

**UK ACID WATERS MONITORING NETWORK (UKAWMN) –
CONTRACT 22 01 249**

LLYN CWM MYNACH

ANNUAL SUMMARY PROGRESS REPORT April 2007 - March 2008

REPORT TO THE WELSH ASSEMBLY GOVERNMENT

Ewan Shilland



1. Summary Overview

Chemical and biological sample collection, analysis and data collation, quality control and archiving proceeded without any problems at Llyn Cwm Mynach during the period from April 2007 to March 2008.

2. Water Chemistry

Samples were collected in early June and September and December 2007, delivered to the analytical laboratories on schedule and have been analysed, quality controlled and archived in the UKAWMN central chemistry database at CEH Wallingford. March 2008 samples have been collected and are in the process of being analysed.

3. Sediment Traps

Sediment traps were recovered and replaced on the 7th of August 2007. Diatoms in the sediment retrieved from the traps are currently being analysed.

4. Thermistors

Lake top and bottom thermistors were removed and replaced on the 7th of August 2007. Both had functioned well during the previous year and the data were added to the ENSIS thermistor water temperature database.

5. Epilithic Diatoms

Epilithic diatoms were retrieved from three sampling points around the lake on the 7th of August 2007. The samples have been made into slides and are currently in the process of being analysed.

6. Macroinvertebrates

Aquatic macroinvertebrates were sampled on the 16th April 2007. Five 1 minute kick samples were performed. The samples were counted and the data sent to ENSIS Ltd. After quality screening the data was added to the UKAWMN biological database at ENSIS.

7. Fish

No fish survey was performed during the period of this report. This was the first gap since UKAWMN monitoring began at the site in 1989.

8. Aquatic Macrophytes

No aquatic macrophyte survey was performed during the period of this report.

9. Data Management and Reporting

No problems or hiatus with the collation and transfer of data within methodological programmes, or to the UKAWMN databases occurred during the period.

The 2006-2007 annual report was uploaded to the AWMN web page in December 2008, and the section dealing with Llyn Cwm Mynach appears in Appendix 1.

An interim interpretative report detailing 18 years of the UKAWMN was published in Autumn 2007 and is available from the UKAWMN web page.

Further publications from the contract period utilizing data from Llyn Cwm Mynach, including a paper in *Nature*, are detailed in section 10 below. Section 11 provides a bibliography for the site.

10. Llyn Cwm Mynach 2007 and 2008 Publications

Evans, C. D., Monteith, D. T., Reynolds, B., Clark, J. M. Buffering of recovery from acidification by organic acids. *Science of the Total Environment*, **In Press, Corrected Proof**.

Battarbee, R. W., Monteith, D. T., Juggins, S., Simpson, G. L., Shilland, E. M., Flower, R. J., Kreiser, A. M. (2008) Assessing the accuracy of diatom-based transfer functions in defining reference pH conditions for acidified lakes in the United Kingdom. *The Holocene*, **18**, 57-67.

Gardner, M. J. (2008) Long-term proficiency testing for the UK Acid Waters Monitoring Network. *Accreditation and Quality Assurance: Journal for Quality, Comparability and Reliability in Chemical Measurement*.

Beaumont, W. R. C. (2007) *Acid Waters Monitoring 2006 Report on Fish Studies*. 1-34. Centre for Ecology & Hydrology, Dorset.

Curtis, C. J. and Simpson, G. L. (2007) *Freshwater Umbrella - The effect of nitrogen deposition and climate change on freshwaters in the UK. Report to DEFRA under contract CPEA17*. ECRC Research Report 115. ENSIS Ltd. University College London, London.

Monteith, D. T. and Shilland, E. M. (2007) *The United Kingdom Acid Waters Monitoring Network Assessment of the First 18 Years of Data. Data Summary Annex Accompanying Research Project Final Report. Report to the Department for*

Environment, Food and Rural Affairs (Contract EPG 1/3/160). 1-276. ENSIS Ltd. Environmental Change Research Centre, University College London, London.

Monteith, D. T., Stoddard, J. L., Evans, C. D., de Wit, H. A., Forsius, M., Hogasen, T., Wilander, A., Skjelkvale, B. L., Jeffries, D. S., Vuorenmaa, J., Keller, B., Kopacek, J., Vesely, J. (2007) Dissolved organic carbon trends resulting from changes in atmospheric deposition chemistry. *Nature*, **450**, 537-540.

Shilland, E. M., Monteith, D. T., Hutchins, M., and Beaumont, W. R. C. (2007) *The United Kingdom Acid Waters Monitoring Network Data Report for 2006-2007 (year 19). Report to the Department for Environment, Food and Rural Affairs (Contract EPG 1/3/160)*. 1-203. ENSIS Ltd. Environmental Change Research Centre, University College London, London.

