

SAVING FRESHWATER FISHES AND HABITATS

Newsletter of the IUCN SSC/WI Freshwater Fish Specialist Group

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- Blind cave fish in Turkmenistan
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The South American Silver
Arowana (*Osteoglossum
bicirrhosum*). Photo: Zeb Hogan.

Message from the FFSG Global Chair

Dr. Richard Sneider



For many who accept the fact of global warming, the debate and notion of climate change has been a distant threat, or a concept. But that is changing. There are plenty of studies, and evidence demonstrating this impending “fate”. Here in the US a recent study by scientists from NASA and Cornell and Columbia universities has shown that the southwest and central US are probably on the brink of a decades-long megadrought (<http://wapo.st/1voOJqu>). There are thousands of other studies which substantiate the effects of climate change elsewhere. But, there are also plenty of alarming documentaries, such as “Chasing Ice” (<https://chasingice.com/>), that help to visually document this anthropogenic disaster. However, it is one thing to be intellectually and emotionally engaged on this topic, but it is another dimension when you have to actually start planning to relocate your people because your land will be under water.

Such is the reality facing the people of the Island nation of Kiribati, which comprises just 33 atolls and reef islands. There is a population of over 100,000 people living on these, half of which live on Tarawa Atoll. Most of the islands are about 6.6 feet above sea level, and it is predicted that the rise of the ocean level will be 3.3 feet by the end of this century. This means that the islands will partially if not fully submerged by then.

The people of Kiribati are keenly aware the environmental impact on their wellbeing, and the ecological importance of their homeland and sea. In a remarkable demonstration of leadership, Kiribati joined a group of Island Nations in declaring its territory part of what is now the third largest marine protected in the world: The Phoenix Islands Protected Area (PIPA). The development of PIPA was also promoted by my colleagues at Conservation International, in particular Dr. Greg Stone. I encourage you to watch his TED talk on the project http://www.ted.com/talks/greg_stone_saving_the_ocean_one_island_at_a_time?language=en.

Last year I had the privilege to host a group of dignitaries from Kiribati who made a presentation on the challenges and predicaments of their land. This month I attended Conservation International’s annual Gala where President Anote Tong of the Republic of Kiribati gave an eloquent speech for marine protection, and a chilling and inspirational account of the relocation challenges. What struck me deeply on both occasions was both the practical resolve of the people in facing their challenges, as well as their almost poetical mission to lead the world in conservation efforts, even when this required profound sacrifices on their part. PIPA requires that 154,000 square miles will be closed to all commercial fishing activities. Kiribati received important revenue from this fishing, and yet the people voted in a visionary role to look at the larger picture for a relatively intangible benefit compared to the concrete cash receipt of commercial fishing. This is an enormously admirable philanthropic gift to the world at large.

But beyond this, the nation of Kiribati faces this huge challenge of relocating its people. Island Nations and peoples have unique cultures and ways of life which are particular to their history and environment. Many of the skills necessary for survival in other countries, cultures and environments have to be learnt, as many of the specifics are not endemic to the inhabitants of the islands. The people of Kiribati are embarking on training to acquire some of these skills, learn foreign languages, cultures and working skills.

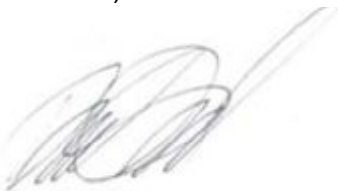
Challenges beyond the obvious await them, such as the ones described in Jared Diamond’s last book, *World Until Yesterday*. Professor Diamond explains the health difficulties people face when making drastic changes in diet and lifestyles. For example, the incidence of diabetes increases five fold within a generation, due to the combination of hypertension from lack of activity in industrialized nations, with a diet loaded with excess sugars and salts. One cannot

underestimate the many faceted difficulties and challenges the Kiribati people are facing and will face. What is most uplifting though is that in the face of these challenges, their choices, leadership and attitude make them a role model to humanity for taking action and thinking beyond one's self in the process. The people of Kiribati and its exemplary leaders deserve our thanks. It is their thoughtful behavior that gives hope to humanity, and with this resolve, we have a chance to ensure that Earth does not become one island from which we do not have the option of evacuation.

Of course, you might be wondering what any of this has to do with FFSG – especially when a quick check of FishBase shows that the only freshwater fishes in Kiribati are introduced ones. The reason I mention this is because the actions that the people of Kiribati are making are bold, adaptive, and visionary. They have, and are, responding to global processes that require huge mitigation and adaptive decisions. And there are lessons to be learned for freshwater conservation and management. We have overextended our use of freshwater ecosystems globally, and we are significantly threatening its fishes. We must be bold, like the people of Kiribati, and make decisions that can mitigate those effects; but our decisions must be adaptive to account for the large and unpredictable changes in climate that will affect freshwater flows and species. Some of the articles in this newsletter touch on these points quite specifically; for example Kevin Smith's on the Eastern Mediterranean.

I also mention the case of Kiribati because it highlights how seriously marine conservation issues are being debated globally – which is a model we must follow. If one looks at some of the Commitments to Action for the Promise of Sydney that arose from the World Parks Congress last year (http://worldparkscongress.org/about/promise_of_sydney_commitments.html), many of them are focused on marine conservation and protected areas - none on freshwaters. Indeed, the Congress specifically included a Marine theme. We know from the December 2014 FFSG newsletter that several members of FFSG worked hard to give a voice for freshwater at the Congress, and that was a challenge. I also know that people who work in both marine and freshwater conservation have said that the marine people are more vocal and insistent than the freshwater people, and that we somehow have a problem in getting our message across to the right people. I am sure we all feel that we are constantly trying to be as vocal as possible and that we are stating our concerns over and over. But our challenge is to do it more – to be bold and loud! I know we can do it – the FFSG is an excellent group of committed individuals. IUCN's Species Survival Commission values the work we do, and has materially shown this by providing some additional support for Alex Mauroner, our Programme Officer, until the end of May, so that he can continue to support you all; we are extremely grateful to them for this. Let's continue with our good work. This newsletter gives some great examples of this. Enjoy reading it.

Best wishes,



Richard Sneider
FFSG Global Chair

FFSG Represented at Citizen Science Conference 2015

Alex Mauroner

FFSG Programme Officer

Thanks to generous support by WWF-US, GEO BON, Richard Sneider (FFSG Global Chair), and conference organizers, I was able to represent FFSG as its Programme Officer at the Citizen Science Conference 2015, held in San Jose, California on February 11 and 12. While attending the conference I presented one of the projects that FFSG coordinates in collaboration with several partners.

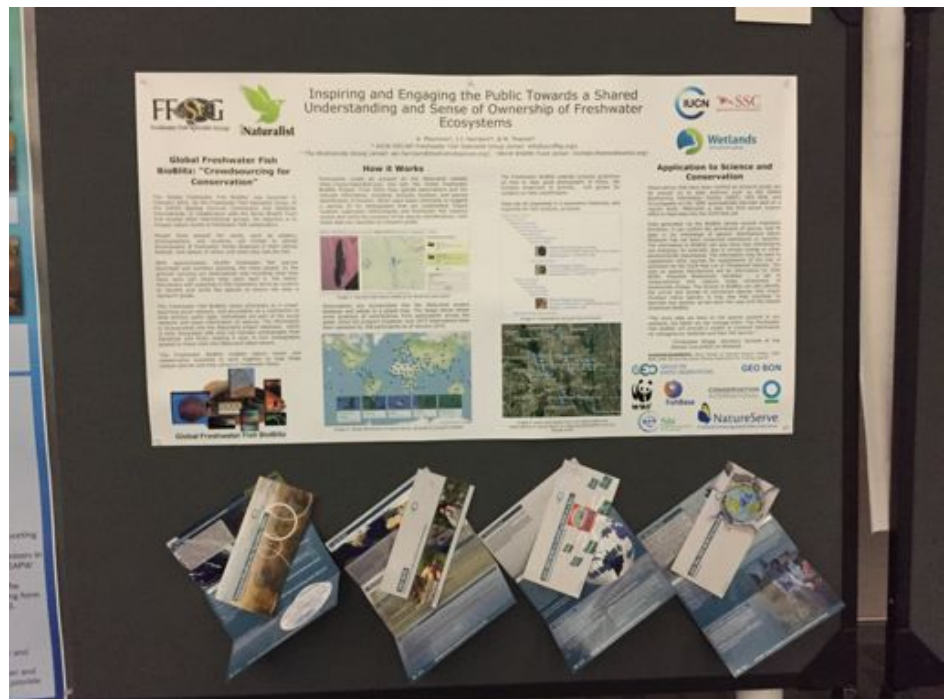
Over 650 scientists, educators, and practitioners descended on the McEnery Convention Center for the inaugural conference of the Citizen Science Association (www.citizenscienceassociation.org). Attendees included citizen science participants, researchers, project leaders, educators, technology specialists, evaluators, and others – representing many disciplines – at any level of expertise. The FFSG was one of several groups working on wildlife conservation that presented their work.

In addition to learning more about citizen science and the newly-formed Citizen Science Association, my goal was to present the *Global Freshwater Fish BioBlitz* project (www.inaturalist.org/projects/global-freshwater-fish-bioblitz) and build recognition and connections for the FFSG. The two-day conference was full of various symposia, panels, and presentations. The sessions were organized into six main themes:

- Tackling Grand Challenges and Everyday Problems with Citizen Science
- Broadening Engagement to Foster Diversity and Inclusion
- Making Education and Lifelong Learning Connections (K-12, university, informal)
- Digital Opportunities and Challenges in Citizen Science
- Research on and Evaluation of the Citizen Science Experience
- Best Practices for Designing, Implementing, and Managing Citizen Science Projects and Programs

Conference participants were able to choose from up to six concurrent sessions at any given time to focus on issues of interest or relevance to their work with citizen science.

