

# The Scientific Angler

**Robert Arlinghaus gives an insight into the work he and his colleagues are doing to put the management of recreational fisheries on a more scientific footing.**

**M**OST of the readers of this newsletter are fascinated by fish and are eager to unravel secrets about the ecology and evolution of fish populations. However, many fish "maniacs" have joined the fish biologist profession because they like fishing! Interestingly, despite the fact that millions of people fish for recreation feeding a multi-billion fishing industry, the scientific study of recreational fishing is poorly developed. In fact, it is in its infancy in many areas of the world. This is hardly understandable given the potential of anglers to negatively affect fish populations and entire ecosystems through overharvest, introduction of non-native fishes and potentially detrimental stocking practices. At the same time, however, anglers are

among the most important ambassadors of the fish biodiversity crisis. They are actively engaged in promoting fish conservation and management by fighting persistently and successfully for sustaining fish populations in the face of various anthropogenically induced threats. Adding to this picture, ethical challenges have recently emerged as recreational fishing is increasingly questioned on moral grounds by supporters of animal liberation and rights that are gaining momentum among certain segments of an urbanized society. Taken together, recreational fisheries constitute a complex and fascinating system that should be both relevant and fun to study. Recently, some research groups have indeed developed an interest,

which some might call it an obsession, for understanding the economic, social and ecological dynamics of recreational fisheries.

Our young research team, which I have the pleasure to lead, is an example of this development. Members of the lab (Fig 1) are ardent recreational fishing researchers who have produced a steady stream of papers on angling in recent years. Based at the Leibniz-Institute of Freshwater Ecology and Inland Fisheries and the Inland Fisheries Management Laboratory at Humboldt-University of Berlin, Germany, two senior scientists (Christian Wolter and myself), eight Ph.D. students, two post docs and several undergraduate and masters students have developed an innovative research program on recreational fisheries that bridges the traditionally deep rifts between the biological and social sciences. Its overall goals are to better understand recreational fisheries and move towards sustainable management and effective conservation of fish and recreational fisheries. We use an interdisciplinary approach to study recreational fisheries because we are convinced that a single field of study cannot solve the multifaceted challenges faced by contemporary recreational fisheries. To this end, the team members apply a variety of natural and social scientific methods to shed light on the biological, social and economic dynamics of recreational fishing. Methods come from disciplines as diverse as fisheries biology, behavioural ecology, population dynamics, evolutionary biology, stress physiology, quantitative genetics,



Fig. 1: Members of the Adapfish-Project at the most recent workshop in June 2007 in Berlin, Germany (left to right, Ben Beardmore, Robert Arlinghaus, Shuichi Matsumura, Carsten Riepe, Christian Wolter, Fiona Johnston, Malte Dorow, Silva Uusi-Heikkilä, Wolfgang Haider, Katrin Daedlow)

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empirical social sciences, resource economics, institutional economics and theoretical modelling. Some of the most visible work produced so far includes:

- impact of angling-induced stressors on the welfare and survival of individual fish
- behavioural and physiological determinants of angling vulnerability
- evolutionary changes induced by recreational fisheries
- socio-economics of recreational fisheries across urban-rural gradients
- social barriers to sustainable recreational fisheries management
- recreational fishers as conservation partners on a global scale
- models of recreational fishing participation globally
- ethics of recreational fishing

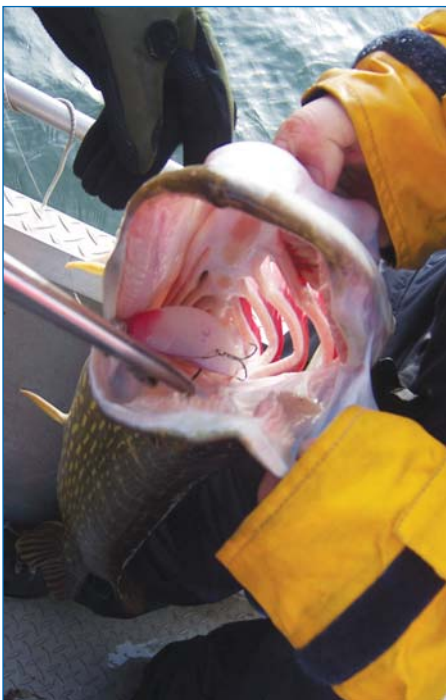


Fig. 2: Studies are mainly focused on piscivorous fish such as pike studying the impact of exploitation and the effect of catch-and-release on injury and survival.

