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**UK Acid Waters Monitoring Network (UKAWMN)
Llyn Cwm Mynach, Afon Hafren and Afon Gwy
Annual Summary Progress Report. April 11 - March 12**

E. M. Shilland, L. Irvine & I. A. Malcolm

March 2012

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

LLYN CWM MYNACH, AFON HAFREN AND AFON GWY

ANNUAL SUMMARY PROGRESS REPORT April 2011 - March 2012

**REPORT TO THE WELSH GOVERNMENT,
COUNTRYSIDE COUNCIL FOR WALES AND ENVIRONMENT
AGENCY, WALES**

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March 2012

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Cover photo: Llyn Cwm Mynach, July 2011. All photographs © Ewan Shilland

3 Llyn Cwm Mynach



Figure 1 Llyn Cwm Mynach. Looking southwest from the north east end of the lake, 19th July 2011.

3.1 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 2011 to March 2012. A legal arrangement formalising AWMN sampling was arranged with the new owners, the Woodland Trust.

3.2 Water Chemistry

Samples were collected by CEH in early June, September and December 2011, delivered to the analytical laboratories on schedule and have been analysed, quality controlled and archived in the UKAWMN central chemistry database at CEH Lancaster. March 2012 samples have been collected and are in the process of being analysed.

3.3 Sediment Traps

Sediment traps were recovered and replaced on the 19th of July 2011 by a team from ENSIS. Diatoms in the sediment retrieved from the traps are currently being analysed.

3.4 Thermistors

Lake top and bottom thermistors were removed and replaced on the 19th of July 2011 by a team from ENSIS. Both had functioned well during the previous year and the data were added to the ENSIS thermistor water temperature database.

3.5 Epilithic Diatoms

Epilithic diatoms were retrieved by a team from ENSIS from three sampling points around the lake on the 19th of July 2011. The samples have been made into slides and are currently in the process of being analysed.

3.6 Macroinvertebrates

Aquatic macroinvertebrates were sampled on the 20th April 2011 by a team from QMuL. Five 1 minute kick samples were performed. The samples were counted and the data sent to ENSIS Ltd. The data is in the process of being quality screened before being added to the UKAWMN biological database at ENSIS.

3.7 Fish

Fish surveying was performed on the 18th August 2011 by the Game and Wildlife Conservation Trust. The data have been forwarded to ENSIS Ltd. After quality screening the data will be added to the UKAWMN biological database at ENSIS.

3.8 Aquatic Macrophytes

Aquatic macrophytes were not surveyed at Llyn Cwm Mynach in 2011.

3.9 Data Management and Reporting

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

Work on the 2010-2011 annual report is underway and it should be uploaded to the UKAWMN web page in April 2012. The section on Llyn Cwm Mynach appears in section 3.12 below.

The UKAWMN website page detailing Llyn Cwm Mynach is here:

http://awmn.defra.gov.uk/sites/site_16.php

Further publications from the contract period utilizing UKAWMN data from Llyn Cwm Mynach are detailed in section 3.10 below. Section 3.11 provides a bibliography for the site.

3.10 Llyn Cwm Mynach Recent UKAWMN Output

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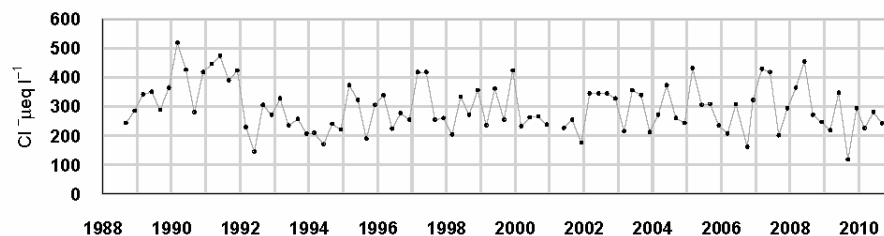
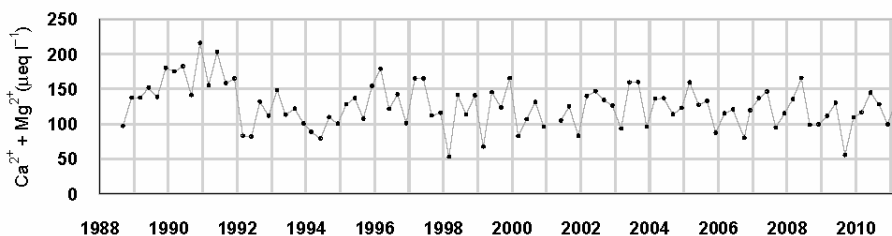
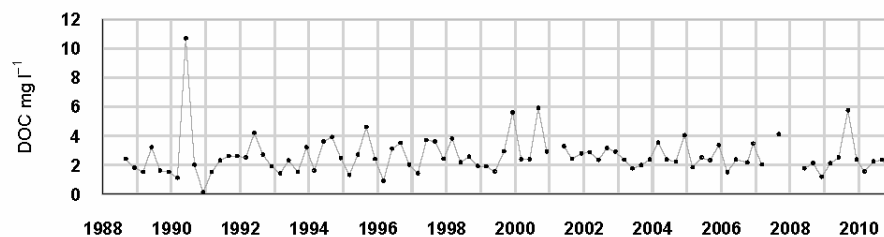
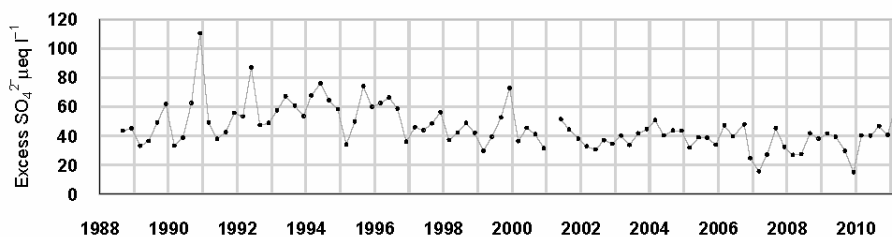
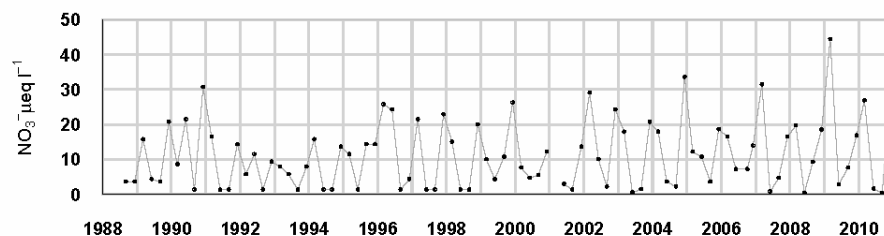
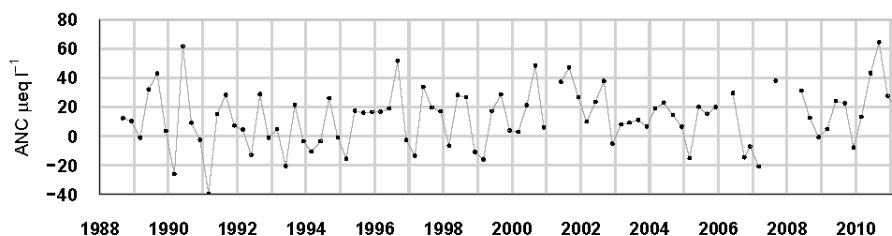
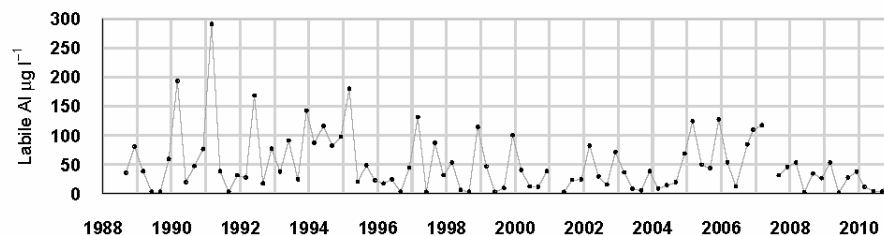
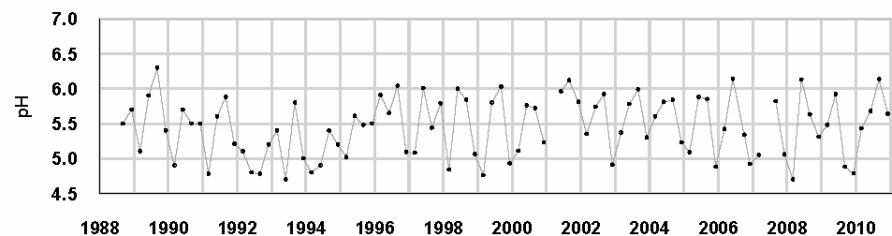
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3.12 Llyn Cwm Mynach Summary Data to March 2011

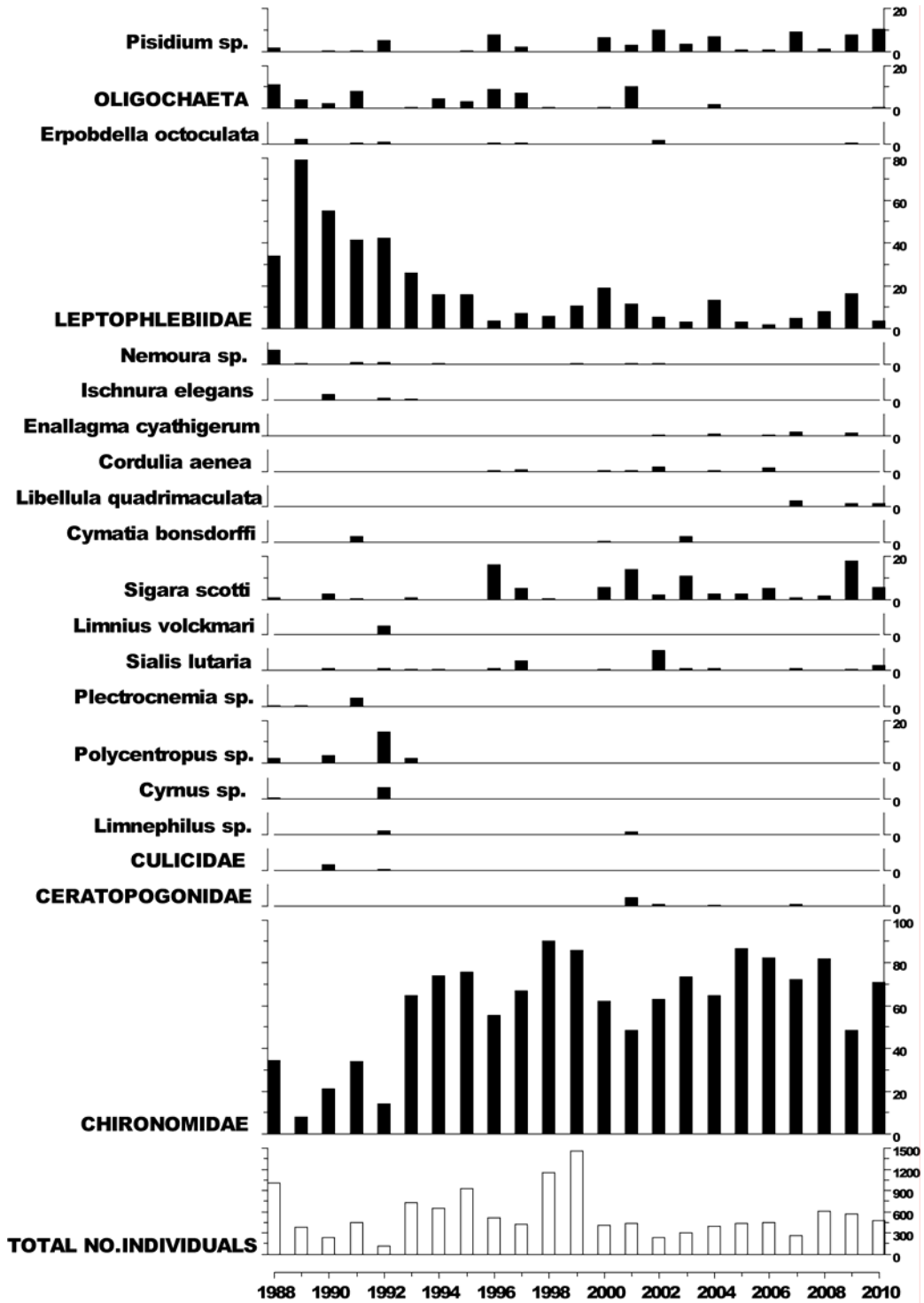
3.12.1 Spot sampled chemistry data



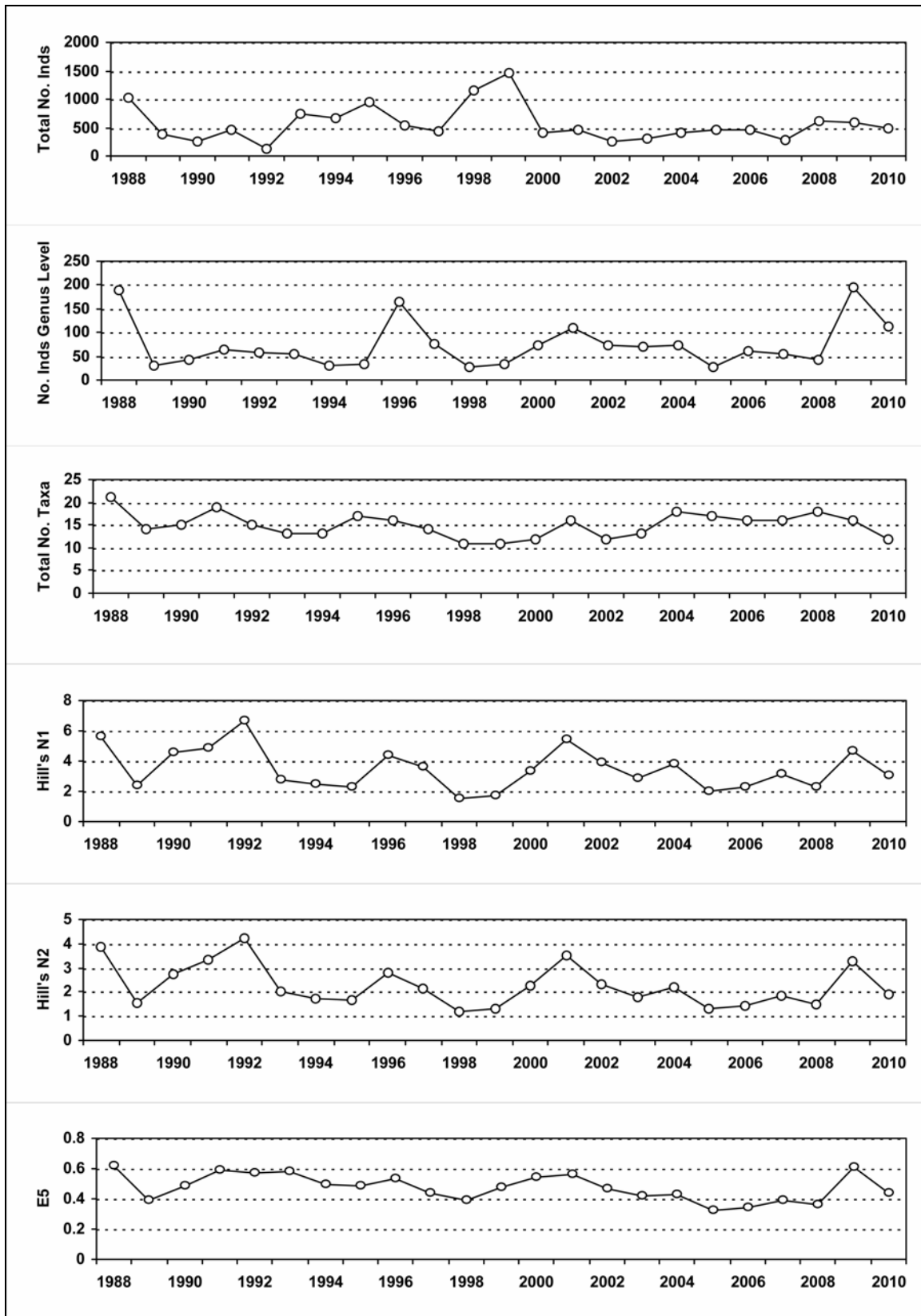
$\mu\text{eq l}^{-1}$, * $\mu\text{g l}^{-1}$, ** mg l^{-1}	pH	ANC	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	*Soluble Al	*Labile Al	Cl ⁻	*SO ₄ ²⁻	xSO ₄ ²⁻	NO ₃ ⁻	**DOC
Mean 1 st 5 yrs	5.35	7.68	77.79	67.45	291.02	3.36	110.75	66.58	337.67	88.32	52.91	9.40	2.50
10-11 mean	5.77	38.43	66.04	60.91	224.03	3.85	28.50	11.00	266.73	75.30	47.33	12.12	1.94
10-11 std dev	0.24	20.00	16.16	5.96	58.74	1.10	14.39	11.63	21.19	11.60	10.42	13.39	0.41

