

SAVING FRESHWATER FISHES AND HABITATS

Newsletter of the IUCN SSC/WI Freshwater Fish Specialist Group

Issue 3 • October 2013

IN THIS ISSUE:

- Thank you to Gordon McGregor Reid
- Queensland's endangered gobies
- Endemic fish species of the Cape Floristic Region Biodiversity Hotspot
- Redline torpedo barbs: Understanding conservation issues
- And more.....



Freshwater Fish Specialist Group

Freshwater fishes sustained in their natural environments

CONTENTS

FFSG UPDATE

- 3 Message from the FFSG Global Chair
- 5 Thank you to Gordon McGregor Reid: A colleague, a leader, a friend
- 9 Online now: New FFSG website
- 10 Clarifying the IUCN Red List review process for freshwater fishes
by Suzanne Turnock, Craig Hilton-Taylor and Rachel Roberts
- 11 Introducing the FFSG European Region
by Jörg Freyhof

NEWS FROM AROUND THE WORLD

- 14 IUCN Red List workshop for freshwater eels
by Matthew Gollock
- 15 Queensland's endangered gobies
by Adam Kerezszy
- 18 Conservation of threatened endemic fish species of the Cape Floristic Region Biodiversity Hotspot
by Alwyn Lubbe, Christy Bragg and Bridget Corrigan
- 21 Drafting IUCN Red List assessments for Iranian freshwater fishes
by Jörg Freyhof
- 22 World Fish Migration Day 2014

OPINION

- 23 Redline Torpedo Barbs: Understanding conservation issues for freshwater fish of the Western Ghats, India
by Rajeev Raghavan



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Clanwilliam sandfish
(*Labeo seeberi*) survey
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Message from the FFSG Global Chair

Professor Gordon McGregor Reid



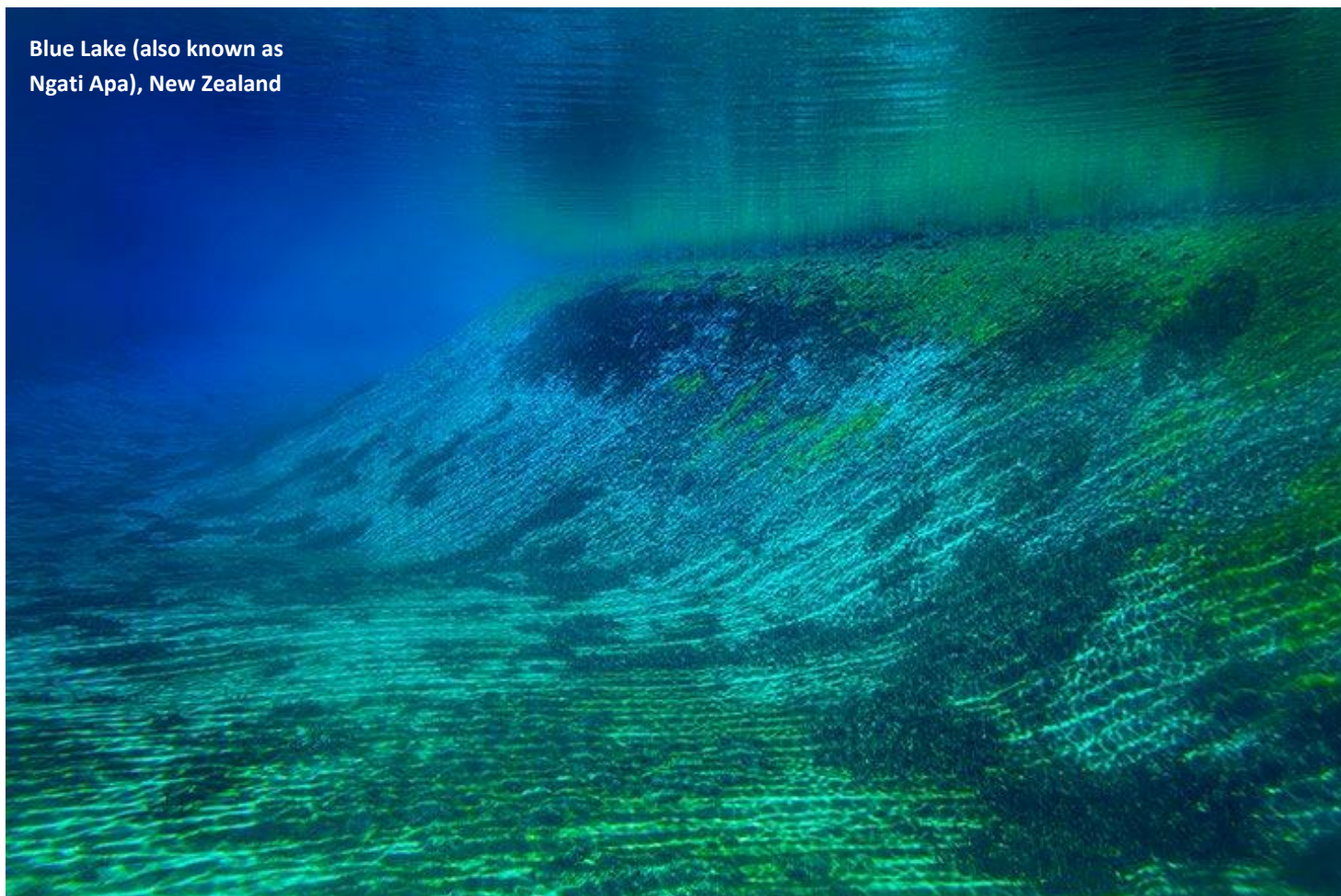
The physical and chemical properties of freshwater fundamentally determine the nature and occurrence of life within, including the fishes. Scratch any freshwater biologist and you will find a person concerned to precisely identify vital physico-chemical parameters such as ‘transparency’ in the waters they are working on. But just how transparent can a natural water body get? The New Zealand National Institute of Water and Atmospheric Research (NIWAR) claims to have found ‘the clearest water on Earth’ in Blue Lake - also known as Ngati Apa and sacred to the Maori. NIWAR have measured underwater visibility at a remarkable 76 metres. This approaches the 80 metres of optically-pure distilled water. The lake is 1,200 metres above sea level, at the north end of South Island. It is above the tree line and thus, avoids turbidity-inducing forest run-off. Ngati Apa receives water from Lake Constance, at a slightly higher altitude, and this supply is filtered through glacial moraine (pictured below).

Occasional small floods can briefly disturb the balance before the crystal-clear quality returns. [Refer to: [‘The clearest lake in the world – in pictures’ by The Guardian](#) and [‘NZ lake pure and crystal clear’](#); image credit: Klaus Thymann/Project Pressure].

Now, we all know that excessive turbidity can be an issue in aquatic conservation (see, for example, the article in this newsletter on South African rivers by Alwyn Lubbe and co-workers). By now, readers may be wondering ‘how turbid can it get?’ Well, I have worked on streams in South Wales polluted by ‘finings’ of coal dust and they were extraordinarily opaque and devoid of higher life.

However, my surprise candidate for turbidity in a healthy natural system is the ‘Bubblegum Pink Lake’, Middle Island,

Blue Lake (also known as Ngati Apa), New Zealand





'Bubblegum Pink Lake', Middle Island, Recherche Archipelago, Western Australia

Recherche Archipelago, Western Australia (pictured above; photo credit: ['Amazing Things in the World'](#)). Properly known as Pink Lake Hillier, it is 600 metres long, set in a strip of sand dunes separating the northern and southern oceans, and surrounded by thick woodland of eucalyptus and paperbark trees. The dramatic natural colour causes airline passengers to peer out in disbelief. The vivid pink may be attributable to hosts of tiny crustaceans, together with primitive bacteria-like organisms (*Halobacteria*). These thrive in their billions in very saline and organically rich aquatic environments.

In the last issue of the newsletter, we shared with you our plans to develop a new Global Freshwater Fish BioBlitz, which is progressing very well. So far, we have recruited 38 volunteers who will act as Curators to assist with species identifications from photographs submitted by members of the public. We are currently approaching other conservation organisations for official endorsement and assistance with communications. The BioBlitz will be launched within the next couple of months. If you would like to volunteer as a Curator or work for an organisation who would like to be involved, please email info@iucnffsg.org

Led by Wanningen Water Consult and LINKIT Consult, the FFSG have partnered with WWF and The Nature Conservancy to support World Fish Migration Day 2014. Taking place on the 24th May, this aims to raise awareness of the importance of migratory fish and their needs, as well as healthy rivers. If you would like to organize an event under the umbrella of World Fish Migration Day please go to page 22 to find out more. Watch out for articles in future issues of the newsletter, which will be reporting on both of these initiatives.