11. Llyn Cwm Mynach Bibliography

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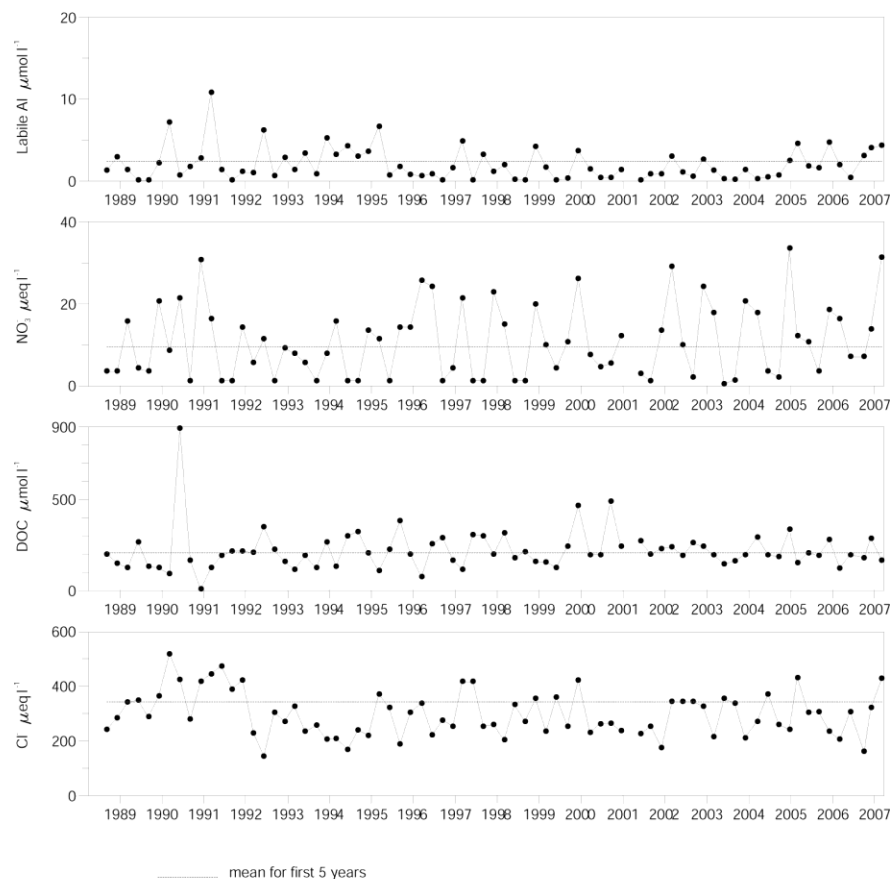
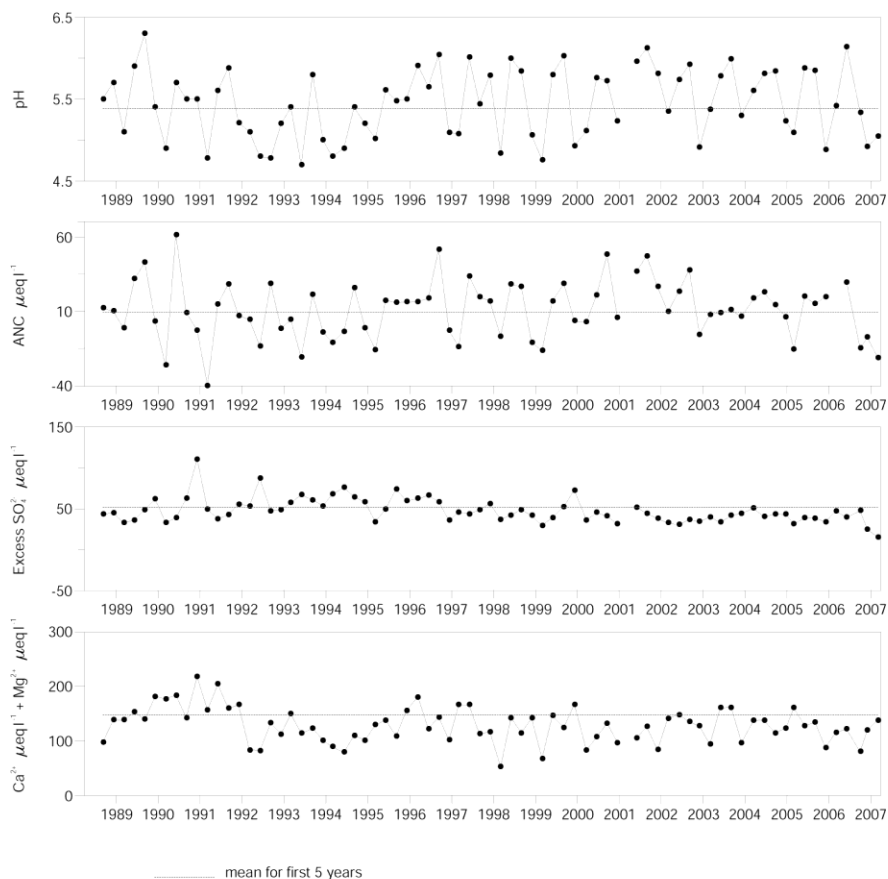
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Appendix 1. Llyn Cwm Mynach Summary Data to March 2007