I presented a poster on the *Global Freshwater Fish BioBlitz* during the poster session and reception in the main ballroom on the first night. Approximately 100 posters were on display during the session as the 650-plus participants walked around to examine the various projects. During the two-hour session, I answered many questions about the BioBlitz with inquisitive conference-goers. I also discussed some of the potential outcomes, future analyses, and possible conservation implications with other scientists including the former Chair of the Citizen Science Association, who was particularly interested in the FFSG and this project. I also discussed the role of those organizations that sponsor the BioBlitz, such as GEO BON, WWF-US,



Poster on the Global Freshwater Fish BioBlitz featured at CitiSci 2015 Conference's poster session. Over 650 people attended this session, many of which stopped by to read about the project. Photo: Alex Mauroner

iNaturalist, NatureServe, and more. I distributed several pamphlets, provided by GEO BON, describing their work on biodiversity databases and the future role of Essential Biodiversity Variables (EBVs) as a means of cataloging biodiversity measurements required for study, reporting, and management of biodiversity change.

Presenting at the session was an ideal opportunity to explore potential areas of collaboration with other groups interested in the data derived from the BioBlitz project. This included EarthWatch Institute's FreshWater Watch: a global citizen science research project investigating the health of freshwater ecosystems (<https://freshwaterwatch.thewaterhub.org/>).

iNaturalist.org, which is both a vital part of the *Global Freshwater Fish BioBlitz* and a sponsor of the conference, had a large presence at CitiSci 2015. I attended two panel discussions featuring Scott Loarie, Co-Director of iNaturalist.org. I later met with Scott to discuss the FFSG project and related iNaturalist campaigns. Additionally, iNaturalist hosted a two-hour bioblitz of their own in downtown San Jose's Guadalupe River Park during the lunch break of Day 2. I attended this nature walk and learned much more about the software used in the *Global Freshwater Fish BioBlitz*.

Following the CSA conference, the FFSG aims to invest further efforts in promoting the BioBlitz project – especially outside of the United States. This will be done through collaboration with Regional Chairs and utilizing their networks. The FFSG also plans to utilize social media more, as well as promotion via the new connections with outside organizations made at the conference.

On behalf of the FFSG I would like to send a sincere thanks to the groups and individuals that made the presentation possible by sponsoring my attendance. Additionally, I would like to thank Ian Harrison (Technical Officer to the FFSG) and Michele Thieme (WWF-US, FFSG Special Advisor on Biodiversity) for their invaluable contributions in creating the poster. Without a doubt, attending this conference helped to spread the word of the FFSG's work, bolster its reputation, and potentially forge new connections with other organizations working to protect freshwater ecosystems.

Passing of Freshwater Fish Legend Rosemary Lowe-McConnell

Professor Gordon McGregor Reid

Veterinary School, University of Liverpool and Scientific Associate, Natural History Museum.
Telephone 01948 860 197.

OBITUARY

Rosemary Lowe (née McConnell)

Dr Rosemary Lowe-McConnell, or 'Ro' to her many friends, was a distinguished Scientific Research Associate of the Natural History Museum who fed the world with 'aquatic chicken' (Tilapia fishes) and revolutionised studies on the global ecology of tropical freshwaters.



Born in the 'roaring twenties' or 'jazz age' she witnessed rapid social, cultural and technical advances - electricity, automobiles, telephones, motion pictures, industrialisation and exciting new political, educational and scientific opportunities for women. Already showing academic promise, she attended Howell's Independent Day School for Girls, Denbigh (1935-39) transferring to the University of Liverpool during World War II to gain a BSc degree in zoology (1942). She was later awarded MSc and DSc degrees from Liverpool (1946 and 1955) based on her outstanding research. In 1942 Ro joined the Freshwater Biological Association, still in its infancy in the Lake District. With a keen desire to explore she went on the first of many expeditions to the colonies, surveying Lake Malawi (then Nyasa) fisheries for the government and diving adventurously with early SCUBA gear. In particular she studied perch-like Tilapia, spotted their great potential in fish farming; and later promoted their use as a protein source in developing countries worldwide.

There were sojourns in Uganda on the Great Lakes (with the East African Fisheries Research Organisation) and in the Okavango Swamps, Botswana (then Bechuanaland). She met geologist Richard McConnell while in the Colonial Research Service but, on their marriage in 1953, was forced to resign under rigid career rules which marginalised women. They travelled to British Guiana (now Guyana, South America) where Ro continued her adventures looking at seasonal cycles and productivity in both freshwater and marine ecosystems. By 1962 she was an Associate of the British Museum of Natural History but with research interests far broader than most of her colleagues. These encompassed behaviour, reproduction, evolution, zoogeography, conservation and the positive and negative impacts of fish introductions and dams on the environment. With more globe-trotting - including to Nigeria, Ghana, Brazil and Panama - she was in the unique position of synthesising principles of tropical ecology from both an old and new world perspective.

Famously, she drove her publishers wild by submitting difficult-to-decipher hand-written manuscripts. Among many publications are the classics: *Fish communities in tropical freshwaters* (1975); *Land of waters: explorations in the natural history of Guyana* (2000) and her often humorous autobiography *The Tilapia trail: the life story of a fish biologist* (2006). An in-depth review of her remarkable scientific achievements is given by Michael Bruton in *Environmental Biology of Fishes* (vol. 41, 1994). Honours include Vice-Presidency of the Linnean Society (1976) and their Gold Medal (1997); Silver Medal of the Fisheries Society of the British Isles and Bronze Medal of the International Limnological Society. Two new species were named for her: a mayfly *Afroptilum loweae* and catfish *Bathyclarias loweae*. Ro was predeceased by Richard (1986) and they had no children. Ro certainly helped launch my career in ichthyology and her extraordinary kindness to students, researchers and friends was legendary, often hosting them in her quirky 'mathematical brick' house in Streat, beautifully set in the rolling green downs of East Sussex.

Rosemary Lowe-McConnell, Grand Dame of Tropical Fisheries and Researcher at Natural History Museum: born in Liverpool 24th June 1921; died December 22nd 2014, St Rita's Care Home, Ditchling, East Sussex.



Former FFSG Global Chair, Gordon McGregor Reid, with Rosemary at an event in 2013. Photo: Gordon McGregor Reid

Readers of this obituary might also be interested in reading:

Stiassny, M.L.J & Kaufman, L.S. (2015). Rosemary Lowe-McConnell, obituary. Environmental Biology of Fishes. Published online 21 march, 2015. DOI 10.1007/s10641-015-0409-1

FFSG Welcomes Two New Regional Co-Chairs

Alex Mauroner

FFSG Programme Officer

At our annual meeting this past December, Steering Committee members agreed that they would seek more involvement from FFSG Regional Chairs for the second half the current IUCN Quadrennium (2013-2016). With this in mind, the secretariat engaged in discussions with some Regional Chairs to explore the possibility of bringing in more support through the addition of Regional Co-Chairs. In the past few months we have added two new Regional Co-Chairs to FFSG leadership.

I would like to introduce Dr. Paul Loiselle (pvl2413@aol.com) as a new Co-Chair for our Madagascar Region. Paul will begin working with the current Regional Chair, Dr. Melanie Stiassny. The two will work closely to coordinate activities in the region and identify priorities for the FFSG. Paul brings over 50 years' experience to this role. He is the Emeritus Curator of Freshwater Fishes at the New York Aquarium, a Senior Conservationist of the Wildlife Conservation Society, and a Scientific Advisor to AZA's Freshwater Fish Taxa Advisory Group amongst other distinctions.

I would also like to introduce Dr. Amirrudin Ahmad (amirrudin@umt.edu.my) as new Co-Chair to our Southeast Asia Region, where he will work closely with current Chair Dr. Chavalit Vidthayanon. Amirrudin is new to the FFSG and based in West Malaysia. He will provide us with more regional expertise, particularly for peninsular Southeast Asia. Dr. Ahmad is currently a Senior Lecturer at the University of Malaysia – Terengganu.

FFSG Members Co-Author Chapter in WCPA Book on Protected Area Governance and Management

Ian Harrison

FFSG Technical Officer

IUCN's World Commission on Protected Areas has published its book on Protected Area Governance and Management. It includes a chapter on freshwater and estuarine conservation, co-authored by members of FFSG.