3.12.2 Macroinvertebrate data

3.12.2.1 Percentage abundance summary, Llyn Cwm Mynach

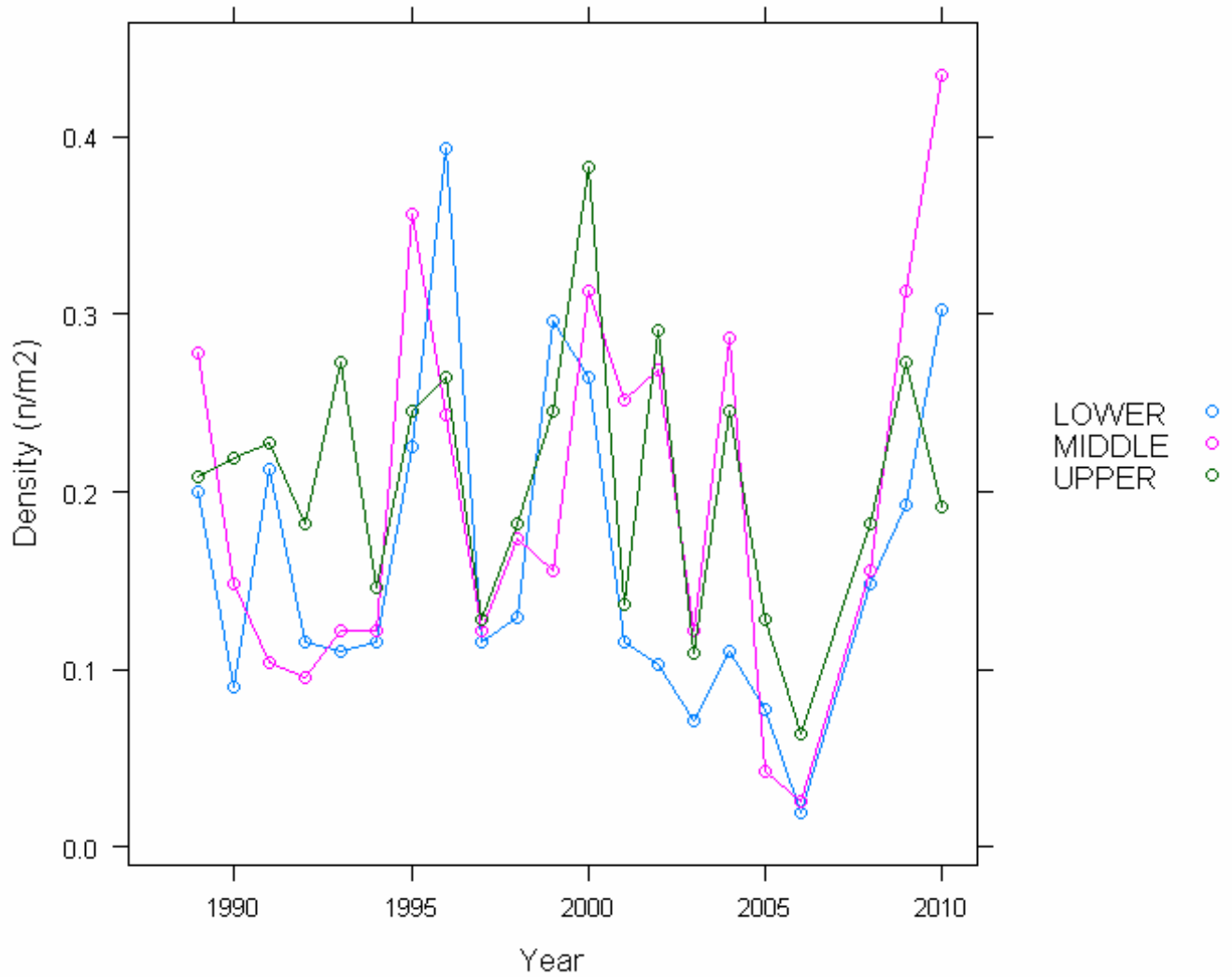


3.12.2.1 Macroinvertebrate summary statistics, Llyn Cwm Mynach



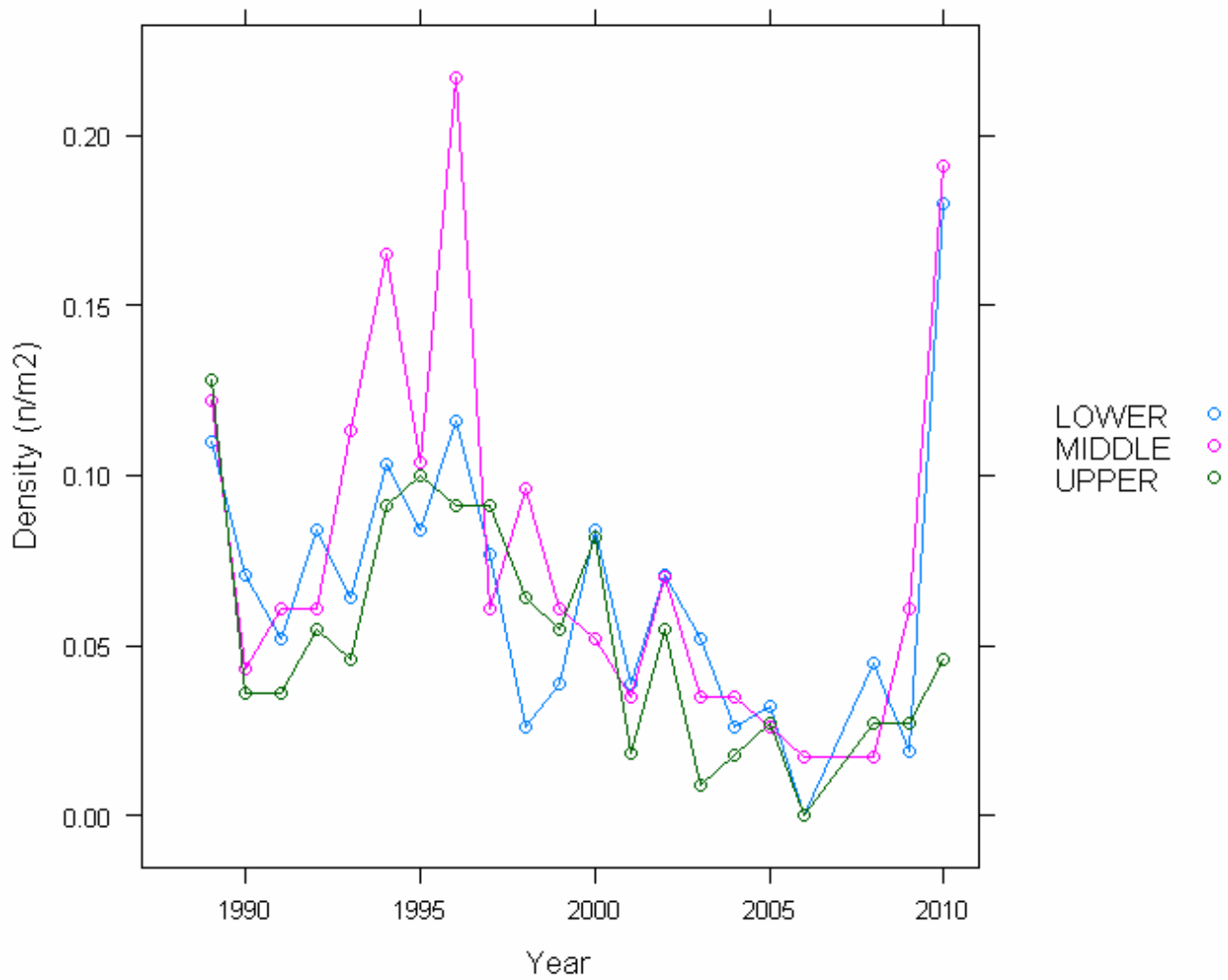
3.12.3 Fish data (for outflow stream)

3.12.3.1 Summary of Trout fry density (numbers m^{-2}), Llyn Cwm Mynach



Blue series = Reach 1
Pink series = Reach 2
Green series = Reach 3

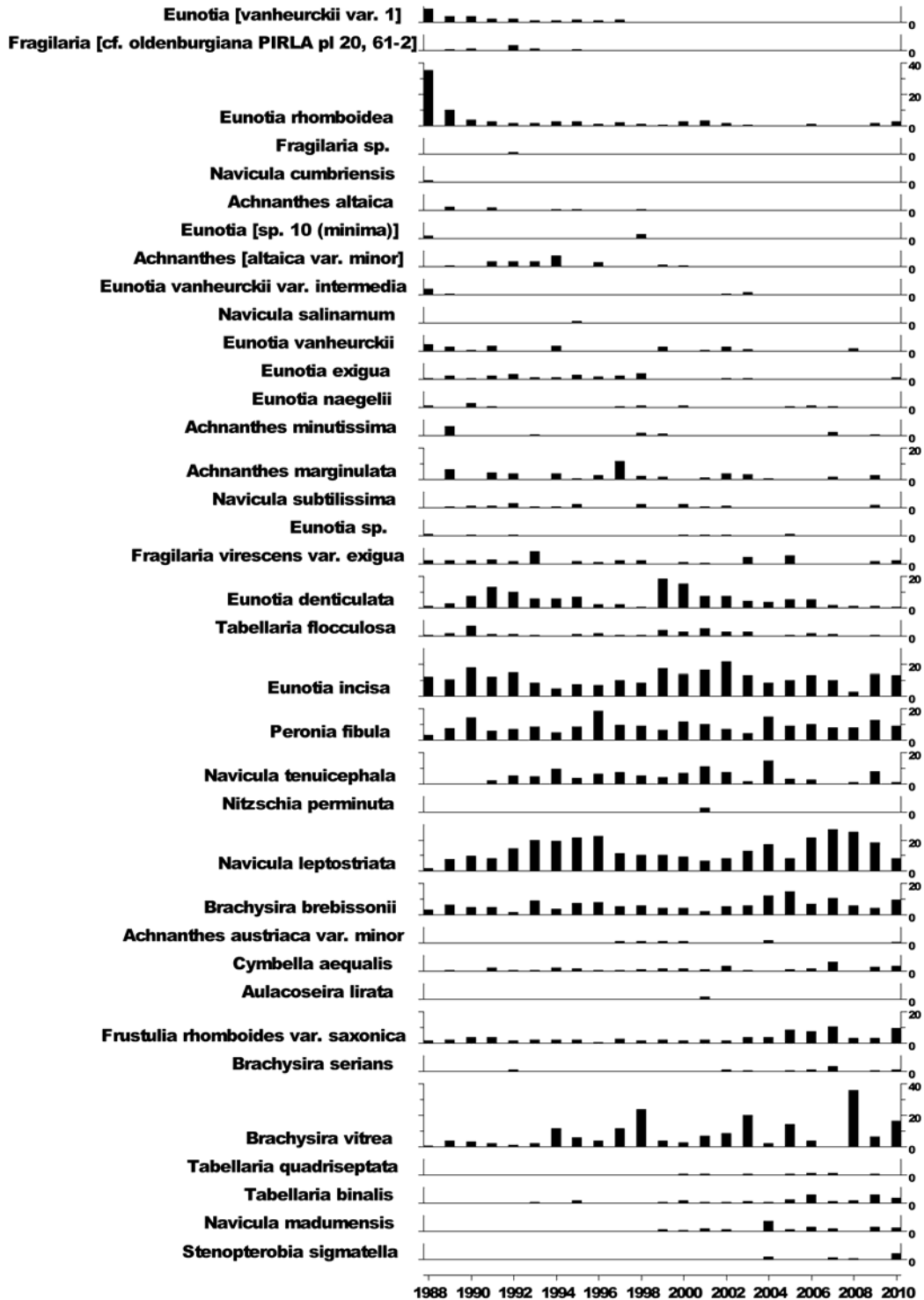
3.12.3.2 Summary of Trout parr density (numbers m⁻²), Llyn Cwm Mynach



