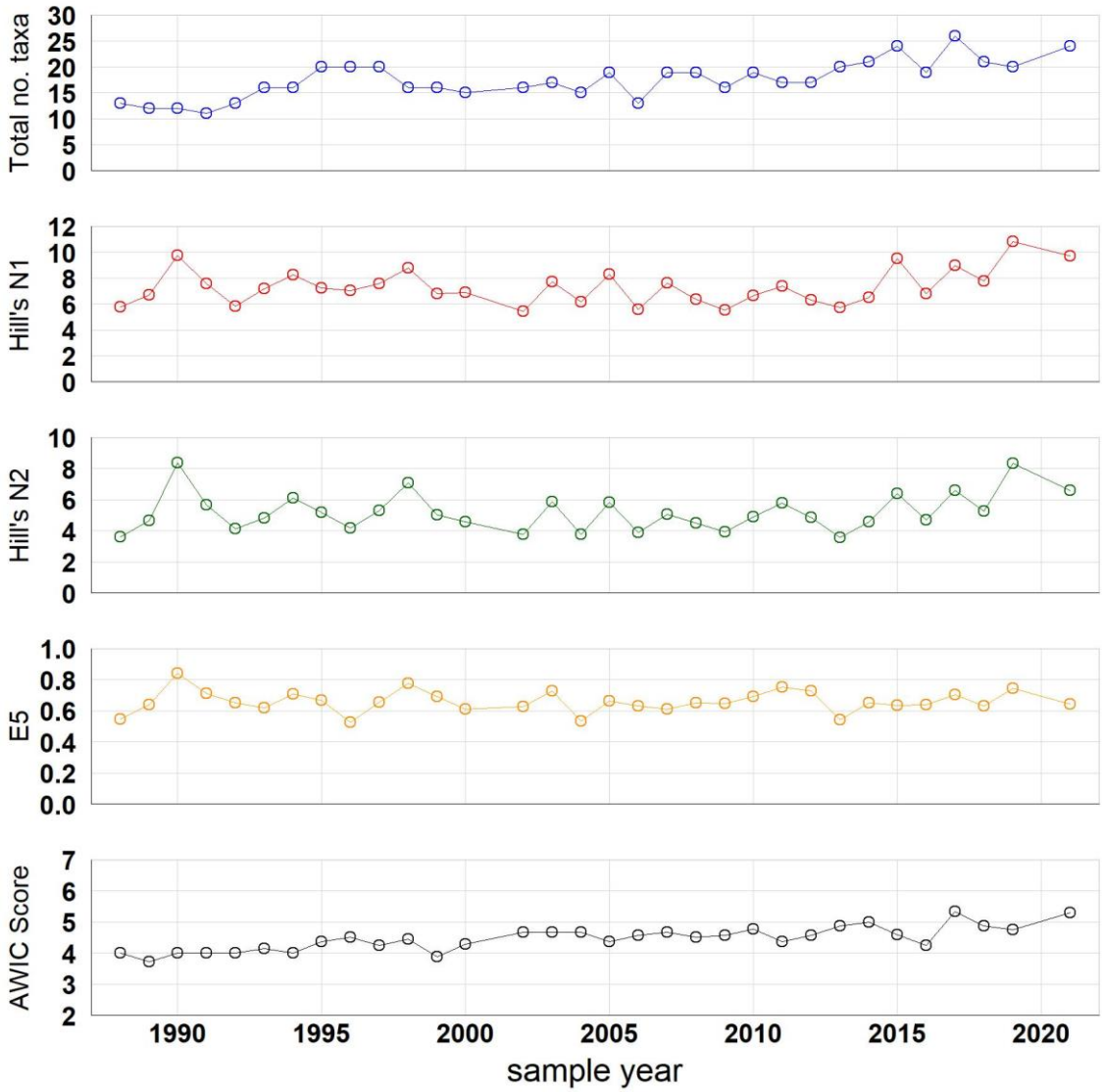
5.9.3. Dargall Lane Burn macroinvertebrates

5.9.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

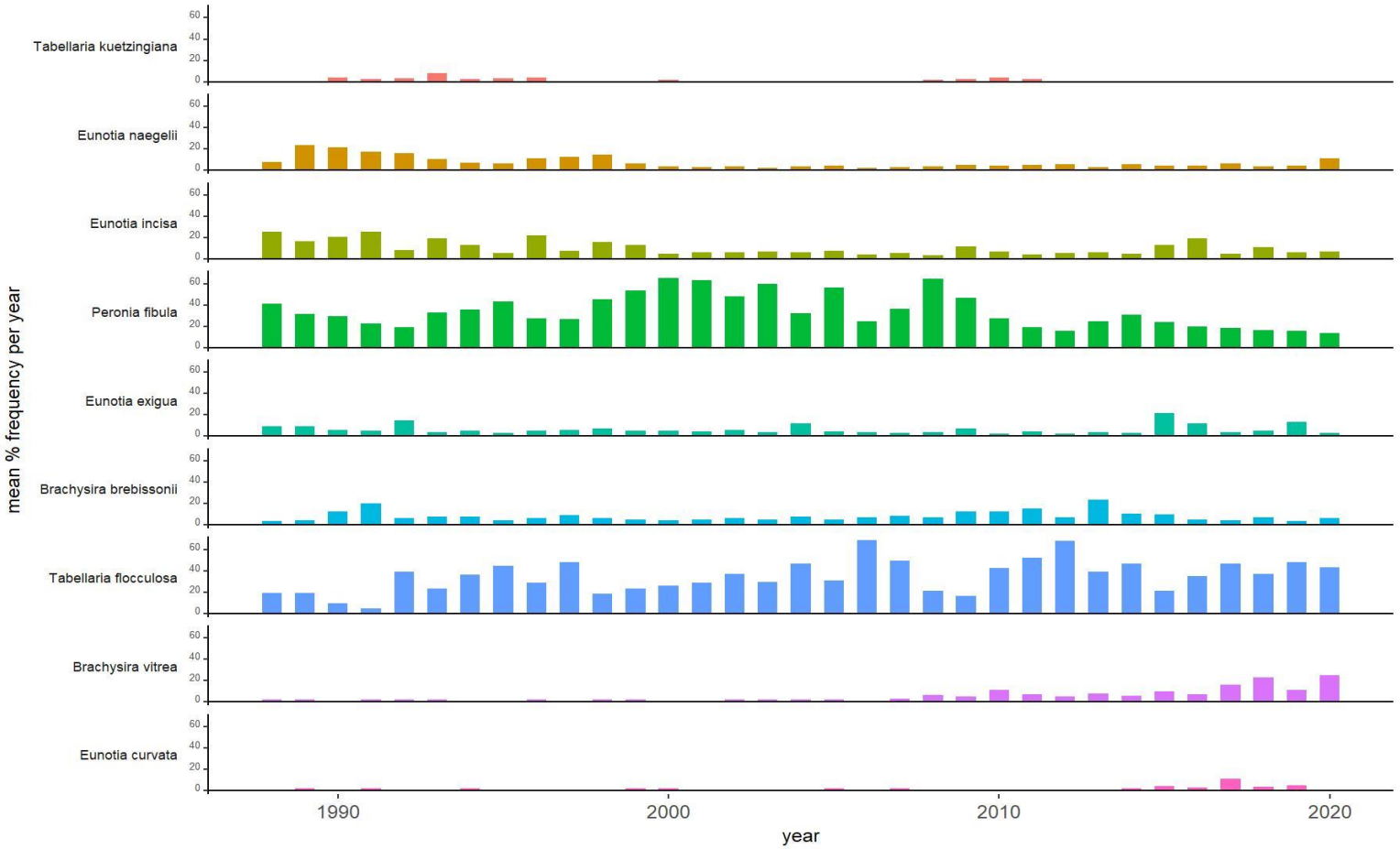
5.9.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

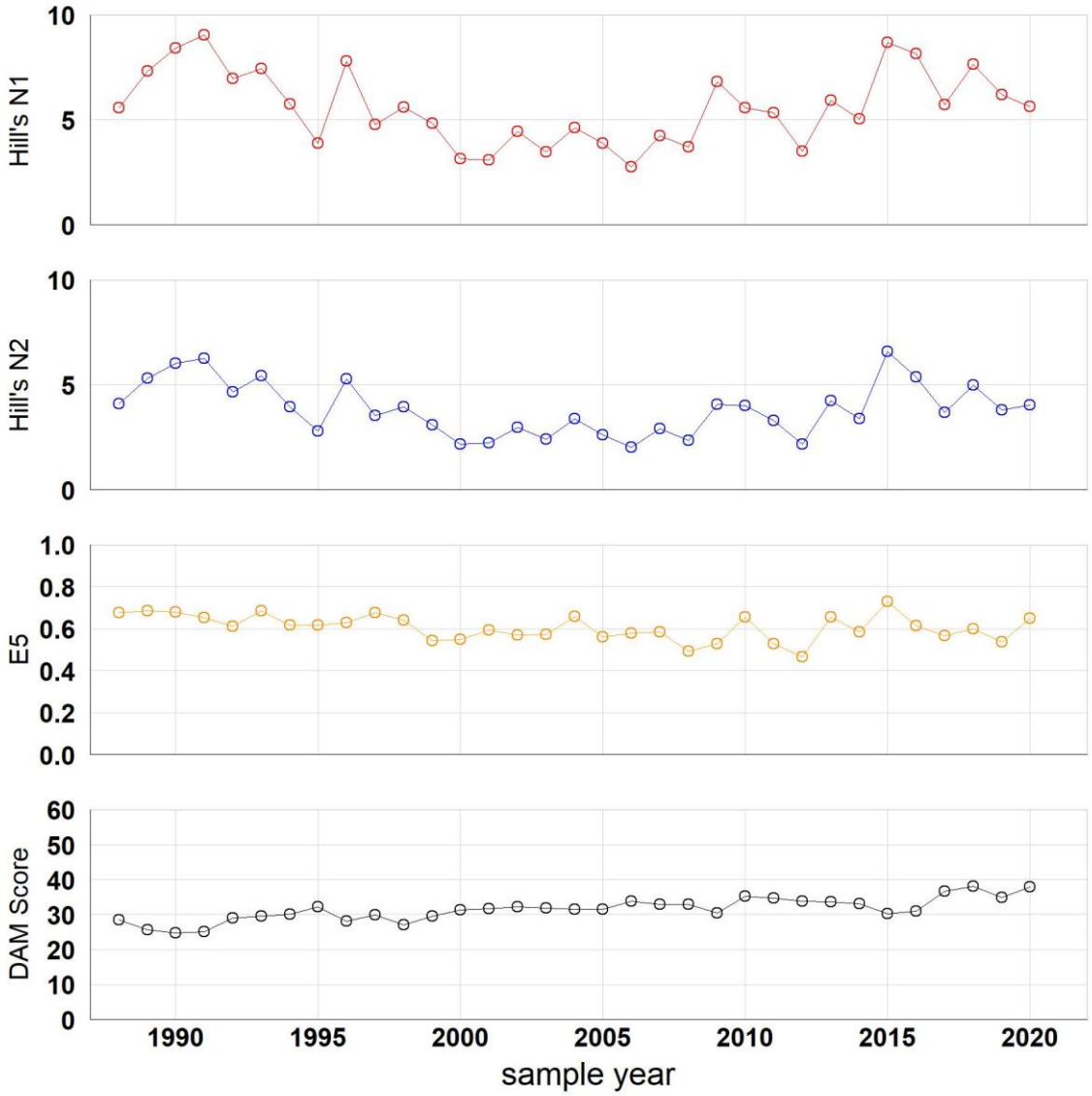
5.9.4. Dargall Lane Burn epilithic diatoms

5.9.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

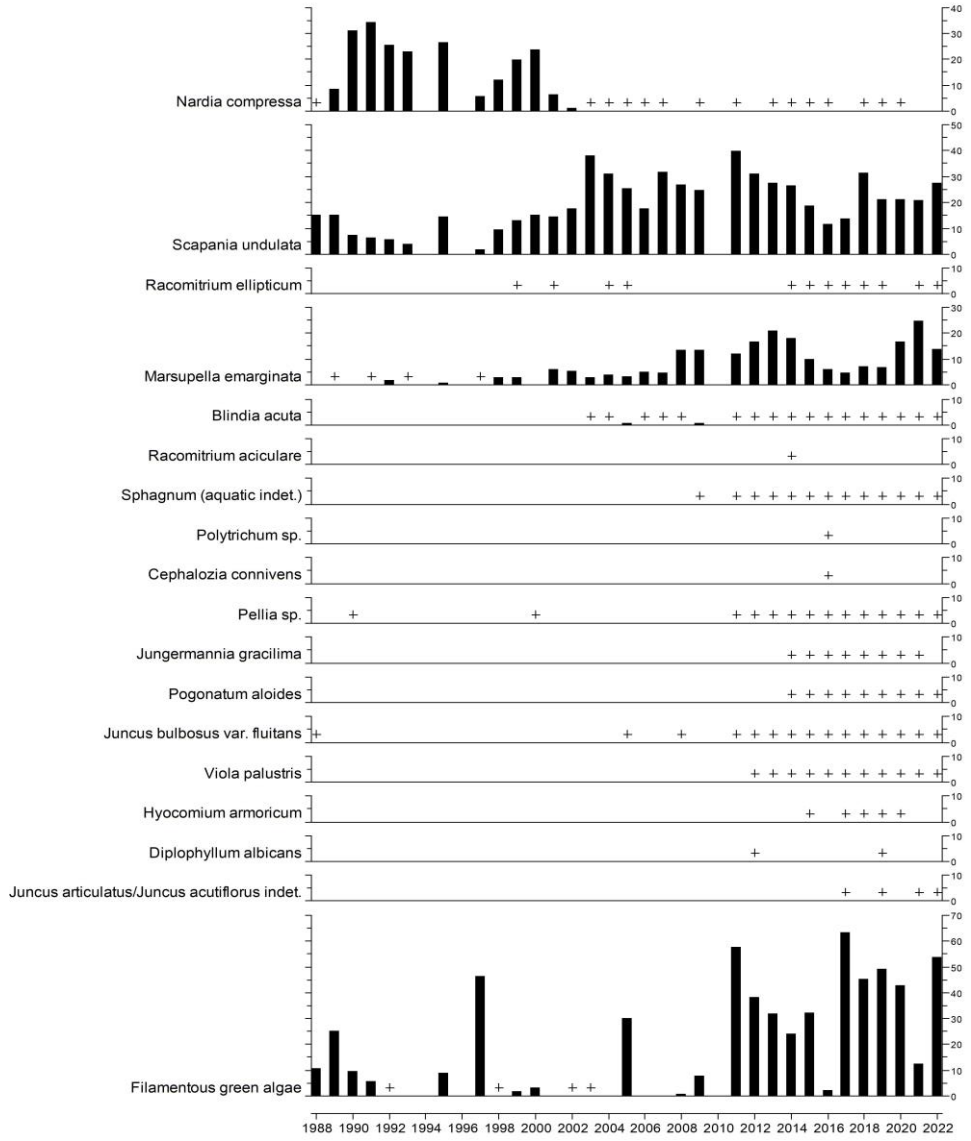
5.9.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.9.5. Dargall Lane Burn aquatic macrophytes

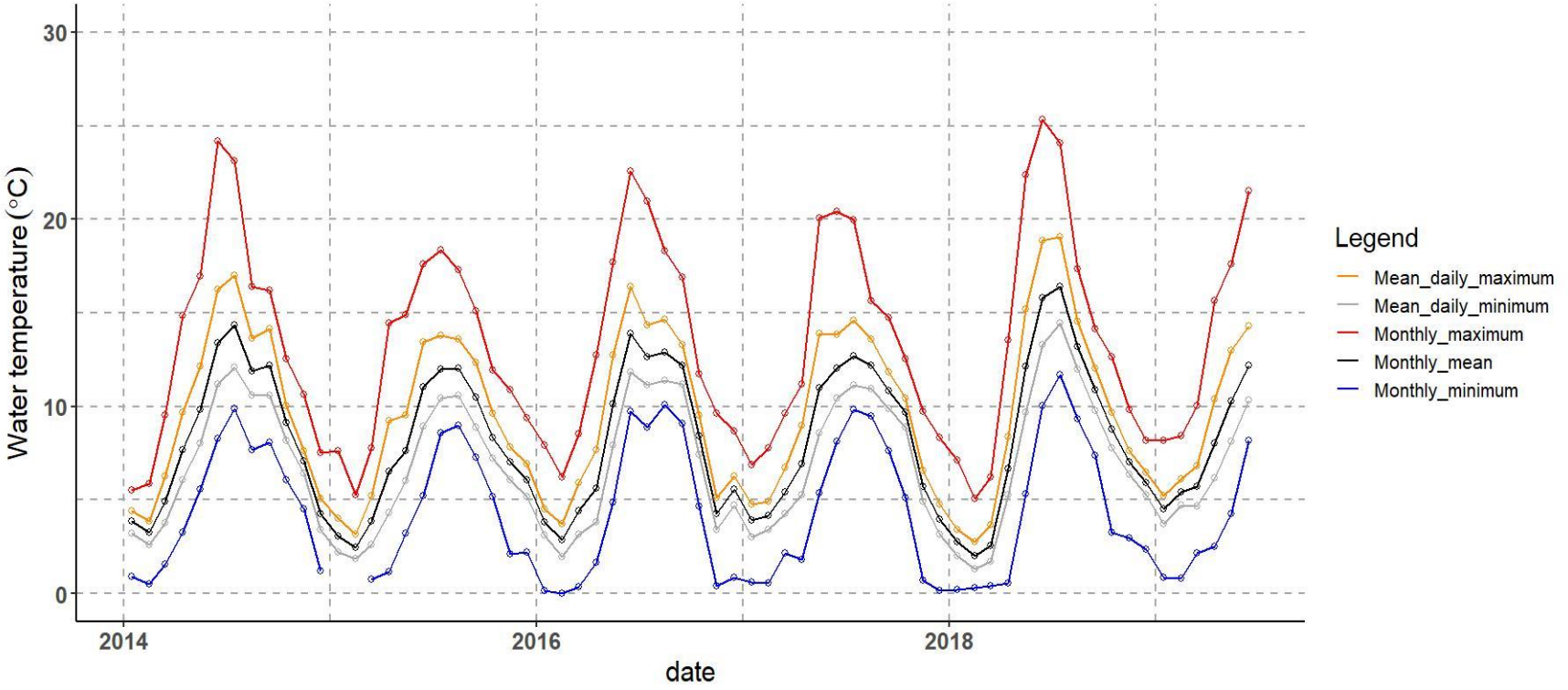
5.9.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.9.6. Dargall Lane Burn water temperature

5.9.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

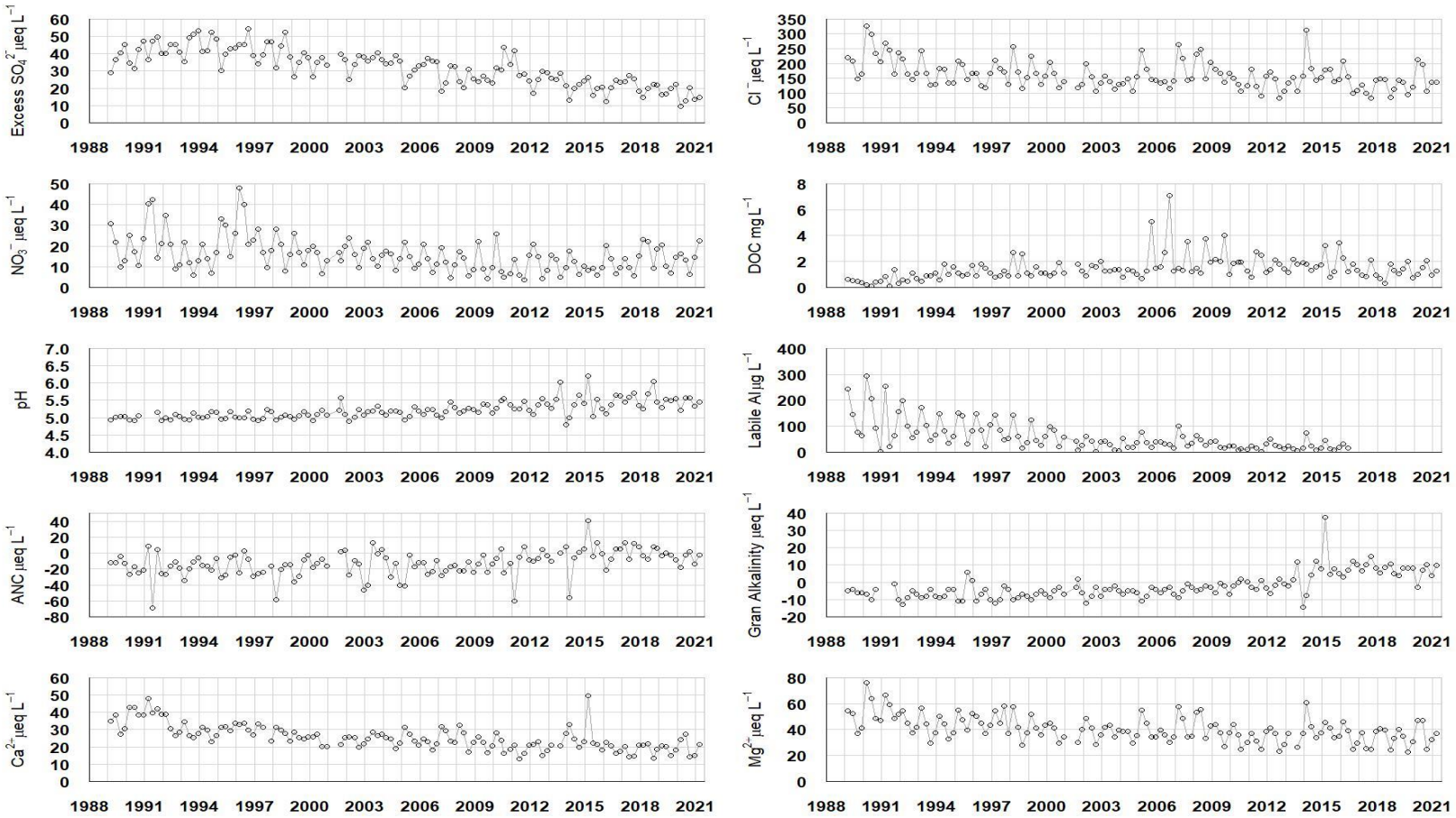
5.10. Scoat Tarn

5.10.1. Scoat Tarn site characteristics

Grid Reference	SY 159104
Lake altitude	602 m
Maximum altitude	835 m
Maximum depth	20 m
Mean depth	10 m
Volume	8.2×10^5 m^3
Lake area	5.2 ha
Catchment area	100.2 ha
Catchment area (excl.lake)	95 ha
Catchment:Lake ratio	19.3
Catchment geology	Borrowdale volcanics
Catchment soils	Shallow peaty rankers
Catchment vegetation	Moorland
Mean annual runoff	2914 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	41.1 – 18.7
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	30.5 – 8.1
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	14.7 – 10.7
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	51.3 – 22.8

5.10.2. Scoat Tarn water chemistry

5.10.2.1. Water chemistry time series



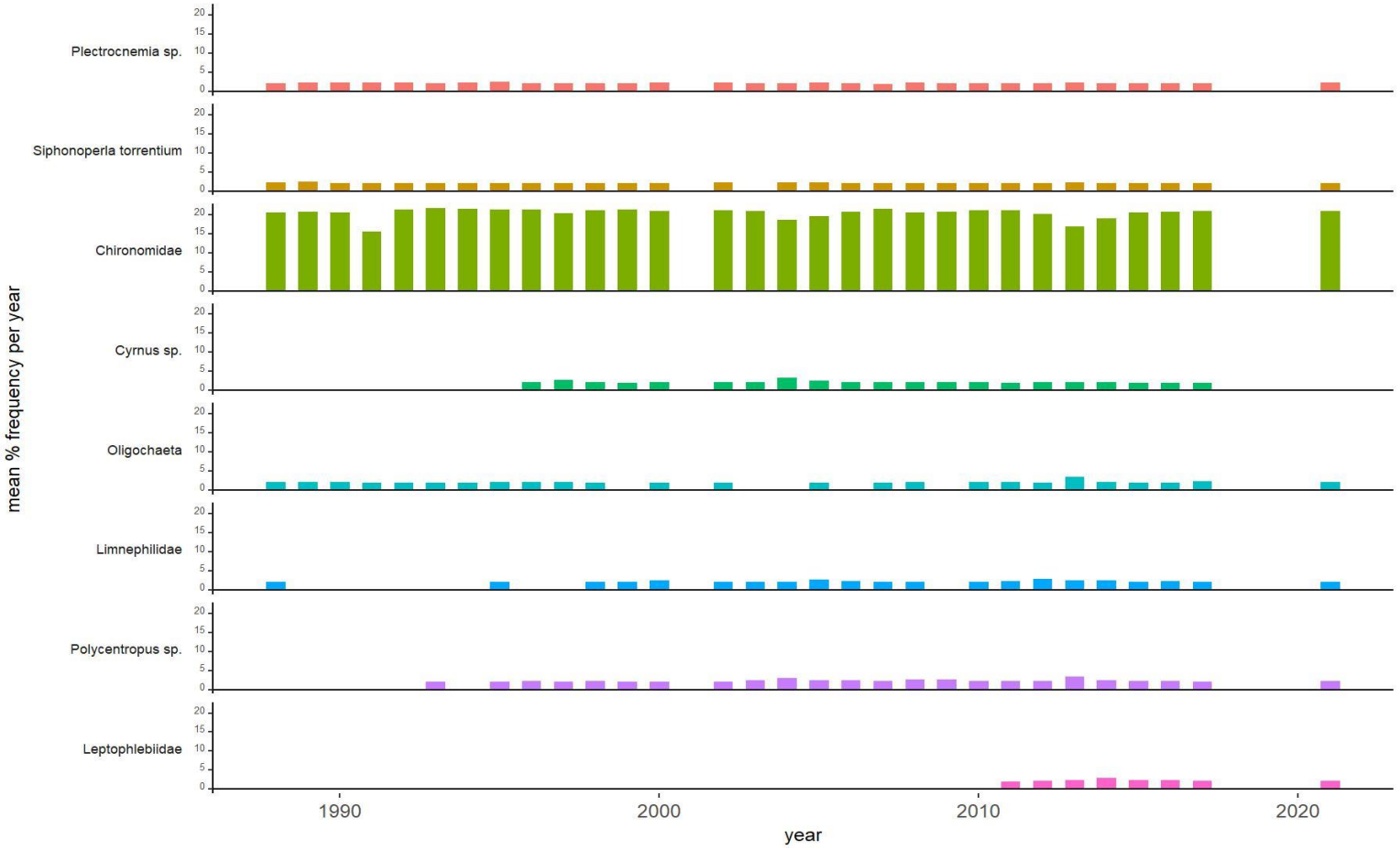
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.10.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	63.53	4.85	60.41	3.88	51.03	2.16	47.91	1.96	40.62	6.12	34.78	4.02	30.12	2.38
non-marine sulphate (μeq L^{-1})	41.66	6.73	43.08	6.55	36.50	4.70	32.78	6.25	27.12	6.30	20.41	4.03	14.07	3.43
nitrate (μeq L^{-1})	19.11	10.48	21.00	10.42	17.00	5.02	12.96	4.89	9.29	6.47	10.29	5.44	13.89	6.69
chloride (μeq L^{-1})	207.34	55.88	166.44	35.76	138.23	33.15	147.82	47.73	142.46	29.44	143.31	48.14	137.52	37.76
calcium (μeq L^{-1})	36.68	6.72	29.94	3.51	25.45	2.76	23.45	4.41	21.01	4.12	20.36	7.28	18.39	6.05
magnesium (μeq L^{-1})	48.53	11.35	44.83	8.44	40.72	6.32	37.43	8.87	36.85	6.58	36.40	8.62	34.75	9.36
sodium (μeq L^{-1})	178.35	40.79	154.43	19.68	128.32	23.32	130.50	31.79	123.11	20.48	127.89	29.27	117.88	25.69
potassium (μeq L^{-1})	7.93	2.64	6.90	1.51	6.14	1.21	5.24	1.84	4.94	2.06	5.65	1.88	4.58	1.11
pH	5.01	0.08	5.02	0.10	5.10	0.15	5.19	0.12	5.37	0.24	5.47	0.28	5.51	0.11
Gran alkalinity (μeq L^{-1})	-7.00	2.92	-8.00	4.60	-5.00	3.22	-5.00	2.46	-1.90	4.99	8.10	7.53	8.50	2.90
labile aluminium (μg L^{-1})	97.00	82.47	81.50	47.22	42.00	32.28	38.00	21.77	17.25	11.67	17.50	20.85	N/A	N/A
conductivity (μS cm^{-1})	35.70	7.32	33.00	4.88	27.00	4.03	28.00	6.72	26.20	4.92	25.75	5.80	25.00	5.23
Dissolved Organic Carbon (mg L^{-1})	0.52	0.34	1.10	0.57	1.30	0.35	1.44	1.63	1.88	0.72	1.33	0.74	1.40	0.47
Acid Neutralising Capacity (μS cm^{-1})	-16.97	15.95	-16.32	13.34	-11.07	16.68	-19.85	10.32	-6.96	15.37	-0.18	16.43	-2.32	6.71

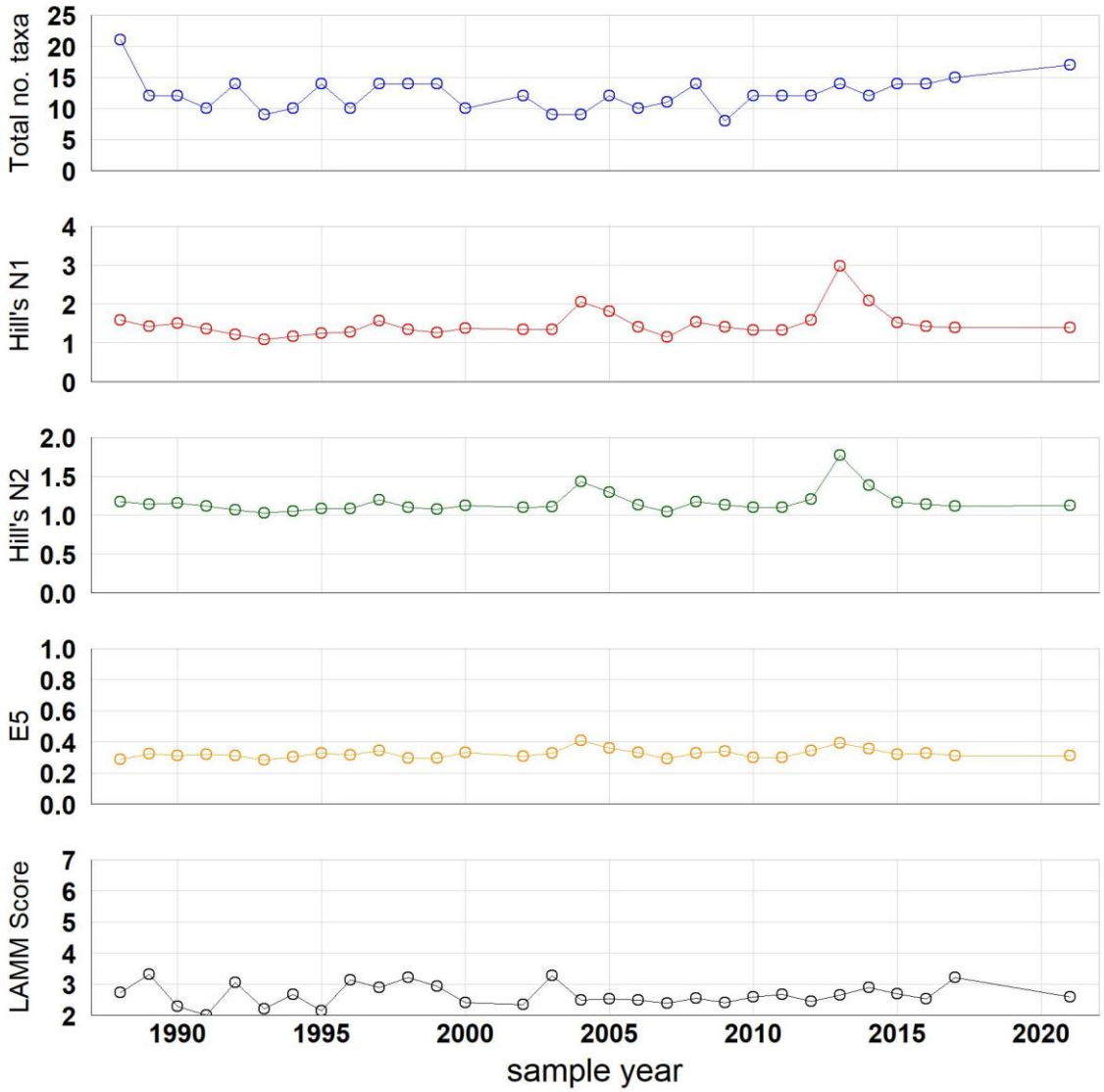
5.10.3. Scoat Tarn macroinvertebrates

5.10.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

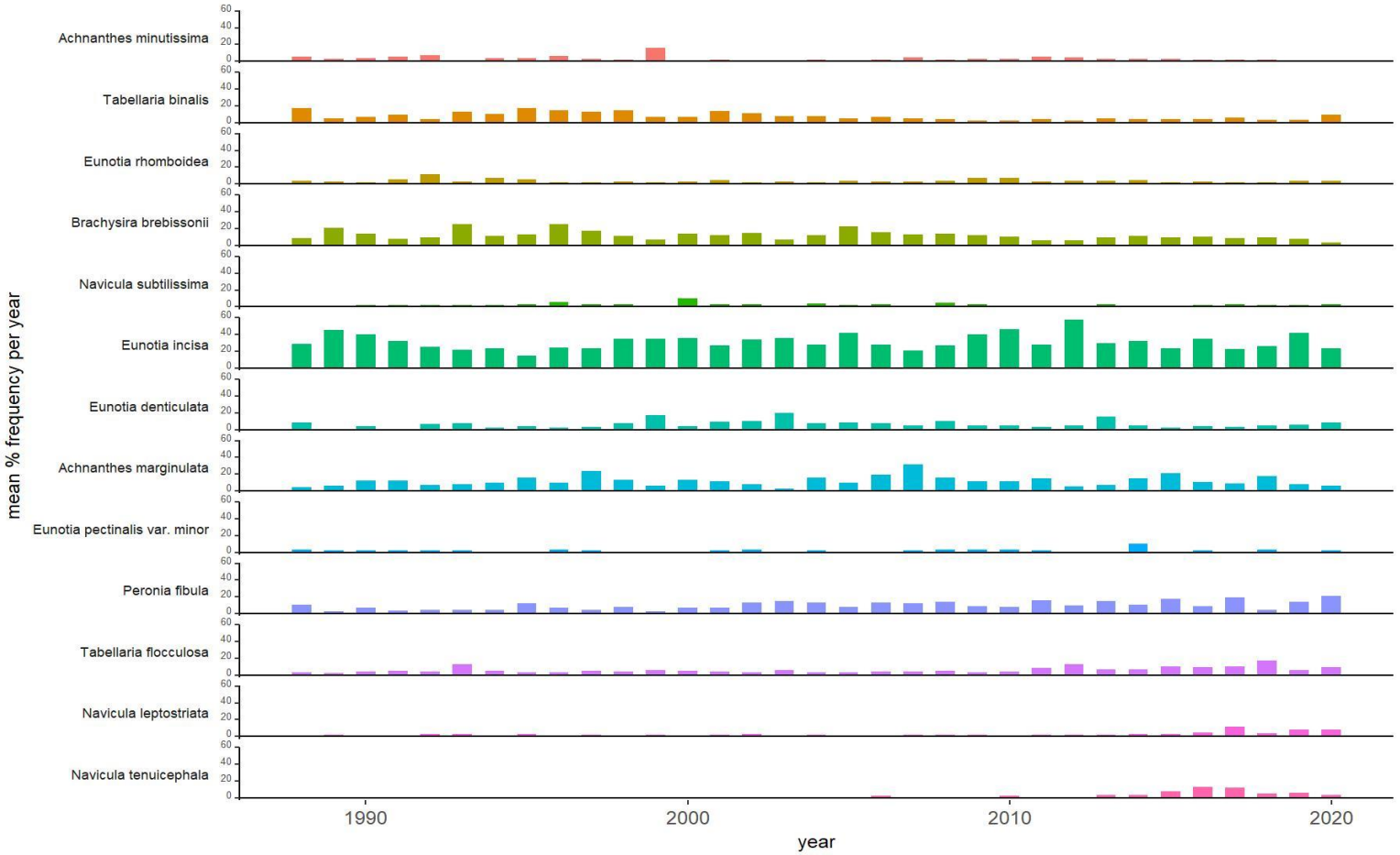
5.10.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

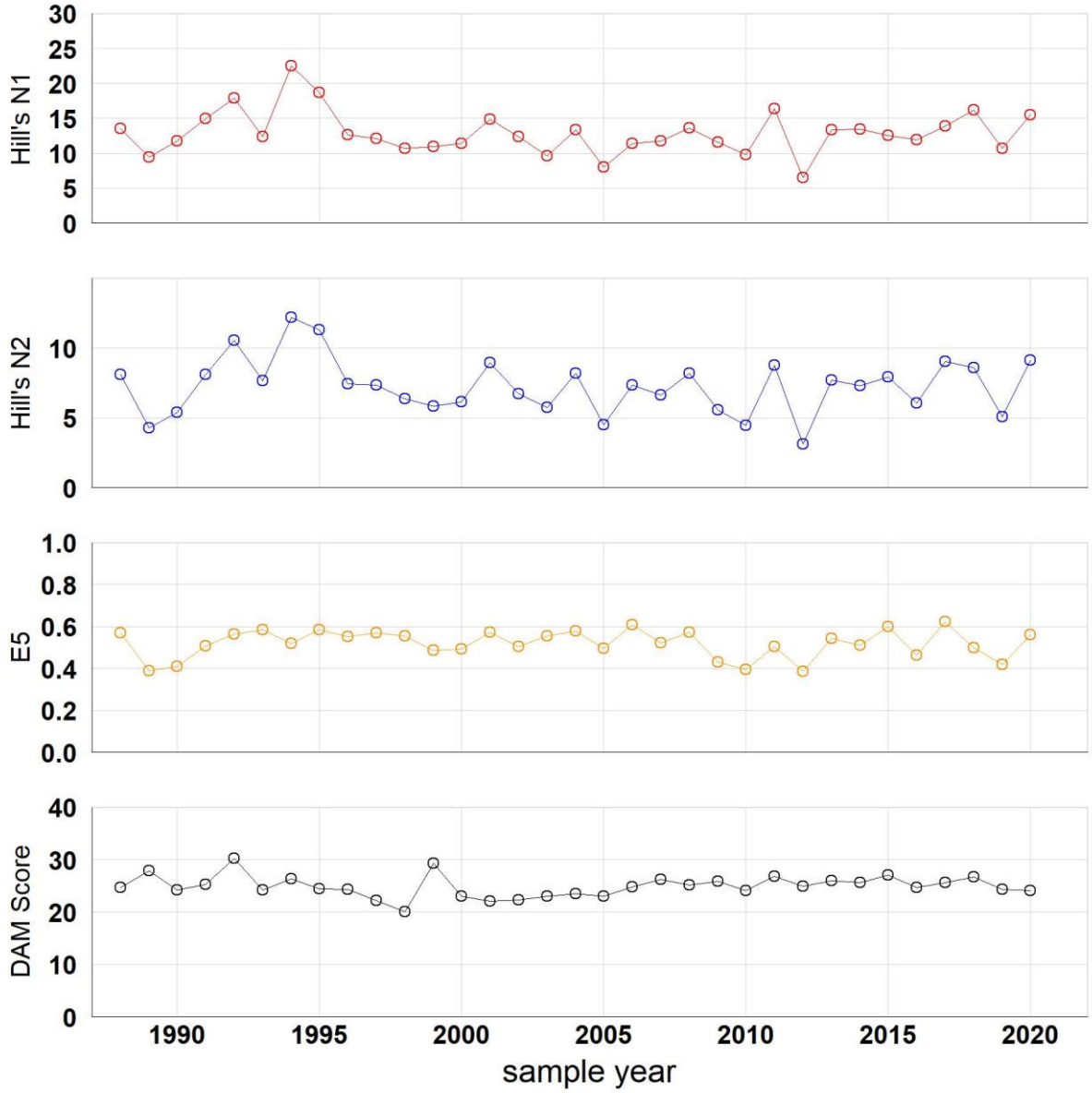
5.10.4. Scoat Tarn epilithic diatoms

5.10.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

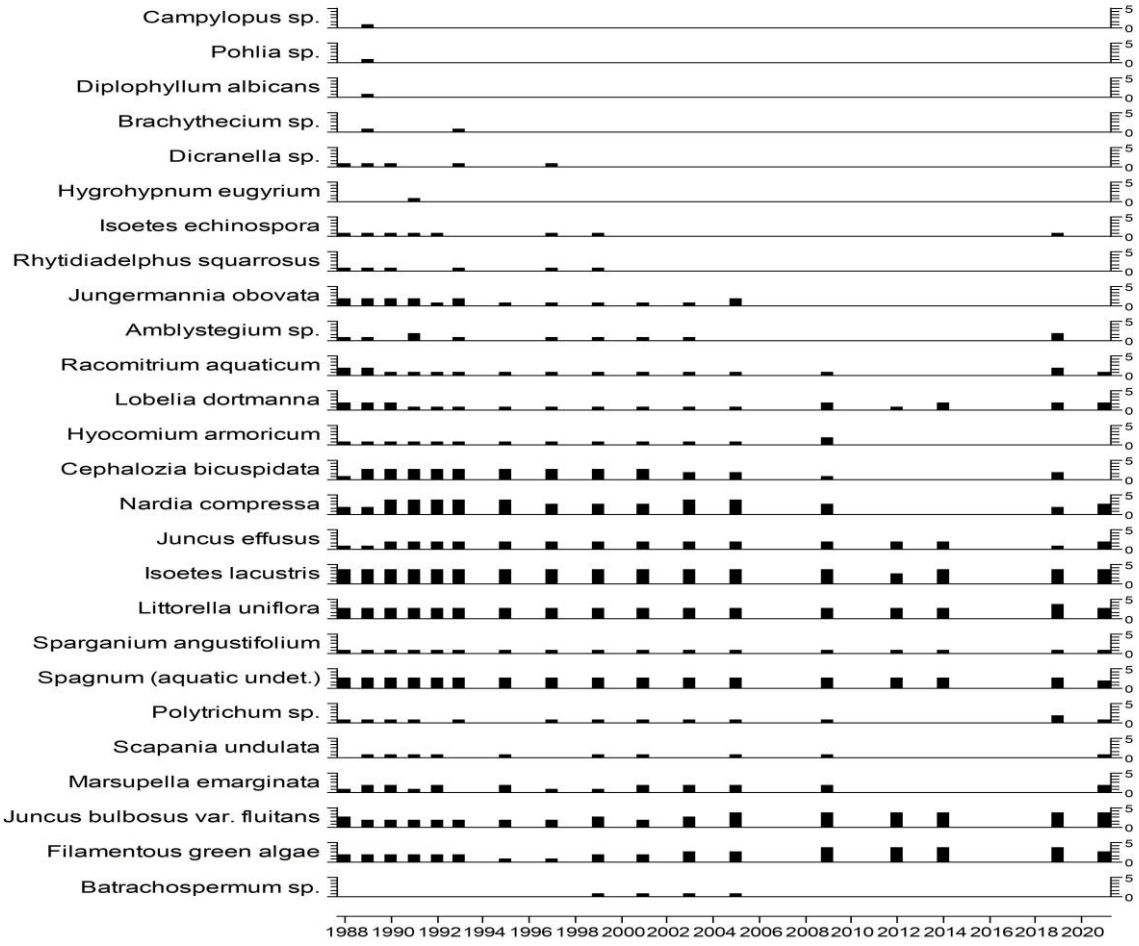
5.10.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.10.5. Scoat Tarn aquatic macrophytes

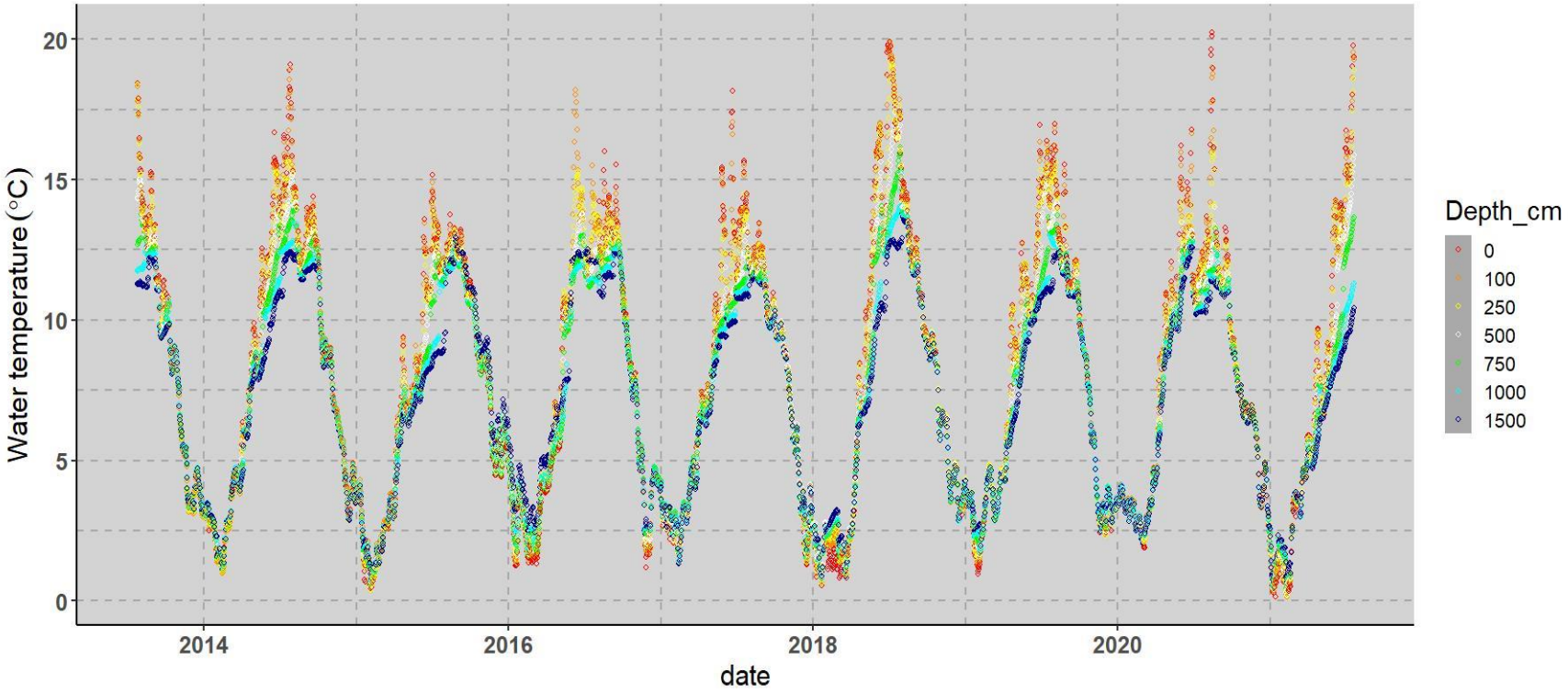
5.10.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.10.6. Scoat Tarn water temperature

5.10.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

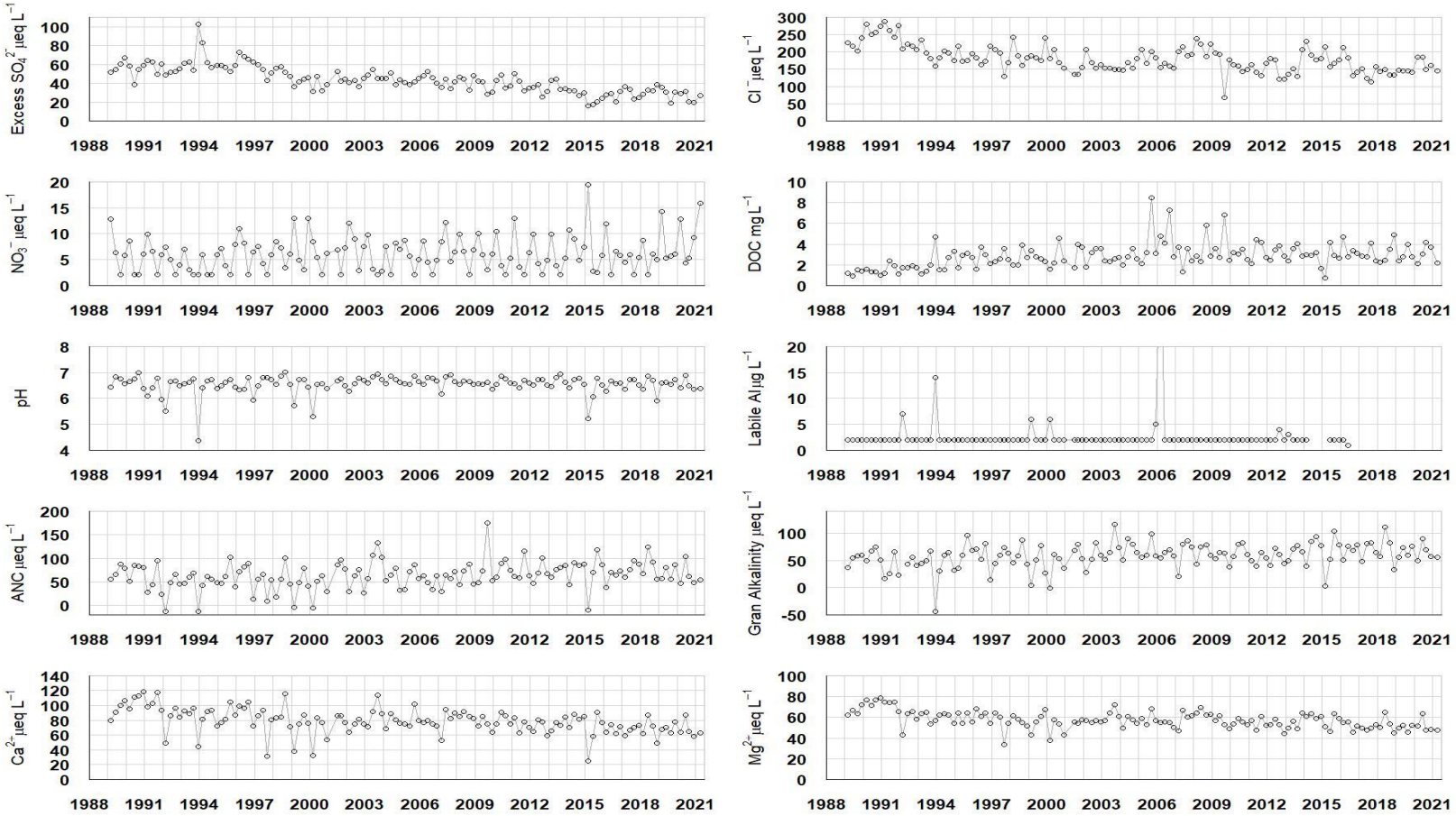
5.11. Burnmoor Tarn

5.11.1. Burnmoor Tarn site characteristics

Grid Reference	NY 184044
Lake altitude	252 m
Maximum altitude	605 m
Maximum depth	13 m
Mean depth	5.1 m
Volume	8.2×10^5 m^3
Lake area	24 ha
Catchment area	250 ha
Catchment area (excl.lake)	226 ha
Catchment:Lake ratio	10.4
Catchment geology	Andesite lava and granite
Catchment soils	Podsols shallow peat, rankers
Catchment vegetation	Moorland – 100%
Mean annual runoff	1676 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	27.7 – 10.7
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	21.2 – 4.7
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.2 – 6.2
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	32.3 – 15.0

5.11.2. Burnmoor Tarn water chemistry

5.11.2.1. Water chemistry time series



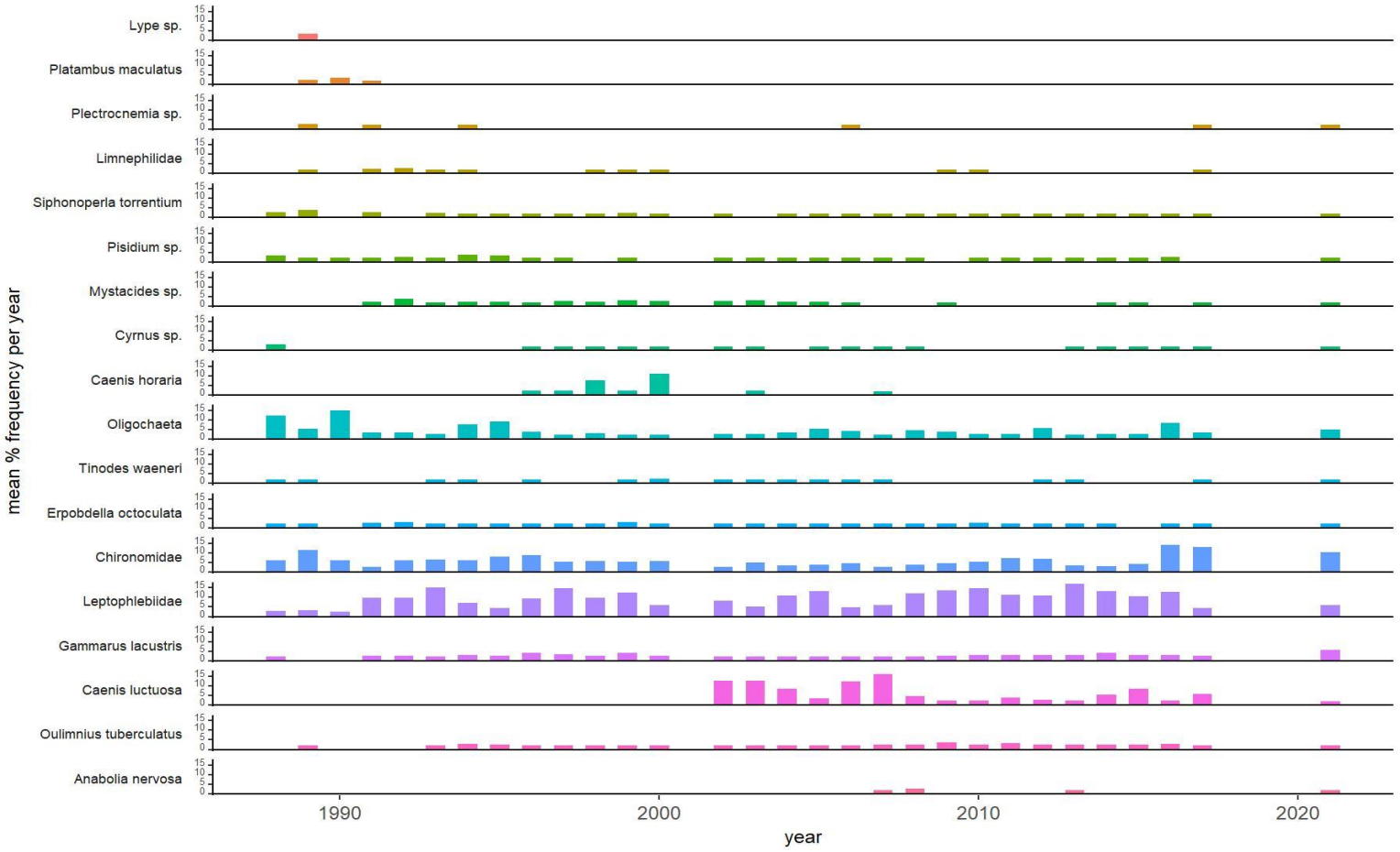
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.11.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	81.24	11.51	78.11	9.76	60.41	6.31	62.49	5.93	55.36	8.55	45.77	6.44	39.15	7.03
non-marine sulphate (μeq L^{-1})	57.05	12.18	58.03	8.89	44.27	6.14	44.01	5.33	36.68	6.64	29.70	6.17	23.52	5.70
nitrate (μeq L^{-1})	5.39	3.05	6.00	2.61	6.29	3.70	6.54	2.80	5.11	3.27	5.86	4.11	7.25	5.26
chloride (μeq L^{-1})	229.91	34.84	183.37	24.51	163.62	26.73	184.78	26.78	154.53	32.20	150.08	30.04	154.17	18.12
calcium (μeq L^{-1})	96.06	19.12	85.33	17.26	76.85	18.63	80.34	10.63	75.17	8.58	70.86	13.98	64.12	12.64
magnesium (μeq L^{-1})	65.81	9.04	60.46	7.42	56.76	8.20	58.40	6.25	53.59	5.06	52.52	6.09	48.00	7.79
sodium (μeq L^{-1})	210.97	24.41	174.00	17.24	156.60	19.90	167.47	22.04	153.58	17.95	153.99	20.36	140.94	24.11
potassium (μeq L^{-1})	8.44	3.33	7.54	1.99	7.16	1.11	6.64	1.72	6.34	2.69	6.93	2.16	7.04	1.42
pH	6.58	0.59	6.58	0.24	6.59	0.40	6.66	0.16	6.60	0.15	6.57	0.35	6.43	0.25
Gran alkalinity (μeq L^{-1})	50.00	26.53	59.50	20.25	53.00	27.75	64.50	17.71	60.85	13.30	74.70	23.55	62.90	15.83
labile aluminium (μg L^{-1})	2.00	2.85	2.00	0.00	2.00	1.26	2.00	8.49	2.00	0.49	2.00	0.41	N/A	N/A
conductivity (μS cm^{-1})	44.60	5.75	39.00	4.38	36.00	3.71	38.00	3.57	34.00	3.75	32.85	3.92	31.55	4.91
Dissolved Organic Carbon (mg L^{-1})	1.46	0.81	2.65	0.73	2.60	0.82	2.98	1.80	3.10	1.06	2.88	0.92	3.38	0.85
Acid Neutralising Capacity (μS cm^{-1})	57.96	30.09	55.27	25.57	62.70	36.42	60.49	17.83	71.32	29.15	74.70	27.23	58.61	24.85