Last, I am sad to say that this will be my last editorial for this newsletter because, after a decade, I am stepping down as FFSG Global Chair to coincide with my recent retirement from the North of England Zoological Society (Chester Zoo). The recruitment process for a new Chair (being organized by Simon Stuart of IUCN SSC in conjunction with Jane Madgwick of WI) is already well-advanced. Please expect an announcement on my replacement some time very soon. I feel sure that my successor will enjoy the role as much as I have and benefit from the broad international expertise of the FFSG! Of course, I will still remain as a FFSG member and hope to continue contributing to the group, albeit in a reduced capacity.

It remains to acknowledge our sponsor Chester Zoo; and to warmly thank Simon, Jane, Will Darwall, Mark Pilgrim, Marie Brookfield, Taej Mundkur, Katalin Csátádi, Suzanne Turnock, the FFSG Steering Committee, FFSG Regional Chairs and all FFSG members for their wonderful support, enthusiasm and friendship over the years. This has been greatly appreciated. Here's to the continued conservation of freshwater fishes and habitats!

A handwritten signature in blue ink that reads "Gordon M.J. Reid". The signature is written in a cursive, flowing style with a horizontal line underneath.

Gordon McGregor Reid

Thank you to Gordon McGregor Reid: A colleague, a leader, a friend

Accolade by Will Darwall

IUCN Freshwater Biodiversity Unit

Way back in 2004 there was no FFSG, then came Gordon. Believe it or not Gordon has been the Chair of the FFSG since 20th August 2004 – 9 years in the saddle of what has become one of the most successful and dynamic of the SSC Specialist Groups.

Back in 2003 when setting up the FFSG and recruiting for a Chair the initial advice I received from several current FFSG members was “Gordon is the best man for the job, but you’ll never get him as he’s a very busy man...” – but we did. All it took was a couple of beers and a bit of talk about freshwater fishes – Gordon’s real love – and he signed up for the job (a little nervously but he was in). In addition to Gordon’s clear desire to do all he could to help improve the situation for freshwater fishes I think the position of Chair also promised a welcome diversion from daily tasks such as the annual budget for ice creams at the Zoo – variety is the spice of life!

Clearly the advice to appoint Gordon was spot on and once appointed Gordon’s tremendous enthusiasm and extensive knowledge of fish has helped to build the great respect we see today from all members of the FFSG and beyond. With the generous support of Chester Zoo and their wonderful staff, which still continues today, Gordon has managed to build the FFSG into an effective and respected worldwide network of our best freshwater fish scientists. We are most grateful for this and I don’t think it would have been possible without his excellent leadership.

Needless to say Gordon will be a hard act to follow, but he leaves in place a very strong and active network. A tremendous amount has been achieved during Gordon’s period as Chair, including: support to numerous projects conserving freshwater fishes on the ground; raised awareness of the problems facing freshwater fishes; key publications such as the *European Handbook of Freshwater Fishes*; advice on many issues relating to conservation of fishes from around the world; and of course provision of the FFSG expertise needed to assess around 6,600 species for the IUCN Red List - representing more than 90% of those species on the Red List today. Let’s do our best to build on Gordon’s legacy and his love of freshwater fishes and work hard towards securing their future according to the FFSG Vision: "Freshwater fishes sustained in their natural environments."

As example of Gordon’s efforts to raise awareness for conservation of freshwater fishes he travelled all the way to



Will and Gordon at the Formula 1 track
in Abu Dhabi, United Arab Emirates

Mexico, accompanied by Topis, to present the case at the 4th World Water Forum. As it turned out this trip revealed the scale of the task as the FFSG appeared to be the only voice for conservation at an event with over 30,000 participants from more than 190 countries. This will be a hard nut to crack and is something for the future.

My highlights. *Gordon’s face after visiting the public conveniences in downtown Yaoundé, while participating in the Central Africa Red List assessment. He’ll have to tell you about that himself after a beer or two. This is closely followed by his description to all present at a plenary session of the IUCN Congress in Jeju of a newly described species of fish from the Mekong Delta where the male has “penis-like male claspers in its head – bringing a new meaning to the term Dick-Head”. This certainly lightened the atmosphere – we need more of this!*

Thanks Gordon and the very best of luck in your new endeavours. Of course we hope you will still remain an active member of the FFSG and hope to see you at the annual FFSG meetings. I have very much enjoyed working with you and am sad to see you leave. It just shows what can be achieved with dedication, enthusiasm, leadership and hard work, even if you are from north of the border (it had to be said!).

As you will see from the following pages, many colleagues and friends share my admiration and respect, and pass on their best wishes for the future.

Paul Skelton (FFSG Regional Chair for Southern Africa)

"Gordon is an old friend of mine going back to the late 70s when I visited the BMNH, now called The Natural History Museum, and Gordon was then a PhD student. He then left for a stint in Nigeria and on his return (I think it was 1981 when I was spending 6 months on a post-doc visit with Humphry Greenwood) - what I remember most was that Gordon was driving delivery trucks around London because there was little else on offer! He then joined the Horniman Museum and attempted to save Lake Victoria - (or at least some of the threatened fishes from Darwin's Dreampond). I picked up with him again much later - when he was Director of the Chester Zoo - and the story I most enjoy about Gordi is his interaction with Boris the chimpanzee chief at the Zoo. Apparently, Boris rather ignored him until the very day he became Director - after which time he (Boris) would put on a really famous display of dominance every time Gordon came by the enclosure! I was able to witness it on one occasion - memorable. Boris at least knew who the BIG BOSS was. Gordon served as one of the international reviewers for the NRF National Facilities when I was still a MD of SAIAB - that provided a very rewarding professional interaction at the level of institutional heads that we had both reached - so there is just so much in common we have to go on. Our friendship has grown richer as we have got to the 'Emeritus' stage of life - and the last time I visited him, he and I visited Shrewsbury in Shropshire together to check out Darwin's birthplace - something I really enjoyed - so I know we will continue to get together and 'chew the cud' at every opportunity. "



Gordon receiving his Honorary Doctorate from the University of Liverpool in 2011, with his wife Sally, and Paul.

Kouki Ikeya and Kanako Tomisawa (Japanese Association of Zoos and Aquariums - JAZA)

"We would like to express our sincere appreciation for his great work. He is the one who opened our door to the worldwide freshwater fishes conservation community. We do appreciate his genuine kindness. JAZA has been working for the conservation of freshwater fishes for more than two decades and keep doing our best, once, now and forever to repay his kindness. Arigato, Gordon."

Roberto Reis (FFSG Regional Chair for South America)

"Gordon, it has been a big pleasure and a real honor to serve the FFSG under your guidance!"

Nicolas Tubbs (FFSG Steering Committee)

"In the years that I have known Gordon, his great sense of humour and endless passion have always given life, inspiring us all even in the most challenging times. Let it be an example to us and prevent us from ever drying up!"

Michele Thieme (FFSG Steering Committee)

"Gordon, thank you for your tremendous leadership of the FFSG – with you at the helm we have grown into a vibrant community and network working to conserve freshwater fish. We will miss you greatly!"

Suzanne Turnock (FFSG Programme Officer)

"In the short time I have worked with the FFSG, Gordon's knowledge, support, and kindness has not ceased to amaze me. It has been an honour working with him in the last few months of him serving as Global Chair."



Following the IUCN World Conservation Congress 2012, Jeju Island, South Korea

Katalin Csatádi (FFSG Programme Officer)

"Dear Gordon, Thank you so much for this experience beyond fluff! I've had one of the best times of my life working with the FFSG. It is of course because of the fish as well but to be honest, if you were a specialist of underground fungi I'd now have a shovel and I'd be the biggest advocate of their conservation. Because your professionalism and enthusiasm, your friendliness and generosity are truly inspiring, no matter what subject you are choosing. Thank you for letting me work with you and being the best boss I have ever had. With love, Kati"

Simon Stuart and Rachel Roberts (IUCN SSC)

"We would like to express our gratitude to Gordon for his outstanding contribution to the SSC over the past 12 years. Gordon's energetic leadership has shaped and strengthened the FFSG, and the success and stability of this group owes much to his dedication and his ceaseless enthusiasm. Gordon's vibrant personality and warm nature will be hugely missed. Enormous thanks Gordon, for all that you have done and we hope to see your continued involvement in some capacity in the future."

Melanie L.J. Stiassny (FFSG Regional Chair for Madagascar)

"Gordie, my "old" friend and fellow graduate student, you have done us proud! Your charm and leadership, evident from the very beginnings of the nascent FFSG, has transformed what started as a vague hope and a loose network, into a proactive (and highly convivial) group of international experts. You got us going and you put our group "on the map" - it couldn't have happened without you, and we all thank you so much."

