FRESHWATER BIODIVERSITY – A HIDDEN RESOURCE UNDER THREAT

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The IUCN Red List of Threatened Species™

SSC
Species Survival Commission

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Cover photo: Diplacodes luminans - *Least Concern. A beautiful dragonfly species which is widespread throughout sub-Saharan Africa and is currently not thought to be threatened.* © Jens Kipping

Freshwater Biodiversity – a hidden resource under threat

William Darwall, Kevin Smith, David Allen, Mary Seddon, Gordon McGregor Reid, Viola Clausnitzer and Vincent Kalkman

Biodiversity in hot water

While freshwater habitats cover less than 1% of the world's surface (Gleick 1996), they provide a home for 7% (126,000 species) of the estimated 1.8 million described species (Balian *et al*. 2008), including a quarter of the estimated 60,000 vertebrates.

Freshwater ecosystems not only provide habitat for the survival of their component species but also enable the storage and provision of clean water for human use. They also provide many important goods and services ranging from food and building materials, to water filtration, flood and erosion control, and are a critical resource for the livelihoods of many of the world's poorest communities (Millennium Ecosystem Assessment 2005). For example, tropical rivers and inland fisheries have been valued globally at US $5.58 billion per year (Neiland and Béné 2008). The goods and services provided by the world's wetlands are valued at $70 billion per year (Schuyt and Brander 2004) - a figure equivalent to the GDP of some countries ranked as being in the top third of the world's economies (World Bank 2008).

The high value and importance of freshwater ecosystems is often overlooked

Harvesting of gastropod snails, Cambodia. © Kong Kim Sreng

Box 1: Pro-poor conservation in wetlands

IUCN has produced a *toolkit* (Darwall *et al.* 2008) that will assist in wetland conservation and development decision-making. It provides an assessment approach that ensures the links between biodiversity, economics and livelihoods are captured, with a particular focus on strengthening pro-poor approaches to wetland management.

The *toolkit* was developed through integrated assessments in Cambodia's Stung Treng Ramsar Site and on the Rufiji floodplain in Tanzania. These wetlands are vital for the food security and nutrition of local communities. In the case of Stung Treng, previous biodiversity assessments had proposed total exclusion zones within the protected area, where fishing and other activities of local communities would be banned. The integrated assessment found that local communities, including migrant settlers, the landless and those depending on fish to provide daily nutrition, relied heavily on the natural resources from within the proposed exclusion zones. The project's results are already helping to shape the management plan for the Stung Treng Ramsar Site, supporting pro-poor wetland conservation and sustainable use of the site's resources to the benefit of both local livelihoods and biodiversity. In the Rufiji, the assessment has provided a village community with vital information on the full value of their wetland resources, informing the development of their Village Environmental Management Plan.

The *toolkit* is targeted at providing policy-relevant information on individual wetland sites. Integrated assessments present the strongest case for conserving wetlands and allow local people to defend their livelihoods from developers. They can also act as an early warning system, highlighting areas of potential conflict between conservation and livelihoods.

such that wetlands are frequently considered as 'wastelands' ripe for conversion to alternative uses. As a result, many wetlands have been drained and converted for ostensibly more 'profitable' uses; 60% of Europe's wetlands have already been lost (UNEP/DEWA 2004) through conversion to alternative use or simply through lack of conservation over the last 50 to 100 years.

Globally, rapidly increasing human populations are putting ever-greater pressure on the goods and services supplied by freshwater ecosystems. The long-term survival of many wetland-dependant species is therefore becoming more precarious as wetlands are increasingly exploited for human use. With the number of people living in water-scarce or water-stressed conditions projected to rise from 745 million in 2005 to 3.2 billion by 2025 (Population Action International 2006), it is therefore no surprise that global development objectives are firmly focused on the world's freshwater supply crisis. For example, the Millennium Development Goals (MDGs) include targets for halving the number of people without access to clean drinking water and sanitation by 2015. However, if we are not careful, the stage could be set for large-scale impacts to freshwater biodiversity. In order to avoid and mitigate major impacts to freshwater species and ecosystems, information on the status, distribution and value of freshwater biodiversity is urgently needed to inform the development planning process.

Girl selling fish at Stung Treng market, Cambodia.
© William Darwall

Data on freshwater species often exist, especially for the more developed catchment areas, but they are frequently widely dispersed in unpublished literature, and are hence effectively inaccessible, particularly in the places where the greatest increase in development is taking place. Such data need to be easily and freely accessible, with species distributions available in a digital format, to enable a full understanding of the impact of developments on freshwater

Aponogeton distachyos. *An edible aquatic plant native to the Western Cape in South Africa where it is used to prepare a local dish. It is listed as Least Concern.*
© Craig Hilton-Taylor

systems. The information also needs to be more comprehensive (i.e., cover more taxonomic groups), reliable, robust and regularly updated. Without access to this information, development projects will not be able to mitigate or avoid actions that may have major negative impacts upon wetland biodiversity and the predominantly poor communities dependant on wetland resources.

Filling the information gap

IUCN is working with a number of partner organisations to fill the information gap on freshwater species by providing relevant data in a format suitable for use within development and conservation planning processes. This is being accomplished by conducting assessments of all known species within the following priority groups; freshwater fishes, freshwater molluscs, dragonflies and damselflies, crabs and selected aquatic plant families.