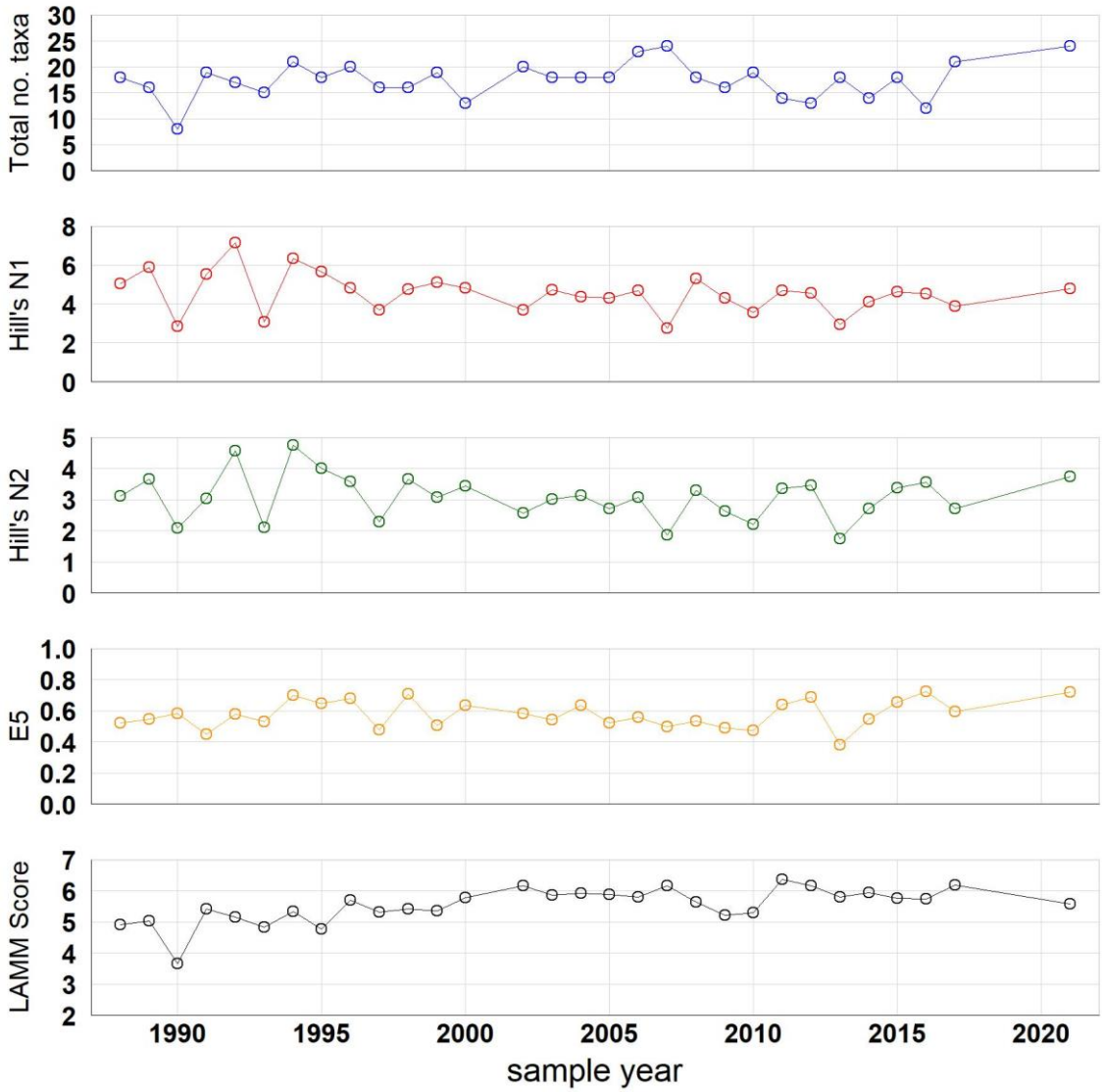
5.11.3. Burnmoor Tarn macroinvertebrates

5.11.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

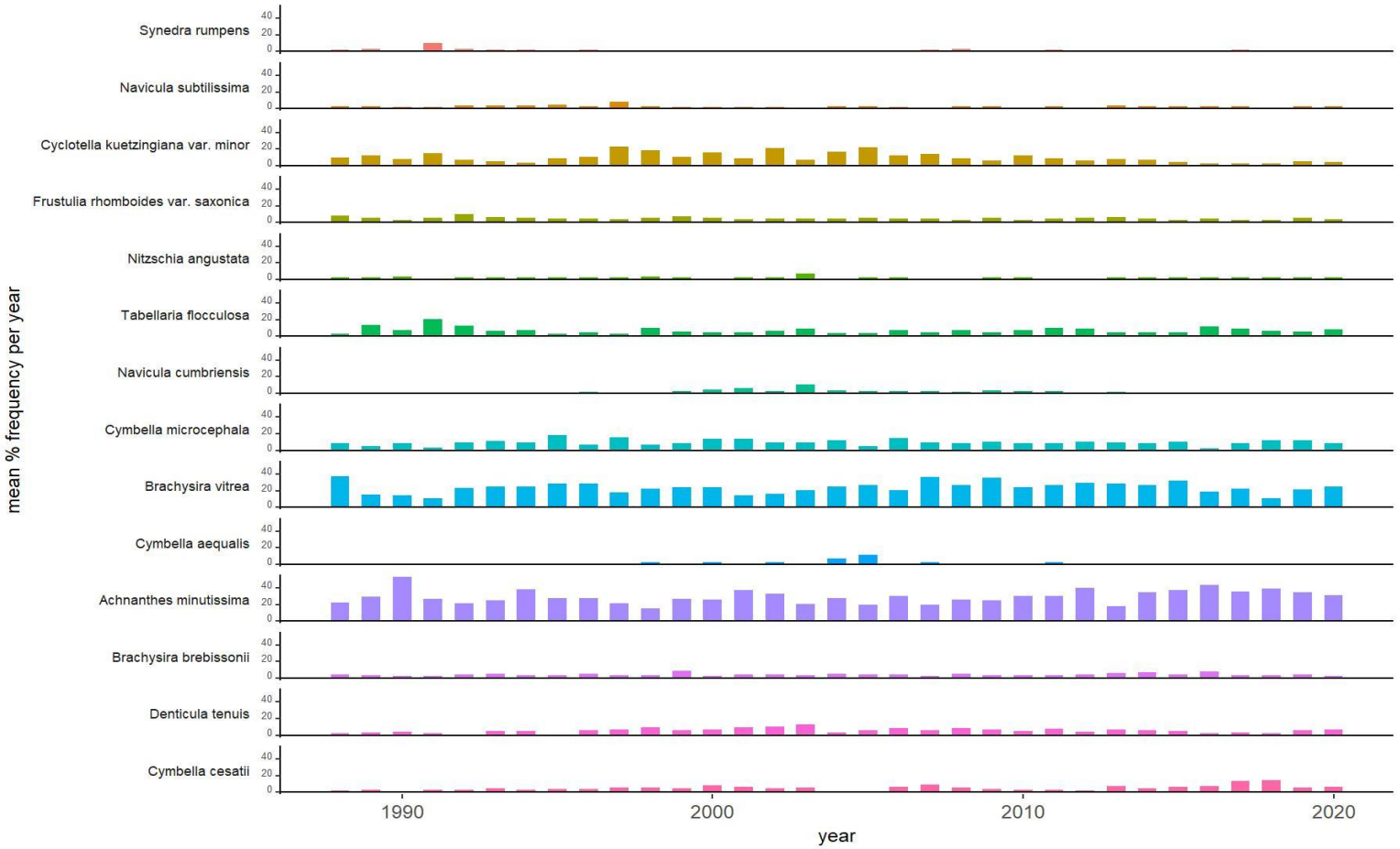
5.11.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

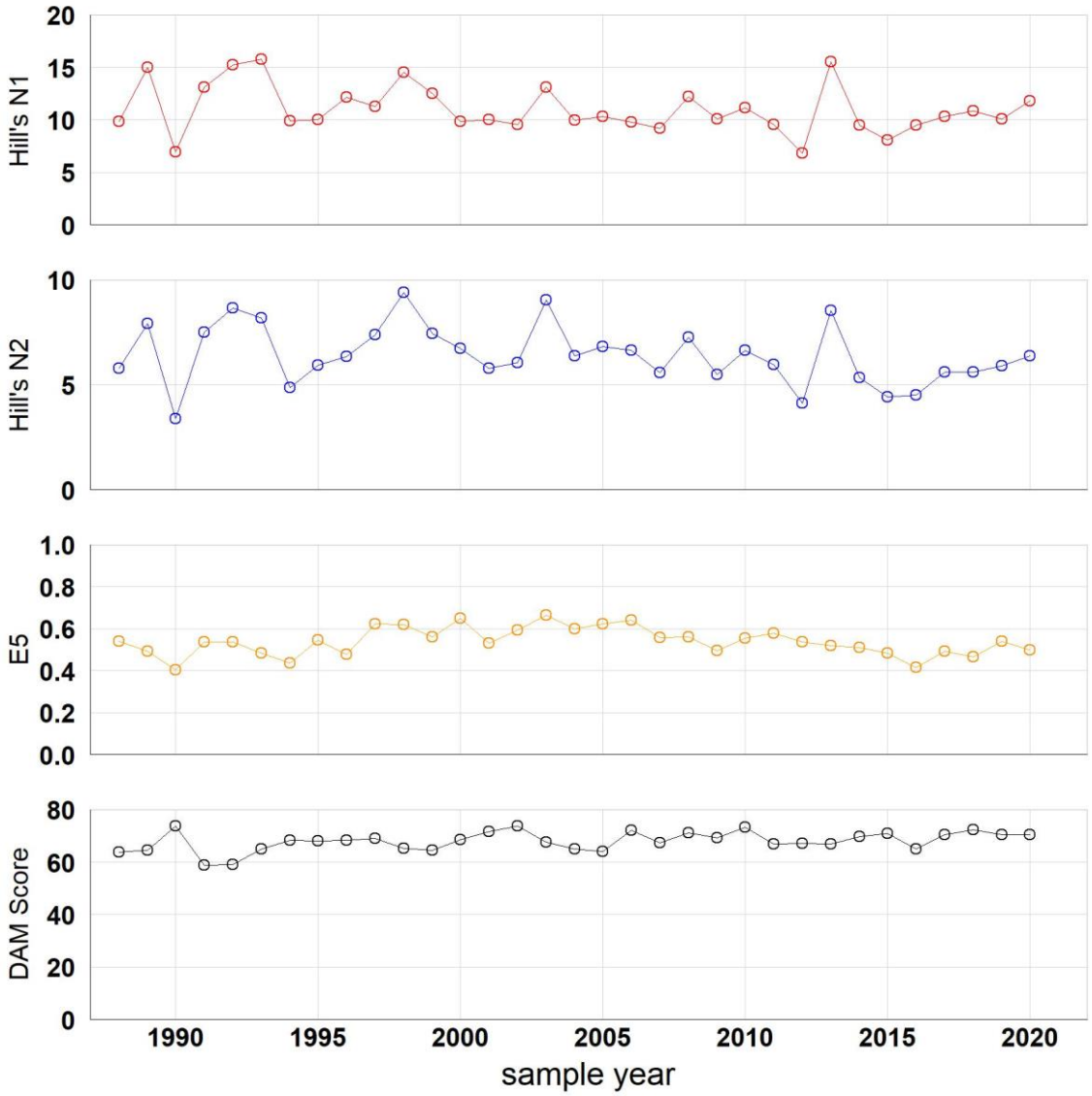
5.11.4. Burnmoor Tarn epilithic diatoms

5.11.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

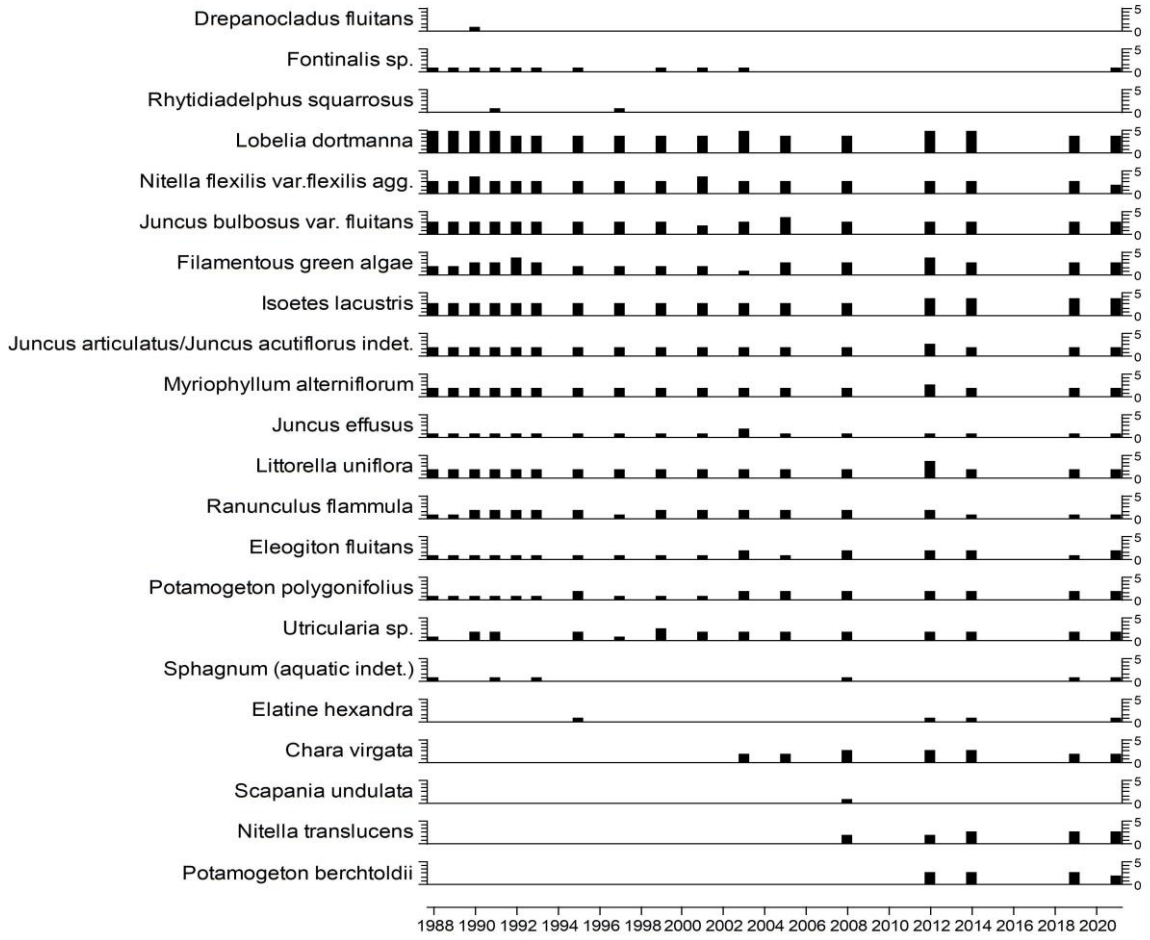
5.11.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.11.5. Burnmoor Tarn aquatic macrophytes

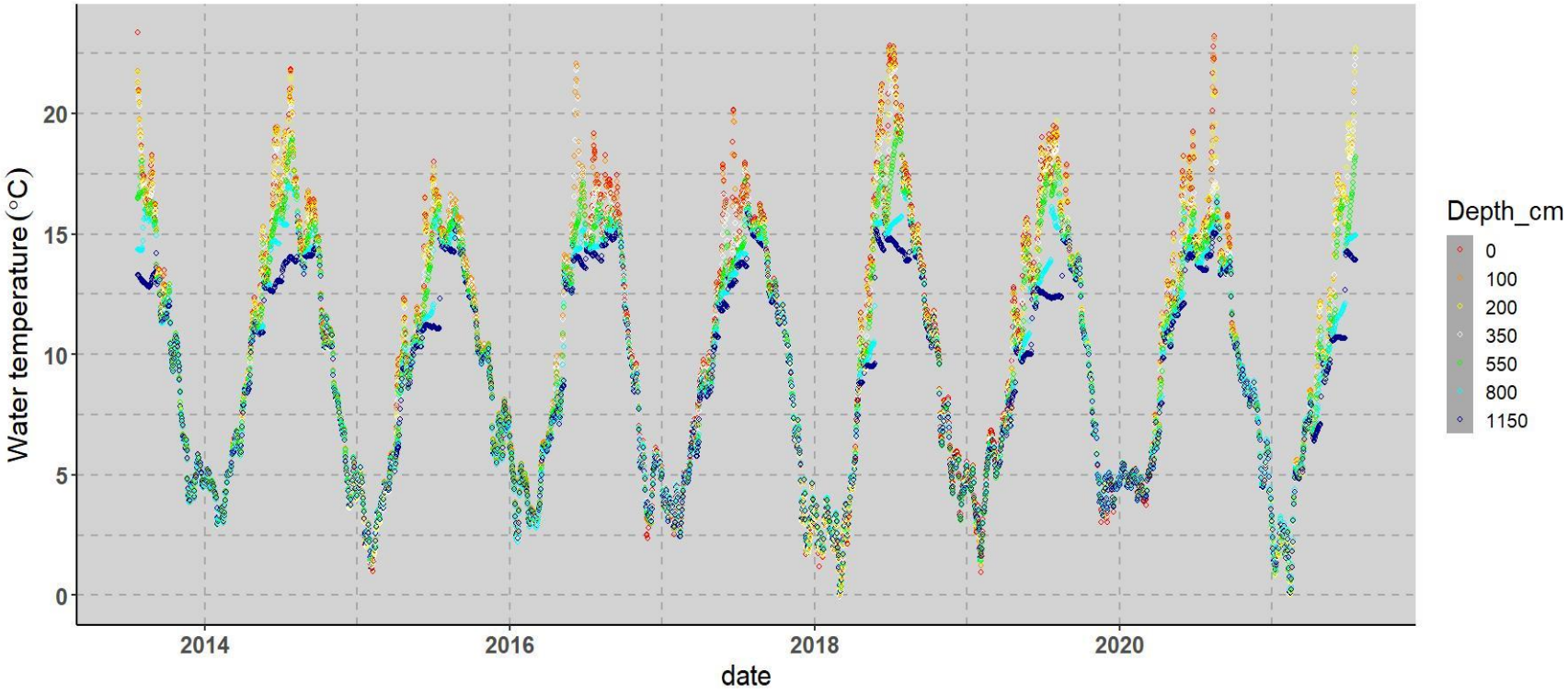
5.11.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.11.6. Burnmoor Tarn water temperature

5.11.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

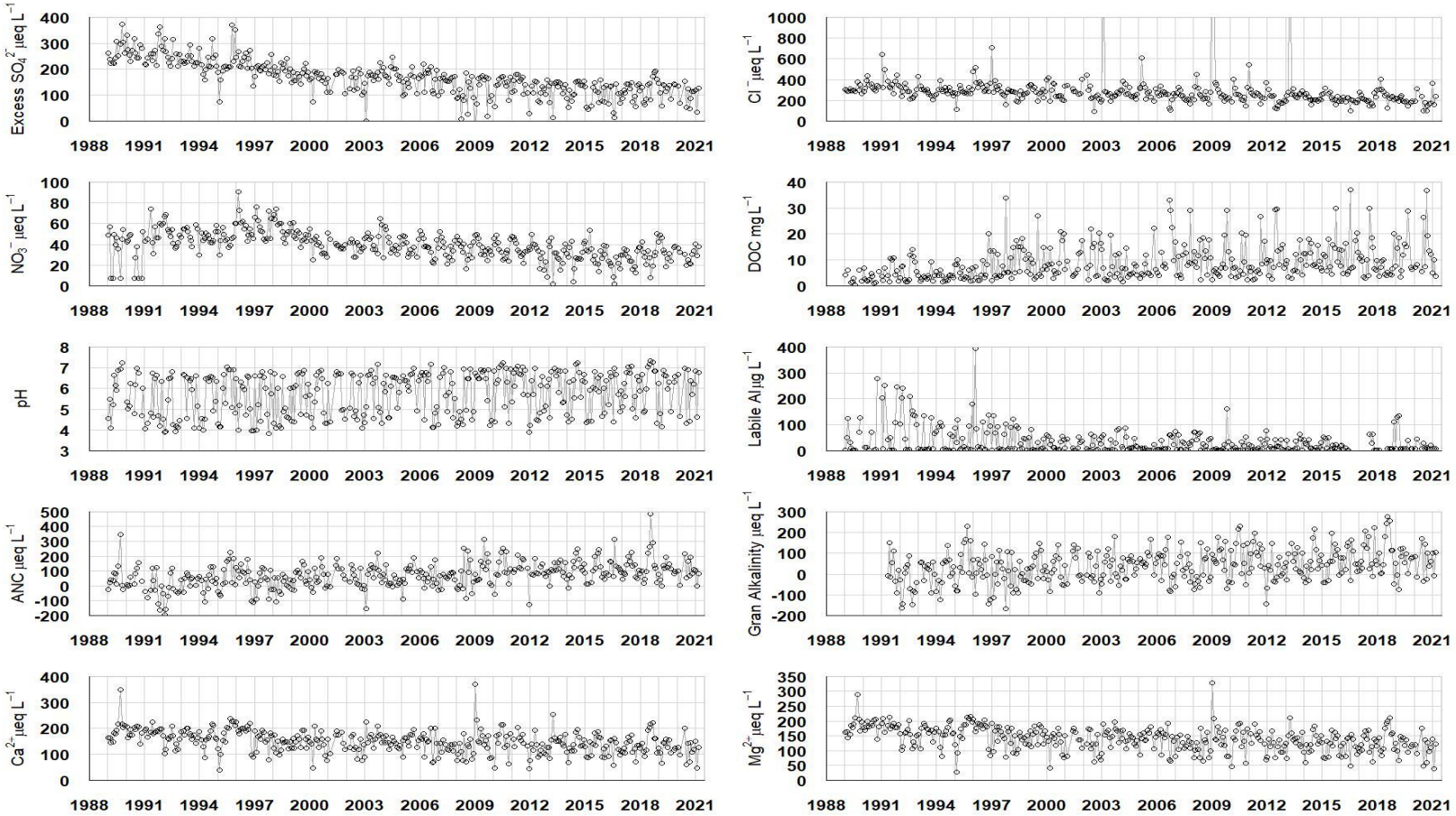
5.12. River Etherow

5.12.1. River Etherow site characteristics

Grid Reference	SK 116996
Catchment area	1300 ha
Minimum catchment altitude	280 m
Maximum catchment altitude	633 m
Catchment geology	Millstone grit
Catchment soils	Peaty podsols, blanket peat
Catchment vegetation	moorland
Mean annual runoff	1087 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	48.5 – 10.2
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	45.1 – 7.1
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	15.8 – 9.3
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	49.8 – 19.9

5.12.2. River Etherow water chemistry

5.12.2.1. Water chemistry time series



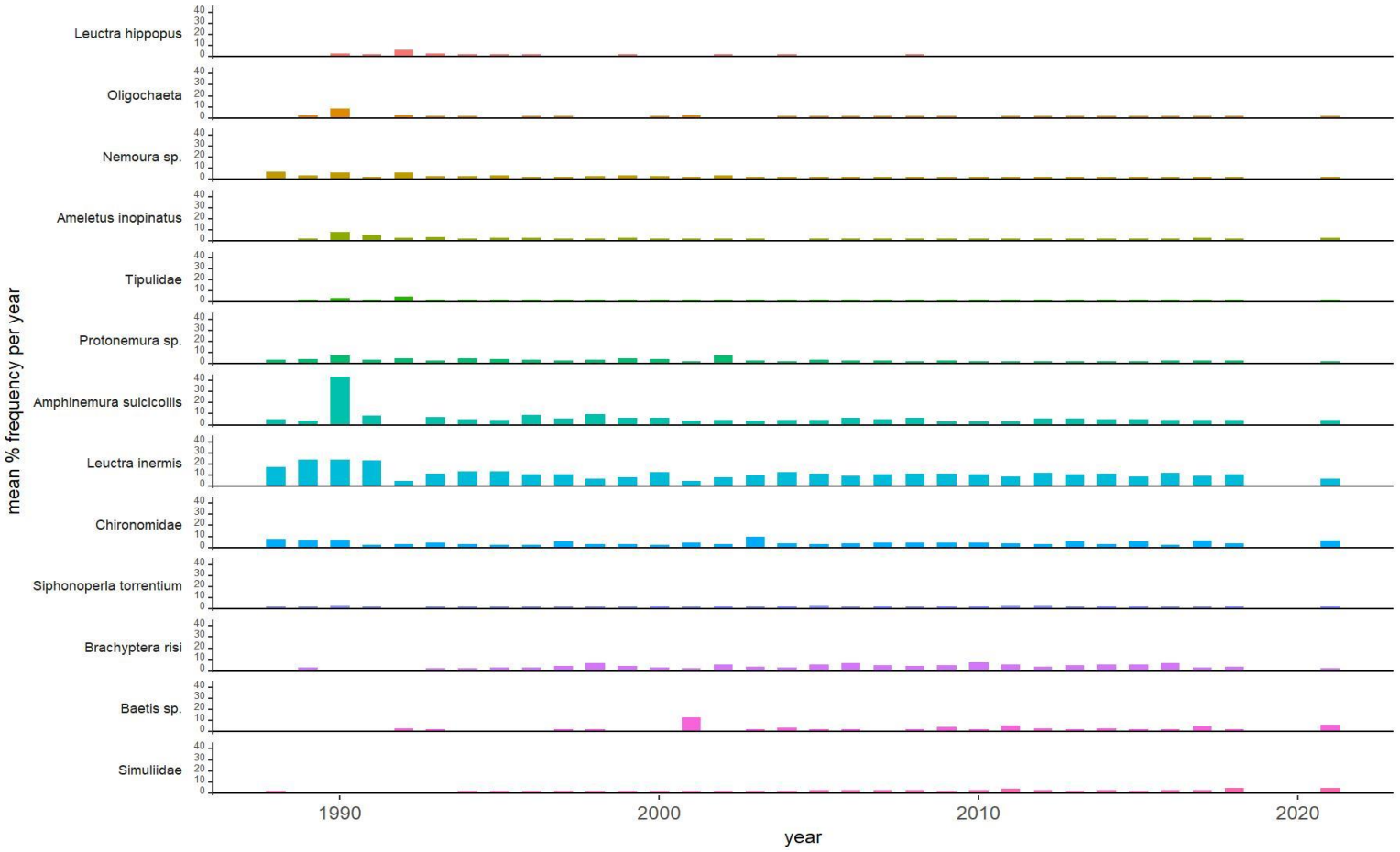
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.12.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (µeq L^{-1})	287.45	39.74	237.46	48.11	202.05	33.01	190.59	46.71	171.22	39.63	146.23	39.04	132.48	45.49
non-marine sulphate (µeq L^{-1})	252.78	38.55	209.36	45.55	172.67	38.27	163.38	45.97	139.54	50.69	122.57	38.35	115.01	40.05
nitrate (µeq L^{-1})	46.71	16.06	52.00	10.94	42.00	8.51	37.14	8.98	33.96	10.13	29.36	10.38	29.79	7.08
chloride (µeq L^{-1})	304.67	71.79	287.74	82.95	272.23	244.09	259.53	75.46	246.84	361.09	210.56	47.96	167.99	77.22
calcium (µeq L^{-1})	181.64	34.84	164.17	42.81	154.94	36.26	140.72	33.27	143.96	52.41	132.23	35.35	122.75	46.82
magnesium (µeq L^{-1})	175.63	31.09	163.70	40.32	146.83	35.78	134.91	31.61	137.37	45.24	122.57	34.38	117.22	43.96
sodium (µeq L^{-1})	295.80	52.90	291.45	86.10	291.45	198.51	248.38	63.37	267.53	297.86	234.46	40.24	197.71	74.07
potassium (µeq L^{-1})	20.20	3.67	19.69	5.07	17.77	4.19	17.06	4.14	17.34	4.52	15.73	4.24	15.85	4.44
pH	5.46	1.07	5.37	1.05	5.67	1.00	6.25	0.96	6.46	0.96	6.25	0.92	6.29	1.07
Gran alkalinity (µeq L^{-1})	-2.00	76.81	10.00	83.84	14.00	66.44	47.00	63.72	54.62	77.16	61.80	79.35	81.60	71.93
labile aluminium (µg L^{-1})	33.00	81.82	15.00	65.58	13.00	24.86	13.00	24.09	8.00	25.91	8.00	30.49	7.50	7.78
conductivity (µS cm^{-1})	80.91	17.69	82.00	16.77	75.00	41.39	69.00	10.77	71.00	37.36	61.20	9.50	49.80	13.61
Dissolved Organic Carbon (mg L^{-1})	3.71	3.26	5.10	5.87	7.50	6.18	8.17	7.06	6.95	6.96	9.58	6.88	11.05	10.69
Acid Neutralising Capacity (µS cm^{-1})	15.26	88.46	40.62	80.44	70.61	69.42	53.27	69.64	106.33	75.45	112.06	83.52	95.26	67.54

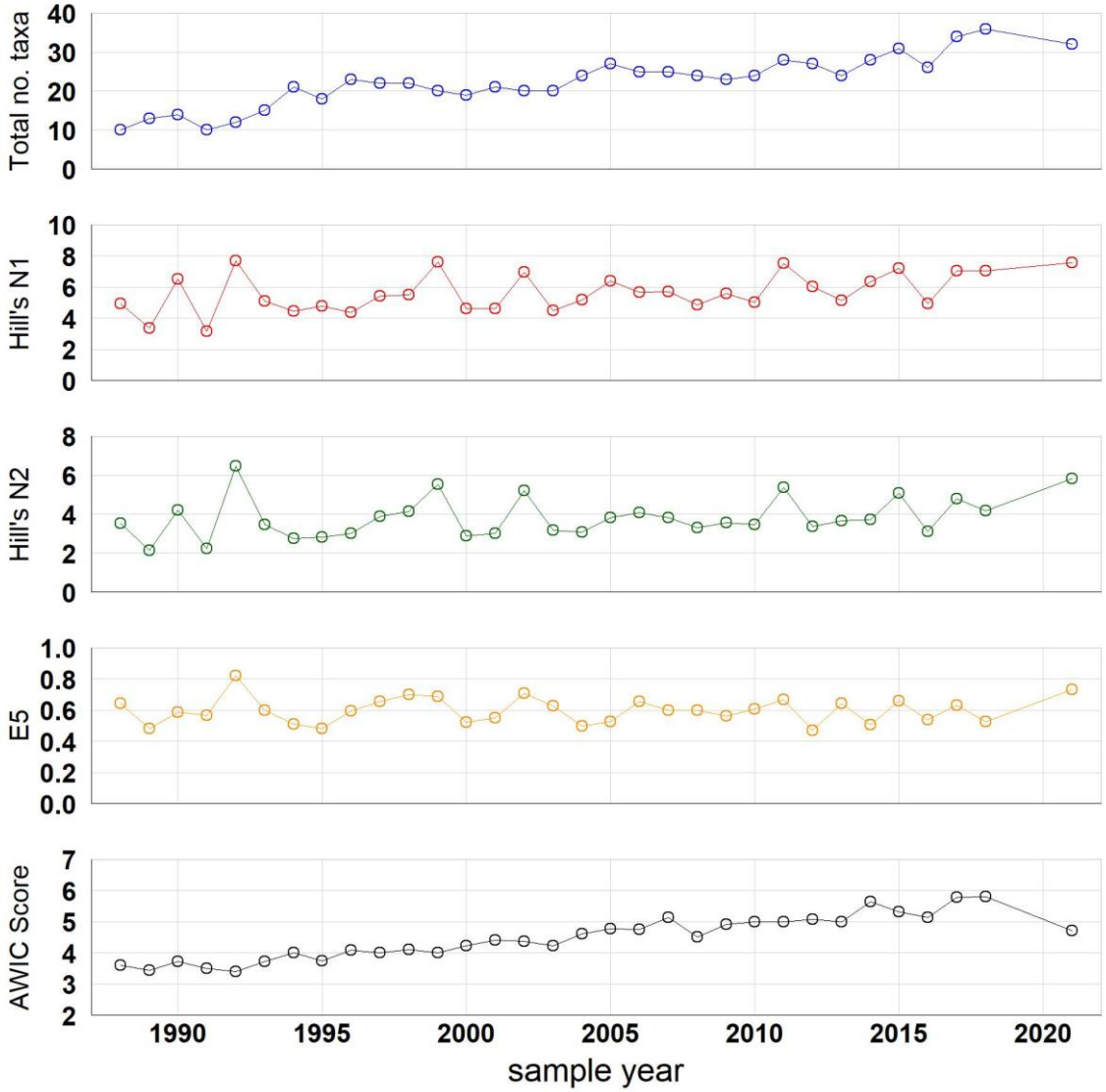
5.12.3. River Etherow macroinvertebrates

5.12.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

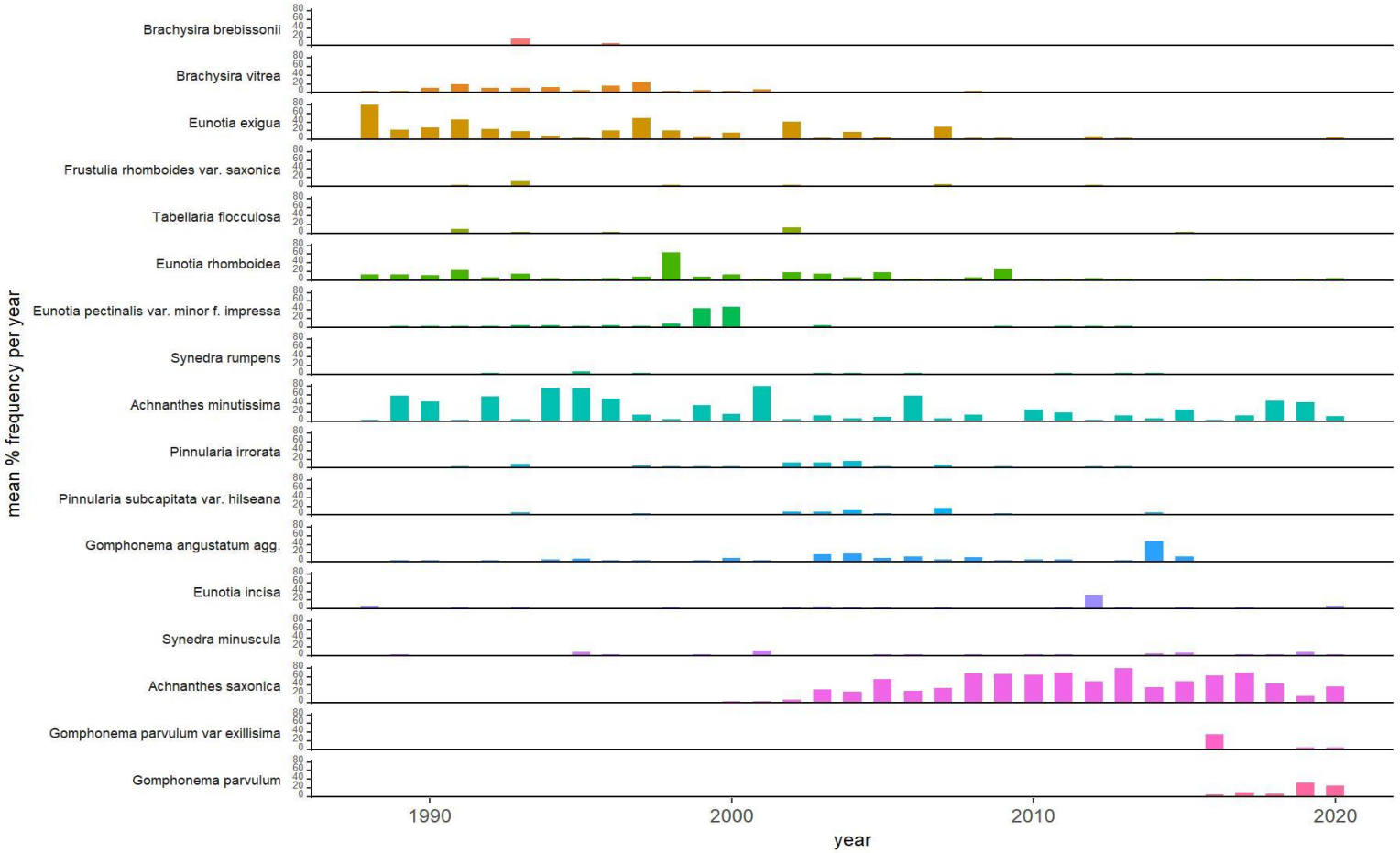
5.12.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

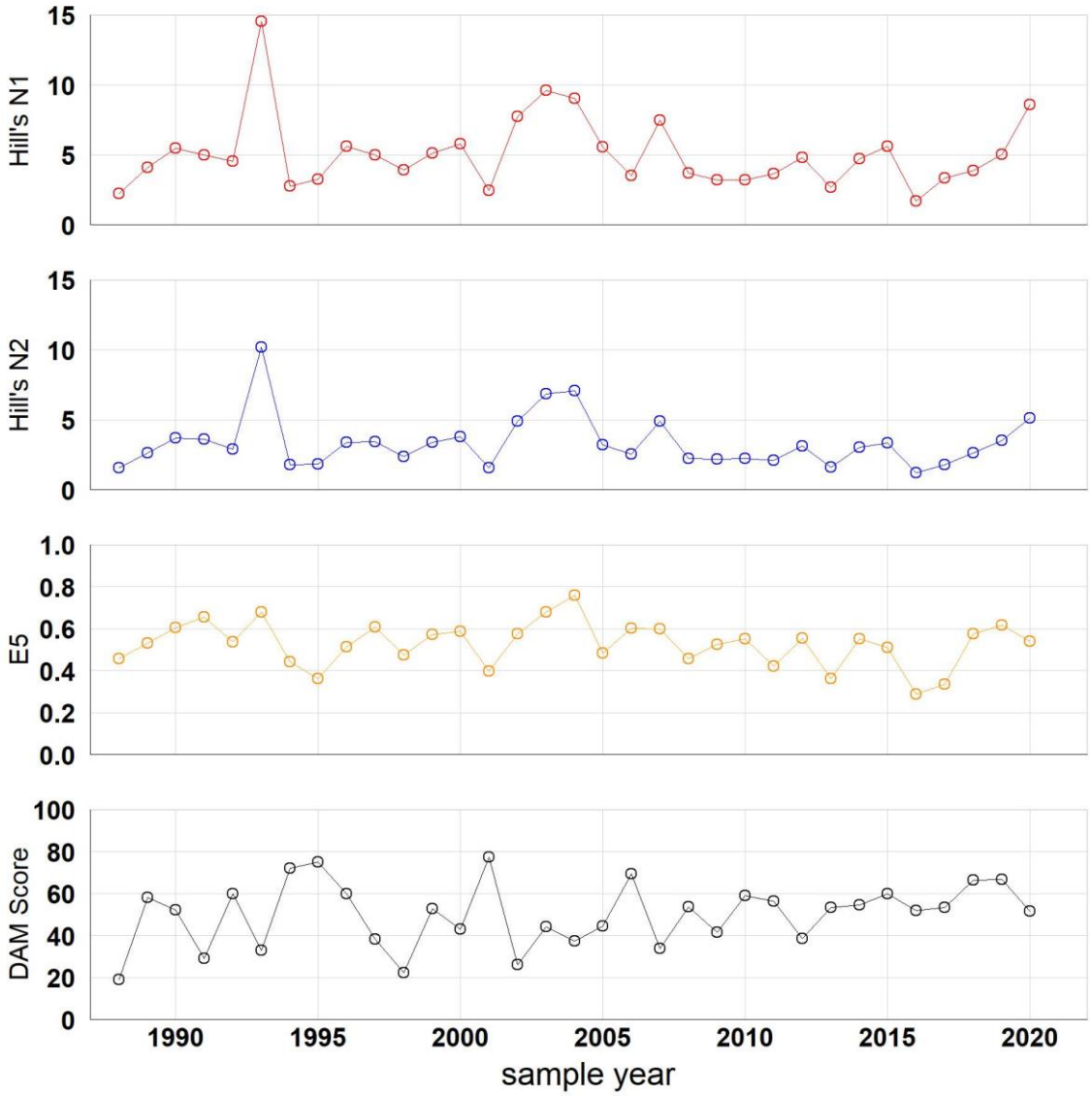
5.12.4. River Etherow epilithic diatoms

5.12.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

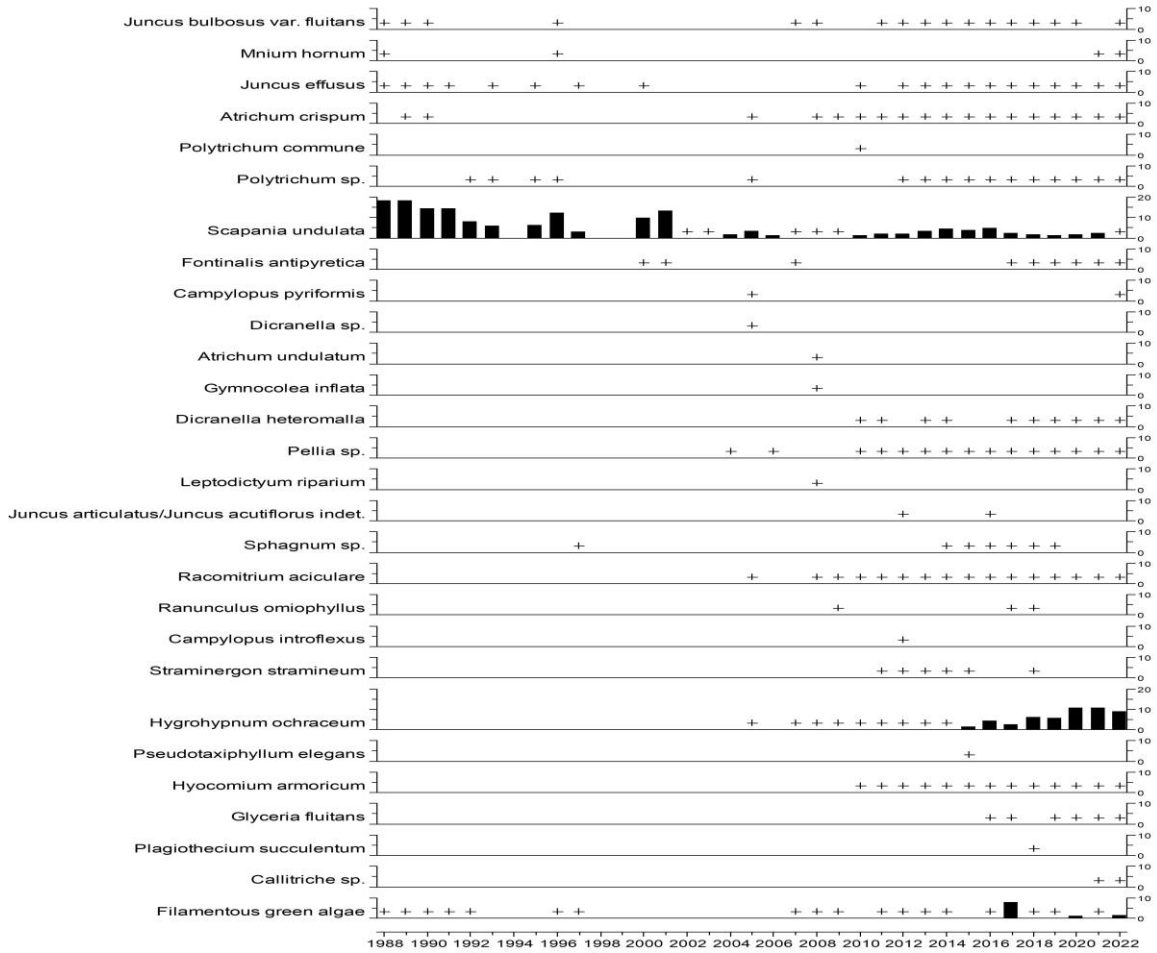
5.12.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.12.5. River Etherow aquatic macrophytes

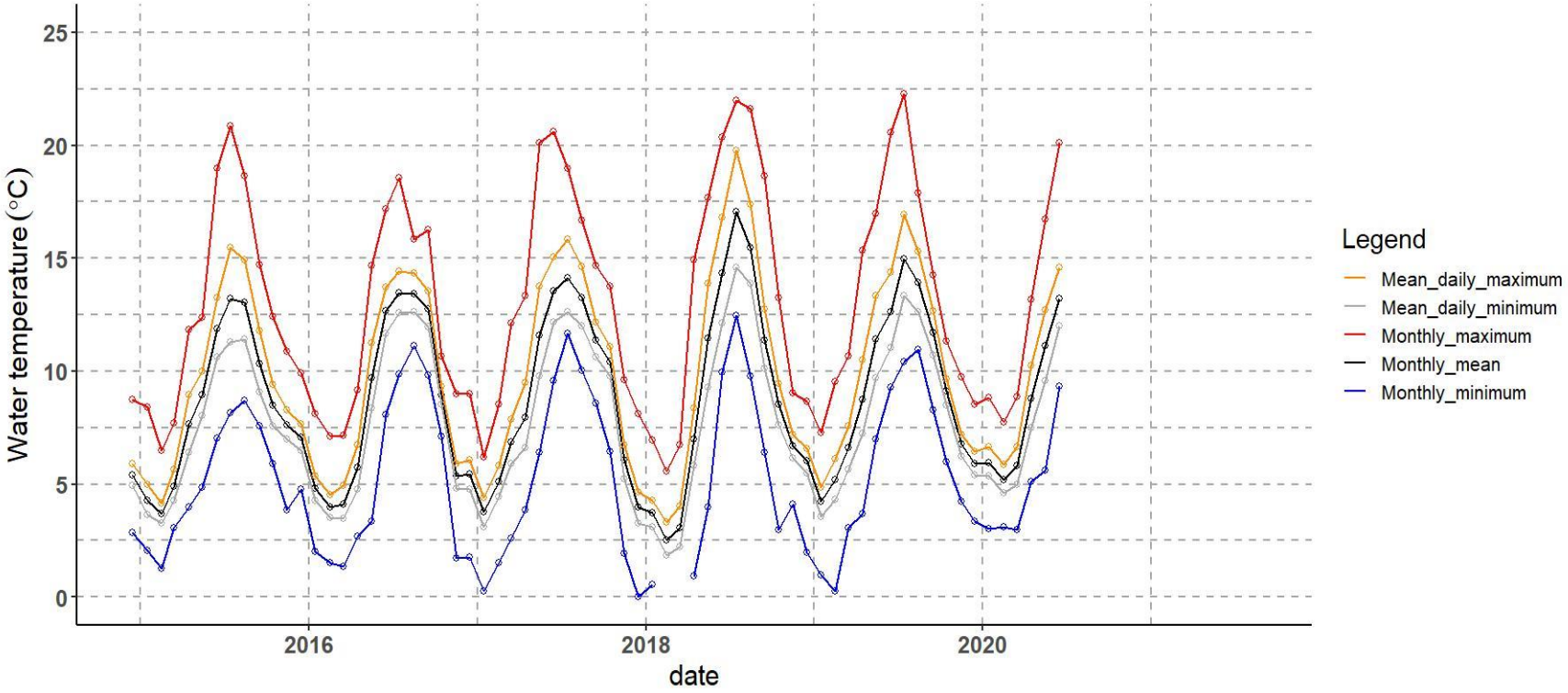
5.12.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.12.6. River Etherow water temperature

5.12.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

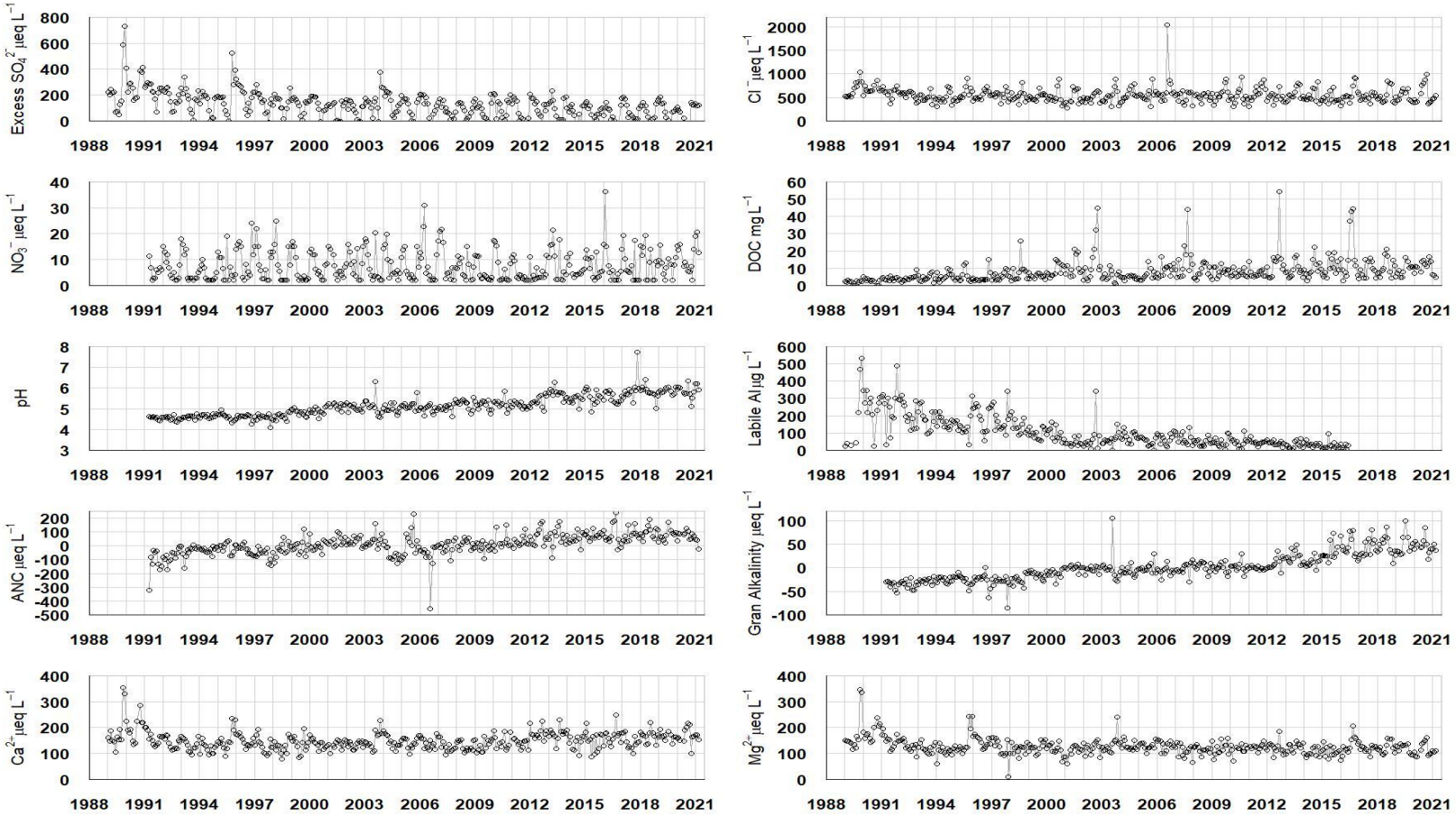
5.13. Old Lodge

5.13.1. Old Lodge site characteristics

Grid Reference	TQ 456294
Catchment area	240 ha
Minimum catchment altitude	94 m
Maximum catchment altitude	198 m
Catchment geology	Ashdown sands
Catchment soils	Podsols
Catchment vegetation	Heath 70% Deciduous wood 15% Conifers 15%
Mean annual runoff	600 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	17.3 – 4.8
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	13.4 – 2.3
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	6.8 – 5.3
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	18.8 – 11.4

