SAVING FRESHWATER FISHES AND HABITATS

Newsletter of the IUCN SSC/WI Freshwater Fish Specialist Group

Issue 6 • September 2014

IN THIS ISSUE:

- **What do Rio Negro fishes and Champagne have in common?**
- **The UN Watercourses Convention: What you need to know**
- **Colorado River Days Events**
- **Asian Taimen conservation milestone**
- **And Much More!!!**

FFSG Freshwater Fish Specialist Group

IUCN

SSC Species Survival Commission

Wetlands International

CONTENTS

FFSG UPDATE

NEWS FROM AROUND THE WORLD

OPINION

NOTICEBOARD

Editor-in-chief
Ian Harrison

Editor
Alex Mauroner

Design
Katalin Csatadi, Suzanne Turnock, & Alex Mauroner

Front cover image:
A 40 lb (18kg) flathead catfish *Plicodicts olivaris* on display at one of the Sierra Club's *Colorado River Days* events hosted by Willow Bend Environmental Education Center, Flagstaff, Arizona, USA. The flathead catfish is an invasive species in the Colorado River that threatens many of the native species. See page 17.

Message from the FFSG Global Chair

Dr Richard Sneider

I am delighted to be opening another newsletter for our Freshwater Fish Specialist Group – and this is an interesting one (as they all are, of course). I feel very fortunate to be Chair of such an enthusiastic and active group. The reports from South and South-east Asia indicate our strong and ongoing presence in parts of the world that are rich in freshwater fishes and urgently need attention. I am especially pleased to see the report from Sara Thornton, colleague of our former Programme Officer Suzanne Turnock, describing how Sara intends to develop and implement a project on the ecological, economic and cultural services provided by freshwater fishes in Central Kalimantan. Thank you Sara and Suzanne for keeping us informed of this important work. Pete Rand's news of the recently designated protected area in the Russian Far East is especially important – the culmination of an enormous amount of work over a long period of time. This is so timely – a tangible victory for the often neglected need to develop freshwater focused protected areas. These are truly the results that we all strive for – when we know that habitat and species are being officially protected. But, before we get ahead of ourselves - this legislation of course never means the battle is over. There is always more to be done!

"And it never failed that during the dry years the people forgot about the rich years, and during the wet years they lost all memory of the dry years." - John Steinbeck, *East of Eden* (as quoted in the October 2014 *National Geographic* issue).

And this leads me to an interesting theme that runs through the current newsletter, and one that is close to my heart – the management and policy of our freshwater resources. Like it or not, our plans to conserve freshwater biodiversity are linked with the policy and management that is focused on the water supply itself more than the biodiversity within it. I live in Los Angeles – and water is easily accessible for me. Our Technical Officer, Ian Harrison, is based in Arizona – an arid part of the world – but water is easily available to him. However, the entire West of the United States, and particularly Southern California and Arizona, and to a large extent, New Mexico, Nevada and Texas, are being challenged by a terrifying three year drought, with possible apocalyptic consequences. Ian knows well, as quoted in the same issue of Nat Geo as above, that the Phoenix area has grown 4 times larger since 1970 to 2010, and along with it, this industrialization and population density claims huge water resources, which has changed the face of the region in a multitude of ways, from geography, to extinction, as highlighted in the previously mentioned Nat Geo article: "Today most rivers in the West are saddled with a complex systems of dams, canals, and aqueducts. Most years the Colorado River never reaches its mouth in the Gulf of California, and its once lush delta has become a vast mudflat. Salmon and other fish are struggling, or gone altogether."

I have spent summers on family vacations at Shasta Lake, California, which is a beautiful location but the images and statistics presented in the *National Geographic* article clearly show the extent of the threat to the lake caused by the drought. The water level at Shasta is 65% below its historic average, and the low water levels and exposed sand banks shown in the article make me shiver with anxiety, and in disbelief of the speed of such water crisis. The problem is the same in many other lakes and reservoirs in the southwestern US; on the Colorado Lake Powell is only 51% full and Lake Mead is only 39% full. What makes all of this more disturbing is that evidence shows that throughout the southwest of the USA there is a truly alarming risk of a megadrought for the region, as noted by Ian Harrison and Zeb

Hogan in their piece about Colorado river fishes. Of course some might say that Ian and I are part of the problem, choosing to live where we do. But, in the next few years there will be many more like us, moving to live in places where there is water stress that affects us and the freshwater ecosystems that we wish to conserve. It is a global problem and we need to be a part of solutions that work from the local, to the regional, to the global.

In many parts of the world the impacts of water management and governance are being felt immediately. As indicated by Waikhom Vishwanath in his article on hill stream fishes of northeastern India, dams that are being proposed in regions such as this affect the communities immediately, and affect the ecosystems immediately. Indeed, these existing threats are what drive much of the work of the researchers and practitioners in FFSG – which is just as it should be. In Europe and North America, our communities have been shielded for many years from the effects of our development, and changing climate, on our water availability. In the US, for example, our major water development plans – the big dams, the big water engineering projects – happened 50 years ago or more. That was when or freshwater ecosystems really started changing; when people started to notice the way water was being managed, who had access, and when freshwater species started becoming seriously threatened or going extinct. Now we, in the US and Europe, are in a phase of massive remediation to buffer the social impacts of those developments. I was very interested to read the chapter on *Sustaining Freshwater Biodiversity in the Anthropocene* in the book on *Water in the Anthropocene*, written by Ian Harrison and Will Darwall from FFSG, with colleagues from several other NGOs and academic institutions (announced in this newsletter). They cite some important publications that show that we are spending an astounding 750 billion US dollars every year on just keeping our water infrastructure operating, and dealing with the problems that are arising over time. Two-thirds of that money is spent in America and Europe. As an example, the new inlet pipe to Lake Mead on the Colorado River in the US to allow water to continue to be removed as the water lake levels fall, was budgeted at $800 million. All of this helps deliver clean and ample water to us when we need it. But we forget that we are all sharing that huge economic cost and, more importantly, and as Ian and others mention in their chapter, we forget that all of that money solves the water problem but it does not solve the problem of the threatened biodiversity that has been present in those ecosystems. In fact, it can often just create technology that adds to the threats. The article by Ian and Zeb on the Colorado river fishes provides a vivid description of how development has had a huge toll on those fishes, and how we have been struggling ever since those early days of development to find a better way of managing the river under the threat of climate change and increasing human demands, and have been singularly unsuccessful at including biodiversity in those management plans. There must be better ways of managing our water than we are currently doing! We have to do a better job of integrating the natural value of the ecosystems into the way we manage them – either retroactively here in the US or proactively in those parts of the world where we can avoid going down the same, perhaps shortsighted, pathways that we have followed in the 'developed' world. The choices are difficult, with many opportunities for success but also with possibilities for further mistakes. So we must think carefully, we must monitor what we do, and be ready to adapt our plans, as Ian Harrison and others point out in their text, and as Carla Sneider points out in her opinion piece.

I hope that we can be wiser than Steinbeck's East of Eden fatalistic view and that we take a much more pro-active pathway, much like Australia did facing their drought crisis. "Australia reduced urban water use by investing billions in conservation, education, and efficiency improvements…California's water system-with annual expenditures **exceeding 30** billion-is a long way from following Australia's shining example…We have been unwilling to make the sort of changes ahead of time that we absolutely need to make to face a drier future," (Michael Hanemann, as quoted in the *National Geographic* October 2014 issue).

At regional and global scales we are on the cusp of many opportunities to do things better. This is perfectly demonstrated by Flavia Rocha Loures' piece on the UN Watercourse Convention that came into force in August this year. Flavia's article shows how important this Convention may be to our work. It can help us manage rivers, like the Colorado here in the US, and rivers like the Mekong in southeast Asia, to the benefit of the ecosystems. But to make the most of this Convention, and to ensure that it is applied in a way that is meaningful for conservation of biodiversity in freshwaters, we have to be pro-active in following its development.

This newsletter outlines some major problems to fishes in our lakes and rivers around the world, and it shows that several of those problems are the same around the world – in terms of dams and the need for better water management. The newsletter also discusses how important those fishes are to us – and what we can do from the local to the international level to protect them.

Best wishes,

Richard Sneider
FFSG Global Chair

FFSG Welcomes New Region

Alex Mauroner
FFSG Programme Officer

On behalf of our global Chair, Richard Sneider, I am happy to announce the recent formation of a new "Central Asia" region within the FFSG. Up until now FFSG did not have full regional coverage in the area. Furthermore, in the near future we will need to develop freshwater fish assessments there as part of the global freshwater biodiversity program being led by Will Darwall and his staff at the IUCN Freshwater Biodiversity Unit in Cambridge. We would like to welcome Bakhtiyar Kamilov (bkam58@rambler.ru) and Bakhtiyor Karimov (b.karimov@gmx.de), both of the Uzbekistan Academy of Sciences, to the FFSG as Co-Chairs for the new region.

The fish fauna in Central Asia is today under unprecedented high anthropogenic pressure and urgent rehabilitation measures are needed in order to stop the destruction of fish populations. The problems in the Aral Sea region are among the best known, and most significant, with a dramatic loss of fish biodiversity, and urgent need for the conservation of endangered and rare fishes, due to ecosystem desiccation in the Sea itself and acutely declining water quantity and quality in rivers draining into it. Dr. Karimov has informed us that, in light of these issues, he with Dr. Kamilov, are very happy to accept our invitation to them to be co-Chairs. They look forward to working with our group and with all fisheries scientists and organizations in Central Asian Region. We certainly look forward to working with them and being able to extend FFSG's coverage to this important region.

In addition to the aforementioned regional freshwater fish assessments, Dr. Kamilov and Dr. Karimov intend to focus efforts on basic and applied scientific research in the fields of aquatic ecology, ecotoxicology, impact of water quality on fishes, and fish biodiversity conservation projects. Other work will include studies on the impact of aquaculture technologies on the raising of fish and various issues unique to the Central Asia region.

As with all regions of the FFSG, the Regional Chairs will need the support of our members on thematic and regional issues in order to succeed. Please feel free to contact the two new Co-Chairs if you have any ideas, projects (ongoing or proposed), comments, or questions related to Central Asian freshwater fish conservation. We thank both Dr. Karimov and Dr. Kamilov for their help, and with their assistance our Specialist Group can make an even bigger impact in protecting freshwater fishes and their habitats.

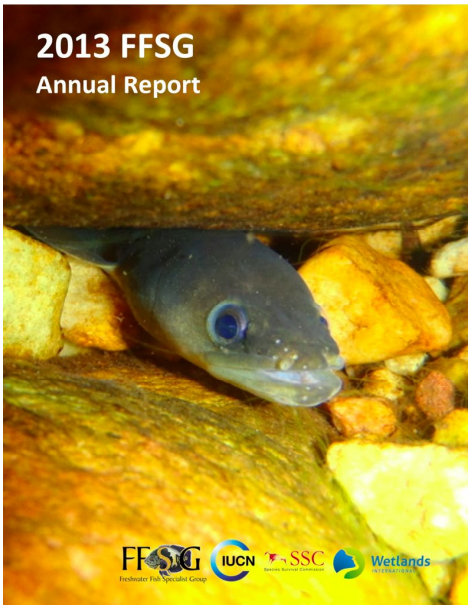
FFSG 2013 Annual Report Now Available

Alex Mauroner
FFSG Programme Officer

The FFSG's Annual Report for 2013 is now available online under the "Assessments, Reports, and Guidelines" section (http://www.iucnffsg.org/resources/) of our website. Within the report are sections including: updates from FFSG regions, FFSG projects from 2013, work as an IUCN Red List Authority, communications updates, and much more.

