SAVING FRESHWATER FISHES AND HABITATS

Newsletter of the IUCN SSC/WI Freshwater Fish Specialist Group

Issue 13 • May 2017

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Front cover image: Morning fishing at Quatre Bras, Mekong River. Photo credit: Zeb Hogan

FFSG UPDATE

Message from the FFSG Global Chair

Dr. Richard Sneider

I would like to open this newsletter welcoming back all FFSG members who have renewed their membership for the 2017-2020 Quadrennium, and extending a very warm welcome to the new members who have joined us. We have an exciting time ahead.

This year has started off very well. In March we had a very enjoyable and interesting set of joint meetings between IUCN, Conservation International (CI), and leaders of several Chinese philanthropical organizations where we discussed the work of IUCN in China and, in particular, our priorities for freshwater projects (see pages 8-10). We hope that those initial meetings will form the basis for more extended discussions on how some of those philanthropic organizations might work together on shared freshwater interests.

I have been working closely with the National Geographic team that are leading the Okavango Wilderness Project (https://www.nationalgeographic.org/projects/okavango/). At the end of April, I travelled out to the Okavango to spend some time assisting the team in their diving exploration of the region March. While there, I spent several very enjoyable hours working alongside Prof. Paul Skelton, our former FFSG Regional Chair for Southern Africa. Paul is the Science Director and Lead Ichthyologist for the project.

We have several interesting initiatives developing this year, and several of these are further developments from the IUCN World Conservation Congress. In the October 2016 FFSG Newsletter (pages 65-68) we discussed the motion that was presented at the Congress, and was led by WWF-US, requesting a *Union-Wide Strategy to Raise the Urgency of Freshwater Biodiversity Conservation*. The Motions Working Group instead recommended that some summary text be added directly into the 2017-2020 Work Programme of IUCN. The recommendations proposed in this motion were noted by the former SSC Chair, Simon Stuart as important, strategic and of great relevance to IUCN's Programme. To hear his statement, see the video of the 4th sitting (part 1) on the Members' Assembly, September 7 (33:30-34:50 in the video):
https://www.youtube.com/watch?v=Dgu8kYWHUk4&list=PLkDmAh6O4MGrAjy-g_Tam2nrDmkqYI2RX&index=4
To hear the IUCN Director General's statement accepting that the Work Programme should be updated to reflect these recommendations, see the video report of the 6th sitting of the Members' Assembly, September 9 (3:03:35-3:04:29 in the video):
https://www.youtube.com/watch?v=aFfNuQivZqI&index=8&list=PLkDmAh6O4MGrAjy-g_Tam2nrDmkqYI2RX

In addition to this, IUCN Councilor Ayman Raybi gave an important message to the Congress on the need for a more integrated platform on water, in his presentation to the 5th sitting (part 1) of the Members' Assembly on September 7 (1:43:00-1:46:00 in the video):
https://www.youtube.com/watch?v=bcrQuOgsCYI&index=6&list=PLkDmAh6O4MGrAjy-g_Tam2nrDmkqYI2RX

All of this means we are in a great positon to strengthen our freshwater conservation messages in the IUCN. The IUCN Programme of Work was updated immediately after the Congress. Several IUCN Secretariat staff and IUCN Members are now moving ahead with planning a workshop to develop this concept further.

Several of our group have also been involved in developing a concept for the *Blueprint for Freshwater Life* (see pages 46-47 of the October 2016 Newsletter). In October of this year the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) will host a small workshop to pursue this initiative further.

Some of our members are also involved in an ongoing survey of the fishes and the ecosystem status of Lake Victoria, Africa – one of the first lakewide surveys of the fishes in the recent past. The research team are posting regular blogs on their trip, which we are sharing on our FFSG FaceBook site:
https://www.facebook.com/FreshwaterFishSpecialistGroup/
So please be sure to check the site and follow the progress of this important project.

FFSG Steering Committee member Zeb Hogan is leading a project on the *Wonders of the Mekong* (see pages 23-24), and we are already preparing ourselves for Word Fish Migration Day 2018 (see page 11). These are just a few of the projects that our FFSG members are currently working on; more are reported in this Newsletter and we will be bringing you news on even more projects via our website, newsletter, and FaceBook page in the next few months. So, stay tuned and stay engaged!

Best wishes,

Richard Sneider
FFSG Global Chair

Update on Regional Chairs, Special Advisors, Steering Committee members, and representatives of other IUCN Commission Groups

Richard Sneider
FFSG Global Chair

The following is a list of the FFSG Regional Chairs, Special Advisors, Steering Committee members, and representatives of other IUCN Commission Groups for the 2017-2020 Quadrennium. Please do not hesitate to contact Ian Harrison (iharrison@conservation.org) for notification of any omissions or others errors in this list.

Global Chair	Dr. Richard Sneider (One World Star Holdings International Ltd)
Regional Chairs	
Western Palearctic	Dr Jörg Freyhof (Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Germany)
Eastern Palearctic	Dr. Dmitry Lajus (Department of Ichthyology and Hydrobiology, Saint Petersburg State University, Russia)
Central Asia	Dr. Bakhtiyor Karimov & Dr. Bakhtiyar Kamilov (Uzbekistan Academy of Sciences, Uzbekistan)
Southern Asia	Dr Rajeev Raghavan (Conservation Research Group, St. Albert's College, Kochi, India); Dr. Vishwanath Waikhom (Manipur University, India)
China	Professor Junxing Yang (Kunming Institute of Zoology, China)
Japan	Dr Katsutoshi Watanabe (Department of Zoology, Kyoto University, Japan); Dr. Yoshinori Taniguchi (Meijo University, Japan)
Mainland and Peninsular Southeast Asia	Dr Chavalit Vidthayanon (Environment Division, Mekong River Commission, Lao PDR); Dr. Amirrudin Ahmad (University of Malaysia-Terengganu)
Sundaland/Philippines	Dr. Tan Heok Hui (Lee Kong Chian Natural History Museum, National University of Singapore)
New Guinea	
Australia/ New Zealand	Dr. Gerry Closs (University of Otago, New Zealand); Dr. Nicholas Ling (University of Waikato, New Zealand)
Pacific	No chair assigned
North America	Dr. Stephen Walsh (USGS, Gainesville, Florida, USA)
Mesoamerica	Professor Topis Contreras-MacBeath (University of Morelos, Mexico)
South America	Dr. Roberto Reis (Catholic Pontifical University of Rio Grande do Sul, Brazil)
Western Africa	Dr Mamaa Entsua-Mensah (Council for Scientific and Industrial Research, Ghana)
Eastern and Central Africa	Dr Jos Snoeks (Biology Department, Royal Museum for Central Africa, Belgium)