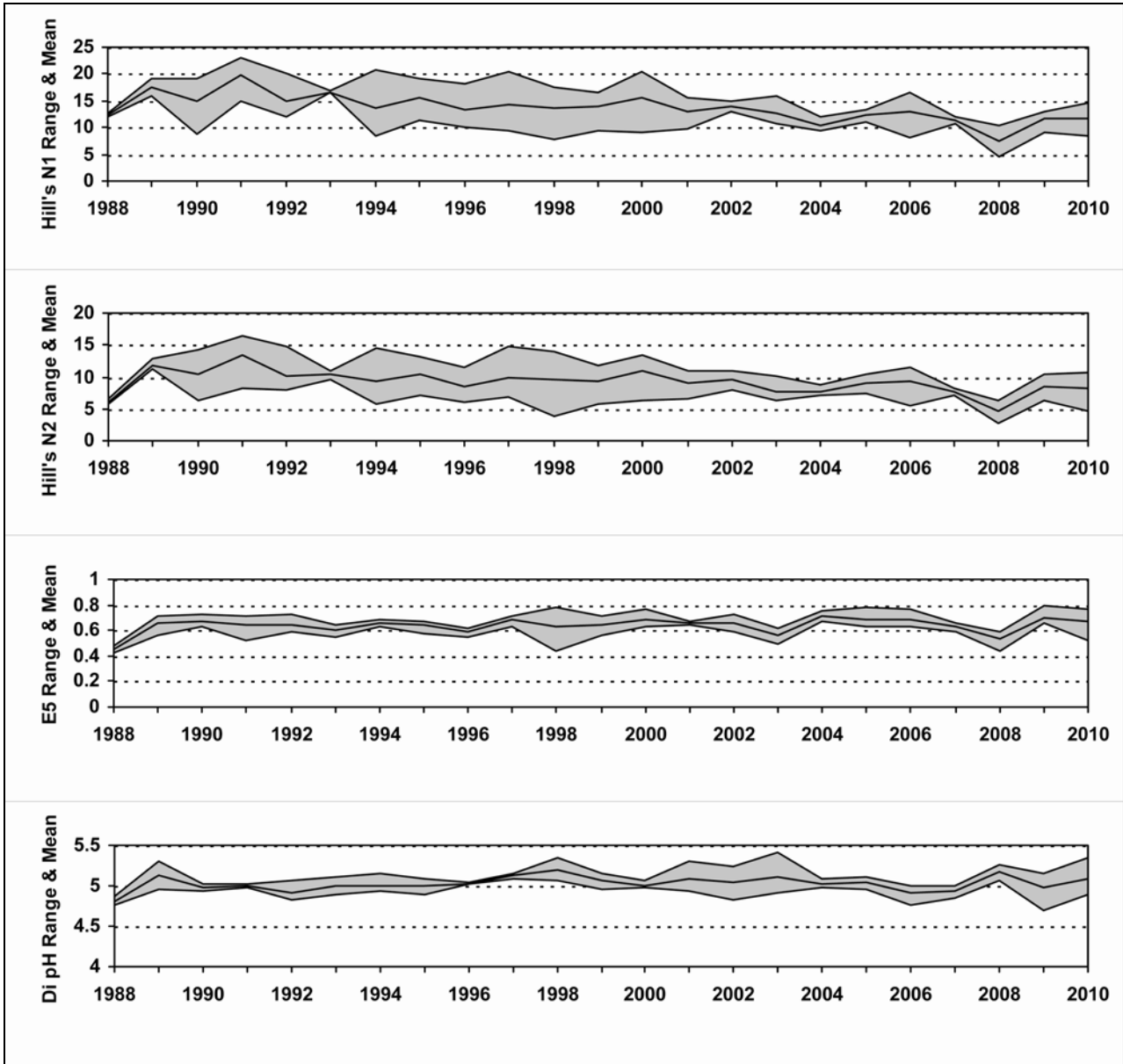
Blue series = Reach 1
Pink series = Reach 2
Green series = Reach 3

3.12.4 Epilithic diatom data

3.12.4.1 Percentage abundance summary, Llyn Cwm Mynach

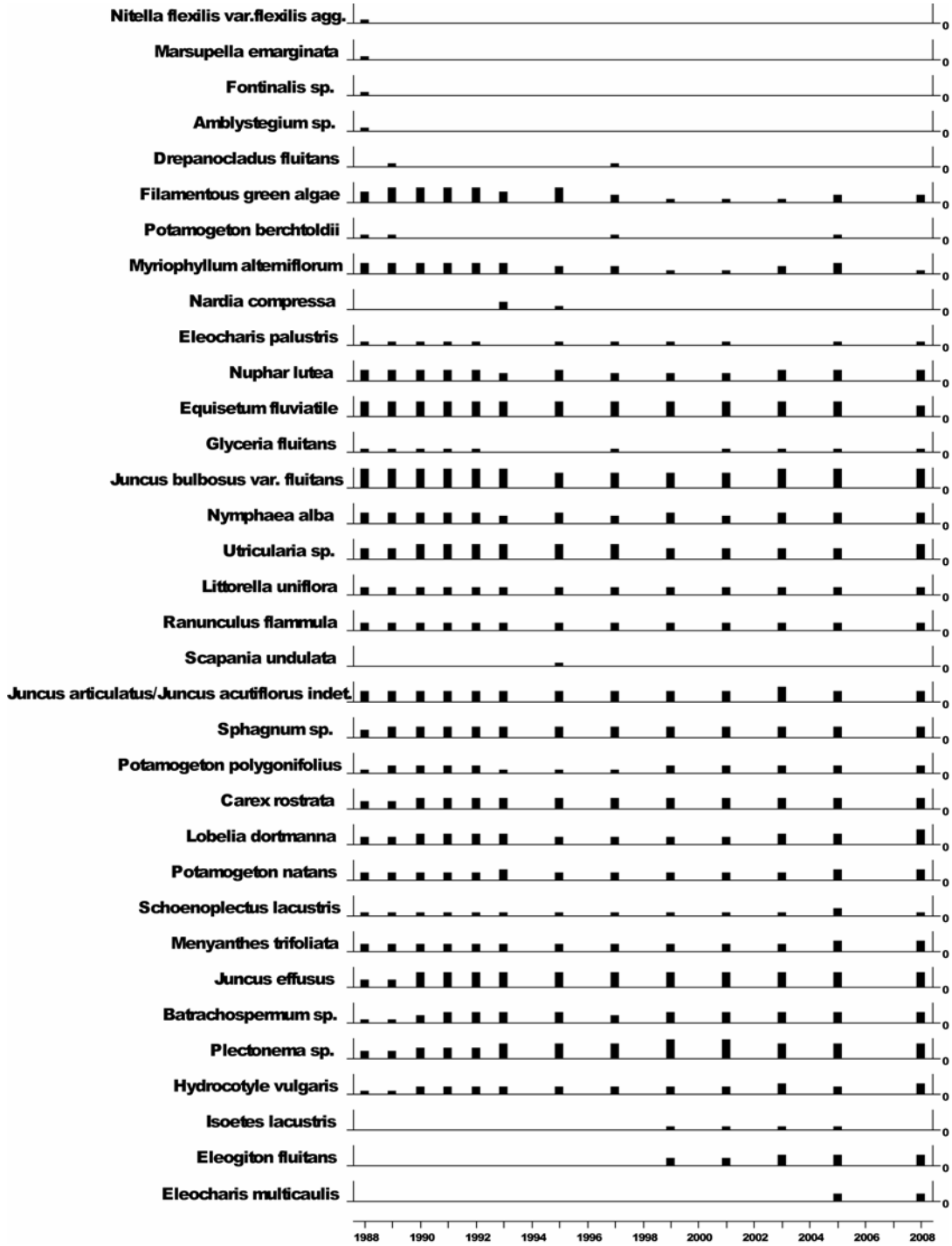


3.12.4.1 Diatom summary statistics, Llyn Cwm Mynach



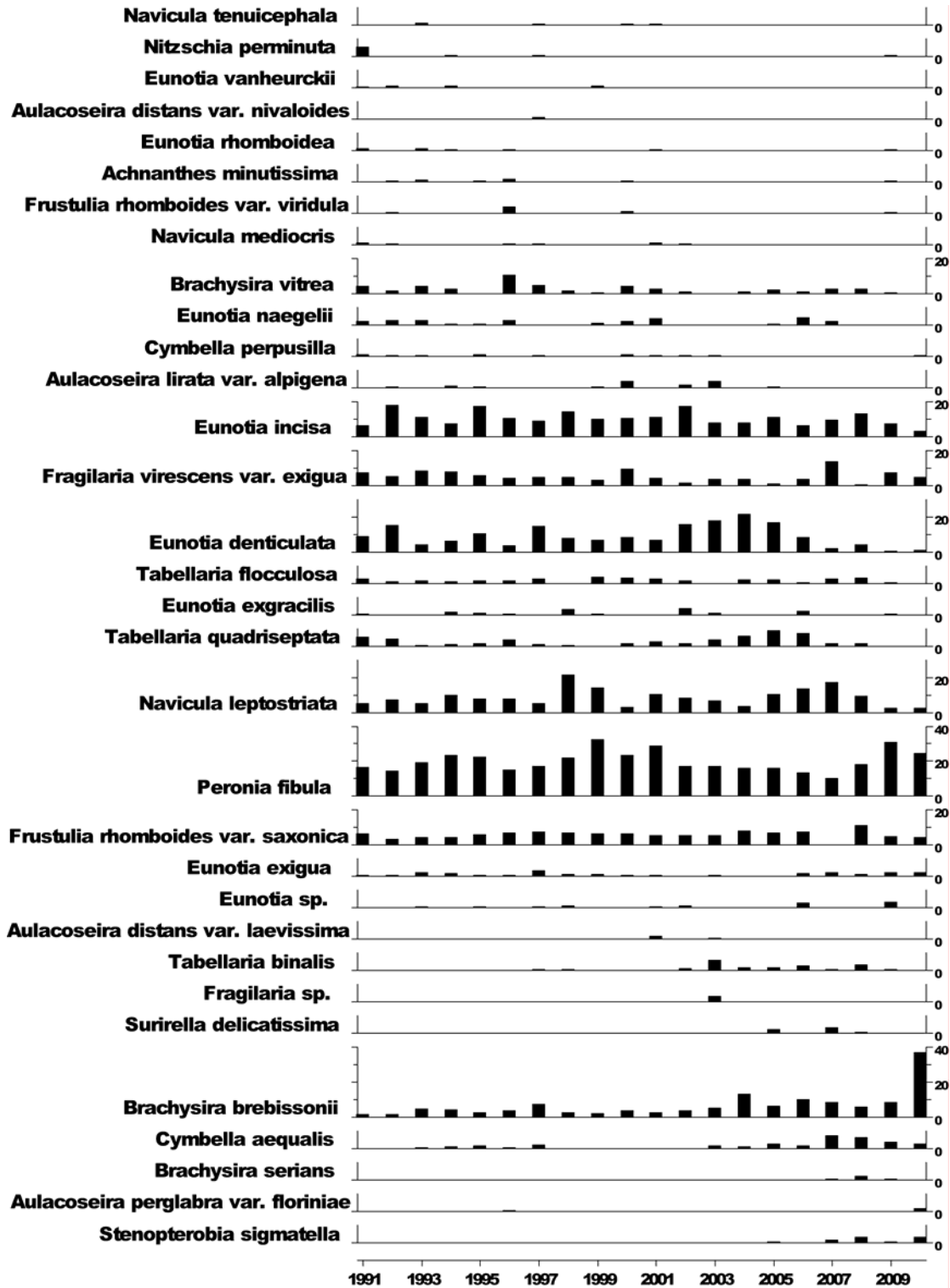
3.12.5 Aquatic macrophyte data, Llyn Cwm Mynach

Species Scores (1-5)

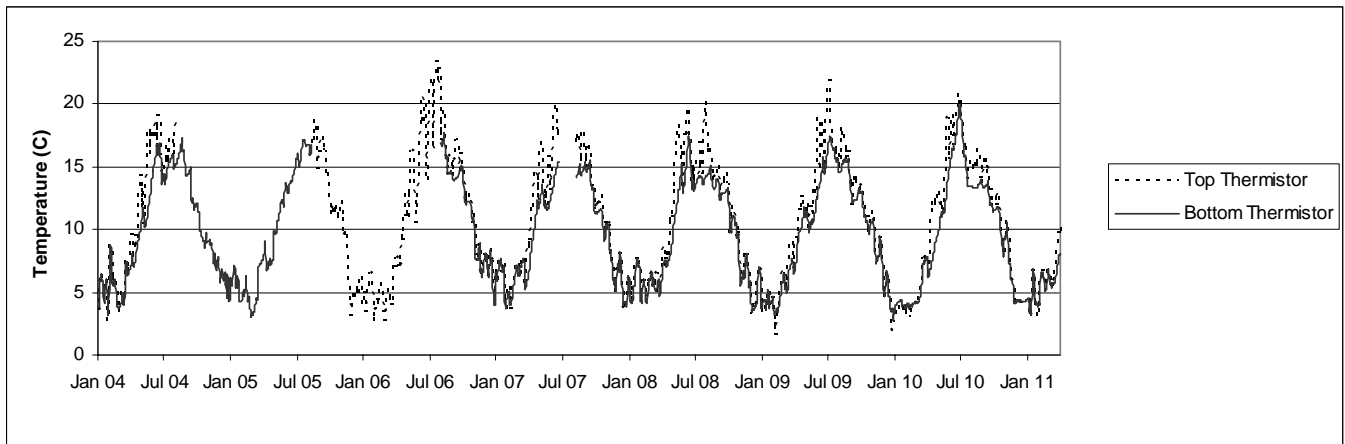


3.12.6 Sediment trap data, Llyn Cwm Mynach

Relative percentage frequency of diatom taxa



3.12.7 Thermistor data, Llyn Cwm Mynach



4 Afon Hafren



Figure 2 Afon Hafren biological survey section 6th July 2011

4.1 Summary Overview

Chemical and biological sample collection, analysis and data collation, quality control and archiving proceeded without any problems at Afon Hafren during the period from April 2011 to March 2012.

4.2 Water Chemistry

Samples were collected by CEH early every month throughout the period April 2011 to March 2012, delivered to the analytical laboratories on schedule and are in the process of being analysed, quality controlled and archived in the UKAWMN central chemistry database at CEH Lancaster.

4.3 Thermistors

The CEH thermistor at Afon Hafren functioned well throughout the period April 2011 to March 2012. Data up to early March 2012 have been downloaded, checked and archived in the central CEH temperature database.

4.4 Epilithic Diatoms

Epilithic diatoms were retrieved by a team from ENSIS from three sampling points in the stream on the 6th of July 2011. The samples have been made into slides and are currently in the process of being analysed.

4.5 Macroinvertebrates

Aquatic macroinvertebrates were sampled on the 20th April 2011 by a team from QMuL. Five 1 minute kick samples were performed. The samples were counted and the data sent to ENSIS Ltd. The data is in the process of being quality screened before being added to the UKAWMN biological database at ENSIS.

4.6 Fish

Fish surveying was performed on the 15th August 2011 by a team from the Game and Wildlife Conservation Trust. The data have been forwarded to ENSIS Ltd. After quality screening the data will be added to the UKAWMN biological database at ENSIS.

4.7 Aquatic Macrophytes

Aquatic macrophytes were surveyed by a team from ENSIS on 6th of July 2011. Percentage cover scores were recorded and data will be added to the ENSIS biological database after microscope confirmation of bryophyte identifications.

4.8 Data Management and Reporting

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

Work on the 2010-2011 annual report is underway and it should be uploaded to the AWMN web page in April 2012. The section on Afon Hafren appears in section 4.11 below.

The UKAWMN website page detailing Afon Hafren can be found here:
http://awmn.defra.gov.uk/sites/site_17.php

Further publications from the contract period utilizing UKAWMN data from Afon Hafren are detailed in section 4.9 below. Section 4.10 provides a bibliography for the site.