Topiltzin Contreras MacBeath (FFSG Regional Chair for Mesoamerica)

"What can I say about my "Compadre" except that he is an extraordinary conservationist that in less than 10 years has managed to consolidate the FFSG. Much of his success has to do with his leadership ability, his academic background, his experience in solving real world problems, and of course to the fact that he is probably the most charismatic environmentalist around. He is also an excellent speaker so every time he gives a talk he ends up surrounded by curious students. Unfortunately, all this has misled him to believe he is a "babe magnet", and he even thinks he looks good in his Speedos, but since he is one of my best friends I prefer not to prove him wrong. Un abrazo Compadre."



Gordon and Topis at the World Water Forum in Mexico, 2006.



Peter Maitland (FFSG Member)

"I have known Gordon for some 50 years and am proud to count him as a close friend. In the 1960s, Gordon worked with me at the Zoology Department of the University of Glasgow, where we shared a love of fish and freshwaters and had a number of exacting field trips to carry out the first echo soundings of fish populations ever carried out in some of Scotland's largest lochs - Loch Ness, Loch Morar and Loch Awe. Gordon was involved in a number of exciting incidents during his time at Glasgow, notably one concerning a capsized boat on Loch Lomond and another in Glasgow involving the Department's transit van and a police horse Our career paths parted in 1968 but I have followed his career with interest ever since - his time with VSO in Africa, his first degree in Wales and then his doctorate in London, followed by other posts leading to his directorship at Chester Zoo where he has done such an amazing job."

As a former Chair of the FFSG I know of the difficulties surrounding putting together a successful Group, but Gordon has done so with spectacular effect and all members of the Group are proud to be part of it. Gordon, we salute you!"

Tej Kumar Shrestha (Tribhuvan University, Nepal)

"Professor Gordon McGregor Reid chaired the Freshwater Fish Specialist Group of IUCN in exciting time in its development. Professor Reid played pivotal role in expanding knowledge of fish diversity and connected issues of global fish conservation by organizing symposium and inviting fish biologists from different parts of the world and consolidation state of knowledge on fish diversity and conservation. His efforts were conducive in developing academic heritage and publicity of rare and endangered fishes. I met him while he was holding prestigious position of Executive Director of Chester Zoo and President of Linnean Society of London and Chair of IUCN fish specialist group. He drew themes of global issues as well as addressed properly those of underdeveloped countries. Dr. Reid was the perfect choice to take dynamic role, he successfully lead several conservation efforts across the globe. Through his publications Dr. Reid imbibed his vast knowledge and expertise in fish biology and, fish conservation action plan of IUCN, and expanded present state of knowledge. He was a great inspiration to work with public at large and popularize wonder, beauty and diversity of fishes. For advancing knowledge freshwater fish biodiversity of Himalayas he endorsed my research from North of England Zoological Society and Chester Zoo. My book "Ichthyology of Nepal" is one of the major outcomes on Himalayan freshwater fish diversity research because of his support. During his tenure in SSC he diverted all his phenomenal energy and commitment to freshwater fish conservation. Every educated public will still remember his inspiring work in action in display centers and aquariums of Chester Zoo. Those of us who worked fundamentally on fish diversity remember him for his committed action in sustaining and developing academic heritage as well as dissemination of knowledge to public at large."



Ian Harrison (FFSG Steering Committee)

"I first met Gordon Reid back in the 1980s, and managed to soak his feet by giving him a lift to a ZSL meeting in my beat-up and flood prone old Volvo. He was typically good tempered and understanding about that event, and I felt lucky to be able to have some time to learn from his expertise as we dried our feet in an Italian restaurant. That was an exciting start to a friendship that has grown so well over the years. I have worked with him on African fish taxonomy, IUCN projects, and on educational projects associated with Chester Zoo, and he has unfailing been the go-to guy to make things happen. None more so than the FFSG; that has achieved what it has because Gordon has brought together the expertise, money and wonderful collegial relationships and joy of work that has been the glue for our group. So - a big thank you to Gordon."



Gordon getting his feet wet in Cameroon, 2008
(Picture from Jos Snoeks)

Cindy Lee (Toronto Zoo, Canada)

"I know you will have an overwhelming number of people wanting to wish you the best and thank you for your many years serving the IUCN SSC/WI Freshwater Fish Specialist Group, but please accept my thanks and congratulations on your outstanding contributions for the conservation of fishes. My perspective is through the zoo and aquarium community and if you recall, the 2010 Chester meeting, I found this meeting was an about turn for me. I left revitalized for the AZA Freshwater Fishes TAG community and also in moving my own facility forward on a number of research endeavours and partnerships. Your inclusiveness, hard work and friendly manner certainly worked on this Canadian biologist. All the best to you and your family and the invitation is still outstanding to come to Toronto."

LIVE



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- About FFSG
- FFSG Activities
- Freshwater Fishes
- Resources
- Support FFSG
- Contact us

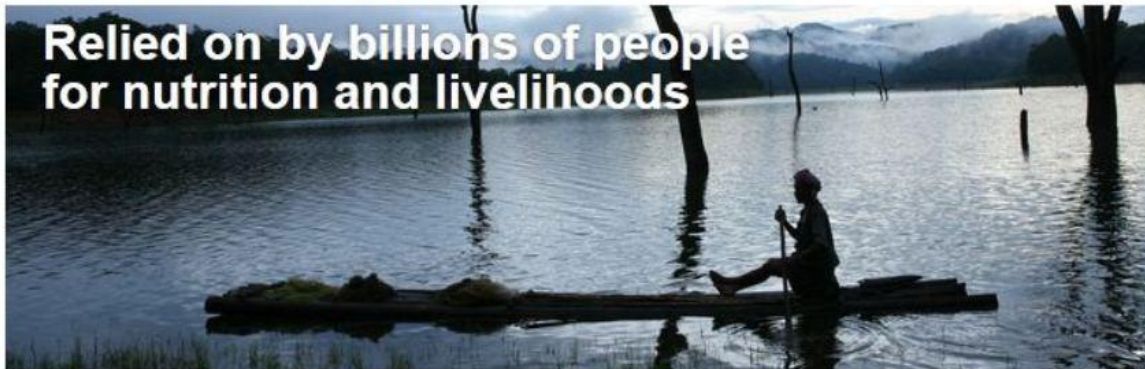


Photo credits (Left to Right) Dean Impton, (Nahurang Technical Institute, Rajeev Raghavan, Bruce Stander, Zeb Hogan

Welcome to the Freshwater Fish Specialist Group!

The group was established in 2004 and is a joint partnership between the IUCN Species Survival Commission and Wetlands International. Chaired by Professor Gordon McGregor Reid (Director Emeritus, Chester Zoo UK), the FFSG are a diverse group of experts, spread over 17 regions around the world, with a solid record in ichthyology (the study of fish) and the conservation of freshwater fishes.

The FFSG is concerned with conserving the aquatic environment worldwide, maintaining fish biodiversity and ensuring sustainable fisheries in relation to people and water resource use. Our biggest challenge is the development of practical, global strategy for freshwater fish conservation in the face of species extinction and rapidly declining freshwater fisheries worldwide.

Working together, the FFSG focuses on a number of key areas; including strategy and policy development, provision of technical information and advice, training and education, IUCN Red Listing and biodiversity assessments.

Highlights



Importance of Freshwater Fishes

Find out why freshwater fish conservation is important, and their value to global biodiversity, the economy, science and culture. Photo: Craig Garrow



Global Freshwater Fish Bioblitz

Citizen science project involving species monitoring – a crucial step in conservation action. Be a part of it! Photo: Zeb Hogan



FFSG Meetings

Bringing together experts from around the world in an effort to address the difficulties facing freshwater fishes. The next meeting is 21-23 March, 2014 in Mexico. Save the date!



Donate to the FFSG

Funds are urgently needed to support the management of the group. By donating to the FFSG you are supporting global freshwater fish conservation.

www.iucnffsg.org

Clarifying the IUCN Red List review process for freshwater fishes

Suzanne Turnock¹, Craig Hilton-Taylor² and Rachel Roberts³

¹ FFSG Programme Officer; ² IUCN Red List Unit Manager; ³ IUCN SSC Network Coordination Officer

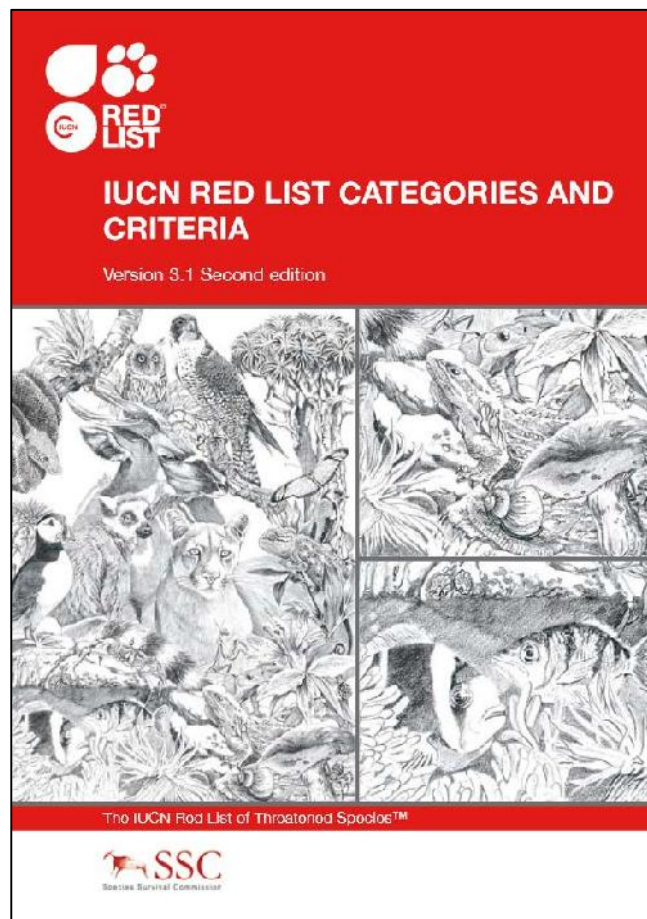
It seems that there is some confusion about how the IUCN Red List assessment process works within the Freshwater Fish Specialist Group (FFSG). The purpose of this article is to clarify the process and give the main point of contact.

