



**Freshwater Biological  
Association**



# Annual Review 2018-2019



## Get in touch with the FBA



**@freshwaterbio**



**Freshwater Biological Association**

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# Foreword

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## From Our President



In the year since I wrote my first foreword to the Annual Report, the Freshwater Biological Association has been through a period of **transition and stabilisation**. My thanks go to all of the FBA staff and Trustees for helping make this happen. Now is the time to look forward to developing the FBA strategy and business plan and working with new partnerships. It has also been a sad year, with the death of Colin Reynolds in December 2018. Colin, a former Director of the FBA, was one of the founders and a leading light of the European Federation of Freshwater Sciences (EFFS), with whom we continue to work. His legacy will live on as we continue to build relationships with the European freshwater community, especially early career scientists and research students. Our **links with Europe** may seem uncertain with Brexit on the horizon but I am sure we will find ways to ensure that long-established and new science-based relationships flourish and also that there will be new opportunities for science and the environment in the UK.

We are also in a time when public awareness and media coverage of **climate resilience**, including the quantity and quality of freshwater resources is unprecedented. There are many funding opportunities within UK Research and Innovation for our research community to apply to, including for example, the Natural Environment Research Council (NERC) UK Climate Resilience programme. The FBA has the **expertise** to provide input to and advise on research in this area and should take this opportunity to bring freshwater to the **forefront of environmental research**. There are exciting things to come.

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Geoff Bateman, the Chair of the Board retired in March 2019 and I would like to offer him my sincere thanks on behalf of the Staff, Directors and members for continuing in his post for another year until he retired in March 2019 and for all of his hard work and dedication during the last 4 years.

## Louise Heathwaite

President of the FBA  
Distinguished Professor and Pro-Vice-Chancellor  
(Research and Enterprise)  
Lancaster University



# Introduction

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## From our Chair of the Board

I am delighted to introduce the newly formatted, **90th Annual Review of the FBA.**

During 2018/2019 the FBA has continued to develop its work and has maintained services to members, published books, reports and keys and produced several editions of **FBA News**. Training courses and associated accreditation have extended their reach thanks to the energy and skill of our trainers and fellows, further enhancing the reputation of the FBA while supporting the finances of the organisation. Our pearl mussel research has reached new heights and the establishment of long term funding will support our ground breaking work for many years.

This year has been a good year for the FBA and I extend my thanks to our President and the Board for their continued support of our work and inheritance. In particular, I would like to thank our Fellows led by Rick Batterbee and Anne Powell for consolidating the network and developing a manifesto at a workshop in Birmingham which has established a core of senior freshwater experts which the organisation can depend on to enhance our work. The FBA can rebuild through our Directors, Fellows, and staff, supported by increasing income from holiday lettings, consolidation of our work at Windermere, and with the encouragement of our many **friends and supporters**.

I am indebted to the efforts of our Chief Executive and his staff in seeing through the necessary changes in culture, estate and staffing arrangements in a professional manner and to my fellow Directors, past and present who have given freely of their time and advice throughout the year. I would like to thank Ron Middleton, our finance Director for his advice and encouragement and especially for standing



in as Chair of the Board when I stood down on 31 March 2019.

This annual review illustrates the highlights and accomplishments of our 2018-2019 year. Thank you to everyone who has contributed to its content throughout

the whole year. The work of the FBA is far too important to the UK freshwater environment not to be a **leading advocate** and I look forward to being part of this work as an ordinary member in future years.

**Geoff Bateman**  
Chair of the Board

# The FBA Fellows

## Strengthening their role

Just as Universities create Emeritus Professorships for staff beyond retirement the FBA has, for many years, appointed Honorary Research Fellows (HRFs). This provides retired staff, both from the ranks of the FBA itself and from other organisations, a home and access to facilities, enabling them to continue their own research, in many cases long into retirement. This has been and continues to be **hugely beneficial** to the FBA both at the river lab at East Stoke and the lake lab at Ferry Landing, Windermere.

Following recent changes to the FBA and in recognition of the importance of HRFs to the future of the FBA, Anne Powell (as Honorary Vice President) and myself were asked to review the role of Fellows and make recommendations to the Board to strengthen the Fellowship. In doing so Anne and I sought the views of all HRFs, meeting them individually in order to discuss what changes, if any, might be made.



There was a general consensus that the FBA should build on the existing Fellowship to create a **strong national (and international) community** of like-minded freshwater scientists and practitioners



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committed to freshwater ecology and committed to the use of research-based evidence in the protection of freshwater ecosystems. However, it was also recognised that in the new FBA, Fellows would need to play a more prominent role than in the past; they should not be constrained by the requirement to pursue their personal research agenda but rather be encouraged to use their scientific, technical or managerial knowledge to help achieve the FBA's charitable objectives more broadly.