Southern Africa	Dr. Olaf Weyl (South African Institute for Aquatic Biodiversity, South Africa)
Madagascar	Dr. Ravelomanana Tsilavina Illitch (Department de Biologie Animale, Faculte des Sciences, Antanarivo, Madagascar); Dr. Paul Loiselle (Wildlife Conservation Society)
Red List Authority Coordinators (for freshwater fishes)	Dr Jörg Freyhof (Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Germany); Dr Rajeev Raghavan (Conservation Research Group, St. Albert's College, Kochi, India)
Sub-Group Chairs	
Home Aquarium Fish Sub-group	Scott Dowd (New England Aquarium, USA)
Special Advisors	
Biodiversity	Michele Thieme (WWF USA)
Communications	Professor Topis Contreras-MacBeath (University of Morelos, Mexico)
Cryobiology	Professor Krishen Rana (University of Stirling, UK)
Development	Dr. Tony Whitten (Fauna and Flora International, UK)
FishBase	Dr. Rainer Froese (FishBase)
Freshwater representative to the IUCN Red List Committee	Dr Rajeev Raghavan (Conservation Research Group, St. Albert's College, Kochi, India)
Fundraising	Dr. Ian Harrison (Conservation International)
Gene banking	No advisor assigned
Geographic databases	Kevin Smith (IUCN Freshwater Biodiversity Unit)
Impacts of dams and canals on biodiversity	No advisor assigned
Migratory species	Dr. Zeb Hogan (University of Nevada-Reno, USA) and Dr. Claudio Baigún (Wetlands International, Argentina)
Fisheries	Dr. Ian Cowx (University of Hull)
Re-introduction and ex-situ conservation	No advisor assigned
Subterranean fishes	Graham Proudlove (University of Manchester, UK)
Sustainable trade in ornamental fishes	Scott Dowd (New England Aquarium, USA)
Taxonomy	No advisor assigned
Steering Committee (affiliations as above, if not noted below)	
Amirrudin Ahmad; Claudio Baigún; Gerry Closs; Topiltzin Contreras MacBeath; William Darwall (IUCN Freshwater Biodiversity Unit, UK); Scott Dowd; Mamaa Entsua-Mensah; Jörg Freyhof; Matthew Gollock (Zoological Society of London, UK); Ian Harrison; Tan Heok Hui Zeb Hogan; Bakhtiyar Kamilov; Bakhtiyor Karimov; Dmitry Lajus; Nicholas Ling; Paul Loiselle; Taej Mundkur (Wetlands International, The Netherlands); Rajeev Raghavan; Pete Rand (Pricne William Sound Science Center, Alaska, USA); Roberto E. Reis; Richard Sneider; Jos Snoeks; Yoshinori Taniguchi; Chavalit Vidthayanon; Michele Thieme; Ravelomanana Tsilavina Illitch; Vishwanath Waikhom; Stephen Walsh; Katsutoshi Watanabe; Olaf Weyl; Tony Whitten; Junxing Yang.	
FFSG members with positions on other IUCN Commission Groups	
SSC Freshwater Conservation Subcommittee	Professor Topis Contreras-MacBeath, Chair (University of Morelos, Mexico), Chair; Dr. Ian Harrison, Co-Chair (Conservation International)
SSC Salmon Specialist Group	Dr. Pete Rand, Chair (Prince William Sound Science center, Alaska, USA)
SSC Anguillid Eel Specialist Group	Dr. Matthew Gollock, Chair (Zoological Society of London, UK)

CEM Wetlands Ecosystems Thematic Group	Dr. Claudio Baigún, Chair (Wetlands International, Argentina
WCPA Freshwater Specialist Group	Harmony Patricio, Co-Chair (Griffith University); Dr. Ian Harrison, co-Chair (Conservation International)

Presentations on Freshwater Conservation to Leaders of Chinese Philanthropic Organizations, March 6, 2017

Richard Sneider
FFSG Global Chair

In early March I contributed to the Executive Leaders in Philanthropy Program, coordinated by the Ash Center for Democratic Governance and Innovation, of the Harvard Kennedy School. The Program's events brought together leaders and other senior delegates of some forty different philanthropic organizations based in China. My role in the Program was a follow-up from my participation in the East-West Sustainability Summit convened by the East-West Center in partnership with the China Global Philanthropy Institute (http://www.eastwestcenter.org/events/east-west-sustainability-summit-0). During the Executive Leaders in Philanthropy Program in March I made presentations on Extreme Exploration, and on Leading Organizational Change. However, I also took this occasion to invite the participants in the program to attend a one day event (March 6, 2017) at the headquarters of Conservation International (CI), in Crystal City, Virginia, USA, to listen to several presentations on the conservation work of IUCN and CI.

Fig. 1. Richard Sneider discusses the importance of conserving freshwater biodiversity to leaders of Chinese philanthropic organizations at the head offices of Conservation International. Photo credit: Luisa Tam, Conservation International.

Presentations at CI included information about IUCN's programs in China, the *Red List of Threatened Species* (http://www.iucnredlist.org/) and IUCN Green List of Protected and Conserved Areas (https://www.iucn.org/theme/protected-areas/our-work/iucn-green-list), CI's *Freshwater Health Index* (http://www.freshwaterhealthindex.org/), and the work of IUCN's Freshwater Biodiversity Unit and the Freshwater Fish Specialist Group on the conservation of fishes, in particular those in China. We discussed our plans to do comprehensive assessments of freshwater biodiversity in China, for the Red List. We also mentioned the work of FFSG's Regional Chair for China, Prof. Junxing Yang and his colleagues, on the conservation of the golden line barbel, *Sinocyclocheilus grahami* from Lake Dianchi, China (Stone, 2008; Fitzpatrick & Yang, 2010).

Fig. 2 Sinocyclocheilus graham. Photo credit: Yuan-Wei Zhang

The National Geographic Society kindly invited the whole group to visit their headquarters in Washington DC, on March 7. The Society staff explained the ways in which National Geographic is advancing science, education, conservation, and philanthropy to make an impact in the world. The group toured National Geographic's archives and the remote imaging lab, and had further discussion on the challenges and opportunities to work together on future projects in China and around the world.

Figure 3. Guests from Harvard's Ash Center China Program gather in front of National Geographic Society headquarters. Photo credit: by Mary-Knox Zealy.

References

Fitzpatrick, L. & Yang, J. (2010). Golden line Fish. (*Sinocyclocheilus grahami*). In: Defying Extinction: Partnerships to Safeguard Global Biodiversity (Fitzpatrick, L., ed). p.71. Earth in Focus Editions/iLCP & Global Environment Facility: Arlington, Virginia, USA.

Stone, R. (2008). From Remarkable Rescue to Restoration of Lost Habitat. *Science* **322** (5899), 184. [doi: 10.1126/science.322.5899.184].

Celebrate World Fish Migration Day, on April 21, 2018

Sandra Chevret
Project Coordinator
World Fish Migration Foundation

World Fish Migration Day (WFMD) is a one day event to create worldwide awareness on the importance of freshwater migratory fish and free-flowing rivers. By raising global attention to the need for restored river connections for migrating fish, we can achieve healthier fish stocks and more productive rivers. WFMD's aim is to bring a greater understanding worldwide on these issues to the general public and individuals who influence fishery and water management policies.

To accomplish this brighter future, we need to start by educating people on the current situation as well as solutions to the problems. World Fish Migration Day has proved to be an effective means to raise awareness at local, regional, national to international levels. Let's grow this event even more, reaching more people with more stories, examples and solutions in 2018! Organize an event and register it on the WFMD website, or join one in your surroundings.

Join us on World Fish Migration Day!

WFMD 2018, Connecting fish, rivers and people.
http://worldfishmigrationday.com

Please check out this video for further information.
https://www.youtube.com/watch?v=Rx9udu_p2QY

Photo credit: Bas Deelman (WFMF)

Are you publishing descriptions of new species? – then read this.

