Habitat patches in the Broken River fish, bugs and food webs

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Natural Heritage Trust

Habitat patches

Habitat patches

Results from previous work

- Fish and shrimp larvae occur predominantly in slackwater habitats (Alison King's PhD 2002 & Campaspe Flow Manipulation Project)
- Abundance of minute prey, refuge from current/predators
- Lowland River Project abundant microfauna
- Slackwater habitats affected by irrigation releases

Low flow recruitment hypothesis

- Some fish breed and recruit during warm, low flow period
- In backwaters and slow or still littoral habitats
- Concentration of prey during declining flow
- Epibenthos may be far more important than pelagic prey (Observation)
- Low flow period may enable development of this prey source

(Humphries, King and Koehn 1999)

An experiment

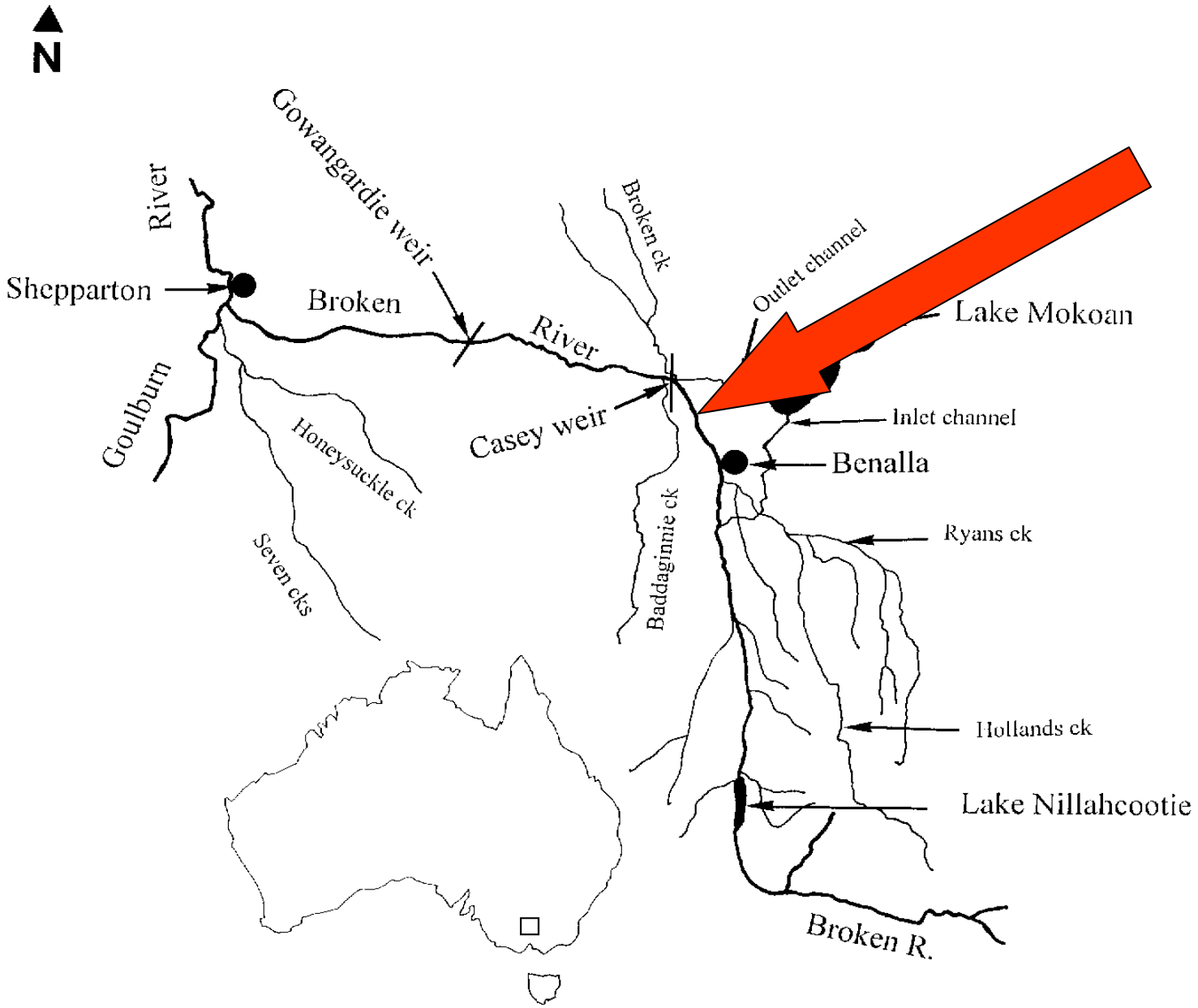
- Hypothesised:
  - that releases during the normally low flow time may make conditions unfavourable for species which breed during this time and which utilise slackwater habitats as nurseries
- Experiment: to alter hydraulic conditions within slackwaters and measure response

Year 1 & 2 - Aims

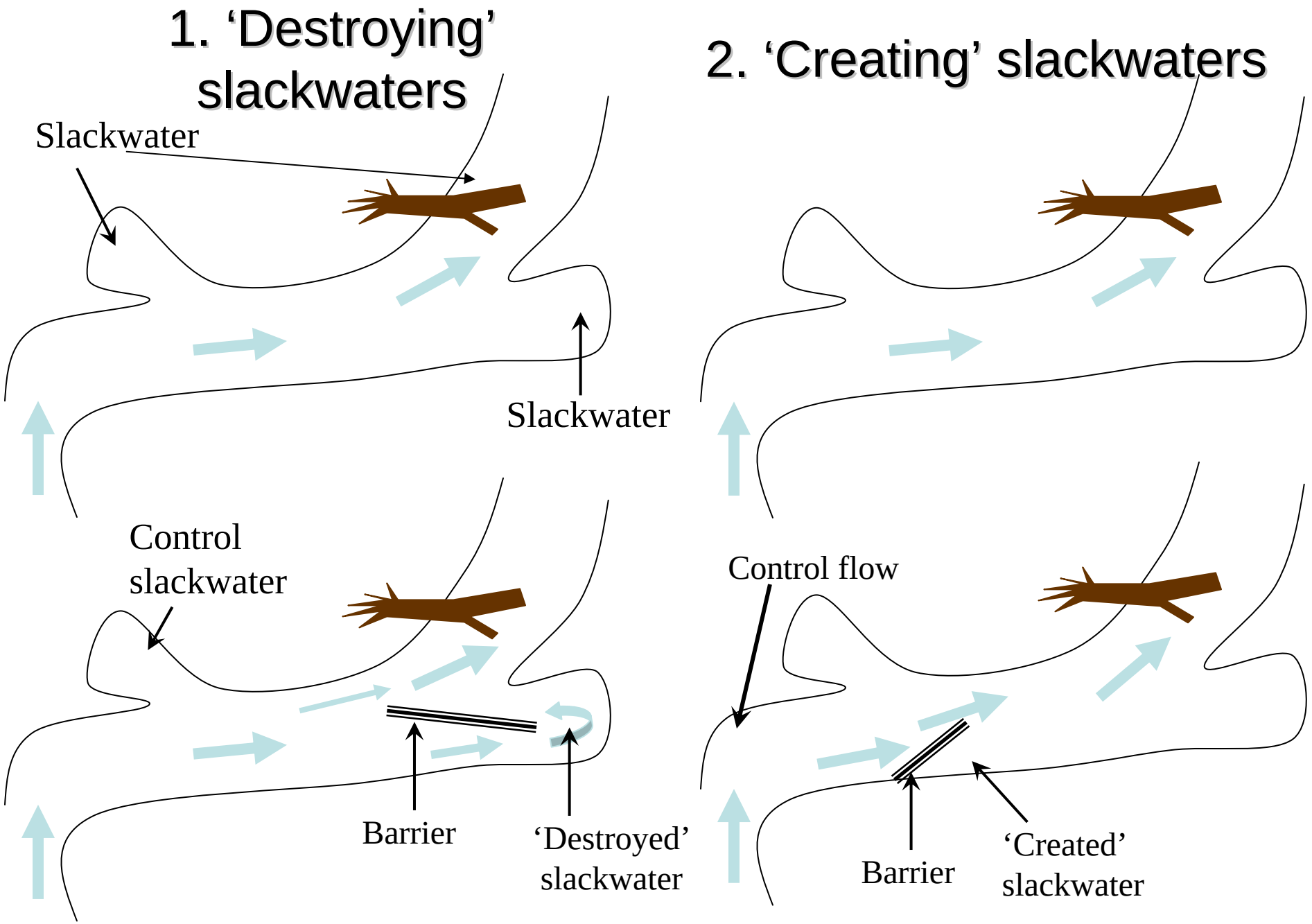
- To determine the effect on fish and shrimp abundance and species composition
  - of an increase in the current speed through slackwater habitats: thus ‘destroying’ slackwaters
  - of stopping the current through flowing habitats: thus ‘creating’ slackwaters