Our principal recommendations were that:

1. Fellows should be elected in recognition of their excellence in freshwater ecology and their achievements in understanding and/or managing freshwater ecosystems;
2. the title "Honorary Research Fellow" (or HRF) should be dropped in favour of the simple title "Fellow";
3. election as a Fellow should be a lifetime honour, but subject to review at four-year intervals;
4. normally no more than four Fellows affiliated to UK institutes or based in the UK should be elected in any one year;
5. nominations (normally one per year) should also be drawn from the international freshwater community;
6. individuals could be nominated to become Fellows before or well before their retirement from regular employment; and
7. as the Fellowship becomes increasingly dispersed geographically an annual Awayday should be arranged for Fellows to meet.

The FBA Board supported our recommendations and we consequently put in motion the immediate actions needed by drawing up guidelines for the nomination and election of new Fellows, and by making arrangements for the first Fellows Awayday. This was held on the campus of Birmingham University in November 2018.

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The Awayday, organised principally by Michelle Jordan, was a great success. It started with a stimulating presentation from Mark Ledger of Birmingham University describing his research including setting up the most impressive experimental facilities now available for



freshwater ecology research in Birmingham. The following agenda was dominated by short presentations from each of the Fellows outlining their own research projects and we had two interesting and most useful break-out discussions on the topics “what can the FBA do for me?” and “what can I do for the FBA”.

The 2019 Awayday will be held on the Leeds University campus in November. It will have a similar programme to the Birmingham one with an introductory talk about freshwater ecology at Leeds University from Lee Brown followed by an opportunity for our new Fellows to present their work.

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**New Fellows** nominated this year are:

1. Lorraine Maltby (Sheffield University)
2. Michelle Jackson (Oxford University)
3. Judy England (Environment Agency)
4. Craig Macadam (Buglife)
5. Stephen Maberly (CEH Lancaster)
6. Geoff Phillips (Environment Agency)
7. Mark Gessner (Leibniz Institute of Freshwater Ecology and Inland Fisheries)

Although our rules (above) indicate we intend normally to elect no more than four UK-based Fellows, the Selection Panel of Bill Brierley (CEO), Alan Hildrew (Vice-President), Keith Beven FRS (Board member) and myself agreed it would be appropriate to recommend six for election in this our first year of the **new regime**. Congratulations and welcome to all six, and especially to our overseas candidate Mark Gessner.