Spot sampled chemistry data



Determinand statistics

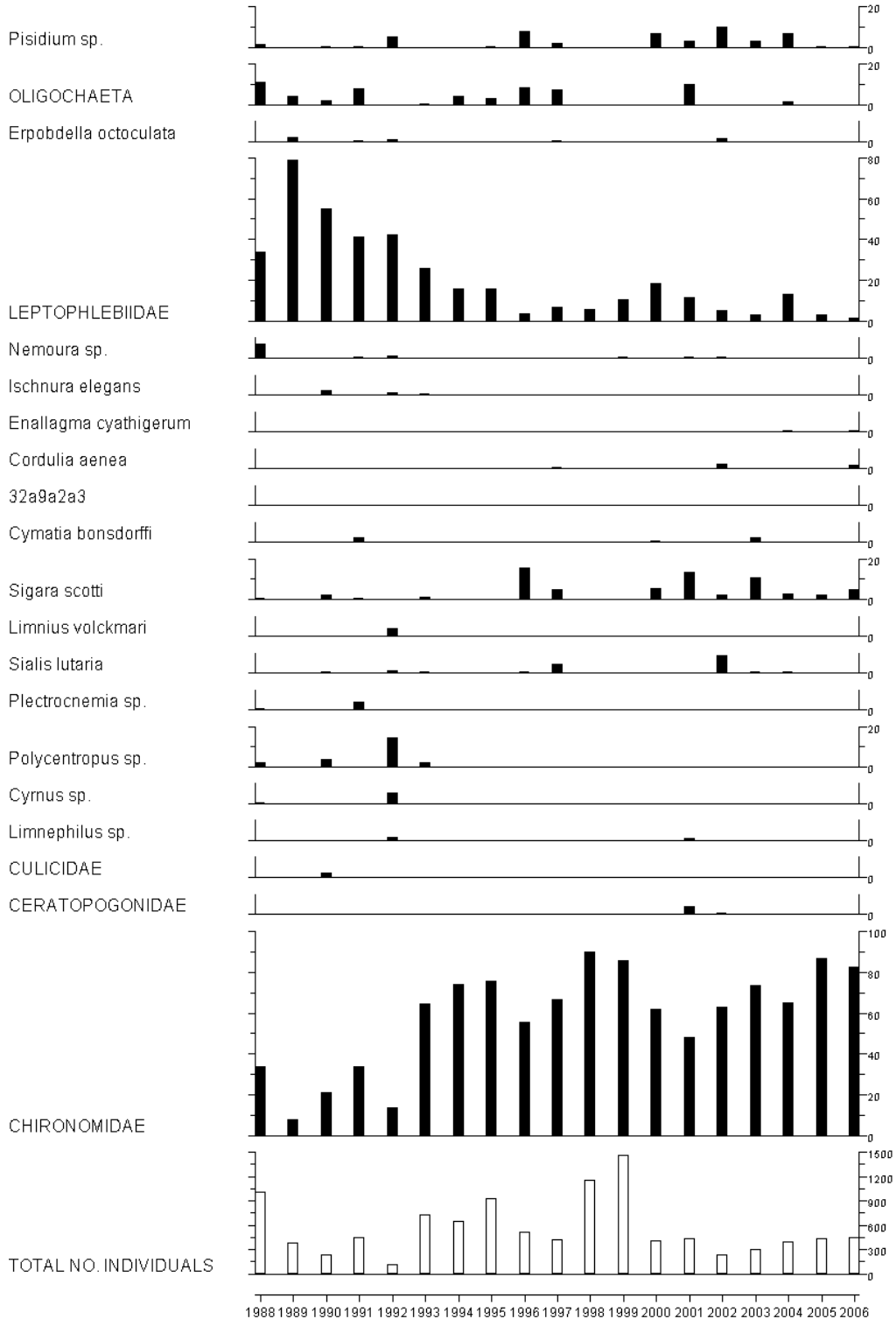
	mean 4/1988-3/1993	mean 4/2006-3/2007	std.dev. 4/2006-3/2007	SK* 4/1988-3/2007	p* 4/1988-3/2007
pH	5.38	5.36	0.55	0.01	0.35
ANC	9.18	-3.45	22.63	0.23	0.50
Ca	79.13	55.75	9.29	-0.02	0.11
Mg	68.86	59.17	16.46	-0.01	0.35
Na	294.5	238.0	65.78	-0.05	0.18
K	3.41	4.55	2.24	0.00	0.00
Sol.AI	3.94	4.49	1.86	1.42	0.12