5.13.2. Old Lodge water chemistry

5.13.2.1. Water chemistry time series



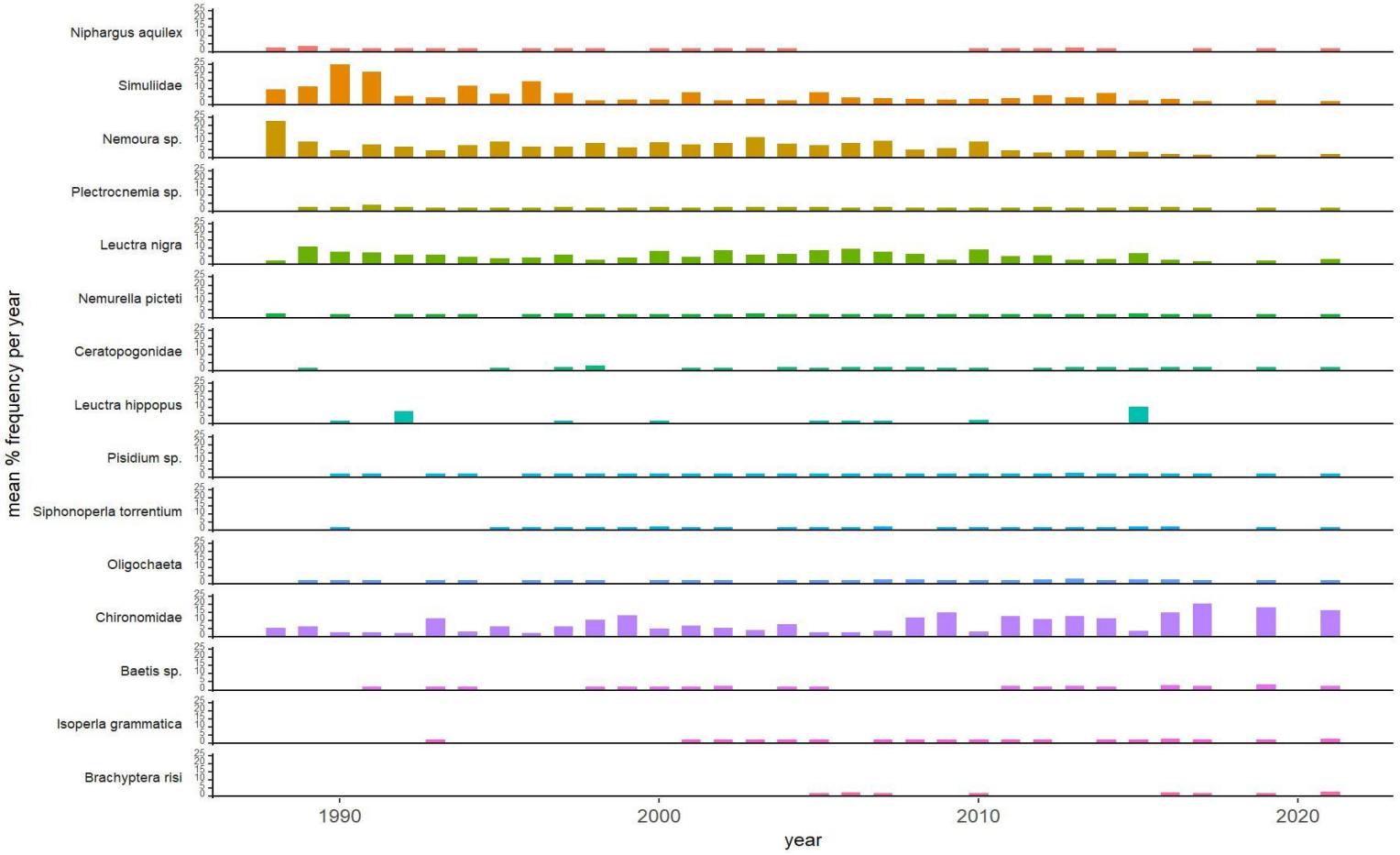
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.13.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	277.04	126.70	218.71	97.85	177.05	68.92	156.22	67.93	149.66	68.41	119.36	56.21	165.60	66.68
non-marine sulphate (μeq L^{-1})	222.79	121.73	173.48	102.24	127.65	75.21	105.68	76.92	99.09	77.04	71.68	63.32	117.89	87.33
nitrate (μeq L^{-1})	5.00	4.70	5.96	6.16	5.71	5.29	5.75	6.47	3.79	5.15	6.18	5.88	7.71	5.87
chloride (μeq L^{-1})	603.69	129.18	516.24	117.81	485.21	130.15	547.27	226.11	524.71	146.00	482.39	135.70	535.99	217.16
calcium (μeq L^{-1})	154.69	48.44	133.73	31.43	139.72	24.87	136.73	22.26	156.19	29.33	164.42	29.46	172.65	32.74
magnesium (μeq L^{-1})	145.60	46.45	123.39	36.04	122.57	26.00	123.39	19.09	123.27	19.73	118.04	23.14	112.70	23.32
sodium (μeq L^{-1})	469.80	96.74	443.70	73.34	408.90	79.32	428.48	135.77	443.70	93.01	415.64	78.65	413.69	129.35
potassium (μeq L^{-1})	20.71	10.10	16.88	14.44	17.39	8.51	20.58	10.47	22.04	10.17	25.95	11.75	27.87	13.54
pH	4.58	0.09	4.63	0.14	4.99	0.27	5.06	0.22	5.30	0.31	5.73	0.38	5.77	0.35
Gran alkalinity (μeq L^{-1})	-32.00	8.28	-26.00	12.50	-6.00	17.55	-3.50	10.66	3.00	13.91	33.30	22.02	42.60	16.69
labile aluminium (μg L^{-1})	221.50	112.86	148.50	61.89	63.50	51.91	60.50	29.23	42.00	21.78	27.00	18.36	N/A	N/A
conductivity (μS cm^{-1})	107.50	23.86	98.00	17.77	86.00	16.16	95.00	22.87	95.80	14.72	90.10	16.46	93.30	20.81
Dissolved Organic Carbon (mg L^{-1})	3.25	1.75	4.55	3.88	6.90	7.28	6.20	6.47	7.74	6.91	9.17	7.89	12.40	4.06
Acid Neutralising Capacity (μS cm^{-1})	-55.00	67.86	-27.82	40.35	12.77	44.30	-12.81	85.66	22.43	58.88	70.17	49.37	69.05	39.44

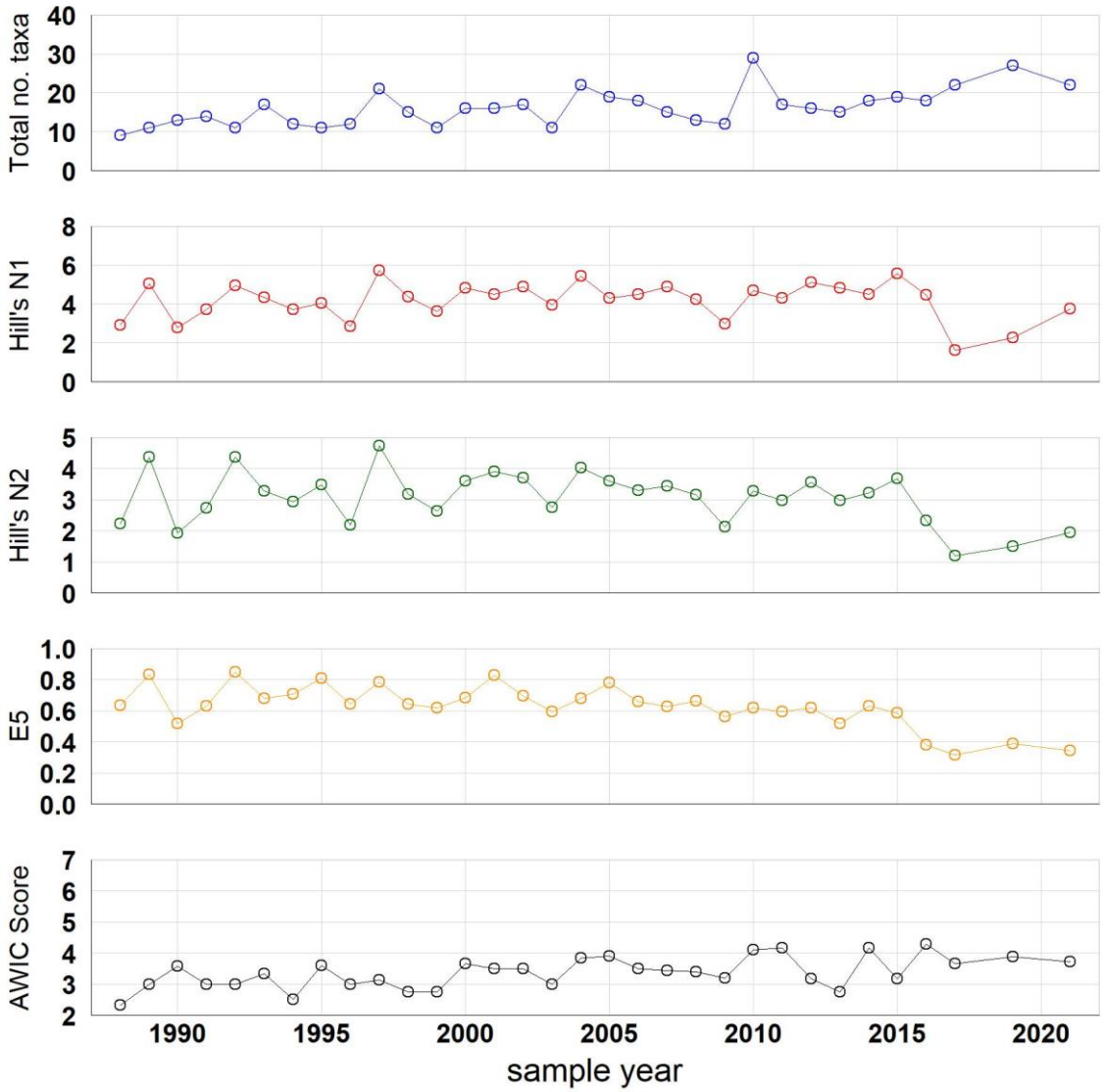
5.13.3. Old Lodge macroinvertebrates

5.13.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

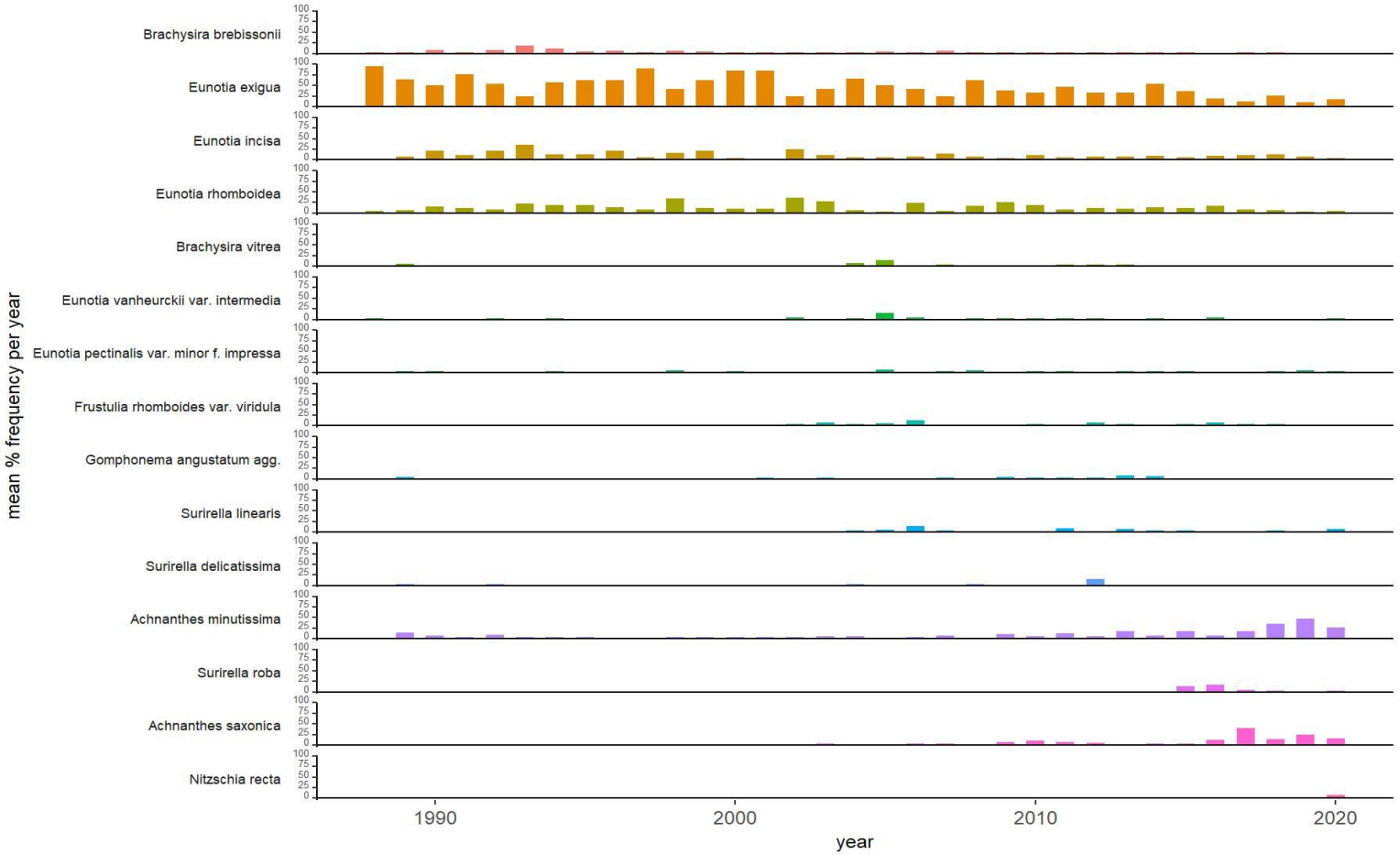
5.13.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

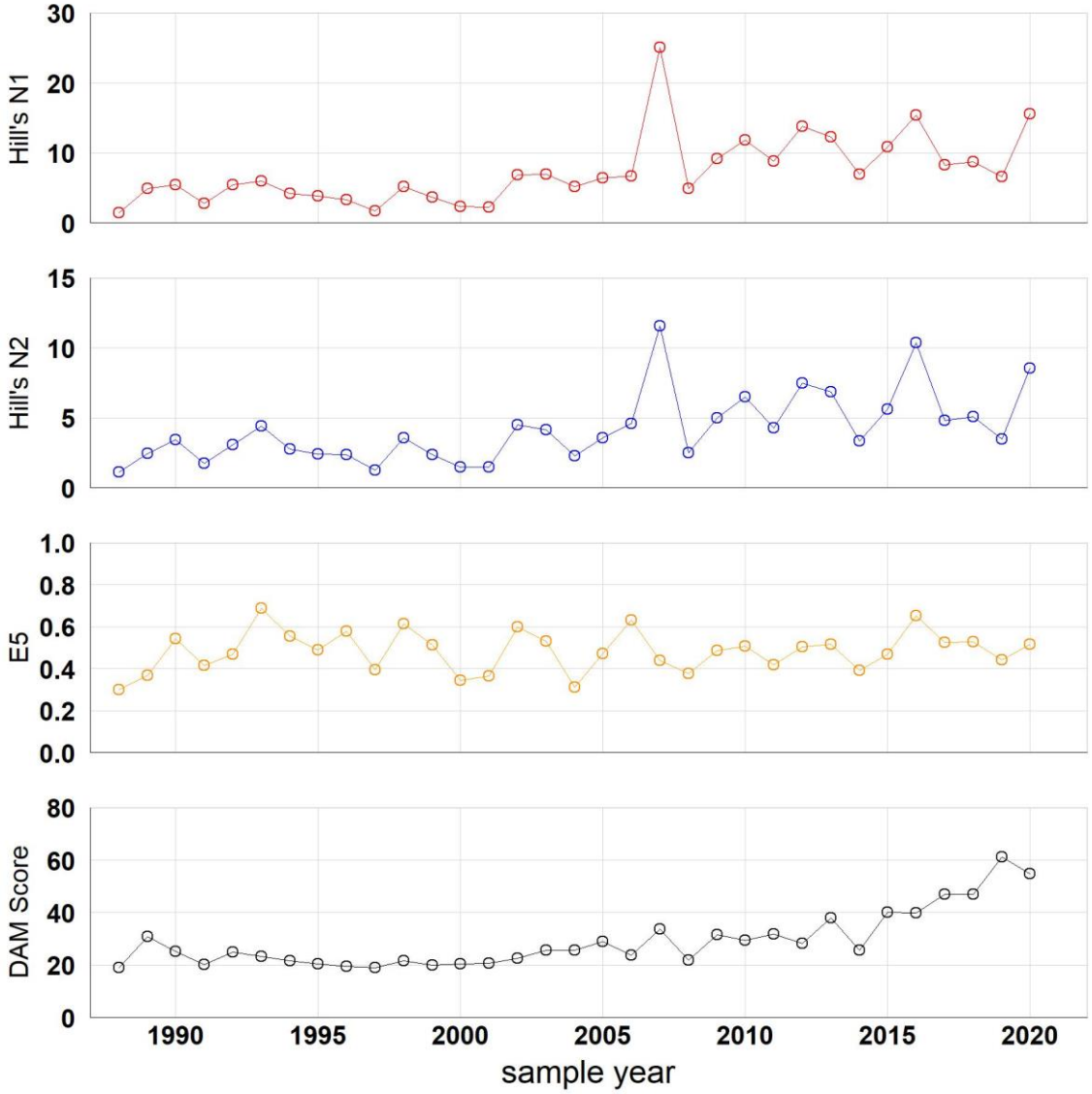
5.13.4. Old Lodge epilithic diatoms

5.13.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

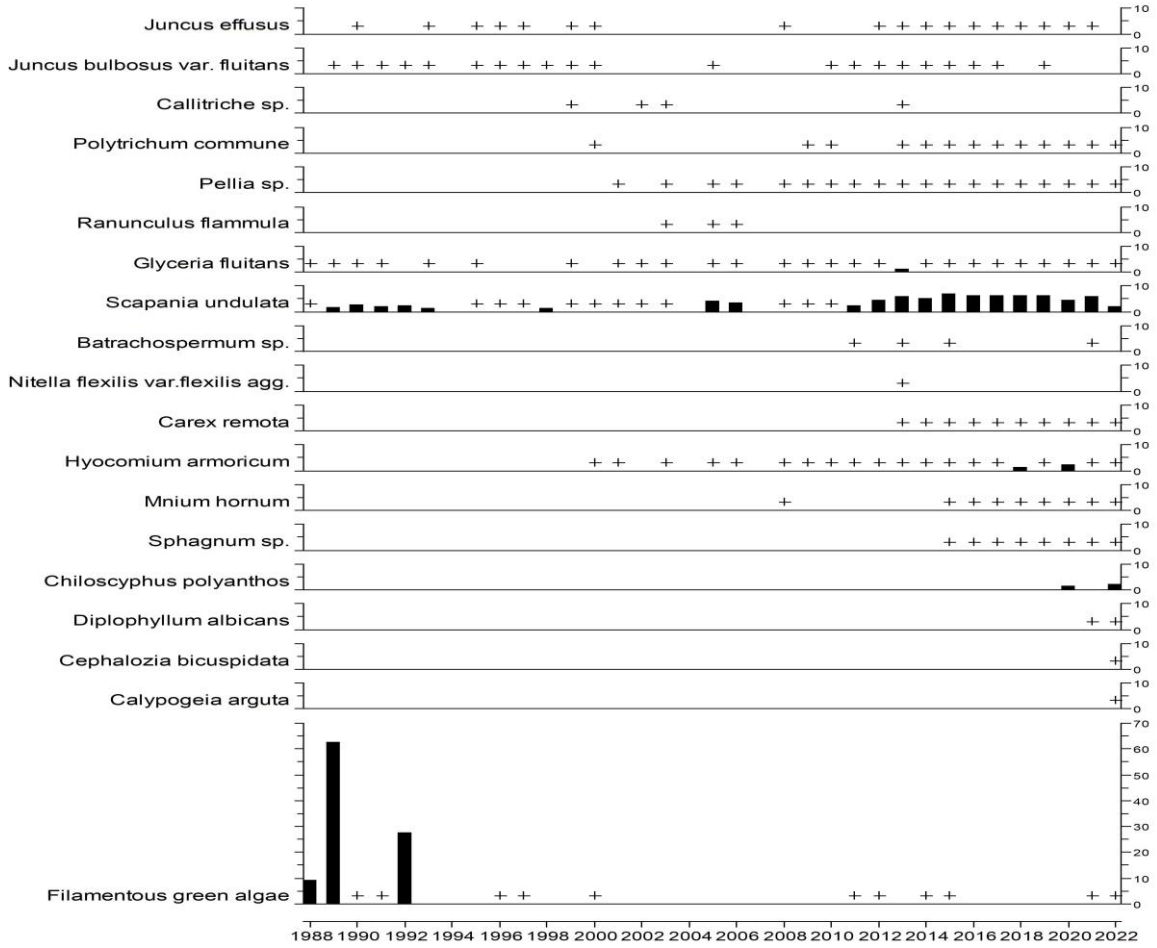
5.13.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.13.5. Old Lodge aquatic macrophytes

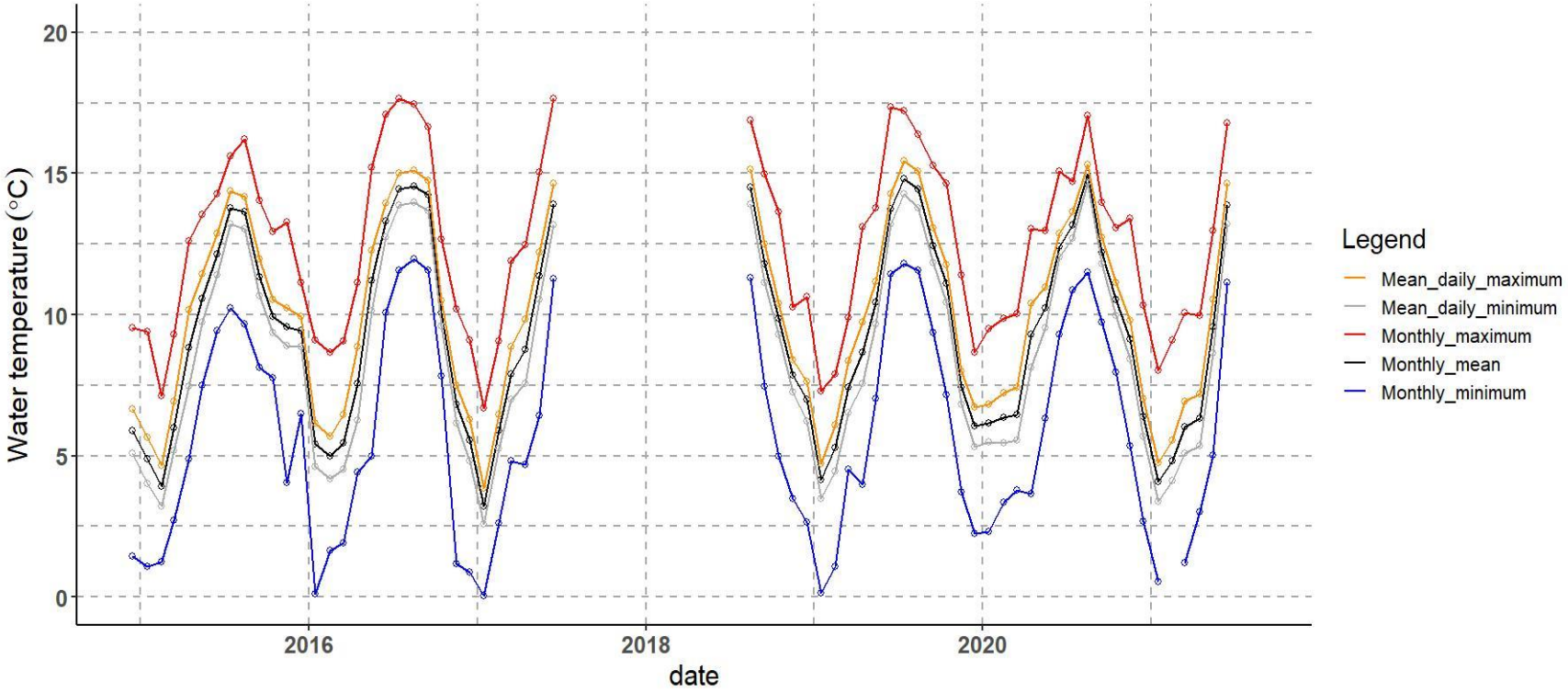
5.13.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.13.6. Old Lodge water temperature

5.13.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

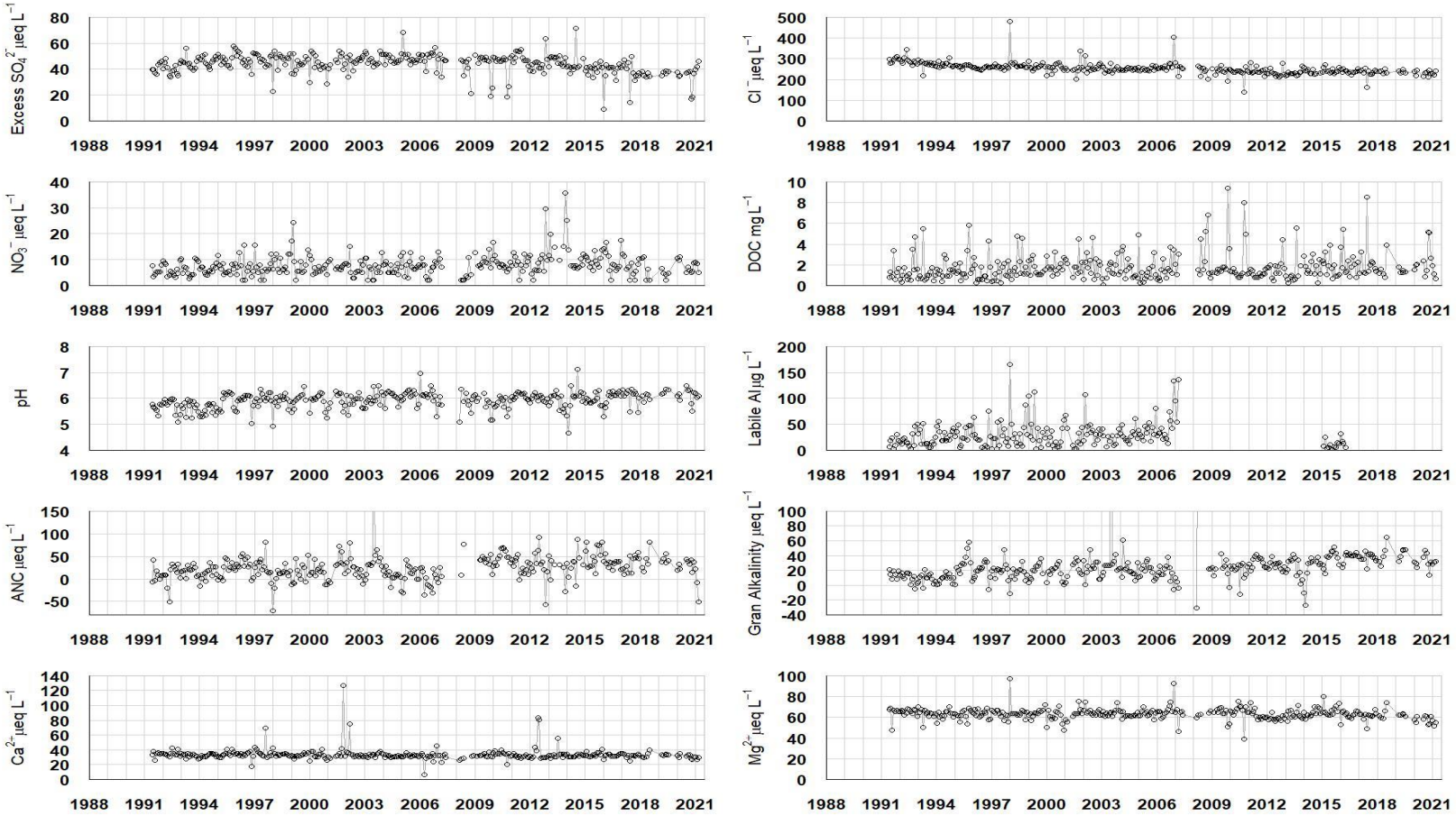
5.14. Narrator Brook

5.14.1. Narrator Brook site characteristics

Grid Reference	SX 568692
Catchment area	253 ha
Minimum catchment altitude	225 m
Maximum catchment altitude	456 m
Catchment geology	Granite
Catchment soils	Iron pan stagnopodsols, brown podsols
Catchment vegetation	Moorland/acid grassland 98%, Deciduous wood <2%
Mean annual runoff	1300 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	20.7 – 10.9
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	11.6 – 3.9
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	6.6 – 5.8
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.0 – 12.6

5.14.2. Narrator Brook water chemistry

5.14.2.1. Water chemistry time series



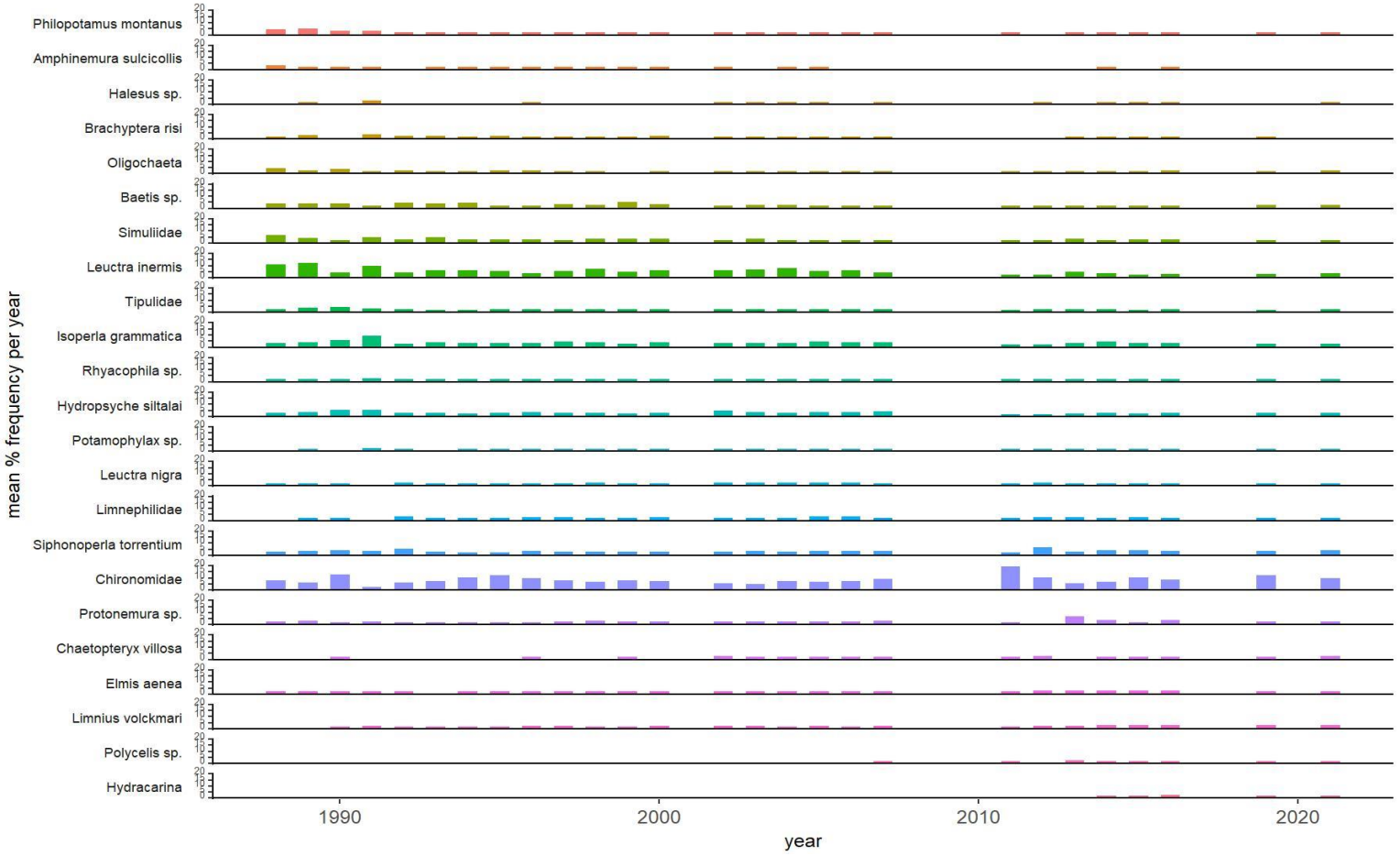
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.14.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	70.82	4.06	74.99	4.33	71.86	5.77	73.11	7.40	71.86	8.86	64.99	8.63	61.80	10.32
non-marine sulphate (μeq L^{-1})	41.48	4.79	47.70	5.33	45.17	5.72	47.38	6.59	46.88	7.64	40.40	7.96	37.80	10.11
nitrate (μeq L^{-1})	5.29	2.41	6.43	3.02	6.75	3.86	7.14	3.01	9.00	5.61	7.79	4.28	5.79	1.71
chloride (μeq L^{-1})	282.10	19.61	263.76	29.65	253.89	21.25	253.89	25.78	235.27	20.21	237.53	14.61	229.07	10.61
calcium (μeq L^{-1})	33.93	3.38	33.93	5.88	32.93	14.07	31.94	4.91	32.26	10.16	32.53	2.57	30.49	2.64
magnesium (μeq L^{-1})	65.81	4.71	63.34	5.70	63.75	5.08	64.16	5.95	62.31	5.89	62.76	4.73	57.01	3.80
sodium (μeq L^{-1})	256.65	11.43	252.30	14.43	239.25	44.92	230.55	20.31	233.16	20.76	230.98	16.91	218.37	11.71
potassium (μeq L^{-1})	20.97	2.01	19.18	2.81	19.31	2.93	18.92	3.08	20.48	3.62	19.92	3.39	18.77	1.94
pH	5.74	0.24	5.91	0.32	5.94	0.28	6.09	0.31	5.98	0.26	6.10	0.35	6.20	0.30
Gran alkalinity (μeq L^{-1})	12.00	6.75	18.90	12.59	22.40	46.12	20.30	103.80	25.30	10.67	38.28	13.87	31.80	9.45
labile aluminium (μg L^{-1})	16.00	13.38	24.00	25.75	27.50	24.61	33.00	28.60	N/A	N/A	8.00	8.55	N/A	N/A
conductivity (μS cm^{-1})	48.40	1.81	37.00	7.28	35.00	6.70	40.00	3.03	42.90	6.04	42.90	2.95	40.90	1.64
Dissolved Organic Carbon (mg L^{-1})	1.00	1.23	1.27	1.13	1.72	0.90	1.38	1.42	1.24	1.67	1.63	1.30	1.93	1.69
Acid Neutralising Capacity (μS cm^{-1})	15.29	17.83	18.57	21.85	22.84	45.95	7.67	21.22	35.96	24.44	37.39	20.81	32.87	31.21

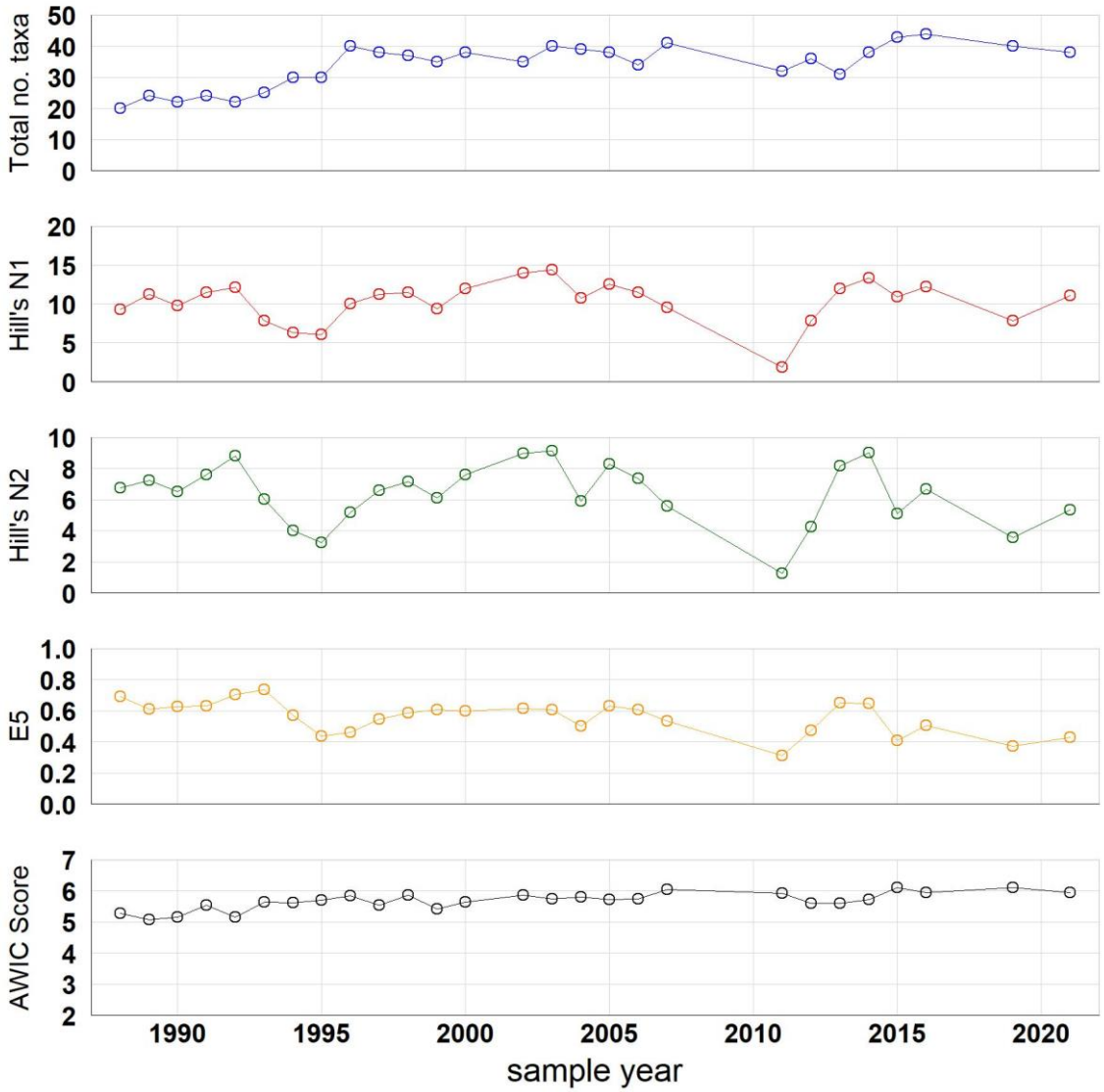
5.14.3. Narrator Brook macroinvertebrates

5.14.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

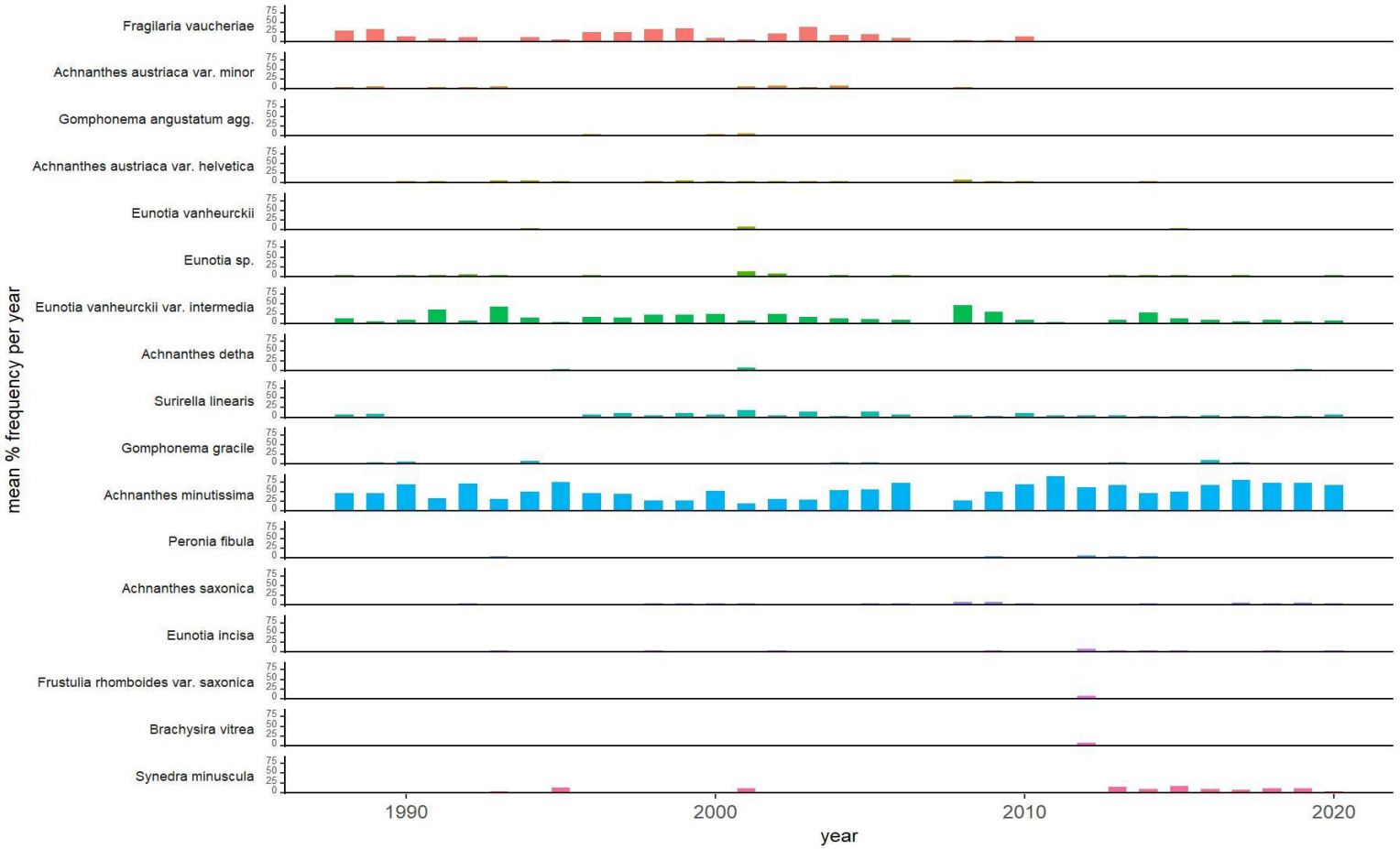
5.14.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

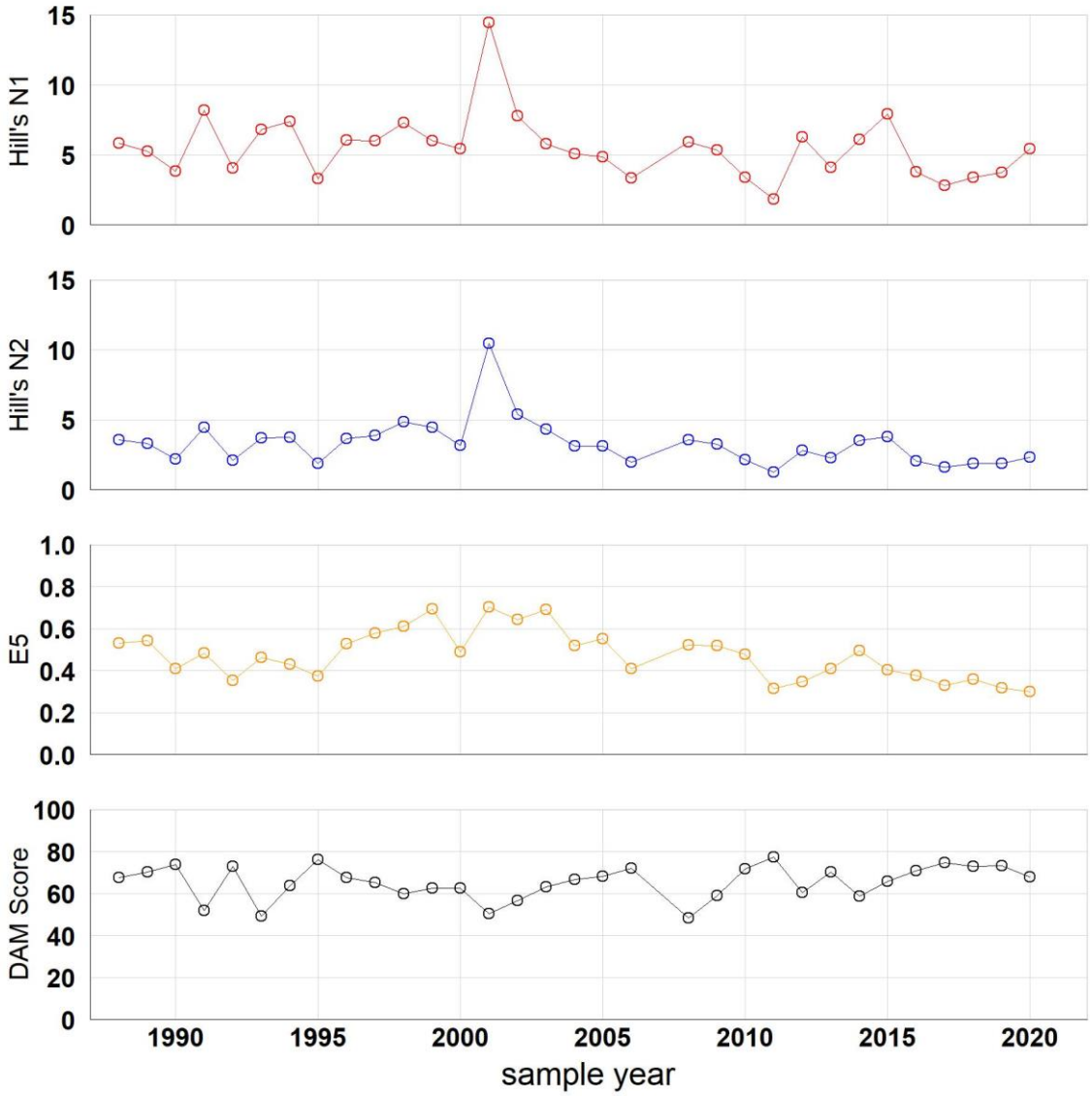
5.14.4. Narrator Brook epilithic diatoms

5.14.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

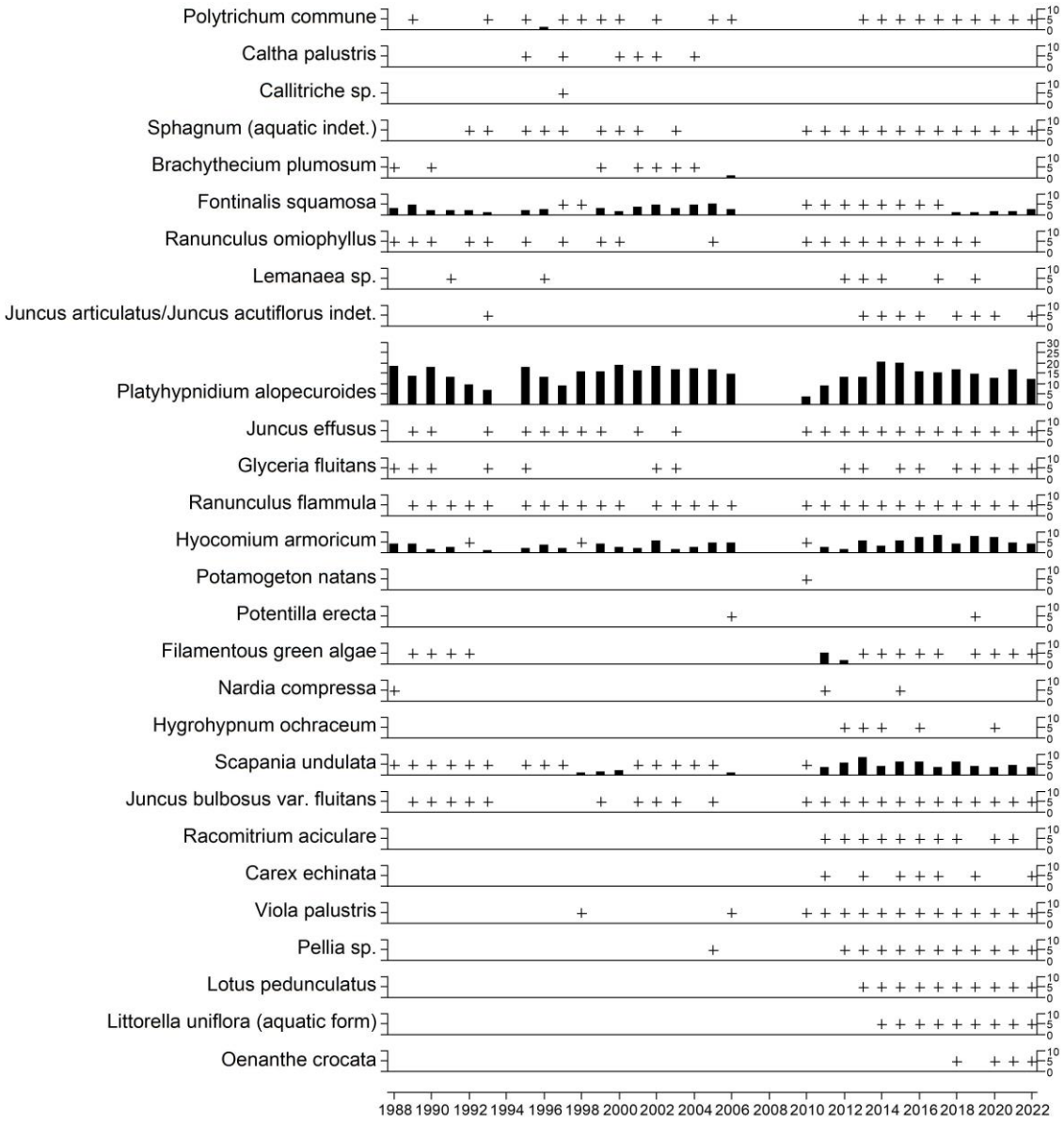
5.14.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.14.5. Narrator Brook aquatic macrophytes

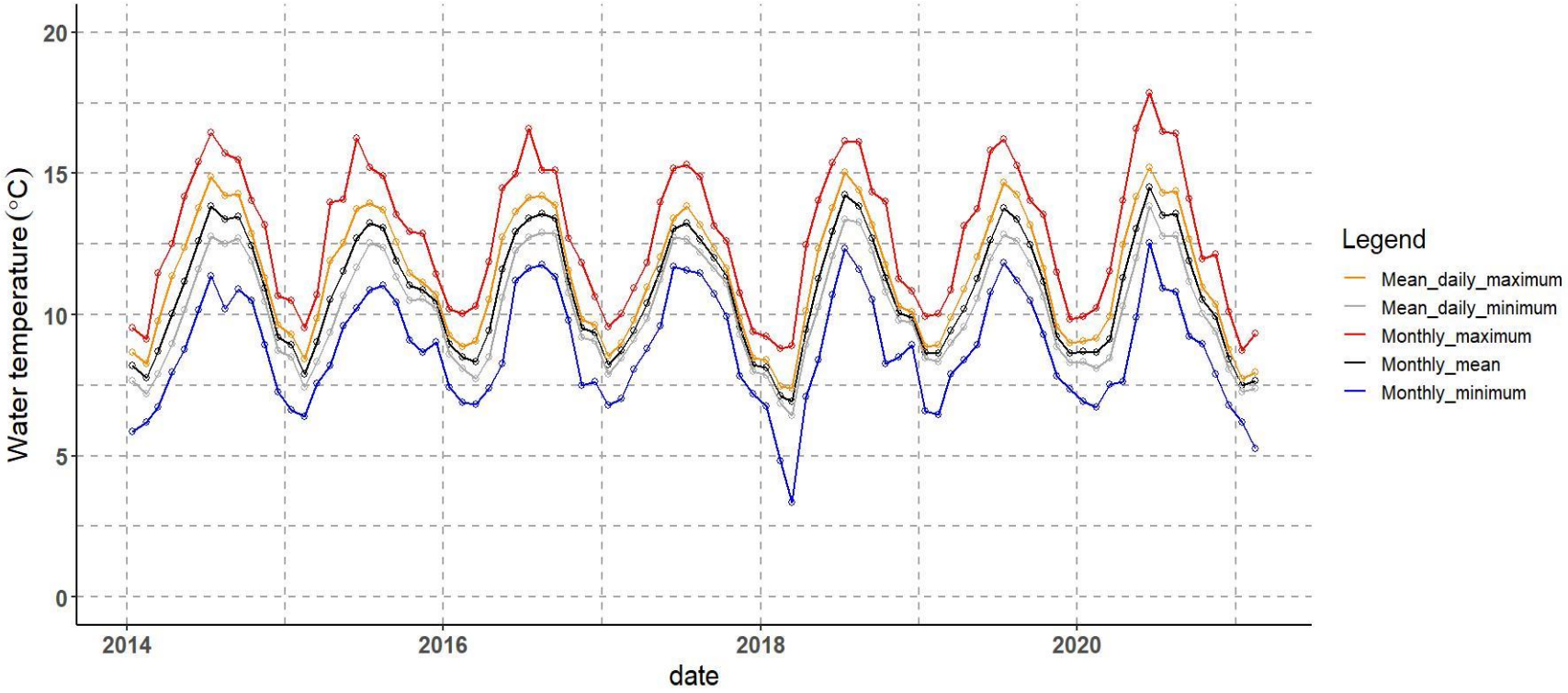
5.14.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.14.6. Narrator Brook water temperature

5.14.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

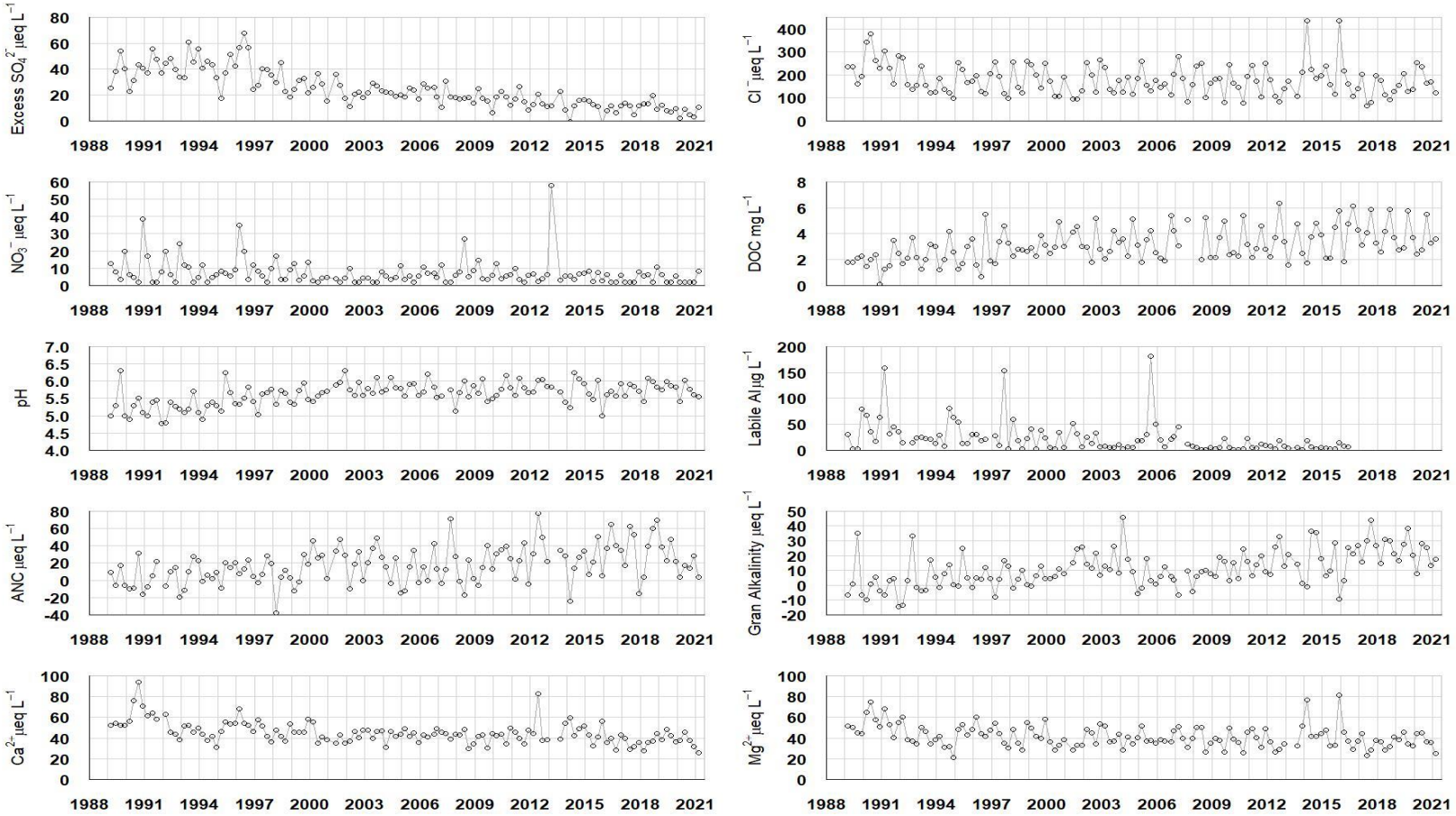
5.15. Llyn Llagi

5.15.1. Llyn Llagi site characteristics

Grid Reference	SH 649483
Lake altitude	380 m
Maximum altitude	680 m
Maximum depth	16.5 m
Mean depth	5.8 m
Volume	8.2×10^5 m^3
Lake area	5.67 ha
Catchment area	1401.3 ha
Catchment area (excl.lake)	157 ha
Catchment:Lake ratio	247.1
Catchment geology	Ordivcian slates/shales, dolerite & volcanic intrusions
Catchment soils	Stagnopodsols, stagnohumic gleys, blanket peat
Catchment vegetation	Moorland
Mean annual runoff	2420 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	29.7 – 11.2
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	19.7 – 4.5
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.5 – 5.2
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	37.9 – 13.0

