

Protection of Drought Refugia in the Murray Darling Basin

No pictures for the 8:30 slot

Dale McNeil – SARDI (Aquatic Sciences)
Katherine Cheshire, Susan Gehrig, John Marshall, Jay
Lobegeiger, Paul Reich, Nick Bond, Stephen
Balcombe, Greg Peters and Bill Phillips



Yes.... it's wet now

- But.....
 - We need to maintain a focus on building resilience into native fish populations
 - It is a certainty that drought will re-occur in the near future and we need to embark on better strategies for building resistance potential for future droughts
 - We have little time to improve management responses for the next drought
 - Especially under a dryer climatic future

The Millennium drought

- What can we learn from the current drought to better protect native fish and refuge habitats for the next drought? (assuming it is not this summer)

Drought Refugia

- What are they?
 - “Habitats in which individuals or populations can avoid the negative effects of drought disturbance, or where these impacts are lower than surrounding areas (or times),
 - (Resistance)
 - and where viable source populations can survive disturbance to repopulate non refuge areas following drought disturbance” (Lancaster and Bellyea 1997).
 - (Resilience)

Regional Management Focus

- What habitats serve as refugia?
- What are the priority native fishes?
- What are the key threats?
- What Management interventions are available?

Refuge habitats in the MDB

| REFUGE HABITAT TYPES | SA | VIC | NSW/ACT | QLD | MDB Total |
|--------------------------------|-----------|-----------|-----------|-----------|------------|
| Unregulated rivers/streams | 5 | 8 | 16 | 12 | 41 |
| Regulated river reaches | 2 | 10 | 13 | 4 | 29 |
| Lake | 3 | 5 | 3 | - | 11 |
| Wetland | 2 | - | 6 | 2 | 10 |
| Floodplain | - | 2 | 2 | 1 | 5 |
| Weir pool in regulated river | - | 1 | 3 | - | 4 |
| Upland wetland | - | - | 3 | - | 3 |
| Channel/drain | 3 | - | - | - | 3 |
| Flowing Anabranch | 1 | 1 | - | - | 2 |
| Estuary | 1 | - | - | - | 1 |
| Total refugia per state | 17 | 27 | 46 | 19 | 109 |



Government
of South Australia

SARDI



SOUTH AUSTRALIAN
RESEARCH AND
DEVELOPMENT
INSTITUTE

Native Fishes in Refugia

| Species | SA | VIC | NSW/ACT | QLD | Total |
|---------------------------------|----------|--------------|-----------|----------|---------------|
| Murray cod | 2 | 7 | 12 | 7 | 28 |
| River blackfish | 3 | 8 | 2 | 11 | 24 |
| Golden perch | 0 | 6 | 9 | 8 | 23 |
| Olive perchlet | 0 | 0 | 5 | 14 | 19 |
| Southern pygmy perch | 5 | 5 | 6 | 2 | 18 |
| Mountain galaxias | 6 | 9 | 1 | 0 | 16 |
| Macquarie perch | 0 | 10 | 5 | 0 | 15 |
| Silver perch | 1 | 0 | 6 | 8 | 15 |
| Murray catfish | 1 | 2 | 10 | 0 | 13 |
| Trout cod | 0 | 8 | 5 | 0 | 13 |
| Murray hardyhead | 7 | 2 | 1 | 0 | 10 |
| Purple spotted gudgeon | 1 | 1 | 7 | 1 | 10 |
| Congolli | 5 | 0 | 0 | 0 | 5 |
| Flat-headed galaxias | 0 | 2 | 2 | 0 | 4 |
| Diadromous and estuarine | 2 | 0 | 0 | 0 | 2 |
| 2 spined blackfish | 0 | 0 | 2 | 0 | 2 |
| Yarra pygmy perch | 1 | 0 | 0 | 0 | 1 |
| Barred galaxias | 0 | 1(24) | 0 | 0 | 1 (24) |



EPBC listed



Potentially only populations



Government
of South Australia

SARDI



SOUTH AUSTRALIAN
RESEARCH AND
DEVELOPMENT
INSTITUTE

Single species versus assemblage management

| State | Single species | Multiple species | % Single species |
|---------|----------------|------------------|------------------|
| SA | 6 | 10 | 60 |
| VIC | 8 | 20 | 40 |
| NSW/ACT | 13 | 34 | 38 |
| QLD | 2 | 17 | 12 |

Key threats

- Resistance –
 - Drying and WQ
 - Water extraction
 - Flow Regime Change
- Resilience –
 - Barriers to Migration
 - Pest Fish
 - Angling Pressure
 - Land use impacts

Management Interventions

- Regulated Systems:
 - Deliver Water
 - E-flows
- Unregulated systems:
 - Interventions/Rescue
 - Captive breeding and conservation stocking
 - Water Carting
 - Habitat restoration
 - Refuge deepening

Refugia in regulated systems: water delivery

- Water Management Acts:
- **Commonwealth:** Water Act 2007
- **NSW:** Water Management Act 2000; Water Act 1912
 - Water Sharing Plans
- **Vic:** Water Act 1989
 - Our Water Our Future; Environmental Water Reserves; Sustainable Water Strategies
- **SA:** River Murray Act 2003; Natural Resources Management Act 2004
 - Water Allocation Plans
- **QLD:** Water Act 2000; Wild Rivers 2005
 - Water Resource Plans; Resource Operations plans
- **ACT:** Water Resources Act 2007
 - Water ACT: A Draft Policy for Sustainable Water Resource Management; Water Resource Management Plan; Water Sharing Plan; Environmental Flow Guidelines 2006
- Drought Contingencies?



