

Winter 2016

The view from Brazil

Paulo dos Santos Pompeu who works in the Biology Department of the Federal University of Lavras, Brazil and is the FSBI's South American representative asks: *What is going on in the South American fish world?*



Land use change, forest degradation and major infrastructure development are resulting in pervasive changes to tropical ecosystems around the globe. However, the scientific knowledge on the freshwater fish fauna is incomplete, and human-induced changes remain poorly understood and may be underestimated. This situation is likely to be more critical in South America, where fish species composition is still very poorly known for most river basins,

and the landscapes and rivers are under great pressure from intensive and rapid development.

In South America, the Amazon River basin is the largest in area and discharge, being responsible for 1/5 of the world's freshwater that reaches the oceans. The basin is the most biodiverse in South and Central America, which in turn has the most diversified freshwater fish fauna in the world, with current species richness estimates standing above 9100 species. In this context, a

Fisheries boat on the River Amazon

significant part of the studies developed on the continent have still focused on describing new species (over recent years more than 100 new species have been described annually). Moreover, several studies have tried to better understand the effects of different land uses and hydropower production on the fish fauna.

In general terms, the responses of tropical fish fauna to land use ➤



Fish sampling in a floodplain (Pandeiros River) located in a savanna area in southeast Brazil

◀ changes are similar to those of temperate streams, because key processes are governed by similar hydraulic mechanisms. However, the specific nature of such relationships may be different in tropical regions characterized by recent deforestation, rapid increases in mechanization, and high levels of river fragmentation from poorly planned infrastructure developments. In the Amazon, recent studies have mainly focused on the effects of forest replacement by pasture and different monoculture plantation, and on the possible benefits of

forestry management by reduced-impact logging. Meanwhile, studies conducted in the more populated southern areas, have focused on the effects of urbanization and intensive agriculture, like sugar cane plantation, on the aquatic biota.

The effects of hydropower plants on the migratory fish fauna have also received attention. Although few South American species migrate long distances, they are the most important for commercial and artisanal fisheries because of their larger size, abundance and market value.

Fisheries management in South America has been based on stocking, fisheries' harvest limits and construction of fish passes. However, the low yield of fisheries, the precarious conservation status of native populations in southern and southeastern Brazil, and the significant reduction of migratory species clearly indicate that these strategies are not satisfactory. Understanding the reason for this failure is critical, since the Amazon region is experiencing an unprecedented boom in construction of hydropower dams. These projects address important energy needs, but their effects on biodiversity and important fisheries are potentially enormous.

The current scenario in South America presents several challenges regarding reconciling aquatic biodiversity and ecosystems services with economic development. But it can be also considered a great opportunity for fisheries related applied science, including international partnerships.

Suggested bibliography: Reis, R. E., et al. "Fish biodiversity and conservation in South America." *Journal of Fish Biology* 89.1 (2016): 12-47.

Editorial

As outlined by Iain Barber in his President's Piece, next year it will be 50 years since Jack Jones and Peter Tombleson founded the Society. This period covers my entire professional life from PhD to retirement. Jones was my PhD supervisor although his 'supervision' was pretty light by modern standards. I think that his approach, now not approved of by our over-controlling PhD process, echoes one of the delights of the Society. This is the way in which it is possible to take decisions without too much bureaucratic encumbrance. This is still true even though the degree of bureaucracy

has increased over the years as notions of accountability and 'process' have invaded our thinking. A great strength of the generally bureaucracy-free approach has been its ability to trust people to use the resources the Society provides to explore ideas that may or may not lead to productive lines of research. Since the inception of the PhD studentships, it has also been possible to launch careers in fish biology, again trusting the students to build on their enthusiasm and abilities. Overall the Society has been a force for good and we hope that the history

project that Iain and his fellow officers have initiated together with Sally Horrocks in the Leicester History department will produce some interesting insights into the work of the Society over the past 50 years. As the President asks, if there are members who were in at the start of the Society, and there cannot be many of them about as the first meeting in 1967 listed only a very small number of people, then it would be really good to hear from them.

Paul Hart
Leicester, November 2016
Next deadline: 1st February 2017

President's Piece October 2016

As the year draws to a close, and with fantastic memories from the Bangor Symposium now a distant memory, our thoughts are turning to 2017 and the 50th Anniversary of our Society. As well as being a landmark achievement and a time for both reflection and looking forward, our Golden Anniversary year promises to be an important and dynamic one for the FSBI. As you might imagine, things are very busy 'behind the scenes' here at the FSBI, as we prepare for a number of key events and changes over the coming twelve months.



