fsbi
An International Society for Fish Biology
Summer 2016

Charlotte Blackburn, an FSBI Intern, reports on experiments using mirrors to reflect fish personalities

In Lake Massoko, Tanzania, a population of sexually dimorphic cichlids, thought to be descended from the riverine species *Astatotilapia calliptera*, appears to be diverging on a habitat axis. There are two genetically differentiated male phenotypes (or "ecomorphs"), a yellow-coloured "littoral-type", and a blue-coloured "benthic-type". This appears to be an exciting model system for the study of speciation and the first paper on them appeared in *Science* in December 2015, featuring several co-authors from the team I was working in at Bangor (Malinsky *et al.* 2015). A series of recent field observations have indicated these fish only appear to show a distinct habitat preference during the breeding season, in which the wider-ranging littoral-type males inhabit the top 3-4m of water, and the benthic-type males defend smaller, rocky territories below the thermocline (approximately 19m in depth). Observations of these two behavioural phenotypes under laboratory conditions are therefore necessary in order to better understand the history and direction of their apparent divergence.

In 2015 I took part in the FSBI's summer internship scheme, supervised by Dr Alexandra Tyers at the University of Wales, Bangor. For my undergraduate dissertation, I carried out a pilot study investigating the mate choice behaviour of both wild-caught and first-generation laboratory-bred Massoko females, when presented with two males – one a yellow littoral-type, and one a golden ancestral-type *A. calliptera*.

The FSBI internship allowed me to pursue my research further, this time exploring the use of mirror tests as a method of measuring male aggression, and investigating potential differences in extraversion between the two phenotypes.

Experiment 1. Mirror Test

When studying conspecific male aggression in the aquaria, much time can be spent organising the focal fish into closely matching pairs; it is quite unlikely to find a pair of fish that are exactly the same size and weight. Appropriate tank set ups must also be constructed in order to keep these males isolated from each other during experimental trials. As these methods and materials form an integral part of cichlid behavioural research at Bangor, there is a need to explore more easily implemented alternatives, such as mirror testing. However, recent research has suggested that some fish species may respond differently to their reflection as they would to a conspecific. My pilot study aimed to discover any indication of the Lake ➤

Lake Massoko, Tanzania

Massoko cichlids differing in their behavioural response to their reflection, as opposed to a conspecific. I hypothesised that there would be no significant difference between the behaviours displayed by the Lake Massoko cichlids when presented with either a conspecific, or their reflection.

Experiment 2. Exploration

The study of personality, or "behavioural syndromes", proposes 5 key personality factors: openness to experience, conscientiousness, agreeability, extraversion, and neuroticism. The number of fish species studied in the field of animal personality research is relatively small in comparison to other classes. My second pilot study aimed to investigate the personality of the Lake Massoko male morphs, at the population level, in order to identify any possible patterns relating to their potential divergence through habitat preference during courtship. The specific personality factor investigated in this experiment is extraversion, studied through differences in exploration/avoidance behaviours between both phenotypes, when presented with a novel environment. Based on the idea that the benthic-type males are the derived phenotype, I hypothesised that the littoral-type males would show significantly higher levels of exploratory behaviour compared to benthic-type males when presented with a new environment.

With guidance from my supervisor, I designed and set up two tanks, each involving the use of a sliding opaque partition and a small plant pot from which each male could base his territory. The experimental procedure involved five trials, the first two took place in the Mirror Test tank, and the last three in the Exploration tank. Each male was the focal male of the experiment for four days consecutively.

The golden ancestral type *Astatotilapia calliptera*

The blue benthic ecomorph

The pelagic ecomorph

Experiment 1.

The results of Trials 1. and 2. were non-significant – indicating, theoretically, that mirror-testing may be a valid method of measuring aggression in this population of cichlids. However, there were some noticeable differences in the frequency of certain aggressive behaviours displayed in response to a mirror, when compared to a conspecific, across both ecotypes. Hesitative behaviours observed during filming, and the absence of the "quiver" display in every mirror

test conducted in Trial 2. could be potential population-level indicators of an early-stage discrimination between a conspecific and a reflection. However, further study into these individual behaviours, and the frequency at which they occur, is required before any firmer conclusions can be drawn.

Experiment 2.
Littoral-type males were shown to travel significantly further on average than benthic-type males when exploring a novel environment. Recent field observations have suggested littoral-type males spend less time defending smaller territories, and more time defending potential mates, which may involve covering larger distances. However, it could be that these males simply hold much larger territories than their benthic-type neighbours. Whilst the hypothesis cannot be fully accepted, this individual result indicates that perhaps, with a larger sample size, the differences in the other four measurements recorded may also become significant.