Ian Harrison
FFSG Technical Officer

Towards the end of 2016, while working as an Editor for the *Journal of Fish Biology*, the official journal of the *Fisheries Society of the British Isles*, I was made aware that the Journal was not properly following the requirements of the *International Code on Zoological Nomenclature* (ICZN) as it relates to the valid publication on new species names when they appear in electronic versions of papers. This can be a particular problem when an online, 'Early View' version of a paper appears with a new species name. If the Early View publication of that name does not conform to the requirements of the ICZN, then the that use of the name is invalid (it is a *nomen nudum* according to the rules of the ICZN) and the name only becomes valid once it has been published in the hard copy.

My co-editors for the *Journal of Fish Biology* and members of FFSG, Nathan Lujan and Jairo Arroyave, worked with the Journal's Editor-in-Chief, John Craig, to write up an editorial that gives instruction on how to correctly publish a new species name in an electronic copy of a manuscript. A critical part of this process is the registration of the name in ZooBank, and the Journal must include this information, and must include the date of electronic publication of the manuscript as a part of the manuscript.

Complete instructions are given in:

Harrison, I.J., Arroyave, J., Lujan, N. & Craig, J.F. (2017). Correct procedure for uploading information on new taxonomic names to ZooBank. *Journal of Fish Biology* **90** (4), 167–1169.

Version of Record online : 24 APR 2017, DOI: 10.1111/jfb.13271.
http://onlinelibrary.wiley.com/jour…/10.1111/(ISSN)1095-8649

NEWS FROM AROUND THE WORLD

Sports stadium moved for an endangered loach, but conservation concerns still remain—a report from Japan

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Mr. Tsunao Watanabe
Chairperson, Japan Committee for IUCN
Dr. Yoji Natori
Science to Action Manager, Conservation International Japan
Mr. Teppei Dohke
Deputy Head, Society Development Department, Nature Conservation Society of Japan

Since the end of 2012, when local governments decided to construct a sports stadium on the habitat of an endangered Japanese species of loach, exceptionally high social concerns and arguments have been raised against the plan. In August 2016, due to the long time need for environmental surveys and assessment, the local governments decided to make a small change in the planned location of the stadium, accepting a proposal from the Chairman of the Scientific Committee for Environmental Conservation, established by the governments. However, there remain several serious problems both in the original and new sites for the stadium. A clear conservation management 'roadmap' should be developed and implemented as urgently as possible for the critical populations of the loach found in the region of Kameoka, where the stadium has been planned. Relevant stakeholders should take responsibility for rapidly implementing the recommendations identified in the roadmap.

The kissing loach, *Parabotia curtus* (Temminck & Schlegel, 1846) (Teleostei: Botiidae; "Ayumodoki" in Japanese; Figure 1), is a freshwater fish endemic to western Japan, symbolizing the East Asian monsoon climate and nature. The loach reproduces in floodplains, or in temporary puddles of waters, caused by floods in the summer rainy season. Because such natural environments have almost disappeared in Japan, similar environments of water networks, produced by rice-paddy cultivation, are alternatively utilized by the loach. However, loss of habitat and migration routes, resulting from farmland consolidation, changes in agricultural practices and urbanization, and predation by alien sunfish, have all threatened this loach. The species presently remains in only three habitats with a total of 0.9 km^2 for reproduction. This species is ranked as Endangered in the National Red List (Environmental Agency of Japan, 1991); it had been ranked as either

Endangered or Data Deficient in the IUCN Red List, and was recently re-assessed as Critically Endangered (Watanabe *et al*., 2015). Also, this species was designated as a national natural monument of Japan in 1977, and has been listed as a protected species under the Endangered Species Law of Japan since 2004 and the Endangered Species Ordinance of Kyoto Prefecture since 2008.

Figure 1. The kissing loach, Parabotia curtus (Botiidae: Japanese name "Ayumodoki"). Photo: Tsukasa Abe.

At the largest of the three habitats where the species still exists, local governments (Kyoto Prefecture and Kameoka City) announced a plan to develop a city park with a sports stadium at the end of 2012. This site is currently a paddy-field area near the Katsura River, where the waterway network functions as an important nursery ground for young fish. While local people welcomed the development plan from the viewpoints of economic development and sports promotion, several nature conservation organizations, academic societies, and some citizens' groups, as well as the national environmental administration, have expressed concerns about conservation of the invaluable wetland ecosystem including its inhabitants such as *P. curtus*. The lack of a precautionary viewpoint in the plan has especially been criticized. Also, in the local community of Kameoka, serious arguments for the plan have occurred because of concerns that raising land level in some regions which usually have flood retarding functions will expose other, adjacent, lower lying regions, to an increased risk of flood. In fact, the area has sometimes suffered serious floods, the last of which occurred in September 2013, even after construction of a flood control dam in the upper reach of the Katsura River.

The local governments initially planned to develop the city park with the stadium at the paddy-field area of 0.14 km^2, and to ensure a ~0.04 km^2 area for a nature sanctuary. With this basic premise, they established a scientific committee, the Expert Meeting of Environmental Conservation for "Kyoto Stadium", which consisted of specialists of ecology, taxonomy, and hydraulic engineering. During the four years since the Committee was established in May 2013, 33 general meetings and about 100 working group meetings have been held respectively; in addition, basic field surveys have been planned and implemented to assess the modification of the habitat. However, one year before the initially scheduled completion date (March 2017), it became obvious that the surveys, assessment, and planning of conservation measures still need several more years to be done effectively. This situation was just as had been predicted by some academic societies for ecology and fish science, much earlier at the beginning of the consultation process.

Based on this situation, at the end of April 2016 the Chairman of the Expert Meeting group personally proposed a minor change to the stadium's location, to avoid the direct modification of the loach's habitat (Figure 2). The new site is located about 700 m southeast of the original site, which is a part of the land readjustment project district that had already started to be developed. Kameoka City decided to purchase the land, and Kyoto Prefecture supported this.