Firstly, our plans for next year's Anniversary Conference, on the broad topic of 'Understanding Fish Populations', are now at an advanced stage. As I write this, Steve Simpson and his scientific committee at Exeter are finalising an impressive list of plenary speakers, while the FSBI team is busy arranging various sessions commemorating founder members and celebrating FSBI successes over the years. We are excited about the conference, which we hope will be our largest yet, and we very much hope that the deliberately broad overarching theme will appeal to the vast majority of our membership. Steve and I are looking forward to welcoming you to Exeter, and I am hoping to avoid the annual worry about whether or not we will have

enough members to be quorate at our AGM! You will be able to register for the meeting on the website (<http://www.fsbi.org.uk/conference-2017>) very soon (if not already) and the call for abstracts is also imminent. Our hope is that the meeting should have 'something for everyone' involved with our Society, so please can I ask you to spread word of the meeting as widely as possible, and to consider submitting an abstract to one of the many and varied sessions.

Second, we are currently engaged in a project to redesign and overhaul our website. While the existing website has served the FSBI well as a repository of information, web technologies and design have moved on, and the expectations of our community have increased. The website is increasingly our main vehicle for communicating the work and activities of our Society, so we are very keen that this is reflected more effectively in our web pages. We also wish to design a website that better serves our members through greater functionality as well as reporting events and new research. If you have any thoughts on how you would like to see the website develop, then please feel free to contact me directly.

As part of our 50th Anniversary activities, we have also recently agreed to sponsor a project that will generate an oral and written history of the FSBI, from its foundation to the present day, and produce an assessment of the impact of our Society's activities over the years. The project will be carried out in collaboration with Dr Sally Horrocks, who is a member of the British Library's team (<http://www.bl.uk/aboutus/stratpolprog/oralhist/team/team.html>) and a Lecturer in Modern British History at the University of Leicester. While a short history is available on our

website (<http://www.fsbi.org.uk/information/history/>), the time is right for the Society to reflect more deeply on its role in developing the fields of fish biology and fisheries science through its varied activities. Clearly, the FSBI has had an enormous impact (see below), but our Society has also had influence through many other routes. For example, dozens of PhD students have now been funded through the FSBI's studentship scheme, and many of these scientists are now supervising their own PhD students, or working in industry or government. We hope that the project will give us significant insights into the impact that our funded activities have had on the fields of fish biology and fisheries science. As part of the research process for the project, we will be contacting selected Society members for recollections and insights from over the years. If you feel that you would like to contribute to this project, then please feel free to email Paul Hart (newsletter@fsbi.org.uk), who is coordinating the project on behalf of the FSBI.



JW Jones (r) working on the fluvarium on the River Dee, probably 1950s.

Finally, we have begun the process of preparing for the retirement of the current Editor in Chief of the, John Craig, at the ➤

end of 2017, and for finding his replacement. John has served with considerable distinction in the role since taking over at the from John Thorpe in 2000. Over that time, the has increased its impact factor whilst increasing its page budget (a fine balancing act), and has strengthened its reputation as one of 100 most influential journals in the biomedical and life sciences (<http://dbiosla.org/publications/resources/topten.html>). Of critical importance to the financial viability of the Society, the has also increased in profitability under John's watch. The process of identifying and appointing John's successor is already underway, and is being managed by the newly-formed publications committee, with support from our publishers, Wiley. In September, members of the FSBI publications committee and the

editorial team met in London in an inaugural joint meeting, to discuss a number of aspects pertinent to maintaining the academic and financial success of the Journal in an increasingly complex publishing environment. This was a highly valuable and productive meeting, which we hope will become a regular feature in our Society's calendar in the years ahead.

As I write this piece we are experiencing wall-to-wall new media coverage of Brexit and the US election. While the outcome of the latter should be known by the time you read this, the full implications of the former for the UK and Europe, for fish biology and fisheries science, and for our Society, will take far longer to understand. Consequently, there is little to say at this stage about the implications of a Brexit – hard or soft – for the FSBI, except to re-

confirm our absolute commitment to maintaining the international relevance of our Society, and to re-state our support for fish biologists and fisheries scientists wherever they may be working around the world. The FSBI is an International Society, with a membership and influence on research that spans the globe, and we welcome membership applications from anyone that shares an interest in our objectives. At the Bangor meeting we welcomed 200 delegates from 26 nations; my hope is that in our 50th Anniversary year, we can increase the size and international diversity of our conference, and our Society membership, still further.