Year 1 & 2 – Aims cont.

- To assess if the density of microinvertebrates and macroinvertebrates is affected by altered hydraulic conditions and may explain changes in fish and shrimp
- To assess if primary production and decomposition is affected by altered hydraulic conditions and may explain changes in fish, shrimp, micro and macroinvertebrates



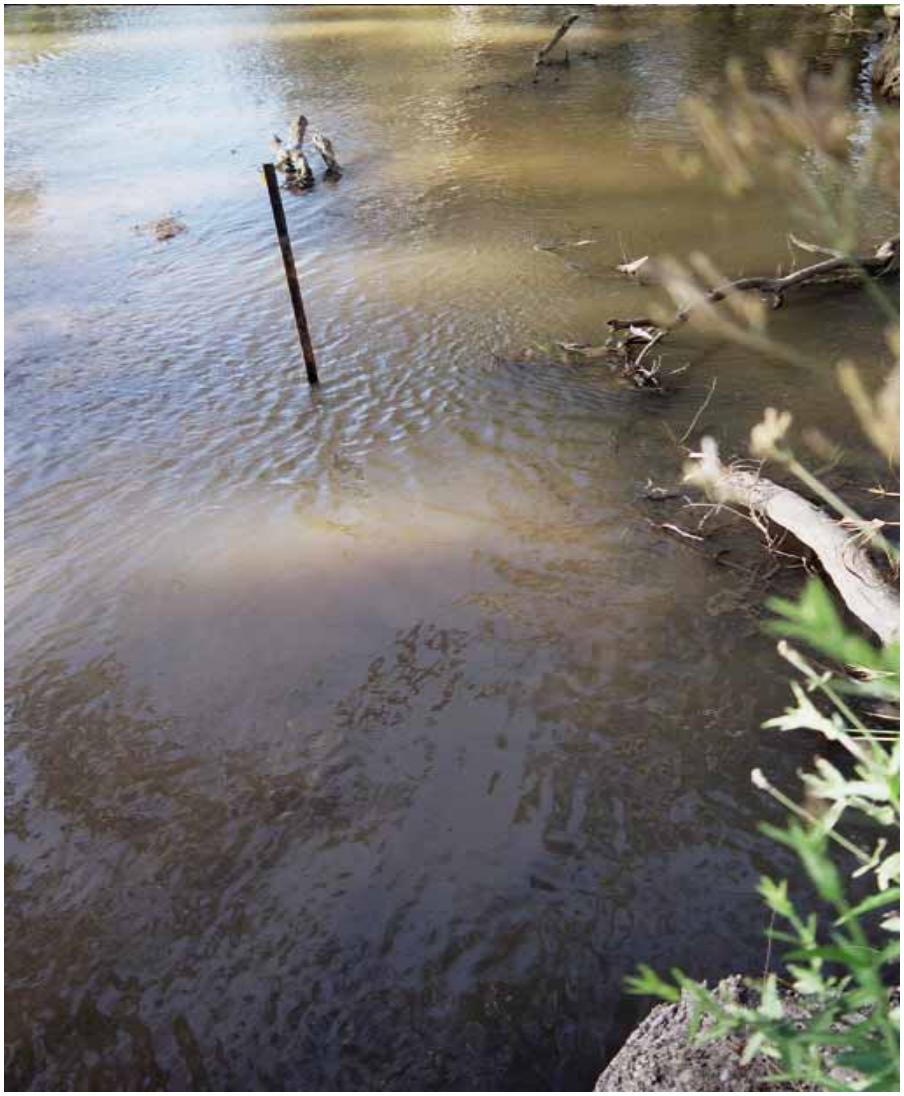
Broken River Catchment


1. ‘Destroying’ slackwaters
Slackwater
Slackwater
Control slackwater
Barrier
‘Destroyed’ slackwater
2. ‘Creating’ slackwaters
Control flow
Barrier
‘Created’ slackwater