The e-book can be downloaded free, on-line at the ANU website at:

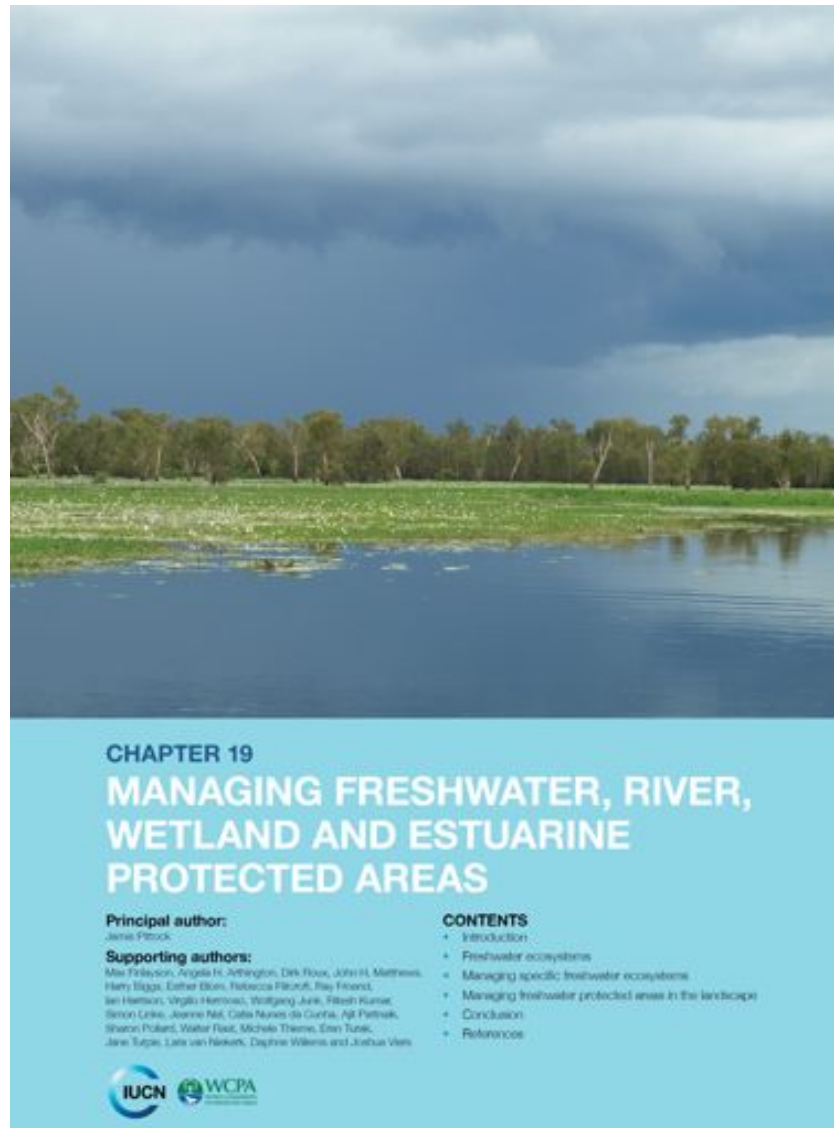
<http://press.anu.edu.au/titles/protected-area-governance-and-management/>

Order forms for printed copies are provided on-line and books will be printed as digital copies on an on-demand basis.

The book took 2 years and 8 months to produce, with the contributions of 169 Principal and Supporting Authors. The book's editor, Dr. Graeme Worboys, estimates that the volunteer time provided by the authors would be worth about US \$2.9 million if the task was completed commercially. The book will be the leading resource for conservation practitioners, decision-makers, and students of conservation biology and landscape planning, for many years to come.

The book was officially launched at the UNEP-WCMC Protected Planet Pavilion, Sydney World Parks Congress on the evening of the 15th November 2014, at an event attended by 300 people. The launch was one of the most successful events of the Protected Planet Pavilion.

A subsequent side event was arranged on the evening of 17th November to launch the freshwater chapter. This was co-lead by Jamie Pittock (Australian National University; and principal author for the freshwater chapter), Ian Harrison (FFSG, co-lead of the WCPA Freshwater task Force, and co-author) and Becky Flitcroft (US Forest Service, and co-author). The side event was attended by members of FFSG and included short presentations from Russ Mittermeier (Executive Vice-Chair, Conservation International) and some of the chapter's co-authors.



Project Piaba Expedition – Sustainable Home Aquarium Fishery

Scott Dowd^{1,2} and Deb Joyce²

¹ Home Aquarium Fish Sub-Group

² Project Piaba

For the past 20 years each winter, Project Piaba has conducted an expedition to the Rio Negro fishing grounds in the Brazilian Amazon. Project Piaba is encouraging the responsible sourcing of home aquarium fish, and promoting social and environmental benefits associated with the hobby and the trade. The focus of the work has been the cardinal tetra (*Paracheirodon axelrodi*) fishery and global market. The most substantial discoveries are the critical role that a wild-capture fishery can play in livelihoods and poverty alleviation, and how effective, economically driven, environmental stewardship can be a unique and powerful tool to protect areas of biological importance that would otherwise be lost.

Very early on it was discovered that the fishery was not only sustainable, but it was the principal driver helping the local people protect the pristine fishing conditions by protecting the surrounding Amazon forest from development by providing a livelihood for the local people. At the same time, the fishery has been under threat by international competition from farm raised fish. This competition has caused the fishery to be in decline. Expedition participants from a variety of backgrounds are concerned that if the Rio Negro fishery collapses the locals will turn to destructive work such as logging, mining and the illegal drug trade. Protection of the fishery results in protection of the pristine forest, rivers and streams.



Photo: Steve Heisey

Every year a group of international fish health specialists, trade stakeholders, public aquarium biologists, and fish enthusiasts are invited to join Project Piaba and the Brazilian team on the annual expedition to Barcelos and the fishing grounds. This past expedition ended on February 7, 2015 when a team of 40 international specialists returned from their experience touring and researching the home aquarium fishery of the Rio Negro in Brazil's Amazon Forest. During the annual expedition participants conduct activities including preparing strategies and plans for the conservation, monitoring, evaluation and threat assessment of the fishery.

Over the years, there has been a large volume of work produced and this year was no different with fish population assessments, water quality work, fish pathology as well as preparing strategies and plans for the conservation, monitoring, evaluation and threat assessment of the ecosystem and the fishery which protects it.

The team focused on getting a better understanding of the capture, transport and export process in place by touring and evaluating to all aspects of the fishery. Joined by aquatic veterinarians from Oregon State University and the Brazil Government as well as aquatic specialists and pathologists, the team examined water quality, fish population and fish health.

Part of this year's expedition included sharing between US-based and Brazilian veterinarians from the Brazilian Department of Agriculture regarding aquatic pathology and viral disease screening. Representatives from ORNAPESCA, the fisherfolk cooperative, also joined in the training and sharing of key information and findings with a goal of providing an updated assessment and strategy development.



Photos: Radson Alves

The team of cross-functional experts cruised in a boat on the river traveling nearly 300 miles into the Amazon Forest via the Rio Negro (Black River) from Manaus up stream to the remote village of Santa Isabel.

During the travels up the river, the group stopped at several communities to work with the fisherfolk and spend time in the communities. Further, these experts also examined the fishing grounds monitoring and assessing the fish populations and fishery processes. Several experts from a variety of areas provided nightly Seminar talks for the group discussions.

In addition to studies on fish well-being, leaders from the home aquarium fish industry were on hand to discuss strengths, weaknesses, opportunities and threats of the largely beneficial fishery. This discussion included fish best handling practices, opportunities to improve the fishery and marketing opportunities to assist this fishery which is in decline.

Studies have been conducted on consumer interests in buying fish from this area. A plan is being developed to organize fishing communities to participate in a cooperative to maximize benefits to fishers. This plan is being aided by the work of Brazilian Economist, Mari Balsan, who sought and received Geographic Indication for the fish of the Rio Negro, the first designation of this kind for an animal.

The findings of project Piaba and the experts on expeditions have been broadly shared with global trade stakeholders and policy makers. Some recent examples include the Association of Zoos and Aquariums RAW Conference, IUCN World Parks Congress, Aquatic Experience and Aquarama.

In May 2015, Aquarama will host the multi-functional IUCN FFSG Home Aquarium Fish Sub-Group's first meeting where strategies and conservation plans will be discussed by three groups: conservation scientists, zoo and aquarium leaders and the home aquarium commercial leaders. This multi-functional group will be developing a strategic plan as a result of this meeting and all are welcome to attend. www.aquarama.com.

The Rio Negro fishery which is driven by 80% of the fishery through the cardinal tetra, has a potential to provide a diverse section of 245 other species of small, abundant fish for the home aquarium trade thereby protecting the forest, flora and fauna and Red-listed species of the area. This fishery has been studied to determine that there are

overwhelming social and environmental benefits, and there is great interest in replicating the model in other regions of critical biological importance. Articles can be found at: <http://projectpiaba.org/what-we-do-2/research/>

Because of the Project Piaba model, responsible ornamental fisheries have been recognized by the leading conservation NGOs. IUCN/Wetland International's FFSG, New England Aquarium and Conservation International have been supportive of the fishery and project Piaba NGO and its efforts.

The New England Aquarium has been one of the key partners with Project Piaba and there is work with the public aquariums to promote visitors to seek responsibly sourced aquarium fish. We have found that public aquarium visitors, not surprisingly, are likely to be home fish keepers. They are a very good target audience to which to deliver this messaging about responsible fishkeeping. Legislation has been proposed in the US that would likely virtually kill the trade in aquarium fish; the cardinal tetra model provided a perfect example of why this aspect of the trade needs to be preserved. Other public aquariums have already started conveying this messaging in their exhibits. More exhibits to promote home fishkeeping are planned.

Last fall, the FFSG formed the Home Aquarium Fish Sub-Group chaired by Scott Dowd, New England Aquarium Senior Aquarist and Executive Director of Project Piaba. In the initial phase, a global assessment of the industry will be conducted. A first draft white paper will be published, describing case studies in which home aquarium fisheries are currently resulting in socioeconomic and environmental benefits, where fisheries could be adapted to maximize benefits, and where there is the need for environmental protectionism that could be provided by community based fisheries. Assessment protocols will be developed and distributed to FFSG members and partnering entities.

Buy a fish, save a tree!

The Rio Negro ("Black River") is the largest tributary of the Amazon River, and holds one of the biggest keys to its ecosystem's health: the Cardinal Tetra. A community-based project called "Project Piaba" fosters and promotes the fishery and market for these colorful fish to ensure the survival of the environment and the people who call it home.