5.15.2. Llyn Llagi water chemistry

5.15.2.1. Water chemistry time series



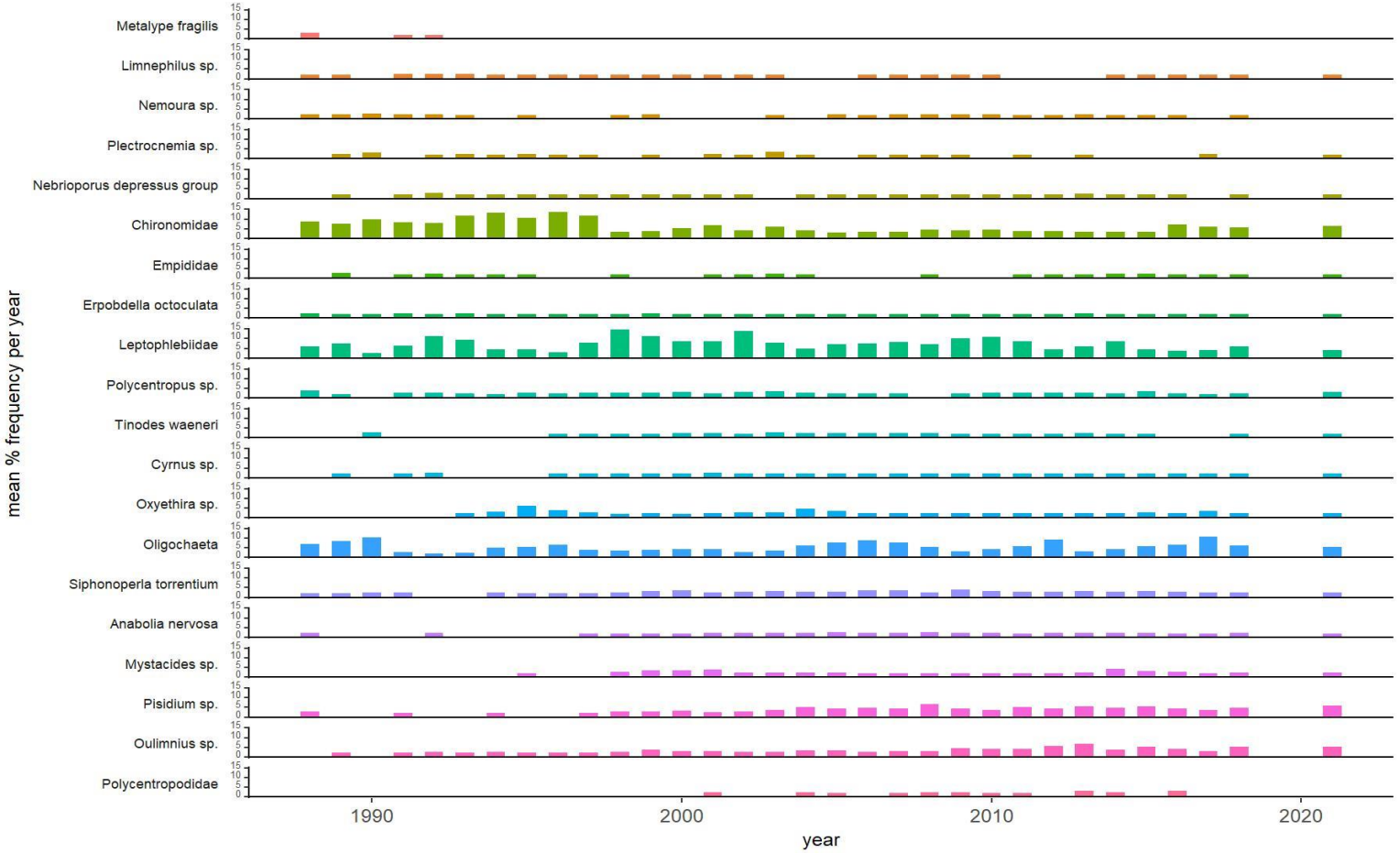
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.15.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	64.57	8.17	58.32	11.61	43.74	5.61	39.58	5.84	31.87	6.47	29.18	7.97	22.84	5.83
non-marine sulphate (μeq L^{-1})	40.49	10.07	39.96	13.29	24.47	6.79	19.03	4.89	15.21	5.84	11.68	4.88	7.10	3.47
nitrate (μeq L^{-1})	7.14	9.50	7.86	7.65	4.29	3.58	5.71	5.50	5.64	12.42	5.50	2.64	2.14	3.14
chloride (μeq L^{-1})	228.50	73.21	169.26	55.84	172.08	58.26	163.05	54.34	171.80	55.43	159.95	91.68	167.43	46.47
calcium (μeq L^{-1})	52.40	12.86	46.91	8.95	45.91	6.50	43.39	5.39	42.96	11.23	39.67	8.31	34.71	8.44
magnesium (μeq L^{-1})	50.18	11.33	43.60	10.18	38.66	8.60	38.25	7.30	36.81	8.47	37.47	13.48	36.03	8.07
sodium (μeq L^{-1})	191.40	48.23	156.60	36.45	152.25	36.14	136.81	34.62	148.12	36.27	143.99	62.13	138.33	39.37
potassium (μeq L^{-1})	2.56	1.61	2.56	1.35	3.07	1.98	3.20	1.49	5.04	1.91	3.59	2.50	4.50	2.20
pH	5.20	0.35	5.41	0.30	5.71	0.24	5.74	0.24	5.77	0.23	5.83	0.29	5.68	0.21
Gran alkalinity (μeq L^{-1})	-0.34	13.20	4.30	7.69	11.00	7.71	5.83	11.59	14.30	8.39	23.50	13.00	21.30	6.91
labile aluminium (μg L^{-1})	25.00	36.12	22.00	36.14	11.00	15.58	12.00	40.55	6.00	6.76	6.50	5.42	N/A	N/A
conductivity (μS cm^{-1})	35.00	9.02	26.35	7.43	27.00	7.59	25.00	5.14	28.20	7.15	29.10	12.14	27.40	6.43
Dissolved Organic Carbon (mg L^{-1})	2.05	0.83	2.62	1.22	3.00	0.95	3.13	1.29	2.86	1.31	3.83	1.35	3.43	1.20
Acid Neutralising Capacity (μS cm^{-1})	5.53	15.50	7.62	14.27	26.78	18.61	12.78	21.47	29.52	20.12	34.27	24.49	15.47	10.20

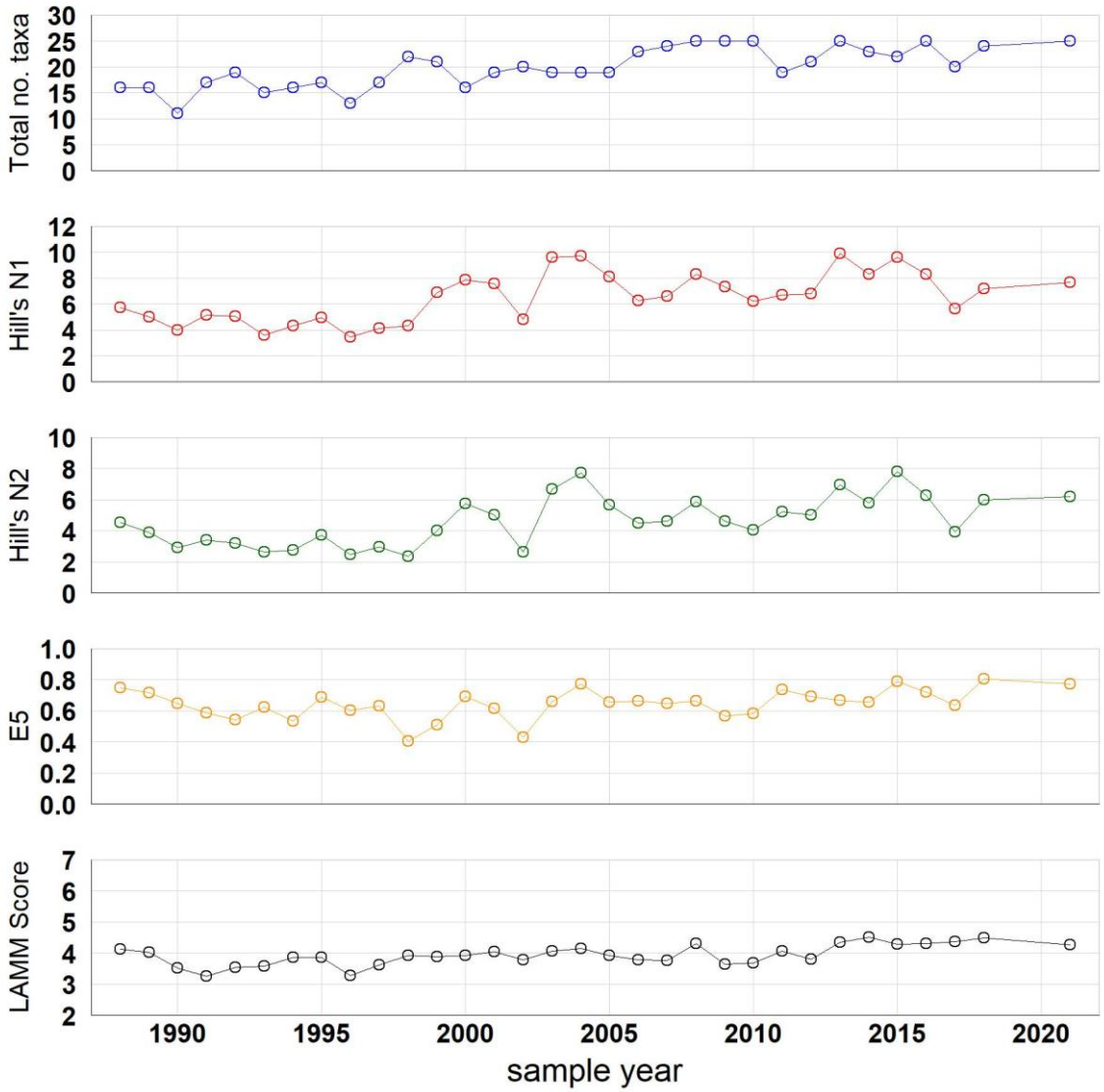
5.15.3. Llyn Llagi macroinvertebrates

5.15.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

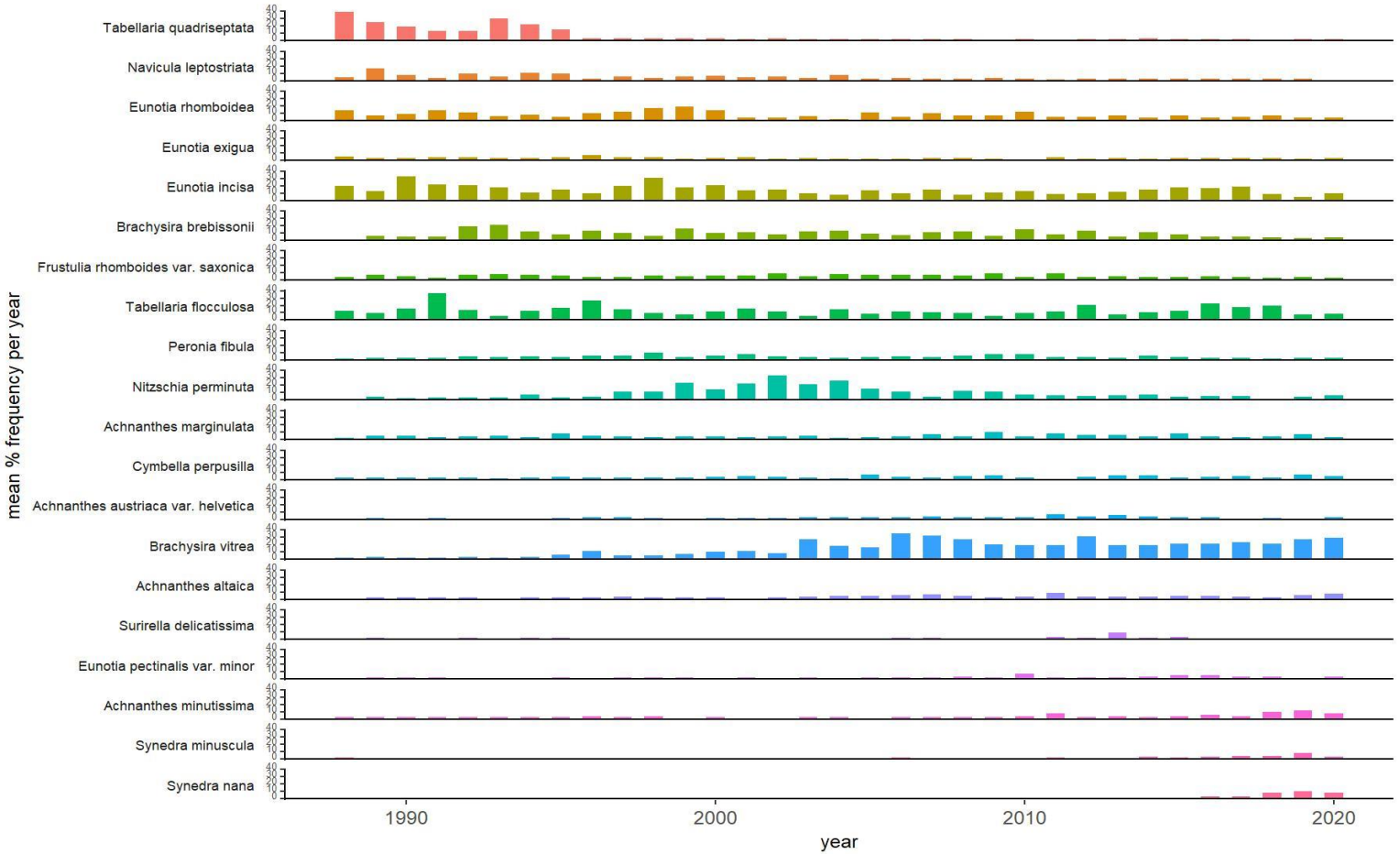
5.15.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

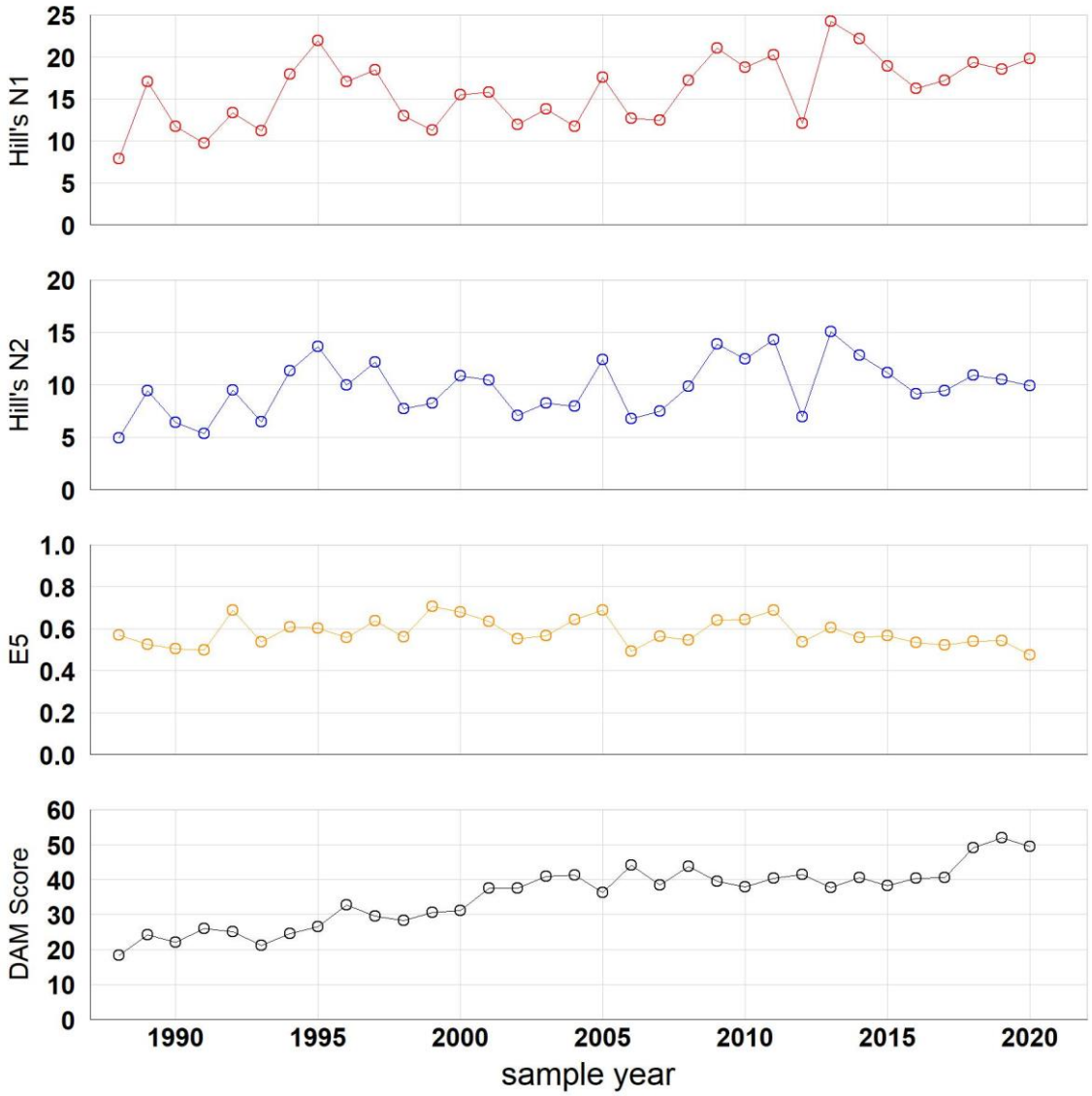
5.15.4. Llyn Llagi epilithic diatoms

5.15.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

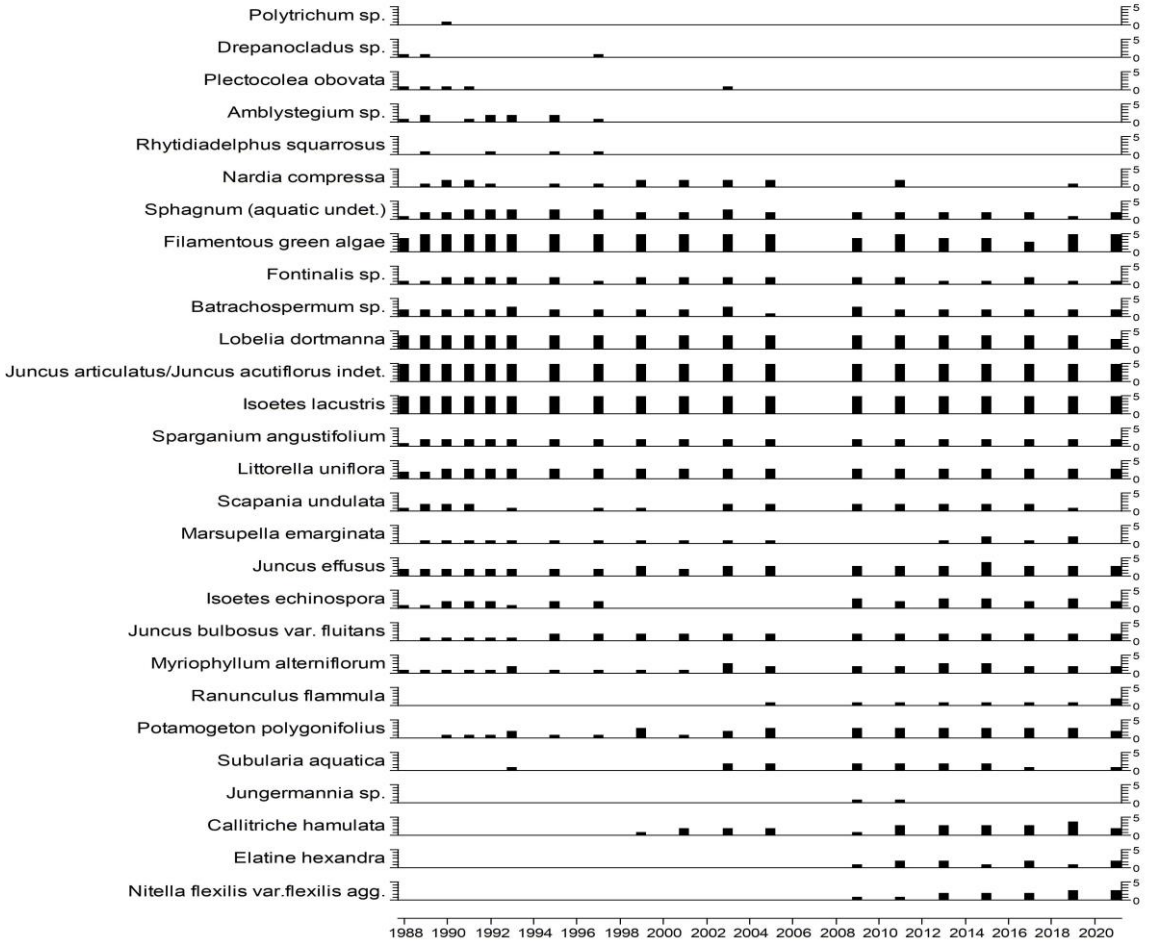
5.15.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.15.5. Llyn Llagi aquatic macrophytes

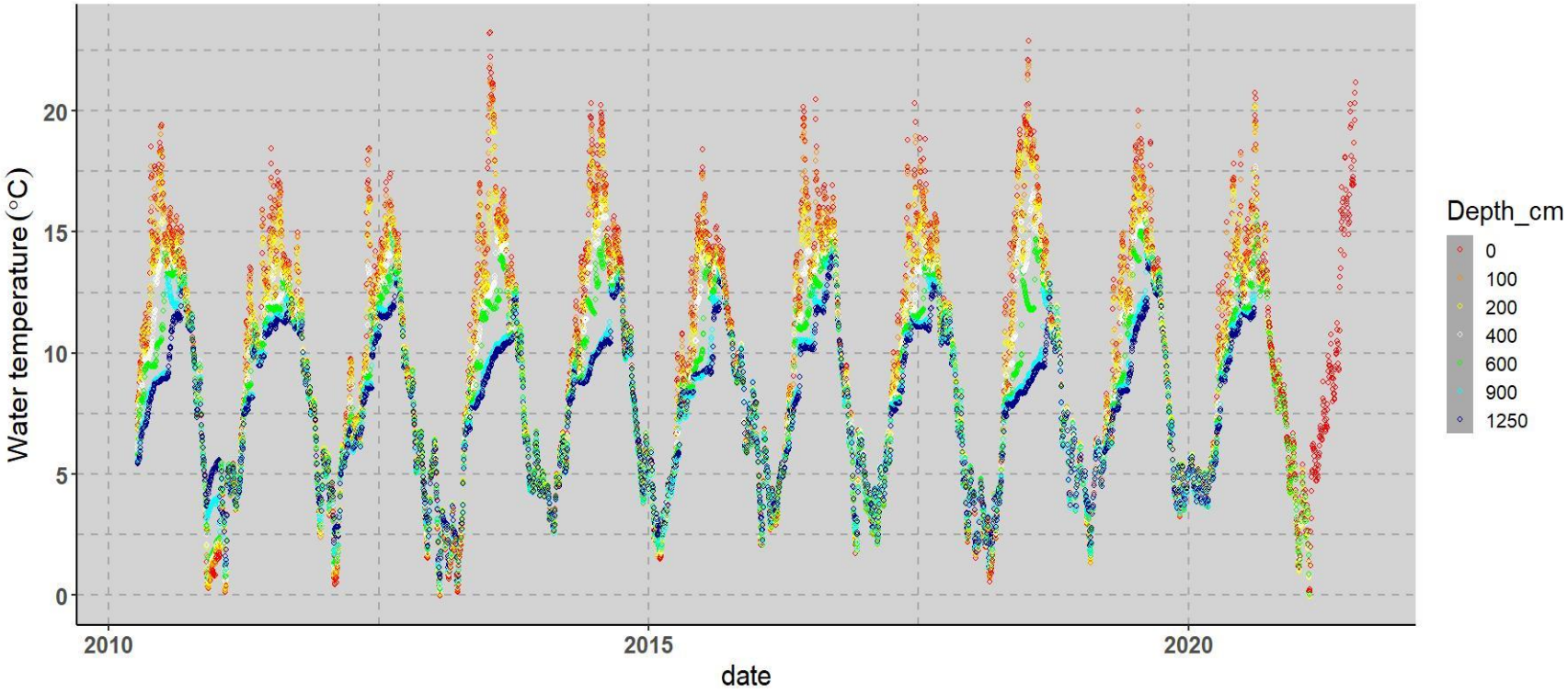
5.15.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.15.6. Llyn Llagi water temperature

5.15.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

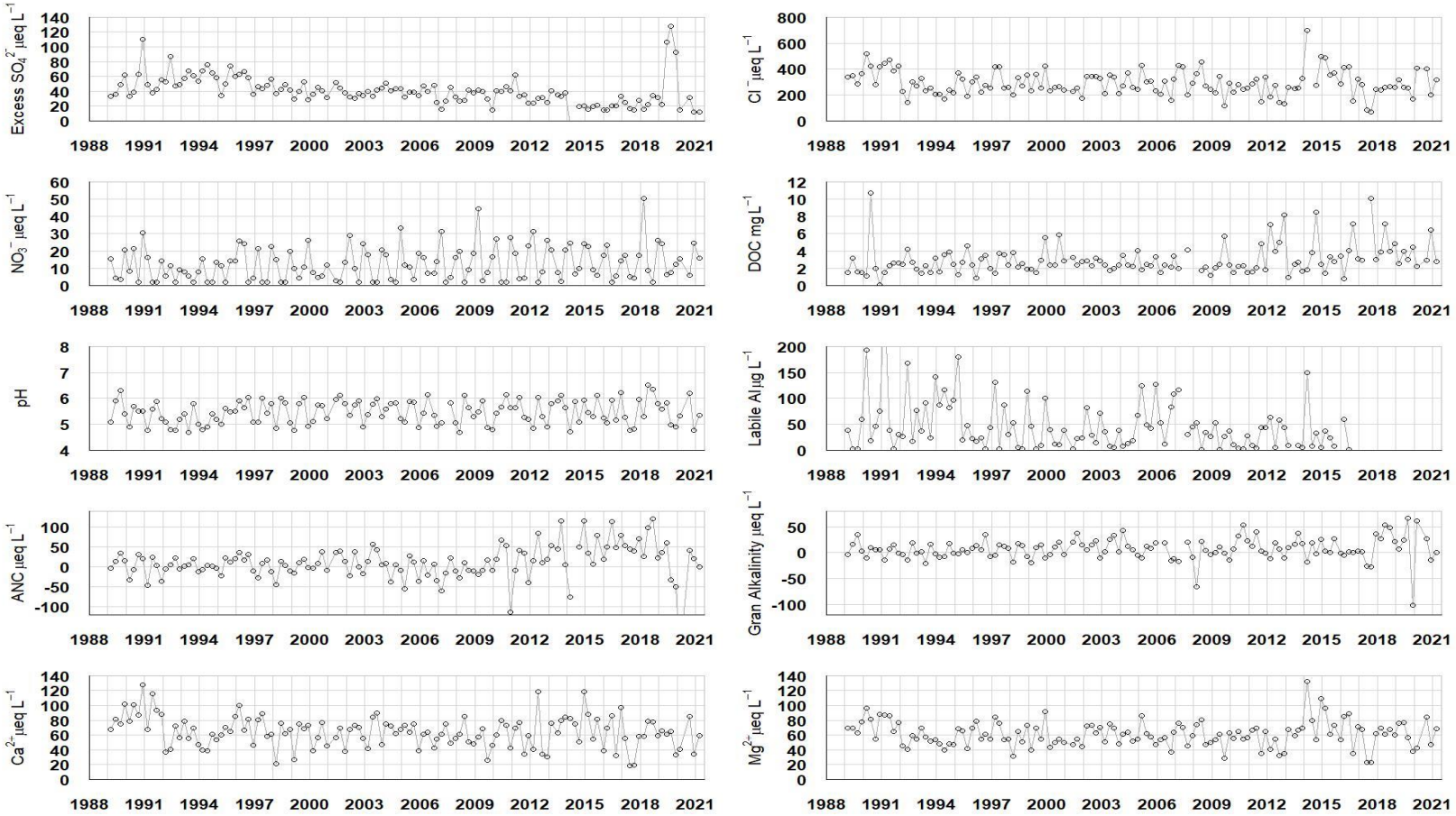
5.16. Llyn Cwm Mynach

5.16.1. Llyn Cwm Mynach site characteristics

Grid Reference	SH 678238
Lake altitude	285 m
Maximum altitude	680 m
Maximum depth	11.0 m
Mean depth	0.9 m
Volume	8.2×10^5 m^3
Lake area	5.9 ha
Catchment area	159 ha
Catchment area (excl.lake)	153 ha
Catchment:Lake ratio	26.9
Catchment geology	Cambrian sedimentary
Catchment soils	Blanket peats, acid rankers
Catchment vegetation	Conifers – 55%, Moorland – 45%
Mean annual runoff	1815 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	26.2 – 9.3
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	18.1 – 3.9
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.1 – 5.8
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	34.7 – 13.0

5.16.2. Llyn Cwm Mynach water chemistry

5.16.2.1. Water chemistry time series



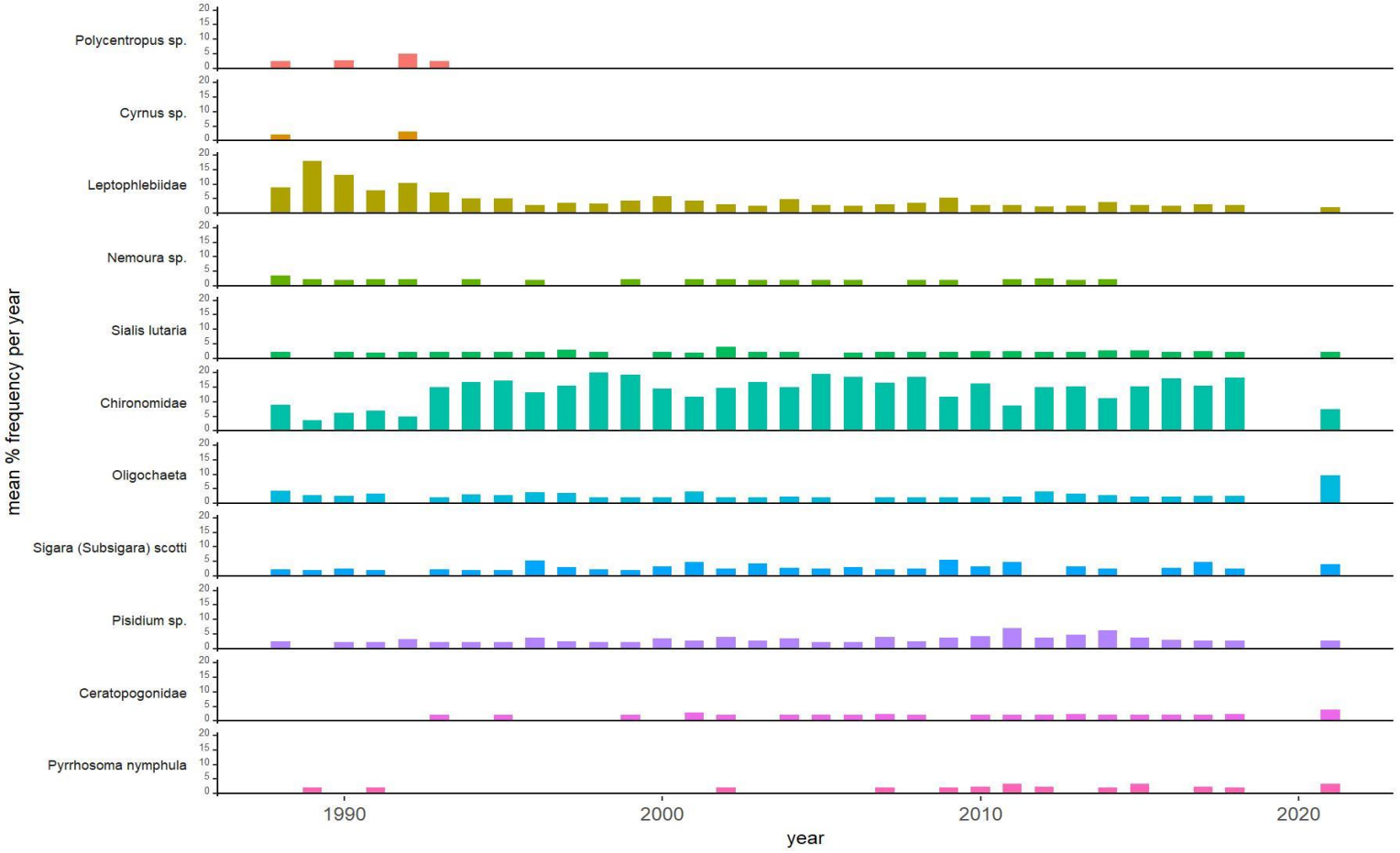
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.16.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	87.49	17.97	85.40	10.32	68.74	7.40	69.36	6.23	62.33	13.43	58.15	30.22	45.62	20.38
non-marine sulphate (μeq L^{-1})	51.39	18.58	53.10	12.59	38.05	6.93	38.99	9.05	34.93	9.99	20.70	31.87	12.47	11.04
nitrate (μeq L^{-1})	7.86	7.94	12.50	8.77	10.00	8.79	11.43	9.19	12.29	12.37	11.18	11.04	15.93	9.47
chloride (μeq L^{-1})	334.29	98.30	265.17	73.43	262.35	67.33	299.03	83.68	255.30	70.08	275.61	138.14	318.77	99.37
calcium (μeq L^{-1})	76.60	23.81	63.87	18.70	67.37	17.36	61.63	12.02	61.63	22.71	62.87	24.12	59.38	25.62
magnesium (μeq L^{-1})	67.45	15.47	54.70	14.08	55.11	13.81	58.53	12.69	58.24	13.33	67.78	25.03	68.44	18.29
sodium (μeq L^{-1})	278.40	67.36	237.07	50.52	239.25	48.94	241.86	53.75	236.64	53.38	278.84	101.00	244.04	75.42
potassium (μeq L^{-1})	2.56	1.69	2.68	1.38	4.35	1.69	4.74	1.39	4.94	1.86	6.90	2.68	8.67	2.03
pH	5.30	0.45	5.46	0.42	5.74	0.42	5.42	0.44	5.63	0.44	5.38	0.53	5.36	0.72
Gran alkalinity (μeq L^{-1})	2.76	13.23	6.00	12.36	10.60	15.41	5.20	22.96	10.80	17.98	2.95	33.08	0.80	20.57
labile aluminium (μg L^{-1})	38.00	75.26	46.00	50.82	24.00	27.73	45.00	40.60	11.00	21.25	24.00	46.68	N/A	N/A
conductivity (μS cm^{-1})	48.50	10.77	38.50	10.94	38.50	8.40	43.00	7.89	45.75	9.29	48.65	19.08	50.80	13.46
Dissolved Organic Carbon (mg L^{-1})	2.15	2.12	2.51	1.01	2.41	1.14	2.30	0.87	2.35	2.00	3.45	2.25	2.96	2.07
Acid Neutralising Capacity (μS cm^{-1})	4.37	21.97	3.88	20.20	10.39	23.02	-8.90	24.87	18.11	48.12	48.28	49.75	21.82	21.17

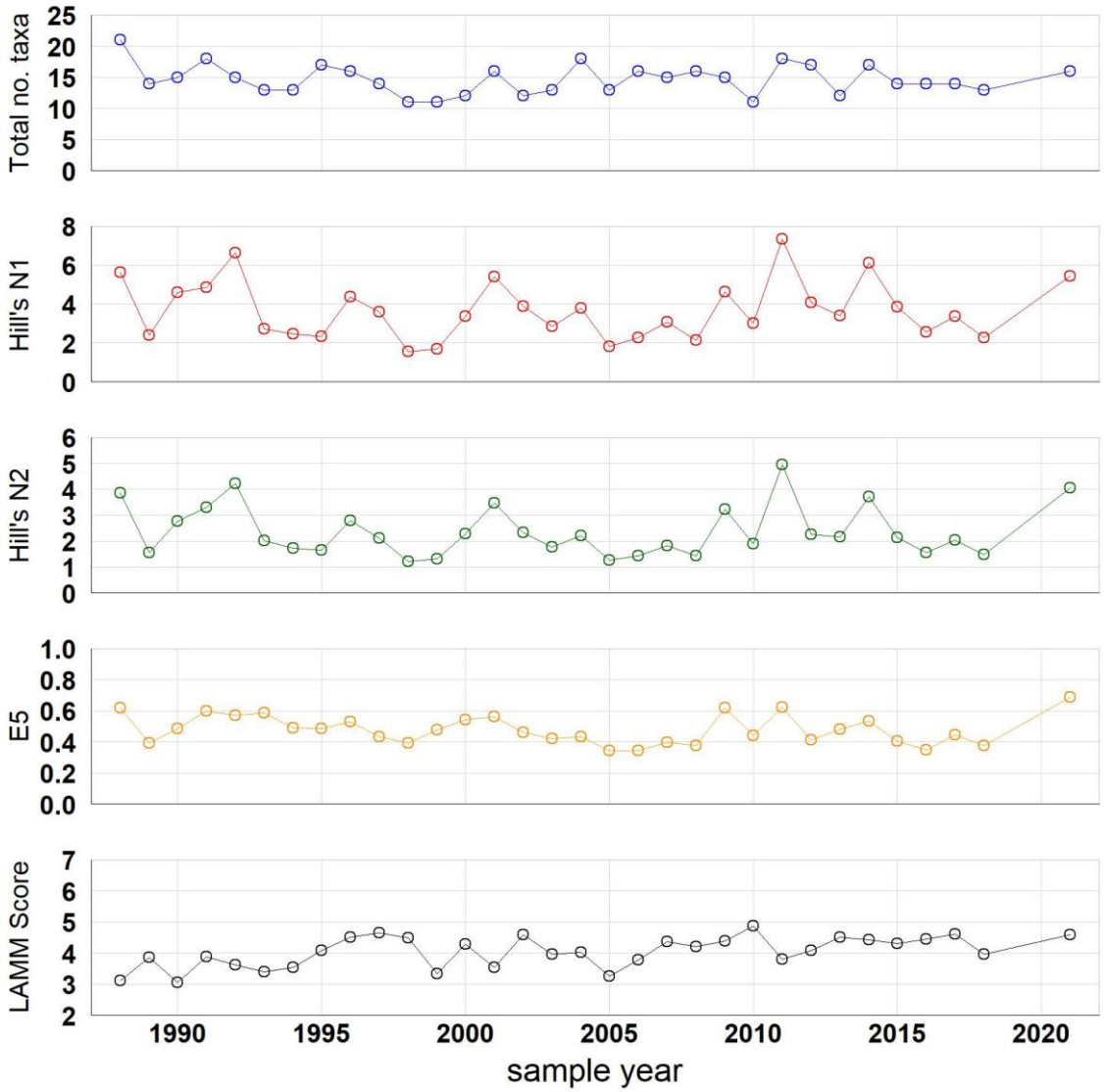
5.16.3. Llyn Cwm Mynach macroinvertebrates

5.16.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

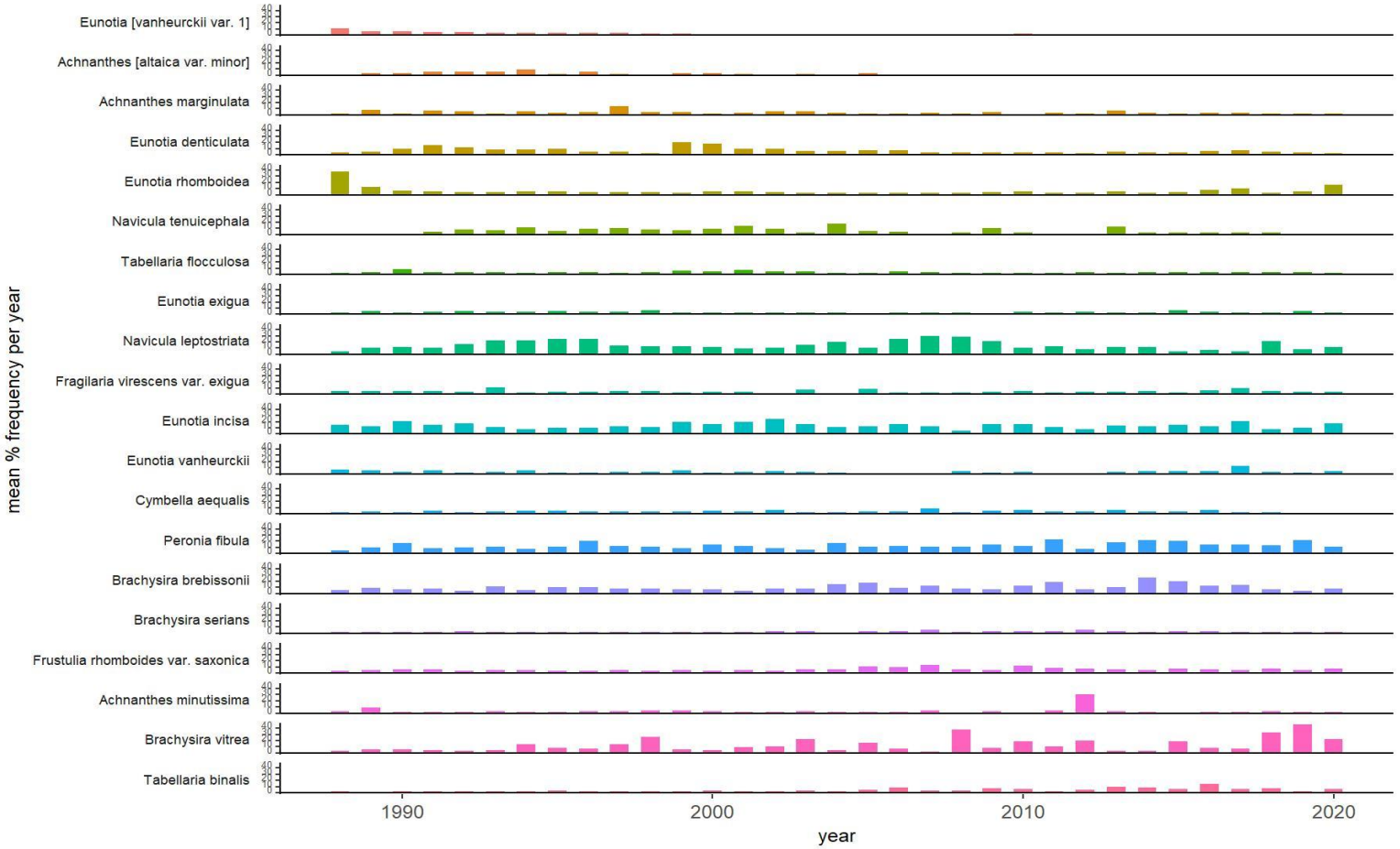
5.16.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

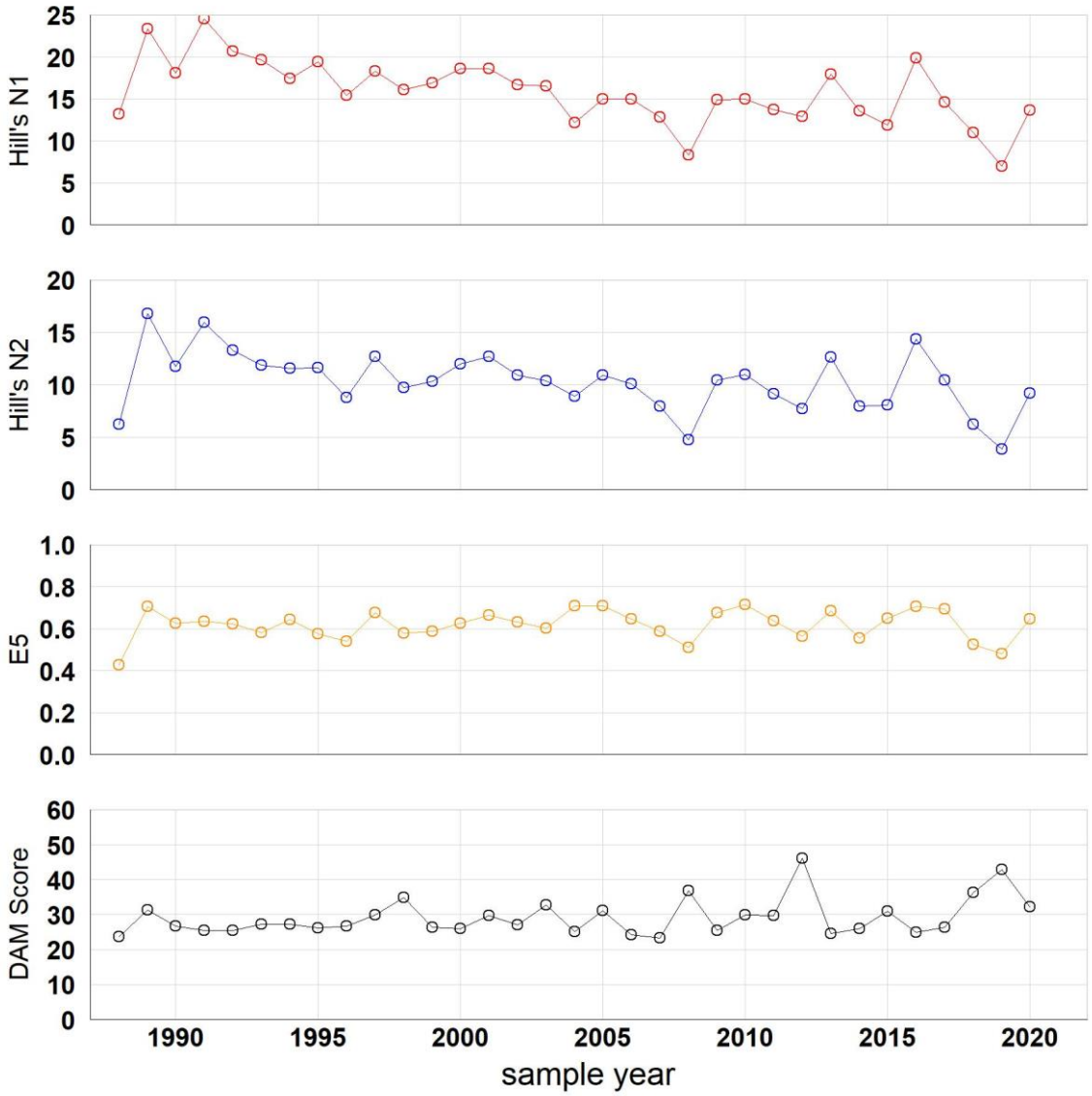
5.16.4. Llyn Cwm Mynach epilithic diatoms

5.16.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

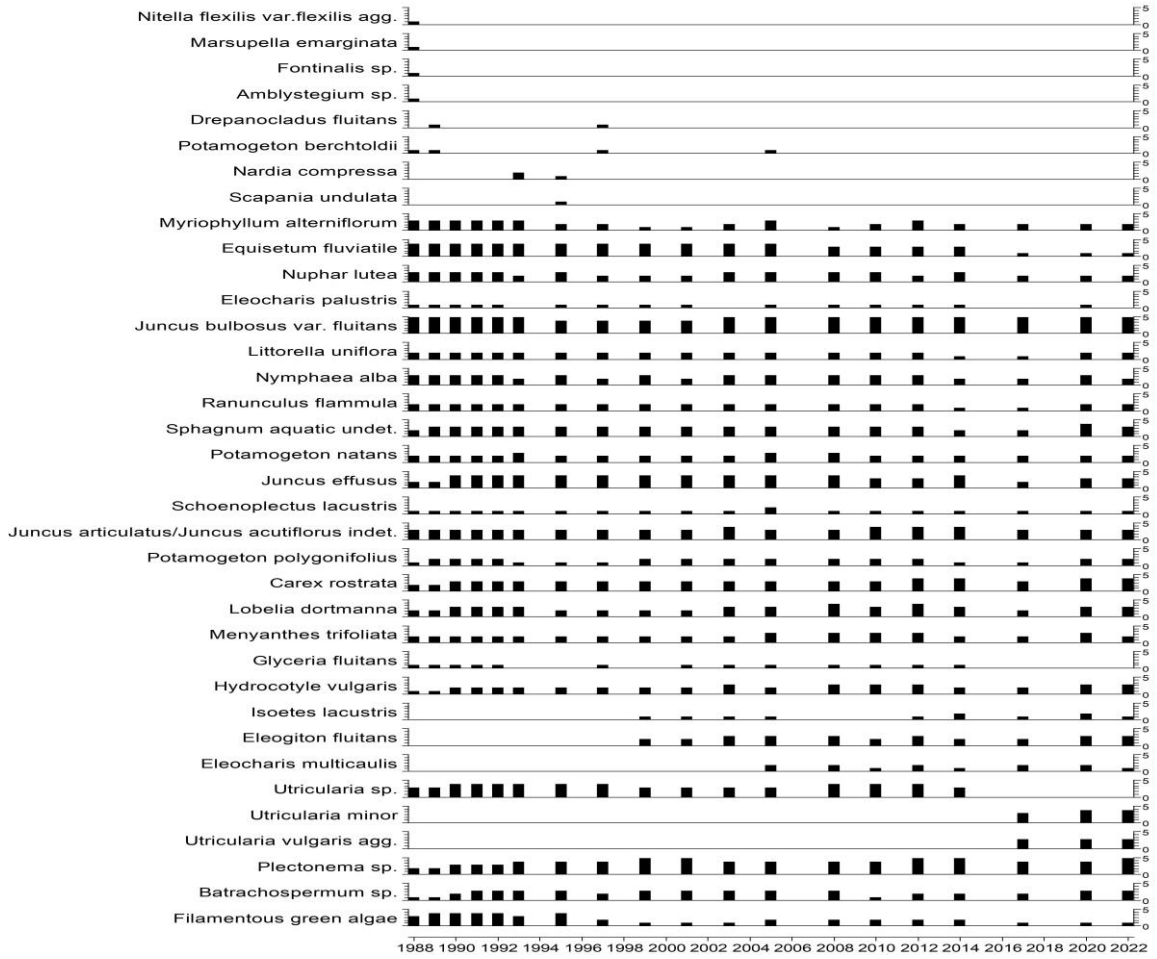
5.16.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.16.5. Llyn Cwm Mynach aquatic macrophytes

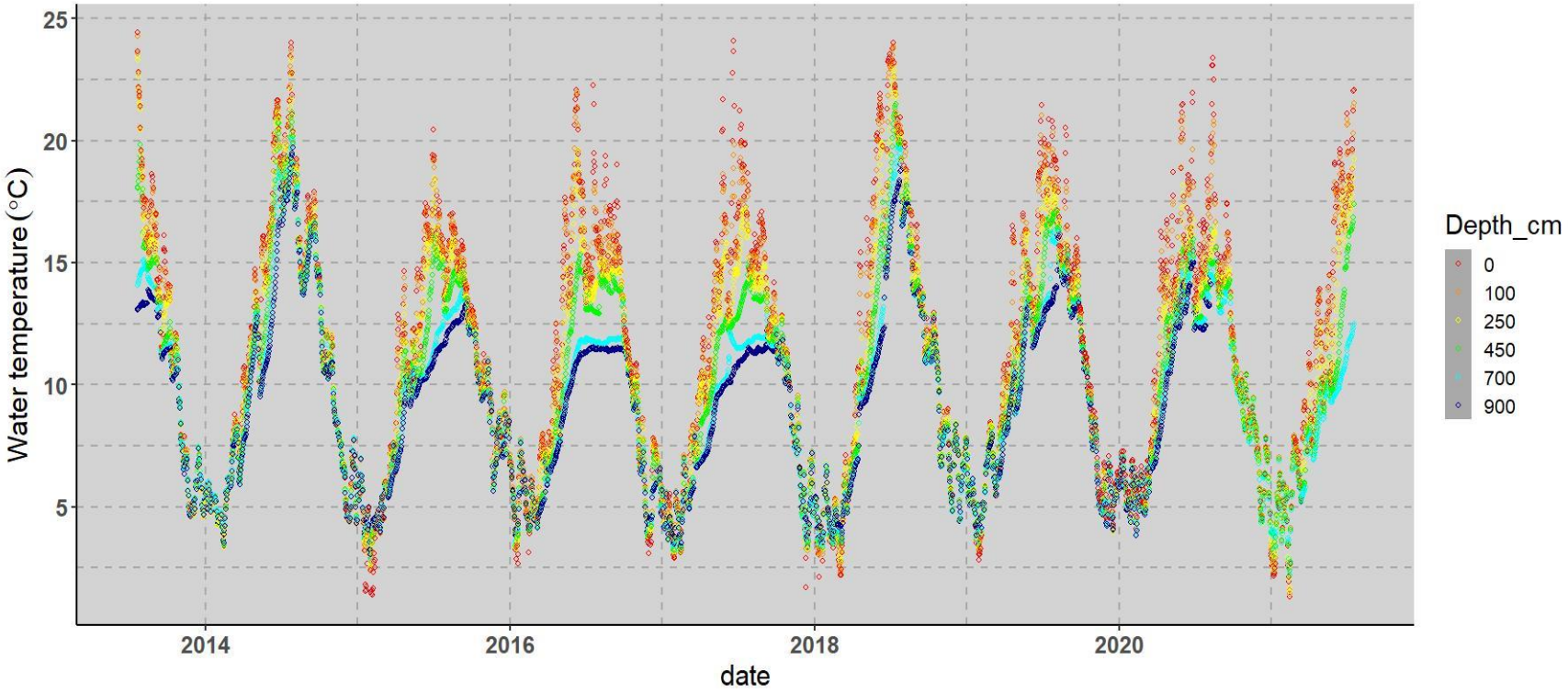
5.16.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.16.6. Llyn Cwm Mynach water temperature