	mean 4/1988-3/1993	mean 4/2006-3/2007	std.dev. 4/2006-3/2007	SK* 4/1988-3/2007	p* 4/1988-3/2007
Sol.lab.AI	2.42	2.98	1.77	0.01	0.98
Cl	342.6	304.2	110.0	-0.06	0.43
SO_4^{2-}	88.16	63.80	5.98	-0.07	0.00
XSO_4	52.17	31.85	14.53	-0.05	0.01
NO_3^-	9.59	14.89	11.47	0.00	0.03
Si	56.77	11.07	9.57	-0.02	0.00
DOC	208.8	207.9	54.38	0.03	0.12

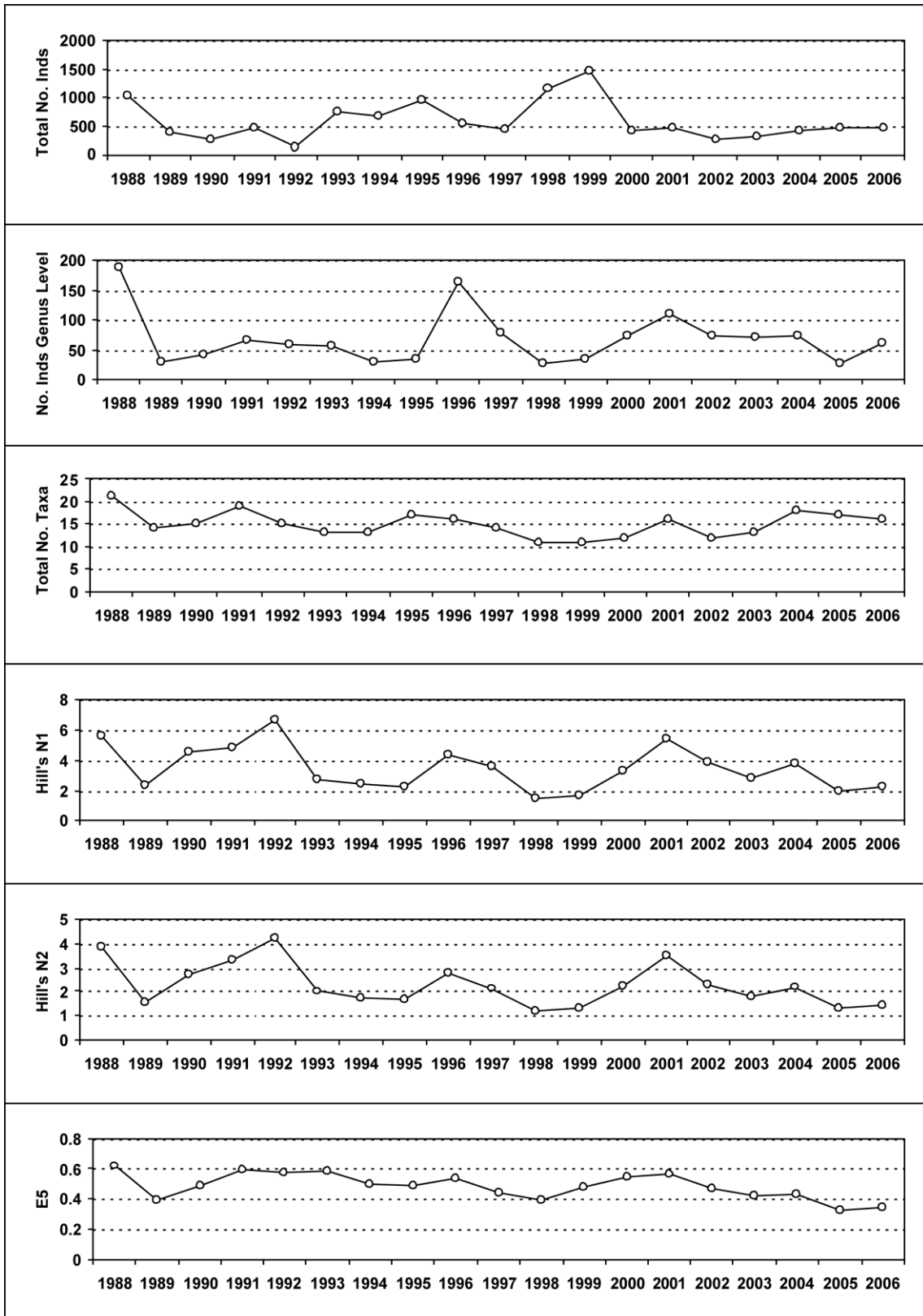
* Seasonal Kendall trend analysis: slope estimate (SK) and significance level (p)
Most units $\mu\text{eq l}^{-1}$, except Sol.AI, Sol.lab.AI and DOC $\mu\text{mol l}^{-1}$