Cardinal Tetras are common in the pet trade, and are safely harvested to be sold in pet stores all over the world. Every fish that is purchased ultimately benefits the resident fishing communities and the environments along the Rio Negro. They provide the community with a source of income, educational opportunities for students, and a sustainable way to benefit the Amazon Rainforest. Overall, if you buy a "Piaba" fish, you can help the ecosystem of the Amazon Rainforest!

To learn more about the Cardinal Tetra and its involvement in the Rio Negro, visit Facebook or www.projectpiaba.org



Photo: Keith Heberling

New Paper on the huchen *Hucho hucho* in the Balkan region

Alex Mauroner

Programme Officer, FFSG

A new paper focusing on huchen in the Balkans was co-authored by FFSG Regional Chair to Europe and Steering Committee member, Dr. Jörg Freyhof. The study examined the species distribution as well as future impacts by hydropower development in the region. The study is a part of the "Save the Blue Heart of Europe" campaign organized by EuroNatur – European Nature Heritage Foundation (www.euronatur.org) and Riverwatch – Society for the Protection of Rivers (www.riverwatch.eu/en/).

You can find the paper online (http://balkanrivers.net/sites/default/files/Huchen_Study_2015.pdf). A massive hydropower development plan threatens the species, which acts as a sensitive indicator species for some of the most ecologically valuable rivers in the basin. The data published in the paper are meant to serve as evidence of the need to keep many of the huchens' habitats undammed. The findings state that the existence of huchen and proposed hydropower developments are incompatible.

The study examines population trends in over 40 river sections in the Balkan region containing self-sustainable huchen populations. These population data are compared to proposed hydropower developments to assess any potential effects that may occur. For anyone interested in huchen, European freshwater fish conservation issues, or the role of hydropower on riverine ecosystems, this study is worth looking into.



Monster Fish Exhibit Launches at National Geographic Museum

Zeb Hogan^{1,2} and Alex Mauroner²

¹University of Nevada, Reno

²Freshwater Fish Specialist Group

On March 26th the National Geographic Museum in Washington, D.C. launched its exhibit *Monster Fish: In Search of the Last River Giants*. The exhibit, which will run at the museum through October 12, 2015, builds upon the work of FFSG Steering Committee member and Special Advisor on Migratory Species, Dr. Zeb Hogan.

Zeb's work is featured in the popular National Geographic WILD television series *Monster Fish*. The series explores the mysterious giant freshwater fishes that swim beneath the surface of the world's river systems. His efforts focus on finding and protecting the world's largest freshwater fish. The show – now in its sixth season - has allowed him to work with biologists and freshwater fish experts across six continents.

Zeb is an aquatic ecologist and researcher at the University of Nevada, Reno. He is also a National Geographic Fellow and the Scientific Councilor for Fish to the Convention on Migratory Species (CMS).

For more information or tickets, visit ngmuseum.org.



One of five live-size sculptures from the Monster Fish exhibit taken during opening night at the National Geographic Museum. Photo: Carly Silverman

Conservation of California's Endangered Freshwater Fish Fauna

Peter B Moyle^{1,2} and Rebecca M. Quiñones²

¹Dept. of Wildlife, Fish, and Conservation Biology – UC Davis

²UC Davis Center for Watershed Science

California, USA, is an extremely diverse State of the U.S. from the perspective of climate, aquatic habitats, and geography. It is like a separate country in many respects, because its watershed and political boundaries largely coincide. Its large size (411,000 km²), length (1400 km, 10 degrees of latitude) and complex topography result in habitats from temperate rain forests to deserts; it contains 50 large watersheds whose isolation from one another has promoted diversification of fishes (Moyle, 2002; Moyle & Marchetti, 2006). The climate is mostly Mediterranean, with wet winters and springs, and long dry summers. Of 129 kinds of native inland fishes (defined as those breeding in fresh water) currently recognized, 63% are endemic to the state and 19% are also found in just one adjacent state, usually in a small area. Because of the state's long coastline, 24% of the native fishes are anadromous, with life histories that reflect the state's habitat diversity (Moyle, 2002; Moyle *et al.*, 2012; Quiñones & Moyle, 2015).

California is also home to 38 million people, a number which is steadily increasing, and, if it were a separate country, it would have the eighth largest economy in the world. The state's economy is highly dependent on storage and movement of water through aqueducts, so over 1700 large dams have been built, blocking most of its rivers, along with countless smaller dams (Grantham *et al.* 2014). These artificial habitats tend to favor the 50 or so alien species that have invaded California's waters. Not surprisingly, the native fishes are in decline. Today, 30 (23%) of the species are listed as threatened or endangered under the state and federal Endangered Species Acts (ESA), while another 70 (54%) fit the IUCN criteria for being threatened (Quiñones & Moyle, 2015: Figure 1). A report for the California Department of Fish and Wildlife (CDFW) considers 60 species that are not currently listed as being species of special concern (Moyle *et al.* in press).

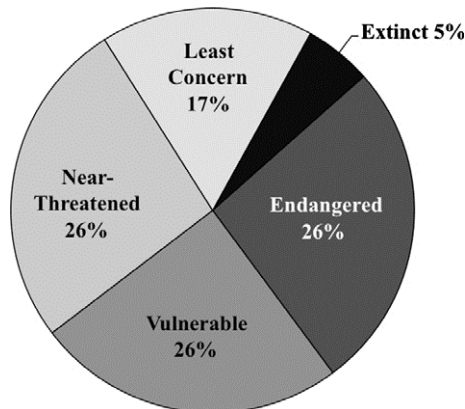


Figure 1. Status of fishes (N = 129) native to inland waters of California in 2010. All threat categories are approximately equivalent to IUCN threat levels of the same name. Extinct = globally extinct or extirpated in the inland waters of California. Endangered = highly vulnerable to extinction in its native range, approximately equivalent to IUCN threat level of endangered or critically endangered. Vulnerable = could easily become threatened or endangered if current trends continue. Near threatened = populations in decline or highly fragmented. Least concern = no extinction threat for California populations.

This change has been rapid (Figure 2): in 1975, 6 species were considered extinct and 10 were listed under the ESAs. By 1989, 15 species were formally listed and 50 more were regarded as imperiled, with one additional extinction. In 1995, there were 19 listed species and 53 imperiled (Quiñones & Moyle, 2015). When climate change is added to the equation, the number of species on a trajectory towards extinction rises to 106 (82%), as the result of increased human competition for water, alien species, and increased water temperatures (Figure 2). This rather depressing scenario assumes that present trends will continue, with little additional human intervention to save species.

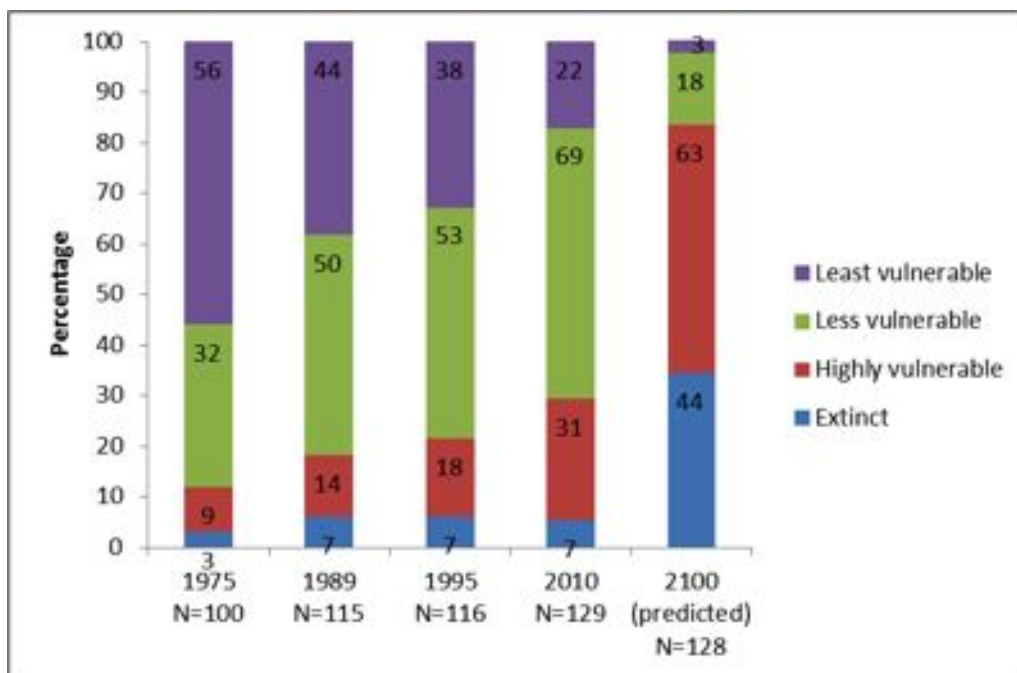


Figure 2. Percentages of California native freshwater fish species in four status categories in five assessments of status (Quiñones and Moyle 2015). Bars reflect percentages in IUCN categories. The percentage of extinct species declined in 2010 because the total number of species recognized has increased. The predictions for 2100 are based on accelerated rates of decline caused by climate change (Moyle *et al.*, 2013).