Destroying a slackwater

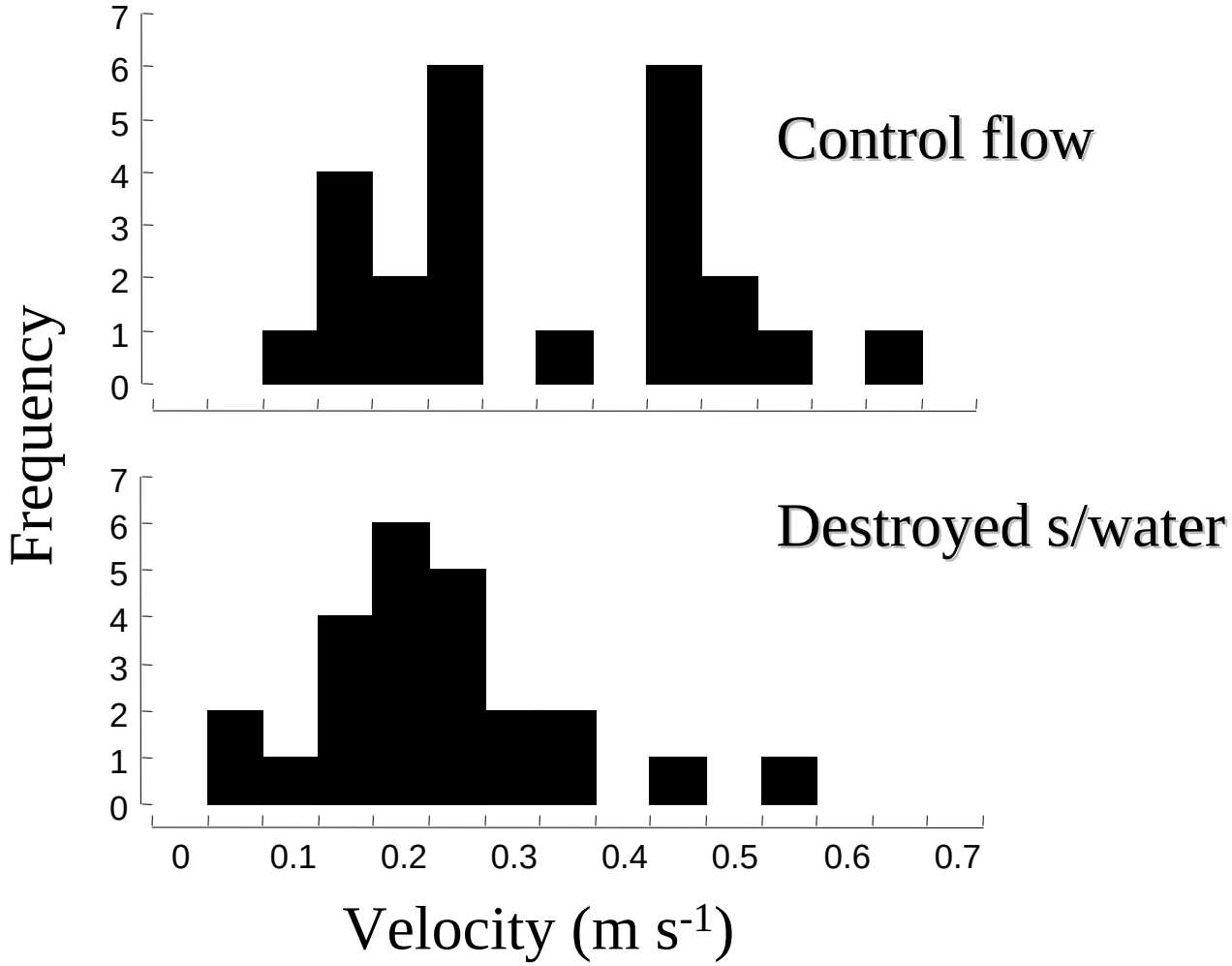
Creating a slackwater

Natural (control) flow

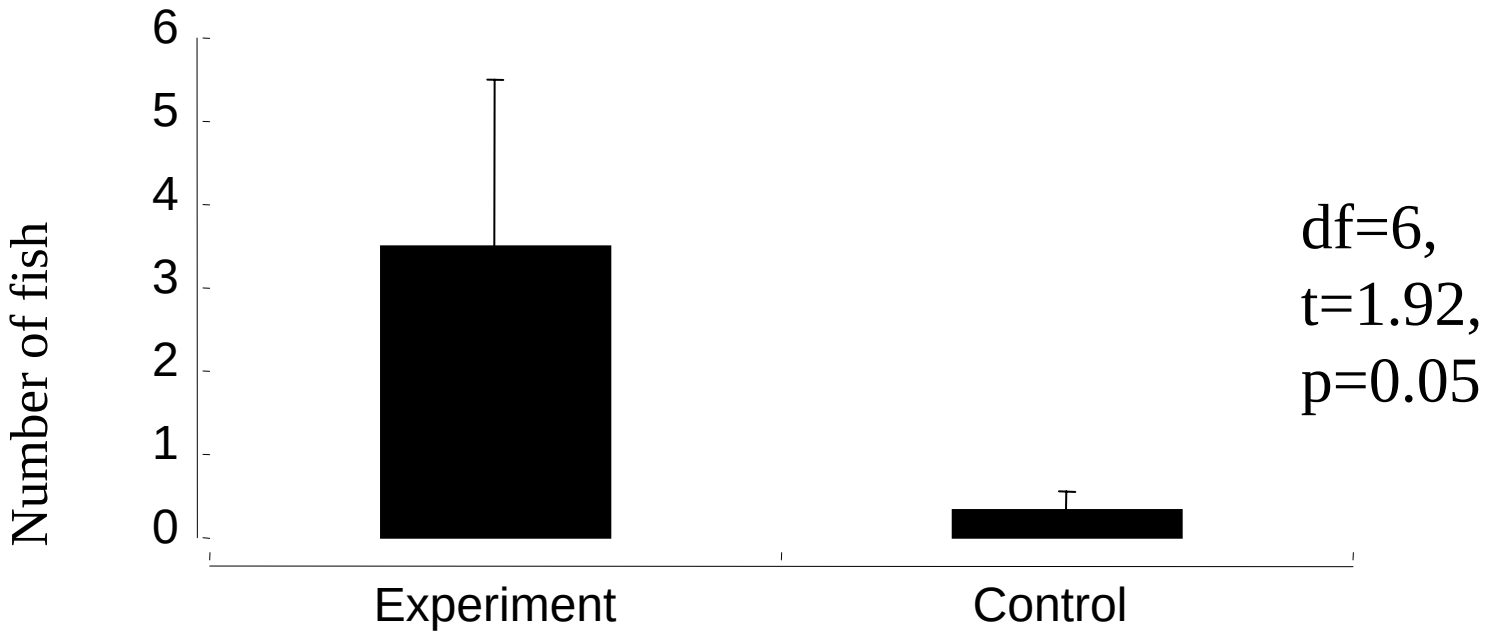


Natural (control) slackwater

Results: Current velocity



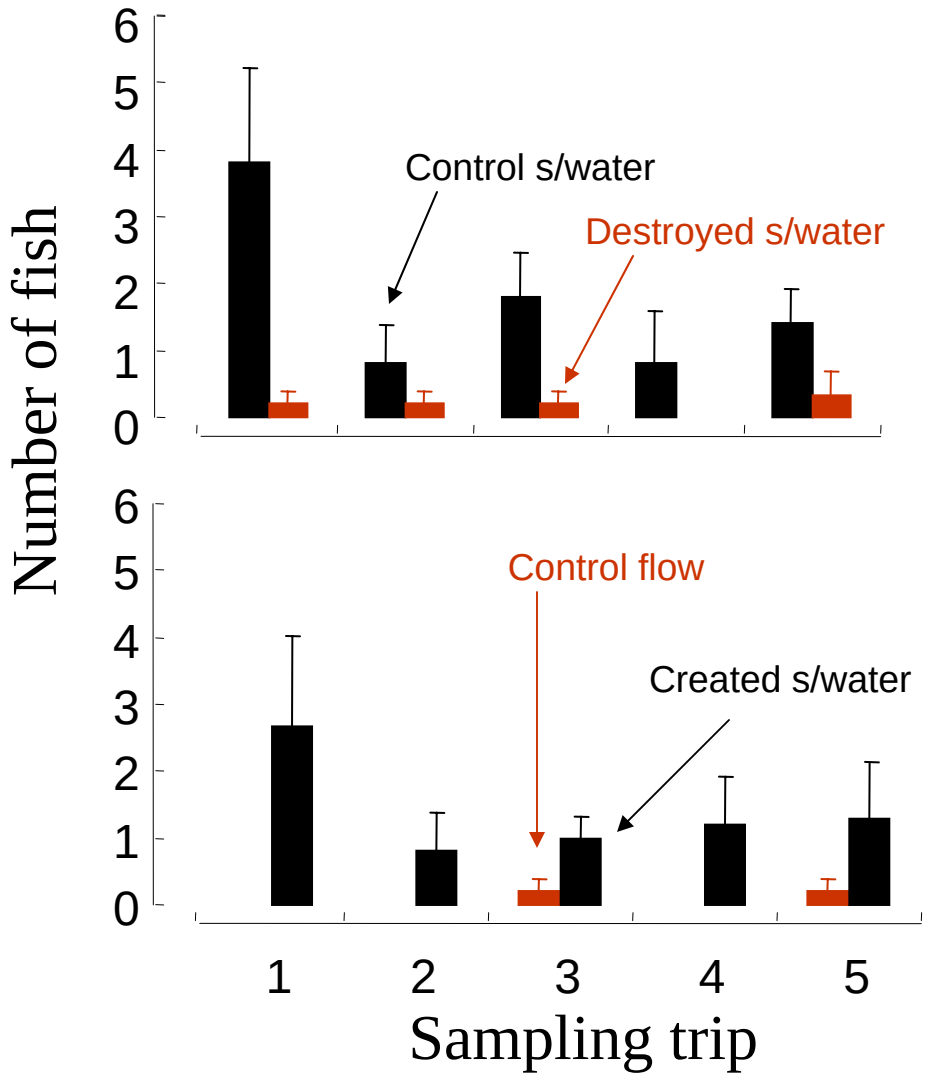
Fauna flushed from slackwaters



Fish and shrimp species in samples

- Fish
  - Common carp, *Cyprinus carpio* ☠
  - Crimson-spotted rainbowfish, *Melanotaenia fluviatilis*
  - Carp gudgeons, *Hypseleotris* spp.
  - Gambusia, *Gambusia holbrooki* ☠
  - Australian smelt, *Retropinna semoni*
- *Shrimp*
  - *Caridina mccullochi*
  - *Paratya australiensis*
  - *Macrobrachium australiense*