These groups were chosen because they represent a wide range of trophic levels and are amongst the better-known species within freshwater ecosystems. The biodiversity assessments collate and make available information on each species' taxonomy, ecology, distribution, conservation status (according to The IUCN Red List Categories and Criteria), use, and value to peoples' livelihoods. Given the wide range of ecological roles encompassed within these five taxonomic groups, the information collated provides a useful indication of the overall status of the associated wetland ecosystems. Data on other species groups already assessed through this process, for example freshwater-dependent mammals, amphibians and birds, are also used to provide an increasingly informative picture on the status of freshwater species.

A regional approach (e.g., focussing on eastern Africa or Europe) has been

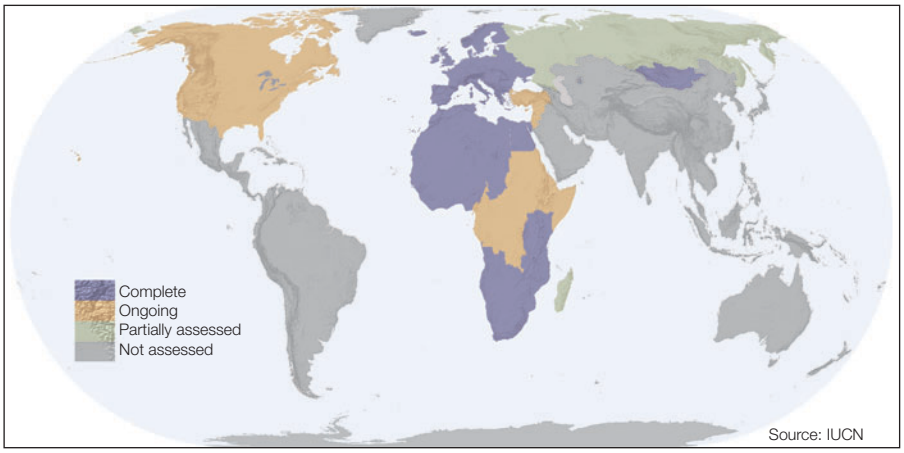


Figure 1. *The state of progress in completion of comprehensive regional assessments of the worlds' freshwater fish species.*

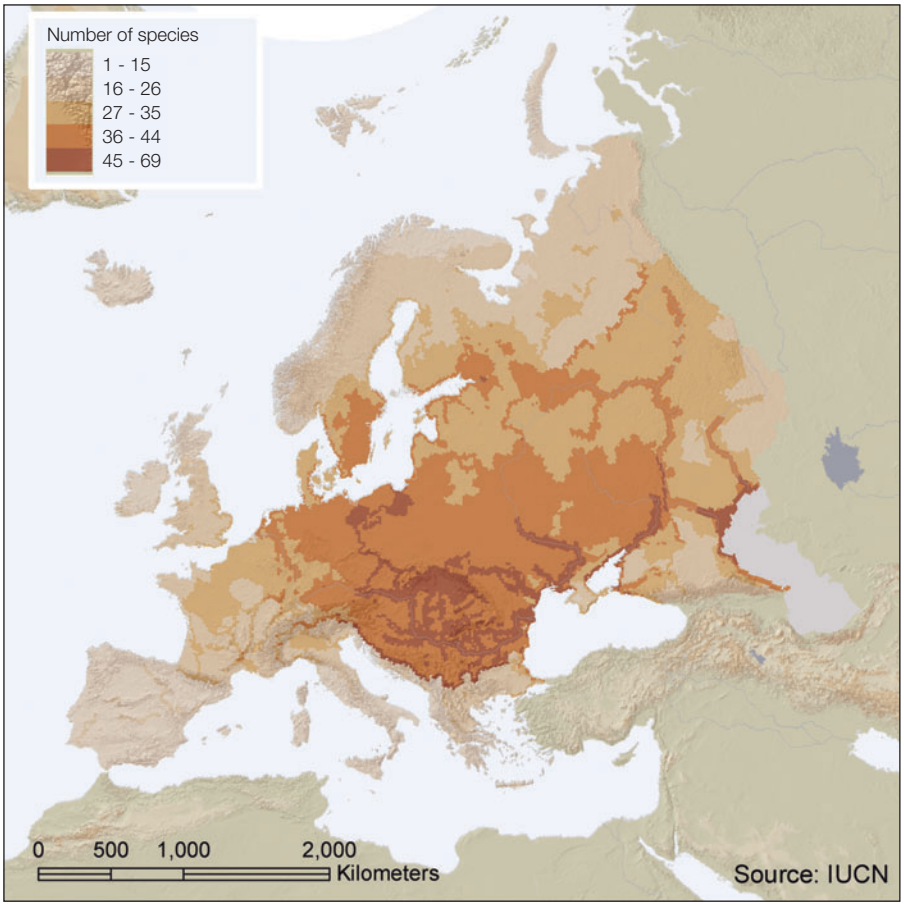


Figure 2. *Species richness of freshwater fishes in Europe*

adopted for conducting the assessments of the key freshwater taxonomic groups. This approach very quickly provides a comprehensive picture of the status of freshwater biodiversity in the region concerned and enables IUCN to meet the information needs of regional bodies in the near term while the work continues towards completion of the longer term goal of globally comprehensive assessments for each species group. IUCN has so far completed freshwater regional assessments for eastern Africa (Darwall *et al.* 2005) and southern Africa (Darwall *et al.* in prep.), and ongoing assessments for the rest of Africa are to be completed in 2009.