4.9 Afon Hafren Recent UKAWMN Output

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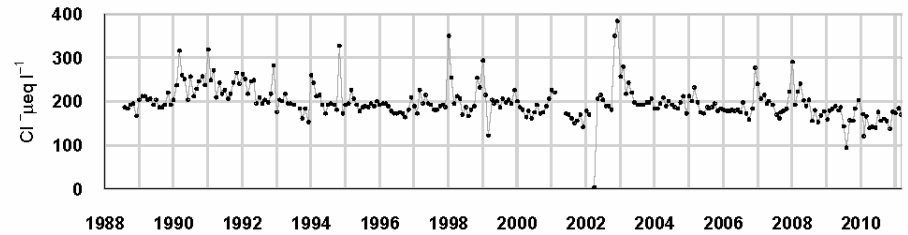
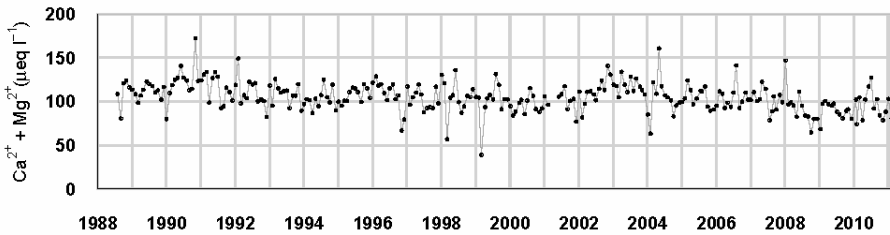
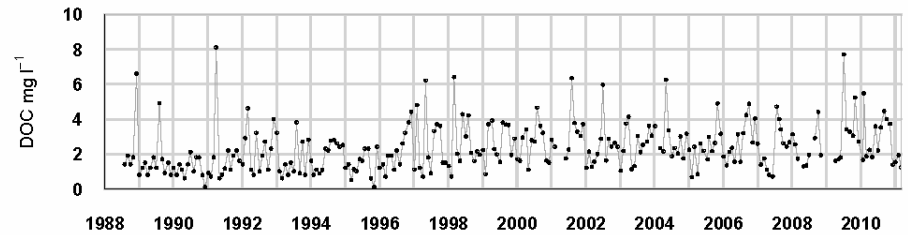
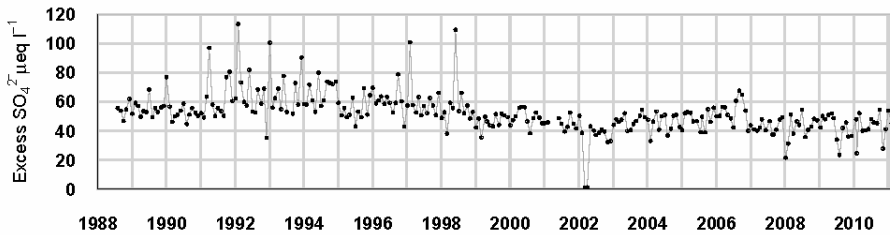
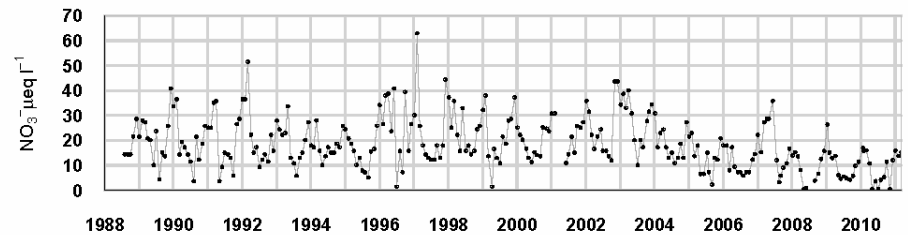
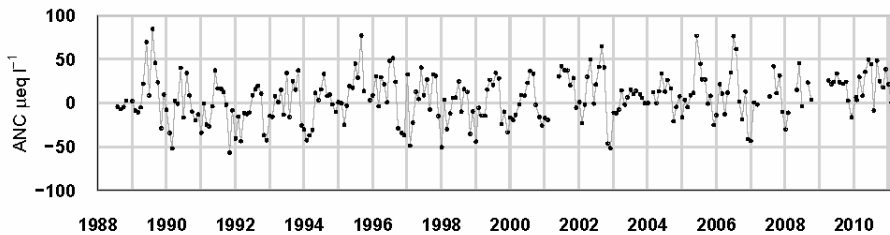
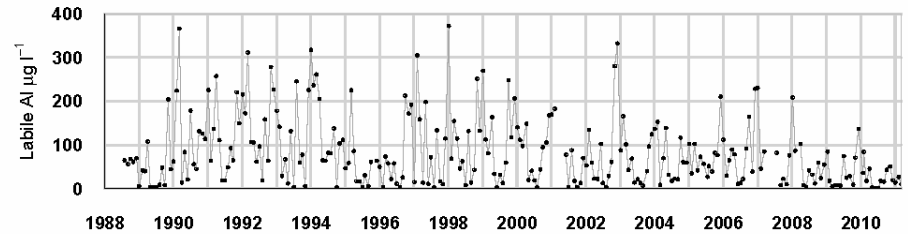
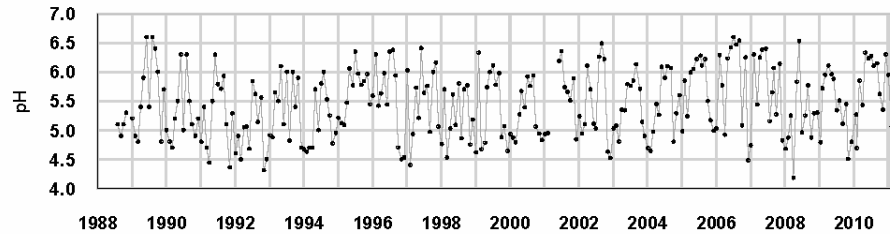
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4.11 Afon Hafren Summary Data to March 2011

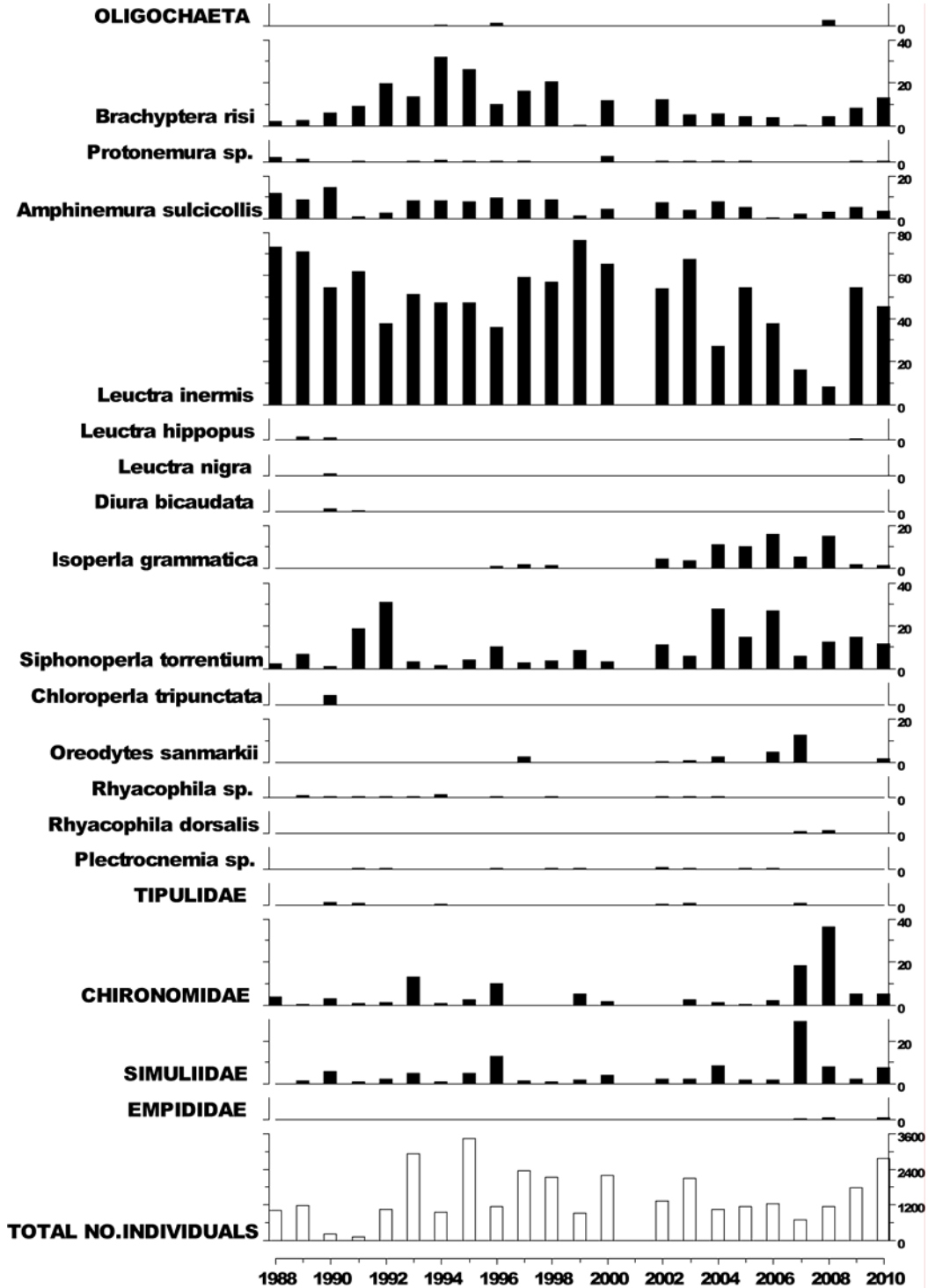
4.11.1 Spot sampled chemistry data



$\mu\text{eq l}^{-1}$, * $\mu\text{g l}^{-1}$, ** mg l^{-1}	pH	ANC	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	*Soluble Al	*Labile Al	Cl ⁻	*SO ₄ ²⁻	xSO ₄ ²⁻	NO ₃ ⁻	**DOC
Mean 1 st 5 yrs	5.29	-2.40	47.91	66.41	200.39	3.16	170.00	101.71	221.09	82.97	59.79	20.58	1.76
10-11 mean	5.92	25.46	38.36	57.12	173.96	3.72	58.33	19.83	158.61	60.82	44.18	7.70	2.63
10-11 std dev	0.44	18.87	9.30	6.65	31.04	2.28	35.12	17.42	16.81	8.33	7.20	5.99	1.14

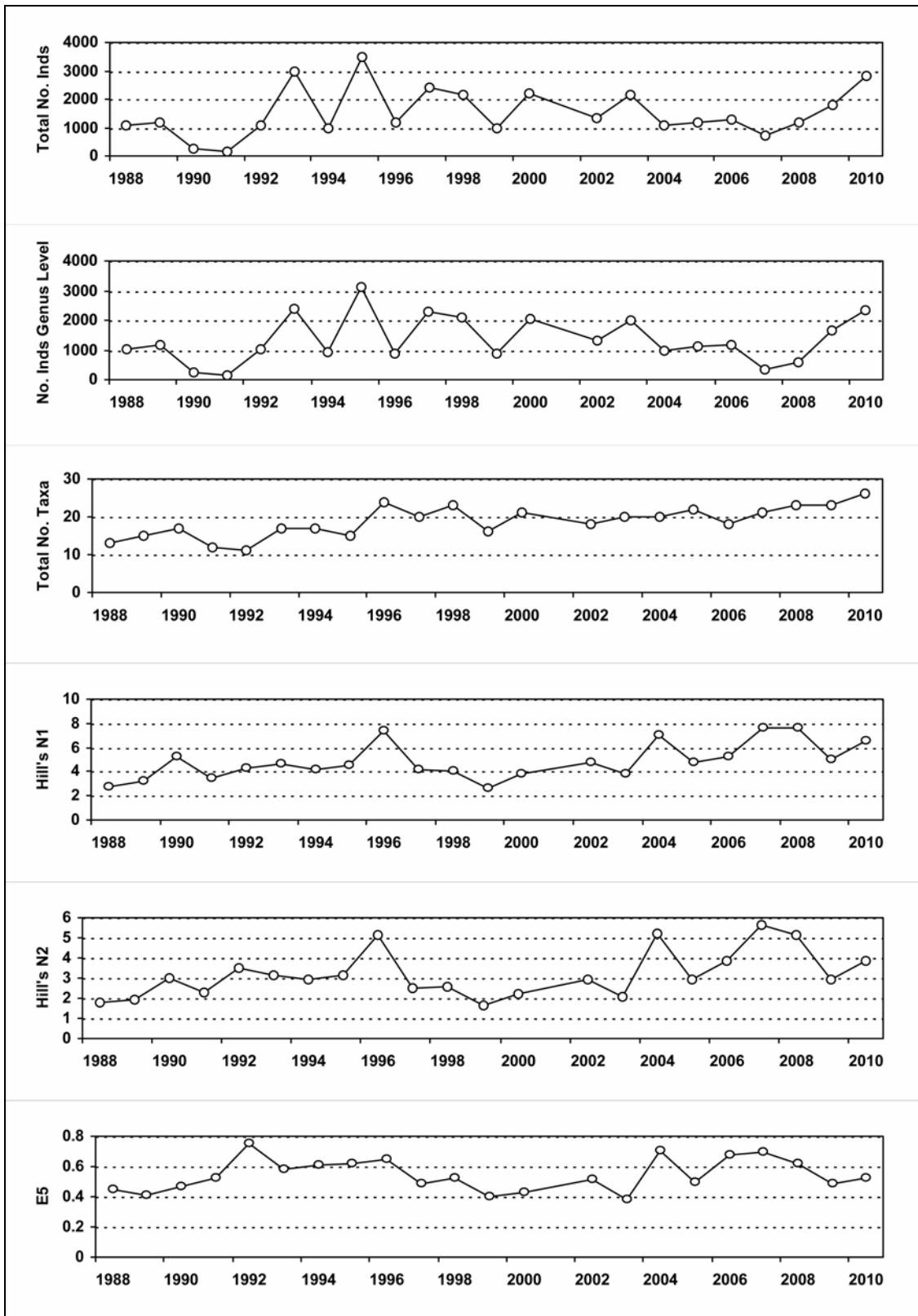
4.11.2 Macroinvertebrate data

4.11.2.1 Percentage abundance summary, Afon Hafren



No sampling in 2001 due to Foot and Mouth restrictions.

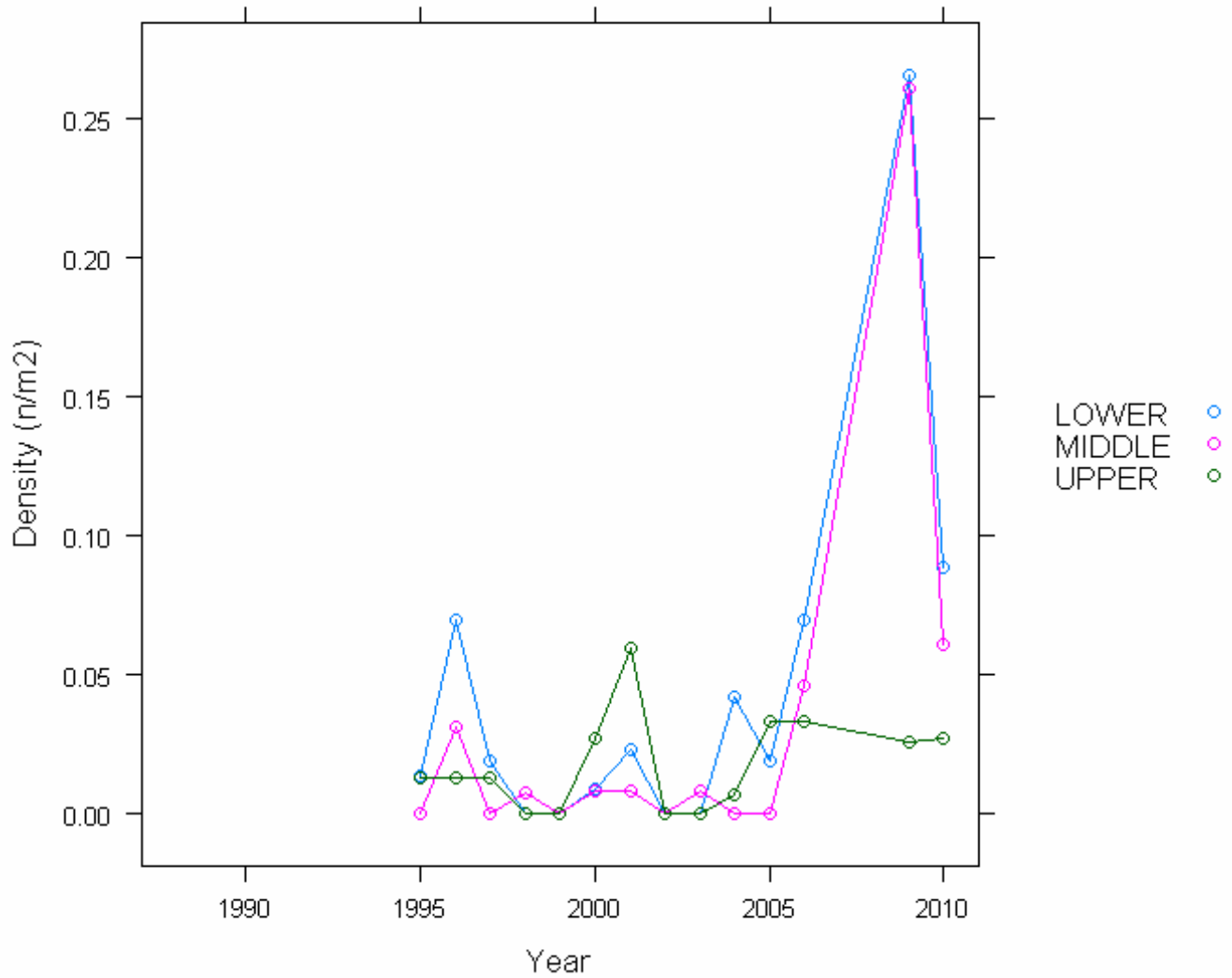
4.11.2.1 Macroinvertebrate summary statistics, Afon Hafren



No sampling in 2001 due to Foot and Mouth restrictions.