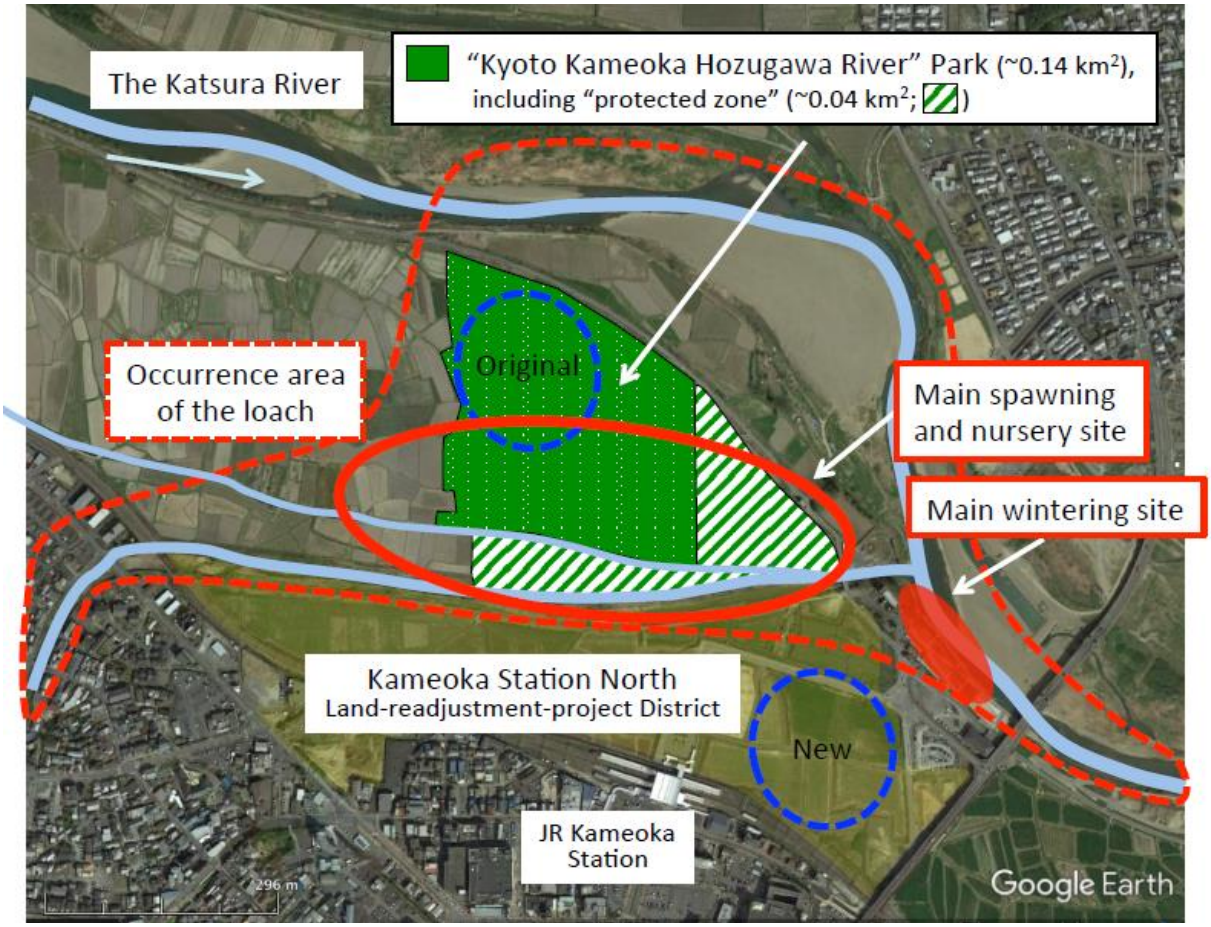

Figure 2. Map of the habitat of Parabotia curtus and the original and new places of the sports stadium in Kameoka City, Kyoto Prefecture, Japan. After Kyoto Prefecture (2017: http://www.pref.kyoto.jp/k-hyoka/h28-02-002.html). Map data from Google Earth.

The new site for the stadium would avoid a significant modification, if not complete removal, of a large part of the species' existing habitat. However, the alternate proposal for the development of the area to the north of Kameoka Station is still unfortunate, because this area was originally an important wetland and is potential habitat of *P. curtus*. Therefore, several concerns remain about the conservation of the loach and wetland environment.

The first concern is the impact on the wintering environment of the loach (Figure 2) mainly via quantity and quality of the underground water, as mentioned also in the proposal from the Chairman of the Expert Meeting group. Population viability analysis suggests the importance of wintering survival for the maintenance of the loach's population (Watanabe *et al*., 2014), and it is inferred that the presence of springs of underground water is important for the successful wintering of the loach. Because the northern area of Kameoka Station is located just above the underground waterway, drilling and construction of underground structures may have some impact on the wintering environment. Monitoring of the environment and the population is of course required. Furthermore, existing wintering sites should be improved, and additional sites should be created before the anticipated impact of the development occurs.

Another important concern is how the site where the stadium was originally proposed (Figure 2) will be maintained. This original site has already become public land, scheduled to become the "Kyoto Kameoka Hozugawa River Park." The hydrological environment there, which traditional farming practices keep suitable for the loach's reproduction, must be maintained by any way possible. However, almost no discussion has been made about the detailed plan of the park, management measures of the wetland, and their implementation system. The conservation area should be expanded also to the surrounding areas, collaborating with a wider group of stakeholders, including local people (farmers), citizens, specialists of relevant fields, local administrative leaders, and nature conservation organizations. The present activities, such as population monitoring, alien species' control, and ex-situ conservation (via establishment of a captive breeding population for future re-introduction), would need to be revised to realize sustainable conservation.

The other two populations of *P. curtus* in Okayama, located about 150 km west of the proposed site for the stadium, are more severely threatened and need even stronger conservation action to maintain than the Kameoka population (Watanabe *et al*., 2014). Hence, the conservation of the Kameoka population represents the best opportunity for success and is therefore specifically important for the protection of the whole species of this loach. The present situation, as described above, is a crucial point of conservation of this species as well as the wetland ecosystem around the traditional paddy fields.

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Watanabe, K., Abe, T., Iwata, A., Shimizu, T. & Hosoya, K. (2015) *Parabotia curtus*. The IUCN Red List of threatened Species 2015: e.T11661A83606443. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T11661A83606443.en. Downloaded on 18 May 2017.

Call for knowledge development and dissemination on migratory fishes in Africa

Kerry Brink
South African Swimway Programme

In Africa there is an unprecedented boom in the construction of dams, which threaten some of the most biodiverse river basins and unique populations of migratory fishes. Unfortunately, however, there is an unmatched amount of relevant data and knowledge about the role that migratory fishes and free-flowing rivers have in these ecosystems and surrounding communities. In an attempt to develop more projects, knowledge, and data sharing, a number of projects are being developed in Southern Africa under the driving force of the *Swimway South African Programme* - a network of stakeholders working together to promote improved research, conservation and management of migratory fishes in South Africa.

Earlier this year, WWF together with the FFSG, World Fish Migration Foundation, South African Institute for Aquatic Biodiversity, and the Institute for Water Education Delft (IHE, which is a partnership with UNESCO) submitted a proposal to the JRS Foundation for a project that aims to improve data and knowledge on the importance of migratory fish species and free flowing rivers in Southern Africa, using the Luangwa River catchment as a case study. The Luangwa (Figure 1) is of particular interest as it is one of the few free-flowing rivers in the Zambezi Basin, which has a relatively pristine fish biodiversity and important lateral migration strategies. For this study, much needed baseline data on fishes will be gathered through social and ecological assessments. It was proposed that local fishermen, fish market personnel, and other key stakeholder groups will be interviewed to get a broader perspective of the current fish biodiversity and to create a path of engagement with communities that are solely dependent on sustainable populations of fishes. These data would then be supplemented by quantitative ecological assessments of the current migratory fish status in the catchment.

***Figure 1. Luangwa River in dry season. Photo credit: Bruce Ellender*.**

Sharing of the information that is gathered on fish migration and biodiversity is also key, particularly in Africa where information is scarce. One of the objectives of the project will be to develop a Spatial Data Infrastructure (SDI), which will involve and train local stakeholders in fish biodiversity efforts and in storing, sharing and analyzing fish biodiversity data. The data will also be used to update existing online databases, and map expected migration pathways. Threats to those pathways will be reviewed, and recommendations for priorities for conservation of unimpacted regions will be made for better management and conservation in the area. Knowledge exchange and building of awareness will be integral parts of the project. The new data created will aid in increasing content of the IUCN Red List, identifying priority conservation areas, developing transboundary management practices for species, and improving stakeholder and public engagement within parallel projects such as the Kafue River Rowing Center project in Zambia.