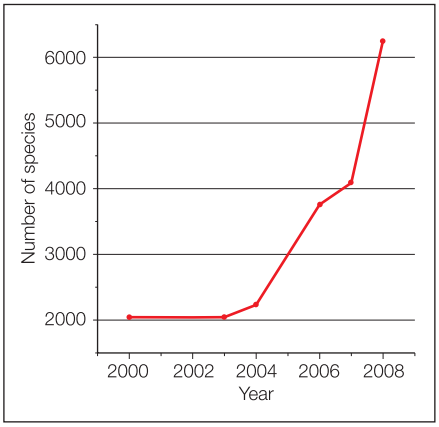
Global assessments for each taxonomic group are ongoing and have been completed for the amphibians (6,267 species; http://www.iucnredlist.org/amphibians) and freshwater crabs (all 1,281 species; Collen *et al.* 2008). Figure 1 shows the progress towards achieving a global assessment of all freshwater fishes; in addition to the regional assessments conducted for Africa, all known species in Europe (Kottelat and Freyhof 2007; Figure 2), Mongolia (Ocock *et al.* 2006), the endemic species of Madagascar (IUCN 2004), and the Mediterranean basin (Smith and Darwall 2006) have now been assessed. Assessments for freshwater species in North America are now underway. Progress is also being made on the global dragonfly assessment with over 40% of the 5,680 dragonflies now assessed, and projects to assess all species of Europe and parts of Asia are underway. A particular strong point in the progress of the dragonfly assessment is the ongoing development of a number of large species distribution databases storing species point locality data in particular for Africa, Europe, Australia and large parts of Asia.

IUCN and Conservation International joined forces to assess an estimated 27,394 freshwater species included in the five species groups mentioned above (Chambers *et al.* 2008; Bogan 2008; Strong *et al.* 2008; Yeo *et al.* 2008; Kalkman *et al.* 2008; Lévêque *et al.* 2008). Of these, only 6,000 species have so far been assessed on a global scale and included in The 2008 IUCN Red List of Threatened Species™ (Figure 3), leaving over 21,000 species still to be assessed. An estimated 2,000 of these species are currently in the assessment process and should be included in 2009. The species still to be assessed are not evenly distributed worldwide, with major gaps including the two regions with the greatest freshwater fish species diversity, namely Asia and South America (Lévêque *et al.* 2008). These regions include some of the major river systems of the world, many of which are subject to substantial modifications (e.g. dam construction and canalization) both in place and planned. Species from many of the world's most extensive and species-rich wetland systems such as the Pantanal, the Mesopotamian marshes, the floodplain marshes of the Brahamaputra, and the Mekong Delta are yet to be assessed.

Results

The information collated through comprehensive regional assessments, where every described species from a taxonomic group within a region is assessed, has enabled identification of those river or lake basins (the logical management units for freshwater systems) containing the highest levels of species richness, threatened species, restricted range species, migratory species and/or species important to the livelihoods of local communities. This information can be used to help prioritize conservation efforts and to inform the development planning process such that impacts of development

Figure 3. *The cumulative total of freshwater species (fishes, odonates, molluscs, crabs, plants) on The IUCN Red List over the period 2000 - 2008.*



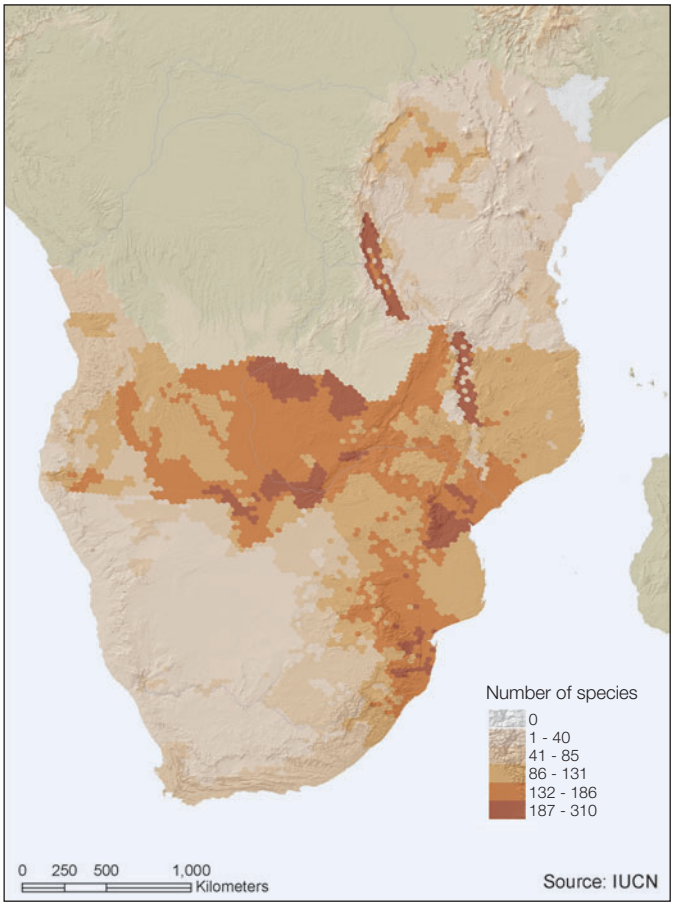


Figure 4. *Distribution patterns of species richness for freshwater fishes, molluscs, odonates (dragonflies and damselflies) and crabs across eastern and southern Africa*