As is already evident from this list, the team's research program is broadly structured with a *natural scientific branch* and a *social scientific branch*. Typically, however, research projects are pursued that emphasize the integration of natural and social sciences by focusing on the interaction between fish and recreational anglers on a landscape level. In the natural

scientific arena the research program has investigated the energetics, physiology, and behaviour of fish to unravel how individual fish and fish populations respond to recreational fishing and particular fishing practices such as catch-and-release fishing. Empirical insights are extrapolated to the population level by constructing theoretically-motivated life-history models. One emerging theme is to understand the potential of size-selectively operating anglers to induce evolutionary changes in life-history and other traits. More recently, the group has also studied the degree to which culling of large fish from fish stocks might have repercussions for long-term population development and angling quality, since large fish provide particularly high social value to anglers but at the same time constitute the more fecund individuals. Typically, predatory fish such as pike, zander or brown trout are used as research models for fishing experiments conducted in laboratory tanks, experimental ponds, and most commonly, field sites in the north-eastern German lowlands. Many of the studies conducted so far use modern technologies such as physiological telemetry, molecular biological techniques that facilitate the monitoring of behavioural and physiological attributes of fish and their individual fitness in field settings in response to recreational fishing exploitation.

The second major branch of the research program focuses on the so-called human dimensions of recreational fisheries. These are studied with a range of scientific methods from disciplines such as social psychology, ecological economics and geography. The main goal of the studies is to characterize and understand the behavioural dynamics, decisions, roles and impacts of regionally mobile anglers on the fisheries landscape. The behavioural rules of heterogeneous angler types are quantified by large-scale surveys applying theories from psychology and ecology such as theory of planned behaviour, optimal foraging theory and ideal-free distributions. Currently, using a rich data set on the behaviour of anglers members of the research group are constructing coupled social-

ecological models to study the economic and biological impacts of alternative management policies on a landscape level.



Fig. 3: Methods from biotelemetry are increasingly used to study the physiological and behavioural correlates of angling vulnerability. Here Ph.D. student Thomas Klefoth is trained in surgical procedures on a dead fish.

Some team members also investigate the decision-making processes that govern management decisions for freshwater fisheries by using qualitative interview techniques to identify the mental representations that anglers and fisheries managers develop about aquatic ecosystems. The idea is that these so-called mental models influence the kind of management intervention that is conducted under private fishing rights regimes that are characteristic for much of central Europe. Clearly, by understanding both the angler and the decision-maker, the essential elements of the recreational fisheries system, biological insights to protect and more sustainably manage aquatic biodiversity can be tailored more effectively by decision makers to influence the development of a sustainable fishing policy. Recently, the group has also launched a nationwide face-to-face survey to study the attitudes of the German public towards recreational fishing, particularly in the context of the contentious topic of fish welfare. This research was initiated because it is believed that public norms are the

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# EDITORIAL

As a learned society, the FSBI follows a long tradition, which arguably started with the founding in 1660 of the Royal Society at Gresham College, London. Unlike the Royal society, most other learned societies focus on one particular aspect of science and one could name a number such as the Geological Society and the Royal Astronomical Society. This last has more of a connection with the FSBI than you might expect. As the FSBI has no property, its Council has to find a location for its meetings. For many years, Academic Press in Camden Town provided space and a very good lunch for Council meetings. With the demise of that arrangement it has been necessary to rent space for the Council to have its meetings in. In the past few years we have used rooms belonging to the Linnaean Society, the Institute of Radiology and the Royal Astronomical Society. The first and the third of these institutions are housed in Burlington House on Piccadilly and their premises are ancient and redolent of history. As Felicity Huntingford recounts in her commentary on December's Council meeting, we met in the RAS's library, lined with ancient books from the 17th century on and including the very first volume of *Nature*.

The President drew my attention to a further connection between the FSBI and the RAS through one of her illustrious forbears. General Alfred William Drayson (1827-1901) was a

military surveyor who had a number of other expertises under his belt. Felicity draws my attention to his various activities, which were extensive and not confined to either surveying or astronomy. The following is a quote from the Biographical Notes published by the RAS.