5.16.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

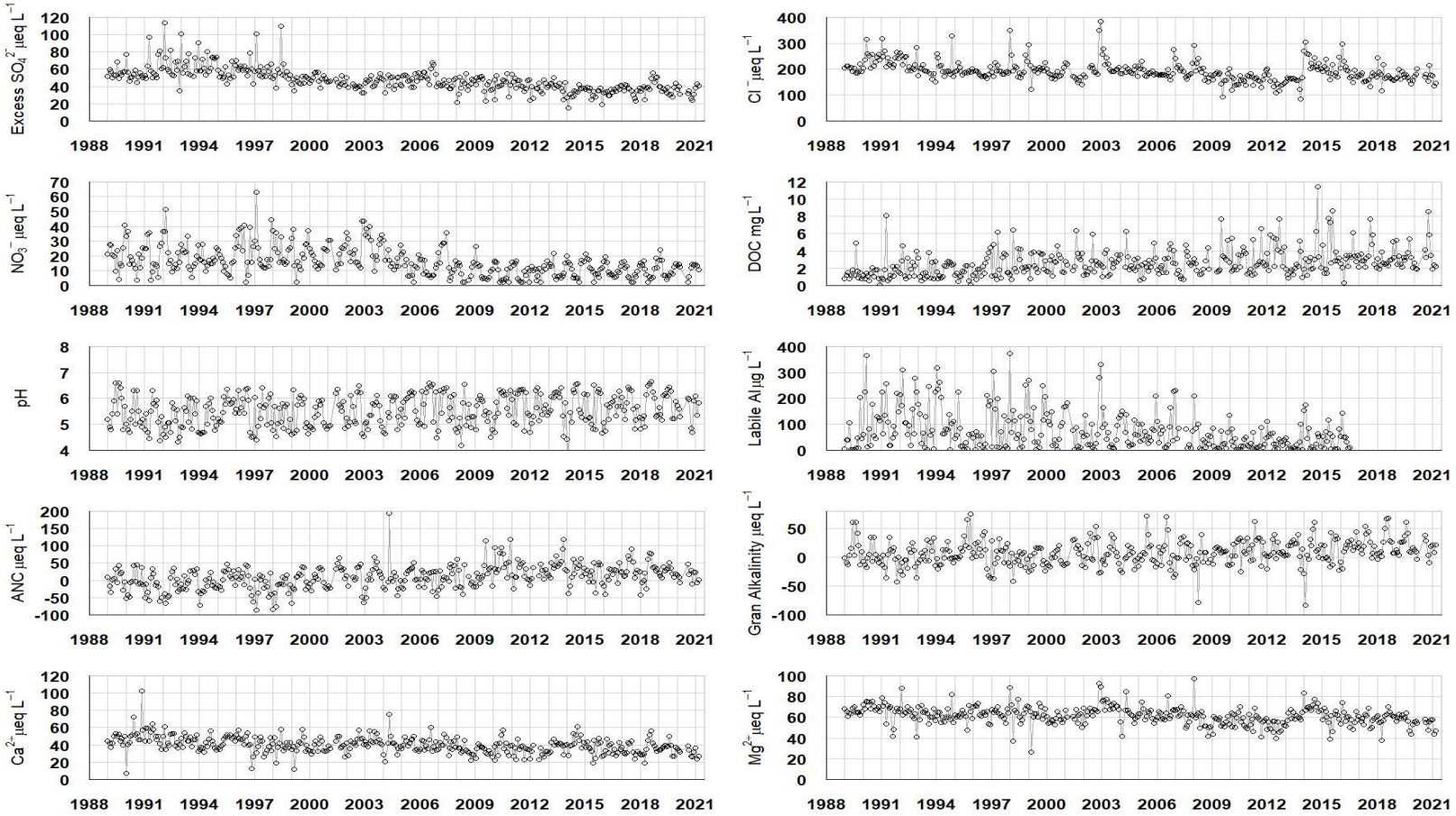
5.17. Afon Hafren

5.17.1. Afon Hafren site characteristics

Grid Reference	SH 844876
Catchment area	358 ha
Minimum catchment altitude	355 m
Maximum catchment altitude	690 m
Catchment geology	Ordovician and Silurian sedimentary
Catchment soils	Podsols and organic peats
Catchment vegetation	Conifers 50%, Moorland 50%
Mean annual runoff	2142 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	42.1 – 18.2
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	29.9 – 7.2
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	18.4 – 9.9
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	44.9 – 21.8

5.17.2. Afon Hafren water chemistry

5.17.2.1. Water chemistry time series



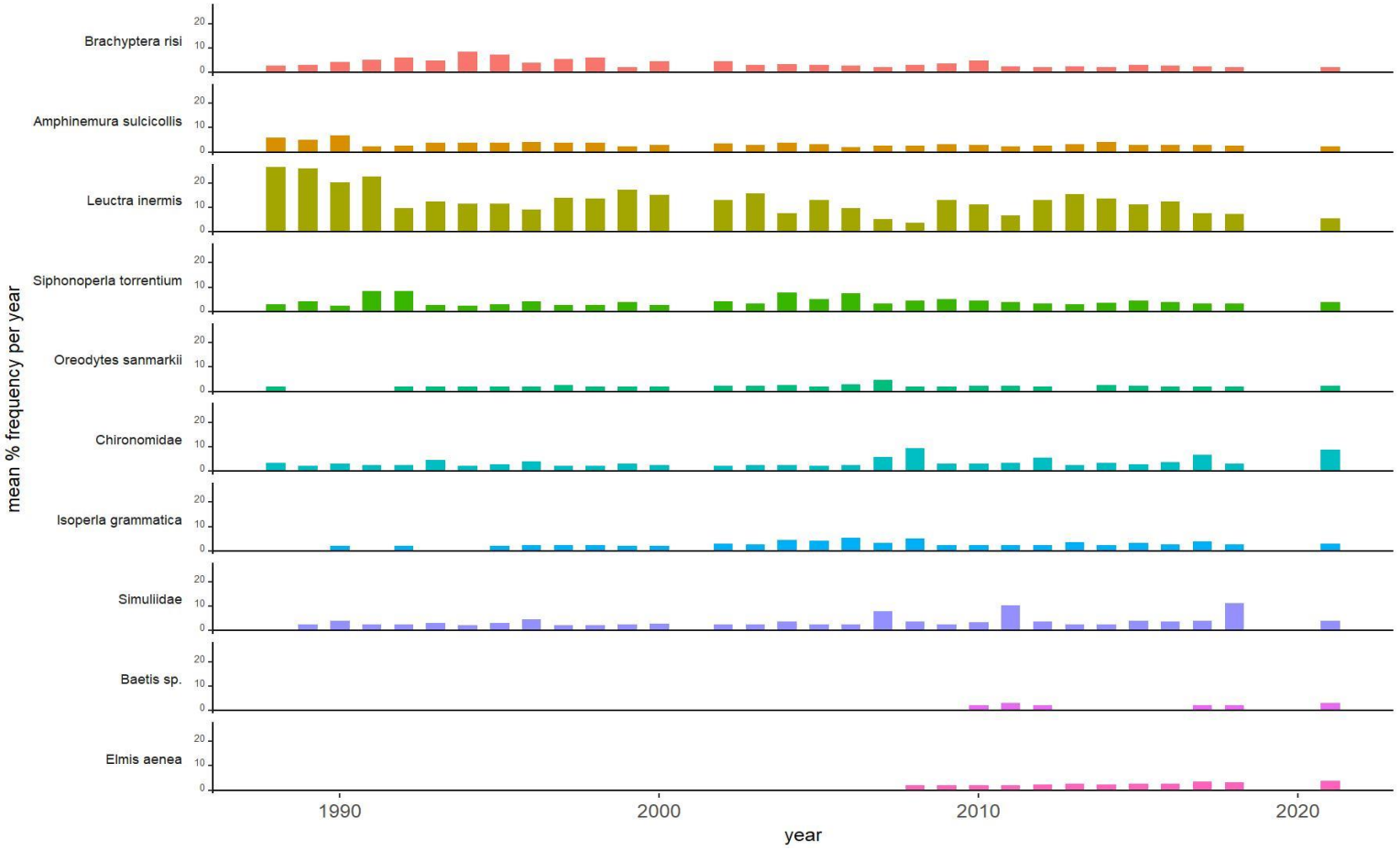
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.17.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	79.15	13.97	79.15	11.78	66.66	6.12	66.66	7.80	58.12	9.17	55.58	6.29	51.65	5.22
non-marine sulphate (μeq L^{-1})	56.27	14.32	58.25	12.03	45.86	5.65	46.68	8.03	41.20	7.65	35.60	6.78	33.43	6.60
nitrate (μeq L^{-1})	19.64	10.02	17.86	10.94	22.07	9.52	12.86	7.71	9.71	5.43	9.75	5.23	12.68	4.48
chloride (μeq L^{-1})	211.58	33.48	191.83	33.64	194.65	44.37	186.19	25.52	158.26	23.86	180.12	35.93	171.80	24.27
calcium (μeq L^{-1})	46.91	11.68	41.17	8.75	40.92	8.17	38.42	8.92	36.03	7.35	37.13	8.42	29.47	5.55
magnesium (μeq L^{-1})	65.81	7.75	63.34	7.78	65.81	9.61	61.86	8.91	56.76	6.61	60.67	8.15	55.28	5.73
sodium (μeq L^{-1})	195.75	18.17	182.70	22.98	182.70	26.41	169.65	23.89	162.47	19.79	174.00	20.30	164.21	16.87
potassium (μeq L^{-1})	2.56	2.00	2.81	1.71	4.35	2.09	3.07	2.44	3.87	1.99	4.23	1.94	4.40	2.32
pH	5.20	0.59	5.50	0.56	5.34	0.55	5.60	0.64	5.73	0.55	5.69	0.61	5.87	0.55
Gran alkalinity (μeq L^{-1})	-0.34	21.23	2.30	21.97	1.00	19.01	0.96	24.63	9.91	17.27	16.80	23.88	20.20	15.17
labile aluminium (μg L^{-1})	80.00	89.55	63.00	90.98	68.00	77.59	59.00	57.77	20.00	30.84	45.00	46.97	N/A	N/A
conductivity (μS cm^{-1})	39.00	10.47	32.00	7.92	31.00	6.95	34.00	5.80	32.60	4.07	35.10	5.01	33.30	3.85
Dissolved Organic Carbon (mg L^{-1})	1.30	1.31	1.85	1.32	2.64	1.14	2.40	1.16	2.42	1.69	3.03	1.84	3.37	2.26
Acid Neutralising Capacity (μS cm^{-1})	-7.44	29.84	-10.20	30.78	9.06	30.62	3.41	35.93	32.27	33.62	26.21	27.72	20.25	19.70

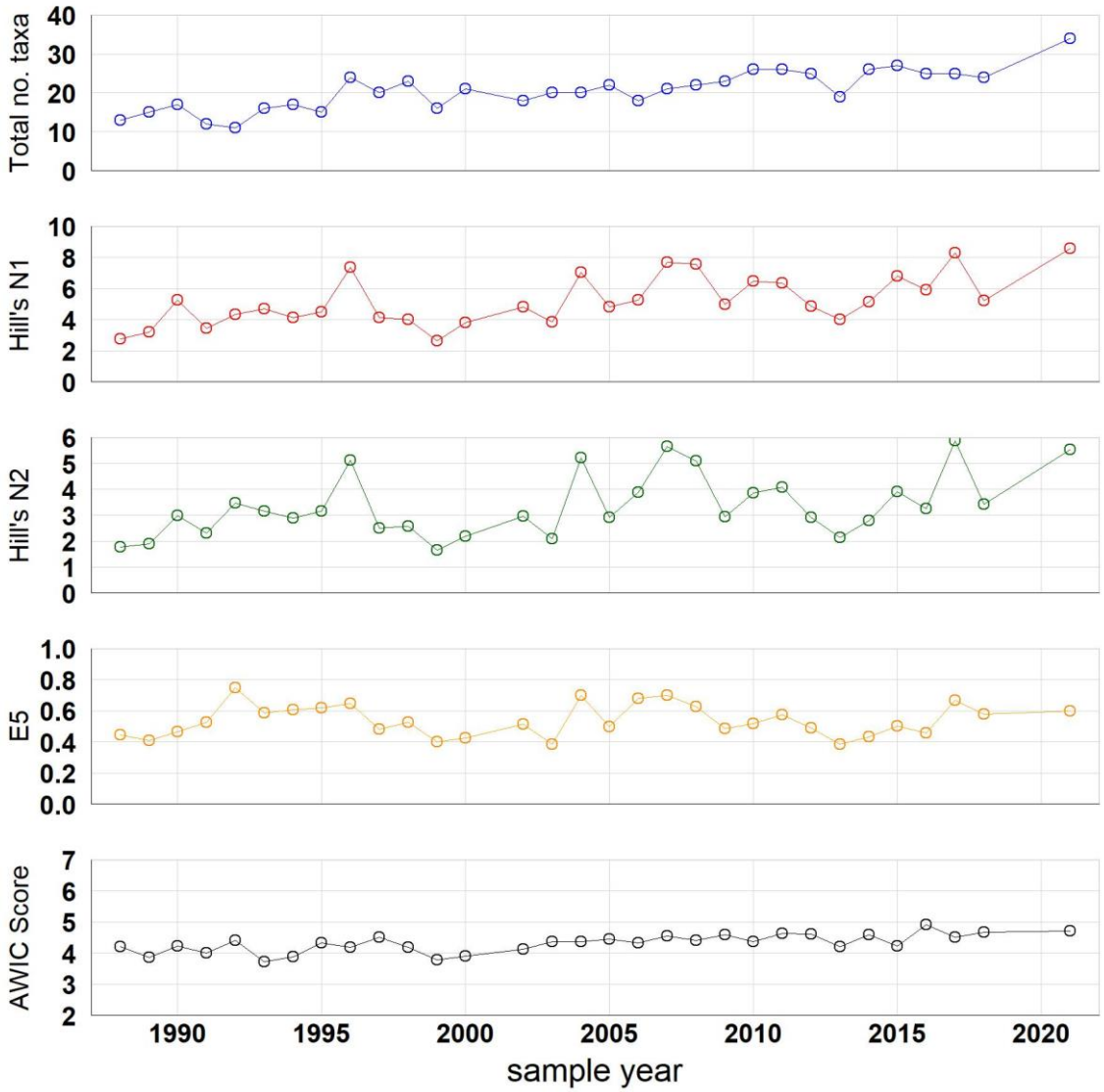
5.17.3. Afon Hafren macroinvertebrates

5.17.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

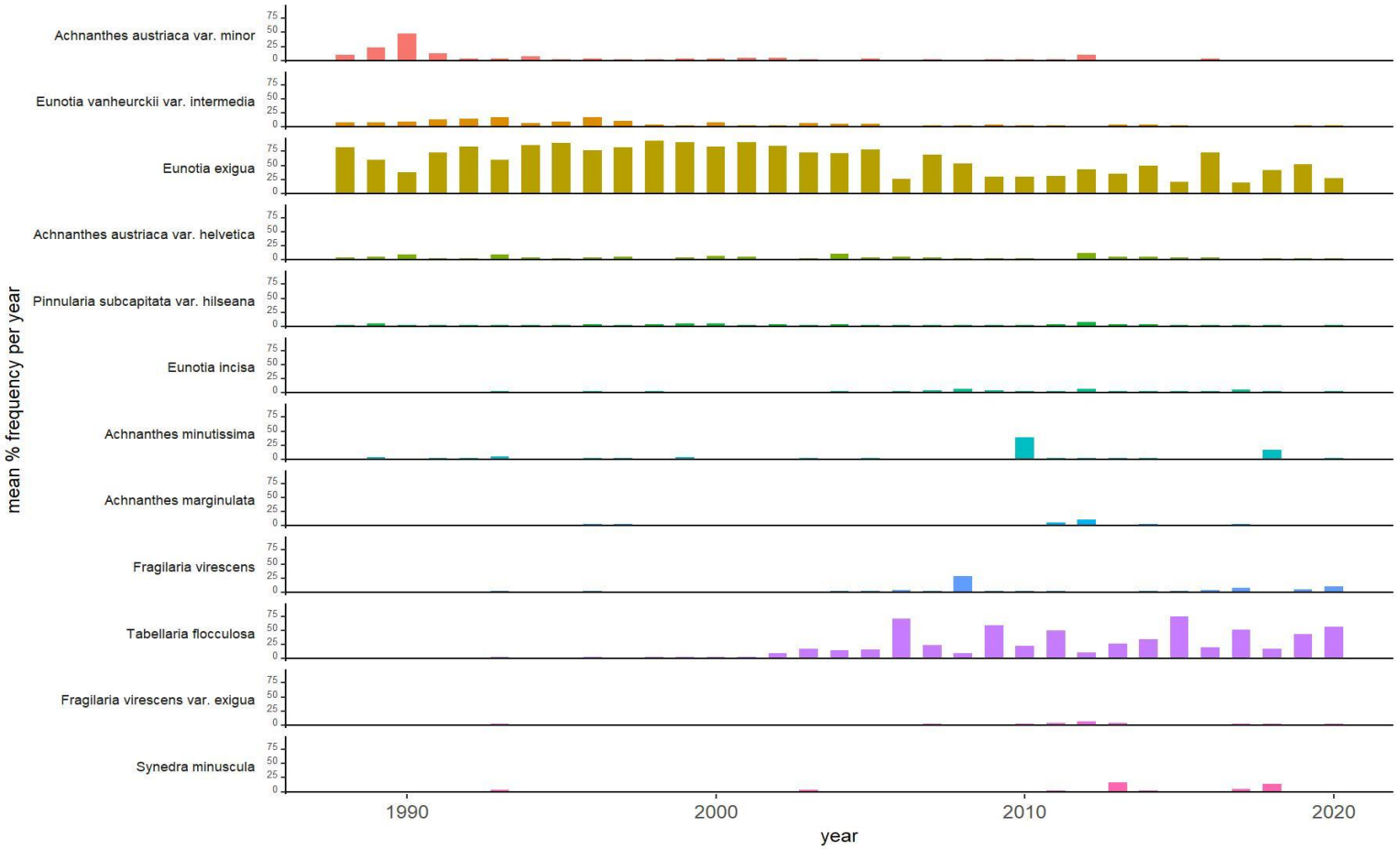
5.17.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

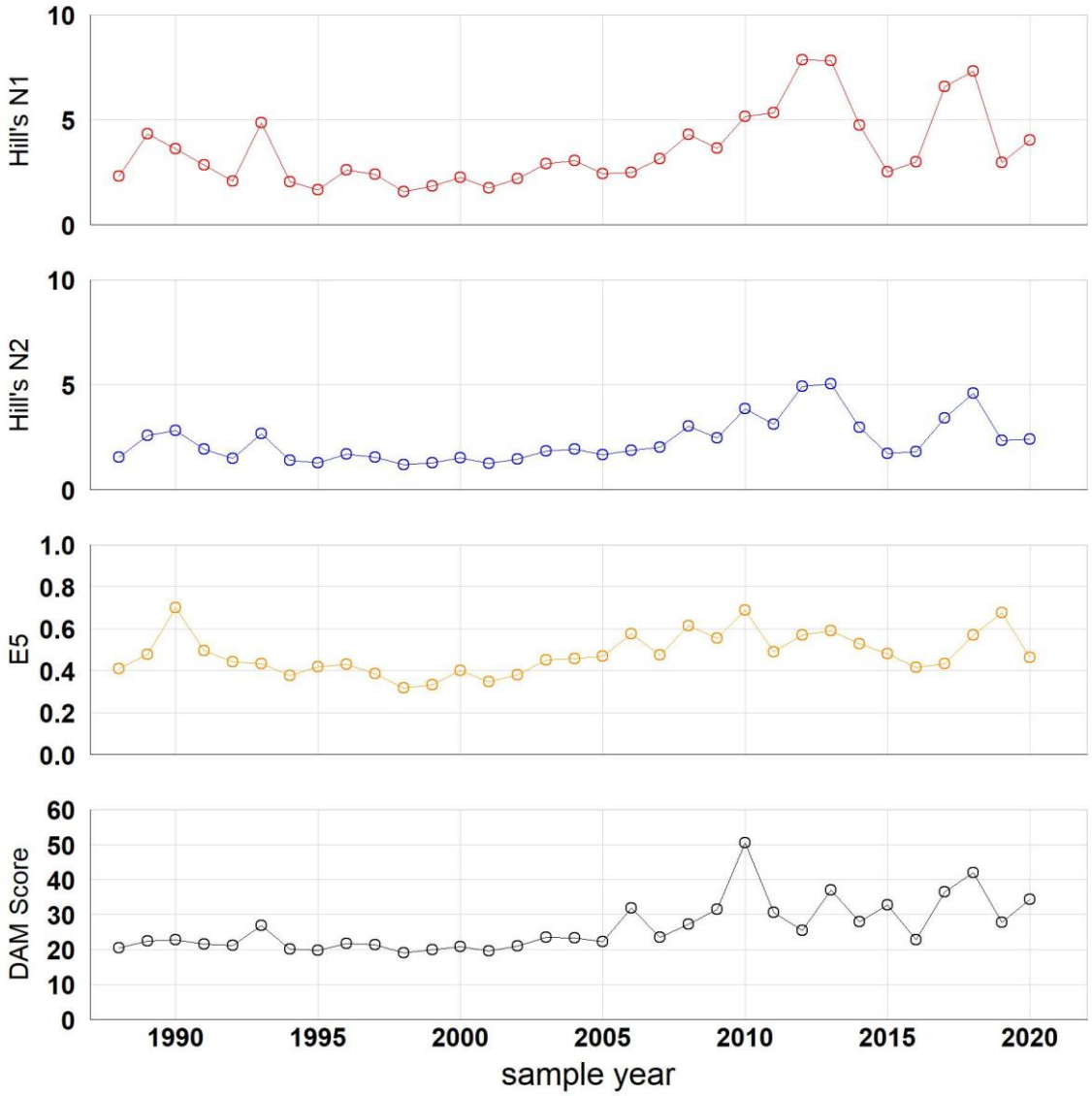
5.17.4. Afon Hafren epilithic diatoms

5.17.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

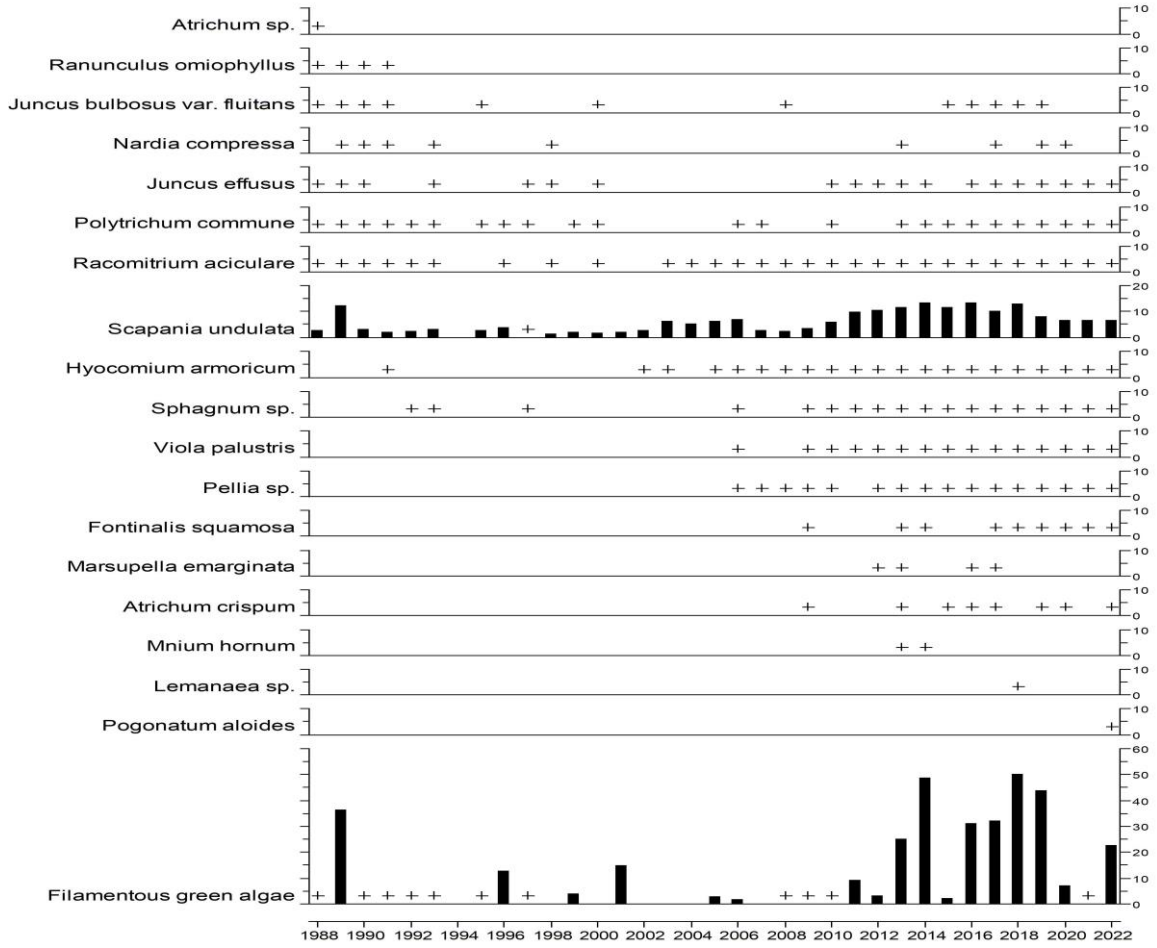
5.17.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.17.5. Afon Hafren aquatic macrophytes

5.17.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

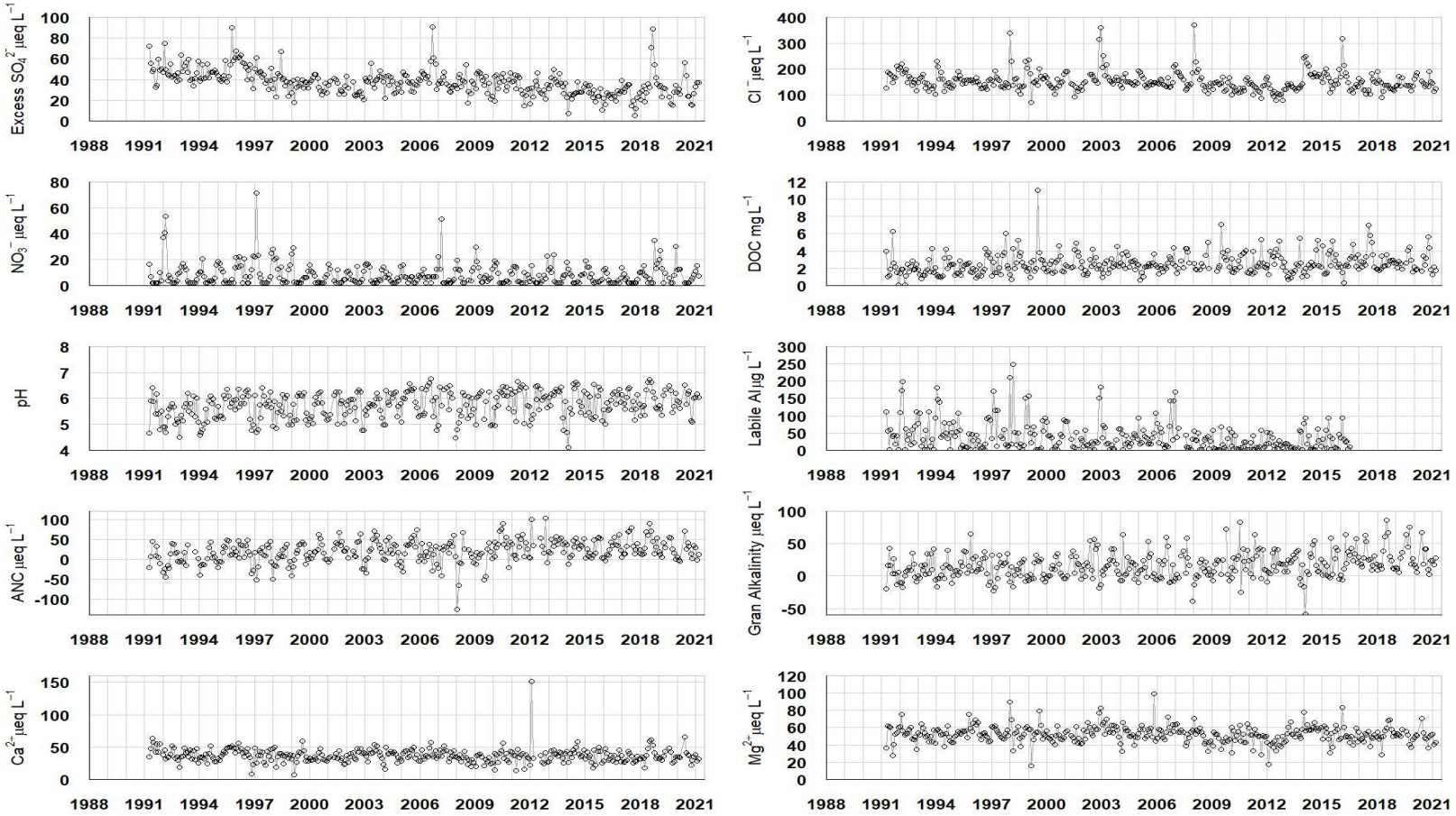
5.18. Afon Gwy

5.18.1. Afon Gwy site characteristics

Grid Reference	SN 842854
Catchment area	389 ha
Minimum catchment altitude	440 m
Maximum catchment altitude	730 m
Catchment geology	Lower Palaeozoic sedimentary
Catchment soils	Peats, peaty podsols
Catchment vegetation	Moorland 96%, Conifer plantation 4%
Mean annual runoff	2136 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	38.5 – 16.8
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	27.0 – 6.5
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	13.2 – 7.9
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	34.1 – 19.2

5.18.2. Afon Gwy water chemistry

5.18.2.1. Water chemistry time series



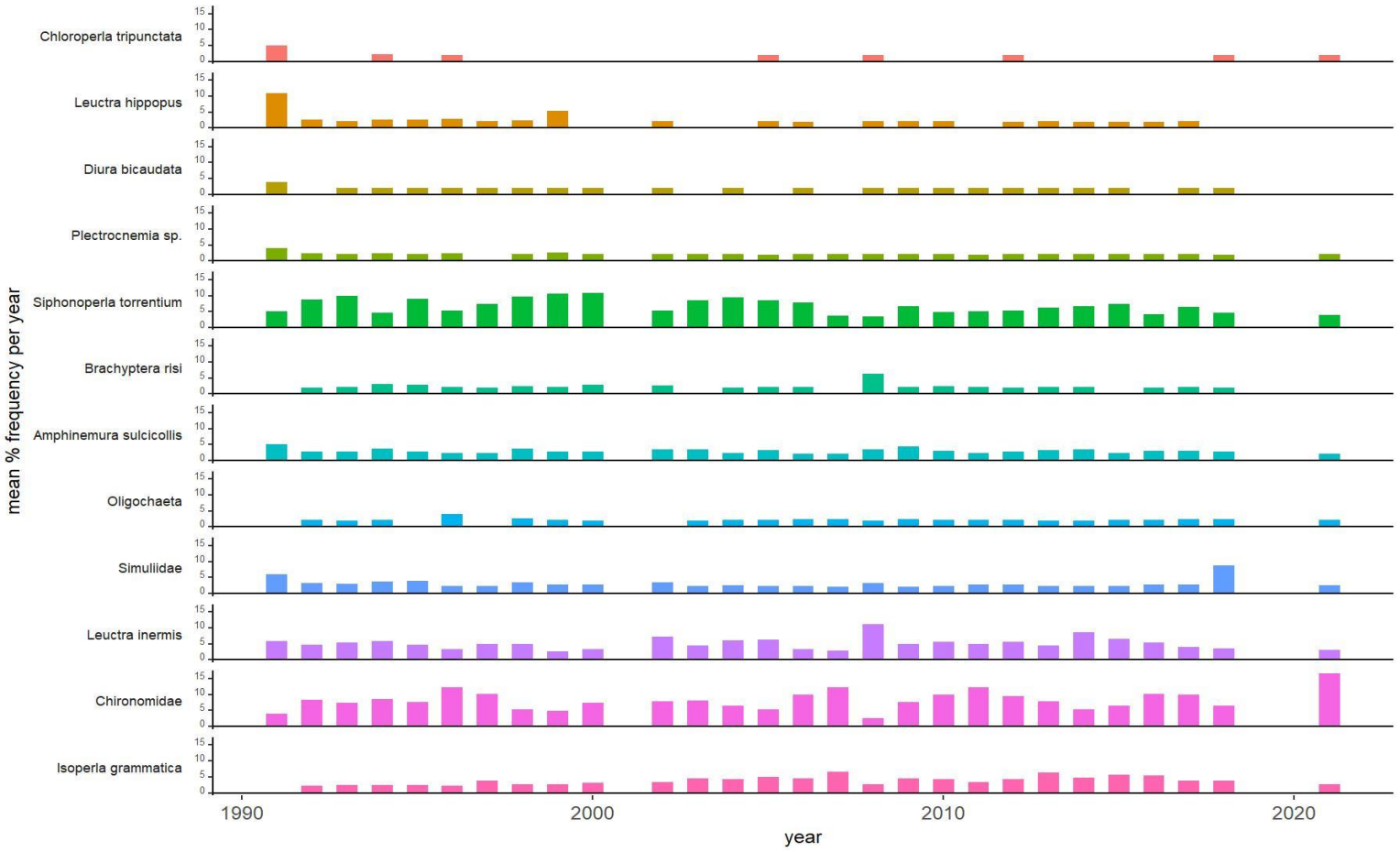
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.18.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	64.57	10.97	62.49	10.85	53.12	8.25	53.71	11.41	48.99	9.31	45.06	11.64	45.24	12.48
non-marine sulphate (μeq L^{-1})	47.32	10.00	44.11	11.41	36.04	7.39	37.26	10.76	35.36	8.35	27.30	12.09	29.83	12.77
nitrate (μeq L^{-1})	3.57	12.15	7.14	11.08	5.00	6.05	6.54	7.54	5.82	6.47	5.54	6.96	5.21	4.50
chloride (μeq L^{-1})	163.62	29.75	152.33	36.36	155.16	46.60	149.51	37.43	127.65	21.35	147.82	38.54	143.17	21.25
calcium (μeq L^{-1})	40.42	9.85	38.17	9.27	35.93	8.50	36.18	8.12	36.48	17.99	35.65	9.21	36.23	11.45
magnesium (μeq L^{-1})	53.47	9.49	53.47	9.04	54.70	10.34	54.87	10.08	49.60	9.13	52.44	9.26	48.99	9.30
sodium (μeq L^{-1})	147.90	18.83	143.55	20.93	145.72	28.85	137.03	20.05	127.89	16.58	140.50	23.59	131.37	17.46
potassium (μeq L^{-1})	2.56	3.08	2.56	2.38	2.56	2.29	2.56	2.50	2.91	2.06	2.98	2.41	1.84	1.54
pH	5.41	0.48	5.72	0.50	5.75	0.44	5.95	0.54	6.07	0.51	5.84	0.51	6.04	0.47
Gran alkalinity (μeq L^{-1})	7.16	16.45	10.30	16.95	10.80	17.20	7.80	19.87	18.79	20.36	21.95	23.69	23.70	18.59
labile aluminium (μg L^{-1})	43.00	49.60	39.00	56.36	26.00	40.04	31.00	35.19	10.00	18.92	24.00	28.93	N/A	N/A
conductivity (μS cm^{-1})	29.00	4.73	24.00	7.32	23.00	6.93	27.00	6.48	27.20	4.17	29.50	5.39	27.90	3.20
Dissolved Organic Carbon (mg L^{-1})	1.80	1.18	2.11	1.14	2.35	1.45	2.38	0.87	2.30	1.27	2.45	1.17	2.28	1.39
Acid Neutralising Capacity (μS cm^{-1})	2.69	23.56	9.54	24.74	19.55	25.24	17.79	33.42	31.44	30.20	27.16	22.19	26.43	21.39

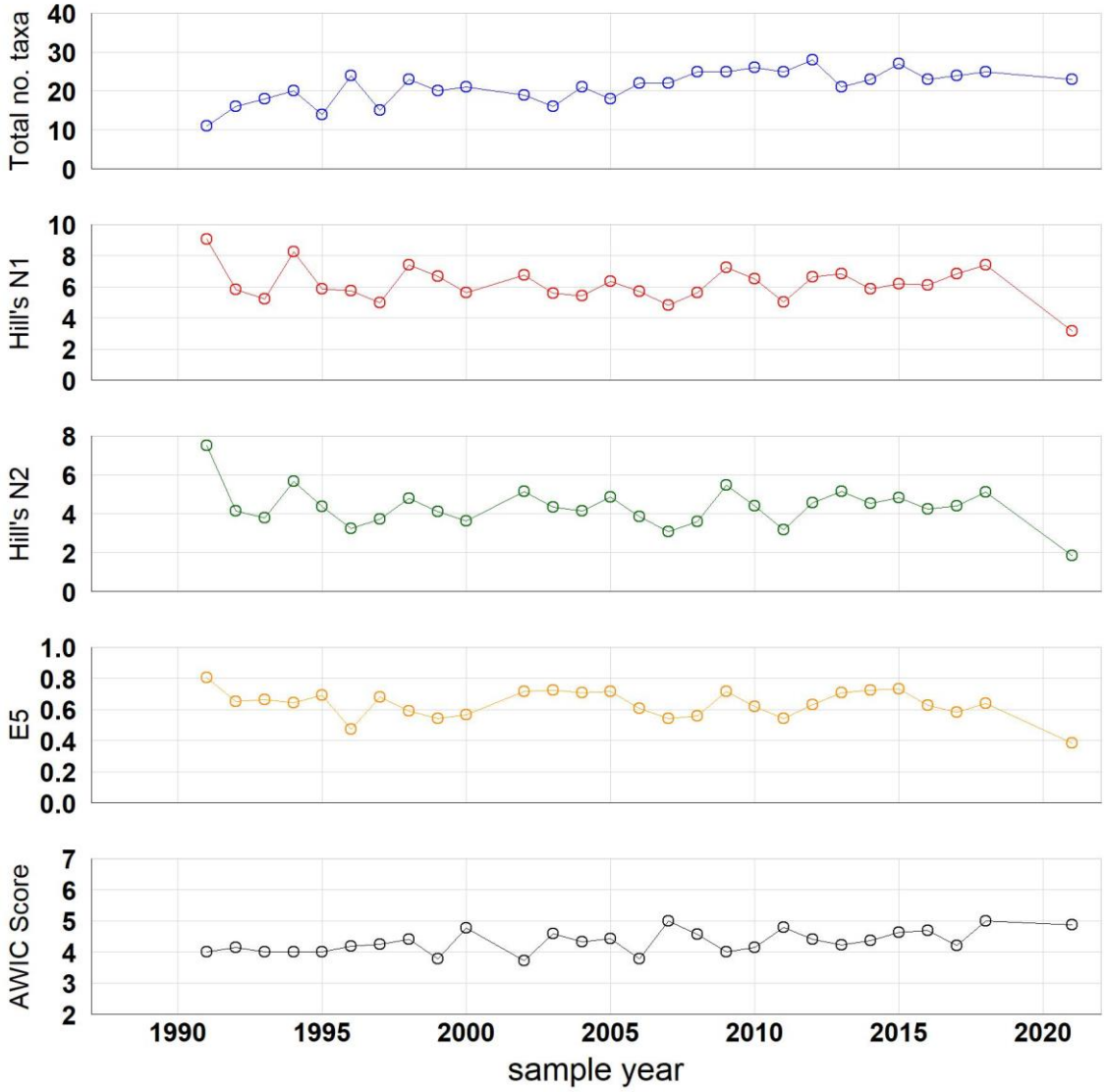
5.18.3. Afon Gwy macroinvertebrates

5.18.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

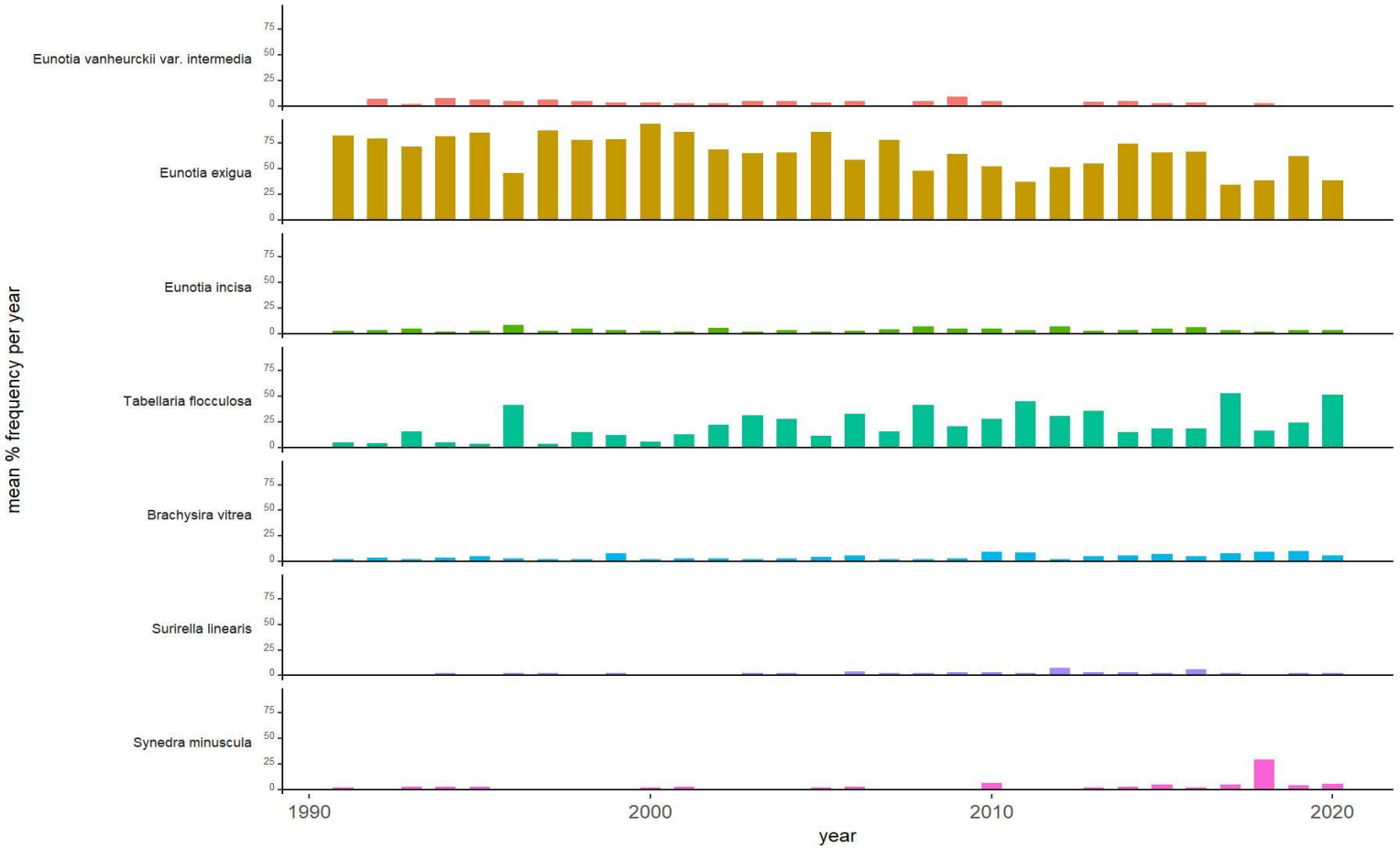
Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

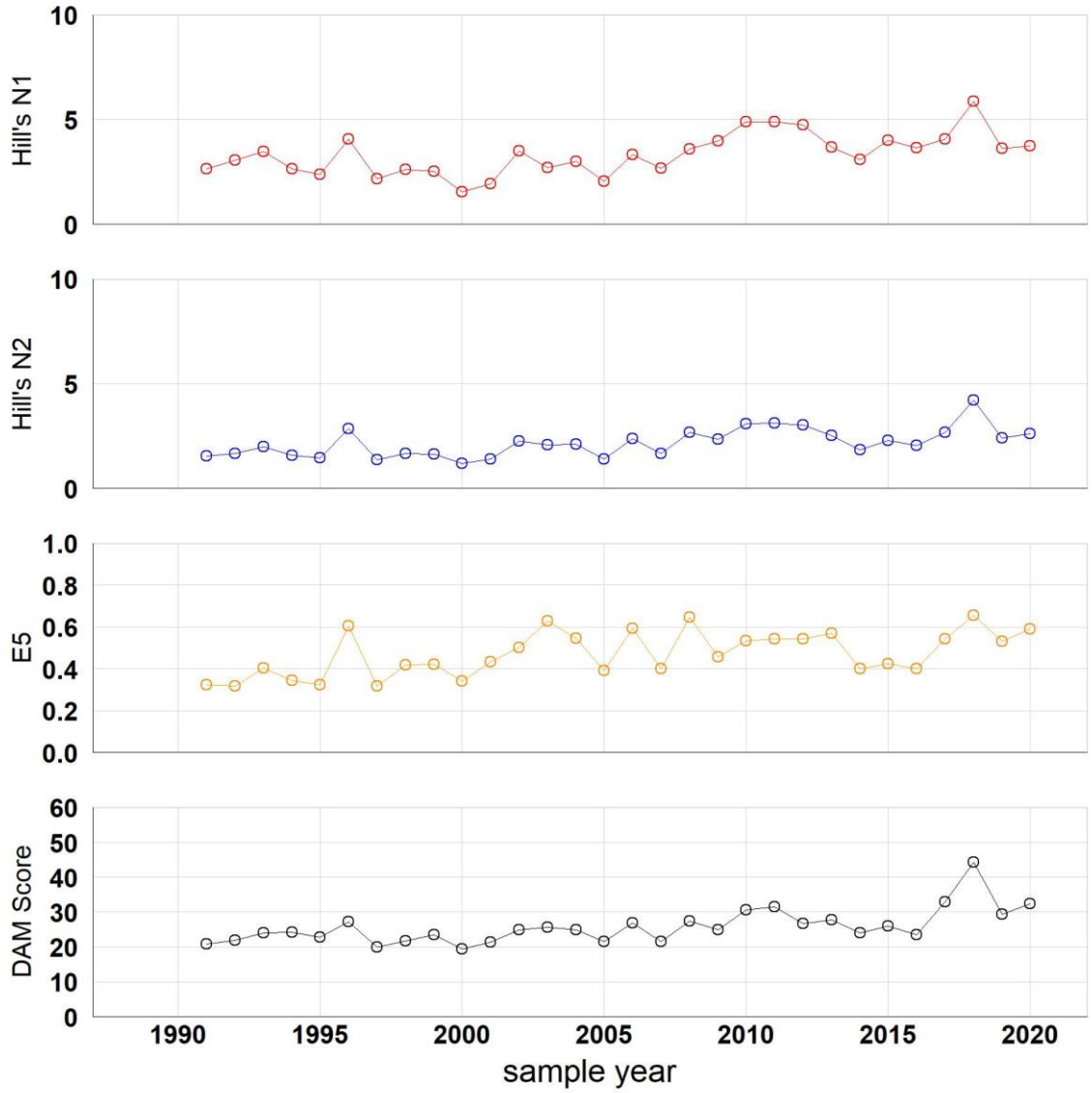
5.18.4. Afon Gwy epilithic diatoms

5.18.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

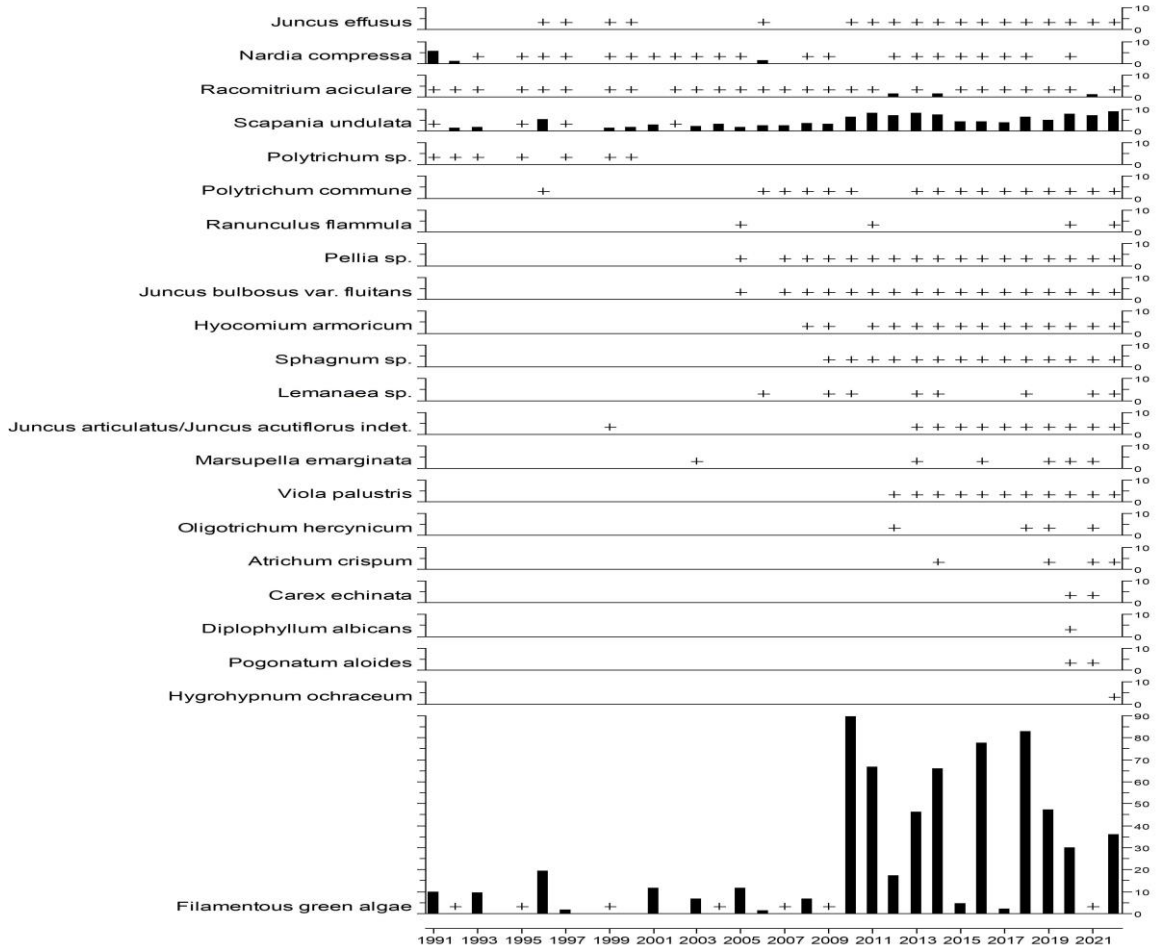
5.18.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.18.5. Afon Gwy aquatic macrophytes

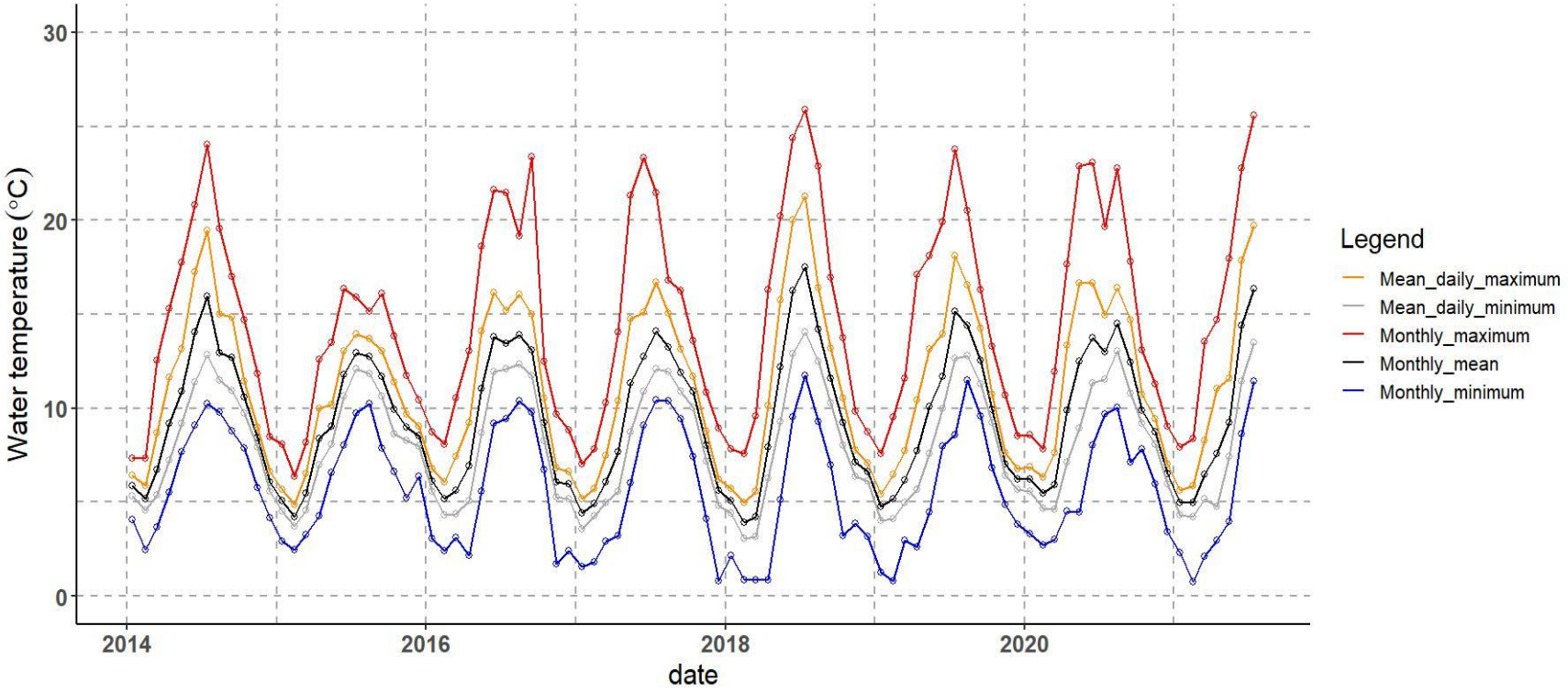
5.18.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.18.6. Afon Gwy water temperature