Compilation of the report began when Suzanne Turnock was still Programme Officer. With the transition of Programme Officers, changes to the Secretariat, and loss of the Chester Zoo as our host organization, the report experienced a somewhat delayed release. Still, it serves as a valuable tool for tracking our progress thus far and measuring our successes and reminding us of successful projects we've undertaken.

If you have not had a chance to look over the 2013 report, please visit our website today.



The River Bank Fundraising Project

Kevin Smith[1] & Alex Mauroner[2]
[1] Freshwater Biodiversity Unit Programme Officer; [2] FFSG Programme Officer

The River Bank fundraising project is in response to the unprecedented loss of freshwater biodiversity due to the pressures of human development. We need to safeguard freshwater habitats to protect the biodiversity and the valuable ecosystem services they provide. With the money raised through the River Bank, IUCN will be able to provide essential (but so far lacking) information on freshwater species to inform development planning and policy makers across the world. We will undertake IUCN Red List species assessments to help us understand the conservation status of species, identify critical sites to ensure that they are 'put on the map' and help initiate conservation actions on the ground.

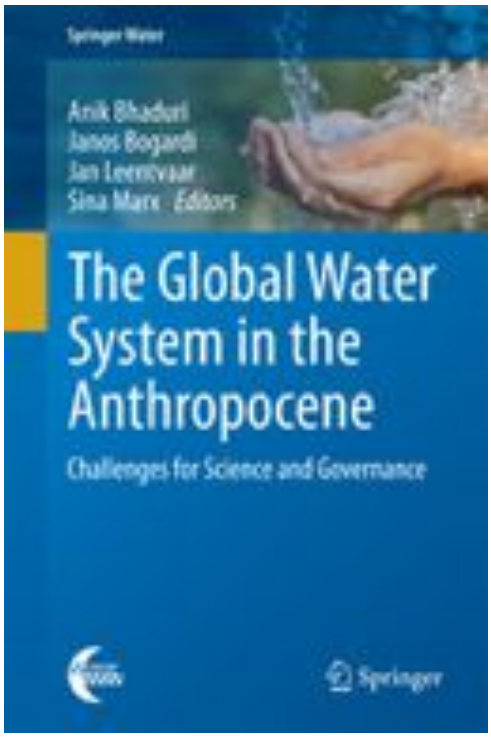
The River Bank project has clear implications for freshwater fish conservation. It will bring attention to the otherwise mostly unnoticed disappearance of freshwater fish species. Increased pressure due to human development is already being applied to freshwater ecosystems. Assessments of freshwater fish populations (as well as other species) will help raise public awareness, illuminate areas where the most urgent threats exist, and provide valuable data to be incorporated into the IUCN Red List and other databases. Please join us in supporting and promoting the Freshwater Biodiversity Unit's River Bank fundraising project.

Video: https://www.youtube.com/watch?v=GcDdho7bp5w
Brochure: https://cmsdata.iucn.org/downloads/13_12_05_final_fbu_brochure.pdf

Bringing Biodiversity and Ecosystems Focus to New Book

Ian Harrison
Technical Officer, FFSG

Members of the FFSG and the IUCN Freshwater Conservation Sub-Committee have co-authored, as part of an international collaboration with colleagues from several other NGOs and academic institutions, a chapter in the upcoming book The Global Water System in the Anthropocene: Challenges for Science and Governance. The chapter, which is entitled "Sustaining Freshwater Biodiversity in the Anthropocene," stresses **the importance of conserving freshwater biodiversity as a critical part of water resources management**.



The book which will be publicly launched on September 16 at the Center for Development Research in Bonn, Germany, will be an important resource for many different decision-makers, academics, and researchers. It includes several contributions from a conference in 2013, Water in the Anthropocene. Some 350 international water experts converged in Bonn, Germany, for this conference to discuss the challenges being posed by human impacts on the earth's water systems, from glaciers, to groundwater, to rivers, lakes and deltas. The conference identified "the countless decades of neglect and millions of misguided decisions we make daily regarding this essential resource", and **searched for solutions in this new era of human dominated change**. See the 3 minute film (link below) that accompanied the conference.

References: http://www.gwsp.org/products/book-the-global-water-system-in-the-anthropocene.html
http://conference2013.gwsp.org/
http://www.nytimes.com/2013/06/11/opinion/global/delivering-water-from-disaster.html?_r=0
http://vimeo.com/66087863 (video link)

South Asia Regional Update

Rajeev Raghavan
South Asia Co-Chair, IUCN-SSC/WI FFSG

International Workshop on Mahseer Conservation

Delegates of the workshop on the banks of the river Cauvery. Photo: Rajeev Raghavan

FFSG South Asia Office partnered with the Mahseer Trust and other regional, national and international institutions including Carleton University (Ottawa, Canada), University of Massachusetts-Amherst (USA), and Bournemouth University (UK) to organize a series of workshops on mahseer conservation in India. The first set of workshops took place in Bangalore, Karnataka on 28th and 29th of March 2014 where experts including ichthyologists, conservation biologists, and policy makers gathered to discuss the current status of mahseers in peninsular India. A range of topics including taxonomy, ecology, fisheries management, recreational fisheries, governance and policy issues were discussed. The second set of workshops was held at Atali Ganga in the state of Uttarakhand on 4th and 5th April 2014 where experts from different parts of North India convened to discuss the state of the golden mahseer in the region. Several current and potential issues concerning the future of the mahseer in the Himalayan region including hydropower development were discussed. The workshops were led by Adrian Pinder from the Mahseer Trust, Steven Cooke from Carleton University (both members of the FFSG), Andy Danylchuk (U Massachusetts-Amherst) and Rajeev Raghavan, South Asia Co-Chair IUCN FFSG. A full report of the events can be seen at the Mahseer Trust webpage (www.mahseertrust.org).

Delegates at the Mahseer Conference in Bangalore. Photo: Rajeev Raghavan

Workshop on identifying freshwater Key Biodiversity Areas (KBA) in the Western Ghats

Staff of the FFSG South Asia office participated in a series of workshops in March 2014 to identify freshwater Key Biodiversity Areas (KBA) in two states (Kerala and Tamil Nadu) of the Western Ghats region, a process led by the Freshwater Biodiversity Unit (FBU) of the IUCN in collaboration with the Zoo Outreach Organization (ZOO), Coimbatore, India (and funded by the Critical Ecosystem Partnership Fund). As part of the stakeholder engagement process, 34 freshwater KBAs were identified and validated. This network of sites in the southern Western Ghats incorporates 110 globally threatened freshwater species, the majority of which are freshwater fish.

A detailed report of the workshop and outcomes will be published in the forthcoming issue.

Freshwater KBA Workshop Session. Photo: Rajeev Raghavan

Participants at the KBA End User Workshop. Photo: Rajeev Raghavan

Aquarium Fishes of the Rio Negro Gain "Geographic Indication" Status

Alex Mauroner
FFSG Programme Officer

After several years of hard work, Project Piaba and colleagues have been successful in declaring the aquarium fishes of the Rio Negro with Geographic Indication status (i.e., as with 'Champagne'). The new status provides a new and heightened sense of identity for the fish affected. "Rio Negro ornamental fishes" must come from the defined area in order for them to be described as such in the fish trade.

Fishes from the Rio Negro captured by local resident. Photo credit: Gary Jones & Mars Fishcare.

The GI area is located in the northern area of the Amazon state. The export of ornamental fish plays a very significant role in regional economies, generating more than 60% of income in the region of the Rio Negro basin ("Geographic Indication – The Region of Rio Negro"). The basin area has extremely high diversity, with around at least a thousand freshwater fish species. The management of ornamental fish species from the Rio Negro is regulated by both the Brazilian Institute of Environment and Renewable Natural Resources and the Department of the Environment.

This is the first ever case of living organisms being recognized with Geographic Indication. The new status will is a component of a broader strategy to help the fisher compete in a changing global market, with the intent of maximizing benefits to the fish communities and the environment. Access and Benefit Sharing has also recently been ratified and will become enacted on October 12 (http://www.cbd.int/abs/), which will help ensure the sharing of benefits arising from the utilization of genetic resources in a fair and equitable way throughout the Rio Negro region.

Congratulations to the team at Project Piaba for their years of work and breakthrough achievements in the region.

For more information on Project Piaba, contact Scott Dowd.

Email: sdowd@projectpiaba.org
Web: www.projectpiaba.org
Social: https://www.facebook.com/pages/Project-Piaba/332179033504804

Reference:

Geographic Indication – The Region of Rio Negro. National Institute of Industrial Property. http://www.icamp.com.br/en/indicacoes-geograficas-a-regiao-do-rio-negro/

The UN Watercourses Convention in Force: What's in it for Aquatic Ecosystems?

Flavia Rocha Loures
Center for International Water Law (CIWL), Xiamen University, Fujian, China
Preface by Ian Harrison

Preface

Flavia Rocha Loures at Stockholm World Water Week, 2011. Photo credit: IUCN.

On August 17, 2014, the United Nations Watercourses Convention, the first global framework on fresh water and the world's only global framework for transboundary cooperation endorsed by the General Assembly of the United Nations, officially entered into force. **Many of us in FFSG may be unfamiliar with this Convention, the long journey from its first proposal to its enforcement, and what it means for those of us who study the biology and conservation of freshwater fishes. But we should be aware of it – because it can significantly affect how the world's 276 transboundary freshwater lake and river basins are managed**. The Convention is focused on the economic, social and environmental *uses* of international watercourses. These uses include a variety of ecosystems services; some are obvious, such as the provision of clean water, and sustainable fisheries. But there are many other services that we use from international watercourses, and these are dependent on the successful management of *healthy* aquatic ecosystems. Importantly, the UN Watercourses Convention includes text that identifies the requirement to protect and maintain watercourses in their natural state, as part of the process of securing equitable use of these resources. It also notes that the different uses of international watercourses cannot, at the outset, be attributed with different degrees of importance. In other words, the importance of a watercourse as a site for a dam to generate power or supply water for agriculture and industry may not, by default, be assumed to be more important than its use to supply other social, economic or environmental uses. **It is our job, therefore, to make ourselves familiar with this Convention, so that we can ensure that the Convention is implemented in such a way that it protects the ecosystems of international watercourses as well as their uses**. Indeed, we, the freshwater conservation community have an absolute responsibility to educate ourselves about this Convention. As it comes into force, we are at a point where we can become engaged and make this work for us as responsible stewards of the environment, or we can sit back and run the risk of it being used and shaped for more utilitarian purposes, by water users and politicians.

In the following article, Flavia Rocha Loures explains many of these points through a description of specific aspects of the UN Watercourses Convention, and how it can be applied to the conservation and management of freshwater ecosystems. Flavia is an environmental law attorney with over ten years of professional experience. She worked from 2005 to 2013 for WWF and during this period she was instrumental in promoting the UN Watercourses Convention and encouraging governments to join the Convention in support of its ratification process. She collaborated with many other NGOs during this process, and coordinated workshops and seminars at international events such as IUCN's World Conservation Congress meetings and regularly at the Stockholm World Water Week. This month she started her PhD in international water law, at Xiamen University. Though she is not a freshwater biologist, or even a fish biologist, her work on ensuring that the UN Watercourses Convention goes into force is a significant benefit to those of us who work on freshwater ecosystems. (When not working on environmental law, she is a productive poet. Her first full-length poetry book – *Vida em Versos/Life in Rhymes* – was published in 2010. I encourage you to check it out – but only after you have checked out the Watercourses Convention).