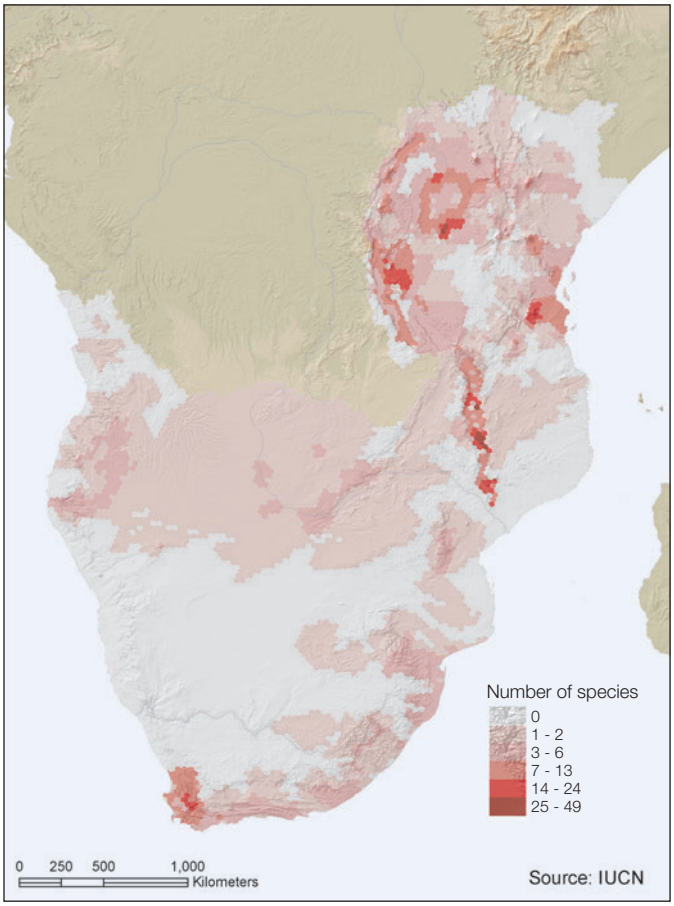


Figure 5. *Distribution patterns of regionally threatened species for freshwater fishes, molluscs, odonates (dragonflies and damselflies) and crabs across eastern and southern Africa*

might be minimized or mitigated, and development of critical sites for biodiversity may be avoided. The results from two of the regional assessments are presented to demonstrate in brief the outputs and potential value of this approach.

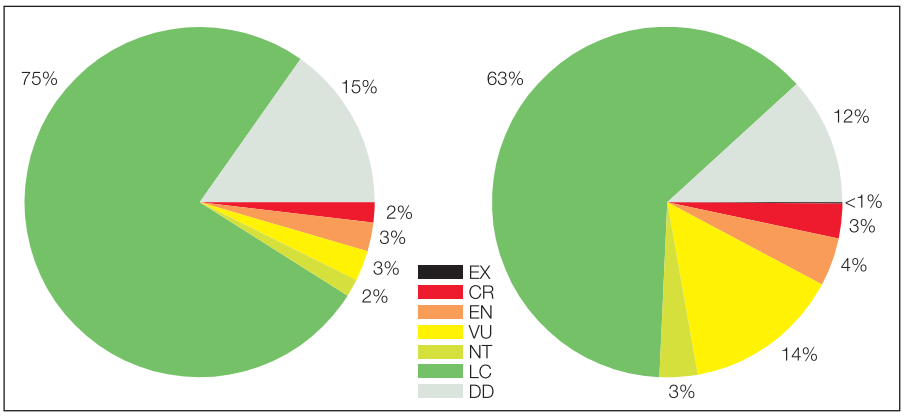
Eastern and southern Africa

The assessments completed for eastern and southern Africa have identified Lakes Malawi and Tanganyika, and the headwaters of the Zambezi river, as containing exceptionally high numbers of species from within the taxonomic groups assessed (Figure 4), whereas Lakes Malawi and Victoria, the lower Malagarasi drainage, Kilombero valley and the Western Cape in South Africa, contain some of the highest numbers of threatened species (Figure 5).

Where all species of fish, molluscs, odonates (dragonflies and damselflies) and crabs have been assessed across a region, the overall level of threat to freshwater biodiversity can be better determined. Figures 6 and 7 show the Red List status for these taxa in eastern and southern Africa respectively. In terms of the numbers of species threatened, freshwater biodiversity is more than twice as threatened in eastern Africa as in southern Africa, with 21% of species Critically Endangered, Endangered or Vulnerable in comparison to 8%, respectively. Within taxonomic groups there are also regional variations with, for example, 23% of

Figure 6. *Percentages of freshwater fishes, molluscs, odonates (dragonflies and damselflies) and crabs within southern Africa in each Red List Category. A total of 8% of species are assessed as regionally threatened.*

Figure 7. *Percentages of freshwater fishes, molluscs, odonates (dragonflies and damselflies) and crabs within eastern Africa in each Red List Category. A total of 21% of species are assessed as regionally threatened.*



EX = Extinct, EW = Extinct in the Wild, Threatened = all Critically Endangered, Endangered and Vulnerable species; NT/LC = Near Threatened and/or Least Concern; DD = Data Deficient.