The FFSG is the Red List Authority for freshwater fishes. It is our role to ensure that all species, within the FFSG jurisdiction, are correctly assessed against the IUCN Red List Categories and Criteria, and that the assessments have the required supporting documentation. All freshwater fish assessments - carried out by members of our network and colleagues from outside of the FFSG - need to be reviewed, before being submitted to the Red List Unit for quality checks and publication. Naturally, the people who have been involved in the original assessment cannot be Reviewers.

The FFSG Programme Officer is the main point of contact for the assessments. It is their responsibility to find Reviewers, sign off once the reviews have been carried out and then submit assessments to the Red List Unit. All assessments need to be reviewed by at least one person, who may or may not be a member of the FFSG. Reviewers do **not** have to be the species expert, what is needed however, is an understanding of the Red List Categories and Criteria (www.iucnredlist.org/technical-documents/categories-and-criteria) and the supporting documentation requirements (http://www.iucnredlist.org/documents/Red_List_Assessment_Resources.pdf - see Annex 1). Knowledge of the Red List can be gained through participation in workshops or assessments, or attending training, either at a workshop or online (<http://www.iucnredlist.org/technical-documents/red-list-training>).

The only exceptions, to this process, are species being assessed as part of a regional assessment by the IUCN Freshwater Biodiversity Unit (FBU); these are led and coordinated by the FBU in Cambridge, rather than by the FFSG's Programme Officer.

We would like to build up a group of Reviewers who can be approached on an ad-hoc basis to carry out reviews of draft assessments. Would you like to volunteer and help the FFSG fulfil a crucial role for the IUCN Red List? If so, there are a couple of things you need to know.



Reviewers need to be:

- Familiar and confident in their understanding of the IUCN Red List Categories and Criteria
- Familiar with the supporting documentation requirements
- Agree to the Programme Officer contacting them on an ad-hoc basis requesting assistance
- Be able to work to a set deadline

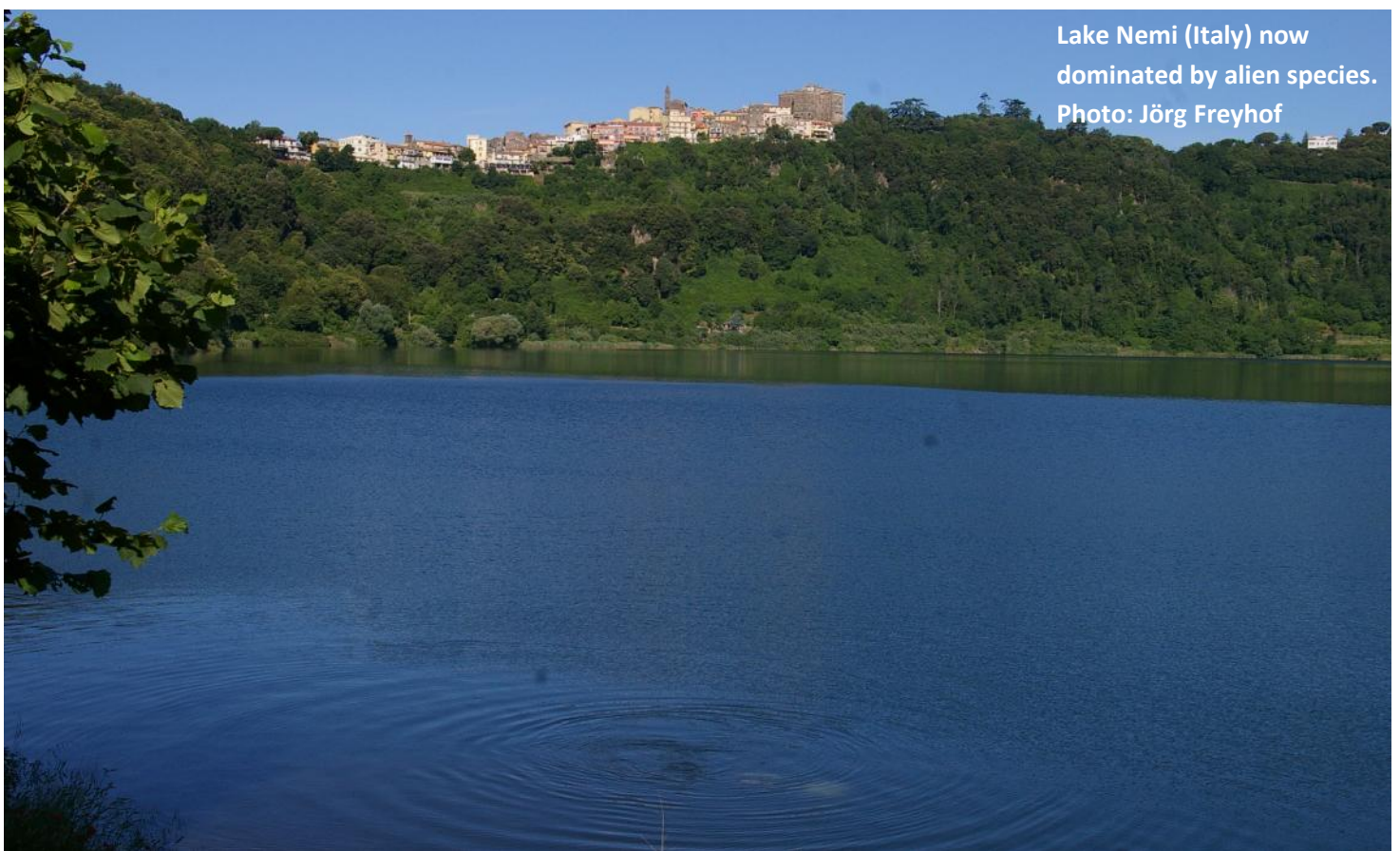
Please have a look at the Red List website: <http://www.iucnredlist.org/>, which provides a range of resources and many of the guidance documents, can be found at: <http://www.iucnredlist.org/technical-documents/red-list-training/red-list-guidance-docs>.

If you have any questions or you would like to be a Reviewer, please get in touch at info@iucnffsg.org

Introducing the FFSG European Region

Jörg Freyhof

FFSG Chair for European Region



Lake Nemi (Italy) now dominated by alien species.
Photo: Jörg Freyhof

The European region, here understood as the European *biogeographical* region, covers most of the Western Palearctic. This region includes all countries from Morocco and Portugal in the west to Novia Semlja to the eastern borders of Europe at the Urals, including the countries of the Caucasus, Turkey, Syrian, Jordan, Lebanon, Israel, all of Iran and Iraq in the east. It excludes the Nile and other waters in Egypt and Lybia and also the countries of the Arabian Peninsula. This large area is very diverse in climates from arctic waters in northern Russia, Iceland and Scandinavia south to the northern borders of the Sahara in the Maghreb countries and the deserts of Mesopotamia. It includes three of the globes most important biodiversity hotspots: the Mediterranean basin; the Caucasus; and the Irano-Anatolian area. These three hotspots were initially designated for their breathtaking plant diversity, but they also host interesting and highly endemic freshwater fish faunas. These hotspots represent many key freshwater biodiversity areas in the European region, being inhabited by a large number of threatened species. In the hotspots many rivers are highly isolated; and it's remarkable that each riverine spring often has its own fauna, evidently isolated from adjacent faunas for millions of years.