With all good wishes of the Season

Iain Barber

The International Council for the Exploration of the Sea Annual Science Conference, 18th-23rd September, Riga, Latvia



Apart from the FSBI (of course) ICES is my favourite international organization and its annual science conference is always a great mix of marine science with topics ranging from plankton ecology to marine management issues.

My involvement was through a talk given in the session entitled 'From individuals to ecosystems: their ecology and evolution'

convened by Anna Kuparinen and Silva Uusi-Heikkilä from Finland, and Anne Maria Eikeset from Norway. This session included much fundamental science about the evolution of fish and the influence on management issues. My talk was titled 'A long-term perspective of the role and relevance of life-history questions in fisheries research'. Whilst researching material for the talk I encountered the fascinating story of Edward S Russell who was director of the Lowestoft Fisheries Laboratory from 1921 – 1945. Being director was a life completely different from the role today. Russell lived in London and only visited Lowestoft at intervals. In London he spent his time lecturing on development and animal behaviour to students at

University College London and was President of the Linnean Society in 1940-41. Science is a very different profession these days!

From the Society's point of view one of the most interesting sessions was on 'Predictably irrational – a new scientific research field for the science underpinning marine-resource management' convened by Sarah Kraak (Germany) and Dorothy Dankel (Norway). This is of interest to the Society because in 2014 it co-sponsored with ICES a workshop in Copenhagen instigated by Sarah on the application of behavioural economics to fisheries management issues. The session in Riga was a development of the Copenhagen workshop. In Riga this session was one of the most ➤



Double Dutch – Sarah Kraak (right) and Natalie Steins in the interactive session

◀ entertaining and illuminating that I attended with experiments for the audience to participate in and active demonstrations of what predictably irrational means. What does it mean? The idea derives from work done by Amos Tversky, Daniel Kahneman and others analysing how people take decisions. Classical economics has worked on the basis that people are rational, that is that their views on matters are logically consistent. They also assume that people have the capacity to work through the various strategies that will produce the optimal solution to a problem. The work initiated by Tversky, Kahneman, Richard Thaler and others has shown that people are not rational in the sense assumed by classical economics, hence the notion that we are predictably irrational. Much of our decision-making is influenced by biases in the way we perceive the world. Kahneman in his book *Thinking Fast and Slow* (2011) comments that he doesn't like the way people have assumed that he and Tversky considered people to be irrational but I guess a common reaction to their work has concluded that if we are not rational then we must be irrational.

The type of economics captured in Kraak and Dankel's ASC session has become labelled as behavioural economics. During the session there was a sequence of papers outlining how this relatively new field of intellectual activity can be applied to fisheries problems. This is not

the place to go into detail but if you are interested in knowing more about the topic then Kahneman's book is a good start. An in depth coverage of the field has recently been published by a colleague of mine at Leicester, Sanjit Dhami *The Foundations of Behavioral Economic Analysis*. I say 'in depth' as the book is 1,764 pages long and took ten years to write!

The conference was held in the Radisson Blu Hotel Lavija which we discovered was built during the Soviet era as the Intourist hotel. It is the tallest building in Riga and perhaps in Soviet times all the rooms were bugged. The city and the country is still re-establishing its independent identity after the fall of communism. Tours can be taken around the old KGB headquarters where people were incarcerated in the cellars and those found 'guilty' eventually executed in a 'killing chamber'. Being in Riga made me realise that living close to Russia creates an unsettling atmosphere, probably more so since the US presidential election.

Paul Hart, University of Leicester

Joyce Ong of the Australian Institute of Marine Science at the University of Western Australia's Oceans Institute, Crawley used an FSBI travel grant to attend the same conference and wrote:



At the conference, I met many distinguished scientists from all over the world and also had the opportunity to meet up with experts in my field whom I had

previously met at the International Otolith Symposium in 2014. This enabled further discussions about otoliths and where otolith science is headed. I also attended many of the interesting talks given at the conference and learnt a great deal about the Baltic Sea and Atlantic cod. Theme session H was of particular interest because it was directly relevant to my field of study, which is the use of otolith biochronologies to determine how climate change affected the historical growth of tropical fishes over the last few decades. I gave an oral presentation at this theme session, which was well received and led to some productive conversations and feedback from fellow researchers in the same field. Overall, the conference was a great chance to learn from and network with experts in my field, as well as obtain feedback about my own research. I am grateful to FSBI for providing this opportunity.



The Freedom Monument in Riga with the Hotel Latvija in the background. The monument commemorates the Latvian War of Independence

Agnieszka Magierecka an FSBI funded PhD student reports on her research, supervised by Neil Metcalfe. Her question is: Does chronic maternal stress affect the next generation of sticklebacks?



