Impacted fish movement into tropical freshwater wetlands discharging water low in dissolved oxygen; the tail of two wetlands

Trent Power

*Catchment Solutions*

Follow this and additional works at: [https://scholarworks.umass.edu/fishpassage_conference](https://scholarworks.umass.edu/fishpassage_conference)
Impacted fish movement into tropical coastal wetlands discharging water low in dissolved oxygen; the tail of two wetlands
Services provided by coastal wetlands in north-eastern Australia

Ecological Services
- Resident/seasonal habitat
- Replenish groundwater
- Nutrient sink

Economic Services
- Physical buffer
- Fisheries
- Agriculture
- Tourism

Social Services
- Recreation
- Cultural values
What are ponded pasture wetlands?

Construction of expansive earth bunds
• Lower flood plains
• Salt marshes
• Upper estuary (occasionally)

Captures stream & overland flow
• Retains moisture into dry season
• Improves pasture conditions
• Increases cattle production

Modifies existing habitats
• Salt to fresh
• Increases duration & extent of flooded marshes
• Reduces vegetation diversity
• Reduces connectivity
Processes that affect connectivity

Physical Barriers
- Bunds & levees
- Flood gates
- Roads & rail infrastructure
- Weed chokes

Physiological Barriers
- Low light

Chemical Barriers
- Low dissolved oxygen
Study Area

Central Queensland
- Rocky Dam Catchment
- Wet season Dec – Apr
  - Peak migration
- Dry season May – Nov
  - Wetlands contract

Boundary Wetland
- Cattle grazing
- Bund repaired 2015
- Fishway installed 2015
- Moderate impact from weeds

Tedlands Wetland
- Cattle grazing/irrigation
- 2 fishways installed 2008 & 2015
- High impact from weeds
Fishways

Boundary
• Cone ramp
• 0.6 m head loss
• 75 mm ridge drops
• 1.5 x 1.5 m pools
• 300 mm pool depth

Tedlands
• Rock ramp
• 0.65 m head loss
• 50 mm ridge drops
• 4 x 1.5 m pools
• 300 mm pool depth
Monitoring – Fish movement into wetlands

Boundary
• 2016 – 2018 (yearly)
• 5 consecutive days/round
• Wet season (Jan – Mar)
• Box trap

Tedlands
• 2016 – 2018 (yearly)
• 3-5 consecutive days/round
• Wet season (Jan – Mar)
• Box trap
## Observations

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DO % Upstream</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundary</td>
<td>86.0 - 128.2</td>
<td>13.0 - 56.5</td>
<td>48.9 - 78.0</td>
</tr>
<tr>
<td>Tedlands</td>
<td>11.2 - 21.6</td>
<td>4.9 - 8.5</td>
<td>0.6 - 5.3</td>
</tr>
<tr>
<td><strong>DO % Downstream</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundary</td>
<td>81.7 - 120.3</td>
<td>20.2 - 40.4</td>
<td>58.1 - 73.9</td>
</tr>
<tr>
<td>Tedlands</td>
<td>21.6 - 36.5</td>
<td>19.0 - 22.1</td>
<td>18.1 - 20.4</td>
</tr>
<tr>
<td><strong>Average CPUE (Daily)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1181</td>
<td>1171</td>
<td>299</td>
</tr>
<tr>
<td><strong>Total Species</strong></td>
<td>12</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

- **2016**: Boundary: 86.0 - 128.2, Tedlands: 11.2 - 21.6
- **2017**: Boundary: 13.0 - 56.5, Tedlands: 4.9 - 8.5
- **2018**: Boundary: 48.9 - 78.0, Tedlands: 0.6 - 5.3
Observations