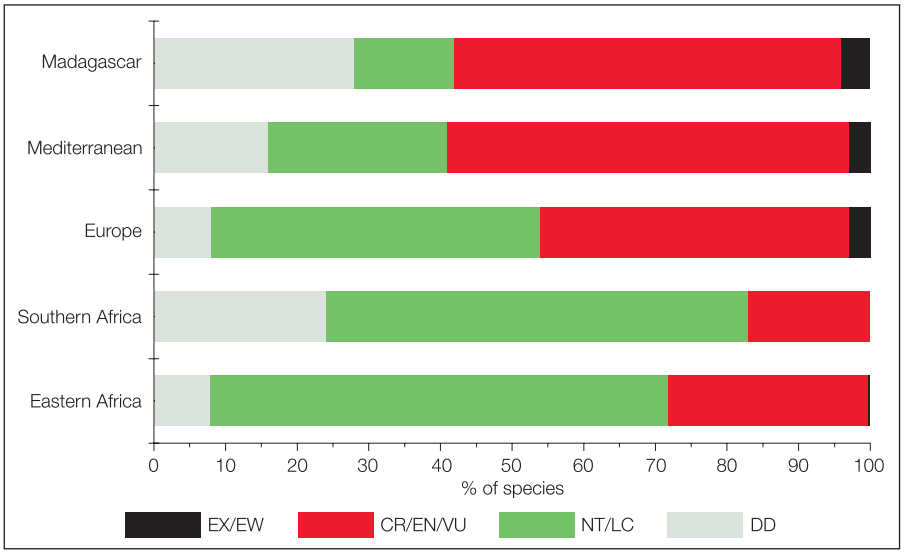


Figure 8. *Proportions of freshwater fish species by threat category in each of the regions assessed comprehensively. Only species endemic to each region are included.*

all molluscs threatened and 28% Data Deficient in eastern Africa and only 8% threatened and 31% Data Deficient in southern Africa.

Identifying threats to freshwater biodiversity across the globe

Freshwater biodiversity is being threatened by a number of key impacts including overexploitation, water pollution, flow modification including water abstraction, destruction or degradation of habitat, and invasion by invasive alien species (Dudgeon *et al*. 2006; Millennium Ecosystem Assessment 2005). Compounding these threats are the predicted global impacts of climate change leading to temperature changes and shifts in precipitation and runoff patterns (Dudgeon *et al.* 2006).

Knowledge of current and predicted threats to species and of the areas where they are likely to be most serious is vital in informing conservation action, policy development and the development planning process. The biodiversity assessment process allows for the major threats to species within regions to be identified and mapped.

Using freshwater fishes as an example, being one of the most widely assessed of the freshwater species groups, the level, nature, and distribution of major threats can be identified. Of the regions assessed so far the Mediterranean and Malagasy endemic freshwater fish are shown to have the highest proportions of globally threatened species with more than 50% of species threatened in each case, and southern Africa to have the lowest proportion with 17% of species threatened (Figure 8).

The types of threat acting upon species can also be analysed (Figure 9) and used to inform conservation and development planners. In the example of freshwater fish, the threats indentified in each region largely reflect the nature and scale of past and present development activities, as summarized below for each region.

Regional variation in threats to freshwater fishes

Madagascar

In Madagascar, the two most significant threats to freshwater fishes are sedimentation, which impacts over 60% of threatened species; and invasive alien species, which impact just under 45% of threatened species. Sedimentation results from the high degree of deforestation and regular burning of grasses on the 'pseudo-steppe' (Benstead *et al*. 2003). Alien invasive fish species are prevalent throughout Madagascar with at least 24 non-native freshwater fish species introduced, mostly tilapiine cichlids, as part of an ill-conceived plan to replace depleted native species fisheries, which had declined largely as a result of overfishing (Benstead *et al*. 2003).

Eastern Africa

In eastern Africa, overharvesting of fishes for food is the primary threat, impacting 60% of threatened fish species; with water pollution, mainly in the form of increased sedimentation, affecting just over 40% of threatened species. These figures reflect the reported overexploitation of fisheries in a number of areas within the region (West 2001; UNEP-DEWA 2006). Increasing sedimentation of river and lake systems is largely a result of deforestation to make