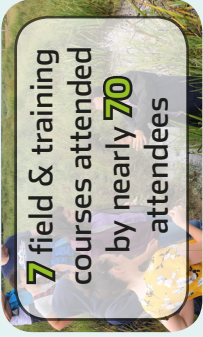
**Rick Battarbee**  
FBA Fellow

# 2018-2019 at a glance

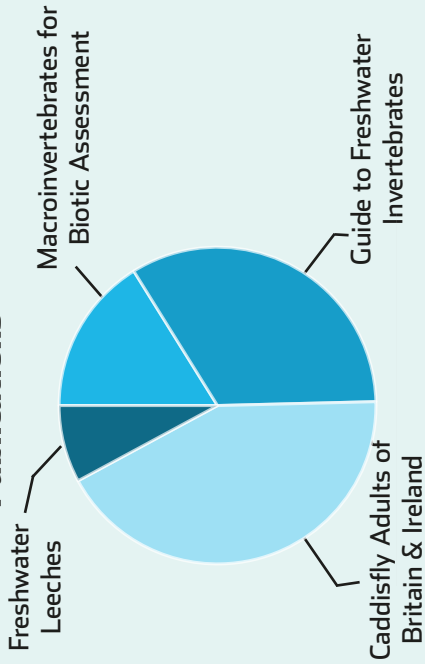
412

Publications  
Sold

1500+  
volunteer &  
placement  
hours



## Top 4 Sold Publications



## 5 Types of Membership

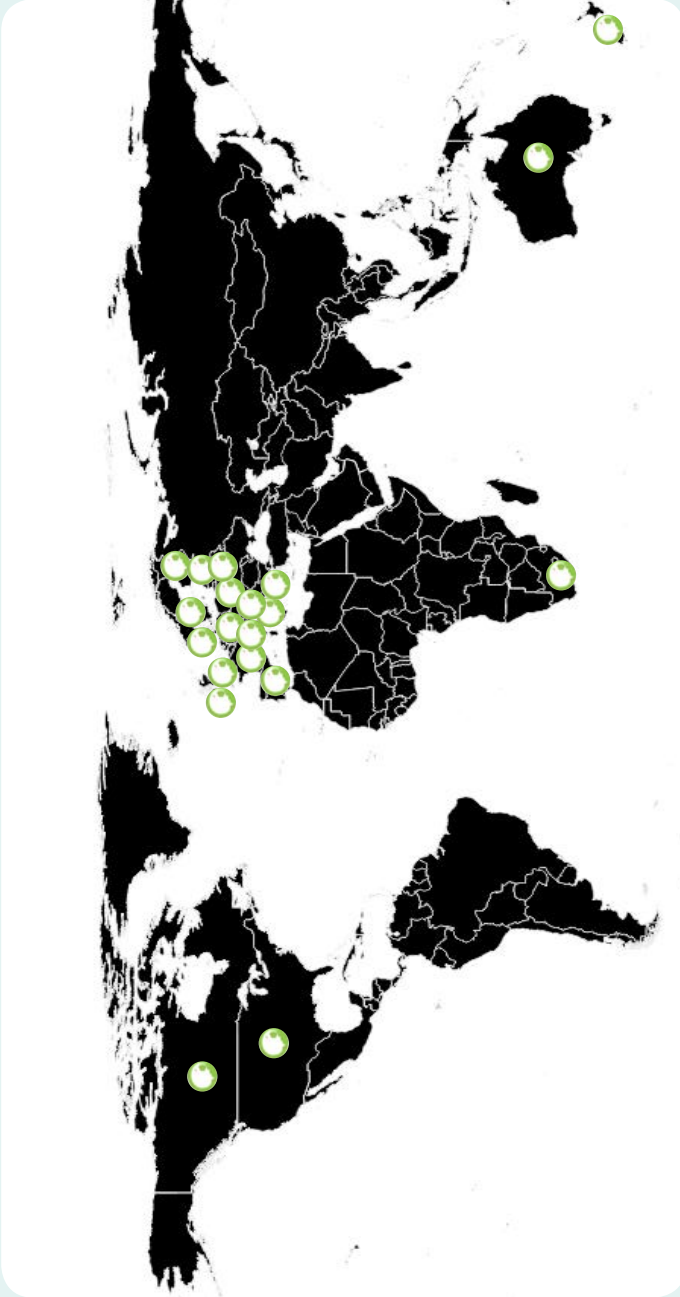


'...and lots of happy  
juvenile mussels!'



**1207**

**Members Globally**



# The Biffa Project

## Restoring Freshwater Mussel Rivers in England



Building communities. Transforming lives.

As part of this **national partnership project**, we delivered an International Symposium at Lancaster University from 2-5th October 2018. This attracted 72 delegates from across Europe, America and New Zealand. 6 presentations show-cased the work of the project whilst 7 were given by experts in their field from across the world. The event provided researchers, practitioners and enthusiasts the opportunity to exchange experience and enthusiasm for the conservation of freshwater pearl mussels and their specific restorative river needs. Special consideration was given to how best to improve and protect water quality particularly in the interstitial gravel sites which are critical for juvenile mussels and the eggs and alevin of the salmonid hosts they rely on. Field trips provided as part of the symposium enabled



delegates to view the complicated situation on **Dubbs Beck** where road construction, release regimes from the reservoir and previous canalisation all conspire to create challenging conditions for the native freshwater pearl mussel (FPM) population. Delegates were also invited to the FBA's facility to see our precious juvenile mussels and compare the FBA set up to other captive-rearing approaches.



Over the 3-year project the partnership surveyed **112,912km of river**



and delivered water quality and habitat improvements at 122 sites including fencing, buffer strip creation, bank stabilisation, improvement of flow regime, refuge creation for young fish and invasive species management. The project also planted over 4,000 trees to create shading. Work with farmers and land managers proved particularly rewarding as the motivated project officers were able to appreciate

business need whilst enthusing about the unique role of FPM in our catchments and heritage. An investment of project funds of £450,851 elicited £182,258 capital investment + £31,218 in labour and machinery hire. £53,579 were also secured from other project funds with similar objectives. As reported previously this project also facilitated the first ever reintroduction of juvenile FPM captive-reared at the FBA Ark along with a trial of captive-breeding for the Devon mussels. In September 2018 funding was secured from United Utilities to continue researching reintroduction techniques. This will include regular monitoring of the Cumbrian reintroduction site to inform success (or otherwise) to increase our knowledge and understanding of this fascinating creature and to document how captive-reared FPM fair in the wild.

The final element for this incredibly valuable project is to produce a publication documenting the broad range of work that the Biffa Award funding allowed and the importance of building confidence in high quality, secure reintroduction river sites. This is very nearly complete and will be available for download from [www.fba.org.uk](http://www.fba.org.uk) or in hard copy by request!

**Dr. Ceri Gibson**  
BIFFA Award and Ark Manager

# The Mussel River Project

## Freshwater Mussel Reintroductions Research

In January 2019 the FBA embarked upon an exciting new project to research methods of releasing juvenile freshwater mussels bred at the FBA's **Freshwater Pearl Mussel Ark**. The project, funded by United Utilities through the River Ehen Compensatory Measures package, will consider different methods of releasing juveniles in



order to inform best practise and to ensure high survival. This project is also supported by **Natural England and the Environment Agency**, and we are building upon our past relationship with West Cumbria Rivers Trust in order to identify, restore and enhance potential mussel release sites.

The project will run for four years (2019 – 2022) and will consider a broad range of factors which may affect mussel survival in the wild. The project also seeks to improve the resilience of one of Cumbria's most endangered freshwater mussel populations. As part of our previous Biffa Award-funded project "Restoring Freshwater Mussel



Rivers in England”, a trial release of **70 nine-year-old juveniles** took place in 2017, and subsequent monitoring has confirmed persistence of juveniles at the release site.