An update on the status of autochthonous freshwater fishes in Tunisian reservoirs

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Higher Institute of Fisheries and Aquaculture, Bizerte, Tunisia

Rym Ennouri
National Institute of Marine Sciences and Technologies, Tunis, Tunisia

Houcine Laouar
Technical Center of Aquaculture Tunis, Tunisia

There are many studies on biology of freshwater fishes stocked in Tunisian reservoirs, but no details are available on the population status of autochthonous species except the study of Losse *et al.* (1991). Those authors indicated that Tunisian freshwaters are home to two autochthonous species, which are barbell (*Luciobarbus callensis*), eel (*Anguilla anguilla*), and phoxinell (*Tropidophoxinellus callensis*).

In order to update the freshwater fish database for Tunisian reservoirs, a new project entitled "*Population status of freshwater fish in Tunisian reservoirs*" was initiated in 2013. The preliminary results gave general information about the freshwater fishes in Tunisian reservoirs, and these results were presented by Mili *et al.* (2015, 2016). The aim of this paper is to provide an overview of the status of populations of threatened, autochthonous species of fishes in Tunisian reservoirs.

Figure 1. Fishing operation using multi-mesh nets

Fishing operations using multi-mesh gillnets were made in 14 reservoirs (Sidi Saad, Seliana, Bekbeka, Kasseb, Bezirekh, Laabid, Mlaabi, Sidi Barrak, Lahjar, Sidi Salem, Ghezala, Bir Mcherga, Bouheurtma and Mellegue) between April 2013 and May 2016 (Figure1).

A total of eight species of freshwater fishes are present in the surveyed reservoirs and only two native species are caught: barbell (*Luciobarbus callensis*; Figure 2) and phoxinel (*Tropidophoxinellus callensis*).

Figure 2. Barbell Luciobarbus callensis

The goby (*Pomatoschistus marmoratus*) seems to be absent in Tunisian waters. *Tropidophoxinellus callensis* was present only in Sidi Salem reservoir (Figure 3) and it was extirpated from Bouheurtma, Sidi Saad and Bir Mcherga according to the data given by Losse *et al.* (1991). However, *L. callensis* was captured in eight reservoirs (Table I). Furthermore, *L. callensis* and *T. callensis* show an alarming stock status and their biomass distribution is governed by depth; also, they are located especially in downstream waters (Fig. 4).

Figure 3. Sidi Salem reservoir

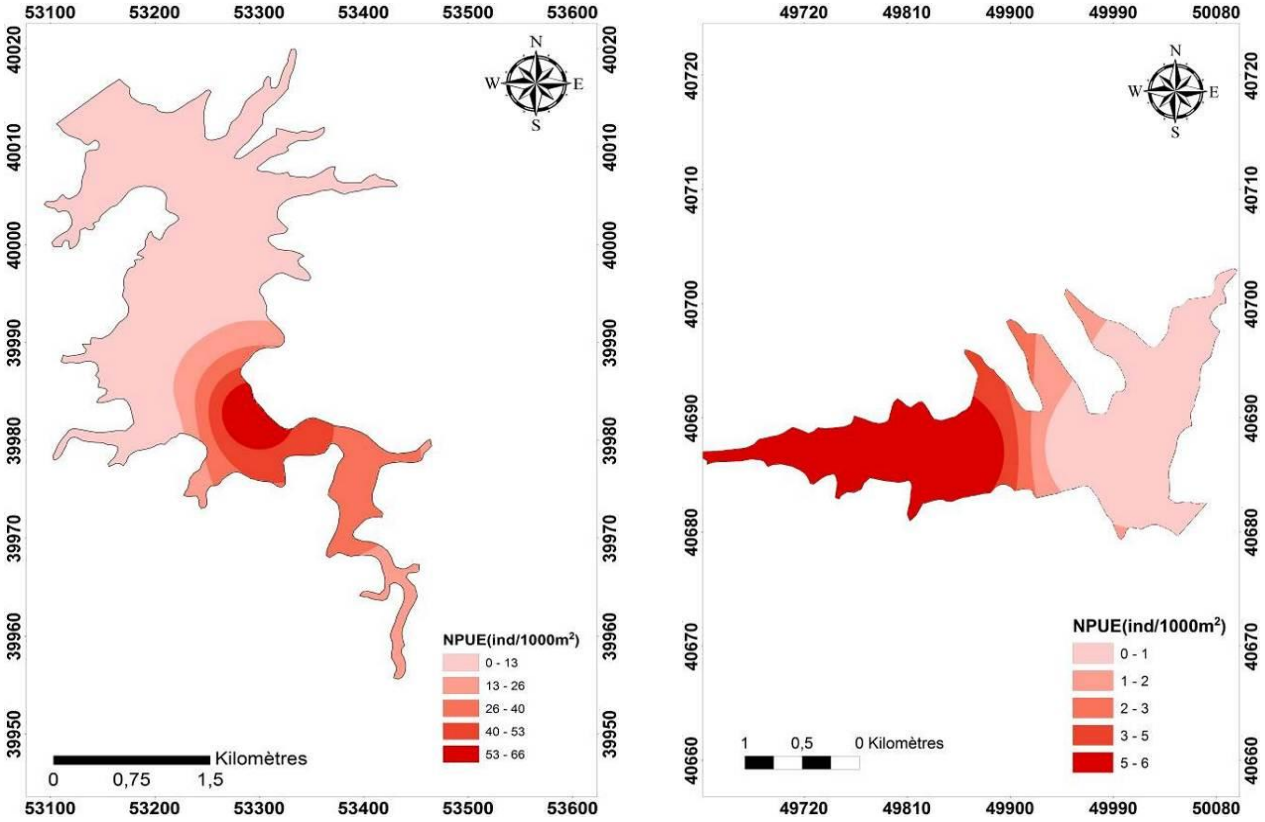

Figure 4. Example of representation of the capture as number per unit of effort (CPUE) of L. callensis in Seliana (left) and Kasseb (right) reservoirs

This work reported here focuses on a study of the exploitation parameters of *L. callensis*, given the absence of gobies and the low yield of *T. callensis*. Yields (catch per unit effort, CPUE) by number of *L. callensis* do not

exceed 50 fish/1000m^2 of nets except for Bir Mcherga reservoir where its predator (*Sander lucioperca*) was overexploited. Furthermore, the decline of the stocks of *T. callensis* and *L. callensis* can be explained by the introduction of carnivorous fishes, especially pike-perch (*Sander lucioperca*) and catfish (*Silurus glanis*).

Table I: Presence and CPUE of autochthonous freshwater fish species in Tunisian reservoirs

	T. callensis	CPUE Fish/1000m^2 of nets	*L. callensis*	CPUE fish/1000m^2 of nets
Sidi Saad			x	7.09
Seliana			x	8.3
Bekbeka				0
Kasseb			x	22.77
Bezirekh				0
Laabid				0
Mlaabi				0
Sidi Barrak			x	45.83
Lahjar				0
Sidi Salem	x	3.28		
Ghezala			x	15
Bir Mcherga			x	88.33
Bouheurtma			x	1.19
Mellegue			x	3.12

The specimens of *L. callensis* captured allowed the identification of five age classes with lengths ranging between 12 and 46 cm. These populations mainly comprise juveniles. Natural mortality targets juveniles especially, whereas fishing mortality targets adults (Figure 5). The late sexual maturity for females (five or six years corresponding to 27.7cm) (Chaouachi & Ben Hassine, 1998) and the relatively low fertility (15000 oocytes/female; Kraiem, 1994) are the main causes of the declines in stocks.