Some examples of California’s threatened fishes include:

- Delta smelt, *Hypomesus transpacificus*, endemic to the upper San Francisco Estuary.
- Winter-run Chinook salmon, *Oncorhynchus tshawytscha*, from the Sacramento River. This Evolutionary Significant Unit (ESU) reflects the status of a number of endangered salmon ESUs in California.
- Clear Lake hitch, *Lavinia exilicauda chi*, a distinctive cyprinid subspecies that is a remnant, along with two other species, of an endemic fauna of an ancient lake.
- Sacramento perch, *Archoplites interruptus*, a centrarchid that is extirpated from its native range in the Central Valley, but persists as introduced populations elsewhere.
- Green sturgeon, *Acipenser medirostris*, anadromous, with distinctive populations in just two California rivers.
- Red Hills roach, *Lavinia symmetricus subsp.*, while lacking a formal description, is a distinctive small cyprinid confined to tiny creeks flowing through a single serpentine formation. During the severe drought year of 2014, it was confined to about 250 m of habitat.
- Owens pupfish, *Cyprinodon radiosus*, which was saved at the last minute by an observant biologist, Phil Pister; here it represents the amazing fishes of California deserts, which are all potentially in trouble.

What can be done to reverse the downward trend in California’s fishes? One approach is to keep listing them under the powerful ESAs, although listing is mostly effective in preventing extinctions, leaving us with small populations per perpetually in crisis. Also a common response to new petitions from regulatory agencies is “warranted but precluded” because the agencies lack resources to deal with additional listed species. The CDFW report mentioned above at least puts the spotlight on the 60 unlisted species and provides them with a small degree of protection through state permitting processes.

The Center for Watershed Sciences (CWS) at University of California, Davis is building a framework for native fish conservation, first by placing fish conservation in the context of water management in general in California (Hanak *et al.*, 2011; Viers & Rheinheimer, 2011), and then by developing an easy-to-access and use distributional data base to

house records for all California fishes, native and alien (Santos *et al.*, 2013). The data base is the result of over 40 years of collections of fishes by the Moyle laboratory at UC Davis. CWS projects have also identified dams from which environmental flows are needed to enhance native fish populations (Grantham *et al.* 2014) and providing the legal basis for requiring such releases (Bork *et al.* 2012). While past efforts to systematically select watersheds statewide for enhanced management of native fishes have not been adopted by state and federal agencies (e.g. Moyle & Yoshiyama, 1994; Moyle & Randall, 1998), renewed efforts to identify key watersheds with improved tools are underway. Given that declining species often occur together in the same watersheds, finding a way to better manage watersheds and habitats, rather than just species, is crucial for the success of future conservation. Increasingly, this means working with novel ecosystems, those that are modified by humans and contain mixtures of native and alien species in unprecedented combinations (Moyle, 2013). Examples of such an approach can be found in Lund *et al.* (2010), Kiernan *et al.* (2012), and Moyle *et al.* (2014). Unfortunately, severe drought, such as the state is currently experiencing, creates severe competition between humans and fish for water, with the fish losing. The future of California's endemic fishes depends being able to resolve this dilemma.

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Water and Wetlands in the Eastern Mediterranean – Critical for People and Biodiversity

Kevin Smith

Freshwater Biodiversity Unit (FBU) Programme Officer

A two-year study involving scientists from across the Eastern Mediterranean has shown that freshwater biodiversity in the region is in an alarming state. With almost one in five species threatened with extinction, and a number of species already extinct, urgent action is required to restore and protect wetlands and flow regimes, and to adopt integrated water resource management practices that incorporate biodiversity needs.

Competing demands for water

In many regions of the world that are facing significant levels of water stress, there is often a perceived dichotomy between the provision of water for people (e.g. for irrigation) and for the 'environment' (biodiversity). When faced with this choice, the needs of biodiversity are, at best, usually only considered if there is any water 'remaining' once all other uses have been catered for. The notion that healthy freshwater ecosystems (functioning as 'natural infrastructure') that support biodiversity will provide, store, and purify water, and also provide many other valuable ecosystem services (e.g. food, flood protection, recreation) is not widely appreciated. In addition, the information required to inform this decision-making process about the needs of biodiversity is usually lacking.

Nowhere is this situation more apparent than in the Eastern Mediterranean region (Turkey, the Levant, and Euphrates and Tigris catchment), where the decision-making processes governing water resources are largely focused upon requirements for irrigation and energy production. This approach, compounded by impacts of climate change and pollution, has led to extensive loss of wetlands (e.g. Lake Amik in Turkey, and Azraq Oasis in Jordan), an alarming reduction in ground water levels, and a reduction and alteration in water flows across the region (e.g. the Qweik River in Turkey and Syria).

Mapping and conserving freshwater biodiversity

As a response to this situation the International Union for Conservation of Nature (IUCN) and partners have recently conducted a project in the Eastern Mediterranean that aims to address the lack of information on freshwater biodiversity, raise the profile of freshwater biodiversity conservation in the region, promote integrated water resource management practices, and better inform decision makers. Through this project, primarily funded by the **Critical Ecosystem Partnership Fund** (CEPF) and the **MAVA Foundation**, we identified the conservation status and mapped the distributions of all described species freshwater biodiversity in selected taxonomic groups in the Eastern Mediterranean. The project engaged scientists from across the region over a two-year period to assess the extinction risk (according the **IUCN Red List** Categories and Criteria) of every described species of freshwater fish, mollusc, dragonfly and damselfly, and a significant number of the regions freshwater plants. The findings, recently published in a **report**, are alarming.

Amazing diversity of freshwater species under threat

Despite the semi-arid nature of the region there is an amazing diversity of freshwater species. In total, 1,236 currently described species were assessed and mapped, of which just under one third are found nowhere else on the planet (i.e. they are endemic to the region). However, almost one in five (19%) of these species, and over half (58%) of those endemic to the region, are threatened with extinction. Sadly, six species, all fishes, are known to have become extinct, and an additional 18 species (seven fishes and 11 molluscs) are possibly extinct. *Molluscs and fishes are particularly impacted, with 45% and 41% threatened, respectively.* Freshwater springs are identified as critical habitats, especially for threatened species as they often provide refuges during times of drought and where there is excessive water extraction.

Freshwater Key Biodiversity Areas

A number of sites that are of particular importance for the persistence of freshwater biodiversity have been identified across the Eastern Mediterranean. These sites, known as freshwater *Key Biodiversity Areas* (KBAs) are presented in a related report, also just published, on **Freshwater Key Biodiversity Areas in the Mediterranean Basin Hotspot**. These KBAs represent critical sites for freshwater biodiversity that may be used to inform future decisions on the designation of Ramsar sites (Internationally Important Wetlands) and inform environmental planning and private sector development – in particular to aid adherence to environmental safeguards policies and guidelines.

One example is the Haditha Karst (Cave) system KBA in Iraq, which is impacted by falling groundwater levels, supporting two endemic and Critically Endangered cave fishes; the **Haditha cave fish** (*Caecocypris basimi*), and the **Haditha cave garra** (*Typhlogarra widdowsoni*). Another is the Lakes Aci and Salda KBA, in Turkey, which support a number of threatened fishes and molluscs including the endemic and Critically Endangered **Aci Göl Toothcarp** (*Aphanius transgrediens*). The Lower Asi River KBA in Turkey supports high levels of threatened species (one of the highest in the region) and contains many critical wetland habitats such as Lake Gölbaşı, a small wetland close to the former (drained) Lake Amik and supports many important mollusc and fish populations.

Finding solutions: Integrated River Basin Management

One of the key recommendations stemming from this research is the need to adopt an **Integrated River Basin Management** approach (or similar strategy) in the Eastern Mediterranean to ensure that freshwater biodiversity is conserved, and to enable that wetland ecosystems continue to provide ecosystem goods and services. This is especially important for transboundary waters where member states should fully implement the principles of the **UN Watercourse Convention** (UNWC) and accept responsibility for protection of connected ecosystems beyond national boundaries. Finally, there is an urgent need to set up and maintain long-term monitoring of freshwater biodiversity across the region if we are to prevent further species extinctions and secure functioning freshwater ecosystems for the benefit of people in the Eastern Mediterranean region.

The initiative was funded by the Critical Ecosystem Partnership Fund, the MAVA Foundation and the Spanish Agency for International Development Cooperation (AECID), with contributions from the European Commission funded Biofresh and the National Parks Autonomous Agency (OAPN) of the Spanish Ministry of Agriculture, Food and the Environment.

Two publications resulting from this project are: the freshwater species assessment for the Eastern Mediterranean region (<https://portals.iucn.org/library/sites/library/files/documents/RL-262.2-001.pdf>), and Key Biodiversity Areas of the wider Mediterranean Basin Hotspot (<https://portals.iucn.org/library/sites/library/files/documents/SSC-OP-052.pdf>)

Nandus nandus: Going towards Extirpation

Prof. Jyotirmoy Shankar Deb

Barasat College, India

Nandus nandus, also known as the Gangetic Leaf fish, is a member of the perciform family Nandidae. It is a high priced fish often described as a “delicious” food source. It is very popular to the people of Bangladesh and India (especially in West Bengal). Nowadays, this fish is almost absent in the markets of those areas. Not only that, but also its presence is almost nil in the harvest, both culture and capture. For that, it may be a critically endangered species, at least in the regions of West Bengal (**note** – *Nandus nandus* is currently classified globally as being **Least**



Photo credit: bdfish.org

Concern by the IUCN Red List of Threatened Species). The farmers and workers of West Bengal consider it as a species with high threat towards extirpation in these regions. *Nandus* can still be found in the wild in some interior areas. However, sightings are becoming more rare and its presence in the future remains to be seen.