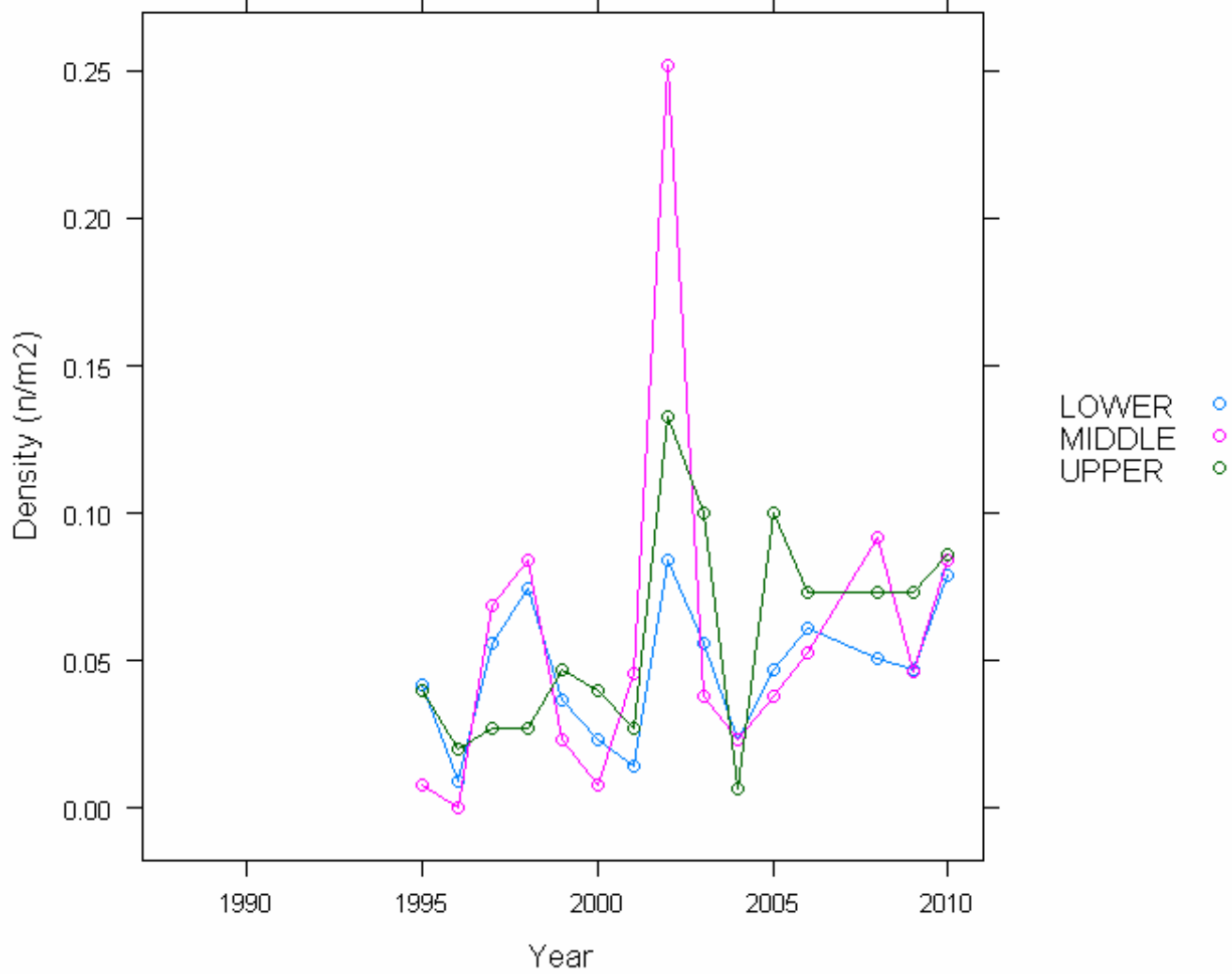
4.11.3 Fish data

4.11.3.1 Summary of Trout fry density (numbers m^{-2}), Afon Hafren



Blue series = Reach 1
Pink series = Reach 2
Green series = Reach 3

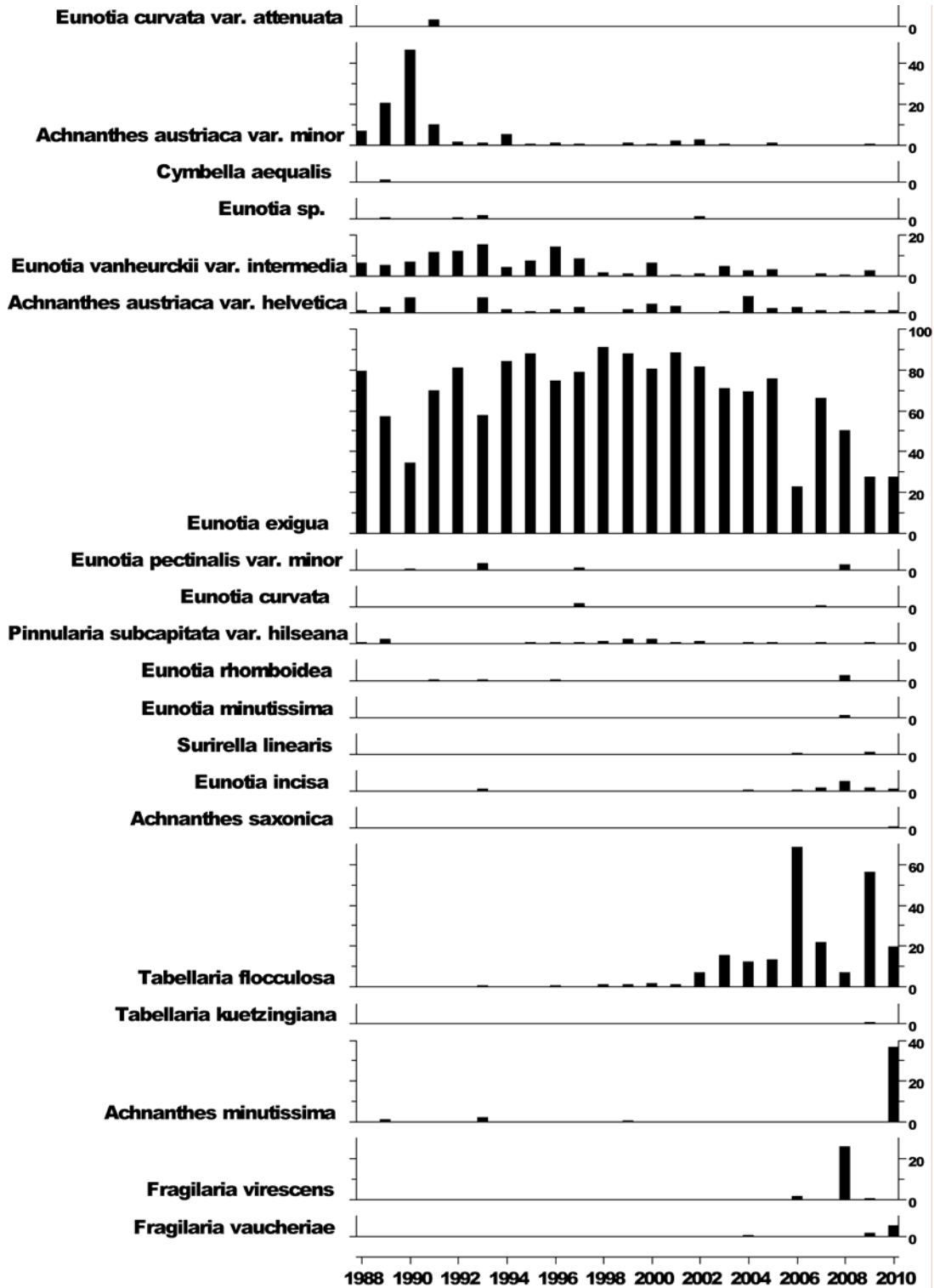
4.11.3.2 Summary of Trout parr density (numbers m⁻²), Afon Hafren



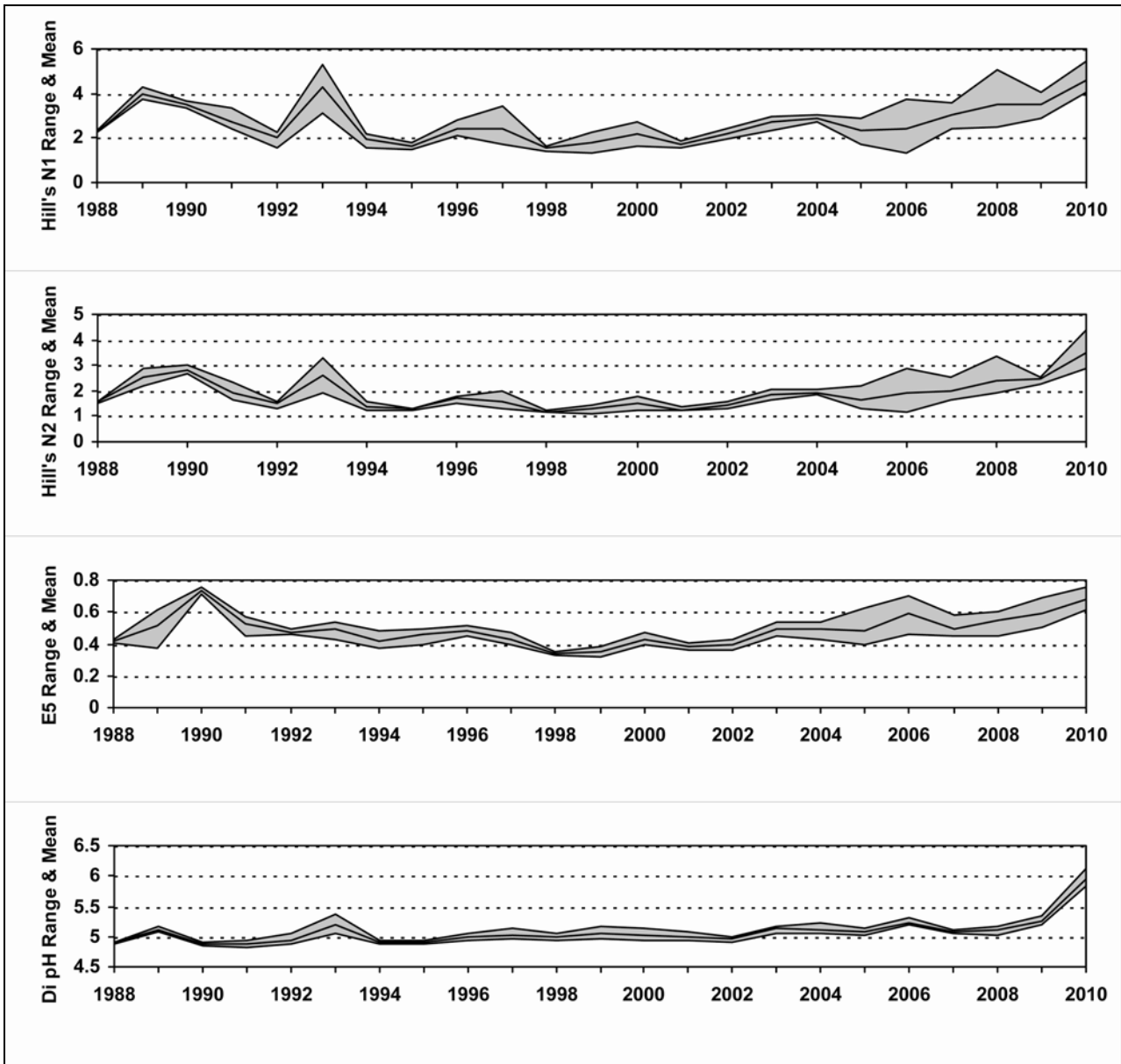
Blue series = Reach 1
Pink series = Reach 2
Green series = Reach 3