Macroinvertebrate data

Percentage abundance summary, Llyn Cwm Mynach

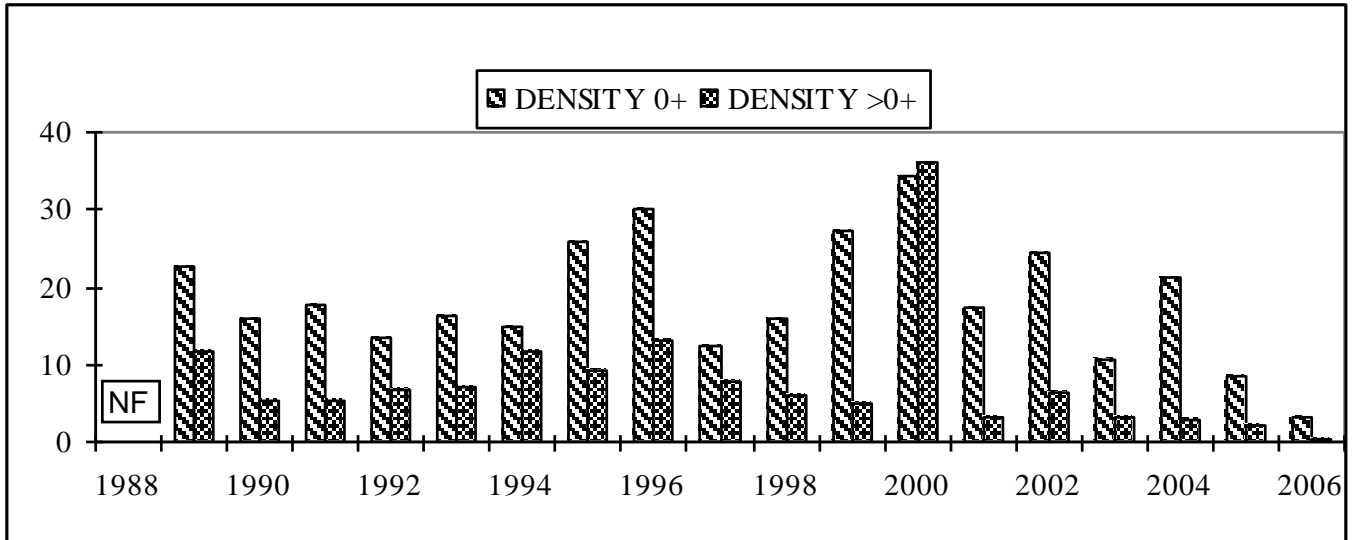


Macroinvertebrate summary statistics, Llyn Cwm Mynach



Fish data (for outflow stream)