1. Introduction

In 1997, gathered under the auspices of the UN General Assembly, an overwhelming majority of member states agreed on the adoption of the *Convention on the Law of the Non-Navigational Uses of International Watercourses* (UNWC). Their motivation was the need to clarify the norms governing the utilization, management and protection of the world's internationally shared freshwaters, as a basis for supporting sustainable development through transboundary cooperation.

After years of continued, multi-stakeholder efforts in support of the ratification process, earlier in 2014 Vietnam became the 35th country to join the Convention, allowing for its entry into force this past August.

This article looks at the convention's role as a tool for facilitating cooperation between riparian states and thus for enabling the protection of the ecosystems of international watercourses, including fisheries.

2. The role and status of international water law

Interstate cooperation over shared freshwaters is necessary to secure the integrity of aquatic ecosystems. Without cooperation, it is not possible to achieve common development and conservation goals through the equitable and peaceful sharing of benefits, costs, risks and opportunities associated with shared freshwaters and their ecosystems.

Therefore, in order to address the question in this article's title, we must start by considering the role of international water law more generally in facilitating collaboration and dialogue between riparian states. International law is a central tenet of good transboundary water cooperation and is among the most influential factors on interstate relations in this regard.

If so, we must ask ourselves: Is the law governing those precious resources fulfilling its intended role to the maximum degree possible? When we look at the status of the legal governance of transboundary waters, we find numerous multilateral and bilateral freshwater agreements across regions and yet significant weaknesses, fragmentation and unhelpful overlapping persist. For example, most international watercourses still lack specific cooperative regimes. Even where water agreements exist, most contain gaps and deficiencies, fail to cover the entire watershed, or do not involve all of the states concerned. Finally, for some transboundary basins or riparian states, there are simply too many applicable agreements in place, which often are neither in harmony with one another, nor mutually supportive.

We are thus a long way from having all transboundary basins fully covered by adequate and coherent agreements – which leads us to another question: How can we enhance the ability of international law to promote the sustainable management of international watercourses? This is where framework conventions, whether global or regional, come into play. As integral components of the legal governance structure of shared freshwaters, those conventions lay out basic standards to ensure some coherence across an entire international legal system, while supplementing and reinforcing basin-specific agreements.

In this context, the UN Watercourses Convention (UNWC), now in force, offers a clear and stable global framework for cooperation between riparian states. As such, the convention has assumed its rightful place in the multi-level legal governance of transboundary waters. Its recent entry into force represents a milestone in the process for the *successful* codification and progressive development of customary law in the field, as called for in the convention's Preamble.

Now, UNWC parties have at their disposal a solid statement of the rules of the game – a commonly agreed legal basis that: a) is binding upon them all; b) has political and some legal persuasive force on non-parties; and c) sediments the content, scope and extent of the relevant norms *and* the direction in which such norms are evolving, including with respect to the ecosystems of international watercourses.

The Lhasa river, part of the Brahmaputra drainage; one of the great transboundary rivers of Asia. Photo credit: Antoine Taveneaux (Wikimedia).

From a practical viewpoint, the UNWC is likely to receive much greater political attention now that it is in force. This, in itself, would be a welcome development towards better levels of awareness and knowledge of the convention's value, applicability, content and functions. Entry into force should also trigger a snowball effect, contributing to an acceleration in the ratification process and perhaps even culminating, eventually, in near universal participation among states.

So, as a key part of the legal architecture governing the world's transboundary waters and their ecosystems, what does the UNWC mean for the world? The convention provides for legal and thus political stability, which should contribute to enhanced cooperation. The Convention does so by ensuring greater clarity of what the relevant norms are; and because rising ratification levels translate into growing support for the validity of such norms and their progressive development.

3. The UNWC's relevance and applicability to ecosystem health and services

3.1 Scope. The UNWC applies "to uses of international watercourses and of their waters for purposes other than navigation *and* to *measures of protection, preservation and management*." (Article 1(1)) During the Convention's drafting, it was made clear that the second part of the sentence "is meant to embrace … [individual or cooperative] measures taken to deal with degradation of water quality … and those aimed at solving other watercourse problems, *such as those relating to living resources*, flood control, erosion, sedimentation and salt water intrusion." (1994 ILC Draft Articles, p.89)

Consistent with this broad scope of applicability, the UNWC defines the term "*watercourse*" as "a system of surface waters and ground waters constituting by virtue of their physical relationship a unitary whole." (Article 2(a)) Components within such a system may include, e.g., "rivers, lakes, aquifers, glaciers, reservoirs and canals. So long as these components are interrelated with one another, they form part of the watercourse." (1994 ILC Draft Articles, p.90)

Reinforcing this integrated approach, Articles 3-4 lay out a series of norms aimed at encouraging the adoption of basin-specific agreements, promoting the participation of all the riparian states concerned in matters affecting an international watercourse, and emphasizing the need to consider the potential for transboundary effects from the uses of a watercourse across the entire watershed. As explained during the drafting process,

> Because the surface and groundwaters form a system, and constitute by virtue of their physical relationship a unitary whole, human intervention at one point in the system may have effects elsewhere within it... [E]quitable utilization could be affected, or significant harm caused, through the same system of waters by virtue of their very interconnectedness." [Accordingly,] technical experts consider that the most efficient and beneficial way of dealing with a watercourse is to deal with it as a whole, including all watercourse States as parties to the agreement (1994 ILC Draft Articles, p.90, 91, 93)

Article 23 then goes even further by bringing within the scope of the UNWC the protection and preservation of the marine environment. It requires parties to, "individually and, where appropriate, in cooperation with other States, take all measures with respect to an international watercourse that are necessary to protect and preserve the marine environment, including estuaries."

The adoption of such an all-encompassing approach by the convention represents an important step forward in the protection of aquatic ecosystems. Many watercourse agreements fail to involve all riparian states or to apply to the entire hydrological unit formed by a river's mainstem and its tributaries, connected lakes, wetlands, glaciers and aquifers (1994 ILC Draft Articles, p.93), not to mention the rarely touched upon interactions between freshwater and coastal/marine ecosystems.

Now that it is in force, the UNWC may serve as a compelling force in pushing states to revisit the scope of those agreements. In aligning more closely with an integrated river basin management approach, watercourse agreements should involve all basin states and consider the water system as a whole, from the mountains to the sea.

3.2 Substantive provisions governing the uses of an international watercourse. The UNWC has in the principle of equitable and reasonable use its cornerstone. Going beyond previous attempts at codification of international water law, Article 5 of the Convention places sustainable development and the protection of international watercourses, whether through individual or collaborative action, at the heart of that principle. The UNWC recognizes those elements as core criteria for determining the legality of a particular watercourse use.

Furthermore, the Convention incorporates the notion of equitable and reasonable participation, which "includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof." (Article 5(2)) This means that states must share both the benefits and the costs associated with the protection of a transboundary basin, including the freshwater ecosystem services on which people depend, such as its fisheries. Equitable participation could be exemplified by **a)** a joint assessment of aquatic ecosystems as a basis for sustainable water management, or **b)** an agreement on cost-sharing for the design and construction of fish ladders in a proposed dam, in order to protect migratory species.

Accordingly, in framing their cooperation, states must consider, among all relevant factors and circumstances, the ecology of the basin, potential transboundary effects, as well as the measures (and associated costs) required to conserve and protect water resources that might be impaired, e.g., by the construction of a dam. (Article 6) In relation to such balancing process, Article 10 goes on to state that, absent agreement to the contrary, all water uses enjoy the same level of consideration under the UNWC. In other words, a state's dependence on a river or lake for its fisheries, or as a culturally important resource of natural beauty (as a national park or sacred site, for example) cannot, at the outset, be considered any less important than the use of water for irrigation, energy or otherwise.

Article 7 codifies another core principle of the UNWC, pertaining to a state's duty to exercise due diligence in avoiding significant transboundary harm, when utilizing an international watercourse. Where significant harm nevertheless occurs, and in the absence of agreement to such use, the riparian state responsible must take all appropriate measures, with due regard for equity and reasonableness, and in consultation with the affected state, "to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation." (Article 7(2))

This process of rebalancing the relations between states could entail, for example, the payment of compensation for upstream benefits associated with hydropower development foregone to secure the delivery downstream of ecosystem services, such as livelihoods and food, from fisheries. In this provision, therefore, the UNWC is "setting forth a process aimed at avoiding significant harm as far as possible while reaching an equitable result in each concrete case." (1994 ILC Draft Articles, p.103)

3.3 Relevant procedural duties. Article 8 again refers to the goal of achieving the adequate protection of an international watercourse, when codifying a *general obligation to cooperate*. This means that states must cooperate not only when discussing the effects of specific water uses, but also by working together proactively as necessary for achieving that objective of protection.

As a specific practical application of this duty of cooperation, Article 9 codifies and clarifies norms pertaining to the regular exchange of information. Attuned to sustainable water management requirements, that provision makes explicit reference to data on "the condition of the watercourse, in particular that of a hydrological, meteorological, hydrogeological and ecological nature and related to the water quality as well as related forecasts." (Article 9(1)) During the drafting process, it was clarified that data of an *ecological* nature relates "specifically to the living resources of the watercourse itself", and that the forecasts envisaged would include "the condition or movement of living resources." (1994 ILC Draft Articles, p.108-09)

In Part III, the UNWC lays out detailed principles, rules and procedures governing notification, information sharing, consultations and negotiations in the case of planned measures that may have transboundary effects. These provisions should play a key role in preventing disagreements from turning into more serious disputes, capable of affecting broader interstate relations. They will also create concrete opportunities for dialogue and exchange, through which states may identify shared risks and opportunities and agree on fair, mutually beneficial ways for sharing costs and benefits, including with respect to the conservation of fisheries and other ecosystem services. In

line with a preventive approach, during the period of consultations and negotiations, within the timeframes determined in the UNWC, implementation measures are to remain suspended.

Where these discussions fail to lead to an agreement, however, states may resort to the well-developed dispute settlement mechanisms in Article 33.

3.4 Protection and preservation of ecosystems. Article 20 contains the provision that is most directly relevant for the conservation of the species associated with inland water ecosystems. It requires states to, "individually and, where appropriate, jointly, protect and preserve the ecosystems of international watercourses."

During the UNWC's drafting process, the choice to employ the term *ecosystems* was justified, so as to encompass not only the aquatic ecosystems themselves, but also those areas outside the watercourse deemed to have more than a minimal bearing on its protection and preservation. In this context, the term *ecosystem* "is believed to have a more precise scientific and legal meaning. Generally, that term refers to an ecological unit consisting of living and non-living components that are interdependent and function as a community." (1994 ILC Draft Articles, p.118)

In this sense, Article 20 is not limited to the protection of freshwater in the context of river use and development. The obligation in question encompasses even those activities outside the watercourse that might affect its ecosystems, as well as the protective and management measures necessary to conserve the health of those ecosystems and their services in the long-term, regardless of the potential for transboundary harm.