The influence of stress on animals has been a focus of scientific research ever since the Austrian-Canadian endocrinologist, Hans Selye, published his ground-breaking 1936 paper, in which he identified, for the first time, a range of physiological responses to acute stressors. Stemming from his work is the field of stress ecology, recognising the environment as an important source of stressors for organisms. Each and every organism is in some way influenced by the environment in which it lives, and the environment is never invariable. Starting with changes

in temperature, light and food abundance, and finishing with interactions with predators and competitors, the world is a challenging and stressful place for animals. But can stress experienced by females affect their offspring?

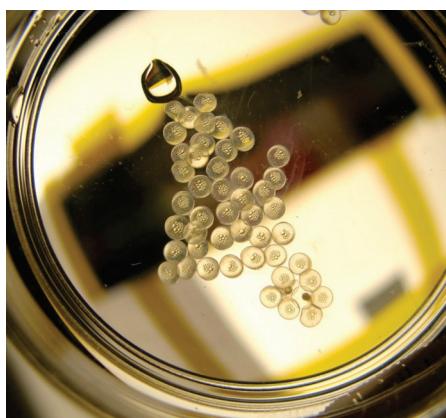
The study of maternal effects, broadly defined as non-genetic contributions of females to the phenotype of their offspring, is a very topical area of research, with dozens of papers published each year that deal with the effects of maternal state (e.g. stress) on offspring growth, survival and other traits. The majority of research on maternal stress effects has been conducted on birds, and has mostly involved acute stressors; relatively little is known about the effects of maternal stress in fish, with chronic stress being particularly understudied. We know that chronic environmental and husbandry stress affects fish in a variety of ways, but does it also affect their offspring, and if so, how? My PhD project, generously funded by the

FSBI, aims to shed some light on these issues.

In this project I mimic environmental stressors in laboratory conditions, using a range of optical, mechanical and social stressors, for example light intensity, increased tank aeration or novel objects placed in the tank, to elicit chronic stress in female three-spined sticklebacks. The challenge is to use these stressors in a random and unpredictable manner – fish are known to habituate rapidly to stressful conditions. As in many other fish species, female sticklebacks do not provide parental care after spawning, which makes them a perfect model for this kind of study. I also use *in vitro* fertilisation to control for paternal effects, which means that any observed effects in offspring can be pinned down to stress hormones deposited by females in developing eggs. How do I know whether the fish are stressed? The answer lies in the stress hormones, mainly cortisol, that they produce.



Stripping of eggs from three-spined stickleback. This may look harsh, but it is performed under anaesthesia and completely harmless (photo credit: Bart Adriaenssens)



Stripped eggs ready for *in vitro* fertilisation (photo credit: Bart Adriaenssens)



1-month old fry photographed on a lightbox. Similar photographs are taken at 2 and 3 months and analysed using image processing software to measure growth rate

Up to relatively recently, the only methods of measuring stress hormone levels in small fish species, like sticklebacks, required sacrificing the fish – not perfect for long-term experiments. Luckily nowadays assay methods are sensitive enough to measure levels of excreted cortisol in the water in which they have been living. This means that I can test the effectiveness of my stress protocol by measuring cortisol levels before and after the stress period.

During the three months of this year's breeding season I performed

138 *in vitro* crosses, which resulted in over 1000 hatched fry. Half of the mothers had been subjected to the chronic stress protocol throughout the breeding season (experimental group) while the other half lived a stress-free life (control group). The dataset I compiled during the experiment includes information on behaviour of females and their reproductive success, number and size of eggs, fry survival and growth rate in the first three months of their life. The next challenge is to analyse these data to see whether there is a link

between maternal stress levels and offspring characteristics. I am also curious to see if chronically stressed females are at higher risk of tissue damage by reactive oxygen species. I am hoping that my research will help to clarify what effect environmental changes, and the potential for increased environmental stress, may have on wild fish populations. Please watch this space for future updates on the results of my project, or contact me directly at a.magierecka.1@glasgow.ac.uk

Travel Report

Tea Basic, Department of Life and Environmental Sciences, Bournemouth University attended the Society for Ecological Restoration conference and writes:



In August 2016, I have attended SER 2016 Conference in Freising, Germany. With this being my first international conference where I could showcase my work and meet like-minded people, I was extremely excited and delighted to be given this opportunity.