Boundary
• 12 diadromous
• 1 marine vagrant
• 8 potamodromous

Tedlands
• 2 Diadromous species
• 7 potamodromous

<table>
<thead>
<tr>
<th>Species</th>
<th>Boundary</th>
<th>Tedlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambassis agassizii</td>
<td>1.20%</td>
<td>19.58%</td>
</tr>
<tr>
<td>Amniataba percoide</td>
<td>0.01%</td>
<td></td>
</tr>
<tr>
<td>Anguilla sp.</td>
<td>0.04%</td>
<td>0.05%</td>
</tr>
<tr>
<td>Arius graeffei</td>
<td>0.10%</td>
<td></td>
</tr>
<tr>
<td>Craterocephalus stercusmuscarum</td>
<td>0.04%</td>
<td>1.21%</td>
</tr>
<tr>
<td>Elops hawaiensis</td>
<td>0.03%</td>
<td></td>
</tr>
<tr>
<td>Gerres filamentosus</td>
<td>5.68%</td>
<td></td>
</tr>
<tr>
<td>Gerres subfasciatus</td>
<td>0.37%</td>
<td></td>
</tr>
<tr>
<td>Giurus margaritacea</td>
<td>0.15%</td>
<td></td>
</tr>
<tr>
<td>Hypseleotris compressa</td>
<td>47.34%</td>
<td>75.92%</td>
</tr>
<tr>
<td>Lates calcarifer</td>
<td>0.84%</td>
<td></td>
</tr>
<tr>
<td>Leiopotherapon uniclor</td>
<td>9.61%</td>
<td></td>
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<tr>
<td>Liza subviridis</td>
<td>0.21%</td>
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<tr>
<td>Megalops cyprinoides</td>
<td>0.31%</td>
<td>0.97%</td>
</tr>
<tr>
<td>Melanotaenia splendida splendida</td>
<td>9.71%</td>
<td>1.89%</td>
</tr>
<tr>
<td>Mogurnda adspersa</td>
<td>0.01%</td>
<td></td>
</tr>
<tr>
<td>Mugilogobius platystomus</td>
<td>0.06%</td>
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</tr>
<tr>
<td>Neosilurus hyrtilii</td>
<td>0.03%</td>
<td></td>
</tr>
<tr>
<td>Porochilus rendahli</td>
<td>0.10%</td>
<td></td>
</tr>
<tr>
<td>Pseudomugil signifer</td>
<td>0.01%</td>
<td></td>
</tr>
<tr>
<td>Scatophagus argus</td>
<td>0.12%</td>
<td></td>
</tr>
<tr>
<td>Selenotoca multifasciata</td>
<td>24.26%</td>
<td></td>
</tr>
<tr>
<td>Terapon jarbua</td>
<td>0.03%</td>
<td></td>
</tr>
<tr>
<td>Xiphophorus maculatus*</td>
<td>0.15%</td>
<td></td>
</tr>
</tbody>
</table>
What does this mean?

DO levels affecting wetland recruitment?

• Lower DO levels were observed at Tedlands, also lower catch rates and species counts
• However, DO levels increased as water passed through fish way (>20% saturation @ entrance)
• Potentially something else deterring fish from entering wetland – tannins, other chemicals

Implications for ecosystem function

• Reduced species diversity and abundance
• Flow on affects through the food chain
• Reduced productivity – loss of nursery grounds
• Population vulnerability

Socio-economic impacts

• Reduced productivity – commercial/recreational fisheries
• Reduced amenity – people won’t value the area as much
The culprits

*Hymenachne amplexicaulis*

*Eichhornia crassipes*

*Typha sp.*

*Salvinia molesta*

*Pistia stratiotes*

*Myriophyllum sp.*
Improving connectivity

Fishways are not enough!

- Presence of excessive aquatic vegetation also impacts fish movement
- Physical barrier – weed chokes
- Chemical barrier – Low DO, other chemical deterrents

Short term

- Poison – costly, chemical residue, decaying plants
- Mechanical removal – Costly, logistically prohibitive
- Controlled grazing – effective in some areas, not always at the right time of year
- Aeration – Costly, only provides refuge

Long term

- Restore tidal movement – reduces grazing productivity
- Riparian revegetation – May be effective in some locations
- Modify wetland to maximize oxygenisation – Dig refuge pools (> 3m), align with prevailing wind, provide access points for cattle to reach wetland islands
- Address excess nutrient load – Improved land use management
Mungalla Wetland – Ingham, QLD

Before - Sept 2013

After - Dec 2015
Walk-about Wetland – Mackay, QLD

1999

2017
Thank you