4.11.4 Epilithic diatom data

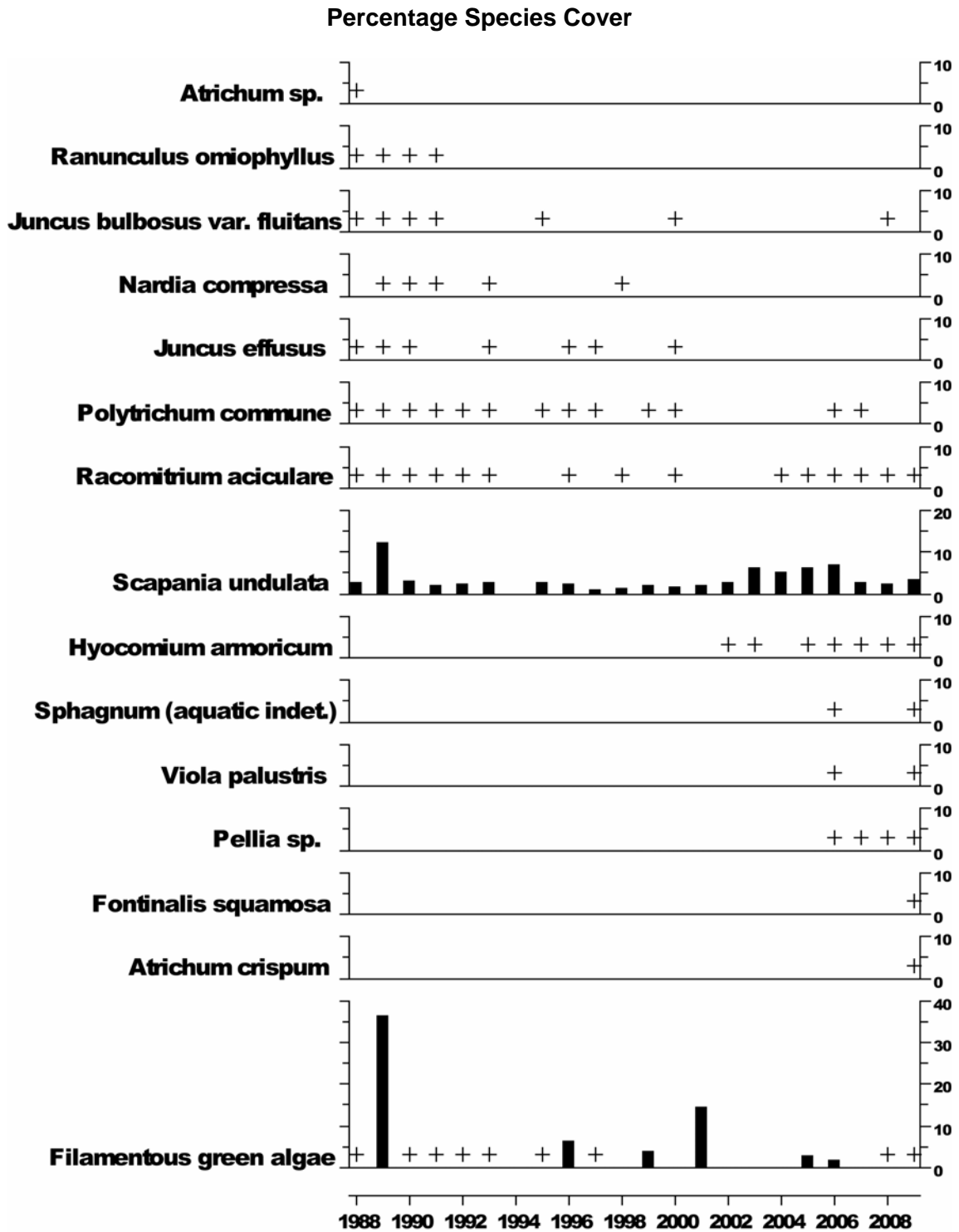
4.11.4.1 Percentage abundance summary, Afon Hafren



4.11.4.1 Diatom summary statistics, Afon Hafren



4.11.5 Aquatic macrophyte data, Afon Hafren



+ Represents <1% abundance

5 Afon Gwy



Figure 3 Afon Gwy biological survey section 6th July 2011

5.1 Summary Overview

Chemical and biological sample collection, analysis and data collation, quality control and archiving proceeded without any problems at Afon Gwy during the period from April 2011 to March 2012.

5.2 Water Chemistry

Samples were collected by CEH early every month throughout the period April 2011 to March 2012, delivered to the analytical laboratories on schedule and are in the process of being analysed, quality controlled and archived in the UKAWMN central chemistry database at CEH Lancaster.

5.3 Thermistors

A thermistor, supplied by Marine Scotland, was installed at Afon Gwy on 6th of July 2011 by a team from ENSIS Ltd. Data will be downloaded in summer 2012.

5.4 Epilithic Diatoms

Epilithic diatoms were retrieved by a team from ENSIS from three sampling points in the stream on the 6th of July 2011. The samples have been made into slides and are currently in the process of being analysed.

5.5 Macroinvertebrates

Aquatic macroinvertebrates were sampled on the 20th April 2011 by a team from QMuL. Five 1 minute kick samples were performed. The samples were counted and the data sent to ENSIS Ltd. The data is in the process of being quality screened before being added to the UKAWMN biological database at ENSIS.

5.6 Fish

Fish surveying was performed on the 16th August 2011 by a team from the Game and Wildlife Conservation Trust. The data have been forwarded to ENSIS Ltd. After quality screening the data will be added to the UKAWMN biological database at ENSIS. No Salmon were recorded in 2011.

5.7 Aquatic Macrophytes

Aquatic macrophytes were surveyed by a team from ENSIS on 6th of July 2011. Percentage cover scores were recorded and data will be added to the ENSIS biological database after microscope confirmation of bryophyte identifications.

5.8 Data Management and Reporting

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

Work on the 2010-2011 annual report is underway and it should be uploaded to the AWMN web page in April 2012. The section on Afon Gwy appears in section 5.11 below.

The UKAWMN website page detailing Afon Gwy can be found here:

http://awmn.defra.gov.uk/sites/site_18.php

Further publications from the contract period utilizing UKAWMN data from Afon Gwy are detailed in section 5.9 below. Section 5.10 provides a bibliography for the site.

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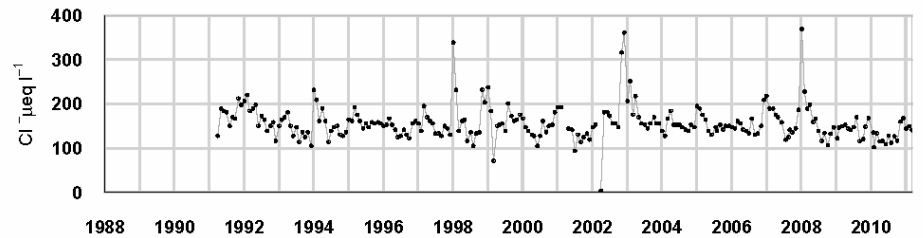
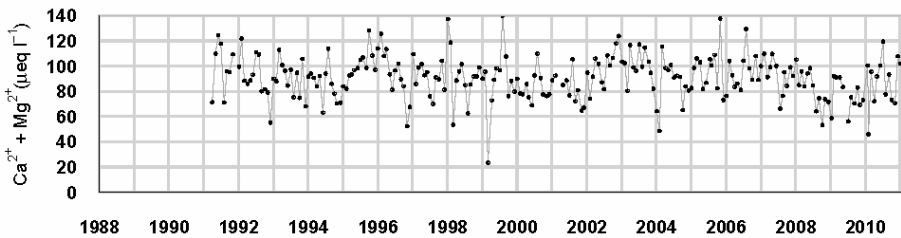
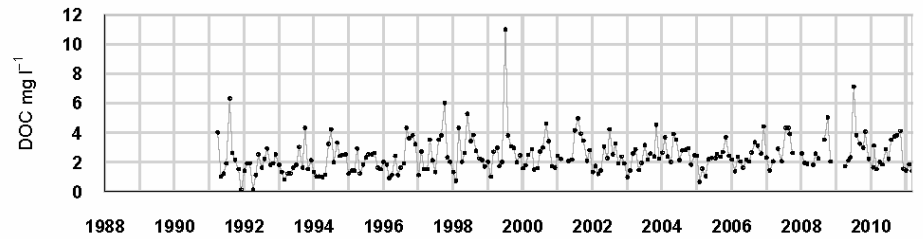
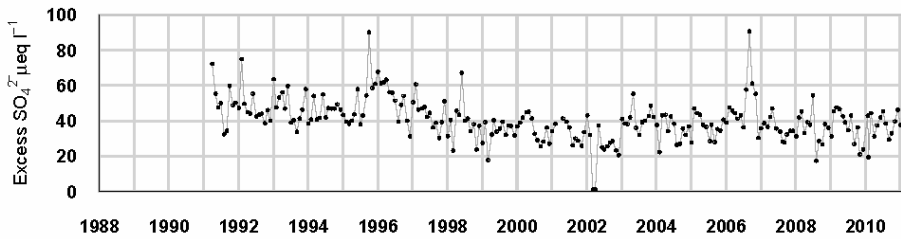
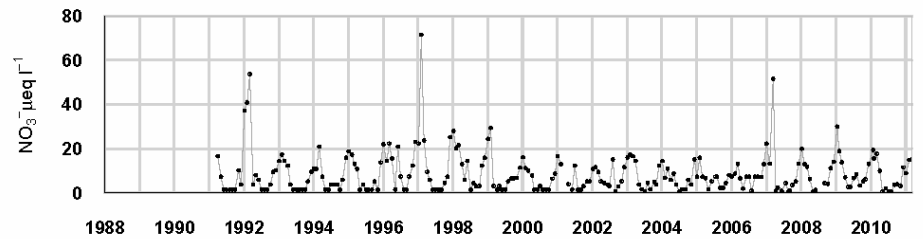
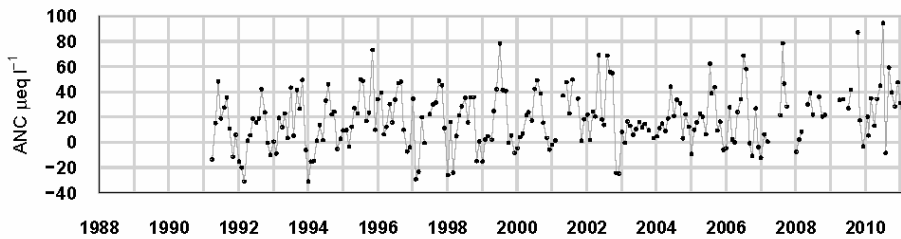
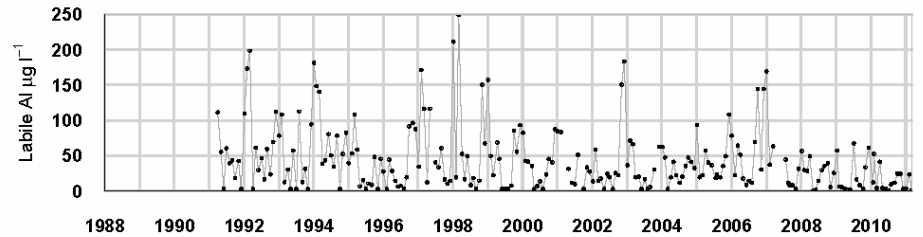
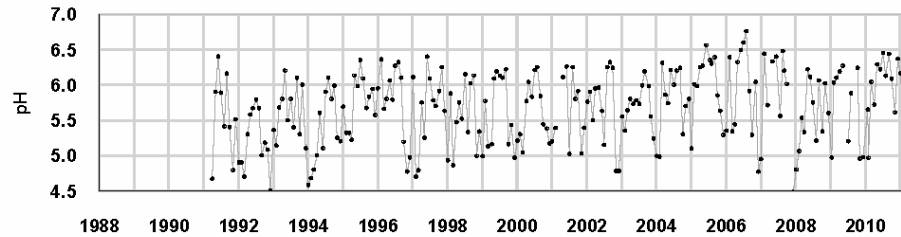
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5.11 Afon Gwy Summary Data to March 2011

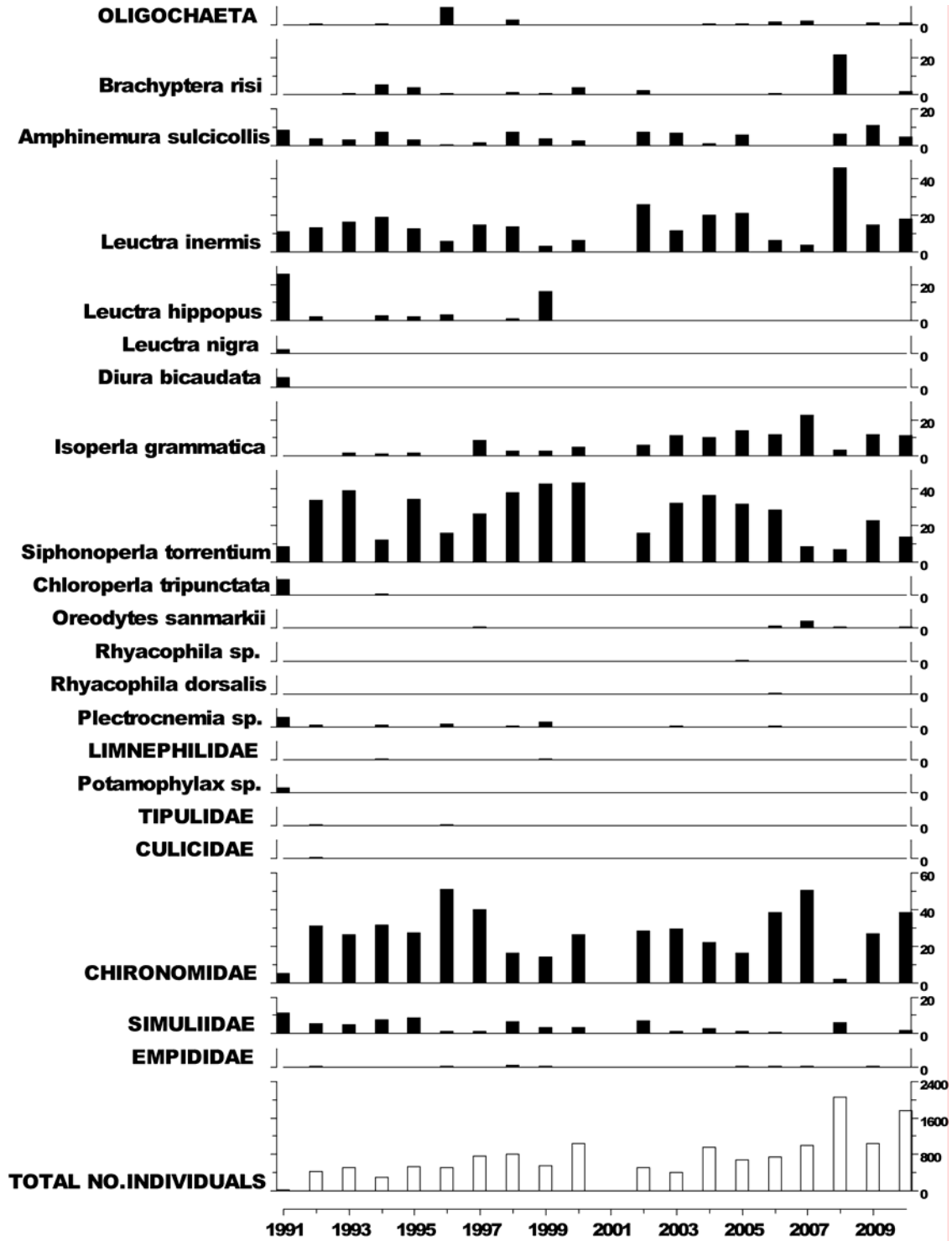
5.11.1 Spot sampled chemistry data



$\mu\text{eq l}^{-1}$, $^*\mu\text{g l}^{-1}$, $^{**}\text{mg l}^{-1}$	pH	ANC	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	*Soluble Al	*Labile Al	Cl ⁻	*SO ₄ ²⁻	xSO ₄ ²⁻	NO ₃ ⁻	**DOC
Mean 1 st 5 yrs	5.51	14.13	40.42	53.22	147.31	3.24	106.64	53.64	159.84	65.67	48.91	8.65	1.98
10-11 mean	6.10	35.25	38.23	52.13	136.23	2.83	36.17	12.25	131.48	52.23	38.44	6.07	2.51
10-11 std dev	0.32	26.11	8.40	7.45	15.50	1.58	21.93	12.83	19.90	6.61	5.42	5.58	1.03