Providing further specificity to the duty to protect ecosystems, the obligation pertaining to preservation "applies in particular to freshwater ecosystems that are in a pristine or unspoiled condition. It requires that these ecosystems be protected in such a way as to maintain them as much as possible in their natural state." (1994 ILC Draft Articles, p.118)

Recalling the duty of cooperation mentioned above, Article 20 makes express reference to *joint* action, where necessary to protect the ecosystems of international watercourses. Such joint action could involve, for example, collaborative fisheries assessments; basin-wide planning for infrastructure development in a way that balances power capacity with the conservation of valuable ecosystems; or an agreement on the establishment of environmental flows, such as the recent one between US and Mexico on the Colorado River.

The provisions that follow provide further content to the general duty in Article 20, touching upon the themes of pollution, invasive species, river management and regulation, the maintenance of installations, harmful conditions and emergencies – all of which are of relevance for the protection of freshwater species. (Articles 21-26)

4. Looking beyond entry into force: the question of effectiveness

With entry into force, there is a unique, urgent window of opportunity for parties and other interested actors to debate and plan for next steps. In so doing, they must bear in mind that, unlike its sister multilateral environmental conventions, the UNWC provides neither for the establishment of governing bodies, such as a meeting of the parties and a secretariat; nor for the adoption of amendments or protocols. In that regard, there are three key messages that merit attention:

- *Integrating the UNWC and its parties into the broader 'transboundary water management' architecture*: This means, for example, formally incorporating the UNWC's implementation and widespread ratification as core elements of the programmatic strategies of existing institutions working in this area at various levels – with the necessary funds set aside and internal capacities developed accordingly.

Such institutions are well-positioned to build on their own experience when embracing UNWC-related programs. After all, as a solid legal basis for advancing interstate cooperation and thus sustainable water management, the Convention becomes another important tool for promoting the development and conservation goals those institutions already pursue.

- *Implementing the UNWC and the United Nations Economic Commission for Europe (UNECE) Water Convention in a coordinated, mutually supportive manner*: Among other aspects of such coordination, UNWC parties should build on the wealth of lessons and guidance developed under the UNECE Water Convention's framework, when interpreting, applying and implementing their own Convention.

In addition, UNWC parties should take into account the experience of the parties to the UNECE Water Convention in setting up and maintaining their governance framework when weighing financial and political costs against potential benefits involved in revisiting the original design of the UNWC in this respect.

- *Establishing a small, informal institutional structure for support and coordination*: Experience with the ratification process indicates that the lack of an "institutional home" for the UNWC might pose a key challenge to mobilizing partners and donors in support of its widespread ratification and effective implementation.

Therefore, UNWC parties should consider establishing, as a minimum, some kind of a "light" informal institutional structure for support and coordination. This could be as simple as identifying an institutional entry point for UNWC-related matters – a door we could knock on when needed, such as periodical informal meetings among the parties and inter-sessional arrangements led by individual states or organizations willing to step up.

Parties should also track and support ongoing efforts carried out by stakeholders, such as fundraising, research and learning, advocacy, awareness-raising and capacity-building, in support of the convention's ratification and implementation processes.

Finally, the *UNWC Global Initiative* has produced and made available substantial information, knowledge and experience, on which parties are encouraged to tap.

At the appropriate pace, if UNWC parties so desired, these informal arrangements could evolve into more formal governance structures.

For more information:

Loures, F., Rieu-Clarke, A., Vercambre, M.-L., & Witmer, L. (2014). Everything you need to know about the UN Watercourses Convention. WWF International. Available from: http://assets.panda.org/downloads/unwc_2014_final_140821_low.pdf

Rocha Loures F. & Rieu-Clarke, A. eds., The UN Watercourses Convention in force: Strengthening international law for transboundary water management (Earthscan from Routledge, 2013).

UN Watercourses Convention Online Users Guide. http://www.unwatercoursesconvention.org/

Native Fishes of the Colorado River

Ian Harrison [ab] & Zeb Hogan [ac]
[a] FFSG; [b] Conservation International, Policy center for Environment and Peace, USA;
[c] University of Nevada, Reno

A megadrought in the US Southwest is highly likely in the next 100 years; the risk may be higher than 90% in certain areas, which is significantly higher than earlier estimates of less than 50% (Ault *et al*., 2014). The operation of dams on the Colorado River, such as the Hoover Dam, are already threatened by low water levels. A megadrought represents an even greater risk to their operation, as well as presenting enormous challenges to the urban centers and agricultural communities that rely on the river for water. This alarming news was discussed at a forum debate on the *Future of the Colorado Plateau*, which opened the week long (September 2-8) *Colorado River Days in Flagstaff*, Arizona, organized by the Grand Canyon Chapter of the Sierra Club with the support of numerous businesses and organizations, including the FFSG.

This threat of drought is forcing major rethinking about how to manage the water in the region. One of the messages presented through several of the *Colorado River Days* events has been the devastating effects that water management has already had on the very distinctive collection of native fishes of the Grand Canyon section of the Colorado river.

Figure 1. *An aquarium of threatened species of suckers and cyprinids native to the Colorado River, on display at an educational event for the Sierra Club's "Colorado River Days at Flagstaff," at Willow Bend Environmental Education Center, Flagstaff Arizona. Photo credit: Rusty Tweed, Director, Willow Bend Environmental Education Center.*

Historically, there were only eight native species of fishes present, of which six are known only from the Colorado basin. These eight species belong to only two families. There are three species of suckers (Catostomidae): razorback sucker, *Xyrauchen texanus*; bluehead sucker *Catostomus discobolus;* and flannelmouth sucker, *Catostomus latipinnis*. There are five species of minnows (Cyprinidae): speckled dace, *Rhinichthys osculus*; Colorado pikeminnow, *Ptychocheilus lucius*; humpback chub, *Gila cypha;* roundtail chub, *Gila robusta;* and bonytail, *Gila elegans*. Three of the species are now extirpated from the Grand Canyon region of the Colorado; the Colorado pikeminnow, bonytail, and roundtail chub; however, the rountail chub has a wider distribution in other southwestern US streams (NatureServe, 2014a), unlike the Colorado pikeminnow and bonytail which have a much more restricted distribution to the Colorado and are in much greater peril (see below).

The species of fishes of the Grand Canyon, living in geographic isolation in this part of the Colorado, evolved adaptations to the river's historically highly variable conditions. The water flows could vary from just a few thousand cubic feet per second (cfs) in summer, to over 100,000 cfs in late spring floods; the temperature would vary from near freezing to 27^{o}C (80^{o}F) (USGS, 2004). The water also usually carried a high sediment load with turbidity exceeding 1000 formazin nephelometric units (fnu) over 50% of the time (Voichick & Topping, 2014). Several species living here have small eyes (because vision is less important in these silty waters), and reduced or embedded scales to reduce hydrodynamic friction, as well as specialized caudal fin shape and the skeletal anatomy that appear to enhance swimming performance (Moran & Gibb, 2014). The humpback chub and razorback sucker develop unusual humps and keels whose function has been, and remains, debated. Theories have been raised that this morphology also confers a hydrodynamic advantage to the fishes in swift flowing waters; however, laboratory tests showed that the large humps create drag and high energetic costs of locomotion and position-holding (Portz & Tyus, 2004). Those authors showed that the humps may have evolved to reduce predation from the large Colorado pikeminnow. Although toothless, the Colorado pikeminnow was an important predator of humpback chub and razorback sucker, due to its large size, attaining lengths of over 1.8m. It seems that the dorsal hump of the humpback chub and razorback sucker may have made it more difficult for a predator without teeth such as the Colorado pikeminnow to capture and hold onto them.

The native fishes of the Grand Canyon were once widespread through the canyon and into the upper parts of the Colorado river. For example, Minckley (1991) noted that, prior to the construction of the Glen Canyon dam, humpback chub must have inhabited most of the river in the Marble and Grand Canyons and ranged upstream into turbulent parts of Glen Canyon. The fishes were also extremely abundant. Quartarone's (1995) fascinating summary of historical accounts of the fishes of the upper Colorado river discusses a popular fishery in the early 1900s for the Colorado pikeminnow, and suckers being caught by the "gunny sack" full or "washtub" full. There is even an account – from further up the Colorado near Palisade, Colorado – where thousands of fish, probably suckers, were deposited across about 10 acres of peach orchard when Plateau creek, a small tributary of the Colorado, flooded out into irrigation channels through the orchard (Plateau creek joins the Colorado near the location of the Grand Valley Diversion dam; see Figure 2). The fishes of the Colorado were also very large, as noted above for the Colorado pikeminnow, the largest minnow in North America, which was known to weigh up to 36 kg. In the 1920s and 30s it was not uncommon to catch Colorado pikeminnows in the range of 15-35 pounds (7-18 kg) (Quartarone, 1995).

However, human activities have changed all that. The impact of introduced fishes, such as the channel catfish *Ictalurus punctatus*, was noted even in the early 1930s when people observed dead Colorado pikeminnows with channel catfish lodged in their mouths because of the catfishes' spines (Quartarone, 1995). It seems that the Colorado pikeminnow, when encountering this novel prey species, were attacking it and either choking to death or being otherwise fatally injured by the spines of the ingested catfish. Large catfish such as the channel catfish and the flathead catfish *Plicodicts olivaris* (see cover photo to this newsletter) are significant predators on native Colorado river fishes in the lower parts of the Colorado below the Hoover Dam. These catfish species grow to large sizes; for example, hook and line records for the Colorado river are 35 lb 4 oz (16 kg) for the channel catfish, and 75 lb (34 kg) for the flathead catfish.

Figure 2. *Map showing locations of major dams in the Colorado River basin. Lee's Ferry, which separates the Upper and Lower Basins, is located just downriver from Glen Canyon Dam. Source: Shannon 1, Wikipedia. Topographic data from DEMIS Mapserver, PD.*

One of the greatest threats to the native fishes have been caused by the construction of dams on the Colorado. Thirteen dams have been built on the Colorado mainstem since 1905, starting with the construction of Laguna Dam near Yuma, AZ (Figure 2). The massive Hoover (formerly Boulder) and Glen Canyon dams are the best known.

Several more dams exist on the small and large tributaries of the Colorado. These obviously restrict or totally prevent the movement of species that used to migrate up and down the river, from Baja California to the mountains of Colorado. The Glen Canyon dam, built in 1964, has dramatically changed the nature of the river as it flows through the Grand Canyon. The highly variable flows, in terms of water quantity and temperature (see above), have been smoothed out. The flows now typically range only between about 8,000 to 25,000 cfs; the water temperature is consistently cold, ranging between 8-12^{o}C (46-54^{o}F) as it is drawn from more than 200ft below the normal water level of the reservoir behind the Glen Canyon dam; and the water is clear rather than silt laden. None of these conditions are suitable for the native species. In addition, the benthic environment of the Colorado river through the Grand Canyon was modified by these managed flows. The braided channels and shifting sand bars of the river tend to have disappeared, and the complex rock and gravel beds used as spawning grounds by several species (Gorman & Stone, 1999) have changed. Much of the in-stream large woody debris was lost or deliberately removed; these regions of densely packed branches and detritus would have been important habitat for the chubs and suckers, especially as places to retreat to evade predation from the large Colorado pikeminnow. Brown trout (*Salmo trutta*) and especially rainbow trout (*Oncorynchus mykiss*) were introduced to the river for sport fishing. The cold, clear waters flowing from Glen Canyon dam are ideal for these trout; however the trout are predators on the native fishes. While adult rainbow trout tend to be insectivorous, they can eat the young of the native species; brown trout, on the other hand, are a much more significant predatory threat.