Figure 5: Evolution mortality of L. callensis according to age

This work indicates the poor diversity associated with an alarming decline of stocks of autochthonous freshwater fishes in Tunisian reservoirs.

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Wonders of the Mekong: a new Mekong project led by FFSG Steering Committee member, Dr. Zeb Hogan

Ian Harrison
FFSG Technical Officer

The following account is based in part on the press release that appeared on the website of the US Embassy in Cambodia, on February 6, 2017
https://kh.usembassy.gov/wonders-mekong-project-promote-sustainable-rivers-southeast-asia/

Zeb Hogan who, besides being a member of FFSG, is a Research Assistant Professor at the University of Nevada Reno, National Geographic Fellow, and host of the television show "Monster Fish" on Nat Geo Wild, is leading the new project *The Wonders of the Mekong*. The project aims to promote sustainable rivers in Southeast Asia. It will bring increased awareness of the importance of the Mekong River and its ecosystems, which are vital to the economic and social health of Southeast Asia.

The project will draw on the expertise of leading domestic and international research institutions, including Cambodia's Inland Fisheries Research and Development Institute.

Release of Critically Endangered giant barb, Catlocarpio siamensis, on Tonle Sap river. Photo credit: Zeb Hogan.

The project has components focused on research, capacity building, and outreach, and includes studies of water and biodiversity, and functional aspects of the ecosystems (e.g., fisheries, and other uses for social and economic sustainable development). The project will have a focus on the Sekong-Mekong-Tonle Sap corridor, with a goal of developing a coordinated management plan and a network of management areas for the corridor.

Wonders of the Mekong will build institutional partnerships and there will be links to projects in which FFSG are already involved, such as the *World Fish Migration Day 2018* (see page 11). The project will use social media to share stories, and these are regularly posted at:
http://news.nationalgeographic.com/wonders-of-the-mekong/

Working with Zeb on leading this project is Dr. Sudeep Chandra, also of the University of Nevada-Reno. Dr. Chandra's work focuses on the conservation and restoration of aquatic ecosystems with a goal of improving environmental policy.

Reinstatement of the Brazilian List of Endangered Aquatic Species

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In a new chapter of the on-going legal battle between the fishery industry and the Brazilian environmental authorities, the Brazilian list of threatened aquatic species was provisionally reinstated on January 25, 2017. The list was originally published by the Brazilian Ministry of Environment in 2014 (MMA, 2014), and granted full protection against capture and commercialization to 475 species of fishes and aquatic invertebrates. As highlighted by the IUCN Freshwater Fish Specialist Group 2015 Annual Report (available from http://www.iucnffsg.org/resources/assessments-and-guidelines/), the publication of the new list sparkled legal action by fisheries organizations, leading to the provisional suspension of the legislation. As result, despite occasional reinstatements of the legislation, all threatened Brazilian fishes, freshwater and marine, were left totally unprotected (Di Dario *et al*., 2015).

The situation was further aggravated in 2015 by the Brazilian political and fiscal crisis, which led to the suspension of reproductive seasonal fishing closures that protect the spawning fishes of several commercially and ecologically important species. The decision was not based on technical studies, but was mostly motivated by the need to avoid the payment of unemployment benefits during the closure season (Pinheiro *et al*., 2015).

In December 2016, a Brazilian Federal court reinstated the Brazilian list of endangered fishes and aquatic invertebrates, reverting a former decision. The decision was published on January 24, 2017 (TRF1, 2017), and was based on a distinction between the concepts of “conservation” and “sustainable use”. The new interpretation states that the use of aquatic organisms for fisheries purposes cannot interfere with the legal decision to protect a species from extinction. The reinstatement of the list of protected species is a welcome step towards a final decision in the protracted legal battle between the economic interests of fishermen and the governmental concern for environmental conservation of living species, but is provisional and far from being a final decision. It may be reversed in the final judgement of the merit of the litigation, which is yet to happen, and previous reinstatements of the federal regulations have been reversed over the past couple of years.

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Trip of a lifetime, to the Amazon and the Rio Negro fishery: diverse collaborators from Brazil, the EU and the USA join the Expedition

Scott Dowd
New England Aquarium, Boston, USA

Brian McFarland
Project Director, Carbonfund.org Foundation

Deb Joyce
Project Piaba

International Hobby Industry Leaders, Zoo, Aquarium and Conservation Scientists collaborated during the trip to the Rio Negro Fishery January 21 to February 3, 2017.

For decades, home aquarium fishes have been collected from regions of biological importance across the globe. While resource extraction usually elicits concerns of overexploitation, in many developing countries the home aquarium trade has instead provided significant environmental and social benefits, including preserving remaining areas of biologically important habitat and moderating climate change by preserving tropical forests. Cash flow from sustainable home aquarium collecting fisheries provides a basis for livelihoods where options are limited (Brummett, UN FAO and World Bank, 2005). The home aquarium live fishes trade is estimated to be US $278 million annually (FAO 1996-2005).

Project Piaba was established more than 25 years-ago to foster an environmentally and socially beneficial home-aquarium fish trade. Originally, we focused on researching the cardinal tetra fishery in Brazil to establish a model that supports a sustainable fishery while incentivizing environmental protection. Over time, our work has evolved and we are now taking a multi-stakeholder approach to conservation that includes research, education, and market forces not only with the Rio Negro fishery, but also with other fisheries, setting the stage for a positive future.

The Rio Negro Fishery Case Study

Beginning in the 1950s, millions of live fishes destined for the global home aquarium trade have been captured and exported from the Brazilian Amazon every year (Zehev *et al*., 2015). The home aquarium fishery is the principal subsistence activity for the riverine communities in the municipality of Barcelos in Amazonas state, Brazil (population 40,000; area 122,490 km^2). The trade in home aquarium fish contributes at least 60% of the income revenues in the municipality (Dowd & Tlusty, 2000). A single species, the cardinal tetra

(*Paracheirodon axelrodi*) constitutes more than 80% of the artisanal fishery and is exported from the Rio Negro basin. The fishery in total provides 60% of the regional economic base, directly and indirectly supporting livelihoods of a majority of Barcelos' residents. A Brazilian government report from 2009 stated that 100 million fish were exported from 2002 to 2005 with yearly values estimated at US$9.6 million exported to international markets (Instituto de Pesca, 2009). A recent report from Ministério da Agricultura, Pecuária e Abastecimento (MAPA), a federal department in Brazil, reported US$1.8 million exported from Manaus during all of 2015.

Fortunately, the annually inundated, floodplain habitats (Figure 1) of home aquarium fishes have remained largely intact despite the fishery's decline. There is evidence that the fishery promotes lasting value and protection for tropical forests because it reduces the practice of slash-and-burn agriculture and exploitation of wildlife for subsistence, and lessens the socio-economic burdens on riverine communities (Chao & Prada-Pedreros, 1995).

These forests contain 6.5 billion metric tons of carbon and remove 13.3 million metric tons of CO^2 from the atmosphere in the 46,000 square mile fishery area, which is significant due to the loss of forest in other areas and resulting climate and biodiversity impacts (Rasmussen, 2014; Brazil FREL Submission, 2014).