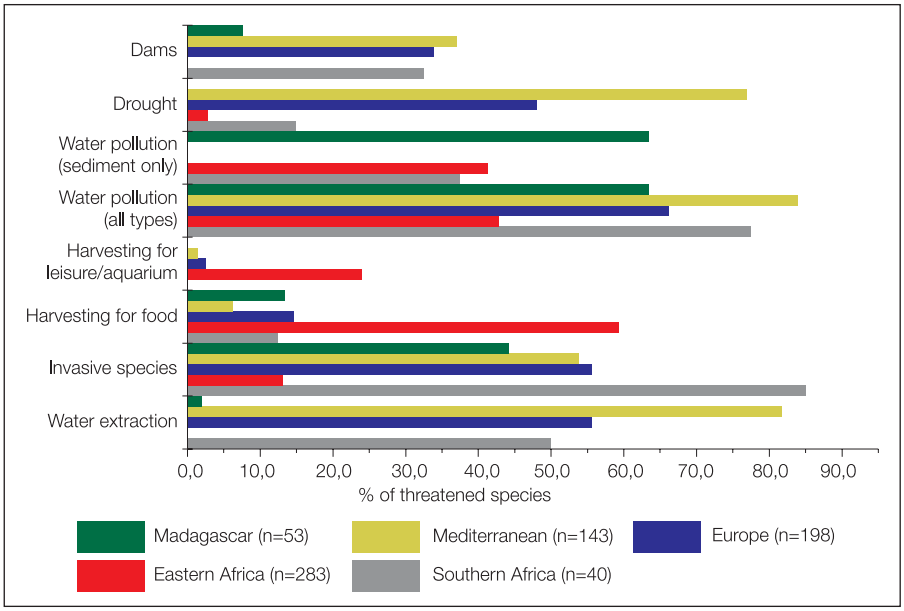


Figure 9. *A regional breakdown of the major threats to freshwater fishes, which have led to species being assessed as threatened according to the IUCN Red List Criteria.*

way for expanding agriculture and as a supply of fuel wood or charcoal. As an example, in Lake Tanganyika increased sedimentation has led to loss of rocky substrates along the lakeshore that provide important habitat for many of the endemic cichlid fishes (Gilbert 2003). Invasive alien species are also a major threat throughout the region in particular to many of the cichlid species endemic to Lake Victoria where a number of alien species, and in particular Nile Perch *Lates niloticus*, have been introduced to support fisheries. These species introductions have significantly changed the native species composition of the lake with many species reported to have gone extinct (Achieng 2006). The popularity of many of the cichlid species in Lakes Malawi, Tanganyika and Victoria has also resulted in possible overharvesting and inadvertent impacts from fish translocations within the lakes, which again threaten many species. With more than 20% of threatened fish species in eastern Africa reported to be impacted by the aquarium trade, either now or predicted, this issue is significantly more important here than in any other region assessed to date.

Southern Africa

In southern Africa, invasive alien species are the greatest current threat to freshwater fishes, impacting nearly 85% of threatened species. Many native species in the Western Cape, Mpumalanga and the Upper Zambesi have been affected by introduced alien fishes including bass *Micropterus spp.*, Sharptooth Catfish *Clarias gariepinus*, Bluegill Sunfish *Lepomis macrochirus* and tilapia species *Tilapia* and *Oreochromis spp.* (Tweddle *et al*. in prep.). Water pollution, primarily from agricultural sources, is increasing in southern Africa (UNEP-DEWA 2006) and has become a major threat to more than 60% of threatened species.

Mediterranean

Increasing human population combined with significant levels of tourism and agricultural intensification has led to high levels of water extraction and pollution throughout the region, which is impacting over 80% of the threatened freshwater fishes. Drought, already a major threat impacting over 75% of threatened fishes (Smith and Darwall 2006) is expected to increase in severity, with many Mediterranean countries predicted to be in 'water scarcity' conditions by 2025 (UNECA 1999).

Europe

As Europe and the Mediterranean partially overlap, it is no surprise that the threats to freshwater fishes in Europe are similar to those in the Mediterranean. The greatest threats in Europe are water pollution, invasive species and water extraction which impact 66%, 55% and 55% of threatened freshwater fish species, respectively. There are currently 28 established alien freshwater fish species in Europe (Kottelat and Freyhof 2007). The good news, however, is that better waste water treatment, and changes in agricultural and industrial practices are leading to improvements in water quality in many parts of the region – hopefully leading to improvements in the status of associated freshwater species.

Threats to freshwater molluscs

The freshwater molluscs contain a high proportion of range-restricted species, such as river rapid specialists and

Dense algal mats impacting freshwater biodiversity, fishing and transport in the Stung Treng Ramsar site in the Mekong, Cambodia – possibly a result of upstream run-off of agro-chemicals. © Alvin Lopez

Sargochromis greenwoodi *(Bell-Cross, 1975). The Deepcheek Bream which is widespread and fairly common in the Okavango Delta, though rare elsewhere in the Upper Zambezi system. . It is listed as Least Concern.* © Roger Bills

spring snails. The river rapid specialists require highly oxygenated clean water, and in Africa and South America a number of species are already listed as Extinct, Extinct in the Wild or Critically Endangered. The recent review of their status in western Africa and central Africa (work in progress) has shown that conditions have not improved and their habitats are typically targeted for dam construction, with water pollution from mining and increased sedimentation being secondary threats.

The spring snail group (family Hydrobiidae) is highly diverse with over 1,200 species in the family, representing around 25% of all freshwater molluscs. Currently the Red List has 283 of these species listed (182 threatened), and in regions such as Australia, North America and Europe this group is disproportionately highly threatened. The springs where these species are found are typically exploited as water sources, with the emphasis on cleaning the point of water abstraction through actions such as concreting over their habitats. Other threats include over-abstraction of the groundwater that feed these artesian spring sources.