5.18.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

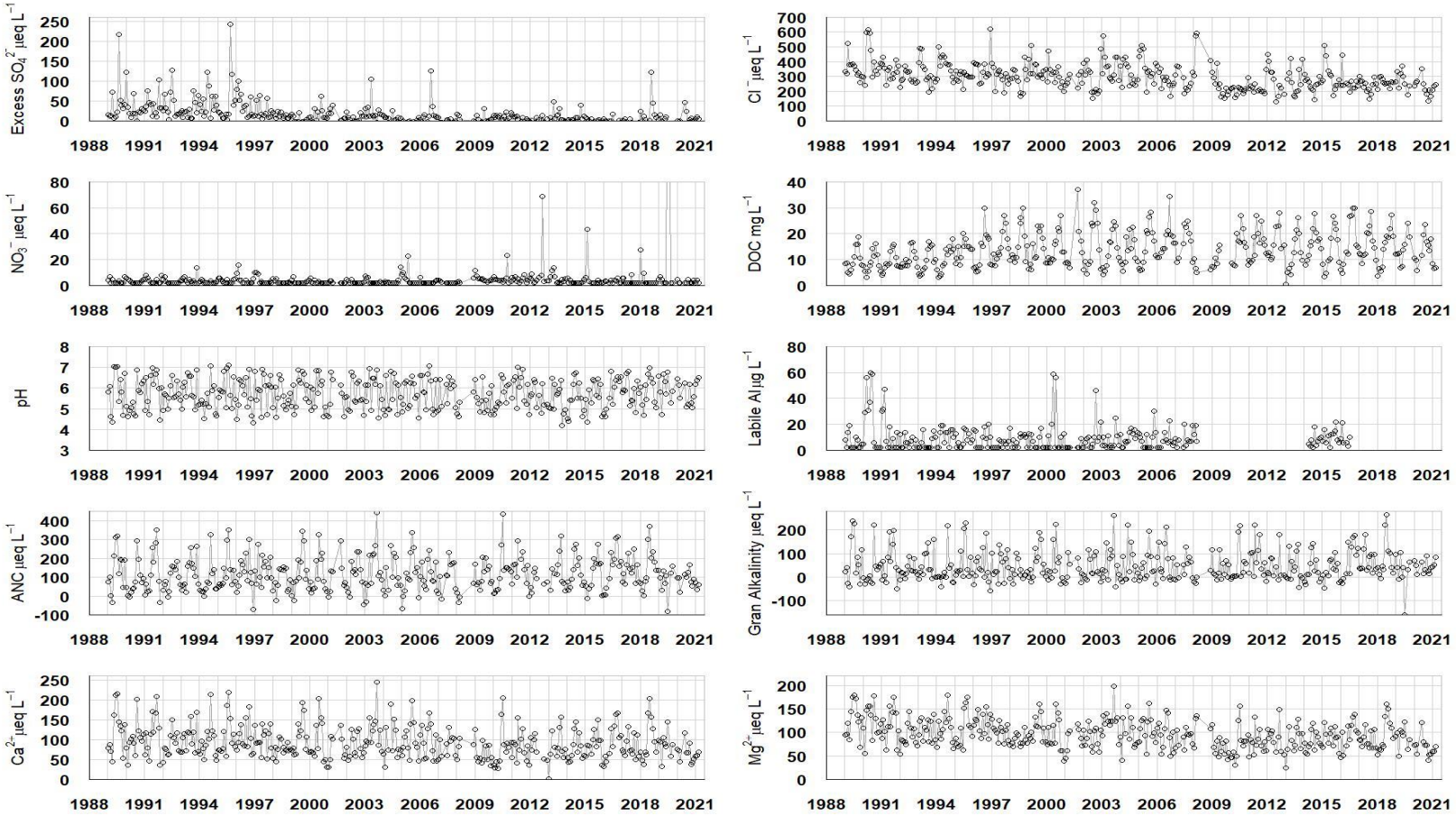
5.19. Beagh's Burn

5.19.1. Beagh's Burn site characteristics

Grid Reference	D 173297
Catchment area	303 ha
Minimum catchment altitude	150 m
Maximum catchment altitude	397 m
Catchment geology	Schists
Catchment soils	Blanket peats
Catchment vegetation	Moorland >99%, Deciduous trees <1%
Mean annual runoff	1210 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	22.3 – 7.7
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	17.1 – 2.1
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	5.9 – 2.6
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	24.4 – 12.1

5.19.2. Beaghs Burn water chemistry

5.19.2.1. Water chemistry time series



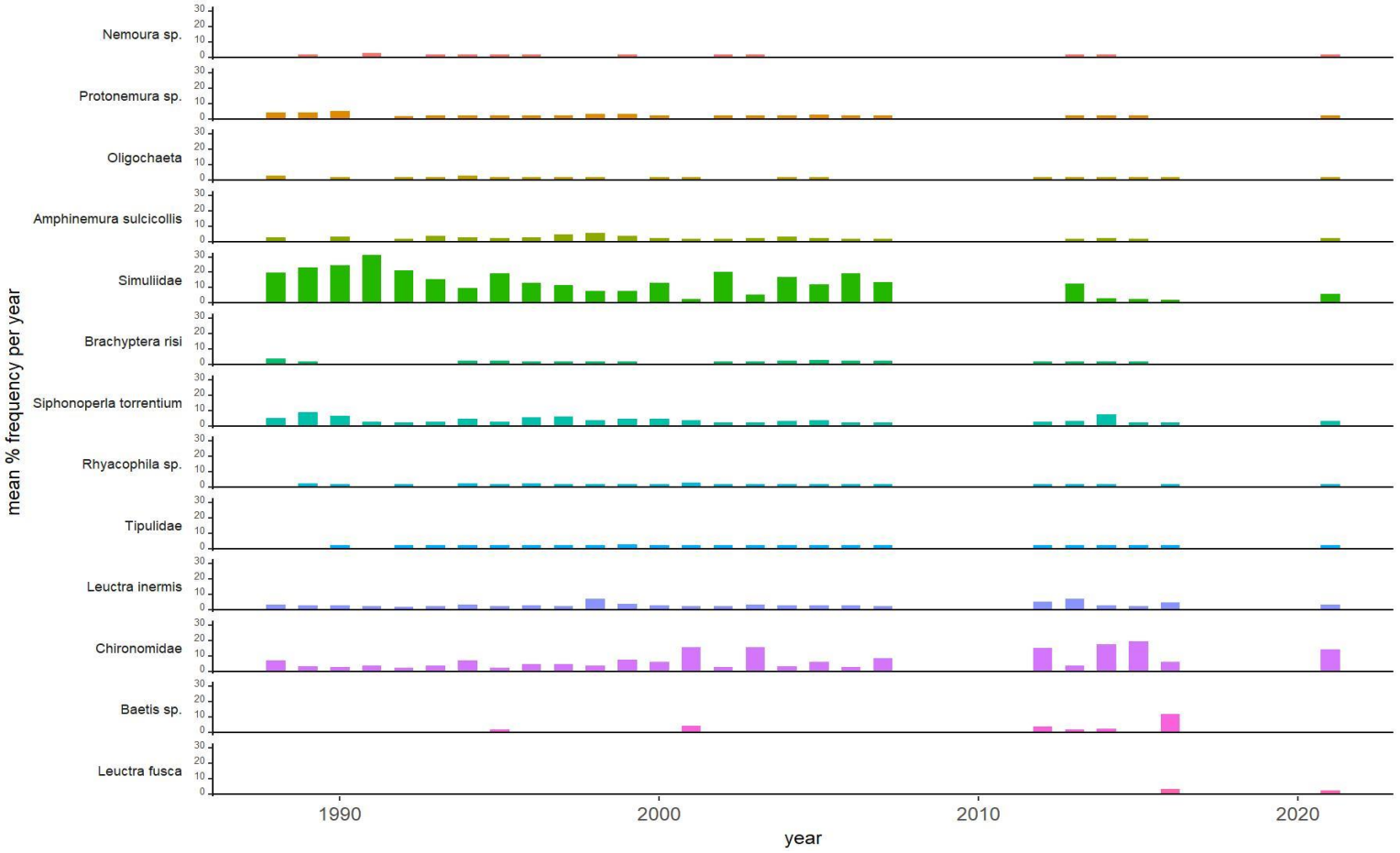
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.19.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	65.61	36.46	52.07	40.66	41.66	21.25	35.41	20.19	31.87	11.94	28.66	18.85	25.59	20.16
non-marine sulphate (μeq L^{-1})	25.13	36.24	20.80	39.13	9.64	18.21	1.16	19.36	3.97	10.06	0.63	17.82	5.71	14.89
nitrate (μeq L^{-1})	2.14	2.22	2.14	2.61	2.14	1.41	2.14	3.64	4.68	9.00	2.14	41.52	2.14	1.21
chloride (μeq L^{-1})	330.06	89.81	315.95	77.73	313.13	85.01	307.49	96.38	221.17	74.60	255.47	62.36	210.31	58.44
calcium (μeq L^{-1})	104.29	44.16	90.07	38.39	85.08	44.43	87.82	39.16	72.11	38.65	83.83	37.76	63.87	23.08
magnesium (μeq L^{-1})	110.23	32.70	102.41	28.32	102.83	30.95	96.24	28.88	78.64	27.84	88.10	25.36	65.19	21.77
sodium (μeq L^{-1})	302.33	53.59	289.27	48.83	280.58	51.74	257.52	55.88	219.24	43.11	244.64	35.58	188.79	47.45
potassium (μeq L^{-1})	11.38	3.68	9.59	3.75	10.10	3.47	9.21	3.18	17.18	10.60	6.60	6.91	6.99	3.33
pH	5.75	0.77	5.66	0.75	5.85	0.73	5.71	0.73	5.56	0.67	5.79	0.71	5.88	0.59
Gran alkalinity (μeq L^{-1})	29.00	70.61	23.50	63.32	26.50	66.33	26.00	63.83	19.43	63.75	37.10	68.50	42.50	26.48
labile aluminium (μg L^{-1})	6.00	14.75	7.00	5.84	4.00	12.19	7.00	6.41	N/A	N/A	8.00	5.54	N/A	N/A
conductivity (μS cm^{-1})	57.50	11.66	58.00	11.48	53.50	12.45	54.00	11.35	43.60	11.33	47.50	8.91	40.25	9.79
Dissolved Organic Carbon (mg L^{-1})	8.50	4.02	13.50	6.24	12.80	7.61	14.20	6.81	13.50	6.51	14.70	7.09	14.50	5.70
Acid Neutralising Capacity (μS cm^{-1})	92.32	95.26	95.60	85.52	93.52	103.40	95.25	89.94	122.24	86.05	127.46	89.92	82.25	38.69

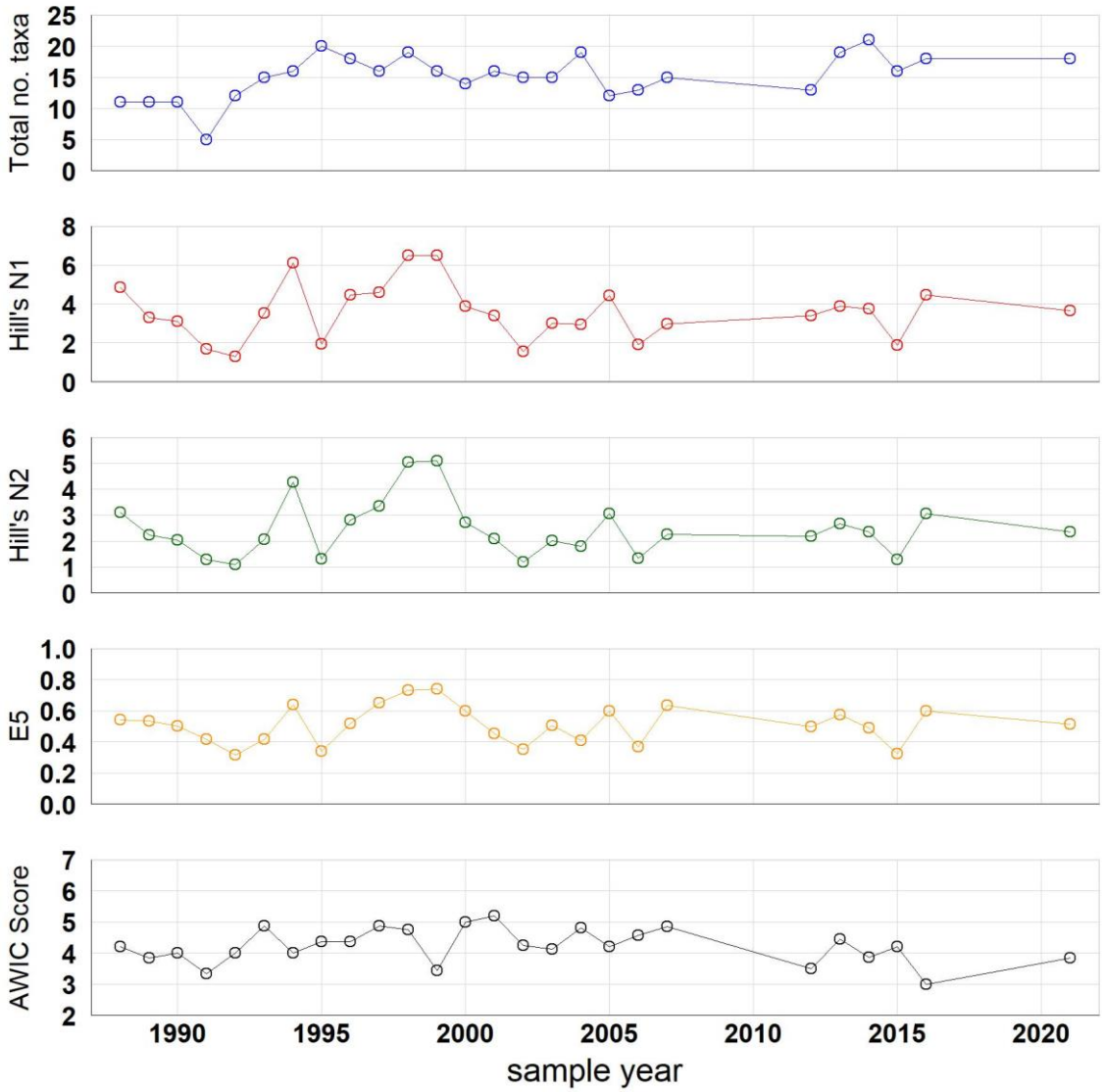
5.19.3. Beagh's Burn macroinvertebrates

5.19.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

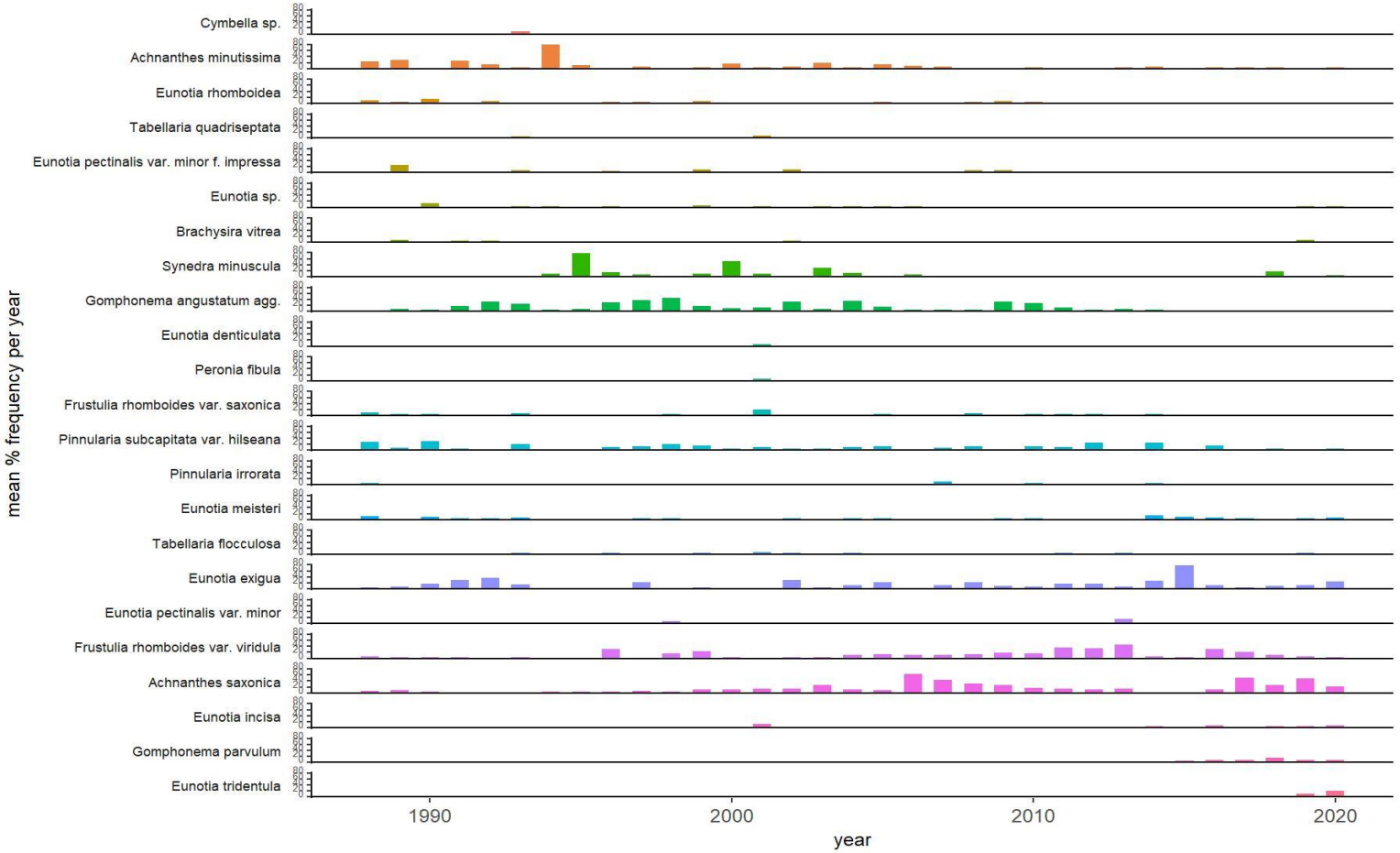
5.19.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

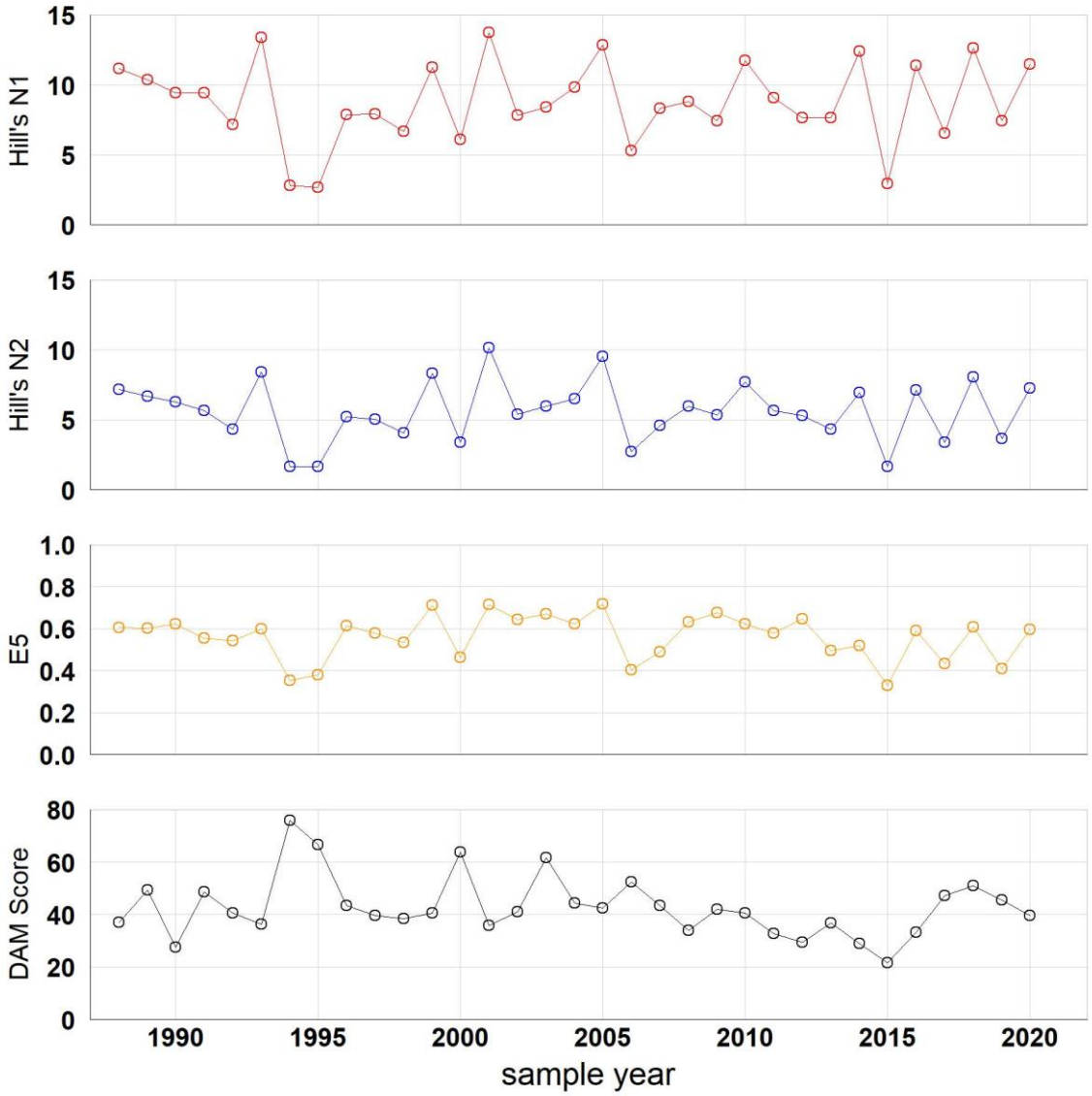
5.19.4. Beagh's Burn epilithic diatoms

5.19.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

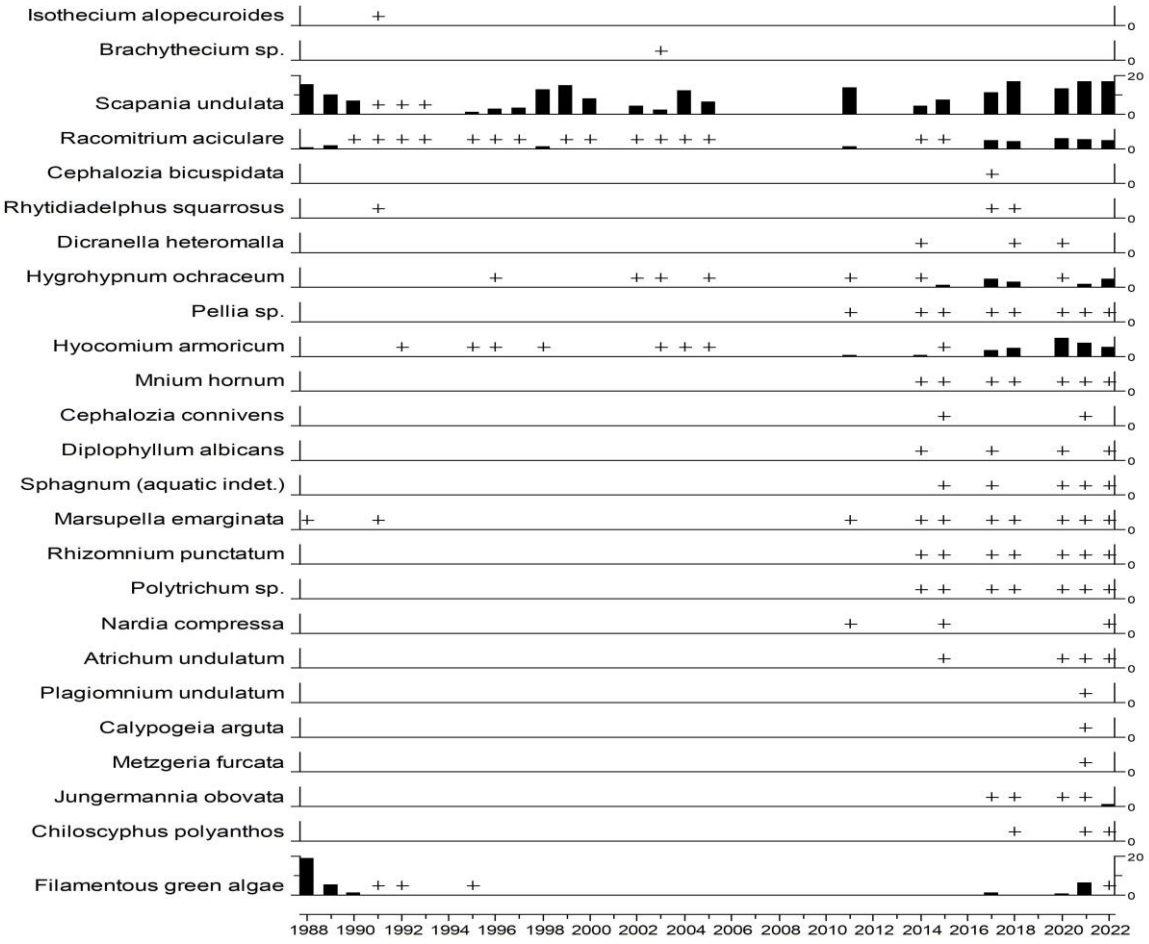
5.19.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.19.5. Beagh's Burn aquatic macrophytes

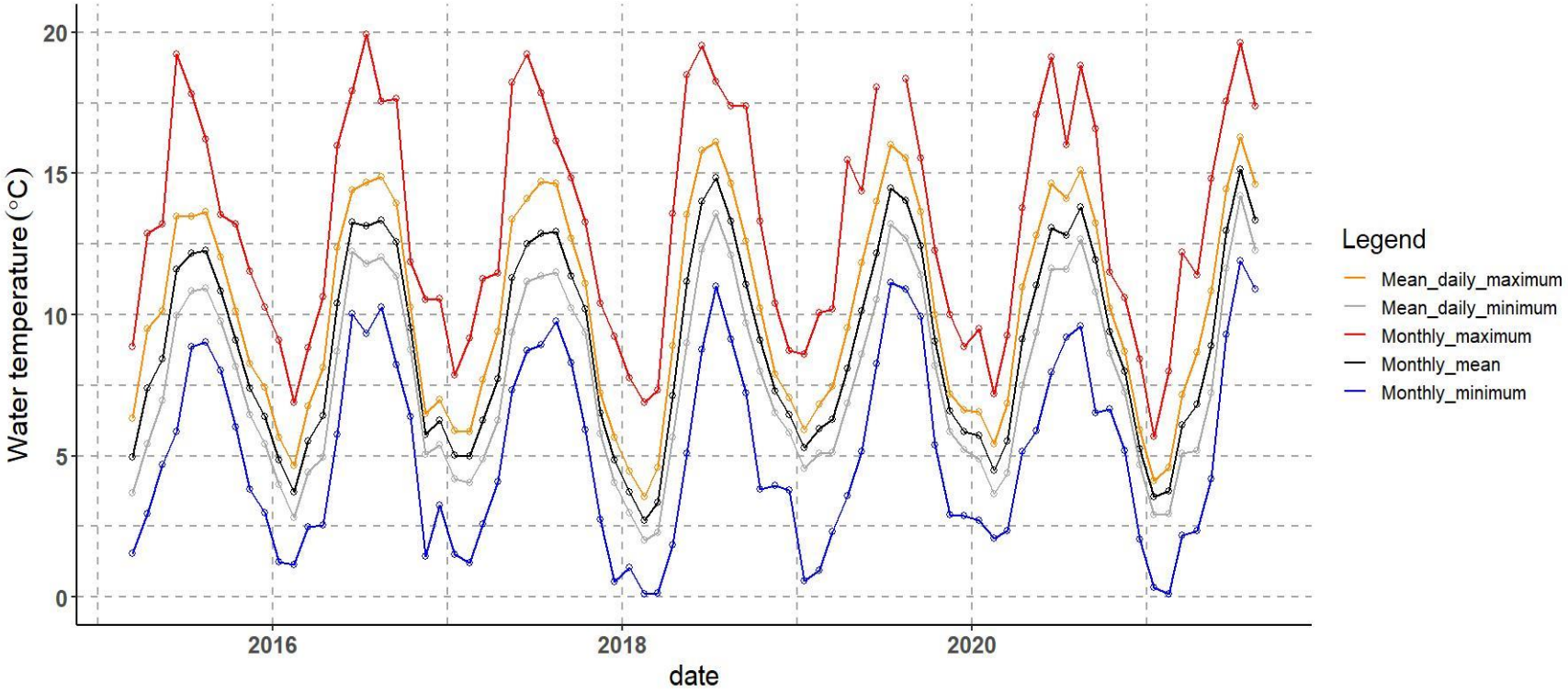
5.19.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.19.6. Beagh's Burn water temperature

5.19.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

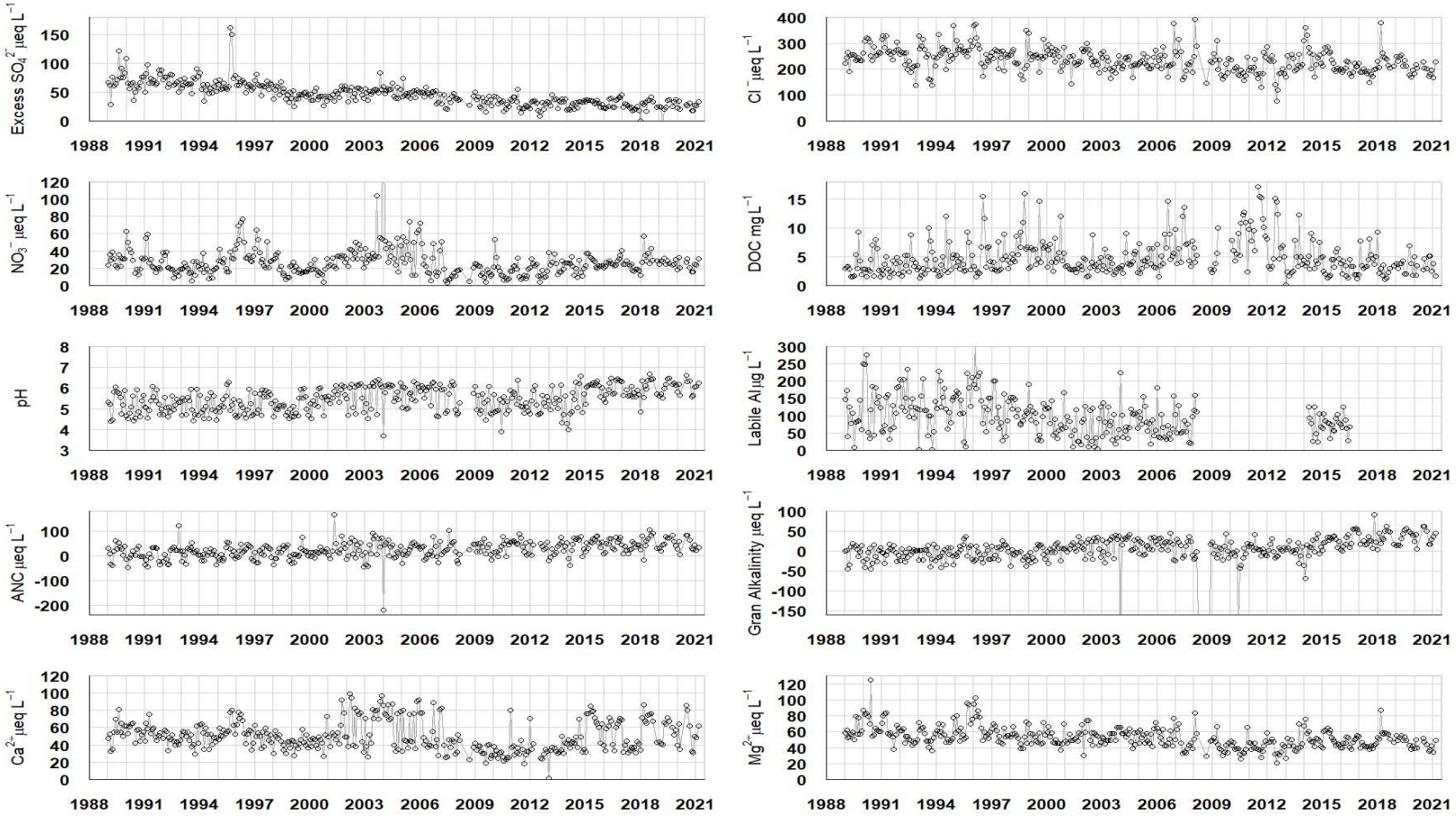
5.20. Bencrom River

5.20.1. Bencrom River site characteristics

Grid Reference	J 304250
Catchment area	216 ha
Minimum catchment altitude	140 m
Maximum catchment altitude	700 m
Catchment geology	Granite
Catchment soils	Blanket peat
Catchment vegetation	Moorland
Mean annual runoff	1358 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	20.3 – 9.2
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	15.1 – 2.9
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	7.1 – 3.7
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	25.0 – 17.5

5.20.2. Bencrom River water chemistry

5.20.2.1. Water chemistry time series



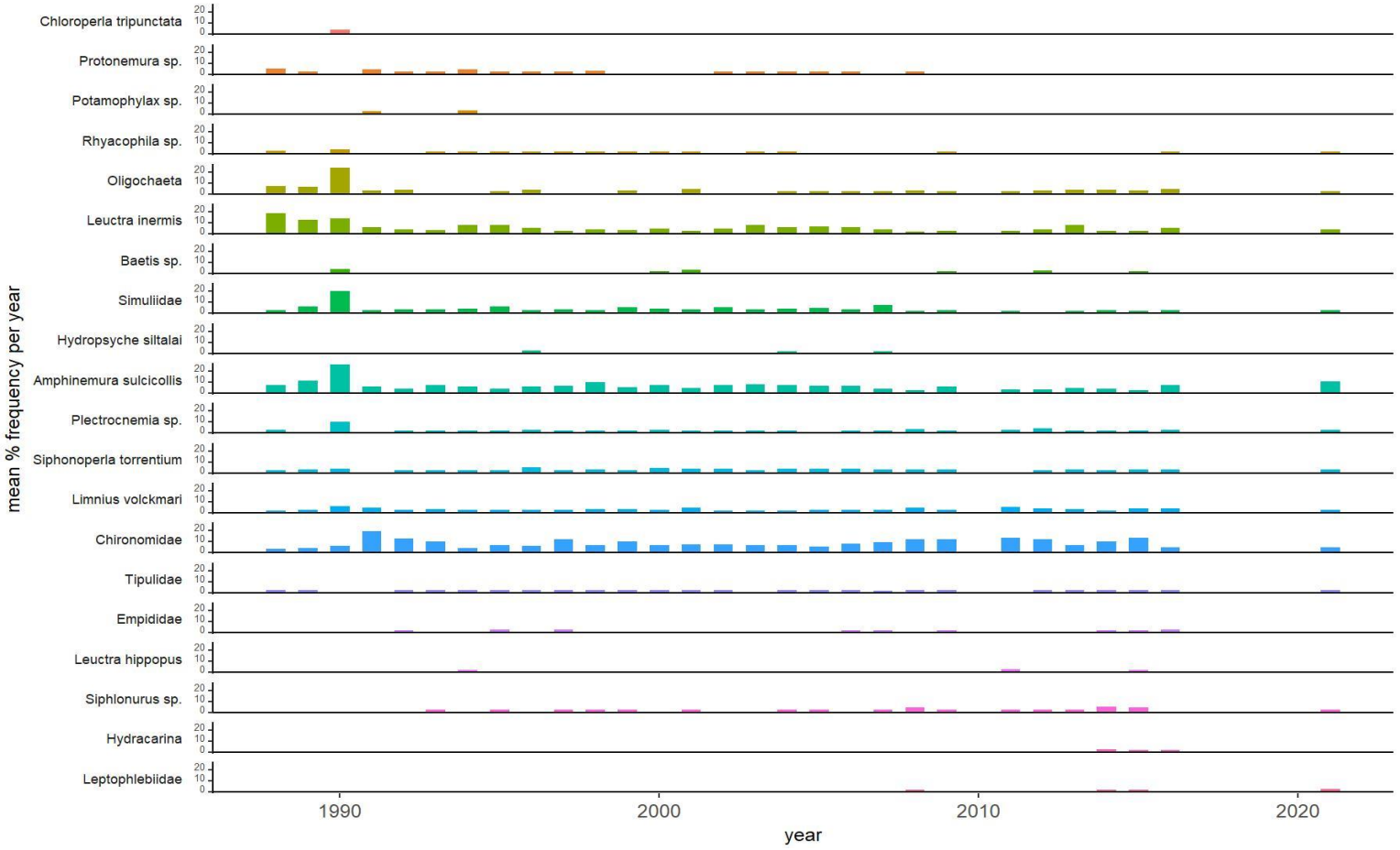
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.20.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	94.78	15.81	88.53	21.60	70.82	10.15	70.82	11.48	52.99	11.91	52.93	10.24	47.96	7.57
non-marine sulphate (μeq L^{-1})	66.86	15.10	60.01	20.48	46.53	9.52	46.62	10.36	32.72	9.35	29.18	9.10	27.17	5.65
nitrate (μeq L^{-1})	22.00	11.76	28.50	15.76	27.00	14.82	26.68	43.52	16.93	9.40	25.43	7.62	24.25	5.81
chloride (μeq L^{-1})	256.71	44.23	256.71	46.05	242.61	35.68	221.93	45.00	202.27	41.07	212.42	43.57	198.18	23.12
calcium (μeq L^{-1})	52.15	10.14	52.15	11.74	47.90	19.36	45.56	21.34	32.39	11.25	54.39	16.37	56.14	20.04
magnesium (μeq L^{-1})	57.99	14.52	56.76	14.16	52.65	9.05	51.82	11.44	40.55	9.40	49.27	9.13	42.94	6.34
sodium (μeq L^{-1})	265.35	32.14	261.00	38.23	243.60	29.14	240.62	35.43	228.38	39.13	234.47	34.14	215.76	27.92
potassium (μeq L^{-1})	12.15	2.52	11.12	3.13	10.74	2.18	11.51	3.27	10.00	4.97	10.13	1.95	8.72	1.02
pH	5.19	0.48	5.11	0.46	5.56	0.56	5.85	0.58	5.27	0.50	5.97	0.54	6.17	0.35
Gran alkalinity (μeq L^{-1})	-2.50	16.93	-4.00	17.23	7.00	19.37	16.00	144.81	2.47	28.66	26.60	23.66	40.30	17.83
labile aluminium (μg L^{-1})	117.50	62.83	125.00	57.14	77.00	44.08	73.00	44.22	N/A	N/A	76.00	28.57	N/A	N/A
conductivity (μS cm^{-1})	49.00	6.89	50.00	8.52	47.00	5.30	47.00	13.59	39.30	7.40	43.10	7.02	40.25	5.71
Dissolved Organic Carbon (mg L^{-1})	3.00	2.04	4.30	3.21	3.70	2.37	4.50	2.80	6.31	4.31	3.46	1.93	3.44	1.30
Acid Neutralising Capacity (μS cm^{-1})	15.04	30.98	11.95	23.56	15.68	36.57	23.28	43.65	38.40	24.97	47.91	27.52	37.46	24.81

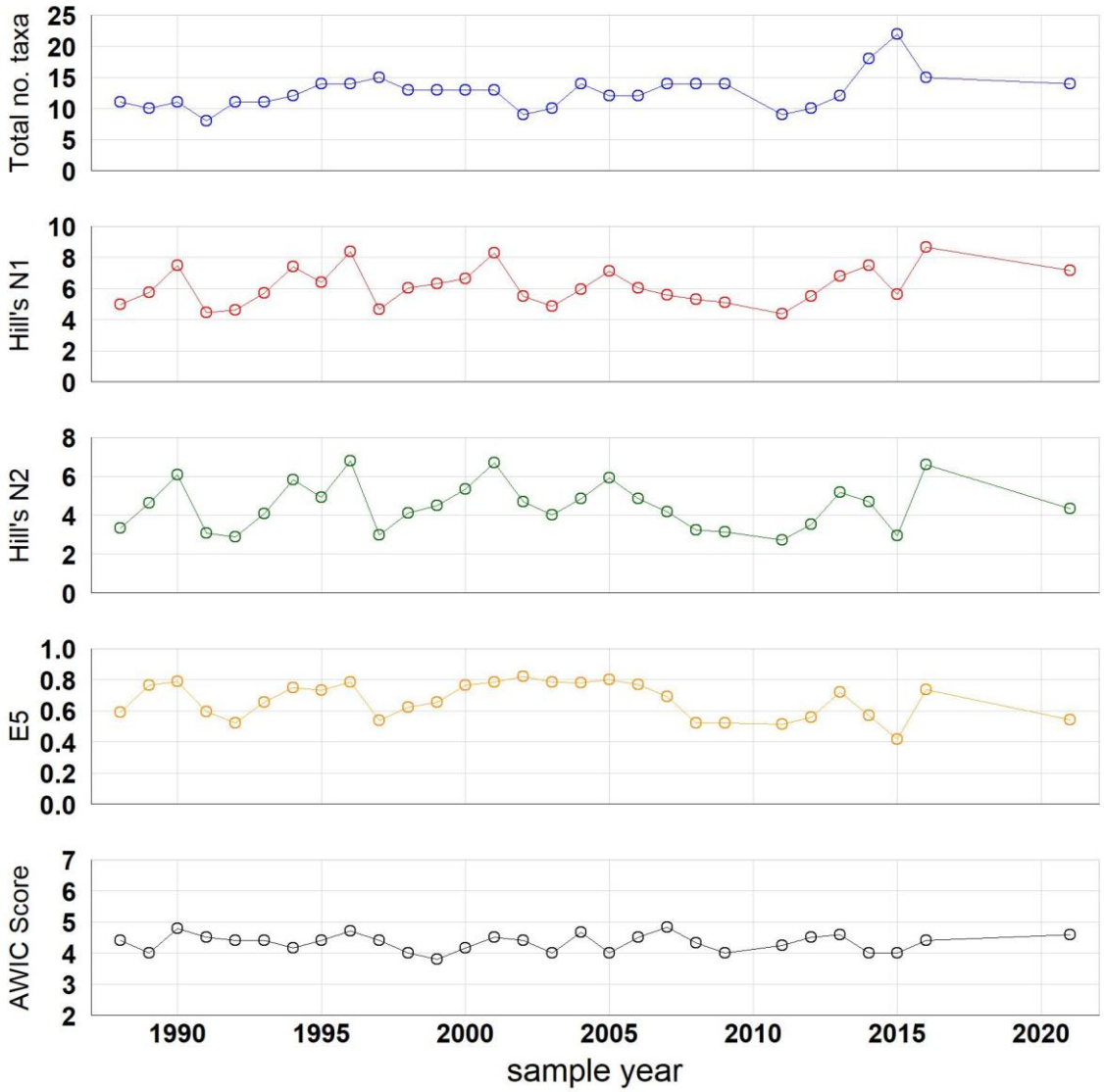
5.20.3. Bencrom River macroinvertebrates

5.20.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

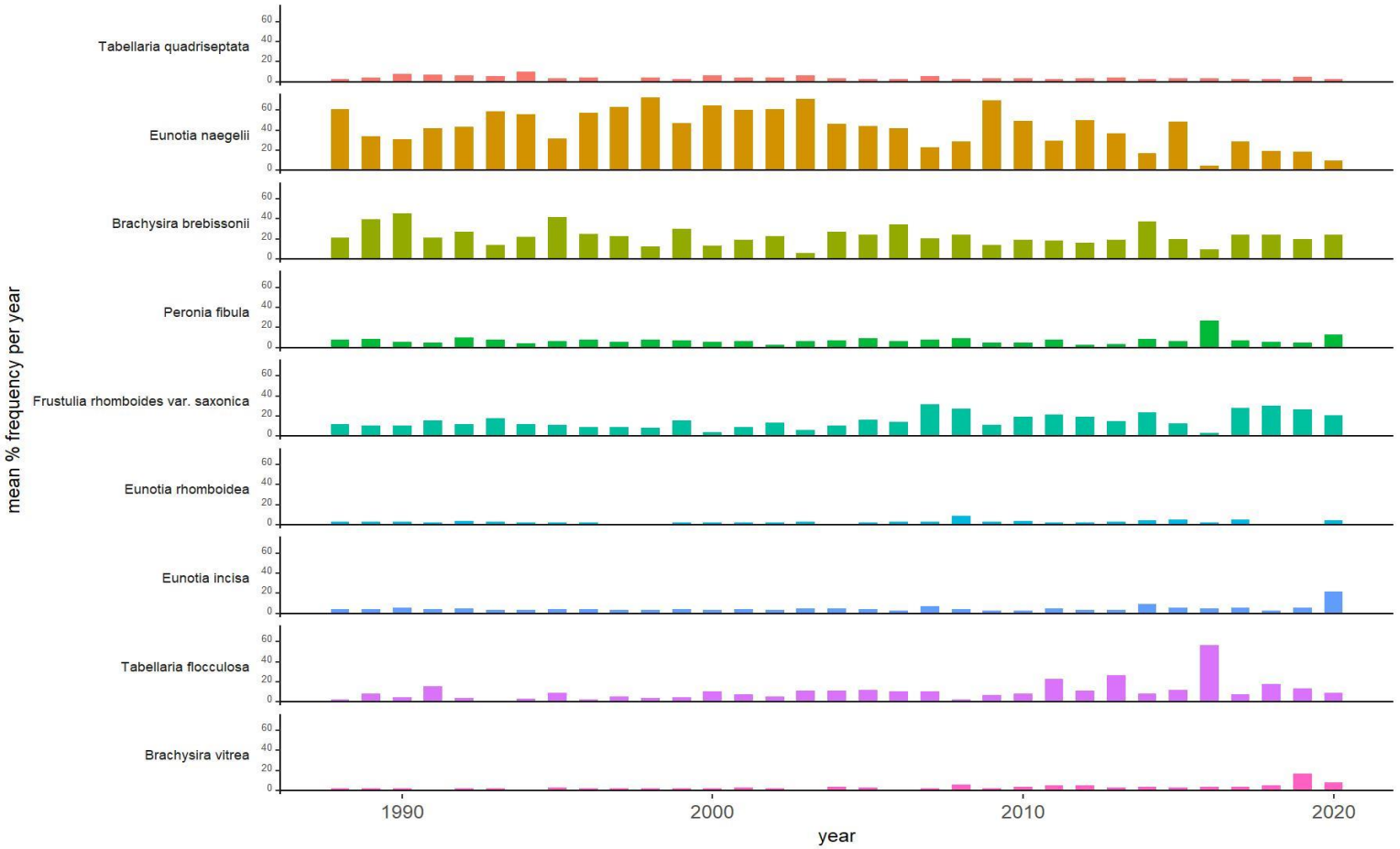
5.20.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

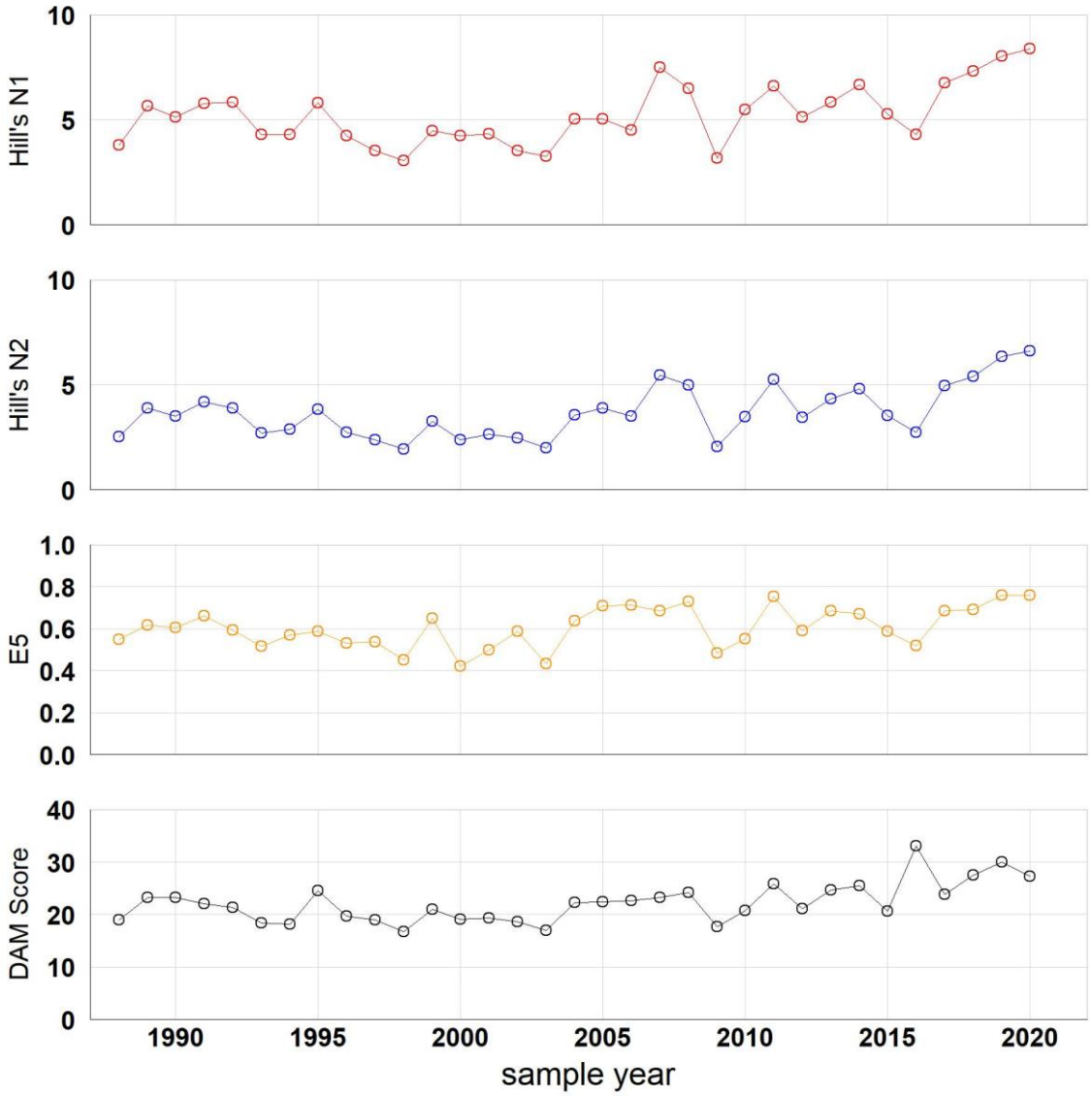
5.20.4. Bencrom River epilithic diatoms

5.20.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

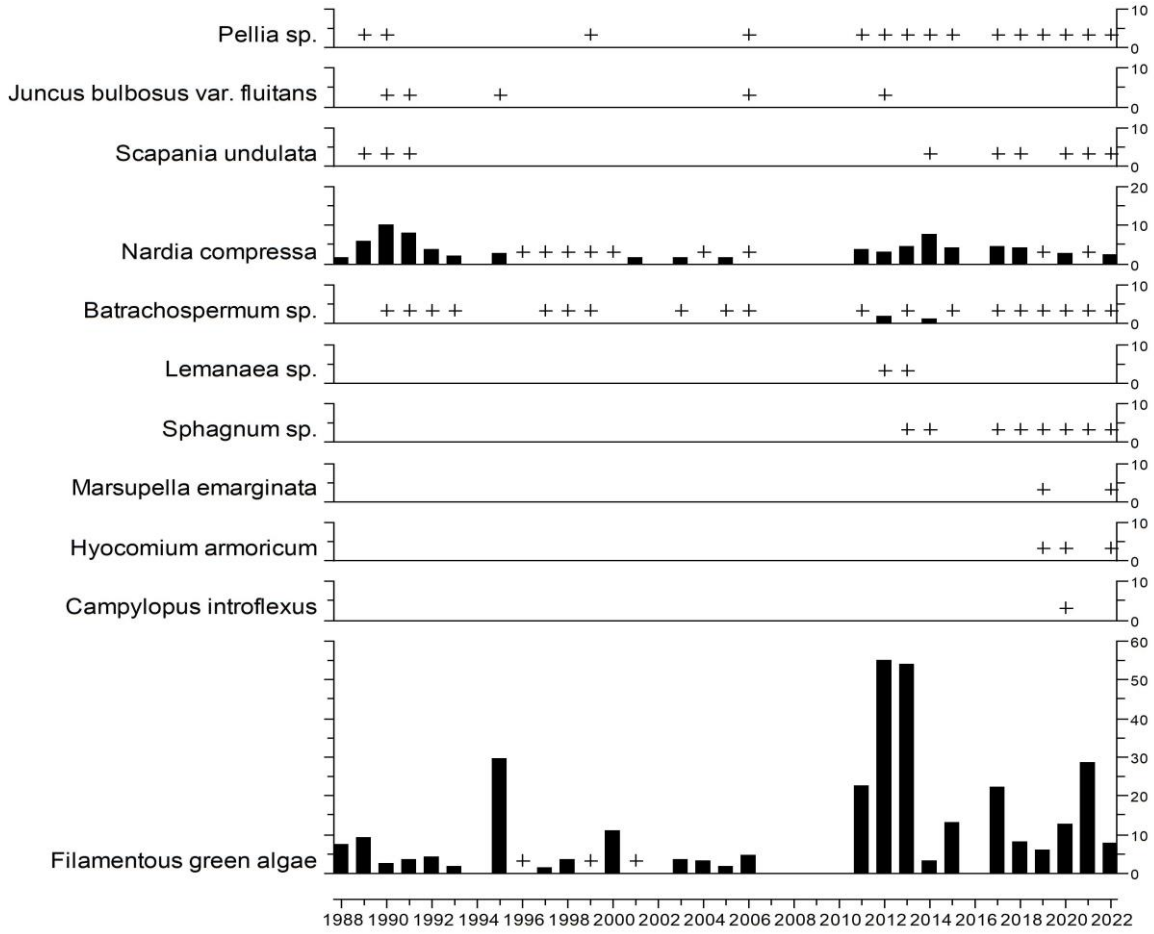
5.20.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.20.5. Bencrom River aquatic macrophytes

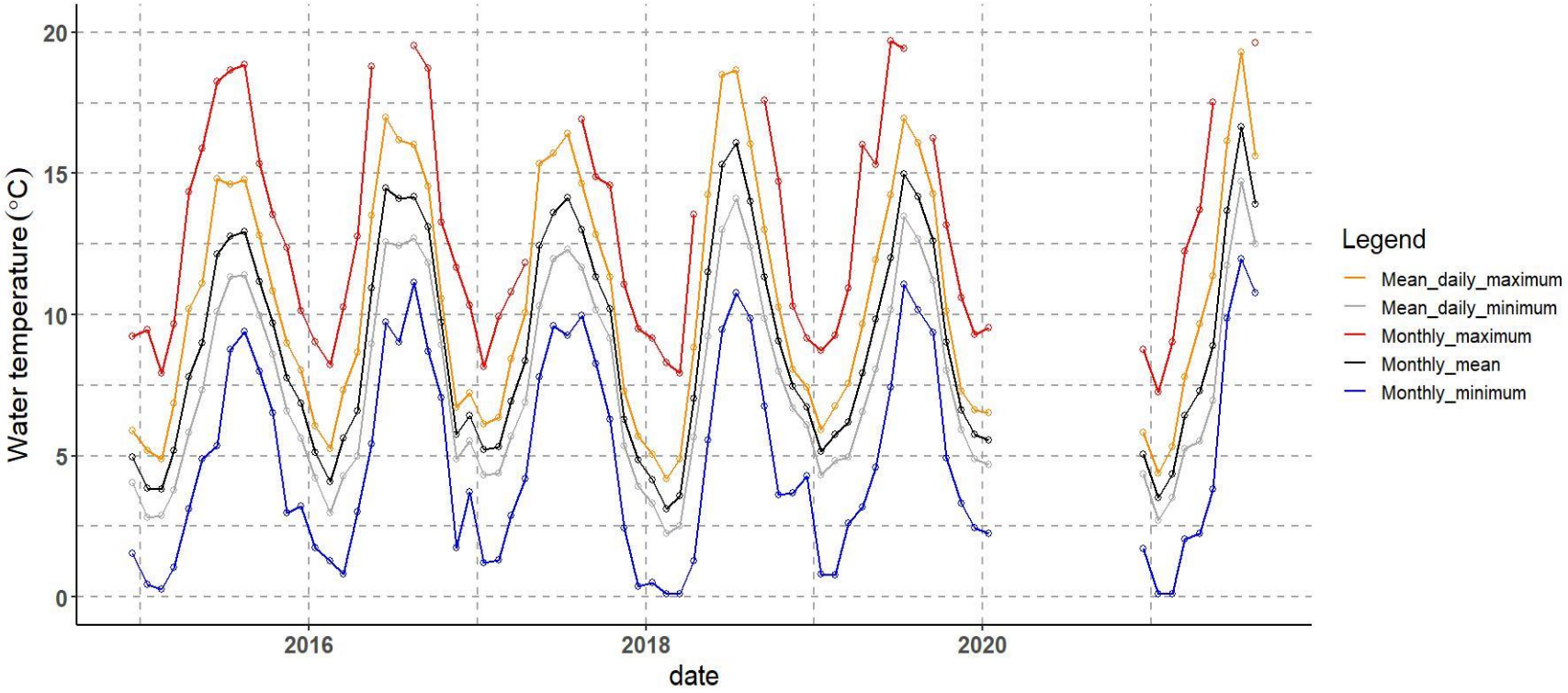
5.20.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.20.6. Bencrom River water temperature