There are many important rivers in the European region, all containing marvellous freshwater habitats. The longest river in the area is the Volga (3,645km), which drains northern Russia and flows south into the Caspian Sea. Once famous for holding the world's most important populations of sturgeons, the Volga is strongly impacted by large dams, which block the migration not only of the sturgeons, but also making life difficult for anadromous lampreys, herrings and the famous predatory whitefish, *Stenodus leucichthys*. Caspian *Stenodus* and several sturgeon species are completely conservation dependent as they have lost all their natural spawning places and are also victims of a high level of poaching. The second largest river is the Euphrates (3,596km) which, together with sister catchment, the Tigris, is the home of an early Mesopotamean (literally 'between the rivers') human civilization (ca 3,100 BCE). Its fish fauna is highly endemic. Almost all of approximately 100 native species are found only in this drainage and in some geologically recent, isolated endorheic basins. Many endemic species are only found in one or only a few tributaries.

A species worth highlighting is *Luciobarbus esocinus*, which is the largest cypriniform fish of the world. Seeing one of these

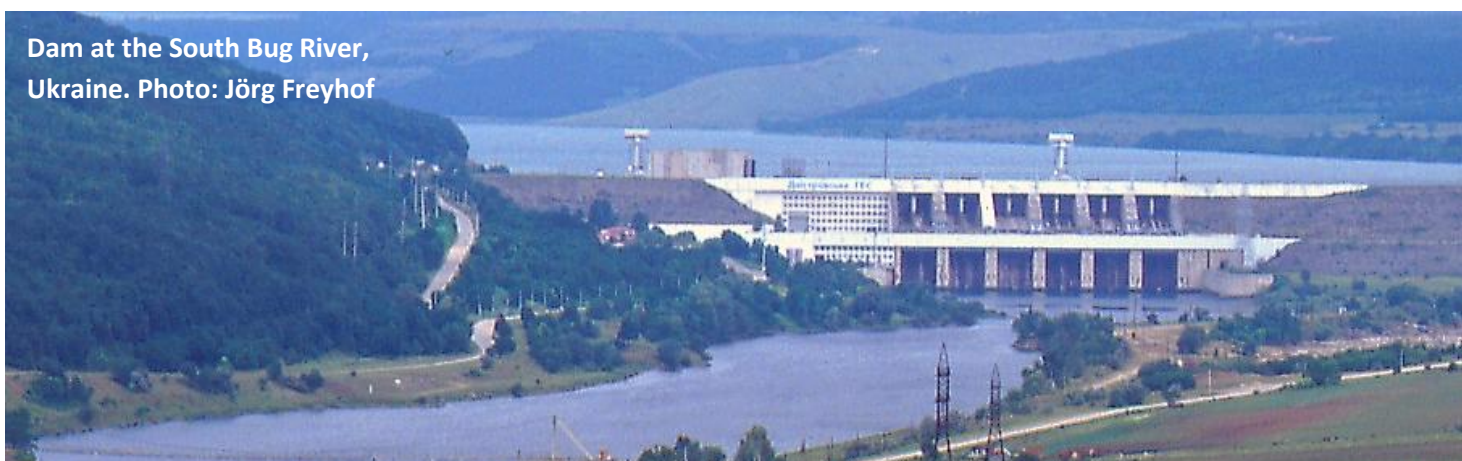


Photos from top to bottom: *Protochondrostoma genei* (highly endemic species of the Italian Peninsula), *Delminichthys krbavensis* (Mediterranean species with very restricted distribution), *Oxynoemacheilus evreni* (locally endemic species of Anatolia). Photos: Jörg Freyhof

alive is really breathtaking. The Euphrates is massively impacted today by dam constructions, water abstraction and pollution, and water resources are extremely overexploited. The Mesopotamian marshes along the lower Tigris are home to the 'Marsh Arabs' and were drained under the last Iraqi government. They are now being revitalized, following the new government's commitment to conserve this remarkable habitat. The third longest river and the most species rich (about 140 native species) in the region is the Danube (2,888km), which flows into the western Black Sea. Today, the Danube is the most important spawning river for the almost extinct sturgeons, such as the beluga, *Huso huso*, and is the home of many endemic species; several restricted to a few tributaries. Despite many dams in the upper and middle

section of the Danube, the lower Danube is still free-flowing and holds large stocks of anadromous herrings and few sturgeons. The marshes of the Danube delta are world famous and the many hillstreams are first-quality freshwater habitats. The last group of habitats not to be forgotten, in this short overview, are the thousands of postglacial lakes of Iceland, Britain and central and northern Europe, all inhabited by rich or unique fish faunas. Many of them are sites of a geologically recent rapid evolution and speciation, and so are small "Darwinian dream ponds." Especially characteristic are charrs (*Salvelinus*) and whitefish (*Coregonus*) adapted locally, often divided into several endemic taxa (up to eight putative species in the Russian Lake Onega), and still insufficiently investigated.

Dam at the South Bug River,
Ukraine. Photo: Jörg Freyhof



Conservation of freshwater fishes

The freshwater fishes of the Maghreb and continental Europe have already been assessed against the IUCN Red List criteria. The Red List assessment of the species of the Asian part of the area is ongoing. There are strong efforts to build up the first version of freshwater Key Biodiversity Areas for the European region and workshops to do so are ongoing.

As part of European Red List assessment (available [here](#)), 531 native and described species have been assessed. Almost 80% of the European species are endemic to Europe. Overall, at least 37% of Europe's freshwater fishes are threatened at a continental scale. A further 4% of freshwater fishes are considered Near Threatened. This is one of the highest threat levels of any major taxonomic group assessed to date for Europe. The conservation status of Europe's eight sturgeon species is particularly worrying: all but one are, at best, Critically Endangered. By comparison, 44% of freshwater molluscs, 23% of amphibians, 19% of reptiles, 15% of mammals and dragonflies, 13% of birds, 9% of butterflies and 7% of aquatic plants are threatened at the European level. The highest levels of species diversity are found in the lower parts of the rivers draining into the Black and Caspian Seas. However, a number of species with restricted ranges are also encountered in the Alps, in Great Britain and Ireland, and around the Mediterranean and Black Seas.

Most of the threatened species are confined to certain areas in southern Europe. Most freshwater fishes are in some way affected by pollution of a domestic, industrial or agricultural origin. Another primary threat to Europe's freshwater fishes is habitat loss due to over-abstraction of water. Additional major threats are the introduction of alien species, overfishing (particularly in the larger rivers of Eastern Europe) and a massive increase in the construction of dams, blocking migration and altering stream habitats.

IUCN engagement

Although a formal committee of FFSG members has not been established in the region there is a very active FFSG network of individuals engaged in freshwater fish research and conservation. In each region and country, there are usually several regional experts who are consulted when it comes to specific questions and many colleagues have and are continuously contributing to keep the IUCN Red List up to date and - as in the Asian part of the region - determined to bring together information for the future Red List. Many countries (as well as the European Union itself) have particular legislations, some of which is very helpful for fish conservation. See for example the [EU Natura 2000 directive](#).



Spotlight on the Chair: Dr Jörg Freyhof

Jörg is an independent research scientist employed at Leibniz Institute of Freshwater Ecology and Inland Fisheries (www.igb-berlin.de) and at the Zoological Research Museum Alexander Koenig (www.museumkoenig.de). He is an authority on biodiversity, taxonomy, evolution and ecology of freshwater fishes. Jörg has 25 years of field experience, and has authored and co-authored some 145 scientific publications, notably including two key papers in *Science* and the *Handbook of European Freshwater Fishes* (together with Maurice Kottelat, 1997). His papers and books have been cited more than 2,700 times! He has been a Member of the IUCN SSC/WI Freshwater Fish Specialist group since its foundation and is a member of the FFSG Steering Committee. He is also Project Leader for the European Red List assessment, as well as for the ongoing assessment of the fishes of the Asian part of the European biogeographical region. You can find out about Jörg's recent activities and an updated publication list on his excellent website: <http://joerg-freyhof.de/>

IUCN Red List workshop for freshwater eels

Matthew Gollock

Chair of Anguillid Specialist Sub-Group

What was the outcome when numerous passionate eel geeks were recently locked-up together in a room close to London Zoo?

The Anguillid (Eel) Specialist Sub-Group (ASSG), a sub-group of the FFSG, was established in 2012 and the first priority was to carry out IUCN Red List assessments of all anguillid eel species. As such, for almost a year, the group's energies were focussed on realising an assessment workshop. With kind donations from the Fishmongers Company and the UK's Environment Agency – and some rather draconian financial accounting by myself – we were able to amass and support a core team of 14 participants from eight countries - plus a few 'floating experts' who joined us for various parts of the workshop.

It was hosted by the Zoological Society of London (ZSL), from 1st - 5th July 2013, and the aim was to assess 15 of the 19 anguillid species and subspecies under the IUCN Red List criteria. The anguillids that are found in New Zealand were recently assessed as part of a regional project and as such were not considered by this workshop. Prior to this point only five anguillid species had been assessed and it was widely agreed that there was a need for a full assessment of these fishes.