One of the major aims of the Freshwater Mussel Reintroductions Research project is to carry out robust and novel research which will inform how mussel reintroductions should be carried out. This information will be used to produce guidelines

for reintroductions, something which was identified as a current knowledge gap when the River Ehen Compensatory Measures package was being proposed. New and innovative scientific methods along with traditional survey and monitoring works will form the backbone of the **Mussel Reintroductions** project and both will be used to assess the success of juvenile releases. One of the tools which will help assess juvenile survival and movement in the wild is Passive Integrated Transponder (PIT) tagging. PITs will be fixed on to the mussel shell which are then detected with a hand-held reader. This will make finding released juveniles much easier, particularly since they often bury beneath the substrate surface, making locating them almost impossible without destructively sampling the habitat.

During this first year of the project, the research priorities will be

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discussed with partners and developed, ahead of practical and experimental works in subsequent years. Additionally, as we go to press, juveniles reared during our first year of propagation at the FBA Ark (2008) have released glochidia themselves, proving that captive-bred juveniles are viable and can contribute to the next generation of mussels in their native catchments upon their release. These are all excellent foundations upon which to build. Watch this space for future updates and developments.

**Dr. Louise Lavictoire**  
Freshwater Mussel Reintroductions Officer

# Anglers' Riverfly Monitoring Initiative

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## Citizen science with the Riverfly Partnership



The Anglers' Riverfly Monitoring Initiative (ARMI), launched in 2007 and established UK-wide, is a **citizen science initiative** in which volunteers are trained to carry out standardised biomonitoring of rivers on a monthly basis and to derive a score which summarises water quality. The key focus of ARMI is to **provide an early warning system** against acute river pollution incidents. ARMI volunteers have identified and reported numerous serious pollution incidents which would otherwise have gone undetected. Analysis of ARMI data shows that ARMI scores correlate closely with Biological Monitoring Working Party (BMWP) scores and that variation between volunteer sampling effort does not significantly affect the ARMI score. The Riverfly Partnership (RP), hosted by the Freshwater Biological Association (FBA), coordinates ARMI at a national level, for which it receives funding support from the Environment Agency (EA). In 2018/19 EA funding of ARMI was spread equally between anglers rod licence income and the Water Environment Improvement Fund (WEIF).

ARMI data are submitted by the volunteers into an online open access database, once records have been verified they are available under the terms of the Open Government Licence (<http://www.riverflies.org>). ARMI now supports a network of over **3400 trained volunteers**



formed into more than 150 Riverfly groups which are aligned to specific rivers and streams. This dynamic network is supported at a catchment scale by 56 Riverfly hubs and ecology officers in every EA area. ARMI volunteers regularly monitor across over **2400 river sites UK-wide**. Since 2015, in excess of 65 ARMI training workshops, organised and funded locally through Riverfly hubs, have been delivered every year to volunteers and the effective annual in-kind contribution from the ARMI network is valued beyond £600,000.

The ARMI network and the robust data on the condition of England's rivers it supplies, is a valuable asset to EA and makes a cost effective contribution to the Government's 25 year Environment Plan. During 2018/19, RP undertook a review of ARMI in England and reported its findings to the EA, including evidence of the benefits that ARMI provides to the statutory body. Examples of the core and wider benefits of ARMI can be seen in boxes 1 and 2, respectively.





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Box 1.

### **Core benefits of ARMI**

- by increasing the spatial and temporal pollution monitoring network, ARMI enables EA to target the efforts of its expert staff on incidents reported by ARMI volunteers
- ARMI national database can be interrogated by EA staff to assess river (ARMI) status and activity
- ARMI volunteers provide high frequency information on river status, notify EA about acute pollution incidents, and act as an effective deterrent to would-be polluters
- analysis of perceived causes of trigger level breaches can provide an indication of the relative importance of different pressures
- ARMI fulfils criteria identified in EA's Strategic Monitoring Review (SMR)

Box 2.

### **Wider benefits of ARMI**

- increases public knowledge of the stressors impacting rivers and increases public engagement in both direct river conservation action and river guardianship
- directly contributes to the national fisheries improvement effort
- consistent ARMI data contributes to effective targeting, by EA, of staff resources across river catchments
- provides weight of evidence (river condition) data to EA for State of the Environment and Water Framework Directive (WFD) reporting
- provides a monitoring network imbedded throughout Catchment Partnerships nationwide
- ARMI network of trained volunteers can be directed, by EA, to specific areas of interest using bespoke additional monitoring protocols (known as Riverfly Plus)

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## Riverfly Plus

Various 'Riverfly Plus' packages have also been developed by RP and others, enabling volunteers to assess and report:

- Presence, absence and abundance of invasive non-native species
- Impacts of outfalls and domestic misconnections
- River hydromorphology
- Water chemistry
- Before and after effects of river restoration projects.



*Reproduced with kind permission by Ueli Zellweger*

Also, by expanding the number of invertebrate taxa used in ARMI, volunteers are able to:

- Assess water quality in urban rivers
- Detect impacts of flow variation and siltation.