As a result of these threats, four of the eight species native to the Grand Canyon region of the Colorado are listed as threatened in the IUCN Red List (with much of the data in IUCN's Global Species Programme database recently updated with information from NatureServe's Explorer database, thanks to funding support from the European Union that allowed collaboration between these two organizations). The Colorado pikeminnow (Figure 3) historically ranged throughout rivers of the Colorado River basin, including the mainstem of the Colorado River and its major tributaries, from Mexico and Arizona to Wyoming. It made long distance spawning migrations from the Colorado River Delta to the Green River and Yampa Rivers in Utah and Colorado. Dam construction stopped this migration. Following the construction of the Laguna dam in 1905 (see Figure 2 above), large numbers of Colorado pikeminnow began stacking up below the newly constructed dam in attempts to get upstream to spawning grounds. They were present in sufficient enough numbers that a cannery was quickly constructed to process and pack these Colorado pikeminnow for human consumption (Mueller & Marsh, 2002). Now, however, the Colorado pikeminnow is entirely extirpated from the Colorado River downstream of the Glen Canyon dam at Lake Powell, with only limited natural reproduction occurring in small portions of the upper Colorado River basin of Colorado, Utah, New Mexico, and Wyoming, and mainly in the Green River in Utah and in the Yampa and Colorado rivers in Colorado and portions of Utah. It is ranked by IUCN as vulnerable across its entire range (NatureServe, 2013a).

Figure 3. *Colorado pikeminnow, Ptychocheilus lucius. Photo credit: Colton Finch.*

Figure 4. *Humpback chub, Gila cypha. Photo credit: Bruce Taubert.*

The humpback chub (Figure 4), which used to occur throughout much of the Colorado River basin, is now reduced to six populations of which only one is self-sustaining (USFWS 2011; NatureServe, 2014b). It is now

ranked as endangered on the IUCN Red List.

Figure 5. *Razorback sucker, Xyrauchen texanus. Photo credit: Ryan Belnap and David Ward.*

Similarly, the razorback sucker (Figure 5) used to range through most of the Colorado River basin, from Wyoming and Colorado to Sonora and Baja California (Page & Burr, 2011). Now it is very significantly reduced in range and abundance; for example, in Lake Mojave below the Hoover dam the populations have dropped from historical numbers in the hundreds of thousands to only 44,000 in 1991 and fewer than 3,000 in 2001 (Marsh *et al*., 2003). It is now ranked as critically endangered in the IUCN Red List (NatureServe, 2013b). It was thought to be extirpated from Grand Canyon until 2012, when individuals were detected in the Colorado River close to Lake Mead.

Figure 6. *Bonytail, Gila elegans. Photo credit: Ryan Belnap and David Ward.*

The situation is even more desperate for the bonytail (Figure 6), also ranked as critically endangered (NatureServe, 2013c). The last known wild bonytail that survived to be brought into captivity for breeding - was caught in 1981, ending a decade long search by fish biologists for the last wild specimens of this species which yielded only eleven individuals (Minckley *et al*., 1989). All of the bonytail in existence today came from those eleven fish (including five females) which were spawned at the Willow Beach National Fish Hatchery in Arizona in 1981 (Hamman, 1982). Bonytail were brought back from the brink of extinction by hatchery propagation, but the long-term prospects for the survival of this species is not good with such a limited genetic makeup. Thousands of individual bonytail exist today, although populations in both the upper and lower Colorado River basin are sustained largely by hatchery augmentation programs.

The fact that some native fish still persist – at least for now – with the help of national and regional government programs and NGOs, is encouraging. Our challenge is to ensure that these fishes continue to survive, and this challenge increases every day with the effects of climate change and very large appropriation of the already reduced amount of water in the Colorado River, to meet the needs of agriculture and urban development.

How do we help these species survive? Hatchery breeding and restocking programs help contribute to wild populations, but at great expense. Moreover, while this process is adding the number of individuals that might be present in the populations in the wild, it is not addressing the ongoing threats to these populations, which cause their continued attenuation. Until we deal with the issues of loss of habitat and threats from invasive species, these restocking programs will not provide a fully effective process for the conservation and maintenance of these native species. Thus, for example, current breeding and restocking programs for razorback suckers produces about 24,000 individuals but, on average, only about 2000 of these actually survive in the wild from one year to the next because of predation by striped bass, *Morone saxatilis*, and flathead catfish (BOR, 2006; Kesner *et al*., 2012).

Experimental high-flow releases from Glen Canyon Dam have been operated several times since 1996, with a goal to mimick pre-dam seasonal flooding of the river and recreating riverside beaches and backwaters. But results from these experiments show that they do not significantly improve the riverine habitats for native fishes and

that, in fact, introduced species such as rainbow trout may proliferate after these high-flow periods. Tributaries such as the Paria River, Little Colorado River and Kanab creek, that join the Colorado along the Marble Canyon and Grand Canyon sections downstream from Glen Canyon dam, are important refuges and spawning areas for native fishes. For example, the Little Colorado River is an important stronghold for the humpback chub with the largest remaining population surviving in this area. Therefore, protection of these tributaries might critical in safeguarding populations until a more comprehensive plan for restoration and conservation of the mainstem of the Colorado River has been achieved.

In fact, we are at the brink of some important opportunities for major changes in the management of the Colorado through the Glen and Grand Canyons. The US Bureau of Reclamation (BOR) and National Park Service (NPS) are in the process of developing the *Glen Canyon Dam Experimental and Management Plan Environmental Impact Statement* (EIS), which will guide management of Glen Canyon Dam for the next 15 years (Glen Canyon Institute, 2014). One proposal, for consideration as an alternative for the EIS, is the *Fill Mead First* plan, submitted to the BOR and NPS by the Glen Canyon Institute. This plan would allow water to flow through Glen Canyon Dam, entirely filling Lake Mead reservoir before any water is impounded in Lake Powell. The *Fill Mead First* plan would rectify the extremely low water levels in Lake Mead, which is currently at 39% full, and reduce the amount of water that is lost from Lake Powell by evaporation and seepage through the porous sandstone rock of the now flooded Glen Canyon behind the dam. But, importantly, from an ecological perspective, it could promote the restoration of the Grand Canyon ecosystem, and could recover some of the Glen Canyon that is currently flooded by Lake Powell.

However, the process of restoration of the Grand Canyon ecosystem is complex, because it has been physically and ecologically altered in such drastic and complex ways. For example, one potentially disastrous outcome of returning the flow regime of the river to warmer water historical conditions is that this would allow the invasive predatory fishes such as catfishes and bass that are proliferating downstream in Lake Mead and upstream in Lake Powell to move into the mainstem Colorado River in the Grand Canyon. These species would represent far greater predation risks to the native species than the rainbow trout that are currently present. This is certainly not to say that the *Fill Mead First* plan would be wrong – in fact might carry many benefits (as discussed above). But, *any* experimental restoration and management plan that is implemented for the Grand Canyon (as part of the EIS or otherwise) must be done extremely carefully, with extensive monitoring of results and allowing for modification of the plan where necessary to improve the likelihood of success.

During the course of the *Colorado River Days Flagstaff* festival, noted at the start of this article, one of us (ZH) gave a lecture on the endangered fishes of the Colorado and drew some comparisons with fishes of other great rivers around the world. The native fishes of the Colorado are as charismatic as the spectacular fauna of many other parts of the world and yet, alarmingly, we still know very little about the biology of these threatened fishes. When we strive to protect the freshwater fauna of rivers like the Mekong, Amazon, and Congo, we often refer to rivers such as the Colorado as examples of the catastrophic effects of short-sighted management plans focused only on providing power and water for people. We owe it to ourselves, therefore, to continue to strive for the restoration and better understanding of the Colorado, so that we may one day refer to it as an example of success rather than failure.

* We are especially grateful to Alicyn Gitlin, Grand Canyon Program Coordinator for the Sierra Club, for organizing the *Colorado River Days at Flagstaff* festival and inviting us to contribute to the events of the week. We are also grateful to the Museum of Northern Arizona, Willow Bend Environmental Education Center, and Riordan Mansion State Historic Park, Flagstaff, for hosting the events in which we participated. We are very grateful to David Ward for providing information about the biology of the fishes, supplying some photographs, and pointing us in the direction of some useful scientific publications. The final opinions expressed in this article are **only** those of the authors and not necessarily shared by any of the other institutions involved in *Colorado River Days at Flagstaff* festival.

References

Ault, T., Cole, J., Overpeck, J., Pederson, G. & Meko, D. (2014). Assessing the risk of persistent drought using climate model simulations and paleoclimate data. *Journal of Climate*. doi:10.1175/JCLI-D-12-00282.1, in press.

Bureau of Reclamation (BOR) (2006). Lower Colorado River multi-species Conservation Program: Final fish augmentation plan. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

Glen Canyon Institute (2014). Glen Canyon Dam Long Term Experimental Management Plan. http://www.glencanyon.org/get_involved/ltemp (accessed September 11, 2014).

Gorman, O.T. & Stone, D.M. (1999). Ecology of spawning humpback chub, *Gila cypha*, in the Little Colorado River near Grand Canyon, Arizona. *Environmental Biology of Fishes* 55:115–133.

Hamman R. L. (1982). Induced spawning and culture of bonytail chub. *The Progressive Fish Culturist* 44 (4): 201-203.

Kesner, R., Karam, A.P., Pacey, C.A., Warmbold, J.W., & Marsh, P.C. (2012). Lower Colorado River Multi-Species Conservation Program: Lake Mohave Razorback sucker monitoring 2012 annual Report. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

Marsh, P.C., Pacey, C.A. & Kesner, B.R. (2003). Decline of the razorback sucker in Lake Mohave, Colorado River, Arizona and Nevada. *Transactions of the American Fisheries Society* 132 (6): 1251-1256.

Minckley, W. L. (1991). Native fishes of the Grand Canyon region: an obituary? Pages 124–177 in G. F. Marzolf (editor). Colorado River Ecology and Dam Management: Proceedings of a Symposium May 24–25, 1990, Santa Fe, New Mexico. National Academy Press, Washington, DC.

Minckley W. L. Buth, D., & R. Mayden., R. (1989). Origin of brood stock and allozyme variation in hatchery-reared bonytail, an endangered North American Cyprinid fish. *Transactions of the American Fisheries Society* 118 (2): 131-137.

Moran, C.J. & Gibb, A.C. (2014). Convergent evolution of high-performance swimming morphology in an Arizona freshwater fish. Society for Integrative and Comparative Biology. 2014 Annual Meeting. Meeting Abstract. http://www.sicb.org/meetings/2014/schedule/abstractdetails.php?id=1398

Mueller, G.A. & Marsh, P.C. (2002). Lost, a desert river and its native fishes: A historical perspective of the Lower Colorado River. USGS Information and Technology Report USGS/BRD/ITR--2002-0010

NatureServe (2013a). *Ptychocheilus lucius*. The IUCN Red List of Threatened Species. Version 2014.2. <www.iucnredlist.org>. Downloaded on 11 September 2014.