"General Drayson wrote a number of stories, beginning in 1888 with *Sporting Scenes among the Kaffirs*, and following with *Among the Zulus*, *The Gentleman Cadet*, and many others. He published books on billiards and whist, on both of which games he was an authority.

As a military writer mention may be made of his work on military surveying, which had several editions and was used as a text-book. In his astronomical writings General Drayson went somewhat astray, in one of these he attributed what were really errors of observation to a gradual increase of the Earth's diameter; and in another he substituted a geometrical movement of the pole (which more or less accounted for the phenomena of recent years, but which was entirely empirical) for the orthodox precession, nutation, and change in inclination of ecliptic to equator which have a dynamical basis".

Not recorded in this extract but mentioned by Felicity is that General Drayson also went hunting for faeries in the New Forest with Conan Doyle.

Drayson was typical of many educated people of the 19th century,

with multiple interests in a wide range of intellectual and other pursuits. It was often true that this type of person was an expert in many of these areas as in those days, so much less was known.

Our main article in this *Newsletter*, very gratefully received by the Editor and written at short notice, by Robert Arlinghaus is an illustration of how current members of the FSBI are expanding the intellectual base of fish and fisheries biology. Like Drayson, Arlinghaus and his colleagues are drawing on a range of different disciplines to derive improved ways of managing and conserving angling and the fish stocks the activity exploits. Unlike Drayson, Arlinghaus and associates are operating at a higher level of synthesis by which they attempt to construct an holistic view of a significant human activity. In Drayson's day it was sufficient to be interested in a wide range of topics that were not necessarily related; for example billiards and military surveying. These days, we need to integrate our different interests to produce new perspectives on old problems.

Finally, may I wish all members of the Society a very Happy Christmas, Holiday or winter break.

Paul Hart  
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Next deadline for copy,  
1st February 2009

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ultimate drivers influencing the accepted future of recreational fishing. As these norms are not static, there is a need to study normative dynamics to a greater extent. For example the question as to whether and to what degree the public feels that anglers are "torturing fish for no good reason" as has been claimed by anti-angling groups.

The young research group does not work in isolation. A large network of international collaborations has been established to take advantage of specialised expertise needed for progressing particular projects. This allows the research program to be constantly inspired by new ideas and to apply the most suitable methods to address particular problems. By truly taking an interdisciplinary approach, rather than giving lip service to it, the entire



Fig. 4: The work of the group also involves the evolutionary effects of size-selective harvesting in a laboratory setting using model organisms such as the zebrafish. We see here Ph.D. student Silva Uusi-Heikkilä monitoring experiments.

research team can be sure of producing a comprehensive understanding of a prime example of a complex social-ecological system which is recreational fishing. But the work does not end with a scientific paper.

Instead, the team actively seeks to apply its scientific knowledge to practical fisheries management. Indeed, I have recently written the first Global Code of Practice for Recreational Fisheries. This policy document was developed for the European Inland Fisheries Advisory Commission at the FAO in Rome and is thought to lead the way to setting a basic global standard for best practice in recreational fisheries development, management and conservation.

Currently, the group is seeking new members to take part in a new project on the stocking of fish in angling waters. Please visit [www.adapfish.igb-berlin.de](http://www.adapfish.igb-berlin.de) where you can learn more about opportunities as well as find more details of everything else we do.

## Felicity Huntingford, President of the FSBI, reflects on the December Council meeting

The Council of the Fisheries Society of the British Isles held its 88th meeting on 1st December 2008, in Burlington House, Piccadilly in central London. We met in the library of the Royal Astronomical Society, an appropriately distinguished venue organised for us by the kind offices of Wiley-Blackwells and the Honorary Secretary, Brian Eddy. We welcomed four new Councillors, Ingrid Ahnesjö from the Department of Animal Ecology, Uppsala, Joanna Grabowska from the Department of Ecology and Vertebrate Zoology, Lodz, Vladimir Kováã, from the Department of Ecology, Comenius University, Bratislava and Ian McCarthy from the School of Ocean Sciences, Bangor. We also took the opportunity to record our thanks to the Councillors who retired this year, namely Anne Brown, Victoria Braithwaite and Pavel Jurajda.