Riverfly Plus schemes relate to **key pressures and risk assessments** highlighted by work completed by the WFD; Riverfly Plus data, collected by the volunteer network and shared with Catchment Partnership

Riverfly Plus Scheme	Focus	Developer
Extended Riverfly	Impacts of flow variation and siltation upon macroinvertebrates	Environment Agency (EA), Lincolnshire Chalk Streams Project, Dorset Wildlife Trust, FBA, Riverfly Partnership (RP)
Urban Riverfly	Water quality monitoring on urban rivers	EA
MoRPh	Physical habitat condition assessment	QMUL, EA
Ecosystem function and river restoration monitoring	Assessing water quality & ecological outcomes of river restoration	Dr Murray Thompson, RP
Smart Rivers	Impacts of flow, sediment, phosphorus, organic pollution & chemicals upon macroinvertebrates	Salmon & Trout Conservation
Freshwater Watch	Monitoring of water quality	EarthWatch
Westcountry CSI	recording wildlife, water quality and pollution	Westcountry Rivers Trust
Outfall Safari	locating, assessing the impact of, and reporting polluting pipes	Citizen Crane Project (advisors: EA, Thames Water)

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Groups, contributes evidence that is vital to effective and dynamic catchment management.

### **5th National Riverfly Partnership Conference**

The 5th National Riverfly Partnership conference will take place on **20 March 2020** in the Flett Theatre, Natural History Museum, London. The conference programme will include presentations and poster talks about freshwater ecology and citizen science and the event will feature national launches of both Urban and Extended Riverfly Schemes, live demonstration of the new RP website and upgraded ARMI database (both currently under development by FBA) and the inaugural presentation of the 'Riverfly Monitor of the Year' award. Registration for the conference will open by the end of November 2019 (see RP website and social media feeds for more information).

**Steve Brooks**  
Riverfly Partnership Chair

**Ben Fitch**  
ARMI Project Manager

# The Riverfly Extended Scheme

## Development & creation of Riverfly resources

The development of the Riverfly Extended Scheme originated from two projects which focused on the identification of a wider range of invertebrate groups found in freshwaters. These projects developed in parallel with one originating in Dorset; its primary aim was to provide a training pathway for citizen scientists to build upon their



skills as well as potentially produce a greater return of information from a Riverfly sample. This project was developed by John Davy-Bowker (FBA) and Angus Menzies (Dorset Wildlife Trust). A key output of this project was a **field identification chart** for volunteers. The second project, based in Lincolnshire, was developed by Richard Chadd (EA & FBA) and Chris Extence (EA) with the aim of using a wider group of invertebrates to identify sites impacted by siltation and flow variation.

These schemes will also help to retain the **engagement of citizen scientists** as well as increase the potential for Riverfly monitoring to detect more subtle changes in freshwaters than has been possible, with just 8-group Riverfly monitoring methods having been used

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previously.

These two schemes merged to become “Extended Riverfly Scheme” following a meeting held in autumn 2018 at the Natural History Museum. NHM, Environment Agency and Rivers Trust colleagues examined the national applicability of the schemes and the



development of the taxa used as well as refinement of the chart. Following this successful meeting, a final list of **33 invertebrate groups** was agreed upon, with the amalgamation of two groups and the addition of several new distinctions within the groups. These included the separation of invasive non-native shrimps from natives, addition of the mayfly families Caenidae and Leptophlebiidae, and some restructuring of the stonefly, water bug and caddisfly groups. John and Angus have worked to produce a final version of the new Riverfly Extended Scheme chart for citizen scientists to identify these invertebrate groups in the field.



### 13. Mayflies – Prong Gilled



#### Distinguishing features:

Up to: 0 10 14mm

- Nymphs with 3 long tails splayed out at rest
- Pronged gills strap-like, lobed at base or branched

**Nymph habitat:** Slow flowing streams, ponds and lakes

**Diet:** Dead organic matter

Notes

Tolerance to stressors

- 🚫 Nutrient enrichment
- ☹️ Slow flow
- 🚫 Sedimentation
- ✅ Acidification

*Insect: Ephemeroptera*  
*Family: Leptophlebiidae*

John photographed many of the invertebrates for the chart. These photographs were taken live at the riverbank so that the invertebrates would appear in their most accurate form, and therefore be more easily recognisable to Riverfly monitors. John and Angus also spent numerous sessions together in front of the computer designing the individual panels for the new chart. This involved detailed considerations about what to include on distinguishing features,

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habitat preferences, diet, and notes about how the various groups move when seen alive in a sorting tray at the riverbank. Another important enhancement has been the incorporation of a set of 'smileys'. These red, orange and green faces summarise the overall tolerance of each of the 33 groups to **four stresses commonly acting on freshwaters**: nutrient enrichment, slow flow, sedimentation and acidification.

The chart is currently in the final stages of drafting and editing and should be printed in autumn 2019. The Riverfly Extended scheme together with the chart will be launched at the **2020 Riverfly conference** in March next year. Attention will then turn to working with the Riverfly Partnership by helping to support the training of Riverfly Monitors and developing the national database to store the extra data.

Other major contributors to the development of the Riverfly Extended Scheme are Ben Fitch of the Riverfly Partnership, Steve Brooks of the Natural History Museum, and Will Bartle of the Lincolnshire Chalk Streams Project.