In summary, the above research has provided a promising basis for future investigations into the validity of mirror testing as an alternative method for measuring conspecific aggression in the cichlid population currently held at Bangor University. Furthermore, the significant result of Experiment 2. suggests that personality is a factor that may play more of an important role in the divergence of this population than previously thought.

This work has been followed up through a 3rd year project by another undergraduate student. This has shown significant differences among benthic and littoral ecomorphs both in exploratory behaviour (benthics were consistently more prone to explore) and in aggression (benthics were significantly more aggressive to mirror images). With both these results and mine, there is an issue that the lab-bred fish belong to relatively few families. It is planned that a PhD student will repeat these experiments with wild-caught fish. The research group leader (Prof. Turner) has also developed a novel model of sympatric speciation based on behavioural personalities building from the work I started.

I would like to thank the FSBI for giving me the opportunity to carry out this research, and I hope that this article will encourage more potential interns and supervisors to get involved in the internship scheme.

Malinsky M, Challis R, Tyers AM, Schiffels S, Terai Y, Ngatunga BP, Miska EA, Durbin R, Genner MJ and Turner GF (2015) Genomic islands of speciation separate cichlid ecomorphs in an East African crater lake. *Science*, **350,** 1493-1498.

A section of Google Maps showing the location of Lake Massoko as the red marker

Editorial

Like Inigo Everson, I had never heard of a Hackathon before this year. What brought the event to my attention was not Inigo's article but a stream of Tweets about a Fishhackathon that took place in Bergen, Norway. The organizer of this Dorothy Dankel was very active in sending out Tweets during the build up to the event, recounting what was happening during the event and who won. Until Inigo sent his article I had no idea that similar events were happening all over the world. The idea of a group of fishery scientists and computer people sitting together for a weekend trying to solve a problem is brilliant although from my cursory study of the topics tackled, they tended to focus on the consumer end of the fishery process, as described by Inigo.

The idea of getting together a group of people with different skills to solve fishery problems is not new. In his book *Adaptive management of renewable resources* published in 1986, Carl Walters at the University of British Columbia, Canada, described sessions in which computer programmers, fishery scientists and fishers would get together to build and explore models of particular fisheries issues. The book was written before powerful laptops were available so organizing and running workshops of this nature required more planning and the involvement of a wider range of technical participants. In addition of course, the organisers and participants could not Tweet about the workshop so only those attending would know about it. Although Tweeting has led a number of well-known people to broadcast stupid and hurtful comments, at the professional level, the medium does allow one to keep up with what is going on in the world of fish biology even if stuck in an office.

This edition announces the medal winners for 2016 and I would just like to add my congratulations to the three: Lennart Persson (Beverton Medal), Julian Metcalfe (LeCren Medal) and Steve Simpson (FSBI Medal). It would also be remiss of me not to also congratulate Leicester City Football Club for winning the English Premier League!

Paul Hart
Leicester, May 2016

Next deadline: 1st August

Inigo Everson reports on his judging experience with Fishackathon 2016 held in London, UK

The name of the good friend who had recommended me, indicated that the invitation was probably not a hoax and a quick web-search highlighted 'hackathon' as a term new to me. It is a computer coding and other technology intensive event that takes place over a weekend. At the hackathon, developers, designers, project managers and subject experts come together to create applications and tools for key issues. Fishackathon was first established in 2014 by the US State Department, under the leadership of Secretary Kerry, to bring together volunteer coders to create tools to address challenges in sustainable fishing around the world.

Over 500 participants worldwide signed up for the 3rd annual Fishackathon which took place on Earth Day weekend, from April 22-24, and comprised a Friday evening event launch at each of over 40 locations worldwide followed by a 24-48 hour 'hackathon' ending on Sunday. The London Fishackathon was hosted by 'The Economist' magazine at its Canary Wharf office. I was invited along as one of the judges by the US embassy in London.

Given that sustainable fisheries is an issue that has been taxing the minds of many experts over a number of years, the task was daunting. Participants were introduced to nine questions, each supported by a case study, after which they joined up in groups to work through one of the chosen problems. During Saturday there were a number of 'Lightening Talks' from invited ocean, fisheries and technical experts, including myself, to provide some practical background for the participants, most of whom had no previous knowledge of fisheries issues. Although the audiences were ➤

small, the talks were streamed so that participants could follow proceedings whilst developing their solutions. All hectically calm.