Council meetings usually last for about 5 hours and include both elected and co-opted members. A rough calculation suggests that, over the years, Council members have dedicated some 8000 person hours to the Society; this translates into more than 50 EC person-months or more than four solid years of work. This calculation does not include time spent working for the Society between meetings, which all our councillors do, or time spent travelling. Nowadays this last is a non-trivial commitment, because Council has members from all over Europe, currently including the UK, Ireland, Poland, Portugal and Sweden. Making the necessary corrections, I estimate that, since the FSBI was formed, Council members have dedicated at least half of one lifetime of extremely valuable and expert time. Once again, I am impressed and hugely grateful for this dedication

We had a fair amount of business to cover, but got through this efficiently, thanks to the

Honorary Secretary, who by dint of persistent but tactful prompting, collected and circulated all the papers in good time and kept the President up to scratch. The report from the Honorary Treasurer, Gordon Copp, was an early item on the agenda. This summarising the Society's annual budget and the Treasurer reminded us that we have a carefully planned reserve policy to help us cope with the present credit crunch. It is very good to know that our affairs are in such safe hands. In terms of what the FSBI does with its money, we probably spend most on studentships, briefing papers and conferences.

The studentship scheme is one of our most important activities, allowing us to fulfil our mission of promoting fisheries science and fish biology through the training of gifted young researchers. This has been an extremely successful year and some of the highlights are described elsewhere in the *Newsletter* in a report from Iain Barber, who chairs the studentship committee. This year for the first time each of our new students has been assigned a member of Council as a mentor, who will be available to provide additional support and guidance where necessary. We hope that this will help to make PhD training of FSBI-sponsored students even more valuable and enjoyable.

Another way in which Council spends money in pursuit of the Society's aims is to commission Briefing Papers on topics of current interest, under the guidance of the Vice-President, Mike Kaiser. These papers are made publicly available through the Society's website, where they attract a considerable amount of attention; for example our most recent Briefing Paper, on the impact of climate change on fish populations in the British Isles, has attracted of total of 6542 hits between November 2007 and

December 2008. Another Briefing Paper, on introduced fish species, is currently under review and we expect this to be equally influential.

Council received reports from the organisers of the annual symposia for 2009 and 2010. The 2009 meeting, organised by Paul Hart who also edits this *Newsletter*, is on *The behaviour and evolution of sticklebacks: their contribution to Darwin's big idea* and will be held at the University of Leicester. The 2010, organised by Chris Harrod, is on *Fish and Climate Change* and will be held at Queen's University, Belfast. Organisation for both is in excellent shape and both offer delegates a really interesting programme. It looks as though the 2011 symposium will be on fish biodiversity and conservation, which is clearly a topic of considerable interest and concern.

Our symposia and the special edition of the *Journal of Fish Biology* in which the proceedings are published are important mechanisms by which the Society works to promote fisheries science and fish biology. FSBI members are encouraged to suggest interesting and timely symposium topics for the future. Still on the subjects of conferences, on behalf of the FSBI, Mike Kaiser organised a workshop at the 5th World Fisheries Congress in Yokohama, Japan on fish welfare and commercial fisheries; this was preceded by an e-conference on the FSBI website. A full report of this is given elsewhere in the *Newsletter*. Not surprisingly, given the complex and controversial issues involved, debate both electronic and in open forum discussion, was robust, but it was also constructive. A series of Brief Communications summarising the content and outcome of our discussions debate is in preparation and the plan is that these be published together in the *Journal of Fish Biology*.

# Michel Kaiser, FSBI VP reports on the Society sponsored symposium at the 5th World Fisheries Congress, Yokohama, Japan on *Fish Welfare in Commercial Fisheries*.

In September 2008 the FSBI hosted an e-conference that addressed the issue of fish welfare in commercial fisheries. The e-conference had five keynote contributions to which participants were invited to reply. The e-conference had 119 registrants, but of these only ten made a total of 42 contributions. We had expected a much more dynamic exchange of views through the on-line medium, and the apparent lack of response from the silent majority caused us some concern prior to the 5th WFC in Yokohama. The prospect of convening five keynote speakers at the 5<sup>th</sup> WFC to talk to an empty room was a worrying possibility that caused Felicity Huntingford and myself to think up 'plan B'. However, our worst fears were ill-founded and the day-long symposium attracted a consistent audience of between 25-45 people.