NatureServe (2013b). *Xyrauchen texanus*. The IUCN Red List of Threatened Species. Version 2014.2. <www.iucnredlist.org>. Downloaded on 11 September 2014.

NatureServe (2013c). *Gila elegans*. The IUCN Red List of Threatened Species. Version 2014.2. <www.iucnredlist.org>. Downloaded on 11 September 2014.

NatureServe (2014a). NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (accessed: September 10, 2014).

NatureServe (2014b). *Gila cypha*. The IUCN Red List of Threatened Species. Version 2014.2. <www.iucnredlist.org>. Downloaded on 11 September 2014.

Page, L.M. & Burr, B.M. (2011). Peterson field guide to freshwater fishes of North America north of Mexico. Houghton Mifflin Harcourt, Boston, Massachusetts.

Portz, D. & Tyus, H. (2004). Fish humps in two Colorado River fishes: a morphological response to cyprinid predation? *Environmental Biology of Fishes* 71(3):233–245.

Quartarone, F. (1995). Historical accounts of Upper Colorado River basin endangered fish. US Fish and Wildlife Service.

U.S. Fish and Wildlife Service (USFWS). (2011). Humpback chub (*Gila cypha*) 5-year review: summary and evaluation. USFWS, Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

U.S. Geological Survey (USGS) (2004), National water information system, water resource data for Arizona online data retrieval, water years 1949–2004: U.S. Geological Survey Water Data Report, http://waterdata.usgs.gov/nwis/uv?09380000, accessed December 2, 2004.

Vernieu W.S., Hueftle S.J., Gloss S.P. (2005). Water quality in Lake Powell and the Colorado River. In: The State of the Colorado River Ecosystem in Grand Canyon, Gloss S.P., Lovich J.E., Melis T.S. (eds). U.S. Geological Survey Circular; Reston, Virginia, 1282: 69–685.

Voichick, N., & Topping, D.J, (2014). Extending the turbidity record—making additional use of continuous data from turbidity, acoustic-Doppler, and laser diffraction instruments and suspended-sediment samples in the Colorado River in Grand Canyon: U.S. Geological Survey Scientific Investigations Report 2014–5097, 31 p., available online only at *http://dx.doi.org/10.3133/sir20145097*.

Hill stream fishes of Chindwin headwaters in northeastern India – new discoveries and their fate

W. Vishwanath and BD Shangningam
Department of Life Sciences, Manipur University

The headwaters of the Chindwin River in the northeastern India has rich freshwater fish fauna. The east flowing hill streams draining the north-south extending Indo-Burman ranges are inaccessible. There is thin human inhabitation. Except for the trucks which ply in the hilly tracks for transport of timbers, there is no means for transport. Except for the collection of Rev. Mr. Pettigrew in 1910 which led to the description of two new fish species from Ukhrul, Manipur, India by Chaudhuri (1912) and the report of Hora (1936), there has been a long gap on the news of fishes of this rich region.

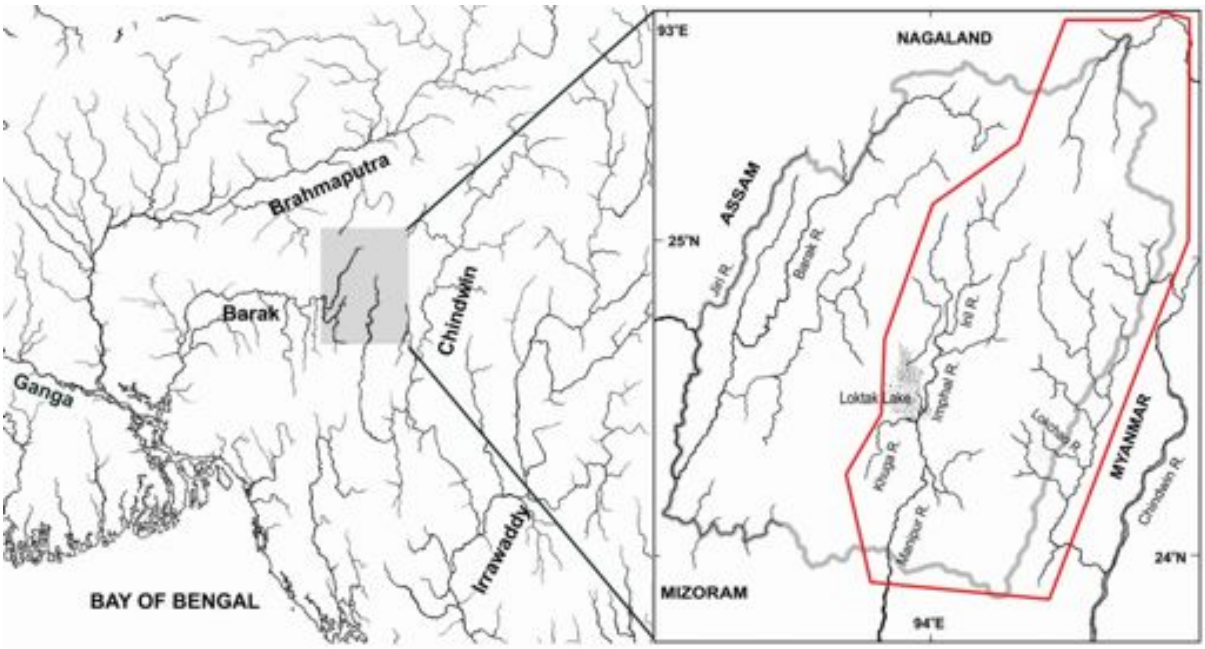


Fig. 1. *Map showing Chindwin headwaters in Manipur (enclosed in red)*

Since the establishment of Manipur University in 1980, ichthyological surveys have been made from time to time and reports on the discovery of interesting new species have been in the news. As many as 48 new fish species have been discovered. The list is given below.

1. *Devario nagaensis* (Chaudhuri, 1912)
2. *Schistura manipurensis* (Chaudhuri, 1912)
3. *Garra abhoyai* Hora, 1921
4. *Garra minutus* Hora, 1921
5. *Lepidocephalichthys irrorata* Hora, 1921
6. *Opsarius dogarsinghi* (Hora, 1921)
7. *Physoschistura prasadi* (Hora, 1921)
8. *Schistura kangjupkhulensis* (Hora, 1921)
9. *Schistura sikmaiensis* (Hora, 1921)
10. *Schistura nagaensis* (Menon, 1987)
11. *Garra manipurensis* Vishwanath & Sarojnalini, 1988
12. *Garra litanensis* Vishwanath, 1993

13. *Psilorhynchus microphthalmus* Vishwanath & Manojkumar, 1995
14. *Meyersglanis jayarami* Vishwanath & Kosygin, 1999
15. *Akysis manipurensis* (Arunkumar, 2000)
16. *Barilius lairokensis* Arunkumar & Tombi, 2000
17. *Garra compressa* Kosygin & Vishwanath, 2000
18. *Macrognathus morehensis* Arunkumar & Tombi, 2000
19. *Neonoemacheilus morehensis* Arunkumar, 2000
20. *Pethia manipurensis* (Menon, Rema Devi & Vishwanath, 2000)
21. *Capdio ukhrulensis* (Selim & Vishwanath, 2001)
22. *Devario yuensis* (Arunkumar & Tombi, 2003)
23. *Pethia meingangbii* (Arunkumar & Tombi, 2003)
24. *Pethia yuensis* (Arunkumar & Tombi, 2003)
25. *Pethia ornata* (Vishwanath & Juliana, 2004)
26. *Rasbora ornata* Vishwanath & Laishram, 2004
27. *Schistura reticulata* Vishwanath & Nebeshwar, 2004
28. *Garra nambulica* Vishwanath & Joyshree, 2005
29. *Garra paralissorhynchus* Vishwanath & Shanta, 2005
30. *Mystus ngasep* Darshan, Vishwanath, Mahanta & Barat, 2005
31. *Sisor barakensis* Vishwanath & Darshan, 2005
32. *Glyptothorax ventrolineatus* Vishwanath & Linthoingambi, 2006
33. *Glyptothorax granulus* Vishwanath & Linthoingambi, 2007
34. *Glyptothorax ngapang* Vishwanath & Linthoingambi, 2007
35. *Pethia atra* (Linthoingambi & Vishwanath, 2007)
36. *Pethia khugae* (Linthoingambi & Vishwanath, 2007)
37. *Pseudecheneis ukhrulensis* Vishwanath & Darshan, 2007
38. *Amblyceps torrentis* Linthoingambi &Vishawanth, 2008
39. *Amblyceps tuberculatum* Linthoingambi & Vishawanth, 2008
40. *Garra namyaensis* Shangningam & Vishwanath, 2012
41. *Parambassis waikhomi* Geetakumari & Basudha, 2012.
42. *Physoschistura chindwinensis* Lokeshwor & Vishwanath, 2012
43. *Physoschistura trigrina* Lokeshwor & Vishwanath, 2012
44. *Psilorhynchus chakpiensis* Shangningam & Vishwanath, 2013
45. *Psilorhynchus maculatus* Shangningam & Vishwanath, 2013
46. *Psilorhynchus ngathanu* Shangningam & Vishwanath, 2013
47. *Devario deruptolatea* Ramananda & Vishwanath, 2014
48. *Schistura phamhringi* Shangningam, Lokeshwor & Vishwanath, 2014

A recent collection of fishes from a tributary of Dutah Stream draining into the Yu River (a tributary of the Chindwin) in the Chandel District of Manipur, India, included two unnamed species, one danionin (zebra-fish) and another nemacheilid (loach), which are respectively described as *Devario deruptotalea* Ramananda & Vishwanath, 2014 (Fig. 2) and *Schistura phamhringi* Shangningam, Lokeshwor & Vishwanath, 2014 (Fig. 3). The zebra-fish has a unique colour pattern consisting of 4–6 dark brown irregularly shaped and arranged bars, each of which is partly confluent with adjacent bar at different levels on anterior one-third of side of body, followed by three distinct dark brown stripes posteriorly. The loach is characteristic in having 6–7 black saddles, each continued on both flanks forming a broad diamond-shaped black bar with narrow ventral margins; bars superimposed on a grey stripe along lateral line; arc shaped black basicaudal bar and a prominent oar-like suborbital flap on male.

Fig. 2. *Devario deruptotalea* (≈ 60 mm SL)

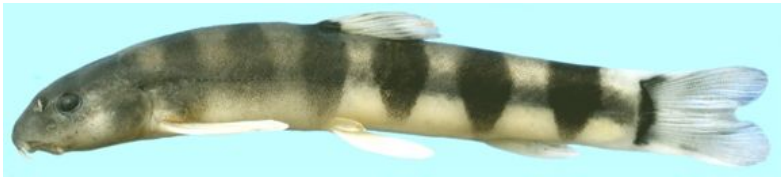


Fig. 3. *Schistura phamhringi* (≈ 50 mm SL)

The villagers inhabiting in the area have become aware of the degrading environment and the loss of fauna. We have not been able to find *Psilorhynchus microphthalmus*, described in 1995 from Chakpi River in Chandel district, Manipur in our recent attempts. The species has been categorized Endangered (Vishwanath et al, 2010). Village authorities have now banned the use of plant poisons and dynamites for fishing. While the government is trying to take up multipurpose projects to tap water and construct dams across the rivers in the hills, local people have understood the adverse effects in the aquatic environments and have come out protesting against such activities (Fig. 4). It is feared that the known fishes and many of those which await discovery might be extinct before they are known to science.