On Sunday afternoon came the moment of truth, when each of our seven teams presented their solutions for assessment by the five judges, including myself. Ingenuity, dogged determination and team spirit all came to the fore as unexpected presentational difficulties associated with a dress rehearsal, no time for that, were coerced into a smooth premiere performance. Judging was difficult because all presentations had elements of quality but three were highlighted by all five judges. As it happened, they all addressed the problem of mislabelling of fishery products and the desire for traceability from capture to plate. Identifying whole fish is difficult enough, but made even more difficult with fillets or other processed products. Although it's obvious that DNA testing can provide answers, the downside of that approach is that, with current technology, this cannot be at a speed commensurate with the timely processing of perishable cargos.

Our chosen winners adopted the novel approach of using Infra-Red Spectroscopy since, from some very newly published papers, they considered that each species would likely possess a unique IR spectrogram. If that were true then samples could be checked quickly with a simple, relatively inexpensive, hand held device. Frantic web searching during the half hour deliberations of the judges brought to light a couple of recent papers to indicate that the scheme might work. We decided that this was too good a chance to be missed so they won the prize.

Prior to the event I had doubted that anything significant to resolve the key issues would come to light. In that assumption I was wrong and, not for the first time, I learnt the value of interdisciplinary co-operation. For me it was an exhausting weekend during which I learned a great deal. Obviously fisheries issues were to the fore but other topics, most notably the role of women in science, received a rousing, tub-thumping, and in my view wholly justifiable, rendition. Apart from the free interchange of ideas, so central to scientific progress, there was the revelation to me that the participants were not a bunch of geeks communicating solely in grunts and groans, but normal, at least for scientists, people. Consequently I look forward to the next Fishackathon, perhaps on my home patch at UEA. There are financial prizes after all!

If you want to know more try: http://www.fishackathon.co/faqs/. But then I guess that if you've read this far you will already have done that.

Inigo Everson, Hon Prof ENV

The London Fishhackathon was organised by Charles Barber, Vice President, PR & Thought Leadership at The Economist
The event was sponsored by Client Earth, the London Aquarium, MCB Seafoods, Virgin, World Animal Protection and Young's Seafood.

Prizes: Global Winner= USD 10,000, London Winner = GBP 2,000 plus a digital subscription to The Economist for each member of the winning team (The subscription was extended to all participants).

Team of Judges: Kristian Teleki, Senior Marine Adviser for the Princes Trust, Miranda Johnson, Environment correspondent, The Economist, Inigo Everson, University of East Anglia, Dr Dougal Goodman, CEO, The Foundation for Science and Technology, Gen Ashley, Women Who Code.

Inigo Everson (right) talking to the event organizer Dougal Goodman

From left to right: Dr Dougal Goodman, Miranda Johnson, Dr Kristian Teleki,Gen Ashley Professor Inigo Everson

FSBI Travel Grant Reports

Kate St John Glew at the Southampton University Marine Isotopes & Ecology Lab obtained an FSBI Travel Grant to help with travel costs to carry out a 5 month research placement at the National Institute of Water and Atmospheric Research (NIWA) in New Zealand, and to attend the 10th International Conference on the Applications of Stable Isotopes to Ecological studies (IsoEcol 2016) in Tokyo, Japan.

Kate reports: I spent the past 5 months working at the Stable Isotope Lab at NIWA, New Zealand. During this placement I was involved in various isotope projects and I learnt a new laboratory technique, which will be extremely useful for my PhD data analysis and for my career in isotope ecology.

This experience allowed me to work alongside experts in my field, gain a greater understanding of the uses and implications of my research, as well as exploring how techniques used in the UK can be transferred to different regions, and gain new knowledge and practical skills. New Zealand was also a fantastic place to live for 5 months and I thoroughly enjoyed exploring and making use of living somewhere so beautiful.

On my way back to the UK, I was also fortunate to attend and present at the 10th International Conference on the Applications of Stable Isotopes to Ecological studies (IsoEcol 2016) in Tokyo, Japan. IsoEcol is a biannual conference bringing together isotope ecologists from across the globe, studying different ecosystems and using isotopes to answer a magnitude of ecological questions. I gave an oral presentation titled "Marine animal assignment to UK shelf sea isoscapes" where I discussed the process of creating isoscapes (maps of isotopes), geolocating different marine animals to their foraging locations within this environment and discussing the implications and current limitations of this method.

This was a really useful opportunity to discuss my research with world experts and receive advice and valuable suggestions on possible developments and improvements. It was also a fantastic opportunity to gain further contacts for future research both during and following my PhD. The conference was not all work, we also had the opportunity to explore the beautiful scenery, taste amazing food and experience both the traditional culture and modern quirkiness of Japan.

I would like to thank the Fisheries Society of the British Isles for awarding me a Travel grant and allowing me to experience this amazing opportunity.