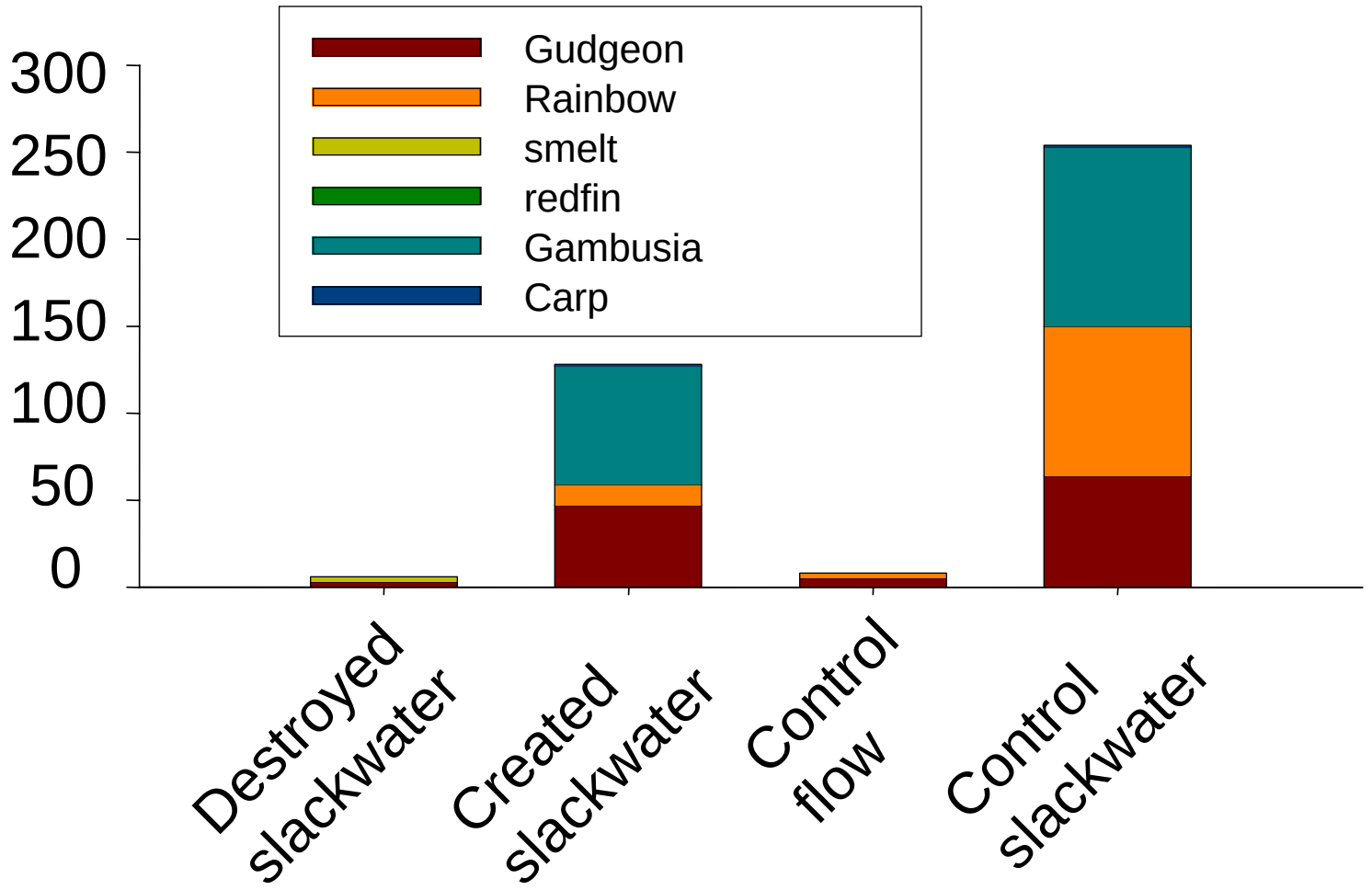
Total fish



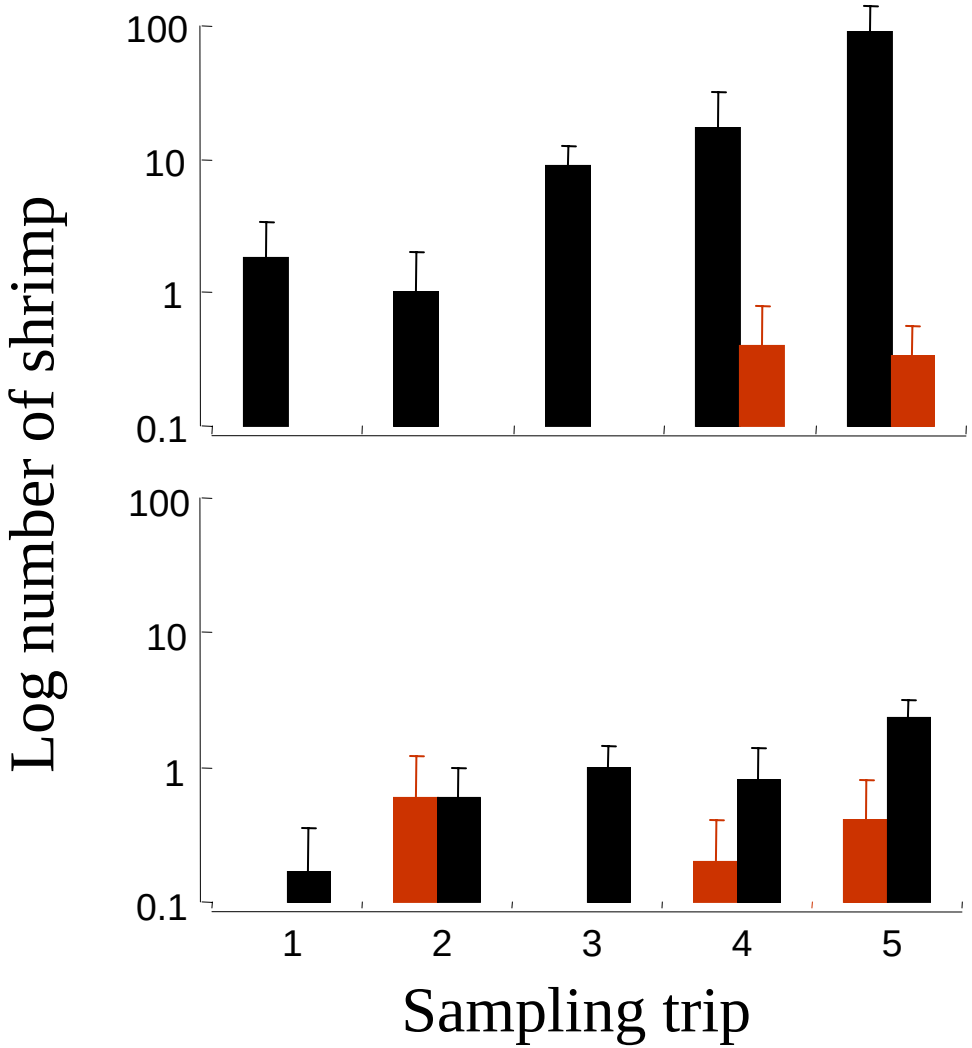
1. Control s/water
vs
destroyed s/water
($p<0.05$)