Now a roomful of people talking about eels for a week would seem surreal in itself, but the fact that there appeared to be quite a bit of media interest in a bunch of 'eel geeks' (or geelks?) made the situation even stranger. At one point a camera crew roamed outside looking sheepish while we stood inside the building looking back out, sipping the finest cup of tea ZSL could offer.

It was agreed by all involved that the discussions that occurred as part of the workshop would be kept amongst the group until the point when assessments have been approved and are published. Hence, it is difficult to divulge too much at this point - but it would be fair to say that it was an enormously productive week. Many of the participants had worked on the same species for many years and never met and so - as well as having the focus of the workshop - many discussions related to eels went beyond the workshop's agenda, and that can only be beneficial for this important taxon. Obviously everyone had strong opinions about their 'eel of choice' and vigorous debates were common. In the end these exchanges were never anything other than productive; and all discussions had a very forward thinking approach. I felt very lucky to be in such a passionate and collegiate group of people.

So after, four and a half days in a windowless room, we emerged blinking into the sunlight having completed our task and celebrated with a pizza lunch before the gang slowly dispersed into a summery Friday afternoon in London. I find it is a rarity these days to get to focus on a task for such an extended period of time. Having the opportunity to do so (on a group of species I have worked with for fifteen years) with people who have an equal passion for eels, was a real privilege. I'm convinced that what we have done was a first step towards doing some great work for the fabulous anguillids and I'm already looking forward to getting started.



Queensland's endangered gobies

Adam Kerezszy

Bush Heritage Australia, Melbourne, and Australian Rivers Institute, Griffith University, Brisbane, Australia



Male Edgbaston goby, *Chlamydogobius squamigenus*. Photo: Adam Kerezszy

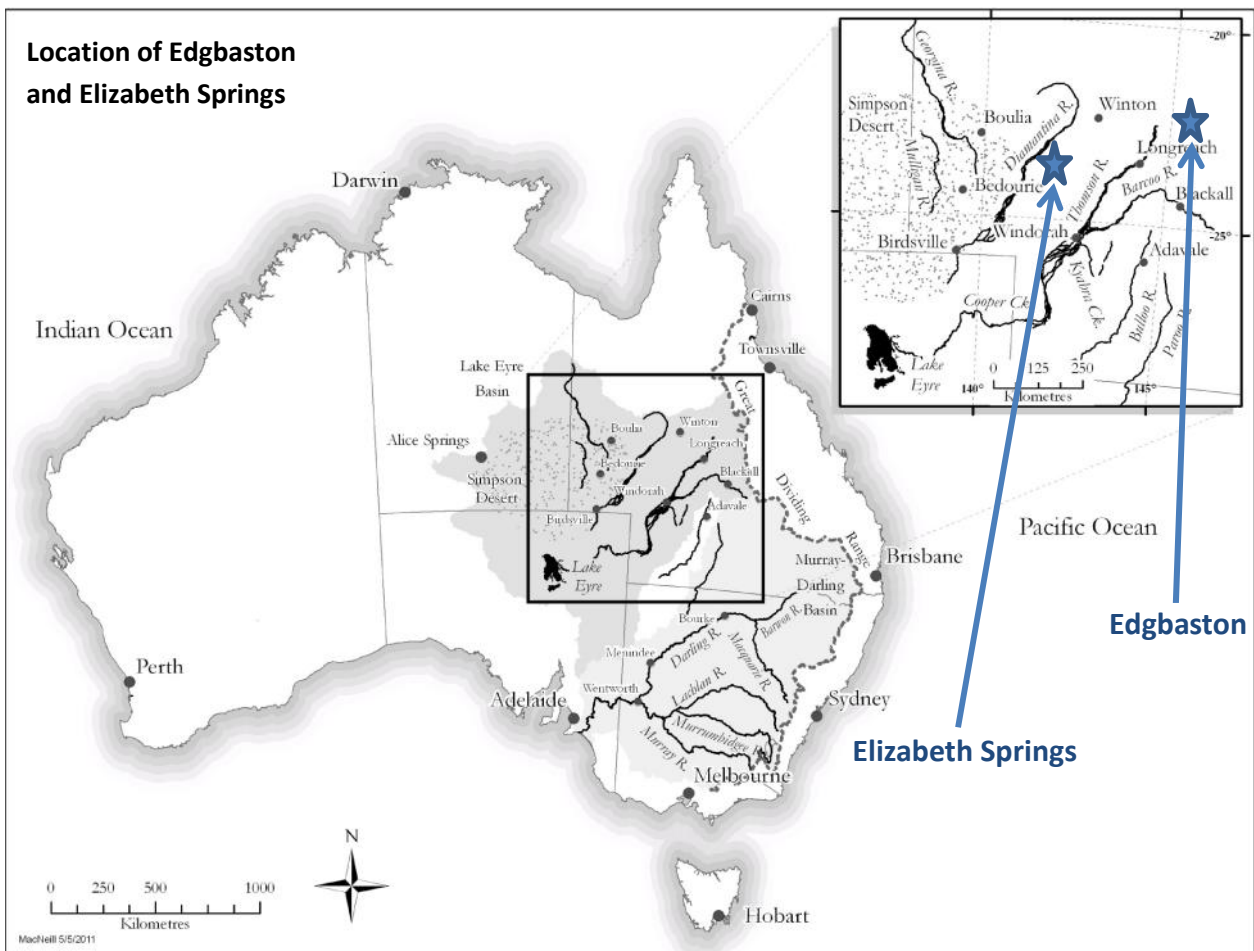
In two remote spring-fed systems in outback western Queensland, Australia, two diminutive gobies have evolved and endured in conditions that very few fish could tolerate.

Gobies are one of the largest and most geographically widespread fish taxa in the world. Even so, the presence of endemic species in the Great Artesian Basin spring complexes of central Australia is a little surprising. Some of these habitats are more like damp swamps than watery oases, and many are no bigger in area than a kitchen table. As a consequence, the gobies that inhabit them are small – no bigger than five or six centimetres – and have the ability to extract oxygen from the air when the springs dry back (Thompson and Withers, 2002). There are five species in total, and all are taxonomically similar, with their speciation evidently a result of isolation in separated habitats. What this means is that the Edgbaston goby, *Chlamydogobius squamigenus*, has been ecologically marooned in the springs at Edgbaston in central western Queensland and the Elizabeth Springs goby, *Chlamydogobius micropterus*, has similarly been stuck at Elizabeth Springs 400-plus kilometres to the south-west (see map on page 16), and other relatives are distributed in South Australia and the Northern Territory. Although they have different names and live in different localities, the various central Australian gobies have much in common. The males are vividly coloured, with a noticeable blue, black and white splash on their dorsal fins. The males also guard the clutches of eggs, circulating water over them

with their fins and tails until they hatch. Like many (non-eleotridine) gobies, they spend the majority of their time resting on fused pelvic fins located on their belly.

The spring habitats where these species reside represent the absolute lethal limit of habitation for freshwater fish, invertebrate and plant taxa. Hence, they have been identified as priority areas for conservation due to the large numbers of endemic freshwater species they contain (Fensham *et al.*, 2011). These water bodies are mostly only a couple of centimetres deep and are located in some of the lowest rainfall areas of the continent. Sustained by a constant supply of 24°C water that seeps from the Great Artesian Basin, the wetted areas of the springs exhibit massive fluctuations in temperature, due to their location in Australia's arid inland. In summer, water temperatures frequently exceed 35°C, whereas on cold winter mornings they can be close to zero. In many springs, the gobies that are present are apex predators and share their diminutive habitat with an array of similarly endemic molluscs, beetles, ostracods and shrimp.

Colonisation opportunities are rare for these fish, and only occur when heavy monsoonal rainfall results in inundation of the flat floodplains and claypans where the springs are located. Presumably, a few lucky gobies emigrate from their spring of origin during such events and wriggle their way to neighbouring springs. Nevertheless, they don't seem to go far, as a genetic analysis of Edgbaston gobies found that there is differentiation of communities in springs less than two kilometres apart (Faulks and Kerezszy, 2011).



Both goby species found in springs in Queensland are listed as Critically Endangered by the IUCN SSC (IUCN, 2013) and Endangered under Queensland legislation (NCA, 1992). Under the federal (national) Environment Protection and Biodiversity Conservation Act, the Elizabeth Springs goby is listed as Endangered and the Edgbaston goby is listed as Vulnerable (EPBC, 1999). The total population of both species is likely to be less than 2,000; although this figure should only be considered a very rough estimate.

All gobies (and also all the other endemic plants and animals from Great Artesian Basin springs) are threatened by aquifer drawdown (from extractive water use) and disruption/destruction from feral and domestic animals. The Edgbaston goby is also under threat from the introduced live-bearing fish gambusia or mosquitofish, *Gambusia holbrooki*, which is also present in the springs at Edgbaston.