Many forest fishes have a short life cycle (less than two years), and fish populations can be quickly replenished. It may, therefore, be possible through proper management to protect the habitat from degradation, while maintaining bountiful harvests at the same time (Chao, 2001). In fact, after continuous operation for more than 60 years, the fishery has shown no indicators of strain on targeted fish populations (Alho *et al.*, 2015). The fishery resource and global market demand provide lasting livelihoods for the human residents of this region, and is a powerful driver of environmental stewardship through habitat preservation (Zehev *et al*., 2015) for the tropical forest floodplain, which in turn protects biodiversity and moderates impacts of climate change (Watson, 2000).

Figure 1. Amazon flooded forest. Photo credit: Dr. Nelson Ferreira Fontoura

Brian McFarland, the Project Director at Carbonfund.org Foundation, is working with Project Piaba to assess the potential for a forest carbon offset project in the Rio Negro Fishery. Mr. McFarland has designed, financed and now advises on the implementation of four other forest carbon offset projects in the

neighboring state of Acre, Brazil. These projects, which are known as Reducing Emissions from Deforestation and Degradation (REDD+), are reducing deforestation while simultaneously benefitting local communities (e.g., offering free agricultural extension courses, building health clinics and facilitating doctor visits, and granting official land titles) and conserving the area's rich tropical biodiversity. Mr. McFarland also has a forthcoming book entitled, *Conservation of Tropical Rainforests: A Review of Financial and Strategic Solutions*, which includes Project Piaba as one of its case studies.

For this year's Expedition, twenty-four people joined the expedition to the Rio Negro in the Brazilian Amazon to witness first-hand the important home aquarium fishery that exists there. Over the course of two weeks, we traced the supply chain upstream to its source—the people who collect aquarium fish in outlying villages on the river (Figure 2).

In the spirit of the collaboration with conservation scientists and the hobby industry, leaders from the US hobby industry joined the Expedition. Several companies sent leaders as representatives to observe the fishery first-hand by participating in the Expedition. We were also honored to be joined by Dominic Whitmee who is the Executive Director of Ornamental Aquatic Trade Association (OATA).

Figure 2. Fishers collecting. Photo credit: Dr. Nelson Ferreira Fontoura

This year, our work plan on the Expedition had three areas of focus. The first area was uptake of the training completed earlier in 2016. Project Piaba's lead Animal Health and Welfare Advisor (and also FFSG Home Aquarium Fish Sub-group Steering Committee member), Dr. Tim Miller Morgan, along with Scott Dowd, Dr. Christiane Loehr, and Dr. Sandra Denize Jouglard held a week-long program in Manaus to train the Brazil ground team on Best Handling Practices protocols for the fishery. During the Expedition, interviews with the Fishery Trainers, Fishers and Exporters in Manaus were held to help evaluate how the training work is being adopted, and how we can continue to support this effort.

Professor Mari Balsan, the PI in Brazil, is a professor of economics. Professor Balsan and Ian Watson of the UK, began to frame out socioeconomic studies for us to get an updated picture of the fishing communities impact on livelihoods, and the impact of the fishery on the communities. Professor Balsan and Ian Watson are working on gathering data, and plan to publish a report in the next year.

During the travel period aboard the boat, Dr. Nelson Fontoura lead a discussion framing out a Masters' and PhD level study to collect and model data for an analysis of the offtake of fish species for the global aquarium

hobby. It is a very unusual and complex fishery to assess, with so many fluctuations – restricted seasons, water levels, market demand, geographic area, diversity and other challenges. Dr. Roberto Reis and Dr. Ferreira Fontoura took water and fish samples, waded into streams and rivers and began their plans for updating the assessment of the fishery's offtake with plans of building from a model which includes sampling and satellite images. This technical assessment may be the subject of a future IUCN FFSG newsletter.

For more information see the website www.projectpiaba.org, or contact Scott Dowd at sdowd@neaq.org.

Editor's note: For a video about Project Piaba go to https://www.youtube.com/watch?v=AqRmDFas_kg

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To manage inland fisheries is to manage at the social-ecological watershed scale

Vivian M. Nguyen
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Inland waters and inland fishes are surrounded by their watershed; thus it is logical that inland fisheries should be managed at the watershed scale. Everything that occurs within the watershed often trickles down into the pond, lake or river, eventually leading to potential consequences on the aquatic organisms. Additionally, the various stressors and drivers that change the dynamics of a watershed are heavily dictated by humans, and so inland fisheries management requires social-ecological systems thinking. This is the basis of a recent review that I conducted in collaboration with researchers from USGS, Michigan State University, Carleton University, University of Ottawa, and the University of Hull in the UK, which was published in the Journal of Environmental Management this year (see Nguyen et al., 2016, for a full review). That review argues for a shift in management of inland fisheries toward a *social-ecological watershed scale*. In this newsletter article, I summarize this review and highlight the concepts of managing inland fisheries at the social-ecological watershed scale.

The concepts presented in the review are not new, but they are found disparately throughout the literature and have not found a common place. The social-ecological watershed scale (SEWS) framework was thus proposed to organize and frame important ideas and concepts that may assist in sustainably managing inland fisheries (see Figure 1 for a conceptual diagram of framework).

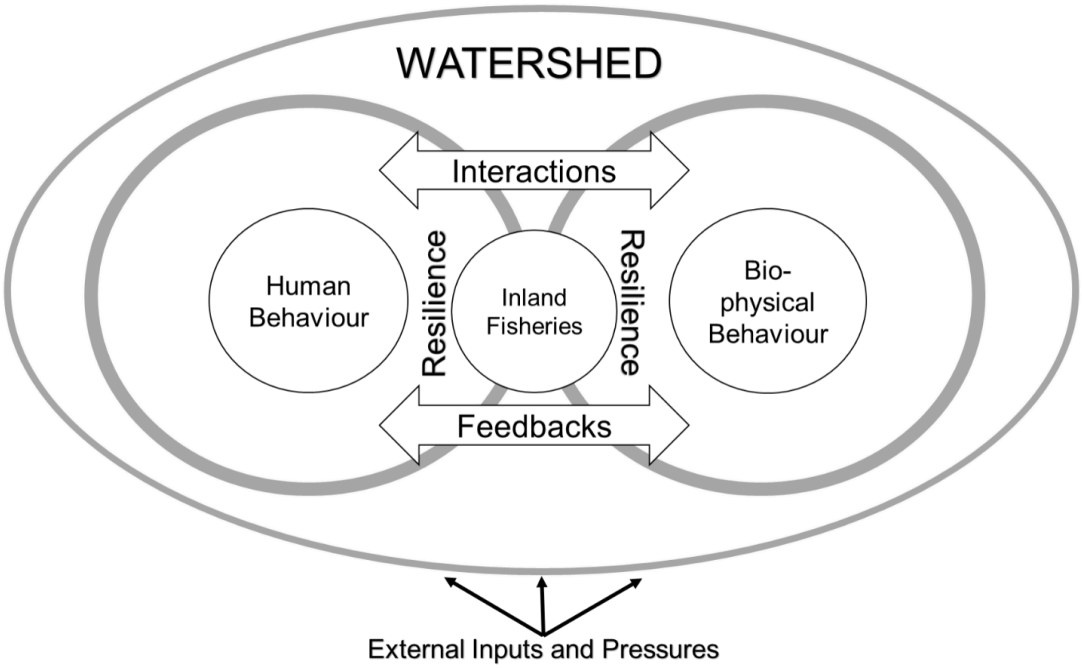

Figure 1.Conceptual diagram of the social-ecological watershed scale (SEWS) framework