2. Control flow
vs
created s/water
($p<0.01$)

Fish species



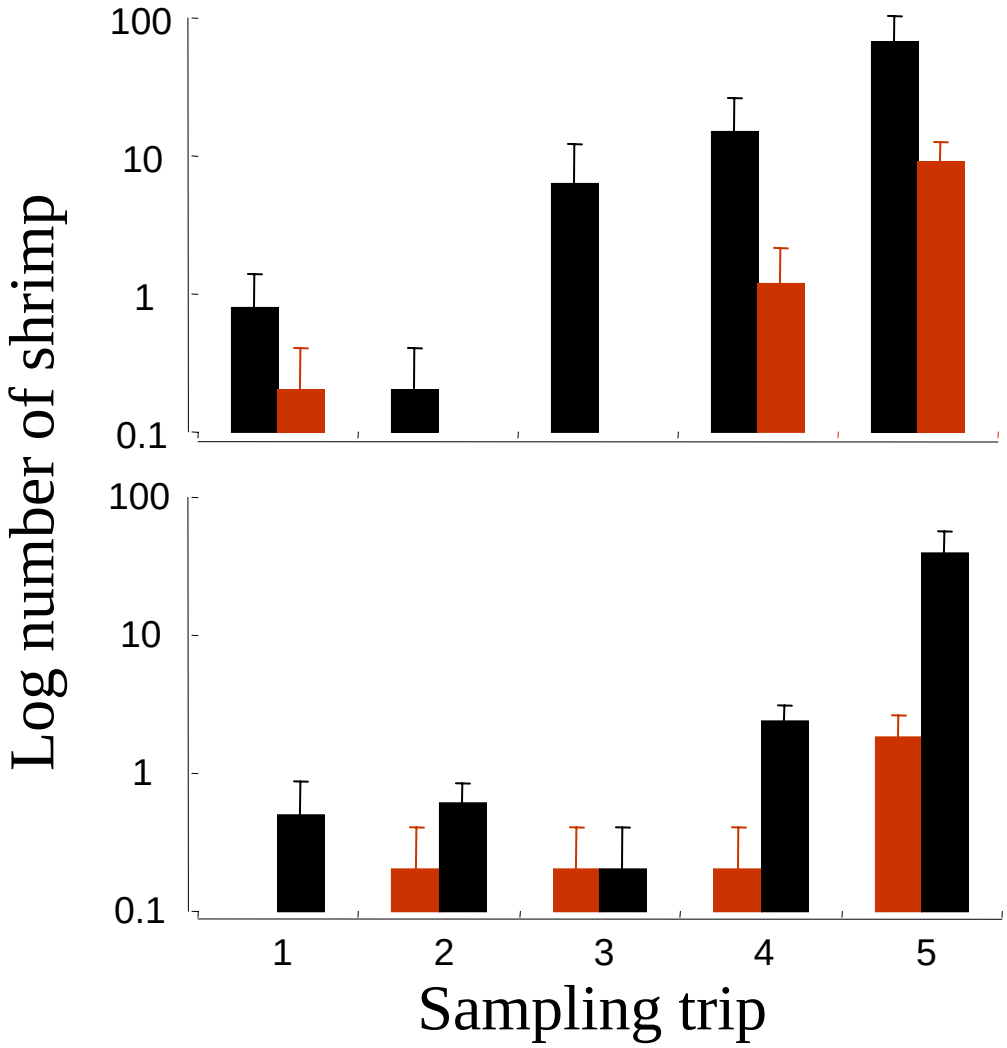
Caridina mccullochi



1. Control s/water
vs
destroyed s/water
($p<0.01$)

2. Control flow
vs
created s/water
($p<0.05$)

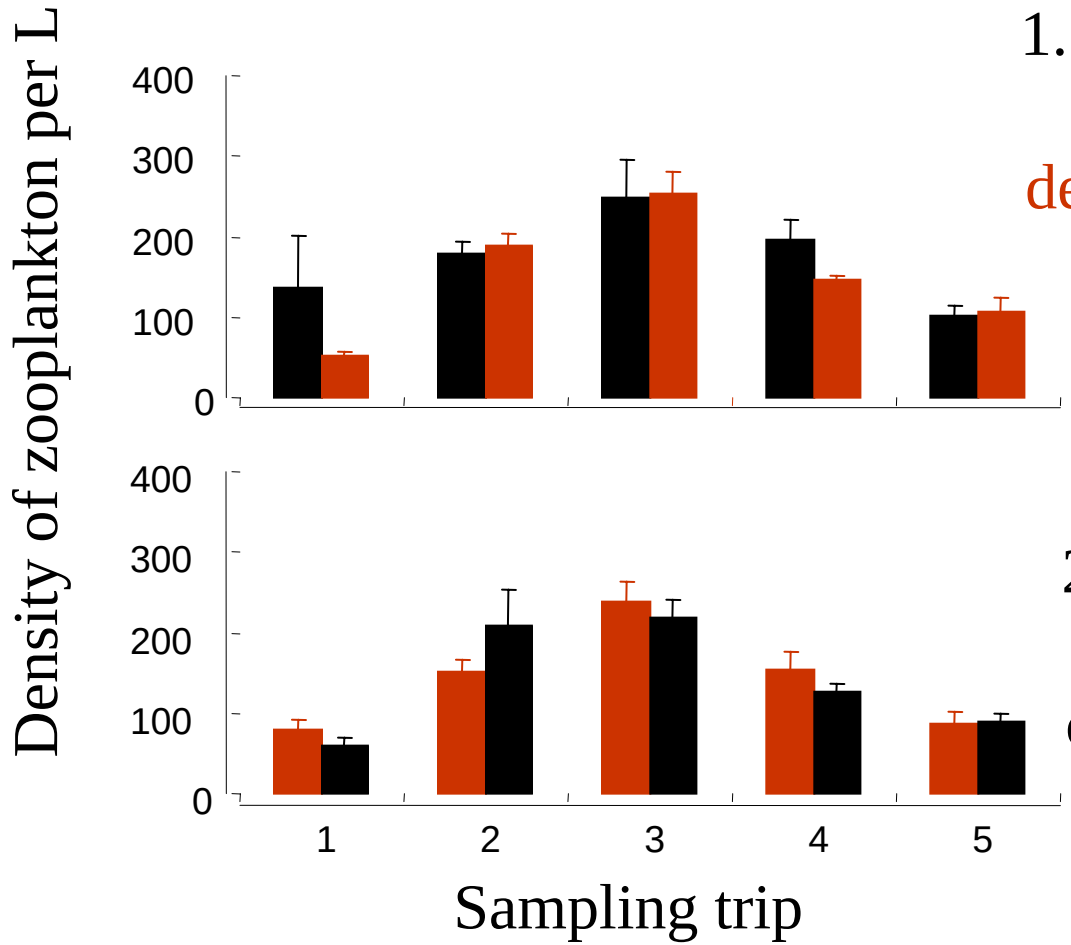
Paratya australiensis



1. Control s/water
vs
destroyed s/water
($p<0.05$)

2. Control flow
vs
created s/water
($p<0.001$)

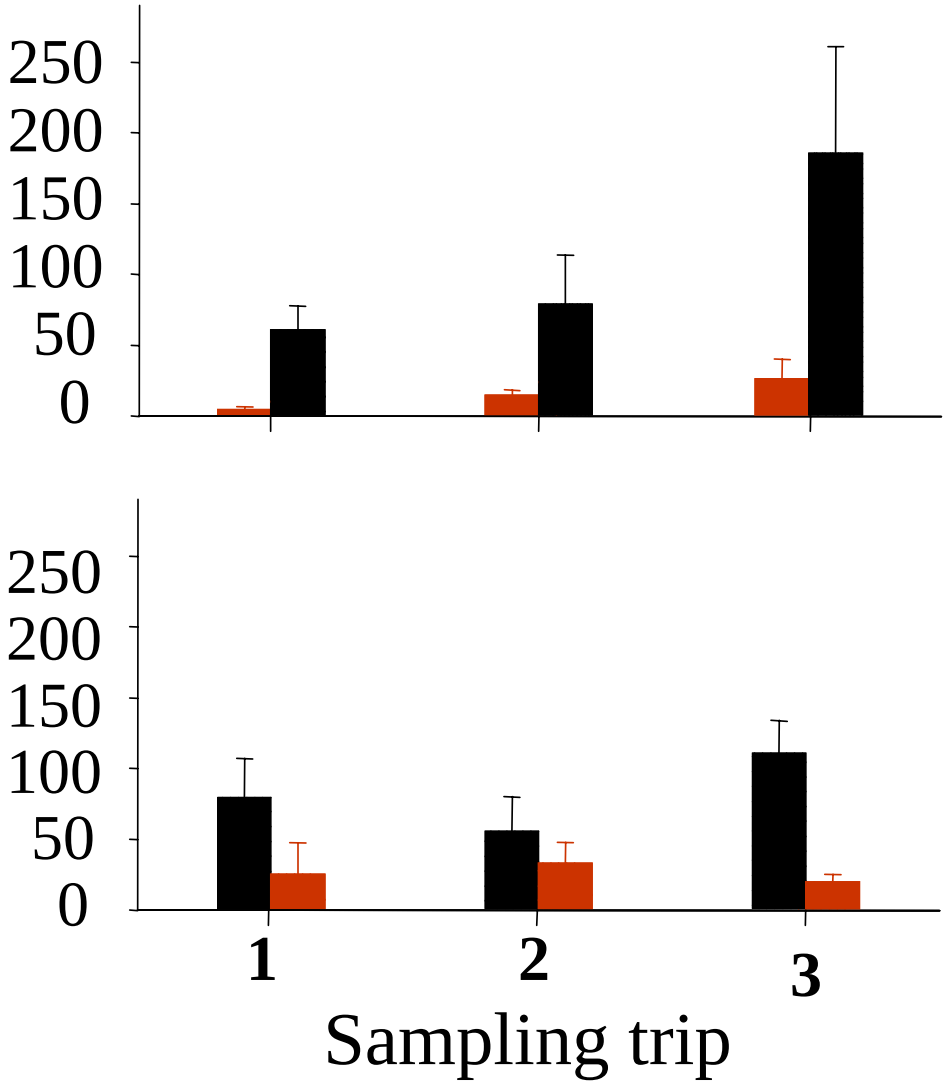
Zooplankton – year 1



1. Control s/water
vs
destroyed s/water

2. Control flow
vs
created s/water

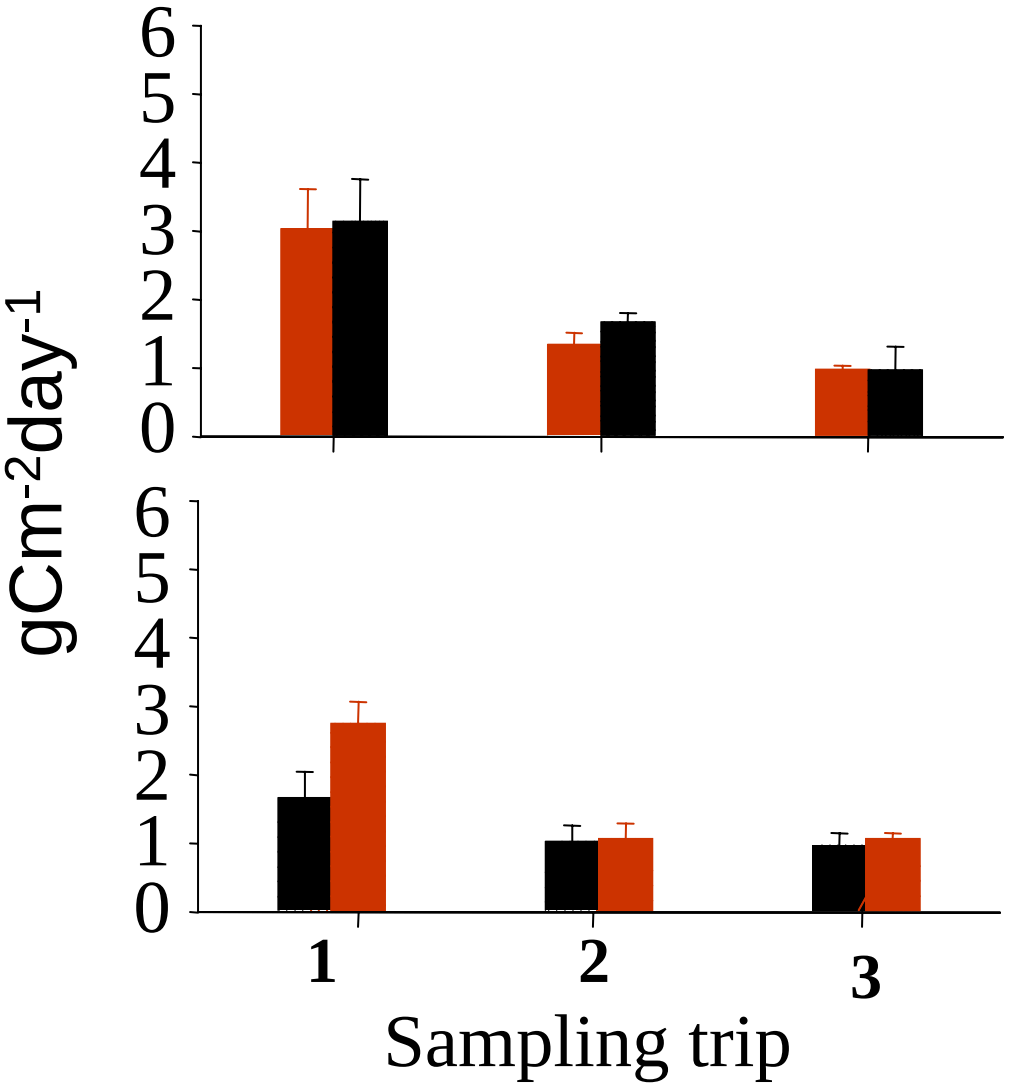
Zooplankton – year 2



1. Control s/water
vs
destroyed s/water

2. Control flow
vs
created s/water

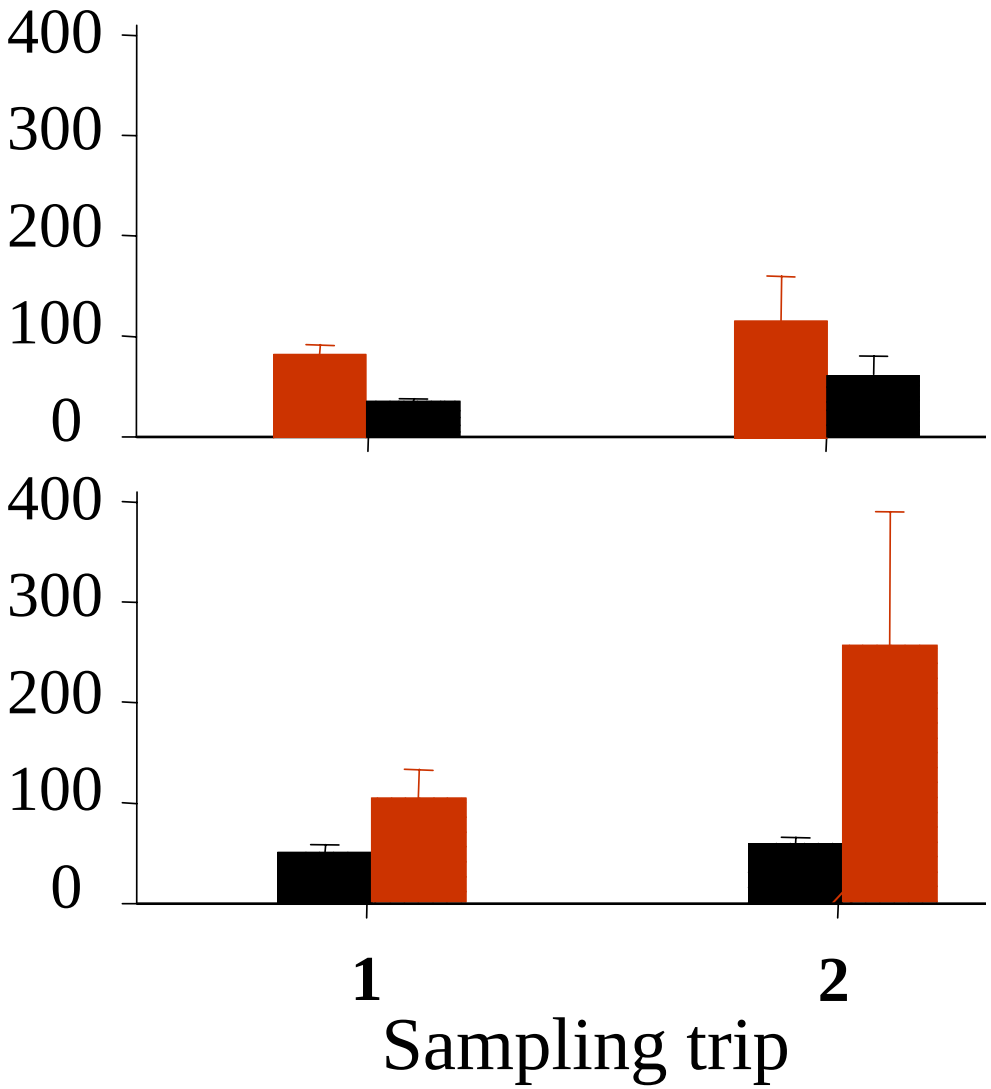
Primary Production



1. control s/water
vs
destroyed s/water