The keynote-speaker-only format worked extremely well and gave the speakers the opportunity to explore in-depth the key issues from their own perspective. Talks covered potential welfare bottlenecks in fisheries (Julian Metcalfe), aquaculture (Felicity Huntingford), recreational fisheries

(Robert Arlinghaus), and philosophy (J. Claude Evans and Peter Sandøe). The session ended with an open panel discussion that proved highly informative as a number of fishing gear and aquaculture technologists from the session next door joined the discussion and added insights into gear developments that have improved fish welfare in respect to discarded and escaping fish. Interestingly, within the audience, there was a representative from the Food and Agriculture Organisation who indicated that they were delighted we had addressed the issue as they were aware that it would need to be addressed either now or in the future. However the FAO currently has no mandate to examine fish welfare in more detail unless instructed by their member nations. We aim to publish a collection of Brief Communications in the *Journal of Fish Biology* that summarize each of the keynote speakers' points of view, together with an editorial and open paper that captures the contributions of those who attended the open panel discussion.



The Yokohama convention centre (sail shaped tower), venue of the 5th World Fisheries Congress 2008.



The FSBI Vice-President Michel Kaiser seeking inspiration in Tsukiji fish market in Tokyo.

## NOTICE

### FSBI to host 6th World Fisheries Congress 2012 in Edinburgh, UK.

In addition to running the Fish Welfare in Commercial Fisheries symposium in Yokohama, Felicity Huntingford and Michel Kaiser presented the FSBI bid to host the 6th World Fisheries Congress in Edinburgh. The professional portfolio produced by the Edinburgh Convention Bureau was a credit to the Society and the bid was warmly received. This means that the Society will have a busy four years in the run up to 2012. Our first task is to appoint a Professional Conference Organiser. Members of the Society who would like to become more closely involved in some aspect of the organisation should contact Michel Kaiser ([michel.kaiser@bangor.ac.uk](mailto:michel.kaiser@bangor.ac.uk)) who will brief you of the roles that will need to be filled.

**Inigo Everson attended the International Symposium on Ecosystem Approach with Fisheries Acoustic and Complementary Technologies, held in Bergen, Norway 16-20 June 2008**

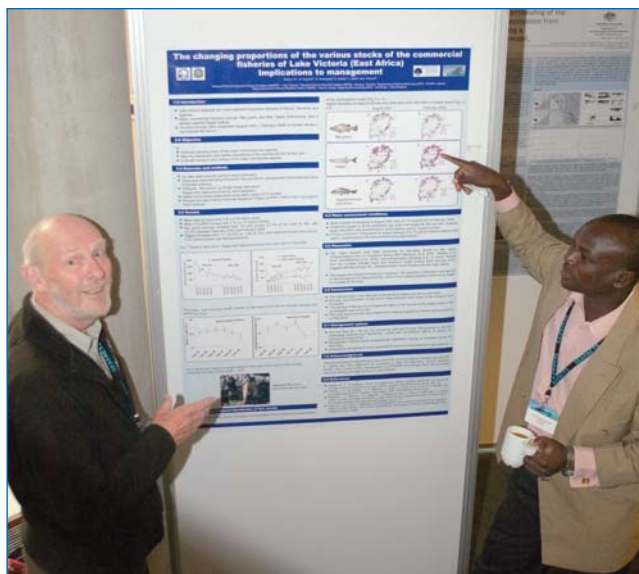
I should have expected music to be 'up front' for the opening of an acoustics meeting, but I didn't expect the symphony for 19 ship's horns composed and led by Ole Hamre. The Premiere, with the horns echoing from the hills surrounding Bergen, must have been spectacular. No less so was the performance in the Edvard Grieg Concert Hall which, for obvious logistic reasons, used video clips in place of the actual ships. Wow, what a start.

This was the latest in the series of fisheries acoustics symposia and drew together over 270 participants from more than 40 countries worldwide. With no parallel sessions (a good thing in my view) and strict adherence to the timetable the meeting seemed to flash by. Poster sessions were introduced by 'Summariser's Presentations' of one minute and one slide per poster; the poster slides had to have been submitted one week before the start of the meeting to give the summarisers a chance of knowing what to highlight.