The spring complex at Edgbaston was purchased by the conservation (not-for-profit) agency Bush Heritage Australia, and the spring complex at Elizabeth Springs is a government designated national park. This affords Queensland's endangered spring gobies a measure of protection as these two bodies do their best to keep stock and feral animals away from the fragile spring habitats. At Edgbaston, Bush Heritage Australia has also been developing techniques to control gambusia (Kerezszy, 2009).

Both Elizabeth Springs goby and Edgbaston goby rightfully deserve listing as Endangered species due to their limited

ranges and specific habitat requirements. At present, Edgbaston goby are under more direct threat than Elizabeth Springs goby as gambusia are present at Edgbaston and are found in massive numbers in some springs they have invaded. Observations over the last five years suggest that as gambusia populations increase, goby populations decrease – a similar situation to the apparent competitive exclusion of red-finned blue-eye, *Scaturiginichthys vermeilipinnis* (Fairfax *et al.*, 2007).

Despite their endangered status and curious life histories, the gobies described are comparatively under-studied, and certainly have not received the dedicated attention of their more high-profile neighbour the red-finned blue-eye (Kerezszy, 2012; Kerezszy and Fensham, *in press*). Over the next few years Bush Heritage Australia plans to direct more effort into auditing Edgbaston goby populations within the Edgbaston complex; such that their populations can be managed effectively into the future. It is possible that this work may follow a similar path to that already instigated with red-finned blue-eye, and that it may include gambusia control, spring quarantine using barriers, livestock relocation and captive breeding.

Preservation and restoration of the unique spring habitats of central Australia, combined with protection of the Great Artesian Basin, a massive aquifer that underlies more than 20% of the Australian continent, are both necessary in order to ensure the survival of these fascinating species.

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Elizabeth Springs – goby habitat
Photo: Adam Kerezszy



Conservation of threatened endemic fish species of the Cape Floristic Region Biodiversity Hotspot

Alwyn Lubbe¹, Christy Bragg¹ and Bridget Corrigan²

¹Endangered Wildlife Trust - Drylands Conservation Programme; ² Endangered Wildlife Trust - Source to Sea Programme

In the last issue of the IUCN SSC/WI Freshwater Fish Specialist Group newsletter (June 2013), Prof. Paul Skelton introduced us to the amazing aquatic biodiversity of the Southern African region. Remarkably, approximately 10% (43 species) of Southern African freshwater fish species occur in the relatively small geographical range of the Cape Floristic Region (CFR), a global biodiversity hotspot in the south-western corner of South Africa. More significantly for conservation efforts, 90% of these species are endemic, and 60% are listed as threatened by the IUCN. Within this region, the Olifants-Doring Rivers basin is the pre-eminent hotspot of both endemic fish species richness and of endemic threatened fish species richness. The Endangered Wildlife Trust's (EWT) Cape Critical Rivers Project, generously funded by the SOS-Save Our Species Foundation, is to be implemented in close collaboration with local governmental nature conservation organizations, namely Northern Cape Department of Environment and Nature Conservation, and Cape Nature, who are providing in-kind support and matched funding. The project, which is a collaborative partnership, will focus on the conservation of threatened endemic fish species, and promote sustainable water and land management practices in two catchments within the CFR – the Breede-Tradouw and the aforementioned Olifants-Doring. Together, these catchments support 17 species of indigenous freshwater fish, of which 70% are endemic and 76% threatened. Out of the ten indigenous freshwater fish species that occur in the Olifants-Doring, eight are entirely endemic to the basin itself. All eight are Red-Listed by the IUCN and include six cyprinids [Clanwilliam sandfish (*Labeo seeberi*), Clanwilliam yellowfish (*Labeobarbus capensis*), Fiery redfin (*Pseudobarbus phlegethon*); with three species of the Genus *Barbus*: Clanwilliam sawfin (*B. calidus*), Clanwilliam redfin (*B. erubescens*) and the Twee river redfin (*B. serra*)].



Clanwilliam sandfish (*Labeo seeberi*) survey. © Bruce Paxton

The Breede-Tradouw catchment is also of significant conservation importance as it is home to what is likely the ancestral lineage of the Genus *Pseudobarbus*, the Critically Endangered Barrydale redfin (*P. burchelli*) - which has only one intact population remaining in a combined river distance of approximately 6.5km – and the Endangered whitefish (*B. andrewi*). Also, within the associated riparian vegetation, is found the Critically Endangered riverine rabbit (*Bunolagus monticularis*).

Clanwilliam sandfish (*Labeo seeberi*)

© Riaan van der Walt





Kliphuis River, Western Cape

© Bruce Paxton

Due to taxonomic uncertainty the freshwater fish biodiversity of the CFR is likely underestimated, as demonstrated by the recent description of a new species of redbfin in the Breede-Tradouw catchment, the Giant redbfin (*P. skeltoni*) – appropriately named in honour of Prof. Skelton in recognition of his immense contribution to taxonomic and systematic research on freshwater fishes in southern Africa (Chakona and Swartz, 2013). Several sections of these catchments have also been recognized as “Critical Biodiversity Areas” and high-priority Fish Sanctuaries according to the National Freshwater Ecosystem Priority Areas. This is a contemporary conservation action plan developed by South Africa to prioritize freshwater conservation.

As in many freshwater ecosystems globally, the primary threat to the persistence of indigenous fish species in the CFR are the spread of invasive alien fish species, which is exacerbated by habitat loss due to the increasing demand for agricultural and domestic water use, and pollution. Currently, approximately 80% of rivers in the CFR are invaded by one or more alien fish species. Most pertinent for the conservation of indigenous fish are the presence of predatory small- and large-mouth bass (*Micropterus dolomieu* and *M. salmoides*), rainbow trout (*Oncorhynchus mykiss*) and bluegill sunfish (*Lepomis macrochirus*). Where populations of these alien species specifically establish themselves, it is largely impossible for viable populations of indigenous species to persist. The indigenes are preyed upon prodigiously by the aliens and/or outcompeted for food resources. Common carp (*Cyprinus carpio*) have also proven to be extremely effective colonizers of the CFR rivers. Although not predatory, they compound the detrimental impacts on indigenous populations by destroying critical spawning and feeding

habitats *via* their bottom-feeding behaviour, which adversely increases water turbidity. Remnant populations of indigenous species are therefore primarily restricted to isolated tributaries absent of alien fish. Worldwide carp, trout and large-mouth bass have been listed amongst the 100 worst invasive alien species because of their impact on biodiversity and ecosystem processes (Lowe *et al.*, 2000). The impact of alien fish can be so severe, that in some cases the entire indigenous fish species assemblage has disappeared following introduction of predatory alien species (Woodford *et al.*, 2005). Addressing the issue of invasive alien species and catchment land and water management is therefore critical if we are to conserve these pockets of unique biodiversity and the ecosystems which they inhabit.

With this in mind, the aim of the Cape Critical Rivers project is to implement the conservation actions outlined by the draft Biodiversity Management Plans (BMP) for the Endangered Clanwilliam sandfish and the Critically Endangered Barrydale redbfin. These BMPs, which are in the process of being formally gazetted, will be the first legally binding BMPs for any freshwater species in South Africa. The draft management plans were developed with comprehensive stakeholder engagement include species-level conservation actions as well as catchment management actions. Once invasive alien species have established themselves in a system, they are very difficult to remove. We will therefore attempt to preserve the existing critically important pockets of pristine habitat for indigenous fish by working closely with landowners and recreational users in identified high priority indigenous fish sanctuaries. This will raise awareness of the risks associated with the introduction of alien species to these systems and help develop co-operative agreements to

prevent introductions in the future. Furthermore, we will be working closely with local conservation authorities and researchers to identify viable habitat sites for developing new fish sanctuaries. This may well necessitate alien fish clearing and subsequent translocation of a population of Clanwilliam sandfish. Any such actions would only be undertaken with adherence to [IUCN translocation guidelines](#) and with expert facilitation of these processes. The long-term objective is to expand the current distribution range and population numbers of this iconic, once abundant species. This should be within the bounds of its historic range and create suitable habitat for the natural re-colonization of other indigenous species.

The Olifants-Doring and Breede-Tradouw catchments are also of high socio-economic importance. They support the economically important fruit and wine agricultural sectors. The requirement for intensive irrigation agriculture provides a challenging backdrop for the implementation of conservation actions in relation to fishes. To promote the sustainable utilization of our freshwater resources, the South African Department of Water Affairs is currently in the final stages of developing a Water Resource Classification System (WRCS), which aims to determine the environmental flow requirements, referred to as the ecological reserve, necessary to sustain ecosystem function in a river. The Olifants-Doring catchment has been the case study for the development of the WRCS, and our project aims to investigate the feasibility and monitor the compliance of implementing the ecological reserve in selected high conservation priority rivers. This will be done in collaboration with the Department of Water Affairs. We are thus, engaging with water users (both agricultural and municipal) on sustainable water and land management practices. One aim is to encourage the sustainable and profitable utilization of our natural resources while maintaining the ecosystems of the CFR, which support an unique assemblage of freshwater biodiversity.