Nandus nandus was a common freshwater fish species throughout the Indian subcontinent comprising India, Pakistan, Bangladesh, Nepal and Myanmar about 40 – 50 years ago. But gradually, it’s population decreased due to non-judicial exploitation, specifically after the Blue Revolution in India and surrounding countries (with increased focus on aquaculture and fish breeding techniques). Due to the culture of inland fisheries, most of the non-cultivable fish species lost importance to the fish farmers. As a result, many of the indigenous small fishes like species of *Nandus*, *Amblypharyngodon*, *Puntius* etc. are being eradicated before reintroductions could begin in the freshwater bodies. Only the Indian Major Carps, Rohu-Catla-Mrigal (*Labeo rohita* – *Gibelion catla* – *Cirrhinus mrigala*) and several exotic carps have been popular to the fish farmers due to their suitability for cultivation. This tendency is still going on now. More than just cultural methods contributed to the decline. The usage of chemicals, pesticides and fertilizers as well as the disposal of waste water directly to the ponds, rivers, lakes, ditches etc. augmented the absence of such species. Moreover, small water bodies like ditches, small ponds, and canals are almost absent from maps for planning irrigation, road expansion, new road and railway construction, urbanization, etc. despite the fact that these are the natural habitats for *Nandus*.

As a food source *Nandus* is known for its flavor. But, after preservation its taste deteriorates with time. This is another reason that it is less popular among the fish farmers and fish sellers. Like some other species, it may be absent from our list in near future. Immediate action is required to save this nice fish from extinction.

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Searching for Cave Fish in Turkmenistan

Brian Zimmerman

EAZA Fish and Aquatic Invertebrate Taxon Advisory Group Chair, ZSL

In late May a team from the Royal Society for the Protection of Birds and FFSG member Brian Zimmerman from the Zoological Society of London will travel to Turkmenistan in search of the Starostin's Loach, *Troglocobitis starostini* (= *Nemacheilus starostini*). This blind fish is listed as Vulnerable and is confined to only one known sinkhole that forms part of a cave system in the far eastern edge of the country in the Koytendag State Nature Reserve.

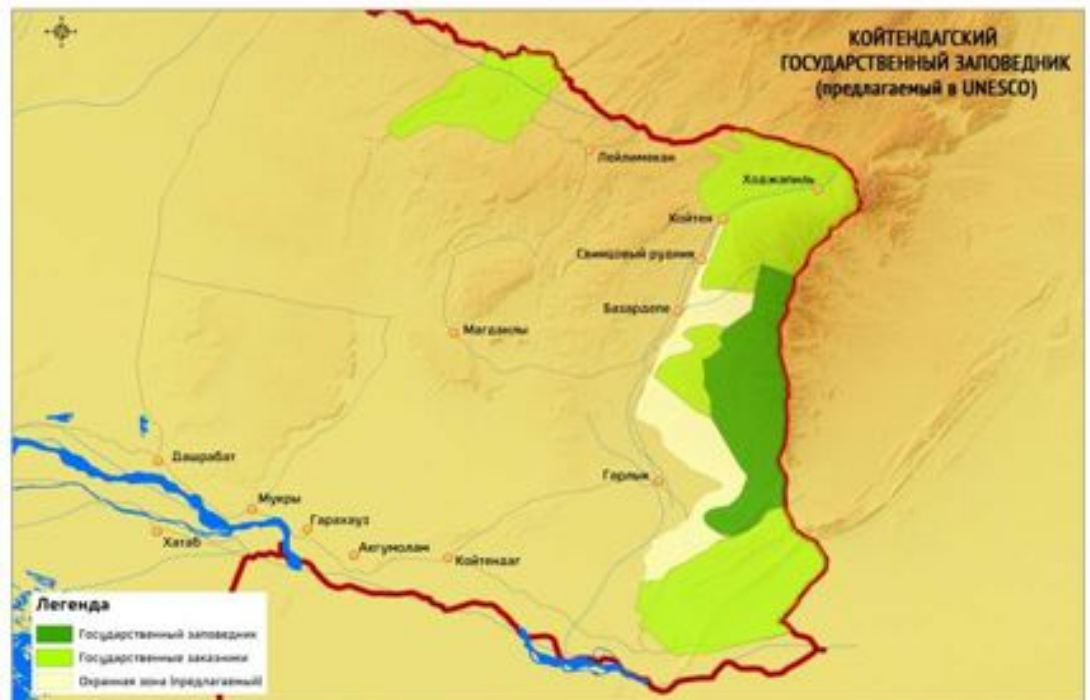
As the result of being situated at the intersection of three biomes, Koytendag Reserve has an outstanding and important flora and fauna, with many species of national and international conservation importance and a high level of endemism. Nine species are listed as Globally Threatened by IUCN and at least 37 species are included in the Red Data Book of Turkmenistan. The extensive system of karst caves and sinkholes, extending over 60 km in length and reaching depths of 310 m, are considered to be the most important and interesting cave system in Northern Eurasia.

In June 2013 RSPB made recommendations to the Ministry of Nature Protection of Turkmenistan to extend the protected areas of the site to give it more integrity and to include a buffer zone around the territory to protect it from encroaching mining interests. This zone is shown in white on the map below.

The total area of the proposed UNESCO Natural World Heritage site, including the buffer zone, is 115,335 ha (90,635 ha of state protected areas). The sanctuary was increased by 10,000 ha and a new buffer zone was created around the site totaling 18,112 ha.

The team traveling to Turkmenistan in May will be collecting data on the sinkhole systems and working with Koytendag Reserve staff to develop a monitoring programme for the sinkholes including water quality monitoring and population assessments of the loach. The team will also try using a small ROV for surveying the sinkhole and observing the behaviour of the fish. Samples will be collected for DNA work back at the Institute of Zoology in London in order to investigate the feasibility of using environmental DNA for monitoring the species.

The project is funded by the RSPB with generous support from the European Union of Aquarium Curators.



This map illustrates the plans to extend the boundary of Koytendag State Nature Reserve to include all the sinkholes and cave system occupied by the loach, along with new buffer zones.

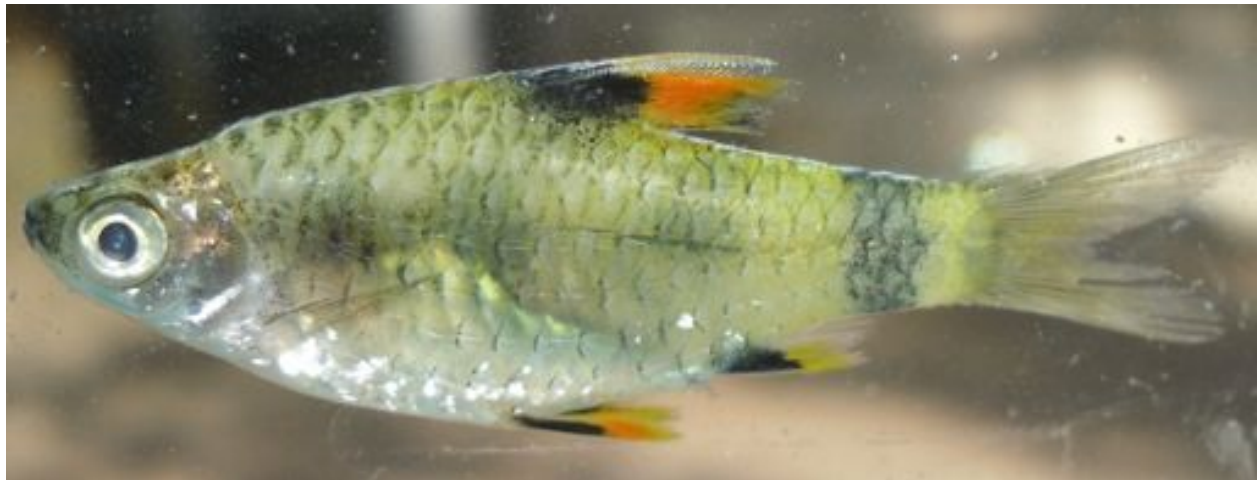
The Golden Barb or Golden Dwarf Barb – An Ideal Aquarium Fish with Commercial Importance to Fisheries of Bangladesh

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Pethia gelius (Hamilton, 1822), or the Golden [Dwarf] Barb, is an amazing freshwater species. Its local name is Jelly or Gili puti. The species was recently recorded in Bangladesh's Tanguar Haor, Sunamganj in November as well as the Brahmaputra River, Mymensingh District in August 2013. Tanguar Haor is a 100 sq km wetland and 'inland sea' that was declared a Ramsar site (wetland of international importance) in 2000.

The Golden Barb is found in canals, beels, baors (beels and baors are crescent-shaped lakes formed when a river bank forms across the neck of a well-developed meander) and rivers (Shafi & Quddus, 2001). They are abundantly found from May to October (Rahman, 1989). Locally the Golden Barb is a rare species in Bangladesh and its global status is Least Concern (LC) according to IUCN 2014. This species of cyprinid fish is native to inland waters in Asia, and is found in Pakistan, India, and Bangladesh. *Pethia gelius* has a wide distribution in India (Madhya Pradesh, Uttar Pradesh, Orissa, West Bengal, Assam, Bihar) and Bangladesh (Jayaram, 1991; Menon, 1999). Reports from Pakistan (Sheri & Saied, 1975) need confirmation. This species is introduced into the natural water bodies in other parts of India due to the aquarium trade (R. Devi pers. comm.).