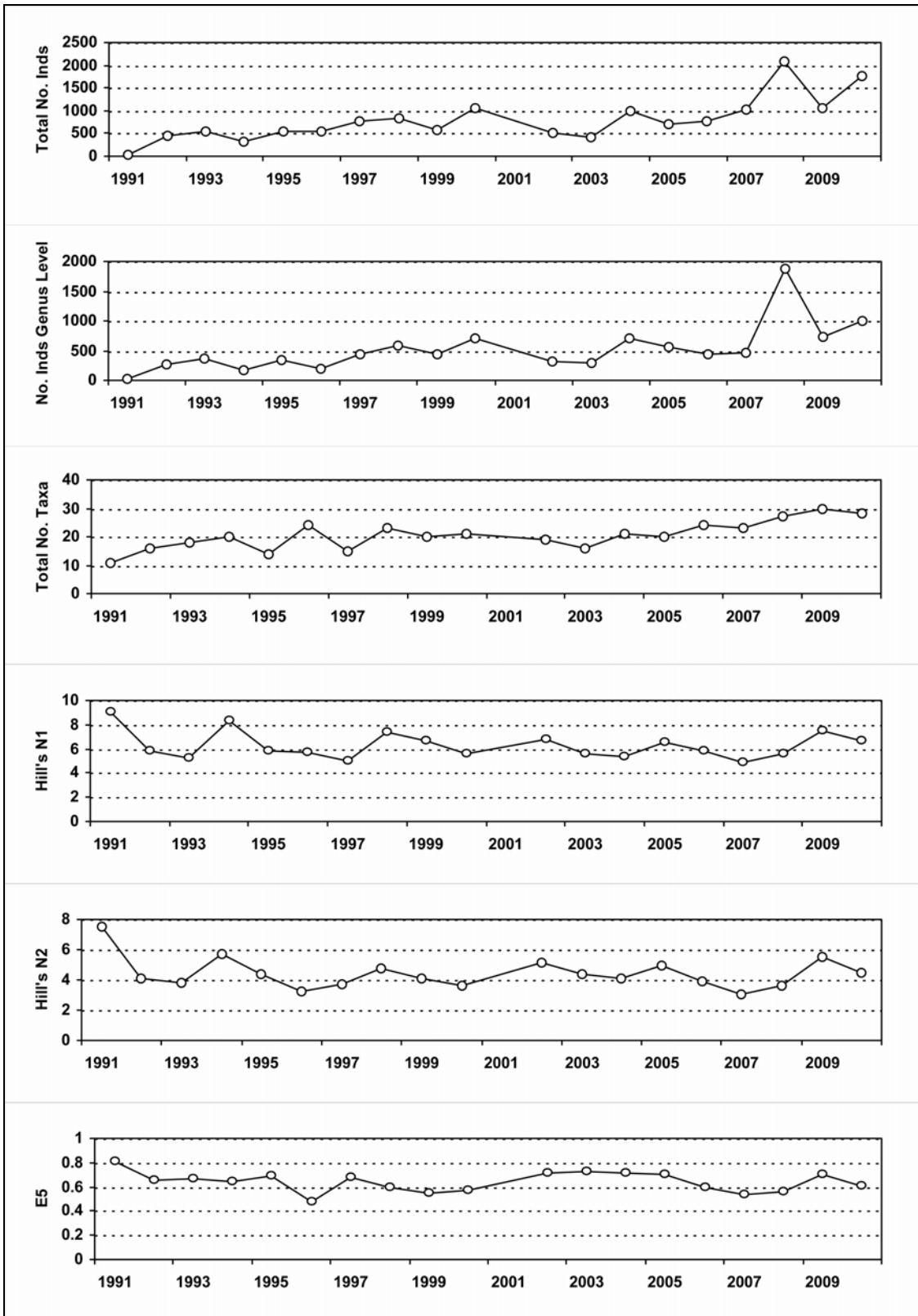
5.11.2 Macroinvertebrate data

5.11.2.1 Percentage abundance summary, Afon Gwy



No sampling in 2001 due to Foot and Mouth restrictions.

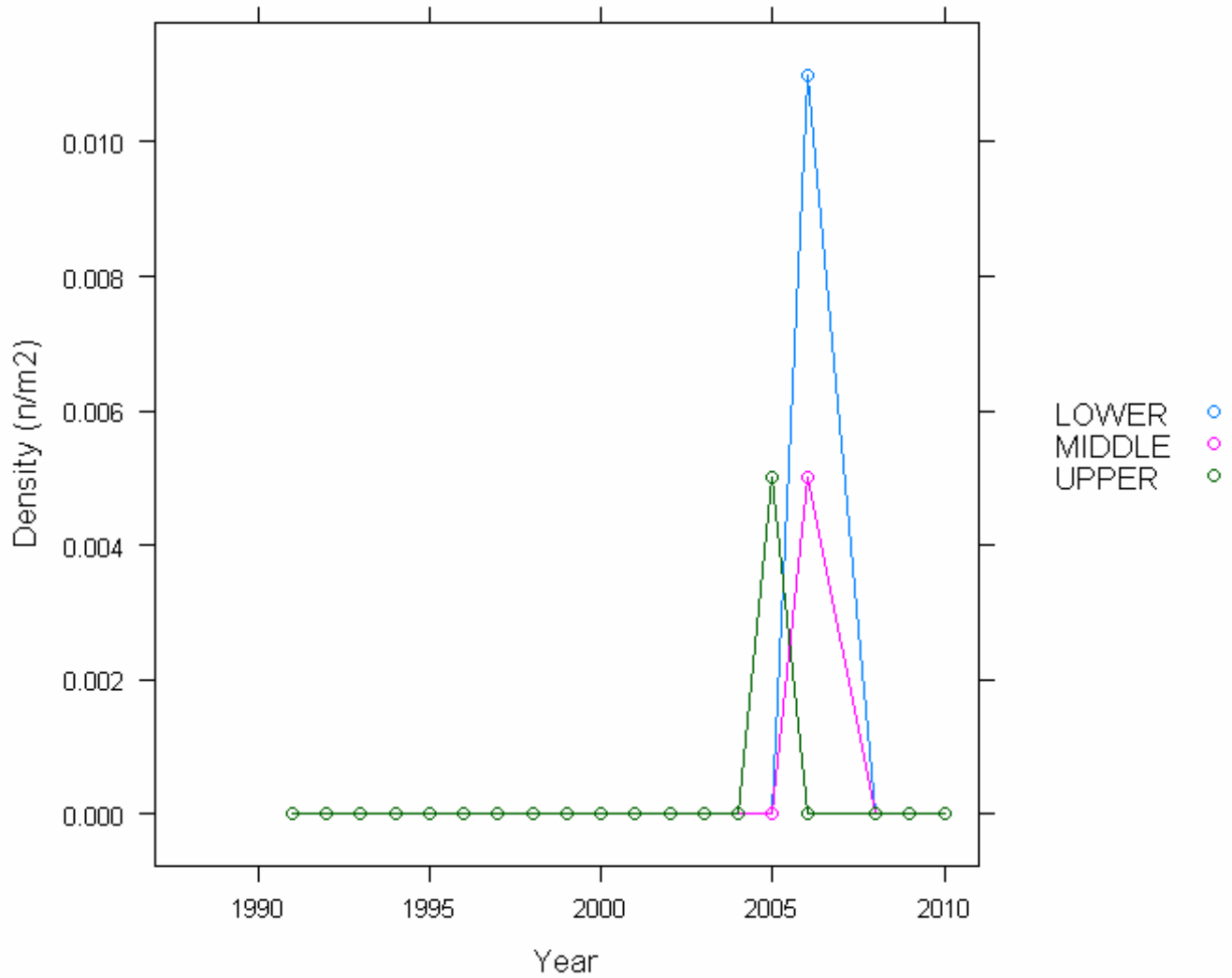
5.11.2.1 Macroinvertebrate summary statistics, Afon Gwy



No sampling in 2001 due to Foot and Mouth restrictions.

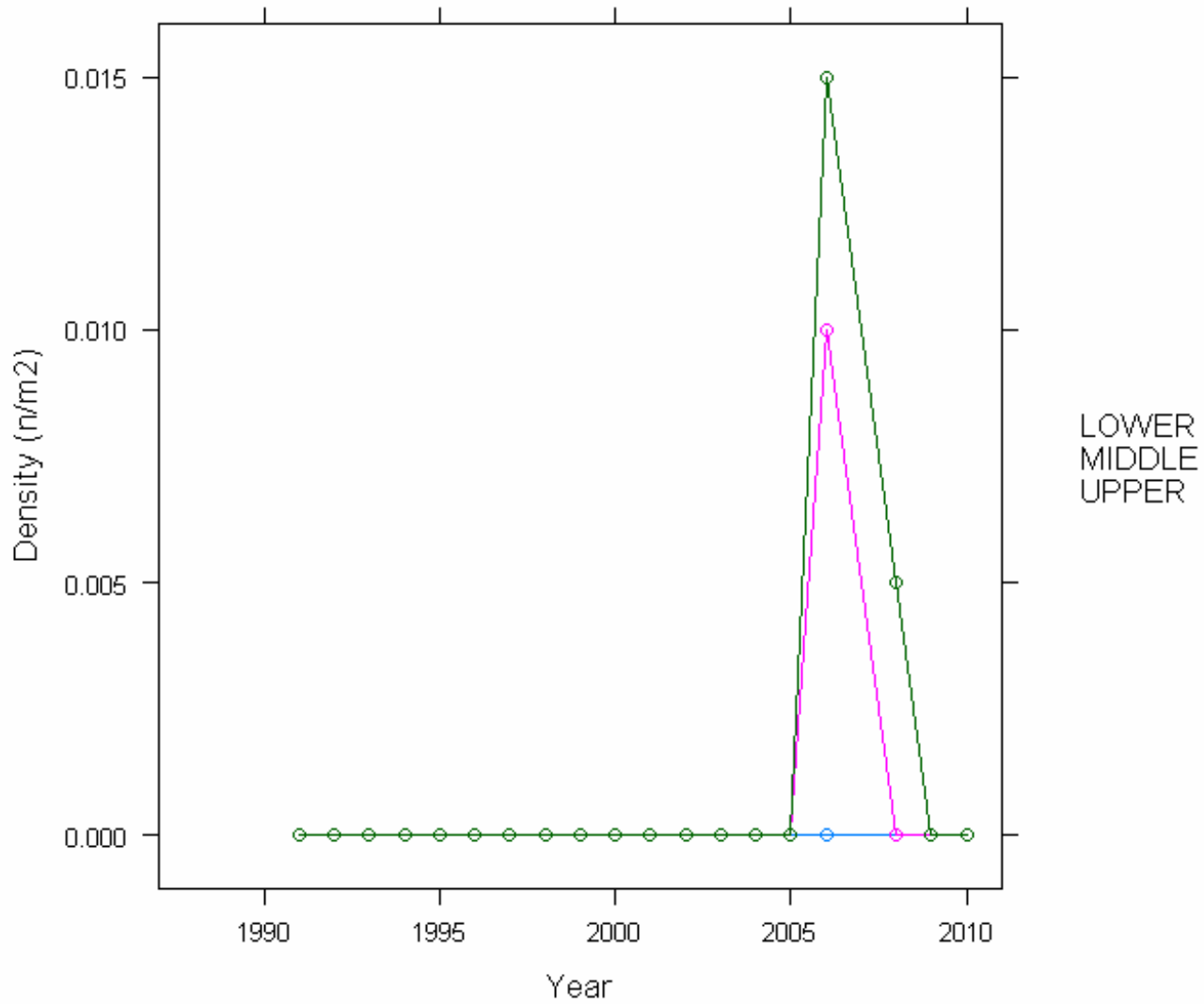
5.11.3 Fish data

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



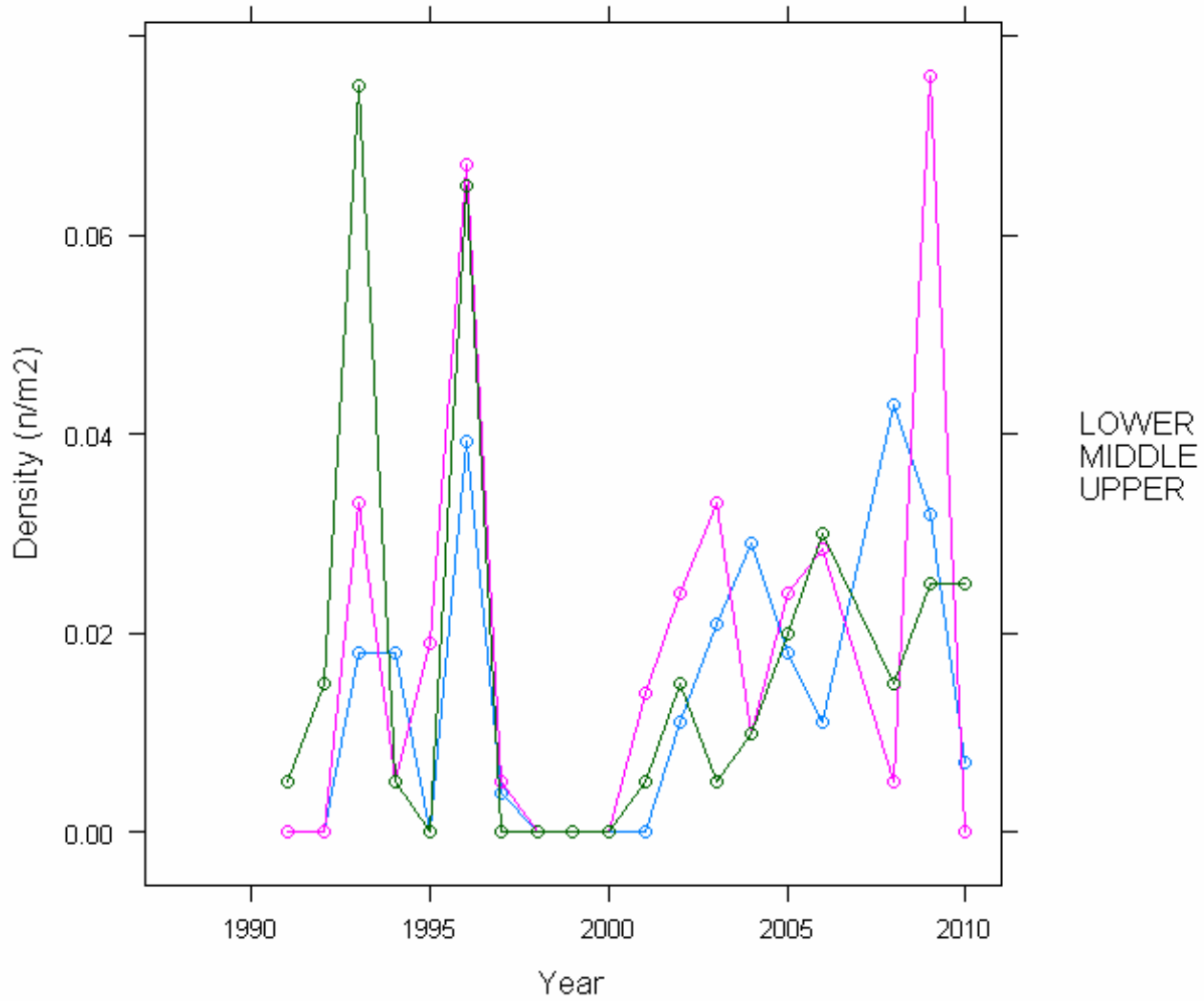
Blue series = Reach 1
Pink series = Reach 2
Green series = Reach 3