5.20.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

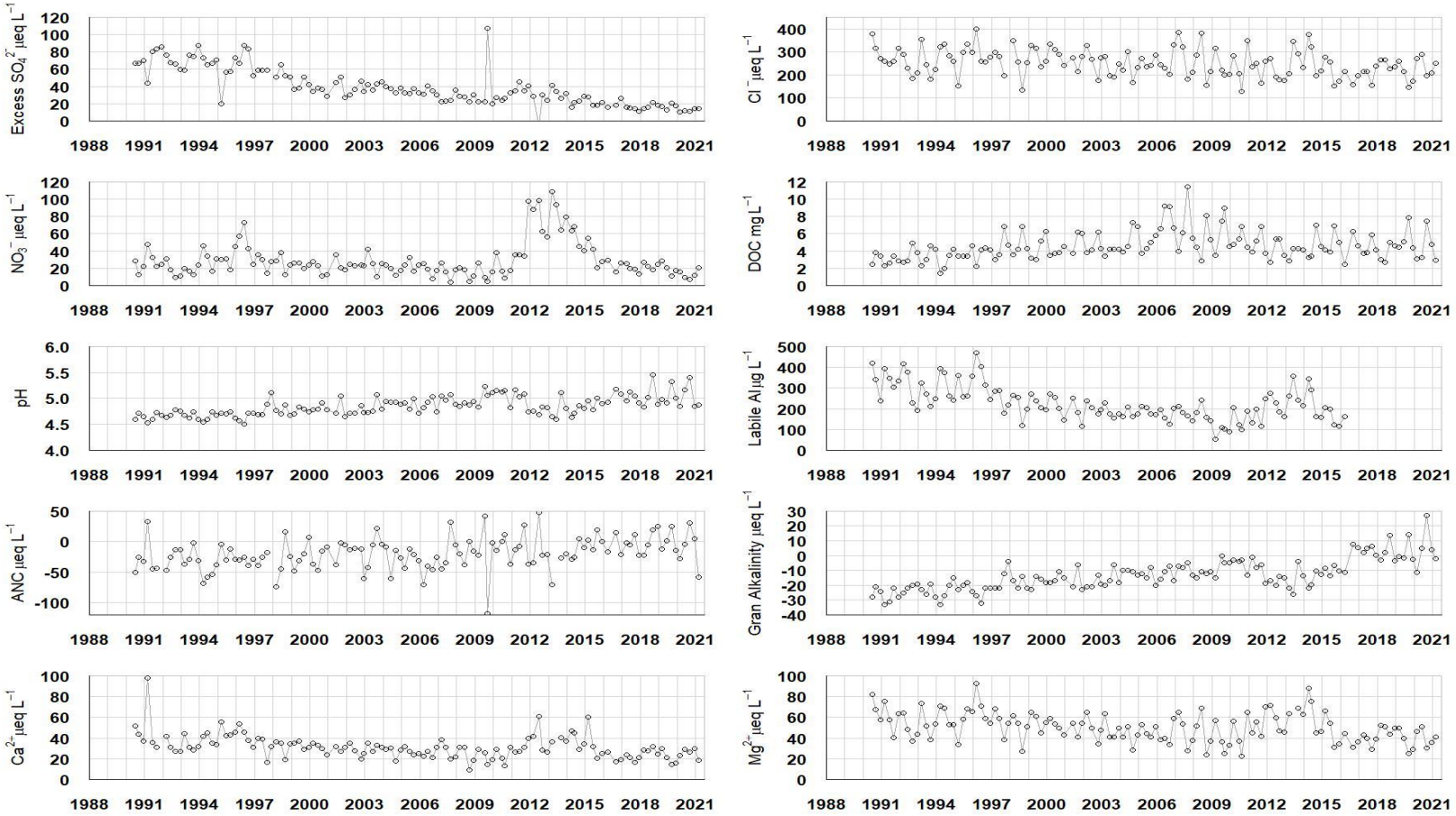
5.21. Blue Lough

5.21.1. Blue Lough site characteristics

Grid Reference	J 327252
Lake altitude	340 m
Maximum altitude	700 m
Maximum depth	5.0 m
Mean depth	1.7 m
Volume	8.2×10^5 m^3
Lake area	2.1 ha
Catchment area	50 ha
Catchment area (excl.lake)	47.9 ha
Catchment:Lake ratio	23.8
Catchment geology	Granite
Catchment soils	Blanket peats
Catchment vegetation	Moorland
Mean annual runoff	1236 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	22.2 – 9.5
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	16.1 – 3.0
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	7.9 – 3.8
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	27.6 – 17.4

5.21.2. Blue Lough water chemistry

5.21.2.1. Water chemistry time series



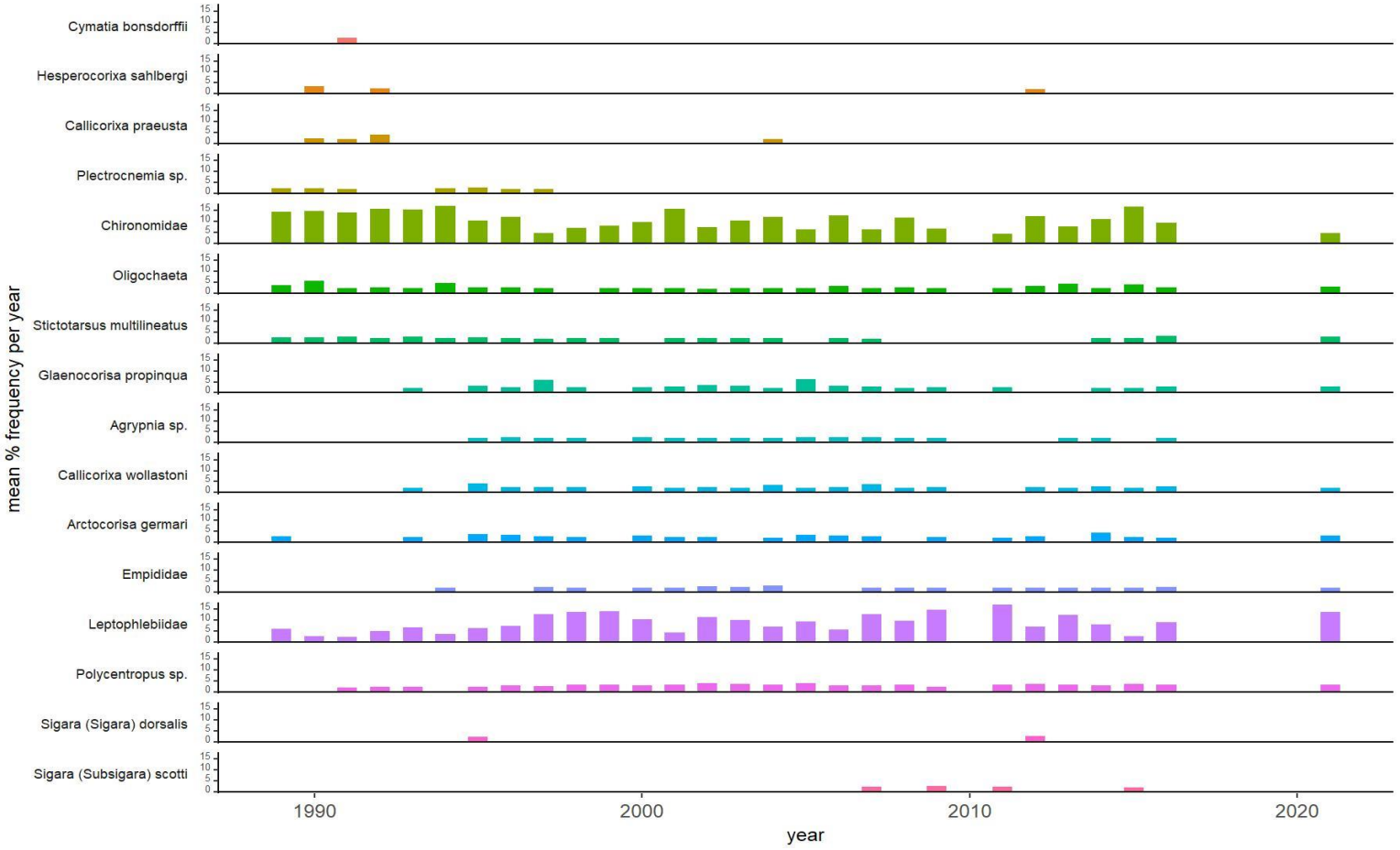
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.21.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	99.98	12.53	90.61	17.83	68.74	6.07	59.22	7.67	56.15	21.54	42.31	7.25	38.18	4.51
non-marine sulphate (μeq L^{-1})	69.74	11.61	58.62	14.56	37.96	6.69	32.07	5.72	29.39	20.66	18.38	4.60	13.07	1.50
nitrate (μeq L^{-1})	22.00	10.01	30.50	14.65	24.00	7.56	18.39	7.30	37.14	34.61	25.57	15.58	10.96	5.75
chloride (μeq L^{-1})	259.53	57.96	279.28	64.19	273.64	47.40	238.37	64.63	226.24	60.59	215.81	55.97	229.91	41.45
calcium (μeq L^{-1})	33.93	18.15	38.42	9.52	31.44	4.53	27.45	6.55	28.99	10.98	25.00	10.90	27.89	5.09
magnesium (μeq L^{-1})	57.58	14.03	58.82	14.55	49.36	8.93	41.95	12.02	55.53	15.13	43.60	15.13	38.42	8.70
sodium (μeq L^{-1})	239.25	35.70	261.00	50.72	247.95	29.01	217.50	44.43	227.51	40.24	205.45	39.88	191.62	27.45
potassium (μeq L^{-1})	11.76	2.10	12.53	4.74	12.02	2.12	10.74	4.58	15.29	5.23	8.69	2.11	8.53	5.07
pH	4.67	0.07	4.70	0.13	4.78	0.11	4.92	0.09	4.93	0.20	4.96	0.18	5.02	0.27
Gran alkalinity (μeq L^{-1})	-24.00	4.32	-22.00	6.64	-18.00	4.96	-11.00	3.73	-10.50	7.68	-2.40	9.60	4.60	12.83
labile aluminium (μg L^{-1})	326.00	75.20	263.00	85.27	203.00	42.85	175.50	28.96	186.50	76.54	162.00	76.30	N/A	N/A
conductivity (μS cm^{-1})	54.00	9.73	57.00	9.03	48.00	6.16	45.00	8.62	49.15	10.79	41.00	9.51	41.65	5.09
Dissolved Organic Carbon (mg L^{-1})	3.00	0.82	3.85	1.32	4.20	1.07	5.65	2.18	4.48	1.61	4.43	1.40	4.01	2.05
Acid Neutralising Capacity (μS cm^{-1})	-29.75	21.82	-30.11	21.41	-12.67	21.33	-26.23	22.88	-19.46	37.48	-4.76	16.60	0.42	37.71

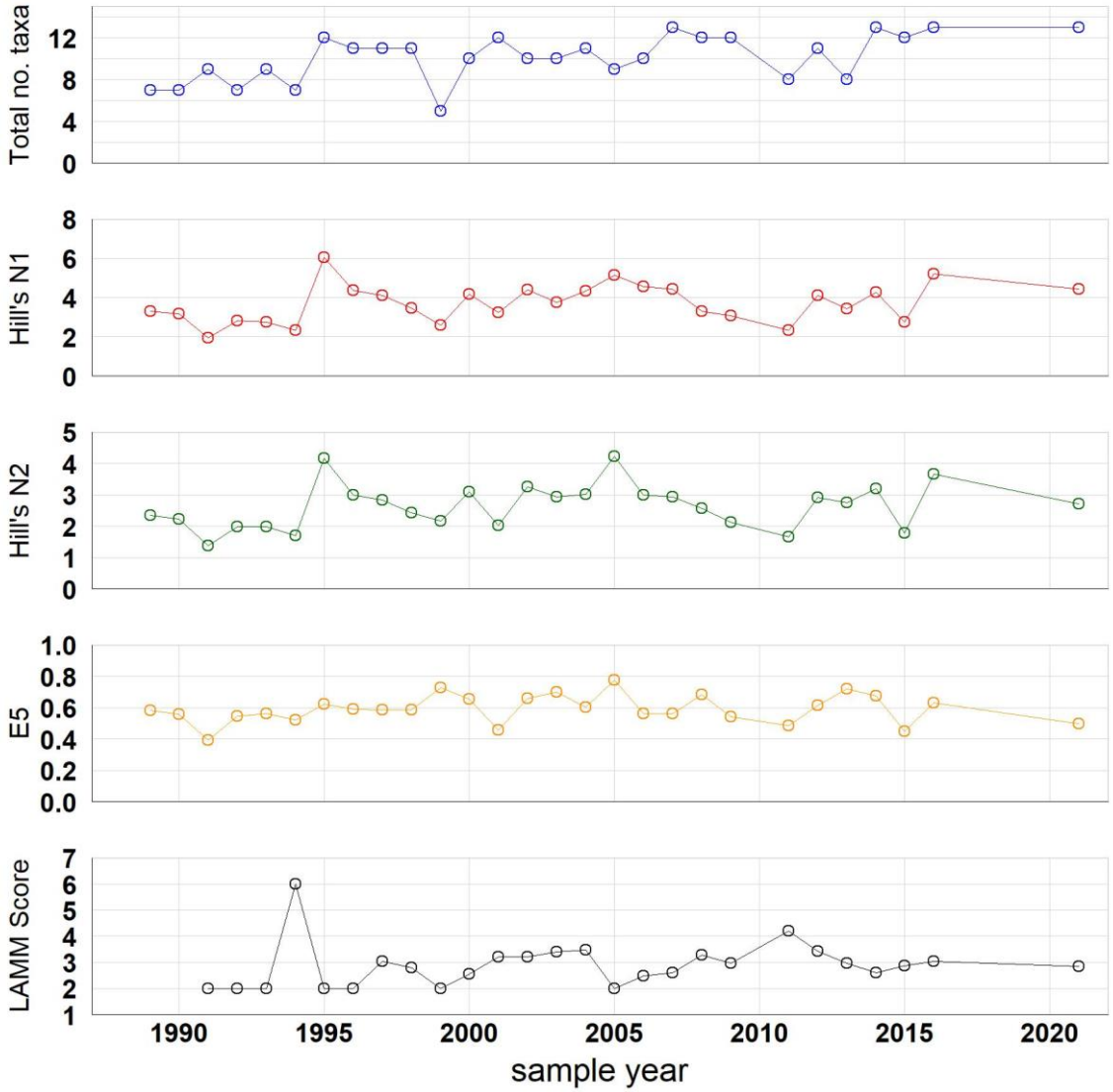
5.21.3. Blue Lough macroinvertebrates

5.21.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

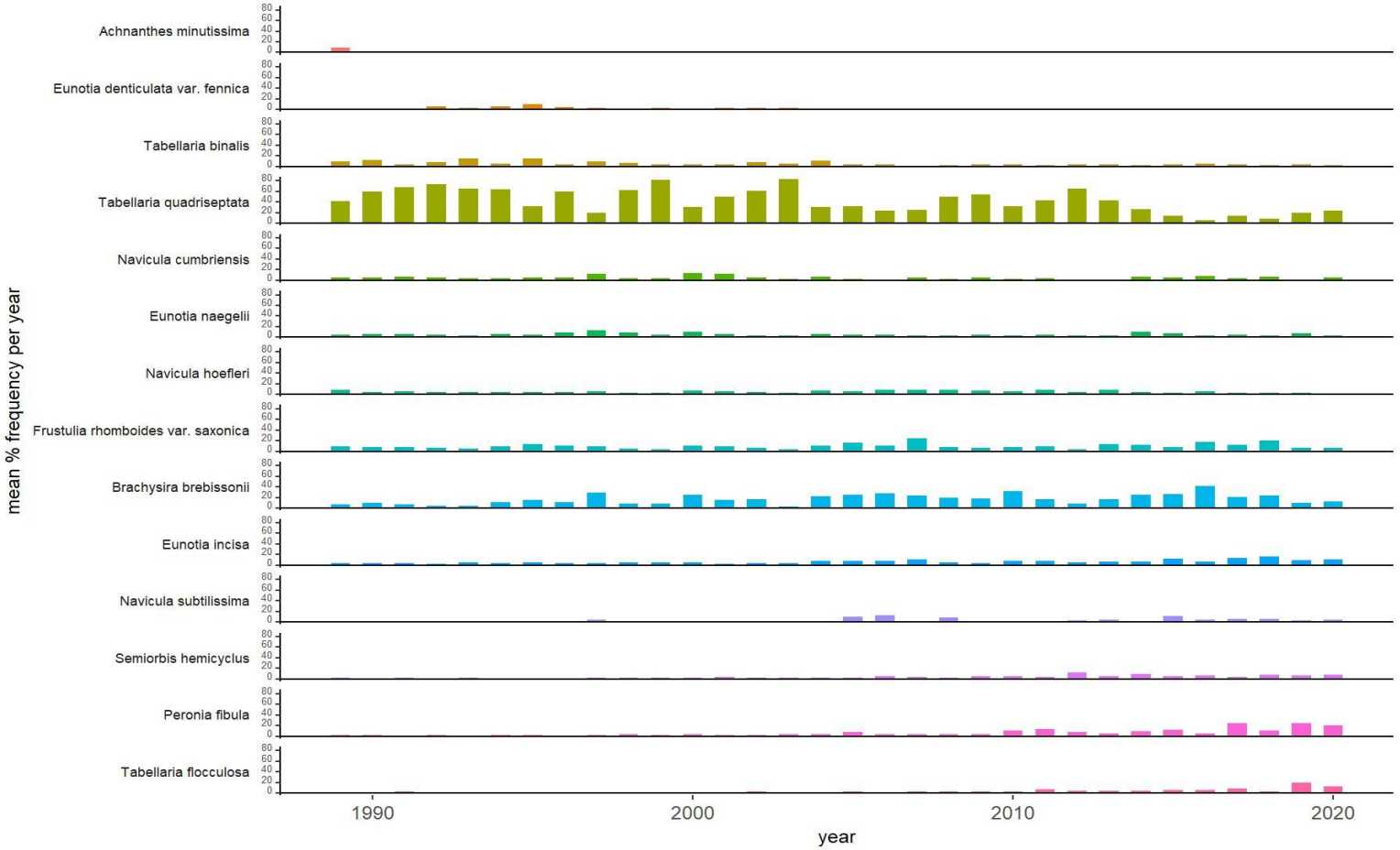
5.21.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

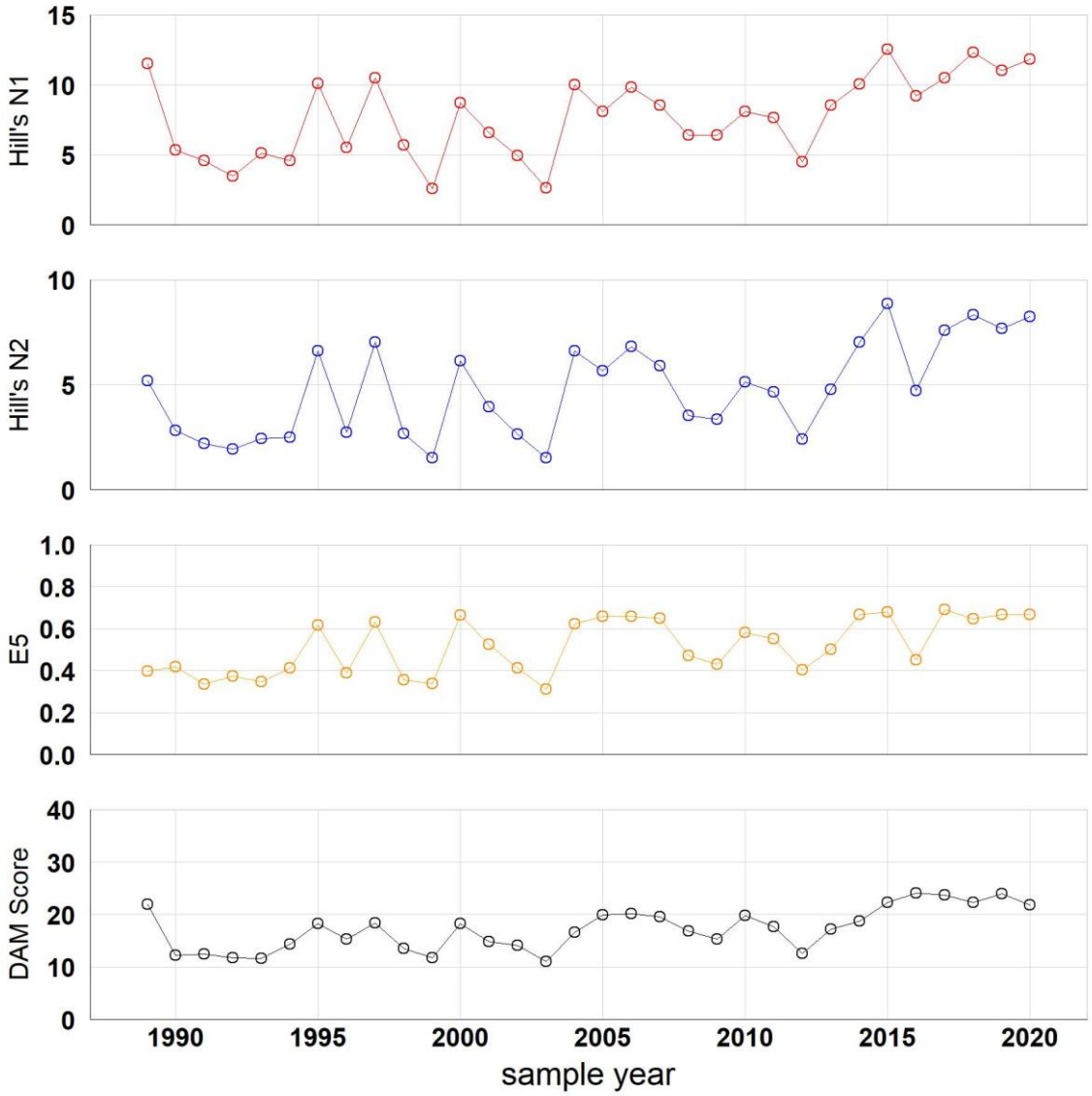
5.21.4. Blue Lough epilithic diatoms

5.21.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

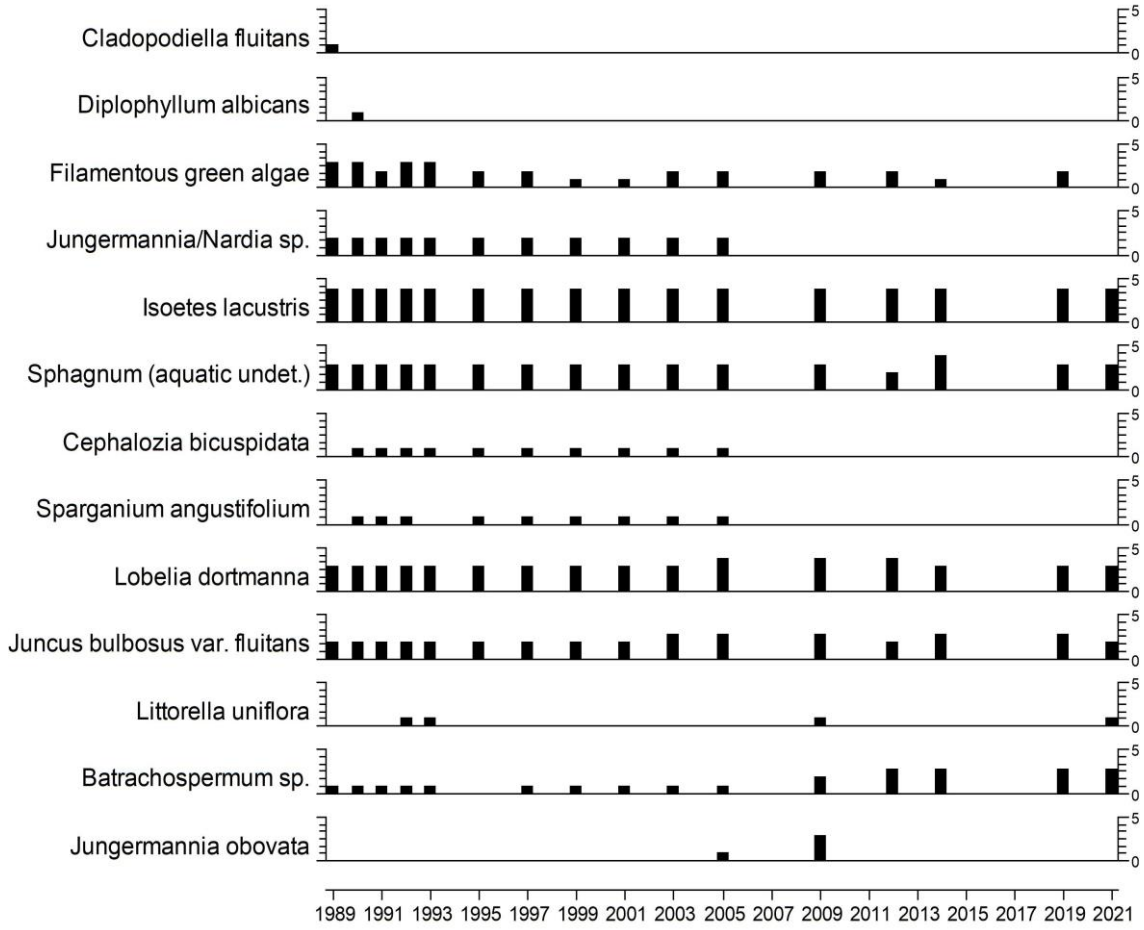
5.21.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.21.5. Blue Lough aquatic macrophytes

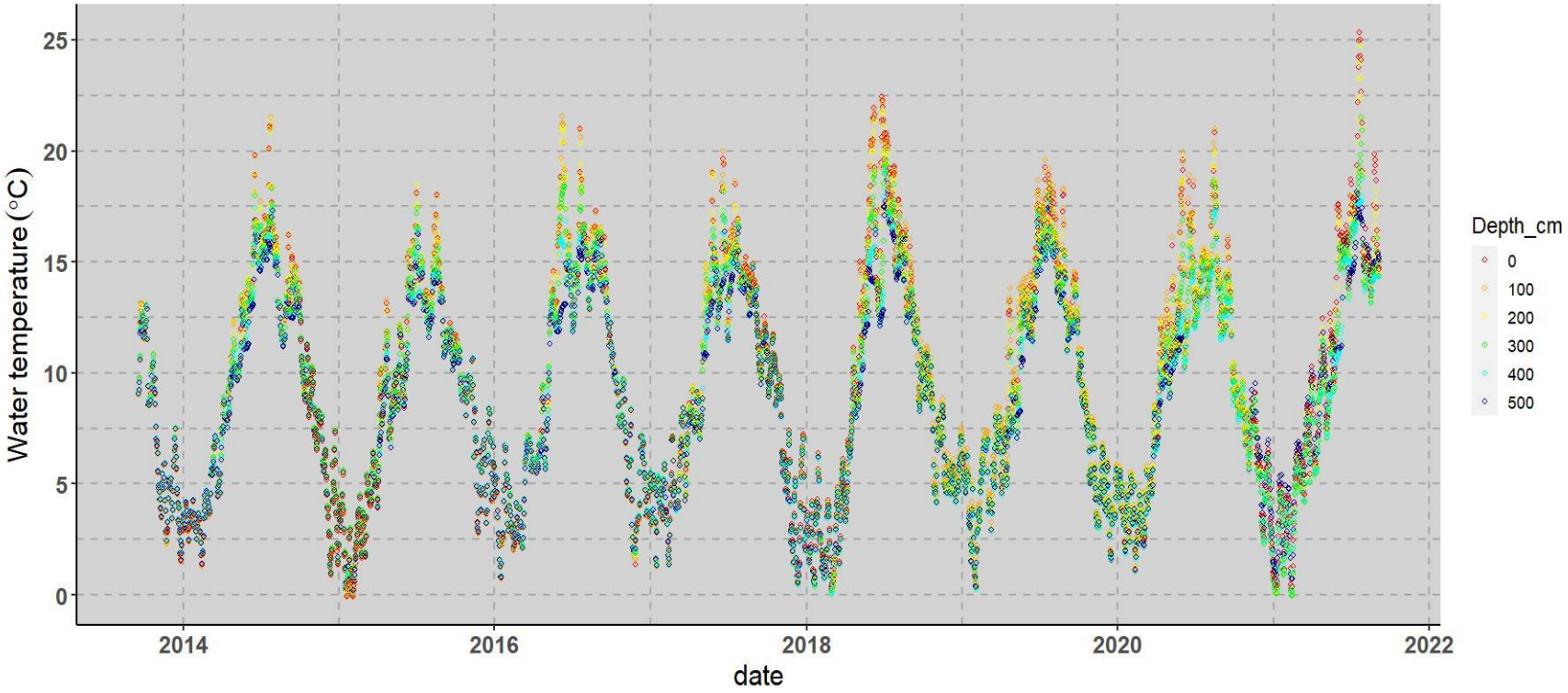
5.21.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.21.6. Blue Lough water temperature

5.21.6.1. Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

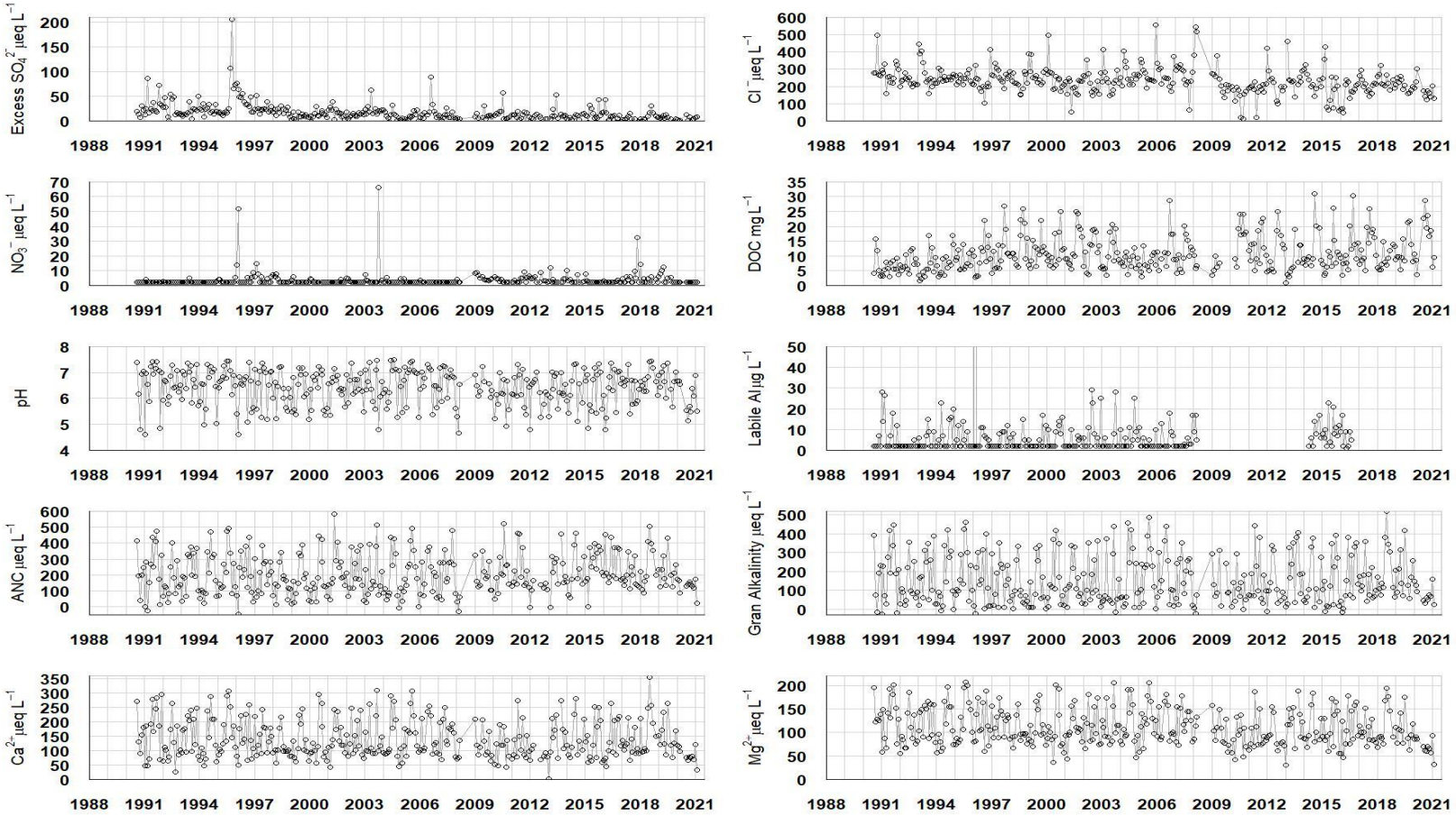
5.22. Coneyglen Burn

5.22.1. Coneyglen Burn site characteristics

Grid Reference	H 641884
Catchment area	1311 ha
Minimum catchment altitude	230 m
Maximum catchment altitude	562 m
Catchment geology	schists
Catchment soils	Blanket peat
Catchment vegetation	Moorland 76%, Conifers 24%
Mean annual runoff	1120 mm
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	17.7 – 7.2
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	12.4 – 2.0
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	4.5 – 2.4
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	17.1 – 12.0

5.22.2. Coneyglen Burn water chemistry

5.22.2.1. Water chemistry time series



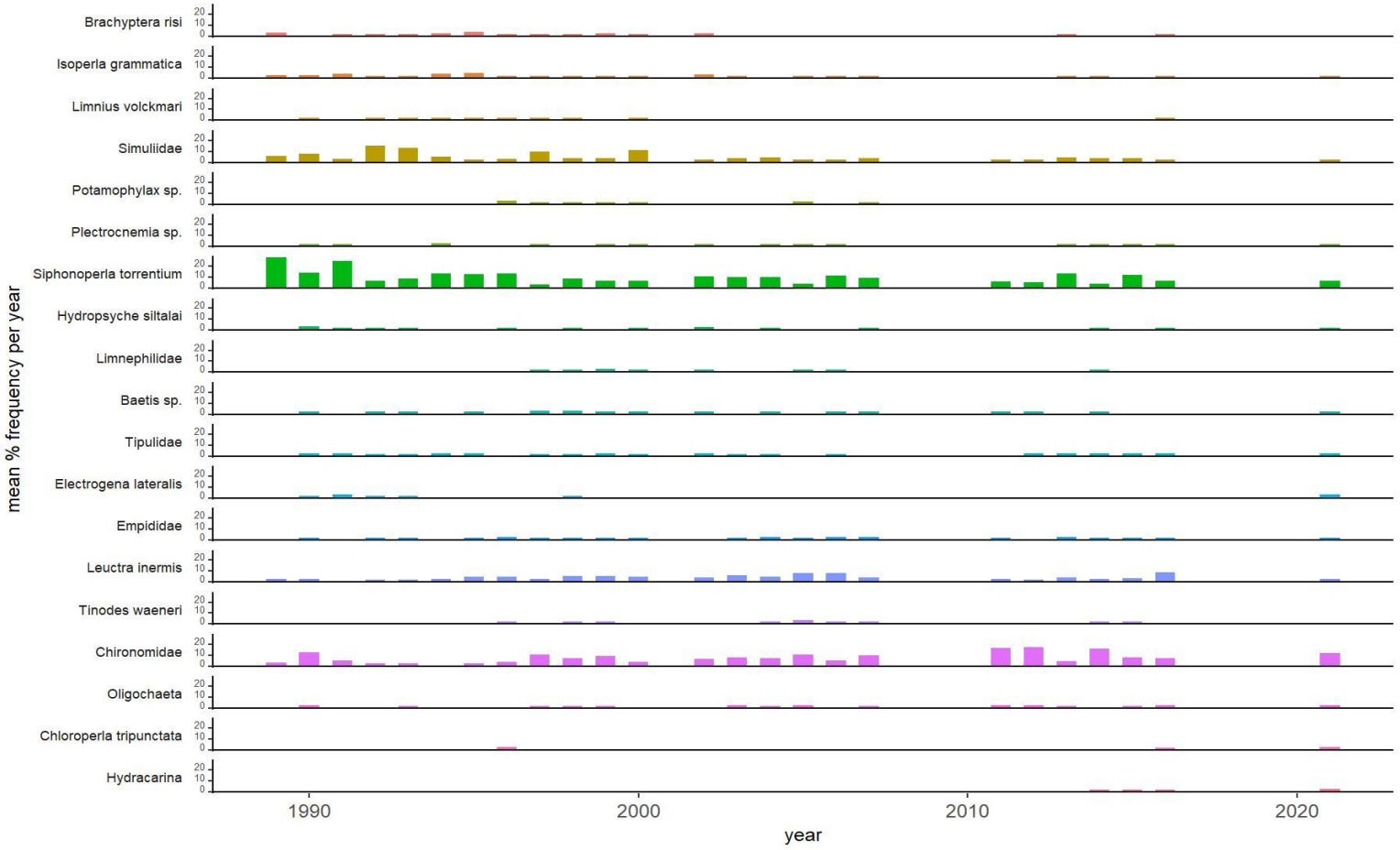
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.22.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	49.99	19.09	47.91	30.12	37.49	10.63	39.37	13.43	33.12	13.28	28.88	9.67	20.47	5.94
non-marine sulphate (μeq L^{-1})	20.92	17.90	24.00	29.40	14.13	9.79	8.46	13.73	10.07	11.07	6.69	9.71	6.11	5.20
nitrate (μeq L^{-1})	2.14	0.54	2.14	6.83	2.14	8.26	2.14	0.76	3.64	2.25	2.14	4.42	2.14	0.00
chloride (μeq L^{-1})	245.43	71.42	242.61	47.87	231.32	71.02	256.71	88.75	200.01	80.57	208.33	69.70	152.19	27.03
calcium (μeq L^{-1})	154.69	75.47	121.76	66.05	116.77	65.14	126.00	67.44	106.29	58.70	120.76	67.60	77.34	24.13
magnesium (μeq L^{-1})	127.50	41.29	103.65	40.12	100.36	39.06	115.16	38.72	92.95	35.93	92.95	36.86	63.83	16.95
sodium (μeq L^{-1})	239.25	39.72	228.38	30.91	221.85	35.56	230.55	43.85	203.36	39.75	217.06	36.92	166.39	25.53
potassium (μeq L^{-1})	8.95	2.38	9.46	3.52	9.21	3.72	8.57	3.24	12.36	7.62	7.47	6.01	4.82	2.22
pH	6.74	0.72	6.58	0.74	6.47	0.64	6.79	0.72	6.24	0.59	6.64	0.67	5.62	0.57
Gran alkalinity (μeq L^{-1})	168.00	133.64	103.50	130.29	100.50	126.11	127.50	140.51	99.37	120.78	122.54	127.56	55.60	42.04
labile aluminium (μg L^{-1})	2.00	6.48	2.00	27.03	2.00	6.77	2.00	5.24	N/A	N/A	8.00	5.97	N/A	N/A
conductivity (μS cm^{-1})	55.00	12.64	52.00	11.67	51.00	11.58	56.00	11.71	43.70	14.17	49.45	12.39	34.25	5.94
Dissolved Organic Carbon (mg L^{-1})	5.60	3.57	9.05	5.62	10.70	5.62	8.95	4.78	9.56	6.54	9.57	6.21	19.05	7.40
Acid Neutralising Capacity (μS cm^{-1})	190.30	133.80	169.57	126.37	161.02	132.76	176.42	137.80	178.42	114.83	201.11	112.62	137.14	44.79

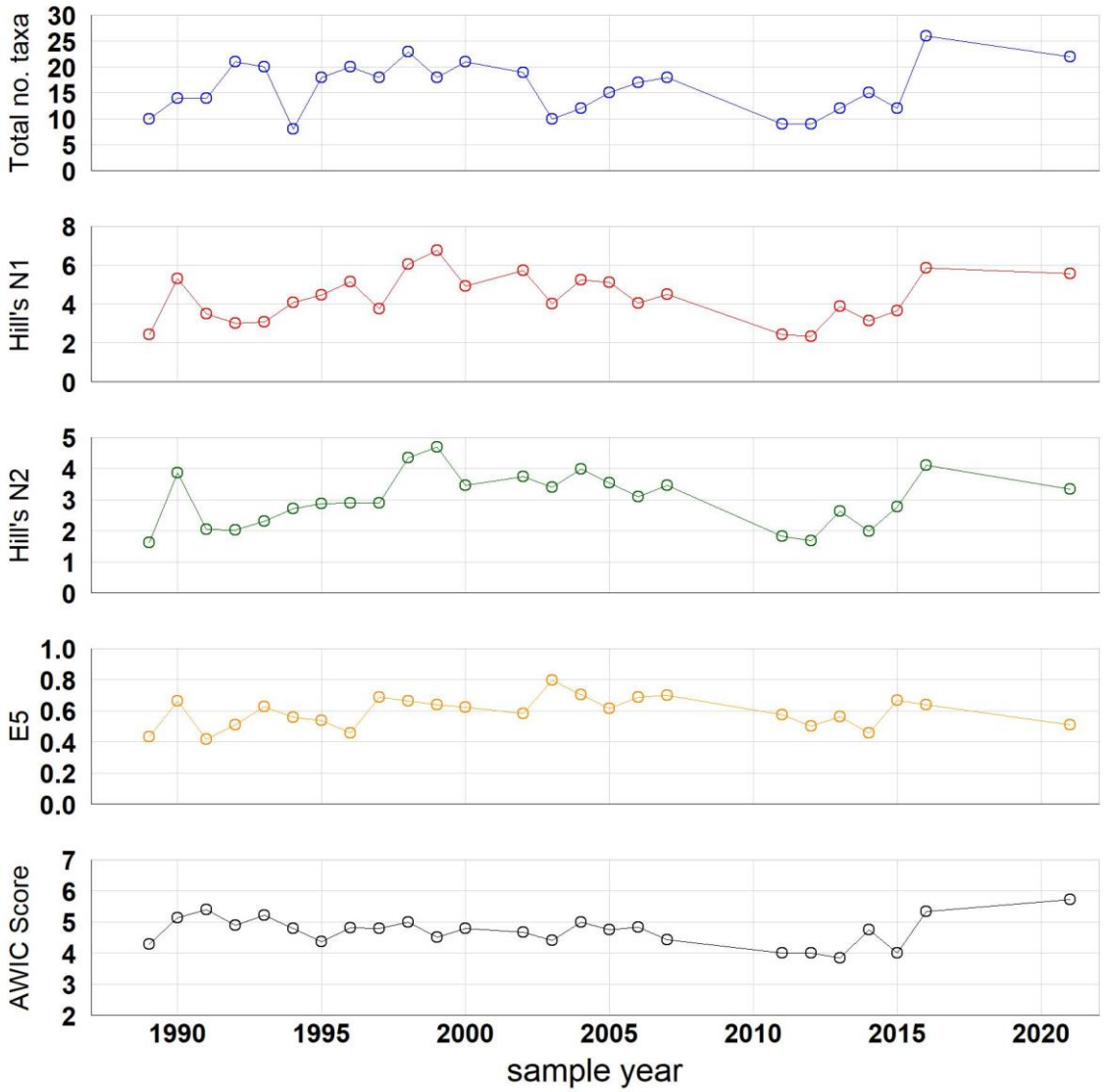
5.22.3. Coneyglen Burn macroinvertebrates

5.22.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

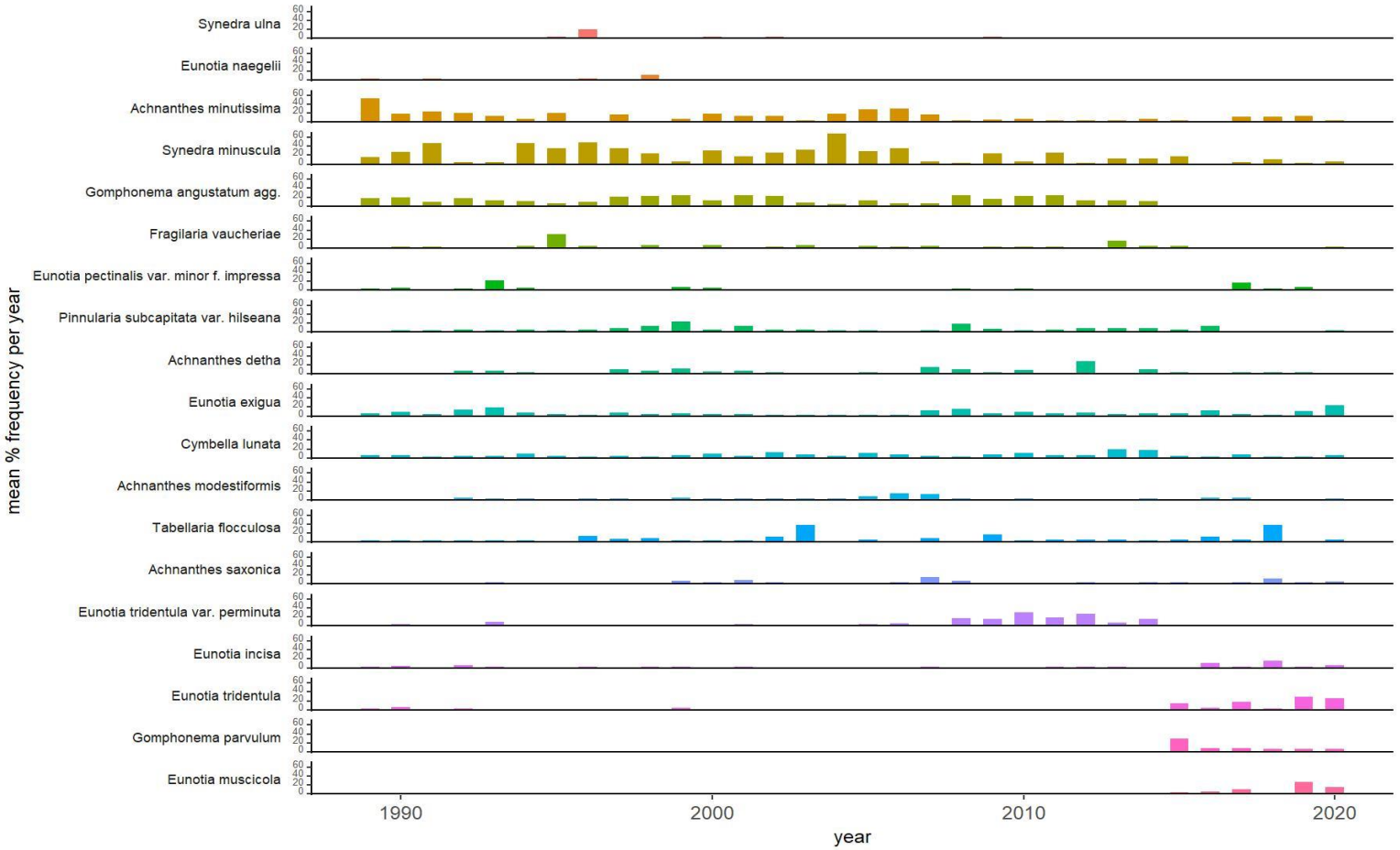
5.22.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

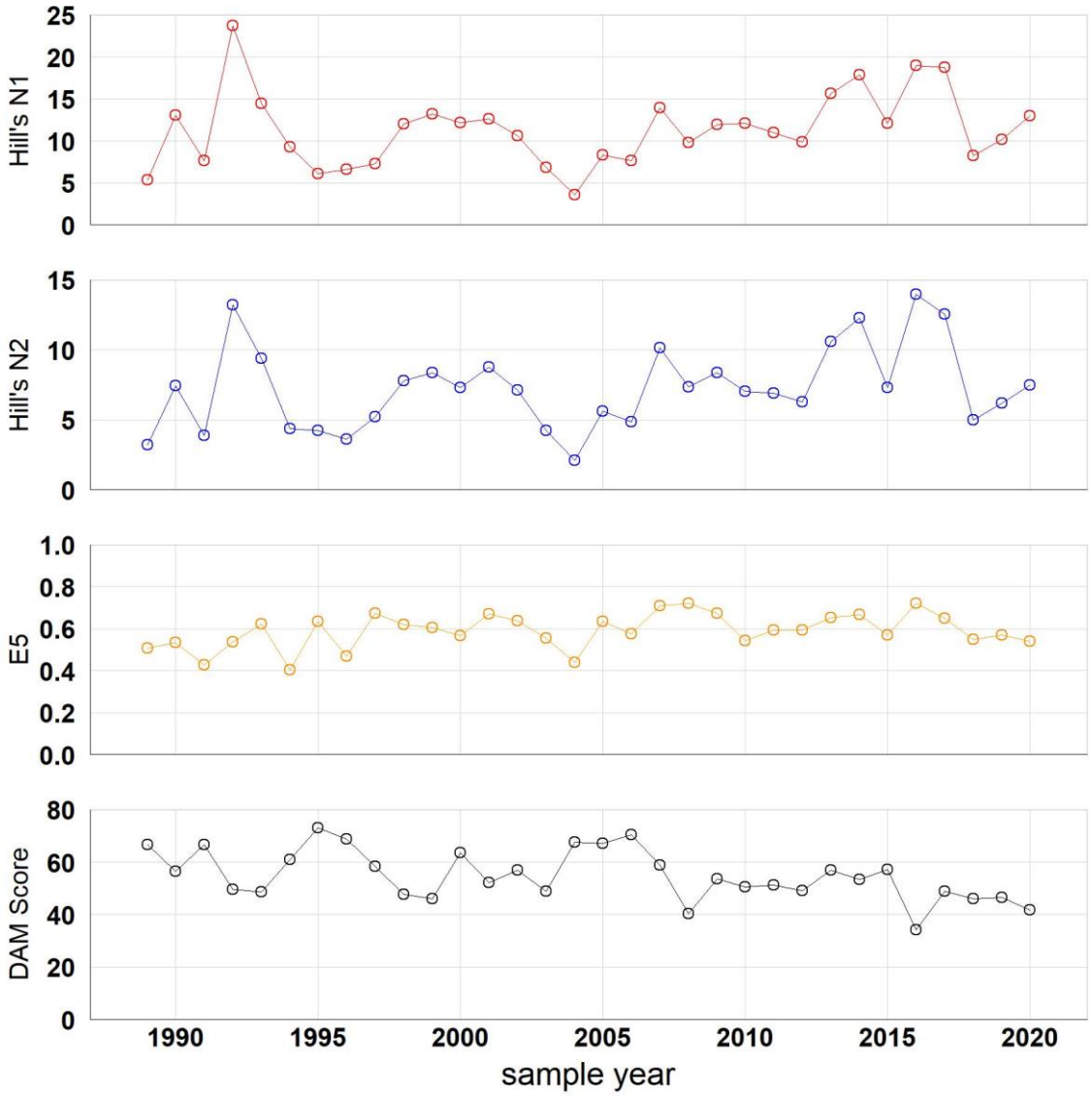
5.22.4. Coneyglen Burn epilithic diatoms

5.22.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

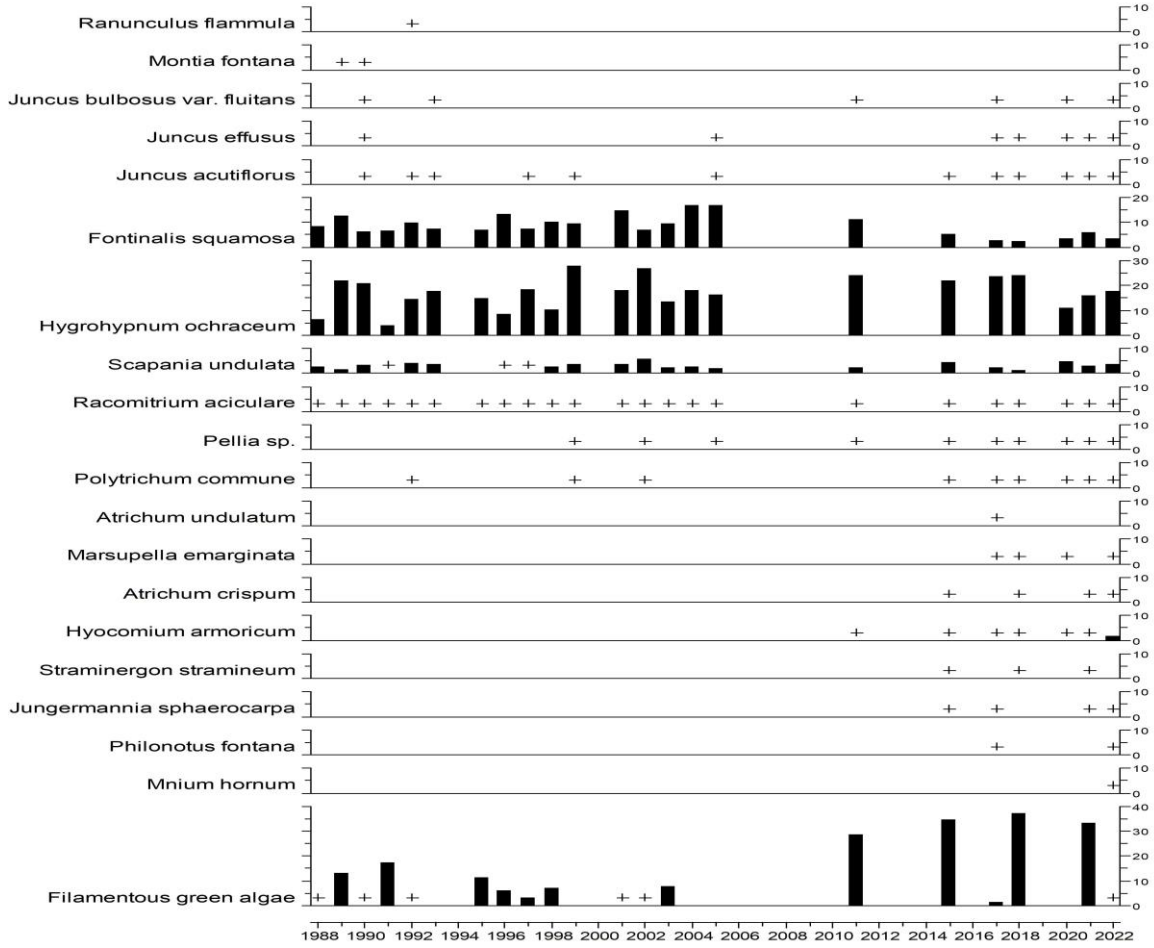
5.22.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.22.5. Coneyglen Burn aquatic macrophytes

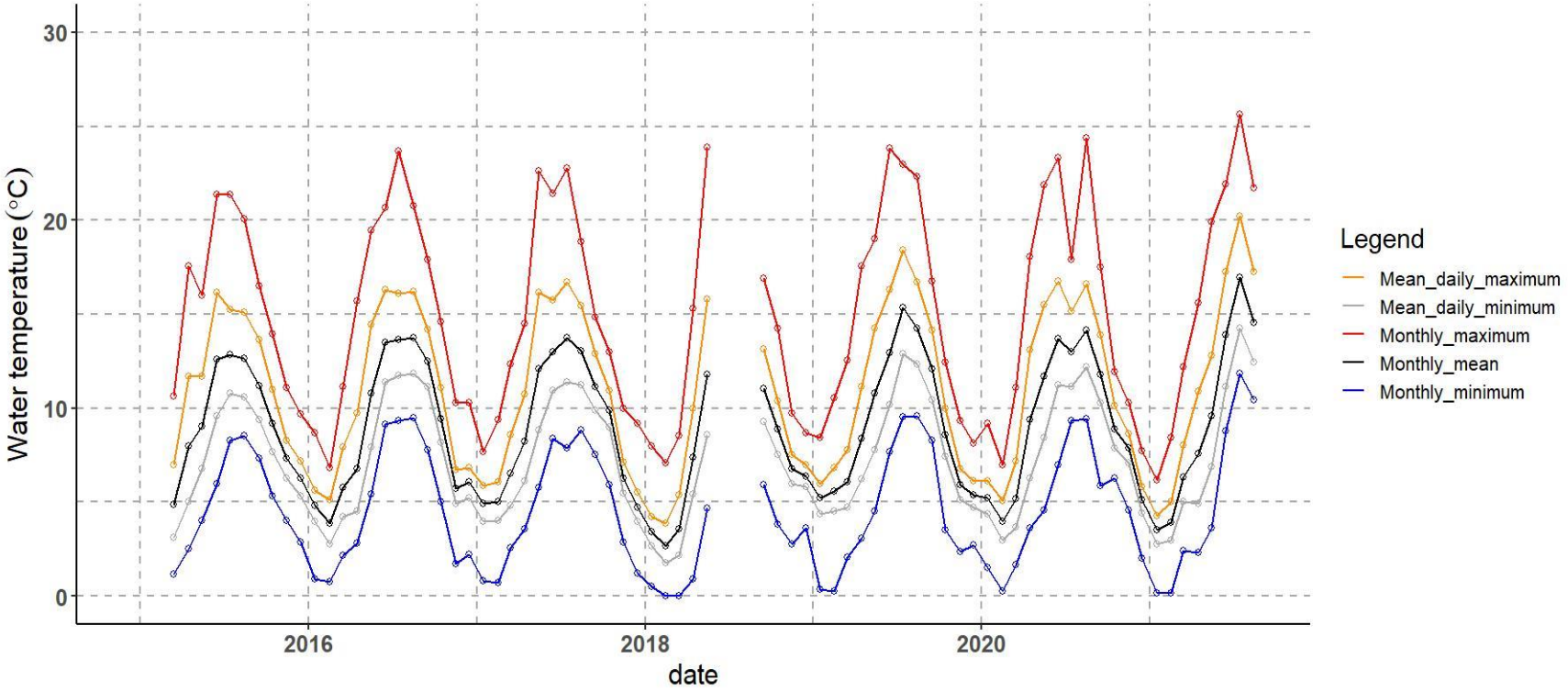
5.22.5.1. Aquatic macrophyte mean percentage cover of survey stretch



Stream aquatic macrophyte summary. Relative abundance determined as the mean aerial cover of ten 5 m sections of the stream bed

5.22.6. Coneyglen Burn water temperature

5.22.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.