Climate change and desertification are increasingly recognized as important future threats to water sources of range restricted species on the edge of drylands and deserts. For example, the western African regional assessment shows that mollusc species restricted to Lake Chad are all threatened due to the rapid decline in lake size and associated mollusc habitat over the last 40 years.

Regional pattern of threats for dragonflies and damselflies

As part of an effort to expand the taxonomic coverage of The IUCN Red List, 1,500 species of dragonflies and damselflies were assessed through a sampled approach (Collen *et al.* 2008). This is about one quarter of the dragonflies and damselflies of the world, giving a good insight into the status and trends of this freshwater group. About one in ten of the assessed species was found to be threatened, a relatively low number compared to some other groups. The centres of species richness are the Neotropical and Indo-Malayan regions which support around two thirds of all known species but the main areas of threatened species are in the Indo-Malayan and Australian regions. The high proportion of threatened species in the Indo-Malayan area is mainly due to the high number of restricted-range species in the Indonesian and Philippine archipelagos, which are threatened by large-scale logging of lowland forest. In Australia the main threat is climate change, which is already resulting in the loss or degradation of freshwater ecosystems.

Box 2: Freshwater biodiversity related Specialist Groups of the IUCN Species Survival Commission (SSC)

Three Specialist Groups have been heavily involved in the biodiversity assessments reported on in this Chapter.

The Odonata Specialist Group (OSG)
The OSG is an active network of experts from all over the world who all bring in their own regional networks. The group focuses on bringing together information on the 5,700 known damselflies and dragonflies. The OSG is currently active in building distribution databases in order to facilitate biodiversity assessments and conservation planning. Species distribution databases have been developed for Africa, Europe, Australia and large parts of Asia with projects for America underway. Other priorities of the group include producing field guides and training fieldworkers in the tropics.

The Freshwater Fish Specialist Group (FFSG)
The FFSG was re-established in 2004. It includes a number of Regional Co-ordinators and several Special Advisors. Regional Co-ordinators each work with their own expert networks to provide the information used in building the species assessments for The IUCN Red List. The FFSG's biggest challenge is the development of a practical global strategy for freshwater fish conservation in the face of increasing species extinction and rapidly declining fisheries worldwide. Since May 2008, the FFSG have been producing bi-monthly newsletters and are in the process of developing a dedicated new website to increase communications and the capacity building potential of the group.

The Mollusc Specialist Group (MSG)
The MSG focus at present is on assessment of species status and making information on the success of conservation breeding programmes accessible to others. Over the past 10 years they have completed 3,000 species assessments from the freshwater, terrestrial and marine biomes. The MSG newsletter *Tentacle* is published annually.

Global threat to freshwater crabs

All species of freshwater crabs have been globally assessed as part of the effort to increase the species diversity of The IUCN Red List; 16% of the species are threatened (Collen *et al*. 2008).

Key Messages

- *Freshwater biodiversity is extremely threatened*. Findings from the comprehensive assessments undertaken to date show freshwater biodiversity to be highly threatened, possibly more so than in other systems. This is largely a result of: i) the high degree of connectivity within freshwater systems such that threats like pollution and invasive alien species spread more rapidly than in terrestrial ecosystems, and ii) the rapidly increasing use and development of water resources with little regard to the requirements of the freshwater dependant species sharing the resource.

- *Public awareness of the threat to freshwater species needs to be raised.* The level of threat to freshwater biodiversity is extremely high, yet public awareness of this situation remains woefully low. Freshwater species are largely unseen by the general public, are not often considered as charismatic, and their values to people not well recognized. Conservation of freshwater species needs to be treated on a par with other more visible and charismatic species groups, such as birds and large mammals. Freshwater species need to be treated as being worthy of conservation in their own right, not simply as exploitable resources for human consumption. For example, in Europe fish are primarily managed as agricultural resources and in many parts of the world molluscs are managed as fisheries resources, not as species of conservation significance – this is in stark contrast to the treatment of birds and mammals.

- *Freshwater species provide important ecosystem services.* Awareness of the ecosystem services provided by freshwater biodiversity needs to be raised. For example, the production of clean drinking water depends on the functions provided by many freshwater species yet this is rarely recognized. A single freshwater bivalve may filter more than seven litres of water a day – without keystone species such as these maintained in river systems the water would not be as pure.

- *Freshwater species are important to peoples' livelihoods.* The value of freshwater species to peoples' livelihoods, which is extremely high in many countries, is not fully appreciated and is often not considered when decisions are taken on the potential development of wetland resources for alternative uses. We need to collate and make available the relevant information to demonstrate these values as a key part of future biodiversity assessments.

- *Management of water resources must take account of the requirements of freshwater biodiversity.* If we are to conserve and continue to benefit from the services provided by freshwater species we need to manage water resources as a resource for both people and freshwater biodiversity. This approach is encapsulated within the Environmental Flows concept, which aims to ensure that there is enough water to maintain environmental, economic and social benefits.