5.11.3.2 Summary of Salmon parr densities (numbers m⁻²), Afon Gwy



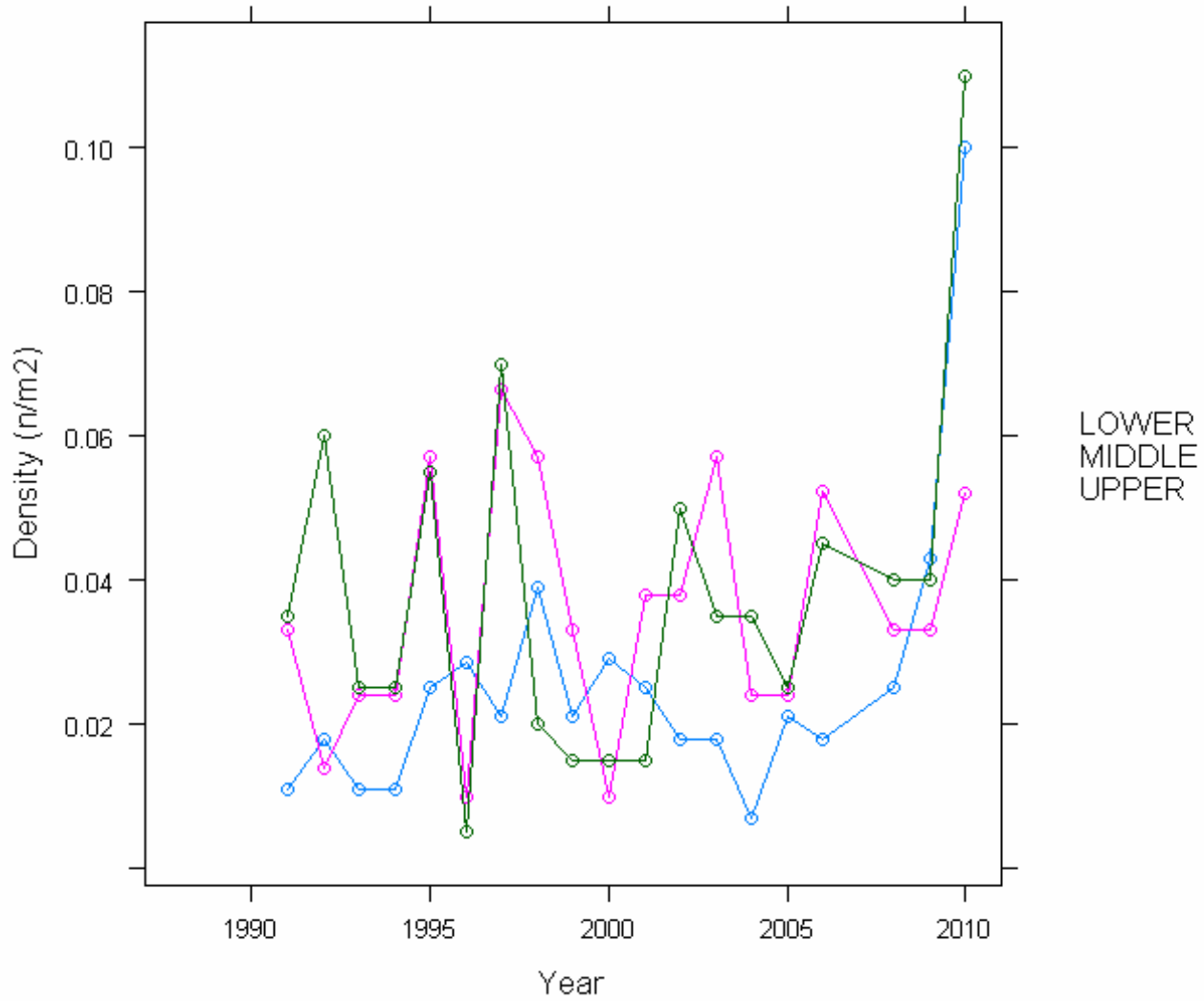
Blue series = Reach 1
Pink series = Reach 2
Green series = Reach 3

5.11.3.3 Summary of Trout fry density (numbers m⁻²), Afon Gwy



Blue series = Reach 1
Pink series = Reach 2
Green series = Reach 3

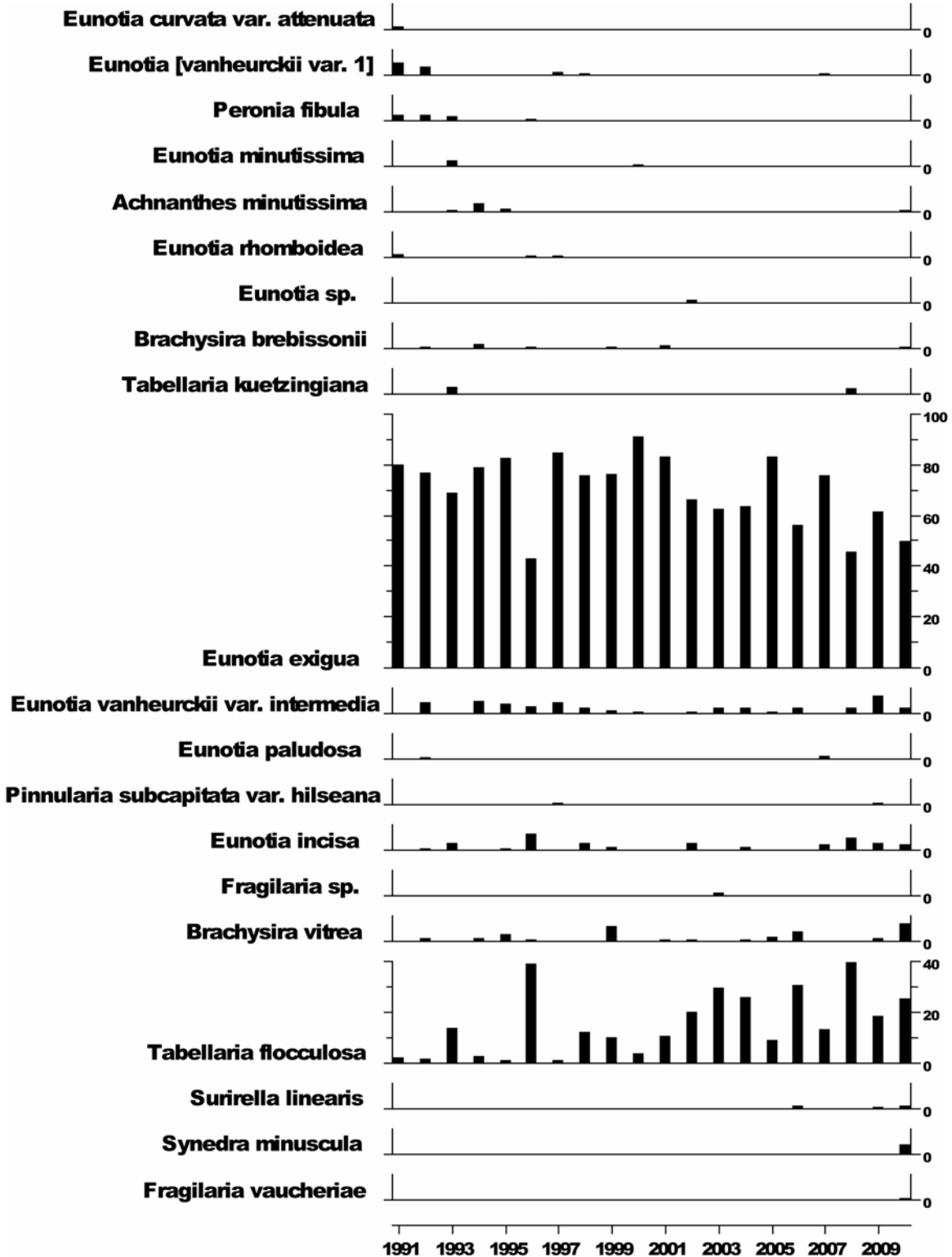
5.11.3.4 Summary of Trout parr density (numbers m⁻²), Afon Gwy



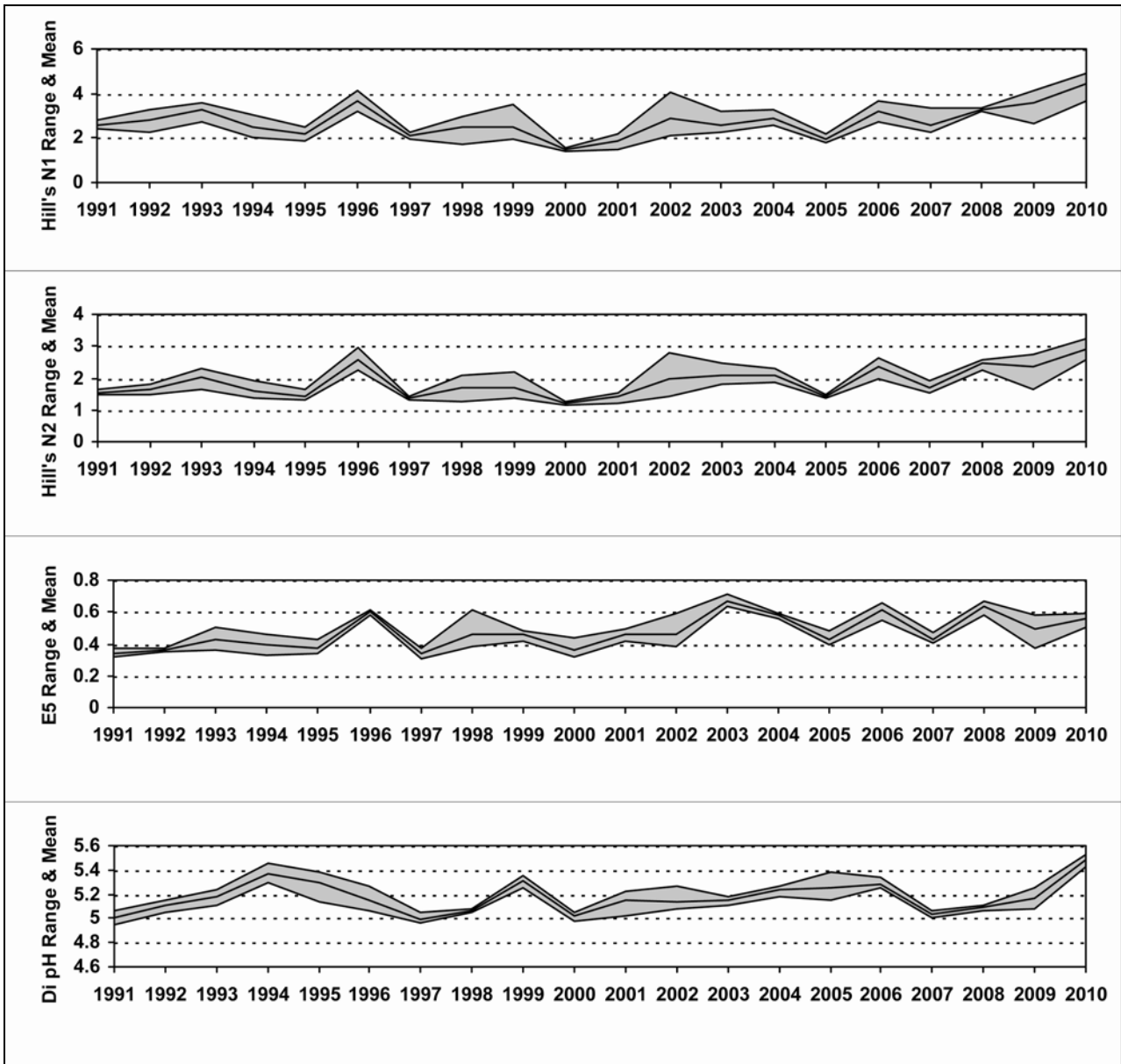
Blue series = Reach 1
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Green series = Reach 3

5.11.4 Epilithic diatom data

5.11.4.1 Percentage abundance summary, Afon Gwy

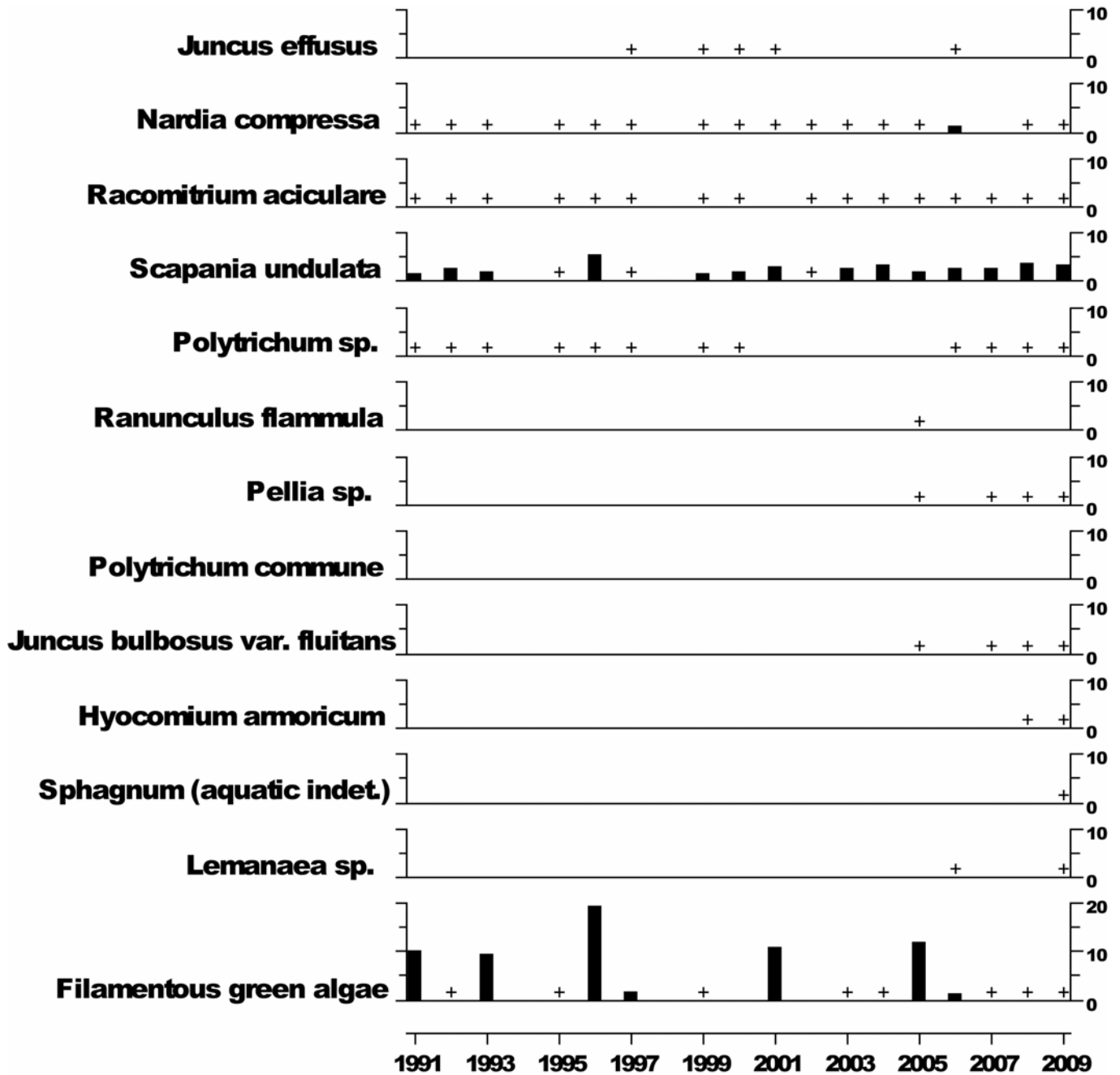


5.11.4.2 Diatom summary statistics, Afon Gwy



5.11.5 Aquatic macrophyte data, Afon Gwy

Percentage Species Cover



+ Represents <1% abundance