I was there to introduce some work that I have been doing with colleagues from East Africa on acoustic surveys of the fish of Lake Victoria and as such was party to two poster papers (Everson *et al* and Munyaho *et al*). Fisheries on Lake Victoria are dominated by two introduced species, the large Nile perch (*Lates niloticus*) and the tiny dagaa (*Rastrine-obola argentea*) a small cyprinid. The fisheries for both have shown large fluctuations in recent years. I had several aims in attending, firstly to introduce the work that we have been doing on Lake Victoria and secondly to encourage collaborative links with what is becoming a very effective local fisheries acoustics group. More importantly I wanted to follow developments in the science and find out what might be applied to the Lake Victoria situation.

In this report I will concentrate on issues related purely to fish, the primary interest of the Society, although it must be understood that there are a number of other issues, such as habitat type and

invertebrate assessment, that are studied through acoustics and were raised in most sessions. Acoustic surveys are ideal for covering large areas in a relatively short time. The major downside is that the method only indicates that something has been present in the water column to cause an echo and not what might be the cause. Consequently there are difficulties associated with the identification of targets, a process that is reliant either on the analysis of the echo signals or else direct sampling using nets, neither of which is perfect. So it was interesting to hear how that problem was being addressed.



*Inigo and Taabu (National Fisheries Resources Research Institute, Jinja, Uganda) discussing one of their poster papers at the Symposium.*

The keynote paper in the session on 'Remote classification and identification' was given by Paul Fernandes from the FRS Marine Laboratory in Aberdeen and developed the concept of regression trees, whereby the data are analysed for frequency dependence allied to echotrace classification so as to provide an objective method for species allocation. Such an approach has enormous merit because it can be 'tuned' by subsequent experience and refinements added whilst at the same time taking out the problem of observer bias when examining echocharts. That was only a 'taster' as in a session on 'Data quality and integration' extensions of the process came out in presentations from Jacques Massé (IFREMER), always an entertaining speaker, on the evolution of schooling patterns of fish in the Bay of Biscay and Pierre Petitgas on combining acoustic and egg survey data as a means of quality control. Pierre's approach is to

look at patterns between surveys rather than at the very fine scale of individual echotraces. He used a statistical process to monitor the index of inter-annual variation in fecundity from egg surveys, and to relate this to the abundance of the key fish species surveyed acoustically. All this was food for thought for myself in trying to separate out at least some of the small fish taxa of Lake Victoria.

Having been to the Fish Stock Assessment in Lakes and Rivers symposium, organised by Jan Kubečka last September, I was interested to 'compare and contrast' work in marine and freshwater environments. Jan's presentation, even though it included 'large-scale' in the title brought home the differences associated with scale. Shallow in freshwater often means less than the two metres of the headline height of a frame net. In freshwater sideways looking systems allied to ingenuity are the order of the day. Contrast that with the marine environment where advanced technology is providing greater insights into the distribution and behaviour of fish on a number of fronts. A colleague wryly pointed out the other scalar difference between the marine the freshwater habitats, that of money!

The snapshots I have mentioned here only give a flavour of the work that was on show. The symposium was very well organised with a full and

attentive audience at plenary sessions and a lively buzz of conversation in the intervals. I am extremely grateful to the FSBI, through the Travel Grants Committee, for providing support to attend the meeting. The next step is to take forward the knowledge gained as we seek to apply acoustics to the quantification of key Lake Victoria taxa as we try to build ecosystem models.

References:

**References:**

Everson, R. Kayanda, A.M. Taabu (2008) Splitting the echoes in Lake Victoria, dividing the signal between the target species. Poster Paper  
 Taabu, A.M., Kayanda, R., Tumwebaze, R., Getabu, A., Sitoki, L., Everson, I. (2008) The changing proportions of the various stocks of the commercial fisheries of Lake Victoria (East Africa). Implications to management. Poster Paper.

**Dr Peter D. Dijkstra, a post-doctoral fellow at the University of Glasgow, UK, attended the International Society for Behavioral Ecology meeting at Cornell University in the USA during August 9th-15th, 2008.**

The travel scholarship allowed me to give an oral presentation at the conference titled "Female territorial behaviour and colour polymorphism maintenance." The talk focused on work I have done during my PhD and Postdoc project on the role of female aggression in stabilizing a colour polymorphism in the cichlid fish *Neochromis omnicaruleus* from Lake Victoria. Presentations covered a variety of topics ranging from colour evolution in the damselfly to the interplay between male-male competition and mate choice in sticklebacks. During the trip I had the opportunity to discuss collaborations with researchers from Austin in Texas on unraveling the molecular underpinnings of phenotypic variation in cichlid fish. In addition, I networked with people who are working on very similar topics as me, such as comparing immunocompetence between fish colour morphs and pleiotropic expression of colour with behaviour. I would like to thank the FSBI for their generous support, which allowed me to attend such an interesting and worthwhile conference.