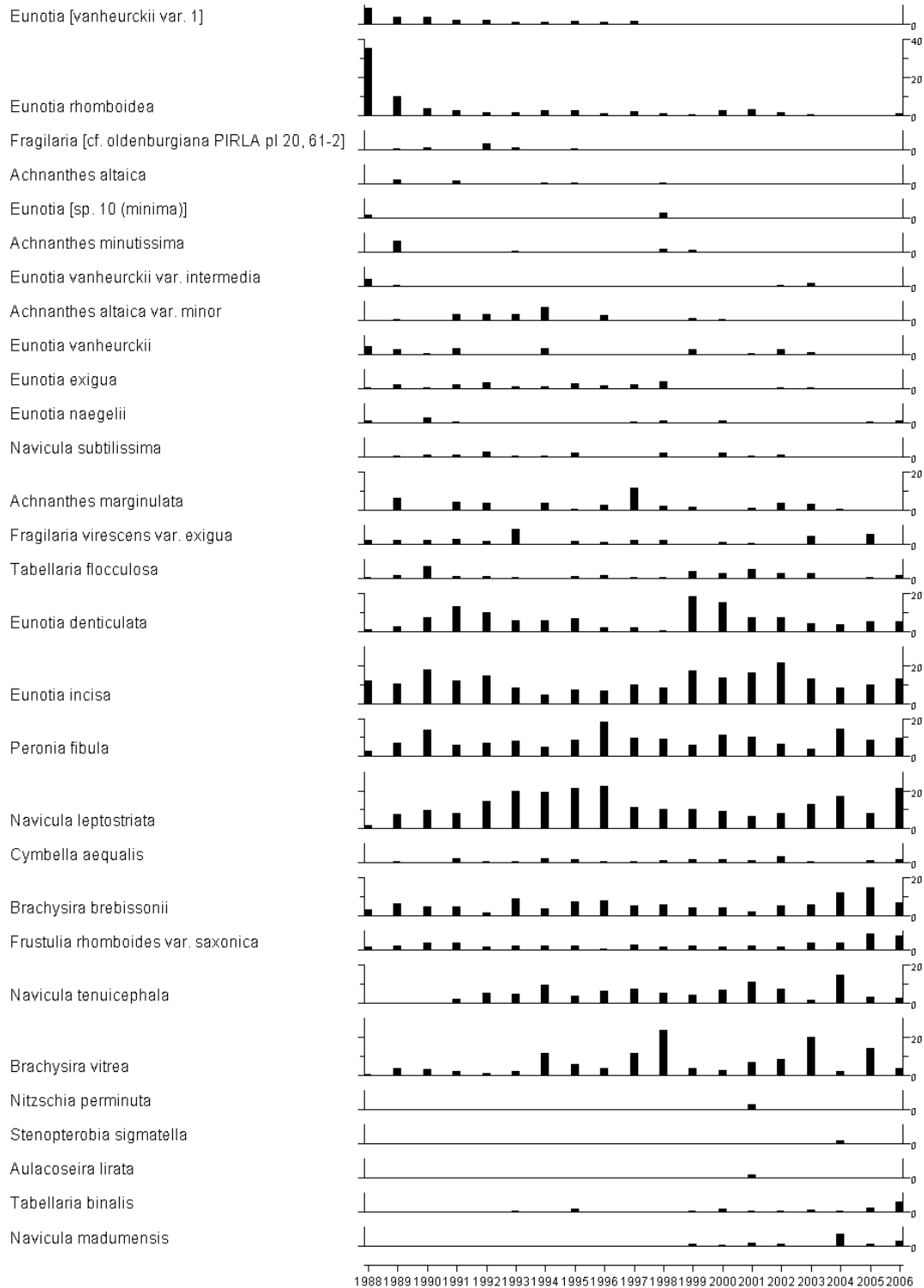
Summary of mean Trout density (numbers 100m⁻²), Llyn Cwm Mynach