Notices

Society medal winners 2016

Beverton Medal: Professor Lennart Persson (Umeå University, Sweden).

The medal is awarded to a distinguished scientist for a lifelong contribution to all aspects of the study of fish biology and/or fisheries science, with a focus on ground-breaking research.

Le Cren medal: Dr Julian Metcalfe (Cefas Laboratory, Lowestoft, UK). This medal is

awarded to one or more individuals who have made a lifelong contribution to all aspects of the study of fish biology and/or fisheries science, with a focus on conservation, training or public understanding of the discipline.

FSBI medal: Dr Stephen Simpson (University of Exeter, UK). The medal is awarded to younger scientists who are deemed to have made exceptional advances in the study of fish biology and/

or fisheries science in recognition of their achievements.

AGM of the Society

The Society's Annual General Meeting will take place on Wednesday 20th July at 12:00-13:00, in the Pontio Arts & Innovation Centre (5th Floor), Bangor University, Wales, UK. ALL MEMBERS ARE WELCOME AND ENCOURAGED TO ATTEND. ➤

Final Announcement and Call for Registration

Fish, Genes and Genomes: Contributions to Ecology, Evolution and Management
FSBI Symposium
Bangor 2016

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FSBI INTERNATIONAL SYMPOSIUM 2016

Bangor University, North Wales, UK 18-22 July 2016

Fish, Genes and Genomes: Contributions to Ecology, Evolution and Management

Registration deadline: 20th June, 2016

Symposium Venue: Pontio Arts and Innovation Centre (5th floor), Bangor University, UK

- Genomics of adaptation
- Evolutionary change in wild populations
- Life history, physiological and behavioural diversity
- Genetics of species interactions
- Genetics of resilience
- Genetic management of exploited populations
- Fish, molecules and policy
- Genetics and aquaculture
- Genomics of speciation and macroevolution
- Conservation genomics

Invited Speakers:

Robin Waples USA
Dorte Bekkevold Denmark
Louis Bernatchez Canada
John Casey UK/Italy
Jennifer Ovenden Australia
Craig Primmer Finland

Registration open from: Monday 18 July 16.00-20.00, 5th Floor Pontio
Opening Session: Tuesday 19 July 09.00 - 09.30, 5th Floor Pontio Lecture Theatre
Science Sessions: Tuesday 19 July 09.30 - Friday 22 July 13.00

Symposium activities include: Young Scientists Publication Workshop (Wiley), Exhibitions from Leading Sponsors and Publishers in Genomics, Aquatic Biology and Evolution

Range of Social Activities include: Welcome Reception, BBQ and Banquet

Symposium contact and enquiries:
fsbi2016@bangor.ac.uk
follow us on twitter: @FSBI2016
http://www.fsbi.org.uk/conference-2016/symposium-theme-2/

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Ray Hilborn to be awarded the 2016 Fisheries Science Prize

The International Fisheries Science Prize Committee of the World Council of Fisheries Societies has awarded the 2016 International Fisheries Science Prize to Professor Ray Hilborn in the School of Aquatic and Fishery Sciences at the University of Washington. Professor Hilborn has had an extremely impressive career of highly diversified research and publication in support of global fisheries science and conservation. Throughout his 40-year career, Ray has been a model of dynamic and innovative science, and in the application of this work to the ever-changing problems of fisheries management and conservation in both marine and freshwater ecosystems. Professor Hilborn's Prize will be awarded at the World Fisheries Congress in Busan, South Korea in late May.

Information Desk

For all membership enquires (except subscription payments), including grant application submissions, please contact the FSBI office at:

FSBI, c/o Charity & Social Enterprise Department, Brabners, Horton House, Exchange Flags, Liverpool L2 3YL, UK

Contact: Shirley Robinson

Phone: +44 (0) 151 600 3362

Email Enquiries: grants@fsbi.org.uk

In the UK and Europe subscription enquiries should be addressed to:

admin@fsbi.org.uk Charities and Social Enterprise Department, Brabners, Chaffe Street, Horton House, Exchange Flags, Liverpool L2 3YL

Tel: 0151 600 3000 (ext. 3362)

Fax: 0151 227 3185

See http://www.fsbi.org.uk/membership/joining-the-fsbi/ for further information.

Secretary: Dr John Pinnegar

Centre for Environment, Fisheries and Aquaculture Science, Lowestoft Laboratory, Pakefield Road, Lowestoft, Suffolk, NR33 OHT

Tel. +44 (0)1502 524229 Fax. +44 (0)1502 513865 Mob. +44 (0)7747 606287
E-mail: Secretary@fsbi.org.uk

www.fsbi.org.uk