- *Protected areas must be designed to protect freshwater species*. Existing protected areas are rarely designed to protect freshwater species. Even where species are protected by species driven legislation, without catchment based planning that extends the designated control areas to the edge of the river catchment, impacts such as from water pollution and invasive alien species will inevitably lead to the decline of the species. Protected areas for freshwater species must be designed to employ the principles of catchment protection

- *We need to support in-situ conservation actions.* The collection of new data is essential for our understanding and monitoring of processes taking place within ecosystems, however

Etheria eliptica*. An Endangered bivalve mollusc restricted to river rapids which is regionally threatened in southern Africa due to dam construction.* © Daniel Graf and Kevin Cummings

Afrithelphusa monodosa*. An Endangered freshwater crab which is restricted to a very small area of Guinea where it is threatened by habitat loss and degradation.* © Poitr Nastrecki

Box 3: Protected areas for freshwater biodiversity

The majority of protected areas, with the exception of Ramsar Sites, are designed for protection of terrestrial fauna often viewing rivers and lakes as useful park boundaries rather than as targets for inclusion and protection in their own right. For example, an analysis of eastern African freshwater fishes showed that only 1.7% of threatened species were completely included within a protected area, more than half were not included within any protected area, and for those that were partially included, on average only 13.7% of each species distribution range was included (Darwall *et al*. 2005).

Freshwater systems are unique in their high levels of interconnectivity and ability to transport threats quickly. This means that a freshwater species within a protected area could very easily be threatened by impacts that take place outside it. A protected area boundary will not stop the spread of threats such as pollution, invasive species, sedimentation, and altered flow regimes. Protected areas need to be designed specifically to protect upper catchments and to include entire wetland systems within their boundaries if they are to provide effective protection to the freshwater species within these systems.

Because of the major gaps in protection of freshwater biodiversity and the need to manage and protect freshwater systems at the basin scale, IUCN has developed a method of identifying important sites of freshwater biodiversity (Darwall and Vié 2005) that falls under the umbrella Key Biodiversity Area (KBA) approach. The criteria used are largely based on the framework of **vulnerability** and **irreplaceability** widely used in systematic conservation planning (Langhammer *et al.* 2007). Of course for effective conservation of biodiversity at these sites, management will need to be at the broader catchment scale to take account of the connectivity and potential for rapid spread of external threats as mentioned above. Using this approach IUCN has identified candidate KBAs for southern Africa's freshwater biodiversity (Figure 10, Darwall *et al.* in prep.).

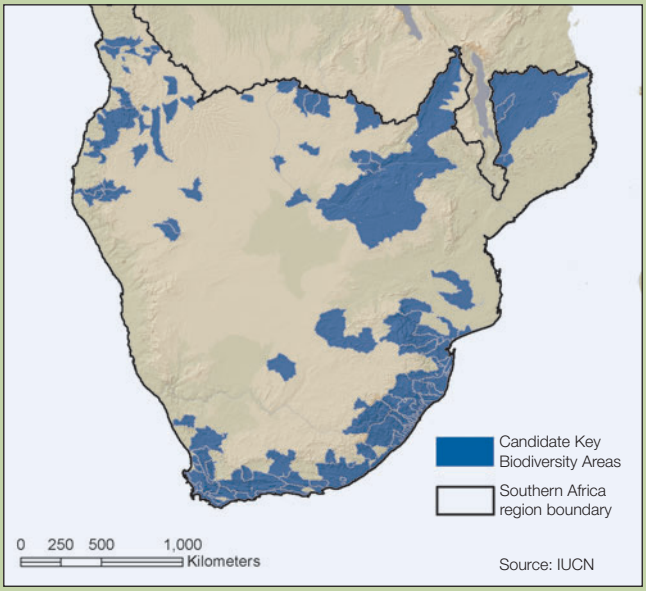


Figure 10. *Candidate freshwater Key Biodiversity Areas for southern Africa (Darwall et al. in prep.). Analysis is based on selection of level 6 river basins as derived by the Hydro1 K dataset (USGS EROS).*

assessments alone do not conserve species. Increased support of *in-situ* conservation initiatives capable of addressing immediate known problems is needed. Furthermore, support should be given to *in-situ* conservation educational programmes which increase awareness of the problems among the local community, highlight potential ramifications for the future, build support and identify and develop practical solutions.

- *Environmental Impact Assessments (EIAs) need to take better account of impacts to freshwater species.* EIA guidelines and legislation should aim to highlight potential impacts to freshwater species. EIA specialists should be encouraged to consult the information being collated through the biodiversity assessments conducted by IUCN, its partners and others.

- *The lack of existing information for many freshwater species needs to be rectified.* A significant proportion of freshwater species remain Data Deficient, in particular due to lack of taxonomic expertise to formally describe new species and lack of spatial information on species distributions. This situation appears to be getting worse as the number of qualified taxonomists decreases and as opportunities for field survey become less frequent. For example, the provision of new location records for dragonflies has declined dramatically over the last 20 years. With an estimated 35% of the world's dragonflies assessed being classified as Data Deficient, there is currently little chance of obtaining better information on these species. An increase in field survey combined with taxonomic training for local experts, and the publication of field guides are recommended.

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Common Hippos Hippopotamus amphibius *are found in many countries throughout sub-Saharan Africa. Recent estimates suggested that over the past 10 years there has been a 7–20% decline of their numbers due to illegal or unregulated hunting for meat and ivory, mainly in areas of civil unrest.* © Jean-Christophe Vié.

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