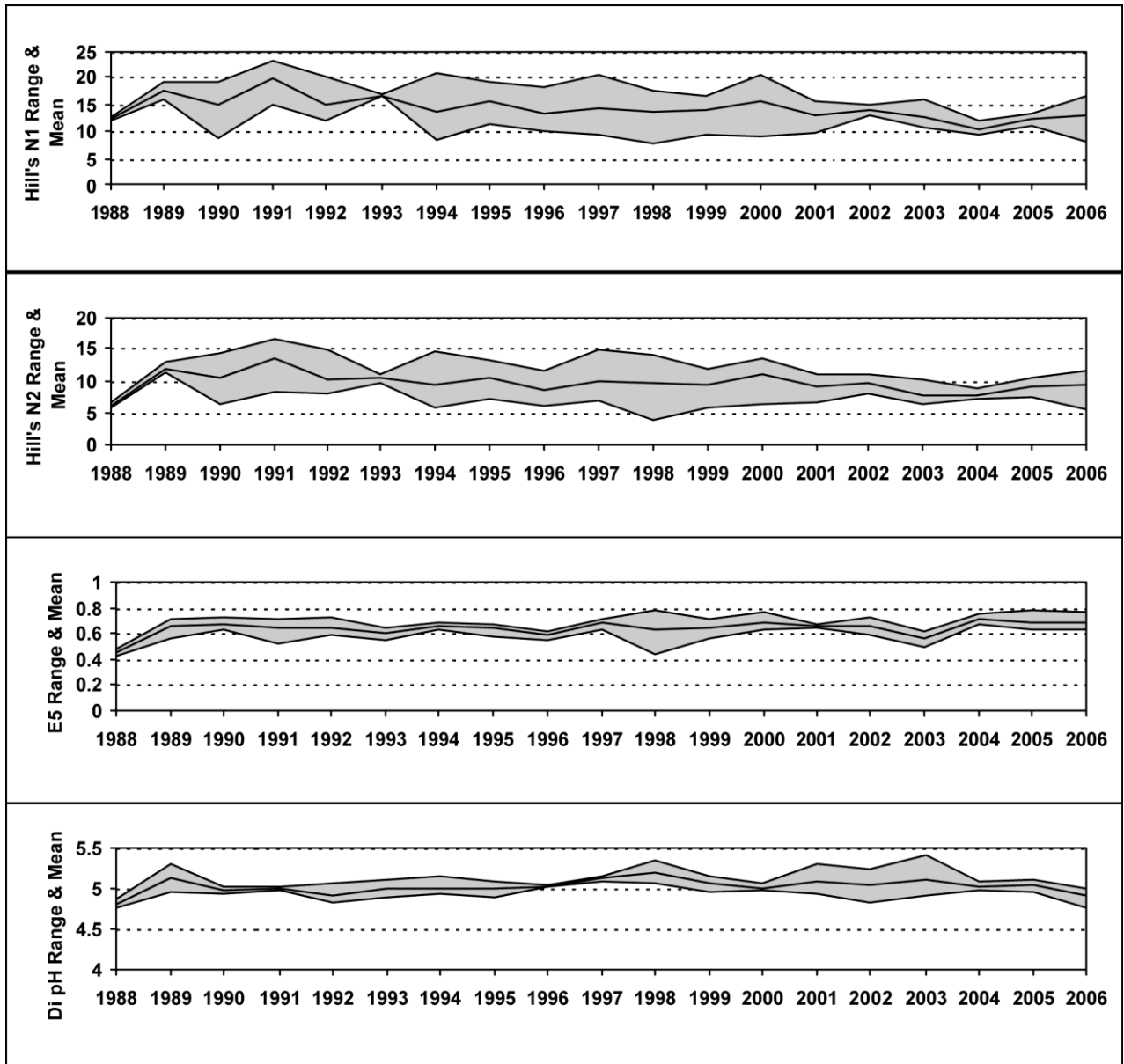
NF = Not fished

Epilithic diatom data

Percentage abundance summary, Llyn Cwm Mynach

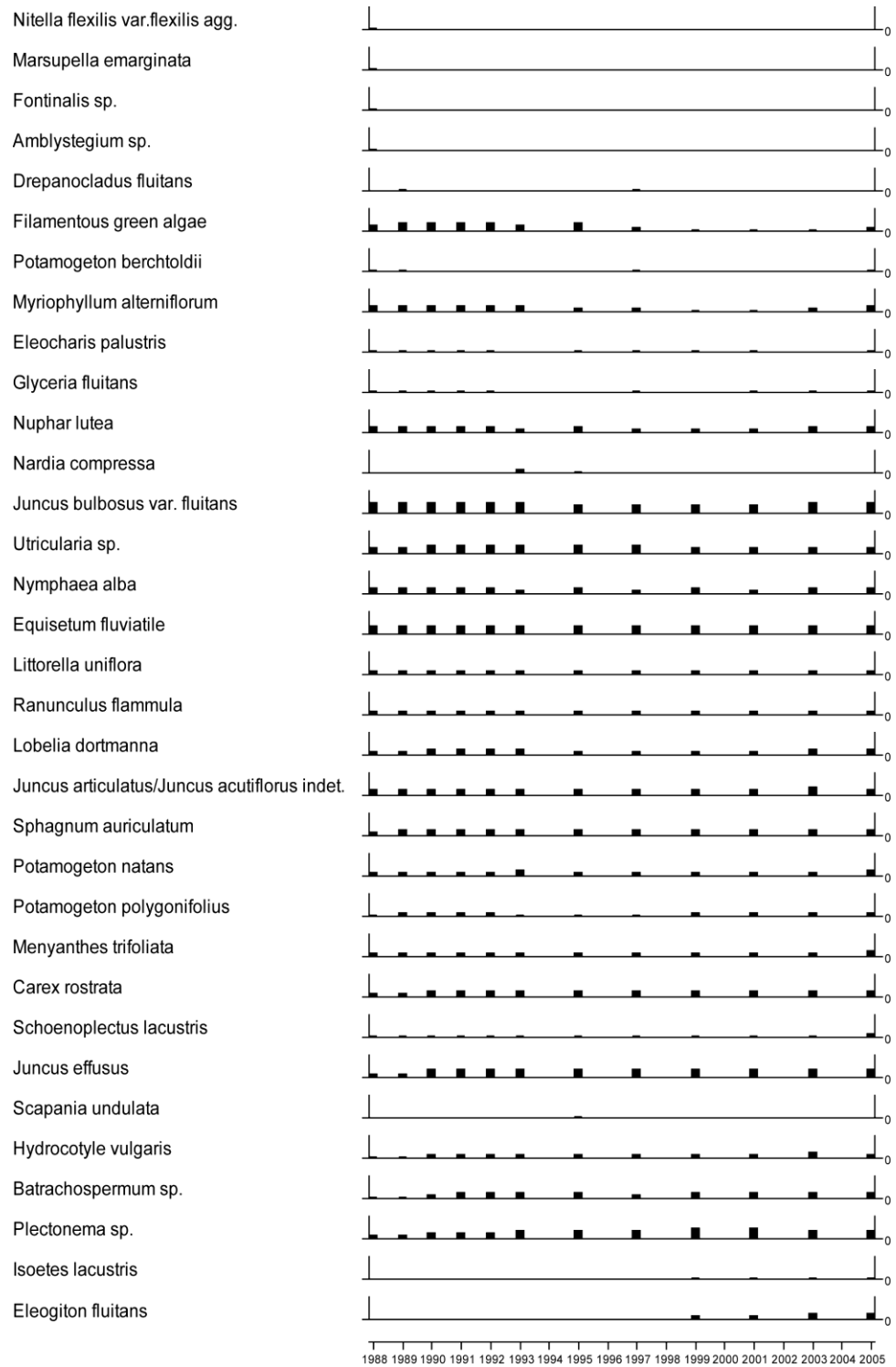


Diatom summary statistics, Llyn Cwm Mynach