The SEWS framework puts emphasis on the following overarching concepts:

- Accounting for the *behavioural dimensions* of both social and ecological systems, which are often what drive and direct the outcome of a change or a disturbance to the systems. One of the behaviours includes the *biophysical behaviour* of inland fishes and water (e.g., a dam changing a river stretch to a lake reservoir). These systems are never in an equilibrium state but are constantly moving and dynamic. The behaviours also include individual and collective *human behaviour* that may both negatively or positively impact the systems
- Understanding the *feedbacks* between social and ecological components that are fundamental to maintaining system structure and function in the face of disturbance
- Understanding the *interactions* of multiple factors (such as stressors) at multiple scales and levels, with and between the social and ecological systems.
- Building social and ecological *resilience*
- Understanding the overarching *external inputs* (or pressures) and outputs to the watershed system

Behavioural dimensions: behaviours can drive changes and responses to change

Many theories and frameworks exist for explaining and predicting human behaviour related to the environment such as attitudinal and normative variables, values and beliefs models, motivational attributes, and other hierarchical models. Managers and researchers focusing on inland fisheries need to account for the human dimension.

Water and fishes can have their own "behavioural component." The behaviour of the river, for example, is determined by its biophysical and hydrogeomorphical features, such as the landscape of the watershed. Individual fish behave differently during mating or foraging, and can have the potential to adapt to changes, leading to potential population-level changes. Understanding this biophysical behavioural dimension is essential for managing and making effective decisions regarding inland fisheries.

Feedbacks, interactions, and scales

There is interplay and feedback between social and ecological systems. Feedback refers to a chain of cause-and-effect, and is important to understand to predict management actions and outcomes. Additionally, interactions can occur due to the interplay of multiple variables, such as stressors (e.g., climate change interacting with poor water quality interacting with overexploitation). Not only are there feedbacks and interactions, but these processes also occur at multiple scales and levels. Considerations of these dynamic variables at various scales are important for benefiting inland fisheries management and research.

Building social-ecological resilience of inland fisheries

Resilience is the ability to withstand or adapt to change whether it is social or ecological resilience. An important goal for inland fisheries management is to build social-ecological resilience. Social resilience can assist humans to adapt to environmental change and withstand external shocks to their social infrastructure, such as changes to livelihoods after severe natural disasters that could devastate the fisheries. Ecological resilience is the ability for the ecological system to rebound back to equilibrium and is often linked to

biodiversity. A resilient system has a buffer that protects the system from erroneous or outdated management decisions, thus (hopefully) allowing managers to learn from their mistakes and/or adapt to changing conditions. Building resilience should increase the capacity of both social and ecological systems to cope with surprises and provide buffers to persist in the face of shocks and disturbances.

Do not forget overarching external inputs to the watershed

There are also factors that are external to the watershed but can have impacts within the watershed such as climate change, and economic and political conditions, which often operate at larger scales with slower processes and have obscure and ambiguous impacts on the watershed. These overarching external inputs are not to be neglected as they can interact with activities within the watershed, which may further compound those activities.

Application of the SEWS Framework

In addition to the number of ideas and concepts (often theoretical) that help us *understand* inland fisheries at the social-ecological watershed scale, there are also frameworks and concepts that help us *apply* these ideas (Figure 2), such as the concepts of adaptive co-management, transboundary governance, and transdisciplinary research.

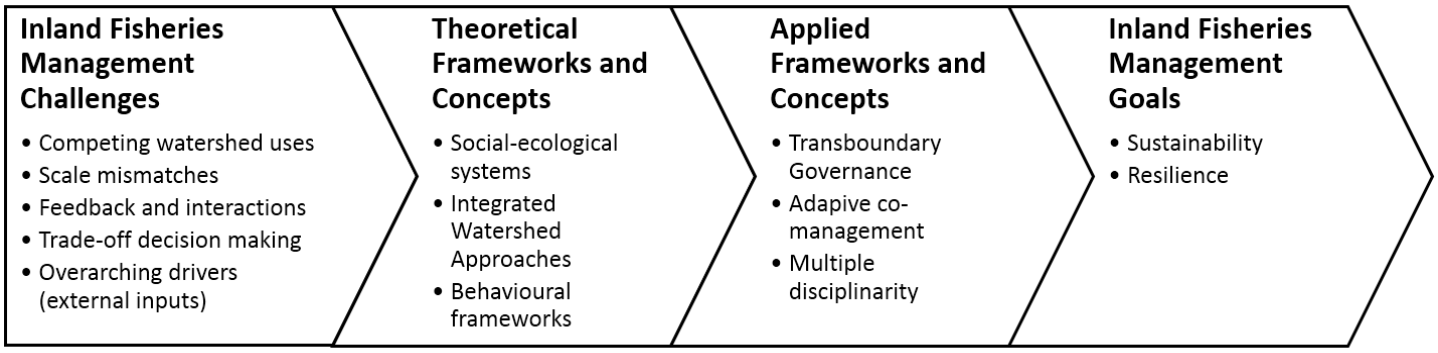

Figure 2. Conceptual diagram piecing together examples of theoretical and applied concepts in a step-wise manner.

Organizations that focus on *transboundary* issues and overseeing issues at the watershed-scale can assist in the management of inland fisheries at the social-ecological watershed scale. For example, the Mekong River Commission and Great Lakes Fishery Commission (for the North American Great Lakes), are some examples of organizations that aim to cooperatively manage natural resources within the watershed.

The concept of *adaptive co-management* is a cooperative, learning-by-doing process that can allow institutions to be flexible and revise policies and/or practices as new information and knowledge is acquired. It also encourages participatory approaches to ensure that multiple perspectives are considered and collective action is taken. The self-organization process of adaptive co-management development has the potential to make inland fisheries and their social-ecological watershed systems more resilient and robust to change.

Research of inland fisheries are encouraged to employ holistic and integrative approaches such *as inter- and transdisciplinary approaches.* The advantage of a transdisciplinary project or team is the ability to focus on the issue and solutions from different angles.

In summary, there exists a multitude of tools and approaches to solve and prevent problems. The proposed SEWS framework supports watershed-scale and transboundary governance to manage inland fisheries, and transdisciplinary projects and teams to ensure relevant, timely and applicable research in support of inland fisheries management. The SEWS framework is an approach that researchers and managers can employ to enhance their understanding of the complexity of inland fisheries and the surrounding social-ecological systems and watersheds, in order to improve decision making, trade-offs, and maintenance of the resilient inland fisheries that directly and indirectly support billions of people worldwide. I encourage you to read the full article (Nguyen *et al*., 2016) for further reading and useful references/sources.

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NOTICEBOARD

A list of upcoming, fish and fisheries related conferences has been circulated by our colleagues in the World Fish Migration Foundation (http://www.worldfishmigrationfoundation.com)

and can be downloaded from the IUCN FFSG website at:

http://www.iucnffsg.org/ffsg-activities/latest-news/

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

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