Government
of South Australia

SARDI



SOUTH AUSTRALIAN
RESEARCH AND
DEVELOPMENT
INSTITUTE

Protecting refugia in unregulated waterbodies

- **Habitat and Threatened Species**
- **Commonwealth:** Environment Protection and Biodiversity Conservation Act 1999
- **NSW:** Fisheries Management Act 1994; Native Vegetation Act 2003; Crown Lands Act 1989
 - Key Threatening Processes; Threat Abatement Plans
- **Vic:** Flora and Fauna Guarantee Act 1988; Crown Land (Reserves) Act 1978; Fisheries Act 1995; Heritage Rivers Act 1992; Water Act 1989; Planning and Environment Act 1987; Wildlife Act 1975
 - Waterways Protection By-Laws; Planning Schemes; Victorian River Health Strategy
- **SA:** River Murray Act 2003; Natural Resources Management Act 2004; Native Vegetation Act 1991; Fisheries Management Act 2007
 - Fisheries Management Regulations; Fishery Management Plans; Murray Cod Fishery Closure ; No Species Loss Policy
- **QLD:** Fisheries Act 1994; Vegetation Management Act 1999; Land Act 1994; Water Act 2000; Nature Conservation Act 1992
 - Fish Habitat Areas; Regional Vegetation Management Codes
- **ACT:** Nature Conservation Act 1980; Fisheries Act 2000
 - ACT Aquatic Species and Riparian Zone Conservation Strategy; Water Resource Management Plan

How was Water delivered to Protect refugia?

- Wakool River – Murray Cod
- Horseshoe Lagoon- pygmy perch and flatheaded galaxias
- Lesson: delivery of water during drought must be well timed and efficiently planned
- Kerang Lakes - Murray hardyhead

Water Delivery Versus Fish Conservation

- NSW Water Sharing Plans (WMA 2000)
 - Put on hold during drought
- Lower Lachlan Endangered Ecological Community (FMA 1994):
 - Requires water to maintain refugia
 - If there is no water left in the tank then these ecological assets cannot be protected effectively

Interventions in unregulated systems

- Water carting: (river blackfish)
- Rescue:
 - Coppabella creek (southern pygmy perch)
 - Lower Murray and Lakes (Yarra pygmy perch, purple spotted gudgeon, Murray hardyhead)
 - Mid Murray lakes (Murray hardyhead)
- Captive Breeding
 - Olive perchlet, purple spotted gudgeon, southern and Yarra pygmy perch, river blackfish
- Translocation (SA DAP, NSW DII)

State Processes for Refugia Protection

- SA – Drought Action Plan
 - High drought impact
 - Good monitoring baseline for threatened species (SAMDNRMB, SARDI, Aquasave)
 - DEH “No Species Loss” Policy
- Developed risk matrix to guide on-ground priorities
- Invested in on-ground interventions

NSW

- No state based process for prioritising or protecting refugia
- Some knowledge of threatened species distribution
 - drought monitoring not funded and incomplete
- Actions driven from bottom – up
 - Local knowledge driving agency response
 - Water Acquisition and delivery difficult

Queensland

- Drought impacts low
 - Broader scale approach
- DERM – researching refugia, modelling triggers for water delivery,
- Identification of aquatic values, assets and threats under a range of programs (AquaBamm, SEAP)
- Disconnection between Water and Conservation /Fisheries legislation
- NRM groups targeting on-ground actions
 - Monitoring, in-channel refuge and habitat creation (Condamine alliance)
 - Pest fish control, angling club support and education

Victoria

- State Based Drought Response Plans
- Regional River Health Strategies (DSE, CMAs)
- Dry Inflow Contingency Plans
 - Scenarios of drought impact direct changes to Investment programs under the RRHS
 - Builds flexibility for NRM to respond to drought

Goulburn Broken DICP

- Under RRHS
 - Priority river reaches identified
 - Investment targeted towards improving ecological values (incl. native fish)
 - Native fish conservation priorities identified
 - Monitoring of threatened fish
- Under DICP
 - Identified refuge locations for conservation priorities
 - population status and significance (monitoring)
 - management options (i.e. regulated v. non regulated)
 - Revised investment plan
 - Regularly re-assessed native fish status
 - Undertook key intervention actions (i.e. barred galaxias rescue)

A flexible approach

- How will shifts between RRHS and DiCP work?
- Must ensure:
 - RRHS build resilience to drought
 - DiCP allows for identification and protection of drought refugia

How do we maintain a focus on refugia during wet times?

A flexible approach

- Formal process for drought contingencies from State Agency
- Monitoring of threatened fish provides essential baseline information to drive drought responses
- CMA delivers state funds for refuge protection
- Annual watering plan directs water to priority reaches

Key Issues

- Refuge protection driven from bottom up
- Monitoring programs are often not comprehensive enough to direct drought responses adequately
- No formal process for identifying drought refugia
- No formal prioritisation process
- Lack of \$\$ delivery to meet state legislative responsibilities
- Planning occurs at the resilience building level, not at the resistance/response level
- MDBA \$\$ central to most on-ground programs

Opportunities

- Improve linkages between water and conservation based legislation/policy
- Develop state processes for protecting refuge habitats
- Ensure drought contingencies are developed for NRM Regions
- Build emergency water reserves for drought into Water plans
- Improve Leveraging of state funds through MDBA investment (Living Murray – water, NFS - rescue & captive breeding)

Refuge Protection Plans

- Currently developing a template through MD1087
- Similar to the DICP process
- Generic planning is difficult due to varying contexts and frameworks
- Pilot Valleys:
 - Moonie: Drought plans need to link DERMs higher level planning with financed delivery on-ground by NRM groups
 - Goulburn Broken: DICPs and RRHS combine to plan for refuge protection and resilience building
 - Drought refuge protection planning needs to incorporate changes to state and regional investment plans and MDBA may serve as a key driver for reform to improve drought responses