Delineating sanctuaries as a tool for conserving threatened freshwater fish

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Background

• Global assessment of status and distribution completed (Snoeks et al 2011)
  – Almost ¼ of Africa’s freshwater fish diversity is threatened

• South Africa, Lesotho and Swaziland
  – 107 primary freshwater species (51% endemic) and 36% threatened
Threats to South African freshwater fish biodiversity

- Alien fish invasion
- Habitat destruction
- Excessive water extraction
- Pollution
- Dams and weirs effective as in-stream barriers to migration of fishes but effect local migration
- Inter Basin Transfer Schemes and physical movement by humans results in loss of genetic diversity through hybridisation
FEPA map
FEPA map: Upper Breede

- River FEPA & associated sub-quaternary catchment
- Wetland or Estuary FEPA
- Wetland Cluster
- Fish Support Area & associated sub-quaternary catchment
- Fish Sanctuary: critically endangered & endangered
- Fish Sanctuary: other threatened
- Phase 2 FEPA & associated sub-quaternary catchment
- Upstream Management Area
Methodology

• 5 types of conservation areas

• Fish Sanctuaries
  – Fish Refuge Areas (areas required to meet fish population targets);
  – Rehabilitation and Translocation Areas (areas crucial to the survival of the highly threatened fish species they support);

• Fish Support Areas
  – Fish Migration Corridors (areas required for migration between required habitats, usually between main-stem and tributary habitat);
  – Upstream Management Areas (areas that need to be managed to prevent degradation of downstream Fish Sanctuaries and Fish Migration Corridors).
Fish Sanctuaries

- **Fish refuge areas**: These are sub-quaternary catchments required to meet fish population targets.

- **Fish rehabilitation areas**: 
  - highly suitable for the re-introduction of threatened fish species that once occurred there

- **Fish relocation and translocation areas**: 
  - threatened fish species have already been translocated to, outside the known indigenous range.
Fish Support Areas

- **Fish migration corridors:**
  - Provide links between certain habitats (usually between mainstem and tributary habitat) necessary for the migration of threatened migratory fish species.

- **Fish upstream management areas:**
  - Human activities need to be managed to prevent degradation of downstream fish sanctuaries.
Species list

• 107 primary freshwater fish species
• 23 formally listed in IUCN threatened categories (CE, EN, VU)
• Further 13 species assessed as DD, LC or not previously evaluated
• 42% endemic to SA (50 incl. Swaziland)
• 35% Threatened
Fish Sanctuary – Distribution Map

Legend
- Primary Catchments

Fish Sanctuaries

Class
1 - Refuge Area
4 - Relocation Area
5 - Rehabilitation Area
6 - Translocation

Fish Support Area
- Fish Migration Corridor

Scale: 500 km
Local Example: Clanwilliam Sandfish
Total Fish Species per sanctuary
Fish Sanctuaries: CR and EN fish

Legend
- Primary Catchments
- Fish Sanctuaries
  - Total Number CR and EN fish
    - 1
    - 2
    - 3

Map of South Africa showing the distribution of fish sanctuaries with a legend indicating the number of CR and EN fish in each area.
Results – Fish Sanctuaries

• 13% of the river length of South Africa, Lesotho and Swaziland – 51% intact rivers

• CR and EN fish species can be conserved in 5% of the river length of South Africa, of which 50% of the rivers are in an intact state

• 12% of the surface area of South Africa, Lesotho and Swaziland

• CE and EN comprise 4% of the surface area.
## Tributary analysis

<table>
<thead>
<tr>
<th>Analysis</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; Order rivers</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; and 2&lt;sup&gt;nd&lt;/sup&gt; Order</th>
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<tbody>
<tr>
<td>Fish Sanctuary</td>
<td>57%</td>
<td>81%</td>
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<tr>
<td>CR and EN</td>
<td>64%</td>
<td>86%</td>
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Results – High Water Yield Areas

• High water yield areas are defined as being more than 300% of the average mean annual runoff of the primary catchment in which it is located.

• 34% of high water yield areas are also fish sanctuaries

• 14% are fish sanctuaries for CR and EN fish

• Conversely only 11% of fish sanctuaries overlap with high water yield areas

• only 4.6% of CE and EN fish sanctuaries overlap with high water yield areas
Conservation Status

- Only 7% of South Africa’s 1:500 000 rivers are in Formal and Informal Protected Areas as defined by SANBI, 2010.

- Fish Sanctuaries only comprise 12% of the rivers in protected areas, of which 58% are for critically endangered and endangered fish.
Conclusions

- South Africa, Lesotho and Swaziland have a high percentage of threatened fish species that will require conservation intervention in future to prevent extinctions.
- However, less than 5% of river length needs to be conserved to prevent extinction of Critically Endangered and Endangered species.
- Fish Sanctuaries do not need to be in an A or B ecological condition.
- Maps showing permitting zones for invasive alien fish have been drafted and can be used with NFEPA maps to plan control operations and assess license applications to stock invasive alien fishes – Cape Nature and Western Cape Province.
Multi-use zones

• Fish sanctuaries do not have to be locked away from human use and can be managed on different use-restriction levels.

• By managing only 15% of our river length, we can conserve all our threatened (Critically Endangered, Endangered and Vulnerable) and Near Threatened fish species.

• Upper tributaries are often least impacted with less cumulative impacts and can therefore often be managed more easily than downstream habitats.
  – In addition, these tributaries have the added benefit of maintaining ecosystem services and hard working main stems.