2. control flow
vs
created s/water

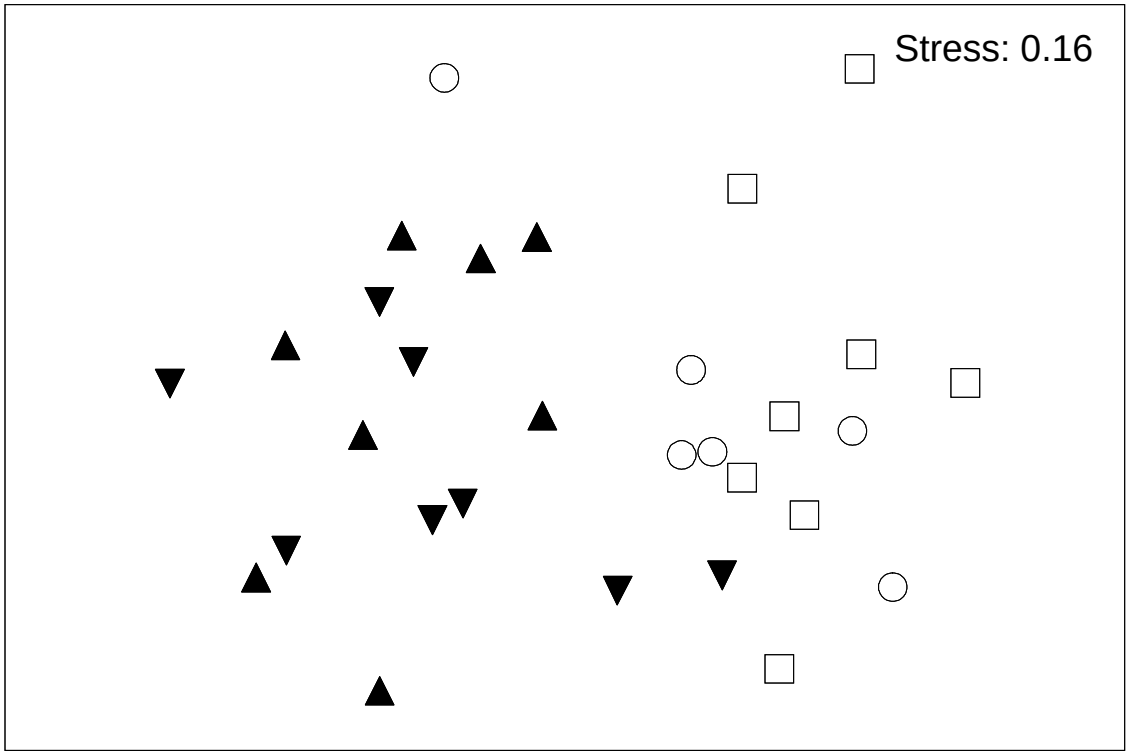
Macroinvertebrates



1. Control s/water
vs
destroyed s/water

2. control flow
vs
created s/water

All biota

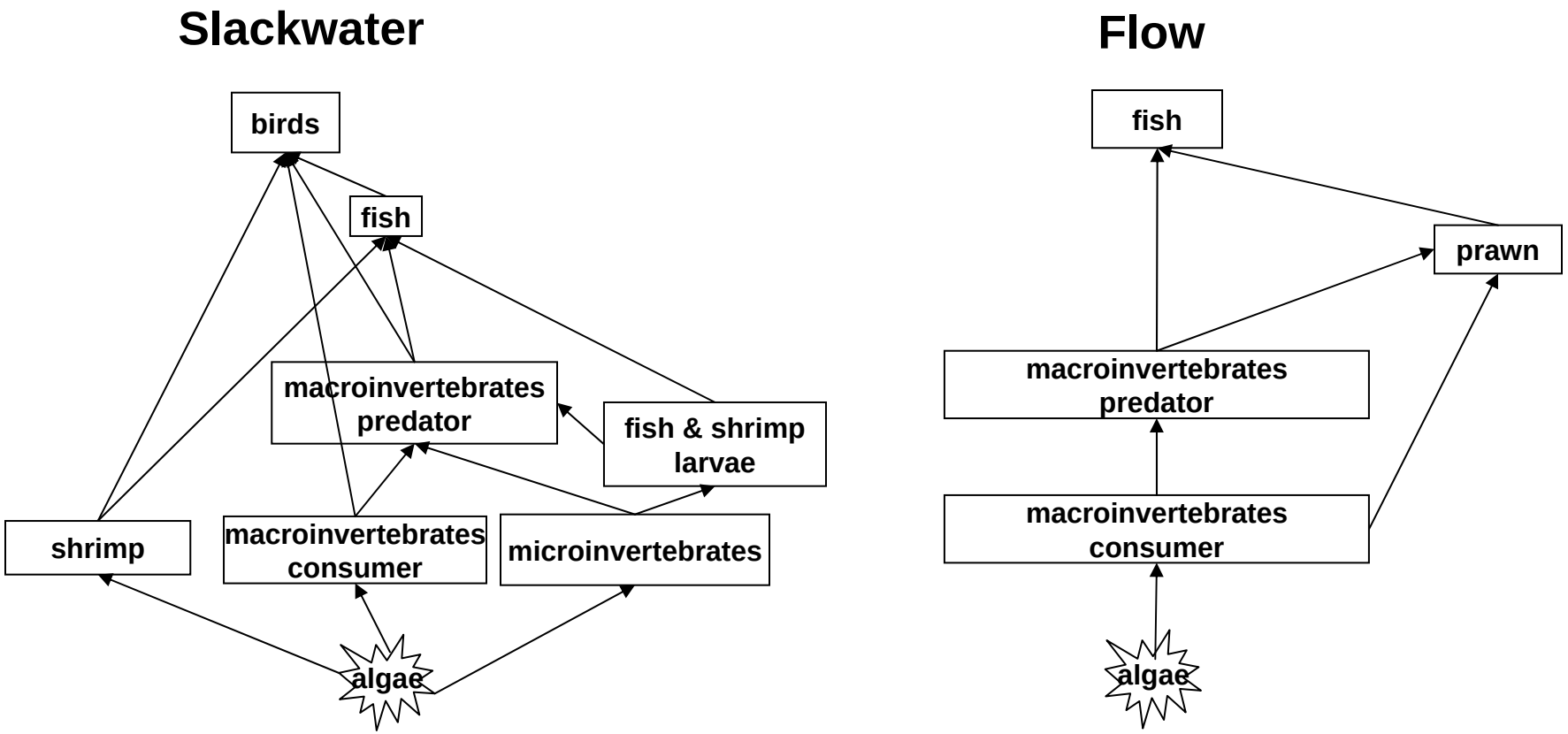


- ▲ Destroyed slackwater
- ○ Created slackwater
- ▼ Control flow
- □ Control slackwater

Year 1 & 2 -summary

- Fish are flushed from slackwaters by increased flows
- Fish and shrimp abundance greater in both control and created slackwaters
- Primary production not different between flow types
- Macroinvertebrate density higher in flow
- Fish and shrimp abundance maynot be explained by density of prey - conflicting
- Hydraulic environment

Habitat patch food webs



Year 3 - Aims

- In progress