The SOS Cape Critical Rivers project started in February 2013, and four water level loggers have already been installed at strategic locations in the Olifants-Doring system. In conjunction with regular flow measurements, these loggers will allow us to quantify the flow regime of these rivers and then use these data in managing the relevant ecological reserves. The project is currently funded for two years, but has a long-term strategy to become a permanent fixture in the Cape landscape. There is an inspiring partnership developing between the relevant governmental organizations, Water Users Associations and stakeholders. A critical goal is to enhance and facilitate co-governance of our natural resources (in particular water and biodiversity) in order to achieve maximum impact. It is vital to better use the limited capacity and resources available to stakeholders and governance bodies for rivers in our developing country.

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Acknowledgements

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Drafting IUCN Red List assessments for Iranian freshwater fishes

Jörg Freyhof

FFSG Chair for European Region



Iran is a major diversity hotspot in the wider European region. It is mostly inhabited by characteristically European species, but also has a few south and Central Asian ichthyofaunal elements. While all IUCN Red List drafts for the species of the Eastern Mediterranean have been reviewed this spring in Jordan (see June 2013 FFSG Newsletter), it was not possible to review the Iranian taxa due to entry visa problems.

The IUCN Red List is believed to really make a difference for fish conservation and funding in Iran and so we made several efforts to fill the gap. Professor Hamid Reza Esmaeili, from the Ichthyology Research Laboratory of the Shiraz University, Iran had already compiled all the data in spring and information needed for the Red List review, but it was not until August 2013 that we met in person at the University of Munich in Germany. Hamid and I spent two long and busy days together (also linked to Kevin Smith from IUCN

Freshwater Biodiversity Unit via Skype and telephone) to review all the draft assessments of the Iranian species, including taxa known to be widespread in the area.

As we originally surmised, the number of threatened species in that arid and highly impacted area proved to be quite high. For example, the number of independent springs inhabited by the tooth-carp *Aphanius farsicus* has dropped from ten down to one during the last 10 years. All but one *Aphanius* species made it on the Red List, as did many other endemics from the small rivers of the Persian Gulf. It should be noted that the bigger species in the area are overfished - such as the 'large barbs' (barbine cyprinids) from the Euphrates and Tigris. We currently lack new, reliable data on threat status and geographical distribution, especially for the endemic species of the southern Caspian Sea and the Lake Urmia basin. Much important work remains to be done!

World Fish Migration Day 2014

Connected for a common purpose, and sharing ideas and lessons across the world

World Fish Migration Day 2014, on the **24th May**, calls attention to the need to maintain or restore the connections in rivers and the sea for migratory fish, in order to achieve healthy fish stocks and productive rivers. Migratory fish (such as salmon, sea trout, dorado, shad, giant catfish, sturgeon and eel) are threatened by barriers such as weirs, dams and sluices. These are built for water management, hydropower, agriculture and land drainage. Around the world people rely on these fishes as a primary source of protein and for trading income. There are also added benefits in recreational fishing. Water and resource managers and conservationists are striving to secure and improve migration routes between and within rivers, deltas and the oceans. These 'fish ways' are vital to their survival.

A World Fish Migration Day will be held to improve the publics' understanding of the importance of migratory fish and their survival needs, as well as the general importance of healthy, freely flowing rivers. Raising awareness, sharing ideas, securing commitments and building communities around river basins are essential aspects of fish passage and river restoration. On this day, we will connect celebrations and events that start in New Zealand, and follow the sun; ending as the sun sets on the west coast of North America. To date we have more than 60 locations worldwide and are looking for more organizations that want to join us. A map with event locations can be found at: www.wanningenwaterconsult.nl/en/products/world-fish-migration-day-2014

Would you like to organize an event? We certainly hope so!

Participating organizations will organize their own event and outreach communication under the umbrella of the World Fish Migration Day 2014. Wanningen Water Consult & LINKIT Consult, partnering with WWF, The Nature Conservancy and the FFSG, will take care of the central coordination, international publicity, and maintain the main website (www.worldfishmigrationday.com - online in October 2013). All projects will be highlighted on this website, social media and in the press. Thank you in anticipation of your support.

For more information or to organize an event please e-mail herman@wanningenwaterconsult.nl or call 00 31 6 18 27 25 72



PARTNERSHIP



Redline Torpedo Barbs: Understanding conservation issues for freshwater fish of the Western Ghats, India

Rajeev Raghavan

FFSG Regional Co-Chair for South Asia



Redline torpedo barb, *Puntius denisonii*. Photo: Ralf Britz

Redline torpedo barbs (RLTB) (Cyprinidae: *Puntius*) are a group of highly popular freshwater aquarium fishes endemic to the Western Ghats region of India. Although these barbs are currently known from two species (*Puntius denisonii* and *Puntius chalakkudiensis*) recent studies indicate that there may be cryptic species, evolutionary distinct lineages and other undescribed diversity in the RLTB group (see 'Further reading' on page 24). It is becoming evident that our knowledge of RLTB taxonomy and geographical distribution is far from complete.

Since the mid 'nineties - when RLTB were introduced to the pet trade industry - they have been collected and exported on an indiscriminate scale from the native range. The absence of any effective regulation on collection and trade (together with other escalating human impacts in the range state) has resulted in severe stock declines. Local populations in some prime collecting areas have been reduced to 30% of pre-exploitation levels. A recent study reveals that more than 300,000 RLTB were collected and exported from India during the years 2005-2012. Several thousand additional individuals

were probably exported in this period without accurate identification and documentation. From their restricted range, marked population decline and a continuing deterioration of key habitats, both *P. denisonii* and *P. chalakkudiensis* are currently listed as 'Endangered' in the IUCN Red List of Threatened Species.

The increasing global attention and focus on the need to conserve and manage the RLTB resulted in the issuance of a government order in 2008 in the southern Indian state of Kerala, restricting collection and exports. It also proposes conservation management measures including quotas, gear restrictions, minimum catch size and a closed season for fishing. However, subsequent studies indicate that these regulations were developed with minimum scientific input and offer little practical protection for the species. For example, a seasonal closure of the fishery was implemented based on the assumption that these fish breed in June, July and October. However, research shows that the actual breeding season extends from October to March. Hence, the timing of the current seasonal closure is inappropriate.

During the seven year period from 2005 to 2012, more than 89,000 RLTB were collected and exported during their spawning season. This badly timed, out-of-sequence harvest constitutes 11 – 44% of annual exports during this period. Further, it was originally inferred that 46% (145,997) of exported individuals during the seven years were specimens yet to reach first maturity. This was erroneously based on early information on the supposed size at first maturity for these barbs (<10cm or 4 inches). Compounding all of this, recent studies suggest that local regulations on collection and export of barbs (as implemented in the southern Indian state of Kerala) have been poorly enforced on the ground. In the last three years of the seven years, at least 11,260 fish were exported during the months of the supposed ban. This amounts to 22% of all RLTB exported from India for 2010–2012.

RLTB may well be unsuitable for large-scale wild collection. This view is based on data on their extremely low fecundity, skewed sex ratio in the wild and high post-harvest mortality. Nonetheless, the commercial trade shows no signs of abating; and many thousands of these barbs continue to be exported in each successive year. There is some prospect for the development and commercialization of captive breeding for RLTB based on operations in Southeast Asia, especially in Malaysia and Indonesia. However, so far, the supply from these sources has not sufficiently eased pressure on natural stocks and the wild capture industry continues undiminished to date. Although experts from the Kerala University of Fisheries and Ocean Sciences in Cochin, India have developed and standardized captive breeding techniques, large scale commercial operations are yet to take off in the range state or elsewhere.

To effectively manage the trade in these beautiful, charismatic species - and develop pragmatic management plans to ensure sustainable harvests - much additional research is needed. This should include studies on population status and dynamics, life history traits, permissible levels of exploitation and so forth. These data are currently unavailable; and obtaining them should be the target for future, more comprehensive, research.

Importantly, there are likely to be undescribed cryptic species, evolutionarily-distinct lineages and other diversity among RLTB. This strongly suggests a need for critical re-determination and re-evaluation of all taxa of conservation concern; and, probably, the establishment of new conservation targets. Conservation action plans (which might involve ranching, stock enhancement, translocations and reintroductions) certainly require an ability to clearly distinguish populations and higher-level taxa, alongside ecological and evolutionary boundaries. The future survival of redline torpedo barbs no doubt rests on the success of a combined and responsible effort aimed at conservation and

sustainable use. This must be developed in a fruitful collaboration involving researchers, collectors, exporters, biodiversity managers, policy makers and aquarium hobbyists.

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