**Karen de Jong, a PhD-student at the Norwegian University for Science and Technology, Trondheim, Norway, also attended the 12th International Behavioral Ecology Congress in Ithaca (NY), USA.**

This years ISBE was one of the largest and most well organised conferences I have been to. The time-schedule was held to very strictly, which made it easy to switch between concurrent sessions and see precisely those talks that were of most interesting to me, both professionally and personally. The time allowed for social breaks and poster sessions was sufficient to create a relaxed atmosphere in which I was able to approach people working on similar subjects and discuss their and my work quite extensively. This was especially important, because such a different group of people attended here than at previous ISBE meetings held in Europe, which gave me the opportunity to meet people I would not easily meet in person otherwise.

Many of the talks were held by young

researchers and presented new and interesting findings in all fields of behavioural ecology and the time allowed for discussion was generally enough to go a bit beyond single questions. My own presentation entitled: "OSR, density and mating behaviour: Insights from the two-spotted goby" was received well and the resulting discussion afterwards was both interesting and enjoyable. I am convinced this conference greatly enriched my view on both my own data and the whole field of behavioural ecology, so I would like to thank the FSBI for the support they provided that made my attendance to this very interesting conference possible.

**Rebecca Moran from the School of Biological Sciences, University of Liverpool reports on her trip to attend the American Fisheries Society's Annual Meeting in Ottawa from 17th-21st August 2008**

I chose to attend and participate in the American Fisheries Society's annual meeting in Ottawa as it included a day-long symposium on the response and adaptation of fish and fisheries to climate change. This topic had been lacking in some of the other conferences I had considered attending, which was surprising considering the temperature-sensitive nature of ectothermic fish.

A major objective of my PhD has been to investigate the individual and combined effects of realistic scenarios of warming and nutrient loading on a fish species with a high tolerance of warming and hypoxia, the three-spined stickleback. The work was part of a large experiment on the impacts of climate change funded by the European Union FP6 programme, Eurolimpacs.

At the conference, I spoke about my fieldwork, which was carried out at the University of Liverpool's Ness Gardens on the Wirral peninsula where I monitored replicated populations of three-spined sticklebacks living in specially constructed outdoor mesocosms, which comprised complete pond ecosystems. These populations were exposed to combinations of temperature (ambient and ambient + 4°C) and three nutrient treatments and were monitored over a 16-month period. The final harvest of fish populations showed that heating significantly reduced the stickleback populations as did nutrient addition. A combination of nutrients and heating resulted in the total loss of the stickleback populations. These results were mainly attributed to the increased

frequency and severity of hypoxia in heated and nutrient supplemented mesocosms leading to fish kills. As the nutrient levels in the experiment were based on levels currently entering lowland freshwaters and the temperatures on climate change predictions for the next century, the impacts I observed are likely to reflect those that will occur in the coming decades in our freshwaters. In the UK, the few species that are tolerant of extremes of temperature and oxygen are introduced species such as the common carp which is widely stocked in freshwater for angling purposes. This species is already known to reduce macro-invertebrates and water plants with associated loss of water birds. With native biodiversity already under threat from the conditions climate change will produce, the removal of habitat by these voracious feeders is likely to exacerbate their decline.

I feel that studies such as this, on the ecological response of fish to environmental perturbations, helps provide mechanistic understanding of the threats to fish, and hence fisheries and the work was well received at the conference. Some of the other presentations in the symposium highlighted the impacts of climatic change on various aspects of fish phenology and populations. Specifically, a great deal of work has concentrated on investigating the impacts of climatic change on salmon fisheries. I found the talk on the Spanish 'campanu' where salmon have been returning later and with lower body mass both interesting and worrying.

In general I found the scope of the conference extremely broad ranging and enjoyed having the chance to expand my knowledge of fisheries science. Being able to discuss my work in depth with people working in a similar field was particularly useful and I made a lot of new contacts. I am extremely grateful to the FSBI for awarding me a travel grant and providing me with the opportunity to present my work at such a high standing international conference.