Fig. 4. *Anti-dam rally in the township of Chakpikarong, Chandel district, Manipur, India*

References:

Chaudhuri, B. L. 1912. Descriptions of some new species of freshwater fishes from north India. *Records of Indian Museum,* 7: 437–444.

Hora, S. L. 1921. Fish and fisheries of Manipur with some observations on those of the Naga Hills. *Records of Indian Museum*., **22** (pt. 3, no. 19): 165-214.

Hora, S.L. (1936) On a further collection of fish from Naga Hills. *Records of Indian Museum,* 38, 317–331.

Ramananda, Y. & Vishwanath, W. 2014. *Devario deruptotalea,* a new species of cyprinid fish from Manipur, India (Teleostei: Cyprinidae). *Zootaxa,* 3827 (1): 078-086.

Shangningam, B. & Lokeshwor, Y. & Vishwanath, W. 2014. *Schistura phamhringii*, a new stone loach from Chindwin Basin in Manipur, India (Cypriniformes: Nemacheilidae). *Zootaxa,* 3786 (2): 181–191

Vishwanath, W., Ng, H.H., Britz, R. Kosygin Singh, L., Chaudhry, S. & Conway, K.W. 2010. The status and distribution of freshwater fishes of the Eastern Himalaya region, Chapter 3. IN Allen, D.J., Molur, S., Daniel, B.A. (Compilers). 2010. *The Status and Distribution of Freshwater Biodiversity in the Eastern Himalaya.* Cambridge, UK and Gland, Switzerland: IUCN, and Coimbatore, India: Zoo Outreach Organisation.

Conservation Milestone Reached in Asian Taimen Conservation

Pete Rand
Senior Conservation Biologist, Wild Salmon Center and Chair, IUCN Salmonid Specialist Group

There has been growing interest and concern about the status of a unique group of fishes, known as huchen or taimen. Endemic to Eurasia, these fish are known to be the largest salmonids in the world, exceeding lengths of 2 meters and living to be over 30 years old. Recent assessments by the IUCN Salmonid Specialist Group revealed that all five species in the genera *Hucho* and *Parahucho* are either threatened or Data Deficient.

Siberian taimen. Photo copyright: Clemens Ratschan.

The future of one of these species, Siberian taimen *Hucho taimen*, is now more secure after the announcement of a new freshwater protected area in the Russian Far East, the Tugursky Nature Reserve. The Wild Salmon Center (WSC), Khabarovsk Wildlife Foundation (KWF), and other partners have succeeded in winning the approval of the reserve, which will protect nearly 32,000 hectares of critical habitat within the Tugur Watershed in the Russian Far East's Khabarovsk Region. A regional decree was signed by the Governor of Khabarovsk to establish the reserve. More information about this significant conservation announcement can be found at our website at http://www.wildsalmoncenter.org/press/Tugur_PR.php.

Tugur River, Russia. Photo copyright: Mikhail Skopets, Wild Salmon Center.

My work at the Wild Salmon Center focuses on establishing a network of protected areas for taimen and other salmonids across the North Pacific. This latest announcement adds to earlier success in protecting critical habitat for a related species of taimen, Sakhalin taimen *Parahucho perryi*, including over 38,000 hectares in the upper Koppi River also in Khabarovsk, and 2,600 acres in the Sarufutsu River in Hokkaido, Japan.

While formal protection is a major conservation win, there is plenty of work to be done to ensure

new regulations are enforced and proper monitoring is established. Illegal and unreported fishing continues to be a major source of concern in Russia, along with lack of any scientific monitoring on key salmonid populations in these newly established protected areas.

I recently spent two field seasons establishing a new monitoring program for taimen in the Sarufutsu River protected area in Japan. Through a combination of imaging sonar and CCD video technology, we successfully estimate the size of the spawning population of taimen in that river system. With help from local partners and conservation sponsors, we hope to establish a longer-term monitoring effort on this species. I report some of our initial findings on a National Geographic blog (see "Resources" below). We are currently in the process of publishing the results of our two year project in a scientific journal.

See larger map at www.wildsalmoncenter.org/pdf/Tugursky-Nature-Reserve.pdf

Building on this success, our hope is to apply some of what we have learned in Japan to the Russian Far East. Not as easy as you might think! The scale of the river systems we are working is on a whole different level, and there are important cultural and political issues we face. Through my NGS blog (http://newswatch.nationalgeographic.com/author/prand/), I hope to recount some of our challenges (and successes!) as we continue some ground-breaking work in these new protected areas in the Russia Far East.

Resources:

http://newswatch.nationalgeographic.com/2014/04/24/tracking-the-worlds-largest-salmon-with-sonar/

http://newswatch.nationalgeographic.com/2014/07/31/sarufutsu-river-jumping-with-itou-salmon-researchers-report/

Convention for Migratory Species Science Council Meeting

Matthew Gollock
Anguillid Species Sub-Group Chair, Institute of Zoology/Conservations Programmes, Zoological Society of London

The Convention on the Conservation of Migratory Species of Wild Animals, or CMS to give it's better know abbreviation, is an inter-governmental treaty developed to conserve species identified as being 'migratory' throughout their range. Within the CMS there are two appendices depending on the level of concern – Appendix II is applied to species that would significantly benefit from international co-operation, and Appendix I is for migratory species threatened with extinction. Until recently, I had had little engagement with the CMS, however, since the birth of the Anguillid Species Sub-Group (ASSG) in early 2012, many colleagues have asked why the European eel (*Anguilla anguilla*) had not been listed on the convention, considering it's lengthy and unusual catadromous migration. A very good question; and luckily, in collaboration with, and with support from, colleagues at the Sargasso Sea Alliance, the ASSG was able to develop a scientific case for the inclusion of *A. anguilla* on Appendix II of the CMS to be proposed at the 18th Scientific Meeting by the Government of the Principality of Monaco, held in July, 2014, in Bonn.

Having never attended a meeting such as this before, I, a mere eel-nerd, was a little nervous to be hob-nobbing with international delegates. However, the meeting was a very welcoming and collegiate affair, and I was pleasantly surprised as to the interest in the eel listing. The CMS covers all species and as such I was a little worried that the mammals and birds might overshadow my slippery friends. After general sessions we broke into taxa specific sessions, with the fish section chaired by Zeb Hogan (a fellow FFSG member), who had been extremely helpful during the drafting of the science case. My role was to make the case for the inclusion of the European eel and support the Monégasque delegate, during the discussions that followed before an agreement was made as to whether the proposal would be supported for inclusion for the Conference of the Parties in Quito, Ecuador in November – ultimately where the final decision on listing would be discussed.

The proposal was well-received by the delegates, and it was only for us to make minor amendments after the Scientific Meeting before Monaco was to engage with range states to encourage support of the proposal prior to the meeting in Quito. For me, the key element of CMS that would be so beneficial for the European eel is to engage range states outside of the EU where a process of developing management plans often overshadows the fact that the species is found in other places, particularly North Africa. Listing on Appendix II of CMS would encourage discussions between all range states and allow the development of achievable co-operative actions that would only benefit the European eel.

The Status of Eels in Japan

Matthew Gollock
Anguillid Species Sub-Group Chair; Institute of Zoology/Conservations Programmes, Zoological Society of London

"You don't mind a film crew following you for three days, do you, Matt?", my friend and colleague Kenzo casually asks as we sit in a Tokyo bar / restaurant, locally known as an izakaya. He has timed this question to perfection, as normally I'm a bit camera shy, even for family photos, but it's my first night in town, I'm jet-lagged and have enjoyed my first beer. 'No problem' I say, the reality of what he has asked only hitting me the next day.

I knew eels – or 'unagi' as they are called in Japan - were a big deal in Japan, and East Asia more broadly. Myself, Kenzo and 14 others had been staked out by a Japanese news team in London in July 2013 when we held the Red List assessment workshop that produced 13 species reports that would ultimately be published on the Red List in June this year. But it was only when I arrived in Japan and spent nearly two weeks with various eel stakeholders in an attempt to better understand the culture, industry and science of the Japanese eel that I fully grasped how important this species was over there. I'd also arrived at a specific time of year so I could be in Tokyo for 'doyō-no ushi-no-hi' or the 'Day of the Ox', a particular day when eel, specifically grilled eel or 'kabayaki', is eaten in enormous quantities.

A chocolate covered bread eel, sold in 7-11 for doyō-no ushi-no-hi. Photo by Matthew Gollock.

During our workshop in 2013, we assessed the Japanese eel as 'Endangered' using the Red List categories and criteria. It was this workshop that catalysed the trip to Japan as well as the plan that myself, Kenzo (Kaifu, an Assistant Professor at Chūō University) and Professor Katsumi Tsukamoto had to hold a second workshop that would bring Japanese eel stakeholders together to discuss the state of the species and what could be done to improve it. Prior to the workshop I met with fishers, farmers, processors, sellers, conservationists, journalists, civil servants and scientists with a specific interest in eels and all were very aware of the concerning status of the species, and all had their own ideas as to how the situation could be improved. This made me realise how important this workshop was, and many of the stakeholders indicated that it had historic proportions. Until this point, there had never been a roundtable meeting where all the stakeholders had discussed their opinions, concerns and solutions for the species.

Hello Kitty in her eel costume, another sign of what a big deal the eel is in Japan. Photo by Matthew Gollock.

Attendees of 2014 workshop discussing the issues surrounding Japanese eels. Photo by Matthew Gollock.

The workshop had an air of nervous expectation, and prior to, during, and after, there was huge media interest. I had been in front of the camera, interviewed and miked-up more in 10 days than I had in all my life. But all the attendees felt it was a great success; we discussed the Red List assessment and what it meant for the species, as well as what options might be available for collaboration across sectors to conserve and better manage the species. I think the greatest success was that it was agreed that this meeting should be the first of many. Despite all the participants having different stakes in the species, there was broad agreement that unless they worked together, the situation was unlikely to improve significantly for the Japanese eel.

I'd like to thank my gracious hosts Kenzo Kaifu, Katsumi Tsuakamoto, Mari Kuroki, Jun Aoyama, Tatsuki Yoshinaga, Shun Watanabe, Michael Miller and all the people I met who took time to talk to me while I was in Japan; without them, my trip would have been significantly less successful.

An eel fisherman checks his trap on the Asahi River. Photo by Matthew Gollock.

Evaluating the ecological, economic and cultural services provided by freshwater fishes in Central Kalimantan, Indonesia

Sara A. Thornton
University of Leicester, UK; The Orangutan Tropical Peatland Project, Central Kalimantan, Indonesia. E-mail: sat32@le.ac.uk
Preface by Alex Mauroner

Sara Thornton is a PhD student currently working on the Sabangau River in Central Kalimantan, Indonesia as part of her studies on the economic and cultural importance of fish to local communities in the Sabangau area as well as the use of fish ponds (bejes) as a sustainable livelihood source. She was introduced to the FFSG by her colleague at the Orangutan Tropical Peatland Project and our previous Programme Officer, Suzanne Turnock. Suzanne sends her best wishes to the FFSG, and we would like to thank her and Sara for contributing such an interesting article.

Peat-swamp forests (PSFs) are tropical forests where waterlogged soils hinder the decomposition of organic materials, such as fallen leaves and branches from trees and even entire trunks. Over time, the build-up of this material leads to the formation of peat. These soils are therefore extremely important for their carbon sequestration and Indonesian PSFs store 54Gt of carbon – more than any other country in the world (Page *et al.,* 2004).