We are also very grateful to the FBA, Dorset Wildlife Trust, the Vitacress Conservation Trust, Environment Agency and Wessex Water for their kind support with the development of the chart. Our special thanks also go to the many volunteer Riverfly Monitors in Dorset and Lincolnshire.

**John Davy-Bowker**  
FBA Fellow

**Angus Menzies**  
Dorset Wildlife Trust

# Setting up a Caddis Group

## Insects deserving of their own enthusiasts

The FBA has always been closely linked with the study of **Trichoptera** (Caddisflies), and especially as the publisher of the current standard



identification keys for British larvae. However, like other aspects of freshwater science, study of caddis larvae, has until comparatively recently

been in the realm of professionals who examined dead specimens preserved in fluid seen under good quality microscopes in laboratories as part of water quality checks. Things changed radically as the Angler River Monitoring Initiative (ARMI) developed, with amateurs trained to collect scientifically useful basic data in a standard way.

**Caddis** became linked with **Stoneflies** and **Mayflies** as **Riverflies**; a successful brand. Caddis larvae only needed to be recorded as “cased” or “caseless”, but interest in learning more about them was demanded and was worth satisfying. It was just not tenable to suggest to someone seeing a diverse range of live caddis larvae in a sorting tray that they could only make progress when the specimens were safely pickled and under a microscope; the “Simple Key to Caddis Larvae” that focuses on live larvae examined with the aid of a hand lens was one response.

The perceptive will have noticed that the adult caddis flies have not

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been mentioned. The publication dates of British keys to adults of 1874, 1939, 1973 and 2012 speaks volumes of the relative obscurity of this stage that, unlike the larval, has no role in statutory environmental monitoring. Their identification was rightly regarded as tricky with keys where wing venation, only seen easily when they are dried and pinned out was paired with genitalia best seen when they are fresh or in fluid. They were for a few determined and well-equipped souls. Lagging far behind larvae, we are only now starting to look at satisfying the demands of the many people, especially light-trapping moth recorders, to name and know more about the attractively



marked caddis they have for years had to ignore as “too tricky”.

*Limnephilus lunatus* adult (drawing by Joan C. Worthington)

The opportunities and demands of the online world changes everything. There are many sources of information, but as they proliferate, the value of a one-stop-shop to “tell me all you know about” grows, that need of course often being served by linked re-direction. There should be **great value** in the caddis-focused information resource that the FBA has agreed to host. It is very appropriate for the FBA with its broad remit on freshwater science. I am delighted we have Sharon Flint as a long-term caddis enthusiast to run the group.

We are particularly keen to develop the **whole life cycle approach**. For example, the basic water quality parameters that enable the larvae to survive where they live may be known but they are there primarily due to an oviposition (egg-laying) decision by a female using cues we know little about. The conservation of these caddis and their habitats

requires a better knowledge than we have. Yet every day, observations are being made or could be made, by people of diverse backgrounds focussed to add to knowledge. The casual observations an editor of a paper-



based journal probably rejected can now be recorded but of course, care is always needed to prevent spurious conclusions being drawn.

Conservation of freshwaters long ago moved into the **whole catchment approach** and we hope our whole life cycle focus will provide a marker for development of resources for other groups at the FBA. Caddis are a fascinating and diverse group of insects that deserves the enthusiasts we are confident the new **Caddis Group** at the FBA will help nurture and grow.

**Ian Wallace**

FBA Fellow

UK Caddis Recording Scheme

# Digitising the Fritsch Collection

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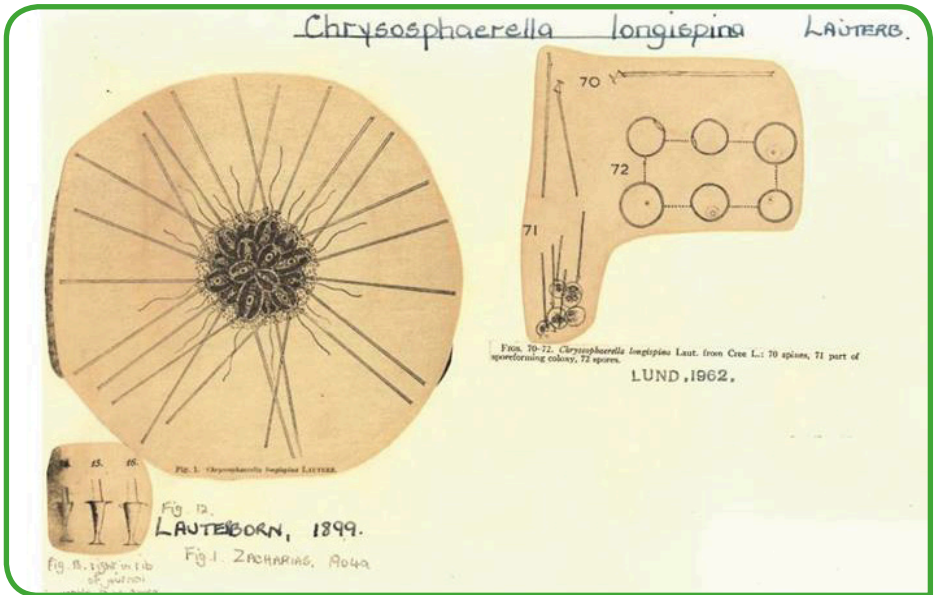
## Putting algae online

We now have the opportunity to get the **Fritsch Collection of Algal Illustrations** online. We will be piloting this project using the Oxford Database **BRAHMS**. The Fritsch Collection of Illustrations of Freshwater, Brackish and Terrestrial Algae, an Algal Reference Collection, was begun by Professor Felix Eugen Fritsch at Queen Mary College in 1912 and continues to the present day. There are currently **c.100,000 sheets** containing a vast number of published illustrations filed by genus and species.