Puntius gelius. Photo credit: M.M. Hossain

The Golden Barb or Golden Dwarf Barb is distinguished from all other species of *Pethia* by the following combination of characters: lateral line incomplete with 3-4 pored scales; 21–22 + 1 scales in lateral series, ½4/1/2½ scales in transverse line on body; 8 predorsal scales; last unbranched dorsal-fin ray thick, straight, and serrated, with 20–25 serrae on posterior margin; barbels absent; a black band over a tail to little anterior base of caudal fin covering scales 19–21 in the longitudinal series; three diffuse black blotches on the body, first behind opercle, second below dorsal-fin origin, third above anal-fin origin; a black spot at base and origins of dorsal, anal and pelvic fins. Iris pale green, mouth tinged with black. Pectoral fins hyaline, caudal fin delicate reddish and other fins hyaline with a yellowish tinge. It is also ideal aquarium fish. However, they eat their eggs just as soon as they drop them (Talwar & Jhingran, 1991). It is typically found in slow-moving, shallow streams passing through cultivated land such as rice fields, ditches lakes, streams and rivers and which may or may not contain aquatic vegetation.

In general the fish markets in Bangladesh are situated in both rural and urban areas. They do not operate well-monitored management systems. Approximately 97% of the inland fish production is marketed internally for domestic consumption while the remaining 3% is exported (Hasan, 2001a). Of the total available fish and fishery products for export 30.06% is exported to USA, 48.51% to European countries, 9.32% to Japan and the remainder to Thailand and

Middle Eastern countries (Hossain, 2003). Both fisheries and aquaculture in Bangladesh play a major role in alleviating protein deficiency and malnutrition, as well as in generating employment and foreign exchange earnings. Moreover, the fisheries sector contributes 5.10% of the country's export earnings, 4.91% of its GDP and provides 63% of the national animal protein consumption (DoF, 2003.). Following full implementation of improved technologies and better utilisation of water bodies, it is estimated that aquaculture production could be increased by about 150% over the next five years (Mazid, 2002). It is vitally important to conserve freshwater fishes of Bangladesh.

The Golden barb is a somewhat sensitive species and is only suitable for well-established aquariums. The aquarium should be covered in a dark soft substrate. Ideal substrates include peat. The peat will also help maintain the water parameters the Golden barb prefers. It is important to ensure that the other fish species kept with this species prefer the same water chemistry. The aquarium should be decorated using roots and cryptocoryne plants or other similar plants. The water should be soft and acidic. Only low filtration is needed when keeping this species.

The water in the breeding aquarium should be soft and pH 6-6.5. The water should be kept in the middle of the species' preferred range. It is important not to use too warm water when breeding this species as a lot of the eggs remain unfertilized in temperatures that are too high. During spawning, the eggs are scattered over the substrate. The parents should be removed after spawning as they will eat the eggs and fry. Each spawning produces about 70-100 eggs. Small fry will emerge from the eggs after 24 hours and can be fed infusorians and, after a week or so, newly hatched brine shrimp. It is important to only use adult specimens more than 2 years of age to breed this species.

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State of Wetland Biodiversity in the Mekong Basin

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The Mekong River Basin is recognized as one full of global biodiversity hotspots, comprising 12 habitat types from highlands to coastal waters, including peat swamps, subterranean streams and crater lakes. Mekong wetland biodiversity also plays an important role as Key Environmental Assets, and important ecological services and function to more than 60 million of riparian people. The main functions of Mekong's biodiversity are as a supplier of food and other livelihoods (water, medicines, fiber, wood etc.) as well as esthetic and cultural support. The significance of water resources and ecosystem services exploitation are long term impact to livelihoods and socioeconomic condition.

Mekong Basin - Physical Point of View

- Source of the Mekong River / Lancang Jiang is situated on Mount Jifu at about 5200 m AMSL;
- **Length:** approximately **4900 km**; the Mekong is the 10th longest river in the world (the Nile is the longest at approx. 7000 km);
- **Catchment area:** slightly more than **800.000 km²**, the 26th or 27th largest watershed (competing with the Danube) of all rivers (the Amazon river has the largest basin at approx. 6 million km²).
- **Annual mean discharge:** approx. 15,000 m³/s; the Mekong is the 15th most water rich river (the Amazon is the most water rich at approx. 200,000 m³/s).



Wetland biodiversity supports livelihood and provides happiness to people. Dried fish seller in Siem Reap Market, Cambodia. Photo: Chavalit Vidthayanon

Species Diversity and Status Key Findings

More than 885 fishes are known in the basin, including 835 primary, secondary freshwater and estuarine fishes and nearly 50 marine visitor species, representing nearly 2% of vertebrates on earth or 3% of global fish species. By the estimated catchment of 800,000 to 805,627 km² (MRC unpublished data; Revenga *et al.* 1998), fish species diversity per area of the Mekong Basin is considerably high; $883/805,627 = 1.096$ species/1000 km² compare to the Amazon ($3,000$ species/ $6,144,727$ km² = **0.488 species/1000 km²**). Among the species of the Basin, at least **288 fishes** are **endemic** (i.e. they are not found outside the basin), and over 20 species are still undescribed. With crustaceans, including crabs and shrimps, numbering over 200 species known in the basin, and mollusks over 200 species (about 190 snails and 40 bivalves), the Mekong Basin is considered one of the global freshwater mollusk biodiversity hotspots (Groombridge & Jenkins, 2002; Attwood, *in* Campbell, 2009).



(Left) Chao Phraya Giant Catfish (*Pangasius sanitwongsei*), one of 100 the Global most endangered species. **(Right)** Tiger Perch (*Datnioides pulcher*), overexploited for aquarium trades, existing only in the Mekong, extirpated elsewhere. Photos: Chavalit Vidthayanon

In 2011 IUCN's Red List Unit in collaboration with local and international experts made an assessment of 1,386 validly described fishes in the Indo-Burma Biodiversity Hotspot (Allen *et al.*, 2012; iucnredlist.org, 2013). Based on this assessment the experts enlisted **98 Mekong fishes** in **Threatened** status including 54 in the Red List and 44 candidates (Nearly Threatened and additional data needed). The assessment listed 11 species as Critically Endangered.

In addition, nearly 200 **amphibian** species were assessed, one was found EN, 9 VU, 5 NT and 18 DD; within this list 22 are endemic in the Basin. Among aquatic **reptiles** species, 15 were found threatened (5 CR, 3 EN 6 VU and 1 NT); two are endemic in the Basin.

The Mekong population of Irrawaddi dolphin is considered a Critically Endangered wetland dependent **mammal**, along with 4 EN and 2 VU mammals. Up to 30 **wetland birds** are considered threatened, including locally threatened (birds in the basin: 4 CR, 6 EN, 9 VU and 6 NT; birds at regional level: 2 CR, 2 EN and 1 VU). Among these, 3 wetland birds are Mekong endemic.

Up to 154 **crabs** in the Indo-Burma region were assessed and 37 Mekong species were considered threatened (2 EN, 4 VU, 31 DD), all endemic species. Mekong dragonflies and damselflies (Odonata) were assessed for 157 species, 18 are enlisted as threatened, mostly DD and 2 VU, 4 NT, with 6 endemic.

Thirty-seven **mollusk** species were enlisted as threatened and/or data deficient in the Basin (6 EN, 23 VU 1 NT and 7 DD), including 10 bivalves and 27 snails.

Overall, **253 Mekong aquatic and wetland dependent species** are enlisted as **threatened** with 128 species foreseen to be declining but more data are needed to support further conclusions. Within this Red List, **137 species are Mekong basin endemic**. Lao PDR possesses most threatened species, 163, followed by Viet Nam (130), Thailand (121) and Cambodia (115), (www.iucnredlist.org and <https://sis.iucn.org>)

At least 192 mammals and over 1100 birds are reported in the Mekong basinwide (Robson, 2005, Francis, 2008). Thirty-six mammals and over 75 bird species are on the IUCN Red List of Threatened Species (www.iucnredlist.org: 2012) and 25 mammals and 12 birds are endemic, especially in the Annamite Cordillera mountain range of Laos-Vietnam border and in Khammuan Karst of Laos. Two new birds and potentially new small mammals have been discovered recently, including the Cambodian tailorbird (*Orthotomus chaktomuk*) from vicinity of the Capital Phnom Penh (Mahood *et al.* 2013).

Area Key Findings

According to Abell et al. (2008), the Mekong Basin comprises **four Freshwater Ecoregions** namely;

1. Lower Lancang Ecoregion No. 726 - from Myanmar-Thai-Laos Mekong, northern Lao, to Loei River basin of Thailand
2. Khorat Plateau Ecoregion No. 727 - all Northeast Thailand and central Lao basin
3. Kratie-Stung Treng Ecoregion No. 728 - from below Khone Fall, including 3S Rivers, southern Lao and central highland Vietnam tributaries.
4. Lower Mekong-Delta Ecoregion No. 729 - from below Kratie, Tonle Sap and Great Lake basin to the Delta and including Dongnai-Saigon basin.