- Succession - determine how rapidly the function and biotic communities develop in slackwaters once state altered from flow to slack
- Assess how the function and biotic communities develop through time

Snag racks

The tanks

Summary

- The nature of slackwater areas altered by irrigation releases
- Distinct biotic communities exist in slackwater and flowing habitats – food webs
- Hydraulic nature of a habitat appears to be driving habitat use
  - Primary production not different between habitats
  - Microfauna (larval fish food) – evidence conflicting

Summary – continued

- Slackwaters are important rearing habitat for fish and shrimp
- Fish are flushed from slackwaters by increased flow
- Altering the hydraulic nature of a habitat will alter the biotic communities
  - Destroy important rearing habitats
  - Loss of species which rely on slackwaters

Management implications

- Slackwater habitats need to be maintained over the late spring to early autumn period
  - Manipulate flow release strategies
  - Instream structures to create slackwater areas

Management implications

- Information on how to manage flows - short and long term flow variations and seasonally:
  - maintain diversity of habitat patches
  - maintain river function
  - recruitment of fish and shrimp
  - maintain food web structure
  - maintain diversity

Management implications – cont.

- Rehabilitation - potential for in-steam structures to create slackwater patches when summer flows cannot be manipulated
  - improved fish and shrimp recruitment
  - maintain habitat diversity