The BRAHMS Database was built by Denis Filer of Oxford University Plant Sciences to digitize herbarium sheets and make them available via a website. The database has now been used for Herbaria around the world, to create photographic National floras, catalogue the Millennium Seedbank of Kew, provide a searchable Red List of Plants, as well as others. This relational database will enable us to upload the images of the Fritsch Collection together with the associated data, and for it to be freely available on a website. Currently we are continuing with the essential checks and photography; it is important to check our data before any uploading as interesting errors do appear!

While the Fritsch Collection is basically a simple list of species names, the database can create different sub-files to provide users with flexible searches and the ability to see the related species sheets. We already have over **15,000 images** in the Collection, with associated data, to upload. BRAHMS web-connect smoothly loads the suitable data and images to the website for inspection. The user will be able to view the whole sheet and then easily magnify and view the specific figures thereon, as well as read the notes written by Fritsch and others.

Furthermore, this Database can accommodate more than one project. This means that if this pilot project is successful using the



BRAHMS Database, we could employ it for further use in other FBA material, such as the **Nigel Holmes Herbarium Sheets**. Making the Fritsch Collection more accessible is a prospect which we are very excited about.

**Dr. Elizabeth Haworth**  
FBA Fellow

**Dr. Brenda Leese**  
FBA Volunteer

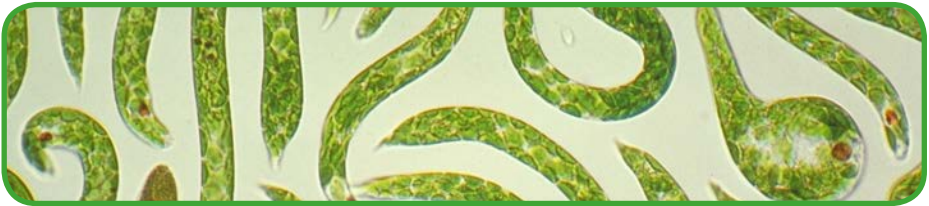


# Freshwater Algae of Cumbria

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## Upcoming Algal & Macrophyte Publications Abound

**The Freshwater Algae of Cumbria** began as a simple list of taxa prepared from my own notes and those found in the earlier publications pre-dating the formation of the FBA. It was intended for personal use but it was soon discovered that there also existed a large number of records that had not been published but were housed in the FBA's extensive archives. The list was therefore extended to include these. Eventually, with the help of Liz Haworth, we managed to include the diatom records and prepare a publication listing **all of the known freshwater algae from the county**. We hope that the resulting flora which includes a section detailing the history of algae collecting will prove useful to other algologists as well as researchers in environmental science. The flora is arranged taxonomically including details of first records, localities, and for some species ecological notes and details of the lakes/tarns from



which the species was recorded.

After completion of the above work I was asked to assist with the **Cumbria Tarns Project** of 2004-9. This project was initiated in 2003 through the Cumbria Wildlife Trust (CWT) Community Action for Wildlife programme. Its aim was to resurvey Cumbrian tarns that had been surveyed by Ralph Stokoe in the 1970's for their aquatic macrophytes (Stokoe, 1983) and to provide volunteers with experience in the identification of macrophytes and undertaking survey work. The first pilot surveys began in 2004 leading to the

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main survey period of 2005-2008 where more than 20 volunteer surveyors were involved with financial assistance from the SITA Environmental Trust and the Heritage Lottery Fund. Throughout the project, the Cumbria Wildlife Trust worked in partnership with the Freshwater Biological Association at Windermere, Natural England (formerly English Nature) and the Centre for Environment and Hydrology (University of Lancaster). With the assistance of



the Trust, we managed to access the original data collected from **370 Lake District** water bodies and prepare a new macrophyte flora using the format of the Stokoe article, allowing comparisons to be made between the two periods.

Both of these works are finished and are set for publication in **2019/2020**.

**Allan Pentecost**  
FBA Fellow

# Priority lake & river habitats

## A webpage helping to deliver England's biodiversity strategy

Priority habitats, listed under the UK Biodiversity Action Plan and embedded in English law under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, form a central pillar of UK commitments to the **International Convention on Biological Diversity**. The FBA has been working in close partnership with Natural England, as well as a wide range of other key partners and stakeholders, **to build a web space** dedicated to better understanding of England's biodiversity objectives for rivers and lakes. A critical component of the work is the development of a citizen science data portal, which will help to develop a clearer picture of where our most natural remaining rivers and lakes are, focused on smaller water bodies where there is currently very little information.