In terms of Terrestrial or Forest Ecoregions, Hoekstra et al. (2010) divide the basin into 13 regions, including;

1. Yunnan Plateau subtropical evergreen forests Ecoregion No. 102
2. Northern Indochina subtropical forests Ecoregion No. 137
3. Northern Annamite rain forests Ecoregion No. 136
4. Northern Khorat Plateau moist deciduous forests Ecoregion No. 138
5. Luang Prabang montane rain forests Ecoregion No. 121
6. Northern Thailand-Lao moist deciduous forests Ecoregion No. 139
7. Cardamom mountain rain Ecoregion No. 106
8. Tonle Sap freshwater swamp forests Ecoregion No. 164
9. Tonle Sap-Mekong peat swamp forests Ecoregion No. 165
10. Central Indochina dry forests Ecoregion No. 202
11. Southeastern Indochina dry evergreen forests Ecoregion No. 210
12. Southern Vietnam lowland dry Ecoregion No. 211
13. Indochina mangroves Ecoregion No. 1402

The exceptional biodiversity of the Mekong Basin has led to designation and enlisting of several particularly important areas, e.g.:

- **Nine Ramsar Sites** in the Lower Mekong Basin; two in Cambodia (Bueng Chhmar/Moat Khla and Stung Treng); two in Lao PDR (Bueng Kiat Ngong and Xe Champone); three in Thailand (Nong Bong Kai, Bueng Khong Long and Kut Ting Marsh) and two in Viet Nam (Bau Sau Wetlands and Mui Ca Mau National Park).
- **Important Bird Areas** designated by collaboration of Birdlife International with local agencies and worldwide NGOs. Forty-one sites within Mekong wetlands were designated. Cambodia possesses the largest number of areas (21), mainly adjacent to the Tonle Sap and Great Lake basin. Lao PDR possesses 5 sites, mostly in Mekong mainstream areas, Vietnam has 11 sites in the Delta area and Thailand has 5 sites (2 from Mekong mainstreams and the rest in inland marshlands).
- Two proposed **Marine Protected Areas** for Whales, Dolphins and Porpoises (Hoyt, 2011): No. 13.1, Mekong River Conservation Zone from Kratie to Stung Treng, Cambodia and No. 13.18 Community fish Conservation Zones in Mouang Khong District, Lao PDR, were proposed in order to help conserve the Mekong population of Irrawaddi dolphin.

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Battle for Endemism

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Of around 17 mahseer (*Tor*) species known to be distributed throughout south and Southeast Asia, the giant hump-backed mahseer of India's River Cauvery represents a freshwater giant, iconized by sport anglers around the globe. With its distinctive body shape and orange fins it is perhaps surprising that this fish, *Tor mussullah*, still requires formal taxonomic description and afforded a valid scientific name.

In addition to a broad range of anthropogenic threats and the common practice of introducing alien species to reservoirs for food security, across their native range, individual mahseer species continue to face a highly significant threat since the 1970's. That threat is the artificial culture of mahseer species. This culture has been well intentioned; however, the conservation success of the artificial culture of mahseer species, intentional hybridisation and the stocking of progeny outside their native range has to date been measured in terms of numbers of fish introduced to catchments and has not accounted for baseline community dynamics and the potential for negative impacts.



There are a few young adult hump-backs around. Photo: Nigel Rowland

Recent research conducted by a team from the Mahseer Trust and Bournemouth University (UK) has used historic photographs spanning the early 1900's to date, to demonstrate that the hump-backed (orange finned) mahseer is endemic to the River Cauvery. Further analysis of angler logs spanning 15 years has also been used to highlight how the community structure is now dominated by a closely related species *Tor khudree* which, despite not being native to the Cauvery, is now known to have originated from hatcheries as part of a stock augmentation programme designed to conserve mahseer stocks across India. As a result, the introduced stock has thrived while the endemic hump-backed mahseer is now facing imminent extinction due to a comprehensive recruitment failure, with the remaining stock represented by a small number of aging individuals.

Having spent a year planning a research mission to obtain genetic material from the endemic stock, the Mahseer Trust embarked on a trip to the River Cauvery in February 2015. Despite support from key high-level officials in both the Forestry and Fishery Departments of Karnataka State, permission to conduct research within the Protected Area (PA) inside the Cauvery Wildlife Sanctuary (a former strong-hold for the humpbacks) was found not to be robust and subsequently withdrawn within 48 hours of arrival; with officials quoting schedules in both the Indian Wildlife Act and the National Biodiversity Act of 2002 as reasons for this sudden change in position.

With the pending threat of arrest, after spending just a few hours within the PA, the Mahseer Trust team were forced to withdraw and refocus their effort in Kodagu (Coorg) district, where open access to the upper river continued to provide some hope of finding a hump-backed mahseer. Despite sampling more than 50 mahseer in Kodagu, no hump-backed fish were found. Every fish captured was the blue finned *T. khudree*. This shows the extent of the problem faced. That there are a remaining few endemic Cauvery fish in this region is beyond doubt, but they make up a tiny

proportion of angler's catches. In more than 500 mahseer that have been landed and documented in the river in Kodagu in the last two years, only two have been hump-backs.

With the support of Karnataka State fisheries Department, the team were invited to the local Harangi hatchery which was husbanding ~ 150,000 cultured mahseer fingerlings intended for imminent release into the river. Not surprisingly, on inspecting the parent broodstock it quickly became apparent to the team that the fish intended to conserve the Cauvery's mahseer stocks were not of local origin and had been sourced from the Lonavla hatchery, Pune, Maharashtra, which since the 1970's has represented an initiative of the multinational Tata Group. While genetic material is currently being analysed to determine the exact identity of the broodstock, initial visual inspection suggested no less than three species, diverse in morphotype and ranging from deep bodied blue finned fish to slender orange finned fish (probably of Himalayan origin) and fish lacking a mental lobe (a fleshy appendage beneath the chin) indicating their identity to be *Neolissochilus* rather than *Tor*. Thus, the juvenile stock destined to conserve to mahseer of the Cauvery represent the progeny of hybrids of unknown parentage.

Based on the advice of the Mahseer Trust and numerous meetings, Karnataka State fisheries department agreed to put a temporary hold on stocking; however, until such time that it can be demonstrated which species the fingerlings represent, stakeholder pressure continues to mount, putting pressure on the fisheries department to release the fish.

Final Nail in the Coffin of the Hump-Backed Mahseer?

While some have described these stocking activities as being paramount to biological vandalism and a ridiculous basis on which to centre conservation plans, we can only hope that in the future, fisheries departments and angling associations across Asia will consult with suitably qualified fisheries scientists before even beginning such extraordinary steps and threatening the incredible endemism that clings on in the region's rivers.

In the meantime, the Mahseer Trust continues to strongly object to the stocking of non-native mahseers throughout Asia and, as a priority, is committed to sourcing endemic broodstock to conserve the genetic integrity of the Cauvery's mighty mahseer.



Mahseer Trust team at work on River Cauvery. Photo: Steve Lockett



Staff at Harangi Hatchery. Photo: Steve Lockett

Further reading:

Pinder, A.C., Raghavan, R. & Britton, J.R. (in press) Efficacy of angler catch data as a population and conservation monitoring tool for the flagship Mahseer fishes (*Tor* spp.) of Southern India. *Aquatic Conservation: Marine and Freshwater Ecosystems*. DOI: 10.1002/aqc.2543

Pinder, A.C., Raghavan, R. & Britton, J.R. (in press) The legendary hump-back mahseer (*Tor* spp.) of India's River Cauvery: an endemic fish swimming towards extinction? *Endangered Species Research*. DOI: 10.3354/esr00673.



Flagship species for freshwater conservation

14 April 2015, 6pm-7.45pm

Huxley Lecture Theatre, ZSL London Zoo

Freshwater ecosystems are essential to life on earth yet they receive little conservation attention and these efforts are poorly resourced. Unsustainable anthropogenic practices, invasive species and climate change are having an increasing impact on freshwater habitats; for example, it is estimated that globally, agriculture accounts for the abstraction of ~70% of fresh water. Habitat loss and degradation are the primary causes of extinction of freshwater species, and the biodiversity of freshwater ecosystems is declining faster than of any other biome. The use of appropriately selected flagship species has been shown to be hugely effective for a range of habitats and conservationists are using the unique fauna associated with freshwater environments as a vehicle for protecting freshwater ecosystems. This meeting will highlight the importance of the integrity of the freshwater environment and associated biodiversity by using three species-focused case studies. These will highlight not only the threats to the species in question but also to the freshwater environment more broadly, and the actions and mitigations that are required.

Speakers: **Matthew Gollock**, Zoological Society of London; **Eleni Kalogianni**, Hellenic Centre for Marine Research, Greece; and **Orieta Hulea**, WWF Danube Carpathian Programme, Romania
Chair: **Brian Zimmerman**, Zoological Society of London

This event is free and open to all. Advance booking is not necessary. Further details can be found at www.zsl.org/science/whats-on



World Fish Migration Day 2016

Save the date for the next World Fish Migration Day – 21 May, 2016

World Fish Migration Day 2016 (WFMD) is a one day global initiative, with local events worldwide, to create awareness on the importance of open rivers and migratory fish. It is a World Fish Migration Platform activity and is held to improve the public's understanding of the importance of open rivers and migratory fish and their needs.

What is World Fish Migration Day?

The concept of WFMD is that organizations from around the world volunteer to organize their own event around the common theme of: CONNECTING FISH, RIVERS AND PEOPLE. By working together, under one worldwide umbrella, we can improve our impact on raising awareness/ sharing ideas/ securing commitments/ building communities. In doing so, we can ultimately create a greater driving force, which will allow for easier management/ conservation/ rehabilitation of migratory fish stocks.

To find out more about WFMD 2016, including how to create and upload your own event, please visit www.worldfishmigrationday.com.

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Do you want to share news from your freshwater fish conservation project with a global audience? Are you doing fascinating research or organising an exciting event? Well, the FFSG Newsletter could be the perfect way to tell your story!

The deadline for submitting material for the next issue is 1st June 2015.

If you have any questions or if you want to submit material, please email info@iucnffsg.org



Doring River, Western Cape,
South Africa © Bruce Paxton

The Freshwater Fish Specialist Group is generously supported by the Chester Zoo, Zoological Society of London, Wetlands International, and IUCN's Species Survival Commission