Figure 1: *Sabangau peat-swamp forest. Photo: Sara Thornton/OuTrop.*

Indonesian PSFs are not only important for the amount of carbon that they store, but also for their terrestrial and aquatic biodiversity. The Sabangau peat-swamp forest is a unique ecosystem and is Borneo's largest remaining lowland rainforest. Sabangau is not only home to the world's largest remaining contiguous orangutan and southern Bornean gibbon populations (Morrogh-Bernard *et al.*, 2003; Cheyne *et al.*, 2008), but is also important habitat for freshwater fish. Due to the acidic water and unique characteristic of PSFs, the waters of these forests may contain various stenotypic species of fish (Ng *et al.,* 1994; Noor *et al.,* 2005). However, fish diversity and distribution in the Sabangau Forest and River remains under-studied, like many freshwater habitats in South-East Asia. To better understand this ecosystem, as well as the cultural and economic importance of fish and the forest to local communities, I have begun an interdisciplinary Ph.D. research project. This project is in the initial stages and data collection will be carried out over the next 12 months.

Working with local field assistants, I will be employing a traditional fish trap used by the local fishermen called a 'tampirai' (Figure 2 below) for sampling in the rivers and forest. This is a rectangular wire trap, and will contain bait consisting of rotten shrimp paste and fermented soya bean to attract the fish. Sampling will be conducted for five days in the forest and five days in the river, each month. I will also be analysing the water quality at my sample sites; taking measurements of P and N nutrient levels, pH, turbidity, conductivity and dissolved oxygen levels. This

is to control for possible environmental reasons for any differences I see in the number and species of fish trapped, as they are important factors for fish health.

Figure 2*: Traditional wire fish trap called 'tampirai'. Photo: Sara Thornton/OuTrop.*

Social surveys will also be conducted in an area of degraded peatland, known as the ex-Mega Rice Project. This area (1 million hectares) of peat-swamp forest on the other side of the Sabangau River, was set-aside for conversion to rice paddies in the mid-late 1990s. As predicted by experts the project failed and sadly, the area is now a mosaic of forest fragments and burned, barren land. Interviews, focus groups and questionnaires will be carried out with the local communities adjacent to the Sabangau Forest and the ex-Mega Rice Project area to understand the economic and cultural importance of fish to this area, as well as the changes which people have experienced with regards to fishing in the past, plus their hopes for fishing in the future.

Another component to this project are '*bejes*'. Fish ponds (or '*bejes*') have recently been created close to the forest edge, in a project initiated by the Centre for International Cooperation in Sustainable Management of Tropical Peatland (CIMTROP) at the local University of Palangka Raya, and funded by the Orangutan Tropical Peatland Project (OuTrop). Four of these fish ponds have been built, which are stocked naturally during the wet season with native species when the ponds are flooded. Fences prevent the escape of the fish from the pond area, and as the water level drops in the dry season the fish are trapped in the ponds, providing improved harvesting opportunities to the local communities. My research project will lastly be evaluating the economic, ecological and social implications of this fish pond project and whether the fish ponds can be a sustainable source of livelihood for the local communities.

This project aims to elucidate the ecological, cultural and economic links between people, fish and the forest in the Sabangau area. Through an improved understanding of these links and the development of fish monitoring methods, my hope is to use this

Figure 3*: Walking catfish (Clarias teijsmanni) collected from a canal in the Sabangau Forest.Photo: Sara Thornton/OuTrop.*

research to support conservation initiatives. Ultimately, this will help protect this unique habitat and the, often forgotten, aquatic species that call it home, many of which may still be unknown by the scientific community.

This research project is kindly supported by The University of Leicester and the Rufford Foundation, and is in collaboration with OuTrop and CIMTROP.

If you have any questions or comments regarding my research, please contact me at sat32@le.ac.uk or via Twitter @Thornton_SA

About The Orangutan Tropical Peatland Project (OuTrop)

Despite OuTrop's name, the focus of their work is not just orangutans! OuTrop take a holistic and ecosystem approach to conservation and research. They are dedicated to helping protect, restore and regenerate the Sabangau Forest and other high-priority forests in Indonesian Borneo through conservation-orientated research, training and conservation support. The core research focuses on primate and felid population density, distribution and behaviour; biodiversity assessments and monitoring; and forest ecology, conservation and restoration. OuTrop works in partnership with the Centre for International Cooperation in Sustainable Management of Tropical Peatland (CIMTROP) based at the local University of Palangka Raya, Central Kalimantan, Indonesia.
Find out more at www.outrop.com | www.facebook.com/outrop | @outrop

References:

Cheyne, S. M., C. J. H. Thompson, A. C. Phillips, R. M. C. Hill and S. H. Limin (2008). Density and population estimate of gibbons (*Hylobates albibarbis*) in the Sabangau catchment, Central Kalimantan, Indonesia. *Primates* **49**: 50-56.

Morrogh-Bernard, H., Husson, S., Page, S. E., & Rieley, J. O. (2003). Population status of the Bornean orang-utan (*Pongo pygmaeus*) in the Sebangau peat swamp forest, Central Kalimantan, Indonesia. *Biological Conservation*, 110:141–152.

Ng, P. K. L., Tay , J. B. & Lim, K. K. P. (1994). Diversity and conservation of blackwater fishes in Peninsular Malaysia, particularly in the north Selangor peat swamp forest. *Hydrobiologia*, 285: 203-218.

Noor, Y. R., Heyde, J., & Suryadiputra, I. N. (2005). Community-based approach to peatland adaptation and management in Central Kalimantan, Jambi, South Sumatra, Indonesia. I n D. Murdiyarso & H. Herawati (Eds.),

Carbon forestry: Who will benefit? *Proceedings of workshop on carbon sequestration and sustainable livelihoods*, held in Bogor on 16–17 February 2005 (pp. 124–138). Bogor: Center for International Forestry Research.

Page, S.E., Wust, R.A.J., Weiss, D., Rieley, J.O., Shoty k, W., Limin, S.H. (2004). A record of late Pleistocene and Holocene carbon accumulation and climate change from an equatorial peat bog (Kalimantan, Indonesia): Implications for past, present and future carbon dynamics. *Journal of Quaternary Science* 19: 625–635.

The Debate Surrounding Dam Destruction: A Review of the Searsville Dam of Stanford, California

By Carla Sneider
Stanford University B.A. Candidate in International Relations
Preface by Ian Harrison

During the summer of 2014 Carla Sneider very kindly offered to be a volunteer for FFSG. She helped review and prepare some documents in preparation for freshwater sessions at the World Parks Congress this November. Due to many scheduling conflicts I was unable to offer her as much work as I know she could have worked on, but I did ask her to write an opinion piece for our newsletter, drawing on her studies at Stanford University on human society and environmental change. Quite by chance she prepared the text below that fits perfectly with the theme of some of the other issues of river management, dams, and freshwater biodiversity raised in this newsletter. Her text, which is a discussion of different stakeholders' opinions, highlights some of the problems to be considered in the debate to remove dams.

In January 2013, Our Children's Earth and the Ecological Rights Foundation sued Stanford University for harming the threatened steelhead trout populations of Northern California- the university's Searsville Dam supposedly impeded the steelhead's upstream migration to spawning grounds and diverted water essential to a healthy downstream ecosystem. The foundation thus claimed Stanford University violated the Endangered Species Act (ESA). The suit has yet to be resolved.

Within the university, administrators, professors, and students are divided on the dam issue. For one, the dam creates a reservoir responsible for the university's irrigation. For this reason alone, proponents of the dam's destruction overemphasize the administration's "self-serving" interest in maintaining its irrigation system. However, the problem of dam destruction is more complicated than it may appear. It is not merely a struggle between ecological and economic interests, as these groups are divided amongst themselves. For instance, both the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service assert contrary to the Our Children's Earth and the Ecological Rights Foundation that the dam's engineering is in accordance with ESA standards and support Stanford's current administration of the dam's affairs.

On and surrounding the university's campus, concerns about flooding neighborhoods and downstream silt contamination counter complaints about water diversions and trout migration. The reservoir behind the Searsville dam is composed of 90% silt, and the consequences of such massive silt releases on downstream ecosystems cannot be fully foreseen. Some argue such great volumes of silt would hurt rather than benefit steelhead trout populations. Others emphasize the certainty of flooding due to the silt. Therefore, opponents of destruction, the NMFS included, point to alternatives such as fish ladders, which may ultimately benefit all parties involved. The NMFS is currently cooperating with the university to construct fish ladders in the adjoining Los Trancos creek and San Francisquito watershed.

Within Stanford's environmental groups, the largest source of debate surrounds the Jasper Ridge Biological Preserve. The preserve has been closed off to human activities since its establishment in 1978. It is home to many of the university's ecological and biological studies and to the Searsville dam. Although many scientists within the university strongly advocate the facilitation of steelhead trout migration by means of dam removal, those in favor

of maintaining the current system argue the dam's destruction would harm a stable, 132-year-old ecosystem. Notably, the reservoir supports large numbers of rainbow trout and provides habitat for many if the region's birds.

The university is expected to make a decision in response to the lawsuit by the end of 2014. In the end, the decision will rely on the extent to which the decision makers value human convenience, money, and different components of the San Francisquito ecosystem- the steelhead trout included.

Freshwater Events at the IUCN World Parks Congress

There will be several freshwater events at the World Parks Congress in Sydney this Australia. Many of the "streams" at the Congress feature contributions from the FFSG. A copy of the programme is available from the Congress website (http://www.worldparkscongress.org/programme/preliminary_programme.html).

An **annotated copy, which has the freshwater events marked up** is available at this link (http://www.iucnffsg.org/wp-content/uploads/2013/05/World-Parks-program-Stream-by-Stream-WEB-2.pdf). To see which events are related to freshwater, click on the **View or add Comments** button on the top right of the PDF and you will see comments kindly marked up by our summer volunteer Carla Sneider. The most relevant topics (those directly related to freshwater ecosystems) are marked in yellow; the topics that relate to water conservation are marked in pink; and those that relate to sustainable fishing are marked in blue.

Many of the events at the Congress can be seen online. Make sure to stay tuned to find out more on how the FFSG is involved.

FFSG Annual Meeting Notice

This year's annual meeting has been officially scheduled for Wednesday, Dec. 10 and Thursday, Dec. 11, 2014. It is being hosted by Topis Contreras MacBeath and held at the Hosteria Las Quintas in Cuernavaca, Mexico. The meetings are being held in conjunction with the IUCN Freshwater Conservation Sub-Committee meetings, which are set to take place Dec. 8^{th}-9^{th}.

Due to a limited budget, the FFSG meeting will not be like the large symposia-type meetings held in Chester in the past. Steering Committee members will discuss upcoming priorities for the FFSG, including projects and fundraising, and then report out to the larger group upon the meeting's conclusion.

Depending on the capabilities of the host site, parts of the meeting may be open to remote participation. Please check the FFSG website as well as your email to find out more.

We hope that this focused series of meetings will bring about many tangible and positive results for both the FFSG and the myriad freshwater fish species and habitats we aim to protect and conserve.

NEXT ISSUE OF 'SAVING FRESHWATER FISHES AND HABITATS'

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 December 2014.

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