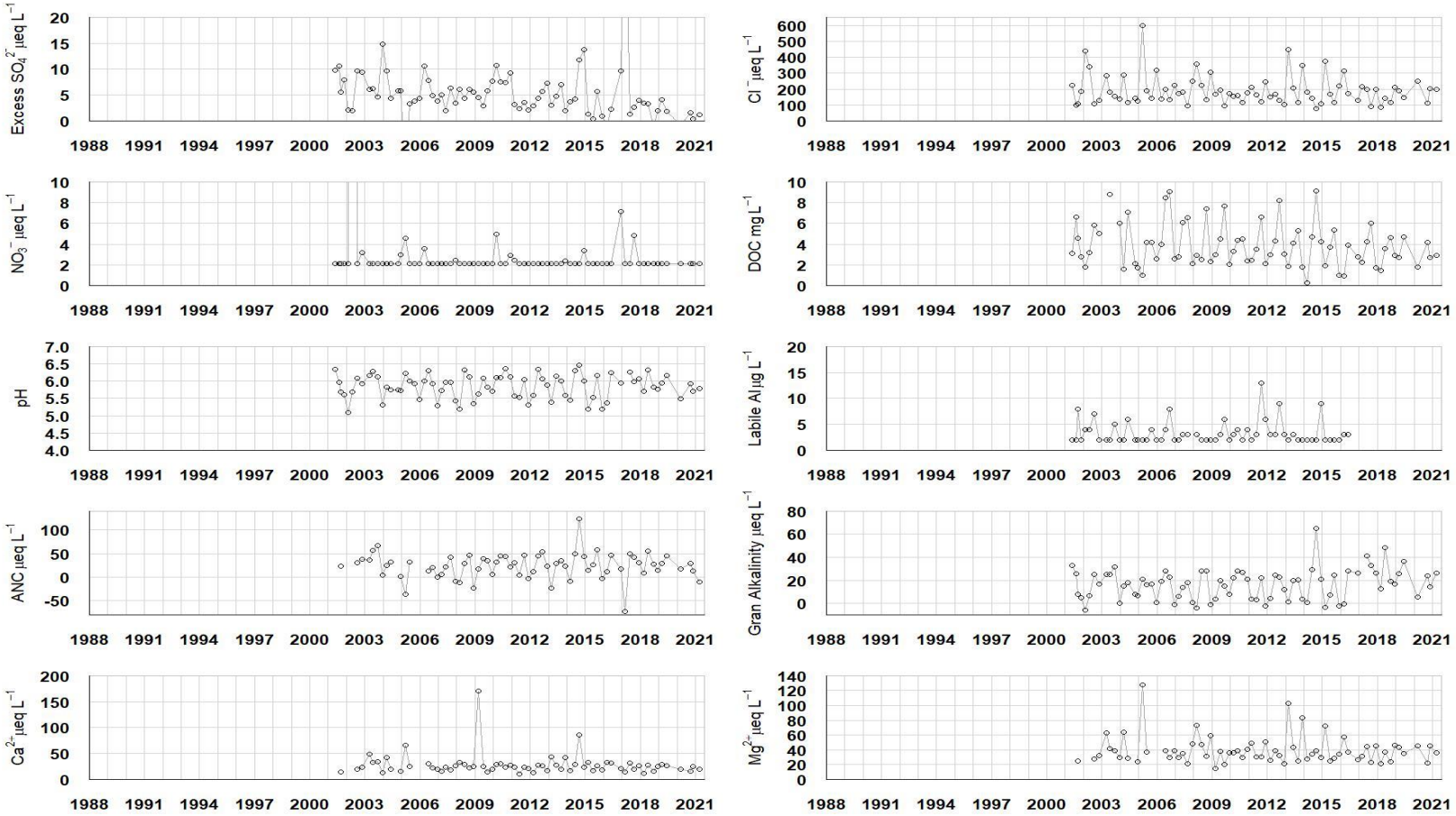
5.23. Loch Coire Fionnaraich

5.23.1. Loch Coire Fionnaraich site characteristics

Grid Reference	NG 945498
Lake altitude	236 m
Maximum altitude	962 m
Maximum depth	14.6 m
Mean depth	5.6 m
Volume	8.2×10^5 m^3
Lake area	9 ha
Catchment area	560 ha
Catchment area (excl.lake)	551 ha
Catchment:Lake ratio	62.2
Catchment geology	Torridonian sandstone
Catchment soils	Peat and podzols
Catchment vegetation	Moorland – 100%
Mean annual runoff	2838
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	20.7 – 14.6
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.9 – 2.5
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.3 – 2.9
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	9.4 – 5.0

5.23.2. Loch Coire Fionnaraich water chemistry

5.23.2.1. Water chemistry time series



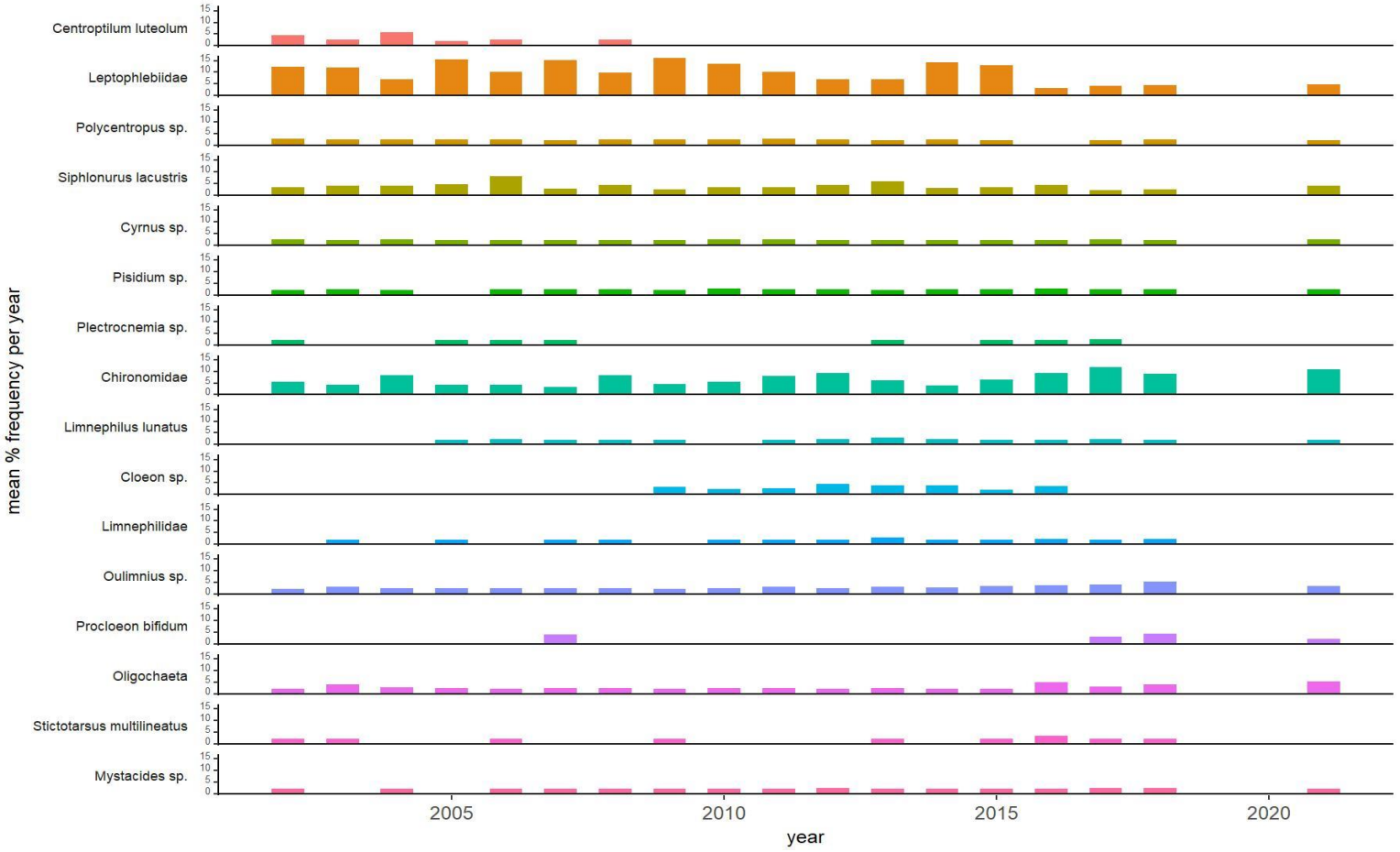
NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.23.2.2. Water chemistry statistics

period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (µeq L^{-1})	N/A	N/A	N/A	N/A	26.04	8.99	23.95	9.91	22.50	7.96	21.75	13.54	21.25	4.80
non-marine sulphate (µeq L^{-1})	N/A	N/A	N/A	N/A	7.11	3.71	4.99	4.05	4.63	2.55	3.31	11.41	1.23	0.64
nitrate (µeq L^{-1})	N/A	N/A	N/A	N/A	2.14	40.59	2.14	0.63	2.14	0.65	2.14	1.23	2.14	0.00
chloride (µeq L^{-1})	N/A	N/A	N/A	N/A	167.85	106.13	184.78	116.57	164.89	84.83	167.96	73.40	196.06	50.63
calcium (µeq L^{-1})	N/A	N/A	N/A	N/A	24.45	12.65	24.45	12.39	24.63	33.64	26.00	15.06	19.96	4.25
magnesium (µeq L^{-1})	N/A	N/A	N/A	N/A	32.08	13.11	37.84	26.46	36.07	20.70	34.71	12.33	36.19	11.64
sodium (µeq L^{-1})	N/A	N/A	N/A	N/A	130.50	46.98	171.82	77.44	145.07	63.20	145.72	54.50	147.03	25.29
potassium (µeq L^{-1})	N/A	N/A	N/A	N/A	6.39	1.84	6.06	2.57	6.35	2.11	6.60	2.01	6.32	0.69
pH	N/A	N/A	N/A	N/A	5.94	0.39	5.88	0.33	5.94	0.31	5.97	0.38	5.78	0.11
Gran alkalinity (µeq L^{-1})	N/A	N/A	N/A	N/A	21.00	13.12	15.50	10.35	17.50	9.83	25.05	17.62	24.00	6.31
labile aluminium (µg L^{-1})	N/A	N/A	N/A	N/A	2.00	2.15	2.00	1.63	3.00	2.80	2.00	2.18	N/A	N/A
conductivity (µS cm^{-1})	N/A	N/A	N/A	N/A	28.00	13.34	29.00	15.56	28.00	10.75	25.55	9.24	30.10	6.39
Dissolved Organic Carbon (mg L^{-1})	N/A	N/A	N/A	N/A	4.80	2.12	2.86	2.48	3.43	1.86	3.59	2.04	2.91	0.77
Acid Neutralising Capacity (µS cm^{-1})	N/A	N/A	N/A	N/A	36.95	20.92	17.12	23.50	30.17	19.11	29.01	36.38	12.84	20.11

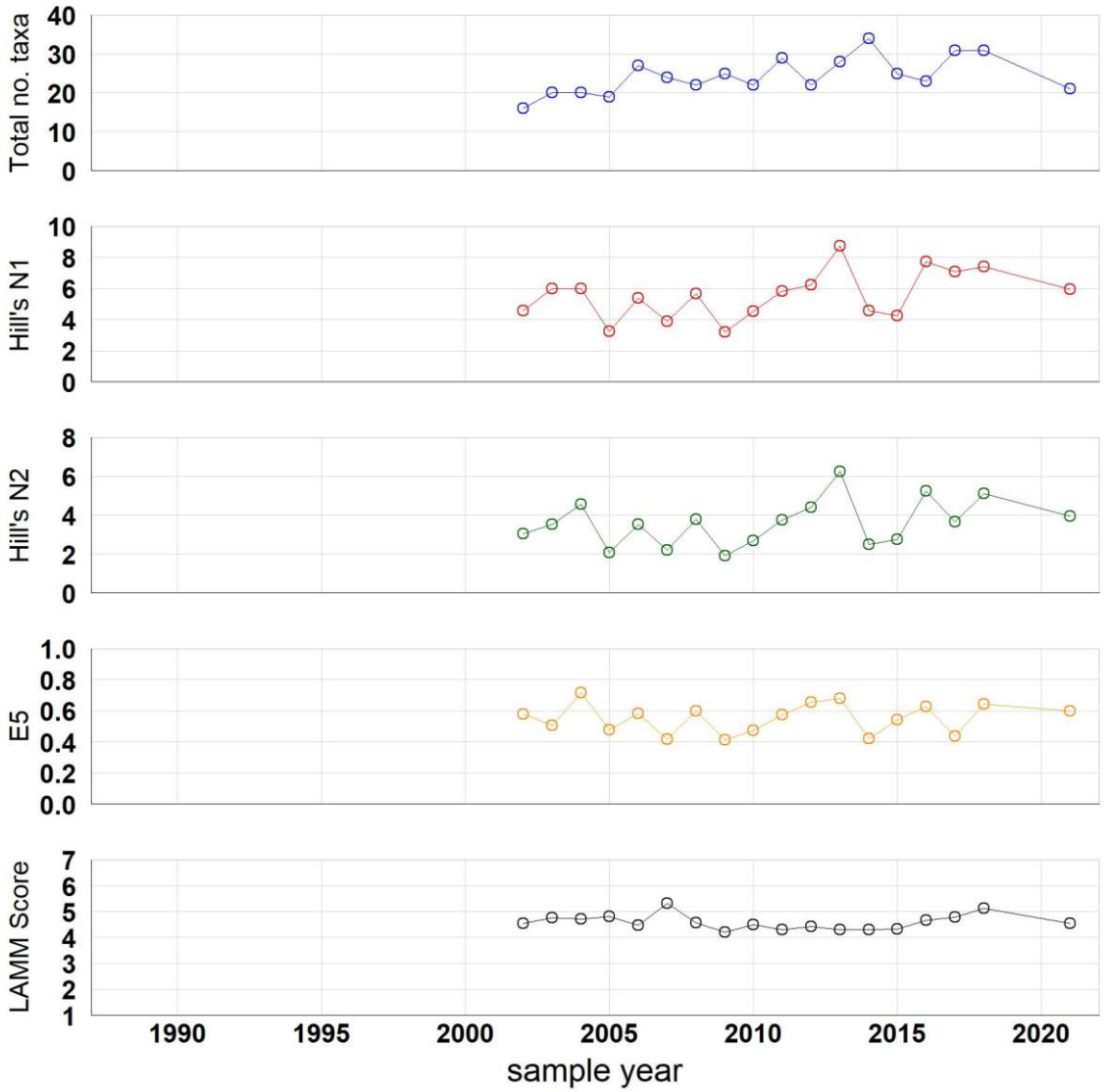
5.23.3. Loch Coire Fionnaraich macroinvertebrates

5.23.3.1. Time series of relative abundance



Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

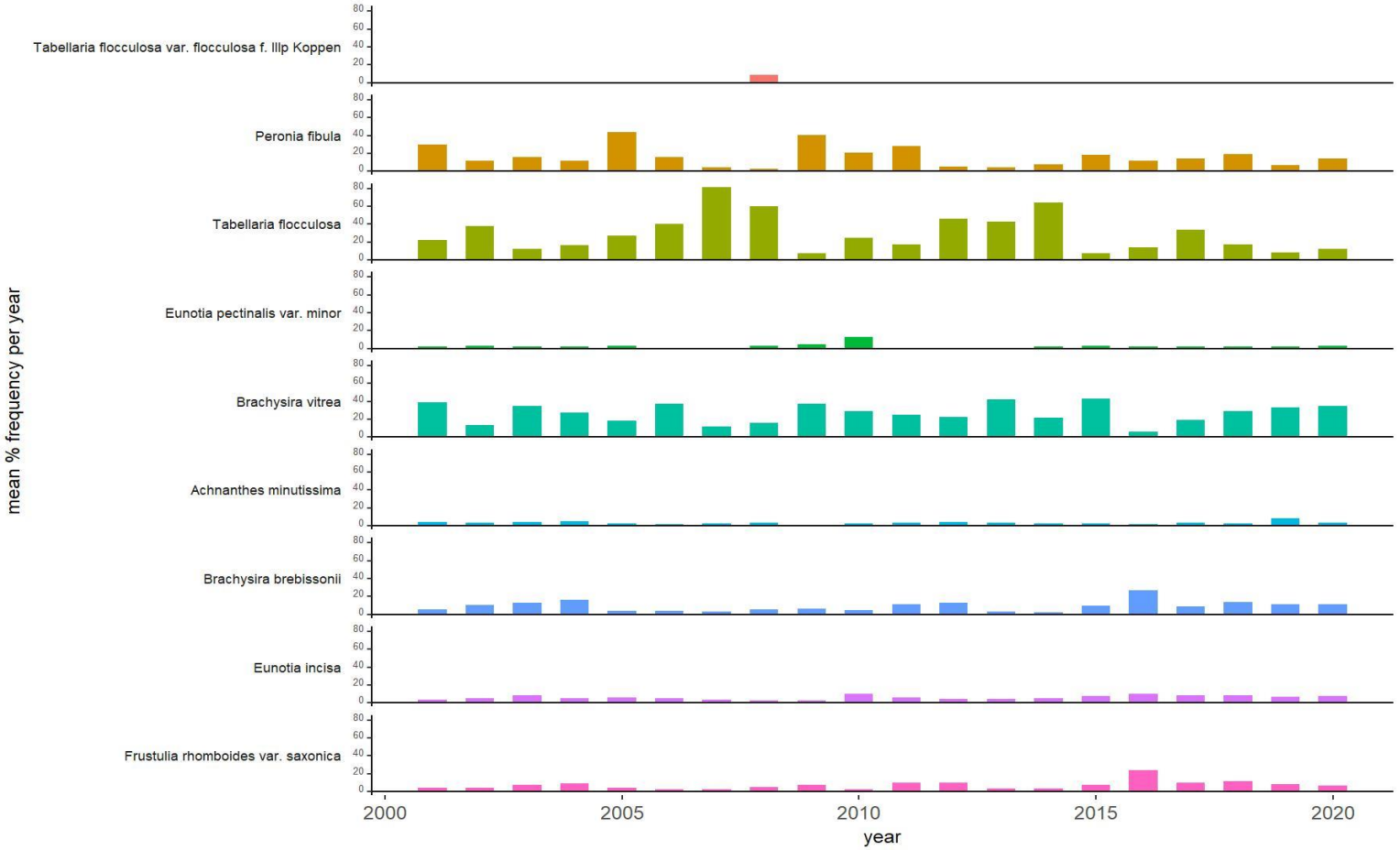
5.23.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

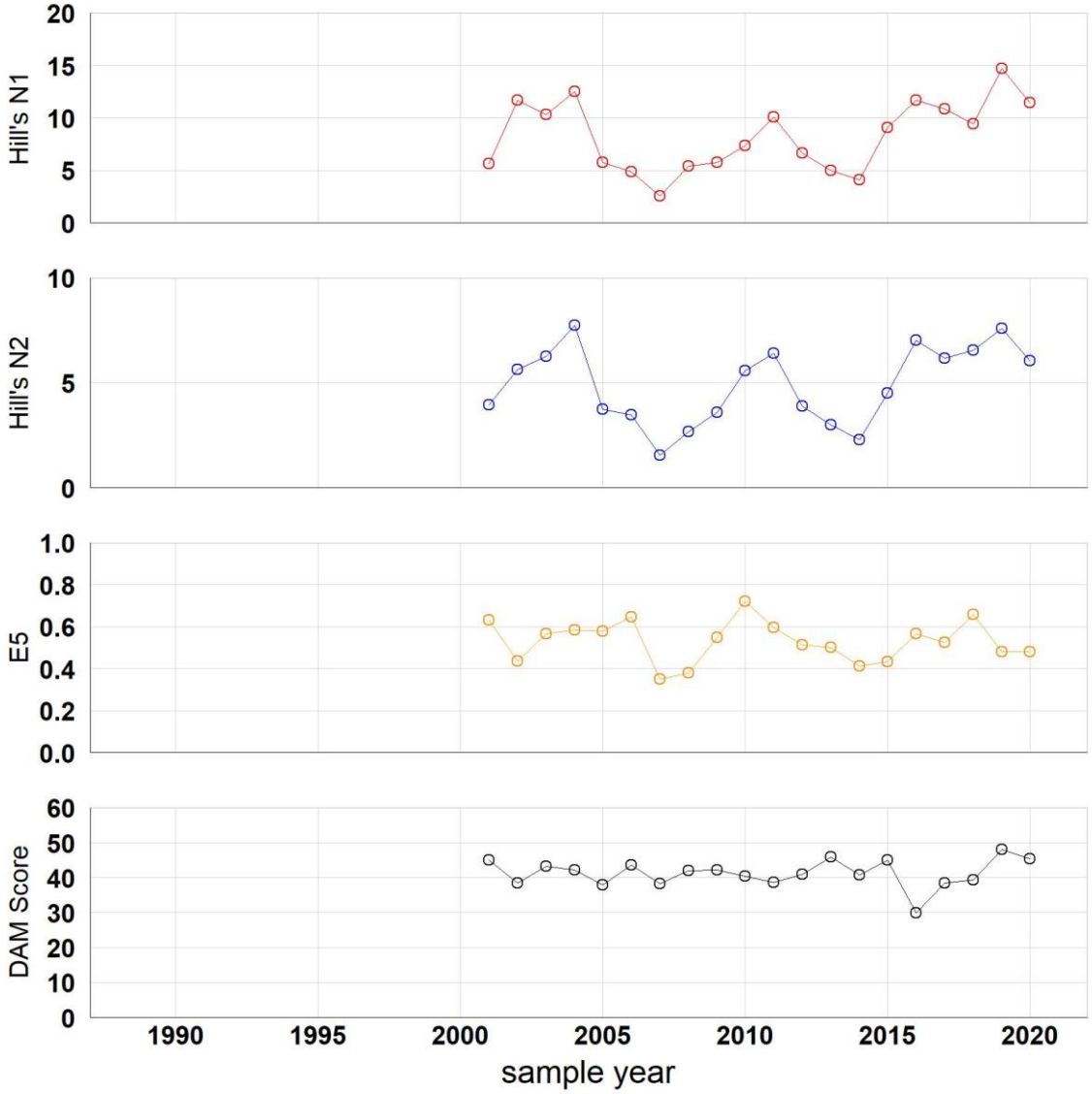
5.23.4. Loch Coire Fionnaraich epilithic diatoms

5.23.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

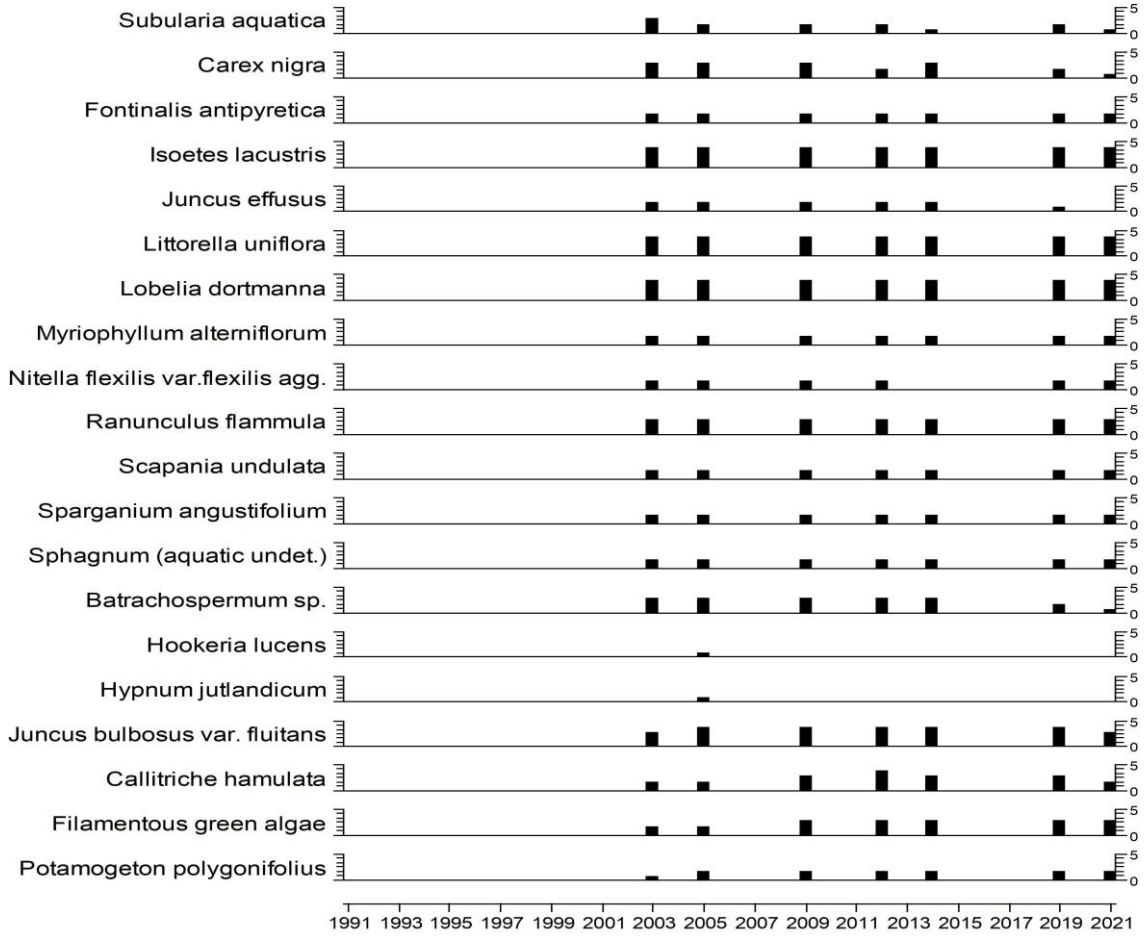
5.23.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

5.23.5. Loch Coire Fionnaraich aquatic macrophytes

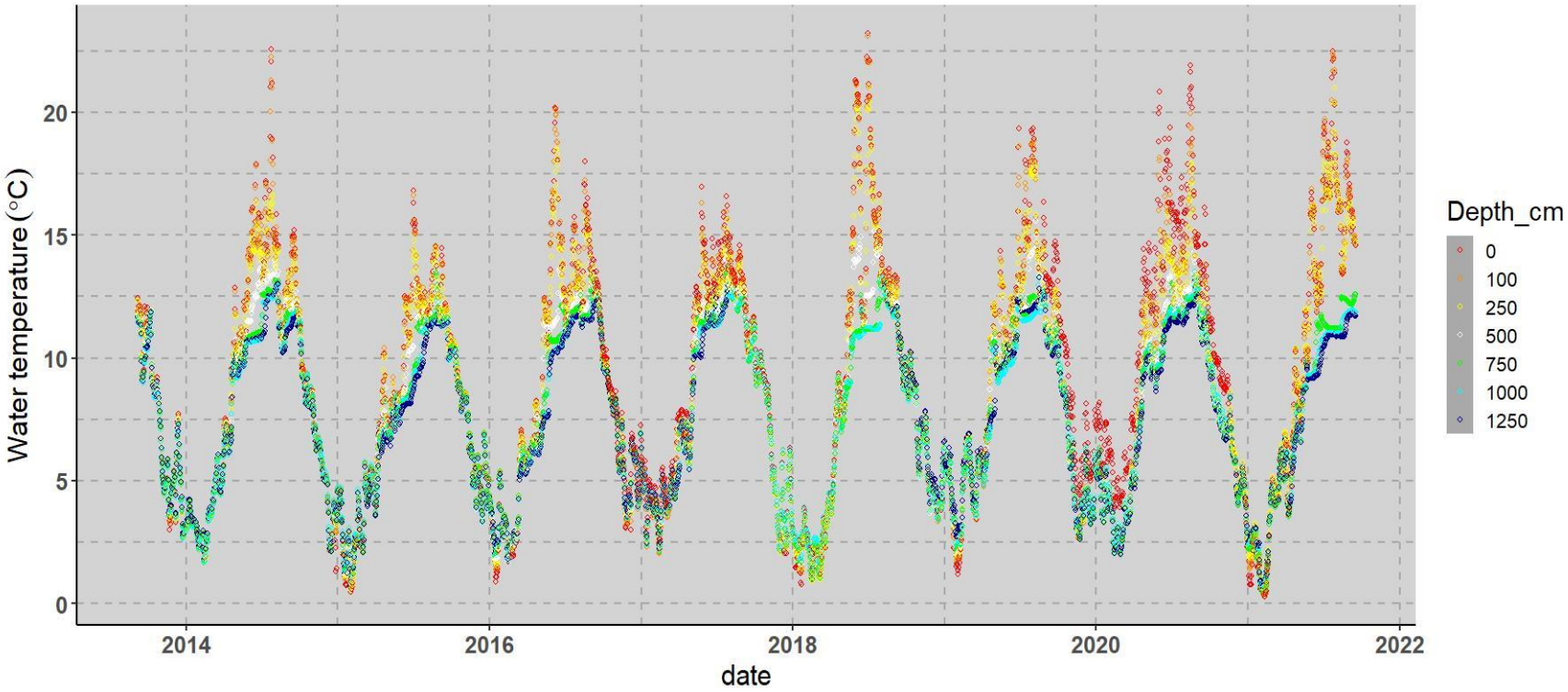
5.23.5.1. Aquatic macrophyte relative abundance (DAFOR scale)



Lake aquatic macrophyte summary. Relative abundance determined on a five point scale comparable to the DAFOR scoring system of Palmer et al., 1992 following shoreline survey, shore transects and deep-water grapnel trawls. 1. Rare/infrequent; 2. Occasional but not abundant; 3. Widespread but not abundant; 4. Locally abundant; 5. Widespread and abundant

5.23.6. Loch Coire Fionnaraich water temperature

Daily mean water temperature time series for multiple lake depths



Daily mean lake water temperatures measured by a chain of thermistors located in an area of deep water.

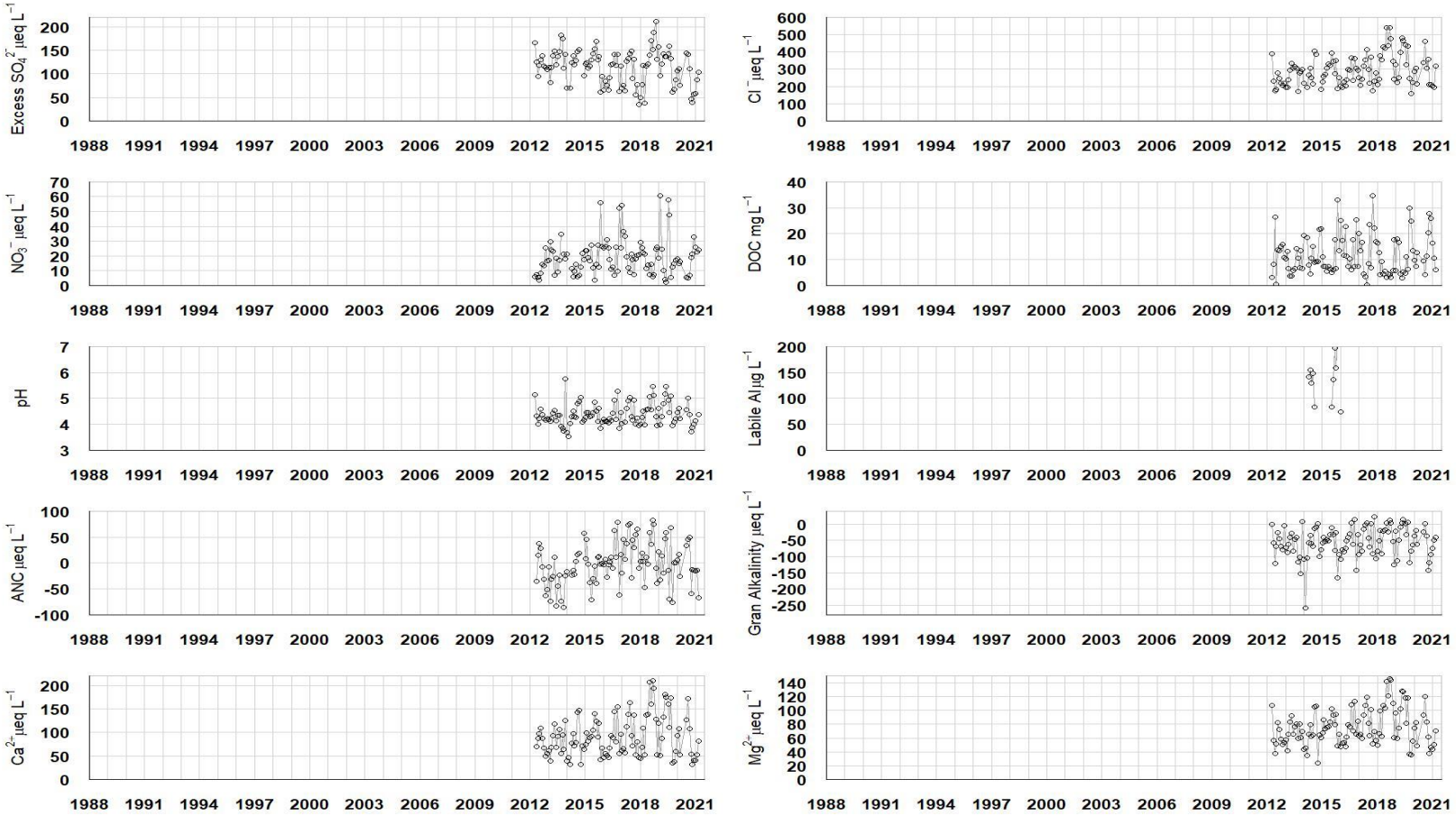
5.24. Danby Beck

5.24.1. Danby Beck site characteristics

Grid Reference	NZ 692024
Catchment area	77 ha
Minimum catchment altitude	299 m
Maximum catchment altitude	432 m
Catchment geology	Sandstone, siltstone and mudstone
Catchment soils	peat
Catchment vegetation	Moorland
Mean annual runoff	to be confirmed
CBED total oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	to be confirmed
CBED non-marine oxidised sulphur (kg ha^{-1} yr^{-1}) (1990 - 2017)	to be confirmed
CBED total oxidised nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	to be confirmed
CBED reduced nitrogen (kg ha^{-1} yr^{-1}) (1990 - 2017)	to be confirmed

5.24.2. Danby Beck water chemistry

5.24.2.1. Water chemistry time series



NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; SO_4^{2-} = sulphate not derived from marine salts; Cl^- = chloride; NO_3^- = nitrate; DOC = dissolved organic carbon; Labile Al = inorganic monomeric (labile) aluminium; ANC = Acid Neutralising Capacity (determined by the equivalent difference between total base cation concentration and total acid anion concentration); Gran Alkalinity = alkalinity determined by a Gran titration; Ca^{2+} = calcium; Mg^{2+} = magnesium.

5.24.2.2. Water chemistry statistics

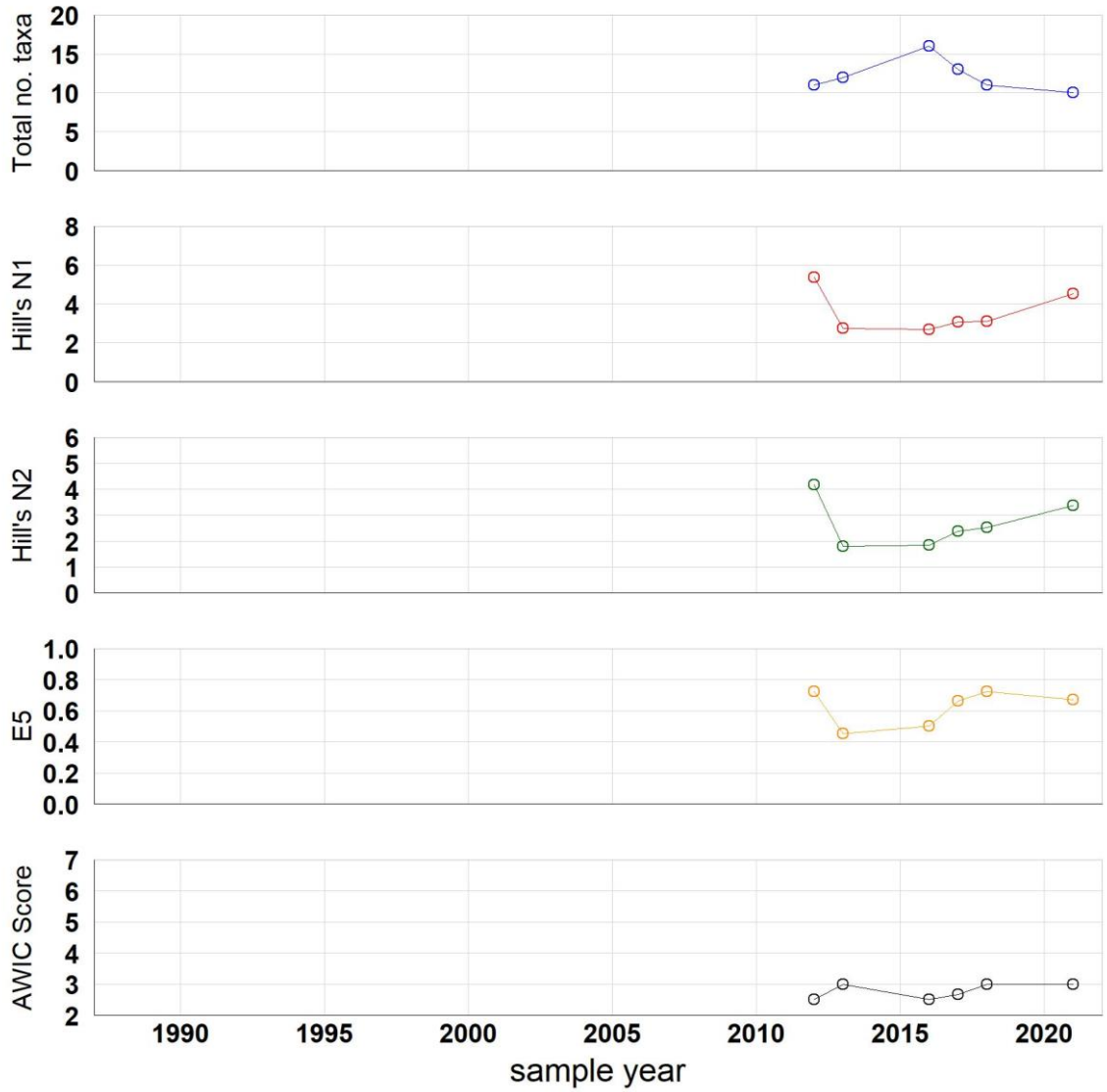
period	1989-1993		1994-1998		1999-2003		2004-2008		2009-2013		2014-2019		2020-2021	
metric	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev	median	stdev
sulphate (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	151.85	28.69	150.60	43.54	107.48	46.32
non-marine sulphate (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	125.21	25.28	120.71	37.27	87.36	39.60
nitrate (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	16.93	8.66	17.96	13.24	21.50	10.02
chloride (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	246.84	59.15	293.38	91.94	307.49	91.45
calcium (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78.84	23.80	87.82	45.95	53.89	47.62
magnesium (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	65.81	16.97	74.90	27.99	61.78	27.19
sodium (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	233.59	42.92	269.70	68.13	247.08	68.51
potassium (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.36	3.64	11.15	3.55	12.53	2.33
pH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.23	0.44	4.30	0.42	4.25	0.41
Gran alkalinity (μeq L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-61.82	40.99	-49.70	49.14	-48.20	46.77
labile aluminium (μg L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	142.00	44.62	N/A	N/A
conductivity (μS cm^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	67.40	10.77	76.75	8.96	74.80	15.32
Dissolved Organic Carbon (mg L^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.40	5.82	9.26	7.85	11.30	8.47
Acid Neutralising Capacity (μS cm^{-1})	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-30.84	36.59	3.48	38.26	-13.59	41.80

5.24.3. Danby Beck macroinvertebrates

5.24.3.1. Time series of relative abundance

Time series of percentage abundance of the more abundant macroinvertebrate taxa. Taxa are ordered so that those most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

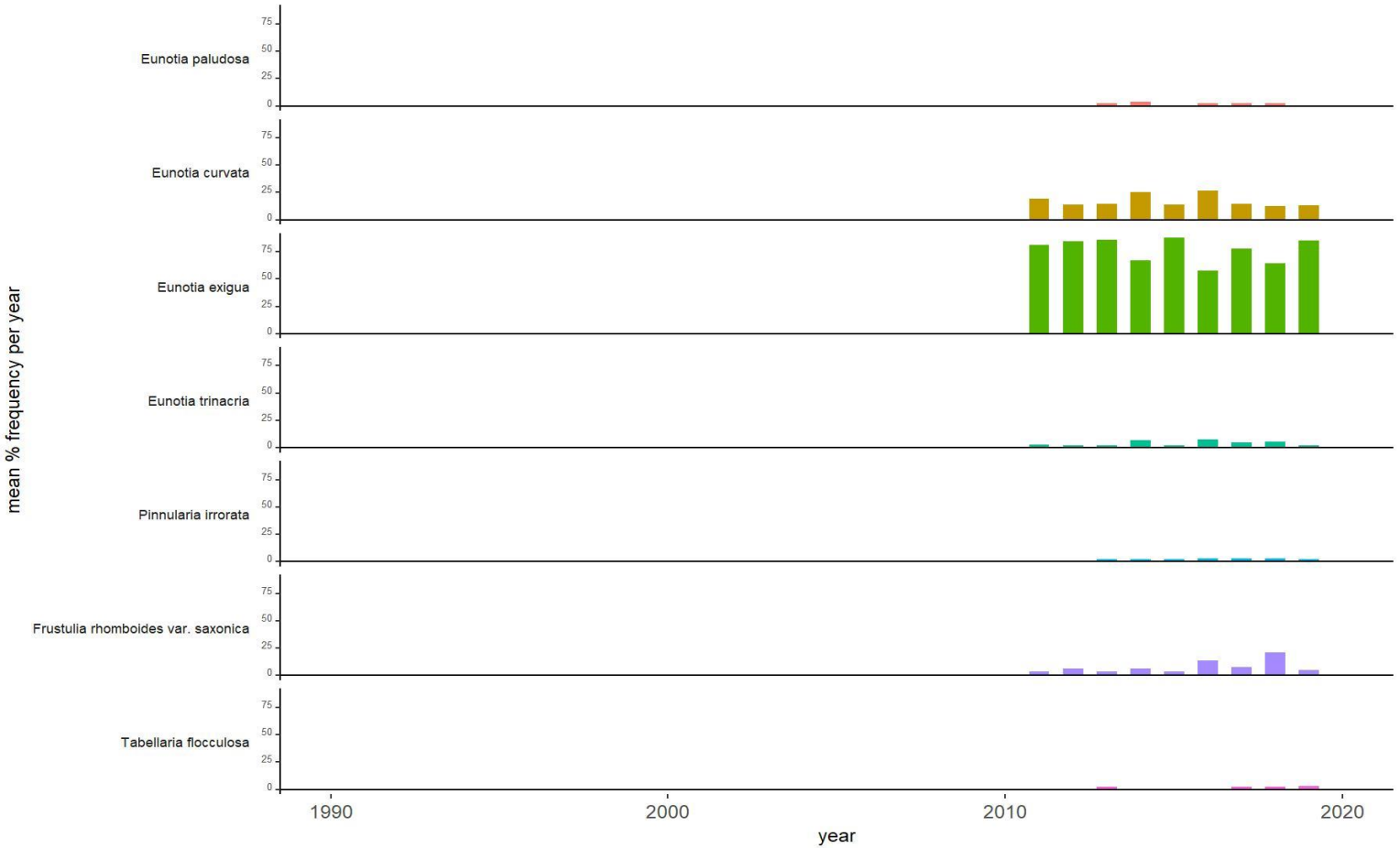
5.24.3.2. Macroinvertebrate diversity and acidity indicator metrics



Time series of macroinvertebrate diversity metrics and acidity indicator score (AWIC for streams/LAMM for lakes). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

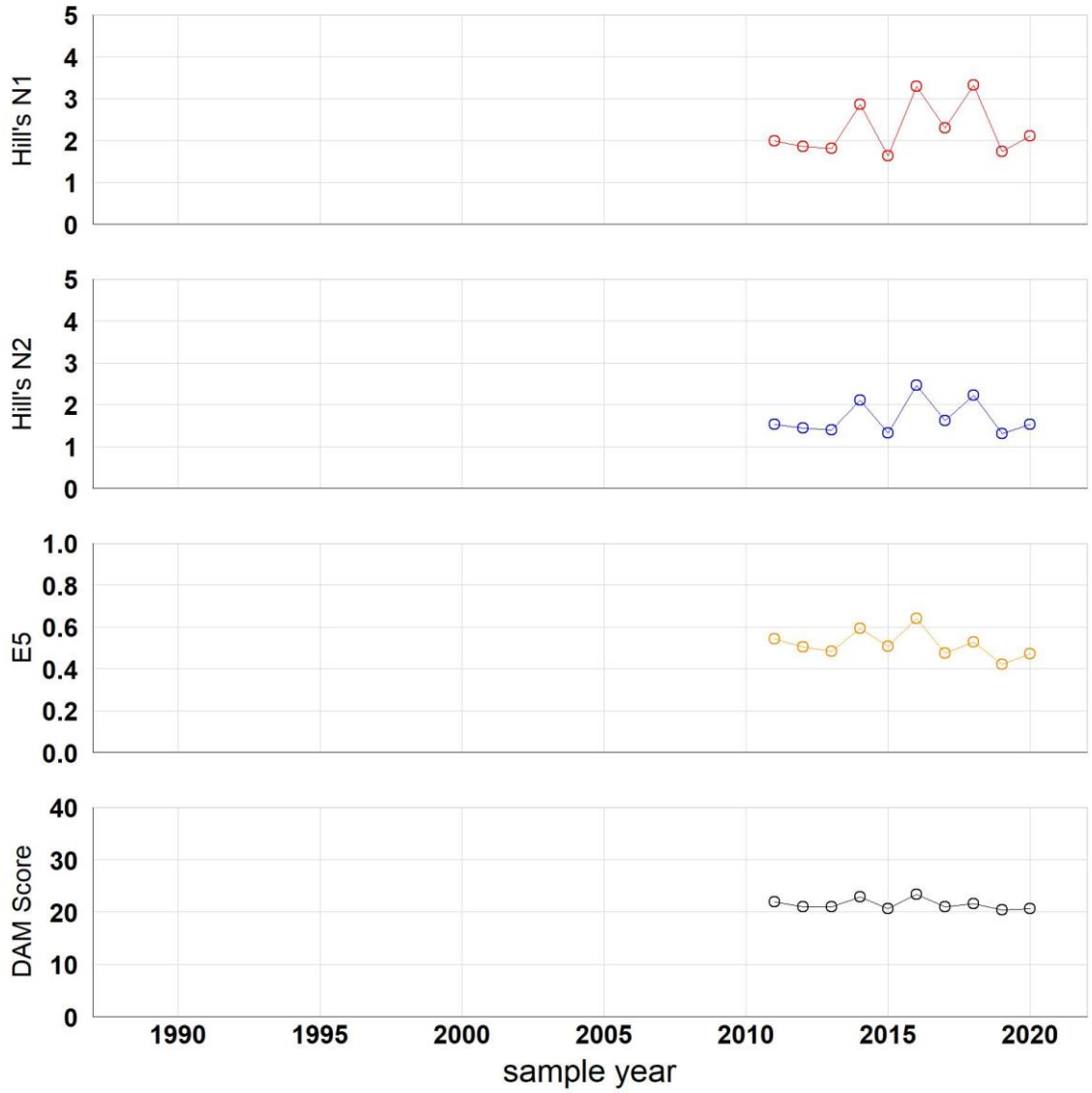
5.24.4. Danby Beck epilithic diatoms

5.24.4.1. Time series of relative abundance



Time series of percentage abundance of the more abundant epilithic diatom taxa. Taxa are ordered so that those that were most abundant in the early phase of monitoring appear at the top of the plot while those that have become most abundant more recently appear at the bottom.

5.24.4.2. Epilithic diatom diversity and acidity indicator metrics



Time series of epilithic diatom diversity metrics and the DAM acidity indicator score (Juggins et al., 2016). Hill's N1 = measure of the number of abundant species in a sample; Hill's N2 = measure of number of very abundant species in a sample; E5 = measure of eveness - the more one species dominates the closer the score approaches zero.

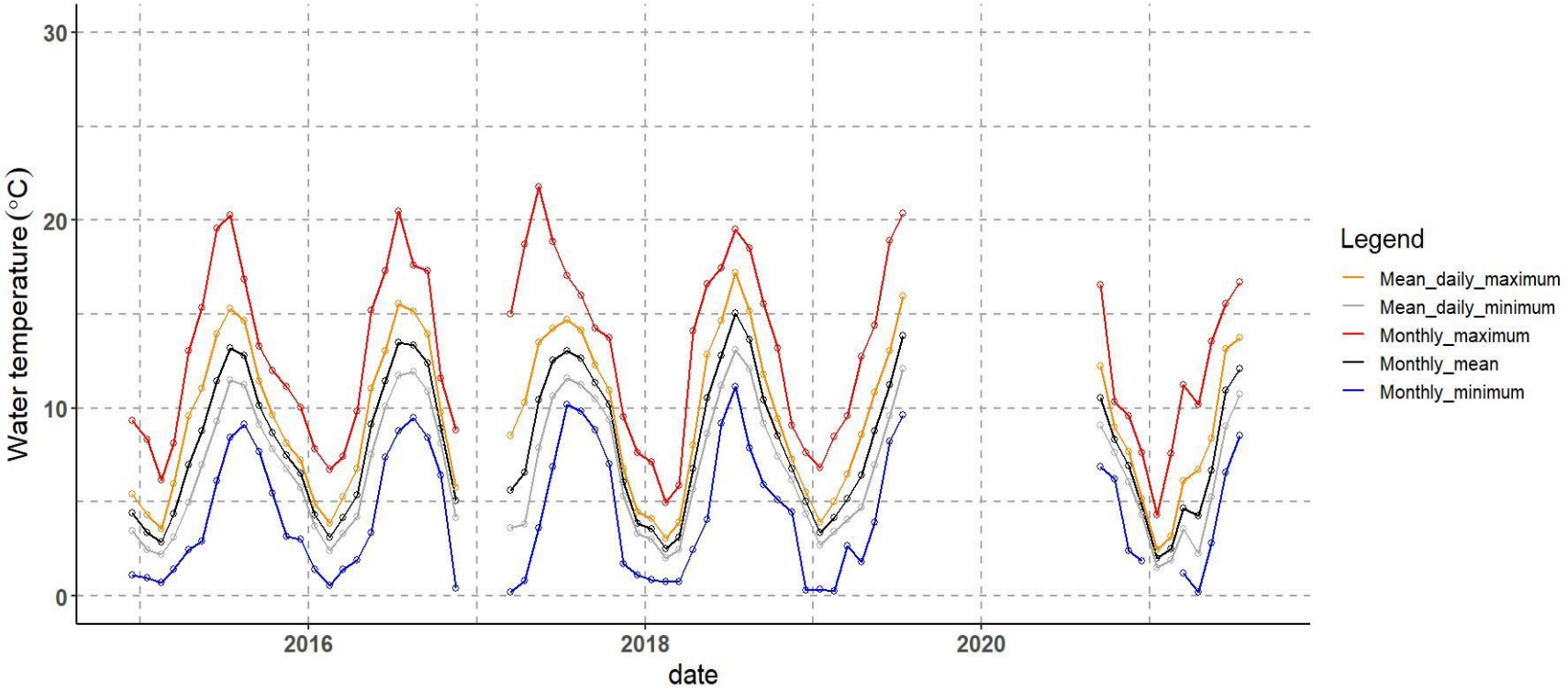
5.24.5. Danby Beck aquatic macrophytes

5.24.5.1. Aquatic macrophyte mean percentage cover of survey stretch

Data pending verification

5.24.6. Danby Beck water temperature

5.24.6.1. Time series of monthly mean, maximum and minimum water temperature



Daily monthly temperature summary data, including the monthly mean, maximum and minimum temperature, and the mean daily maximum and mean daily minimum temperature for each month. Stream water temperature statistics are provided only when data are available for at least 25 days in a month.