The conference opened with an excellent keynote speaker Rob Marrs on soil fertility management for ecological restoration. With the increased fertility representing issues for the restoration of natural systems, management of soil fertility can be accomplished through decreased output of fertilizers, soil dilutions or reduction of biomass. Additionally, this can be achieved through changes in soil management, particularly through deep ploughing and chemical amendments. This followed up nicely on my talk on fine sediment

input in rivers and its effects on spawning substrates of litophilic fish with the emphasis on gravel jetting implications. With the outcomes indicating minor effects of jetting on spawning substrates followed by low endurance, catchment scale management is advised. My presentation resulted in a nice discussion about implications of small scale projects, inclusion of other biota in the assessment as well as river connectivity issues.

Apart from the scientific merit of the conference, the social aspect was equally successful, with amazing networking opportunity over traditional Bavarian style meals where everyone could relax a bit more. In the end, I have to express my gratitude to the Fisheries Society of the British Isles for giving me an opportunity to be involved, which benefited me personally and professionally. I would highly encourage young researchers to get themselves out there as soon as possible as it is highly beneficial for their development.

Nottingham reports on the outcome of an internship project funded by an FSBI Research Grant.

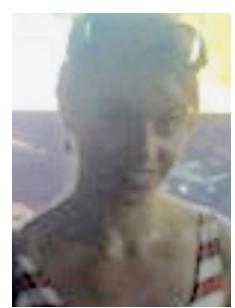
Ectoparasite infection is a major issue concerning the aquaculture industry, causing major problems on salmon farms through sea lice infection. It is likely that ectoparasitism has an effect on the normal flora of skin and could result in the development of secondary microbial infections. However, the healthy skin microbiota of fish and the effect of ectoparasites on the microbiota have not been studied in great depth. This project aimed to investigate the skin microbiota of three-spined stickleback fish infected with *Gyrodactylus* ectoparasites as a model for other ectoparasite infections. Bacterial swabs were collected from fish living in different environments from North Uist, Scotland, with varying water quality and salinity. Bacteria were cultured in Tryptone Soy Broth, streaked out onto Tryptone Soy Agar (TSA) and grown under oxygen depleted conditions. Individual colony characteristics and antibiotic resistance profiles were determined and those with different morphologies used for DNA extractions. The V3-V6 region of the 16s rDNA gene was sequenced and used to determine the taxonomy of the bacteria. All the bacteria found appeared to >

Internship Reports

Angelika Agud based Veterinary Sciences at the University of

◀ be Gram-negative, rod-shaped bacteria. This finding coincides with the results of the sequencing as most of the bacteria were found to belong to the phylum Proteobacteria. All the bacteria cultured were resistant to B-lactam antibiotics, but susceptible to tetracycline and 41% to erythromycin. In conclusion, it is likely that there is a difference between the composition of the microbiota of sticklebacks living in different environments and that the anadromous populations could act as a model for studying the effects of sea lice infection on the skin microbiota of salmon.

Lisa Thiele took up an FSBI Internship at the Institute of



**Aquaculture,
University of
Stirling and
writes the
following:**

Different individuals prefer different temperatures.

Recent research has shown that zebrafish (*Danio rerio*), a widely used model fish species, can be grouped into different personalities, proactive and reactive, and that different personalities have different thermal preferences. The bold, risk-taking 'proactive' individuals prefer higher temperatures whereas their shy, less risk-prone 'reactive' counterparts prefer colder ones. The underpinning molecular mechanisms responsible for this difference in thermal preference are unknown. In a previous study we have shown that the transient receptor potential (TRP) A1 paralog, *trpa1b*, found in zebrafish plays a role in thermal choice and when measured in the brain of proactive and reactive individuals there are significant differences. In order to explore the possible function of TRP channels in thermal choice we used the reactive behavioural phenotype, with lower thermal preference, expressing emotional fever. Emotional fever (EF) is a

fever response characterised with a transient rise in body temperature occurring under stress as described by Rey, et al. (2015). By using this experimental system we hypothesized that reactive individuals expressing EF would up-regulate key TRP channels as they increased their thermal set points. Preliminary analyses using rtQPCR to assess *trp a1a*, *a1b*, *v1*, *v4* and the brain activity markers *cfos* and *bdnf* did not highlight any significant differences in reactive zebrafish expressing EF when compared to normal conditions. Therefore our hypothesis that TRP channels are regulated at the transcriptional level during acute changes in thermal preference was not substantiated. This study has advanced our understanding of the relationship between thermal preference, animal personality and the regulation of TRP channels.

Information Desk

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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:

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Tel: 0151 600 3000 (ext. 3362)

Fax: 0151 227 3185

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Secretary: Dr John Pinnegar

Centre for Environment, Fisheries and Aquaculture Science, Lowestoft Laboratory, Pakefield Road, Lowestoft, Suffolk, NR33 0HT

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