# NOTICES

## FSBI PhD studentships competition – deadline for applications 16th January 2009

The annual competition for FSBI funded PhD studentships is now open. For further details regarding eligibility criteria, funding, guidelines about the types of project that will be considered and a downloadable application form, please refer to the FSBI's studentship webpage <http://www.fsbi.org.uk/studentships.htm>.

The online advertisement can be accessed at [http://www.jobs.ac.uk/jobs/KH146/PhD\\_Studentship\\_Competition/](http://www.jobs.ac.uk/jobs/KH146/PhD_Studentship_Competition/)

The closing date for applications is **16th January 2009**.

Selected applicants will be interviewed in mid-February.

Informal queries about application submission may be addressed to Christine Norgrove ([christine.norgrove@martjohn.com](mailto:christine.norgrove@martjohn.com)), with subject-related queries directed to the Committee Chair, Dr. Iain Barber ([ib50@leicester.ac.uk](mailto:ib50@leicester.ac.uk)).

## Beverton and FSBI Medals for 2009

Members are encouraged to submit nominations for the Society's two medals. The Beverton Medal is for career-long contributions whilst the FSBI medal goes to up and coming fish biologists under 40. See the Society's web page at

<http://www.fsbi.org.uk/info.htm> for forms and further instructions. Nominations should be sent to the Honorary Secretary by the end of January 2009.

## Nominations for new Council members

A number of Council members will come to the end of their terms at the Summer AGM, which will be held on Wednesday 15th July 2009 at the Leicester summer symposium. Members are encouraged to nominate candidates for Council membership. Please send names to the Honorary Secretary.

## Wynne Wheeler post retirement research grant

For those of you approaching retirement but with the energy and desire to continue with your research, the Wynne Wheeler research grant could be just what you are looking for. See the Society's web pages for more detail.

**AND** – don't forget the FSBI Annual Symposium 13th-17th July 2009 in Leicester. We've had 85 abstracts submitted by the deadline so there is every prospect of a dynamic meeting. See the Society's website for details of registration.

## Recently successful FSBI PhD students

The last few months have seen a flurry of thesis submissions from FSBI-funded PhD students, and three have successfully passed their PhD vivas.

**David Boyle** (King's College London, supervised by Nic Bury) passed his viva on 29th July 2008. His thesis was entitled *Metal bioavailability in natural diets: Toxicological implications for fish*. David has recently taken up a research scientist position in the seafood safety research group of the National Institute for Nutrition and Seafood Research (NIFES) in Bergen, Norway. A key paper to arise from his research has also recently been published (Boyle, D., Brix, K. V., Amlund, H., Lundebye, A-K., Hogstrand, C. & Bury, N. R. (2008). Natural arsenic contaminated diets perturb reproduction in fish. *Environmental Science & Technology*, **42**, 5354-5360).

**Nick Graham** (Newcastle University, supervised by Nicolas Polunin) passed his viva on 5th September 2008. His thesis was entitled *Effects of coral bleaching on coral reef fish assemblages*. Nicholas published a remarkable number of papers during his PhD and he has recently started a 3-year post-doctoral research fellow position at the ARC Centre of Excellence for Coral Reef Studies at James Cook University, Townsville, Australia on the 1st October 2008. To date, Nick's PhD research has led directly to five papers, including a paper in the high-impact journal *Conservation Biology* (Graham NAJ, Wilson SK, Jennings S, Polunin NVC, Robinson J, Bijoux JP, Daw TM (2007) Lag effects in the impacts of mass coral bleaching on coral reef fish, fisheries, and ecosystems. *Conservation Biology* **21**: 1291-1300).

**Joel Kimber** submitted his thesis entitled *Elasmobranch electroreceptive foraging behaviour: male-female interactions, choice and cognitive ability* on 30th September 2008 and successfully defended his thesis on 5th December. Joel is busy writing up papers from his thesis, and has one paper currently under review at a leading animal behaviour journal (Male-female interactions affect foraging behaviour within groups of small-spotted catshark *Scyliorhinus canicula*). Joel is currently looking for postdoc positions.

*We send our warm congratulations to all of these students on their remarkable achievement, and wish them well for their future research careers.*

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