The work stems from extensive efforts to generate a more coherent conservation rationale for freshwater and wetland habitats, now embodied by 'A narrative for conserving freshwater and wetland habitats in England (NERRO64)' which can be found at <http://publications.naturalengland.org.uk>. This seeks to clarify the relationship between designated **wildlife site objectives**, **priority habitat objectives** and **Water Framework Directive (WFD)** ecological status objectives, highlighting the common aim to protect and restore natural ecosystem function (see Box on page 35). The narrative has been used as the basis for recently produced biodiversity

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guidance for the WFD catchment-based initiative (CaBa) which can be found at <https://bit.ly/2nTHhMb>.

Construction of the webpage started in earnest in Autumn 2018, following extensive stakeholder consultation over the design of simple survey methods for assessing the naturalness of river and lake habitats. The front end of the page is intended to provide a **one-stop shop** for partners, stakeholders and interested members of the public to understand how a priority habitat is defined and mapped and how to contribute to its protection and restoration. Links are provided to a wide range of organisations and local initiatives to promote join-up and increased levels of volunteer effort. The data portal (hosted by Cartographer) allows simple survey information on habitat naturalness to be entered electronically and then displayed on base maps in various ways.

A **test page** (available at [priorityhab.wpengine.com/](http://priorityhab.wpengine.com/)) was made available to key stakeholders in February 2019. The work was very well received and the detailed feedback has allowed us to make considerable improvements. At the time of writing, final refinements are being made prior to a public launch.

The FBA will continue to maintain the page under a memorandum of agreement with Natural England. At regular intervals, naturalness data will be harvested from the data portal and used to update the priority habitat maps for rivers and lakes that are embedded in a range of regulatory, management and planning processes across Natural England, the Environment Agency and local planning authorities.

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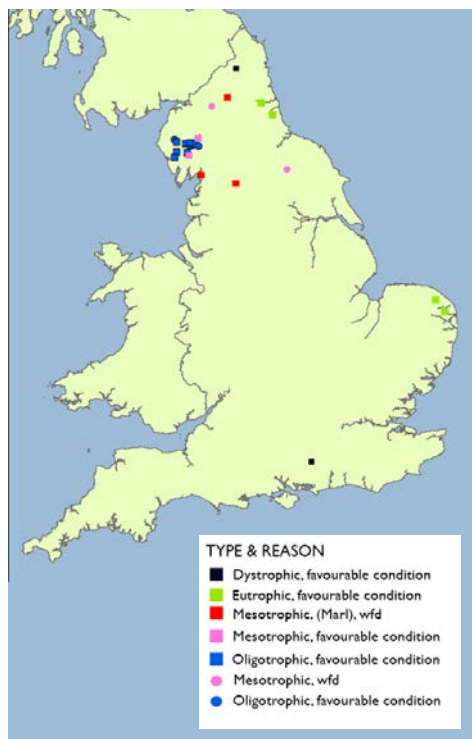
## Promoting Natural Ecosystem Function

*Naturally functioning freshwater and wetland habitat mosaics are of critical importance to all of our water-dependent species, providing an environment in which all of our native species, including rarities, are catered for in balance. Such systems also help retain water in catchments, releasing it slowly through pathways that store carbon and provide clean water to downstream areas in ways that help address flood risk.*

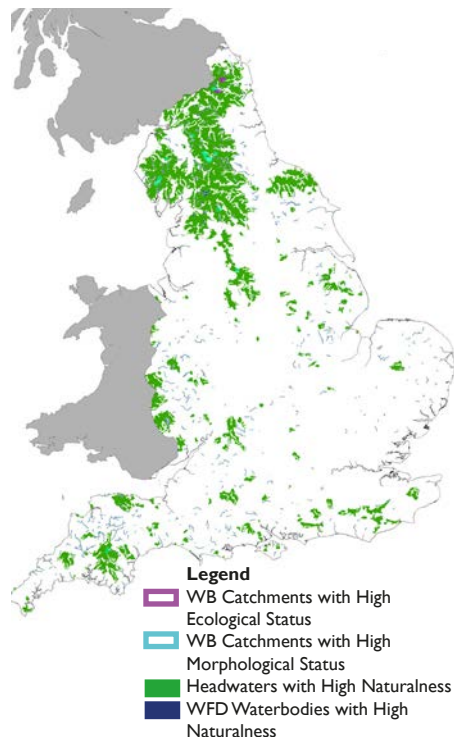


*Whilst our habitat resource in England has been greatly damaged by a wide range of pressures over many years, some very natural places still exist and there are plenty of opportunities even now to restore lost natural function in landscapes. Many of our best remaining examples are found in small headwater catchments that have escaped development, and many of these are not properly recorded or therefore protected.*

## Priority Lakes



## Priority Rivers



*The priority habitat maps for rivers and lakes in England seek to identify the most naturally functioning remaining examples of habitat, which serve to demonstrate the importance of natural function to our characteristic flora and fauna and the benefit of restoring that function in the wider habitat resource. The maps provide recognition for these sites, which helps to protect them against future damage.*





[www.fba.org.uk](http://www.fba.org.uk)