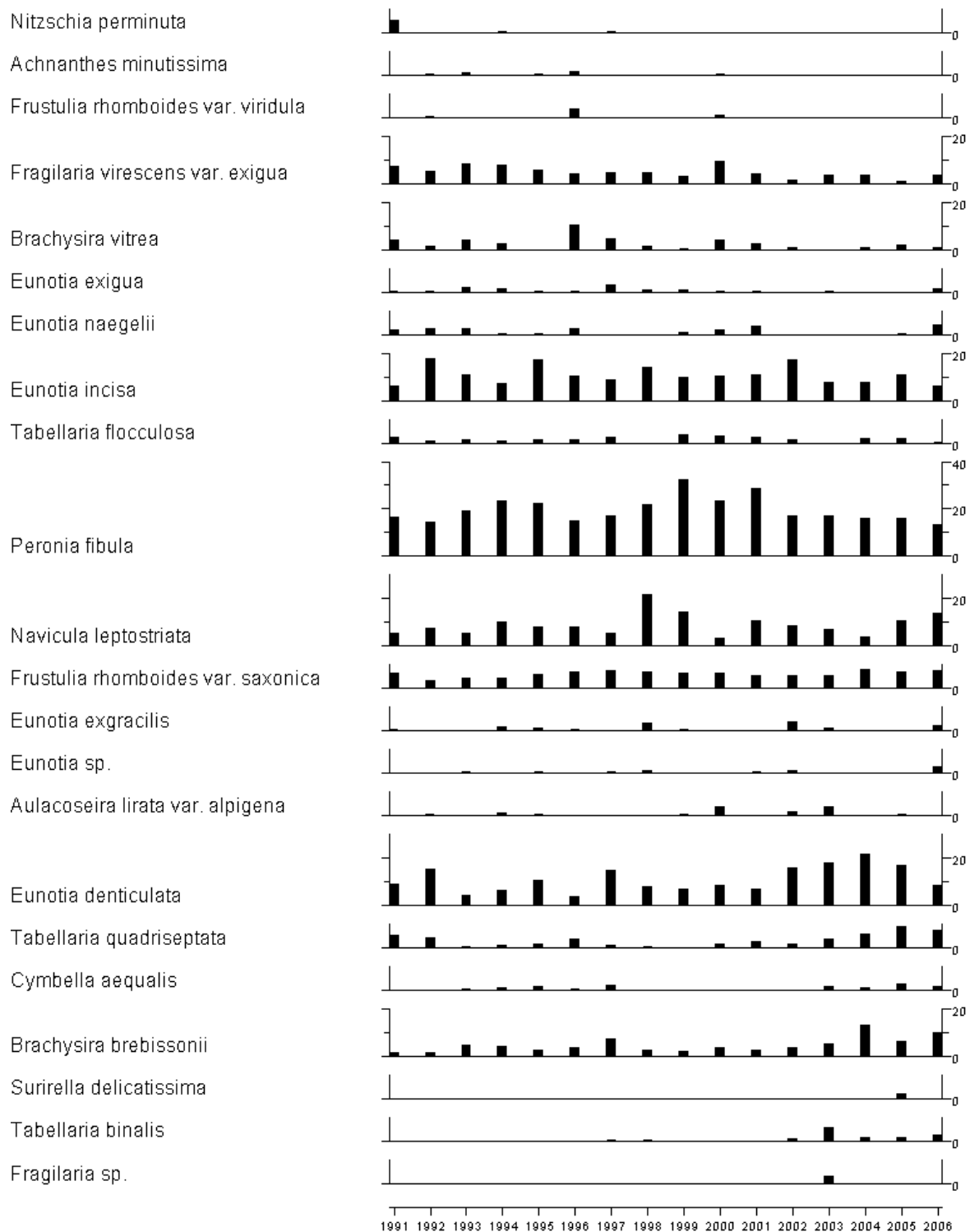
Aquatic macrophyte data, Llyn Cwm Mynach

Species Scores (1-5)



Sediment trap data, Llyn Cwm Mynach

Relative percentage frequency of diatom taxa



Thermistor data, Llyn Cwm Mynach

