Ecological response to an experimental high flow release in the upper Yarra River, Victoria, Australia

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**Australian Grayling** *(Galaxiella pusilla)*

- Catadromous, threatened & rare
  - Downstream spawning migration April-May
    - Triggered by high flows
  - Upstream migration adults (June-July) & juveniles (Sept-Dec)
    - Triggered by high flows

- Only spawn one or twice
- Only live 3-4 years
- Appropriate flows critical
Yarra River
Environmental flow recommendations for Yarra River

- Summer/Autumn (Dec to May)
  - Low flows
  - Freshes
  - High Flows

- Winter/Spring (June to Nov)
  - Low flows
  - Freshes
  - High flows
  - Bankfull
  - Overbank

- Reach based environmental objectives developed

April to May high flows

• Reach 1 – not recommended to minimise risks to habitat, native fish, macroinvertebrates & platypus
• Reach 6 – 1,300 ML/day to trigger Aus. Grayling spawning & transport larvae downstream
  • 50% flow compliance
  • Risks to Grayling populations - require frequent spawning
  • Not delivering critical flows more detrimental than increased flows in upstream reaches
  • Monitor ecological conditions during high flow release to assess risks
600 ML/day experimental high flow release
Study sites & methods

- Three sites within 5 km Reach 1
  - 600 ML/day experimental high flow release (summer/autumn)
  - 300 ML/day high flow release (winter/spring)
  - Monitoring pre & post releases
- Flow – Hydrograph of releases & river flow
- *In situ* water quality
- Physical habitat – HC500 Hyperfire field cameras
- Macroinvertebrates – 5 x Surber samples each site
- Fish – Backpack electrofishing & bait traps
- Platypus – Level TROLL® 500 Series Data Loggers
Upper Yarra River release volumes & flow

- 600 ML/day experimental release
- 300 ML/day release
Upper Yarra River – physical habitat
Upper Yarra River - macroinvertebrates
Upper Yarra River - macroinvertebrates

600 ML/day
Global R 0.305
$P = 0.001$

Recovery
Global R 0.206
$P = 0.001$

300 ML/day
Global R 0.074
$P = 0.077$
Upper Yarra River - macroinvertebrates

- Response 1 - Decreased abundances post-releases
  » Worms (Oligochaeta)
  » Midge fly larvae (Chironominae & Orthocladiinae)
  » Mayflies (Leptophlebiidae)
  » Caddisflies (Hydroptilidae & Hydropsychidae)
  » Water mites (Acarina)
  » Stoneflies (Gripopterygidae)

- Response 2 - No change in abundances
  » Midge fly larvae (Aphroteniinae & Tanypodinae)
  » Riffle beetle larvae (Elmidae)
Upper Yarra River - macroinvertebrates

Response 1

Response 2
Upper Yarra River 600 ML/day release - fish

- YAR0342
- YAR0352
- YAR0358

Abundance

Pre-release | Post-release | Pre-release | Post-release | Pre-release | Post-release

River blackfish
Short-finned eels
Brown trout

[Image of fish]
Upper Yarra River 600 ML/day release - fish
Upper Yarra River 300 ML/day release - fish

The graph shows the abundance of different fish species (River blackfish, Short-finned eels, Brown trout) before (Pre-release) and after (Post-release) a release event. The species abundance is measured on the y-axis, while the x-axis represents the pre-release and post-release periods for three different locations: YAR0342, YAR0352, and YAR0358.
Upper Yarra River 300 ML/day release - fish

YAR0342  YAR0352  YAR0358

Length (mm)

Pre-release  post-release  Pre-release  post-release  Pre-release  post-release

River blackfish
Short-finned eels
Brown trout
Upper Yarra River - platypus

• Risk due to increased water level in pools from January to March compared to normal winter flow
  » Low risk <0.5 m
  » Medium risk 0.5 to 1 m
  » High risk >1 m

• Depth data loggers 600 ML/day release
  » Average increase 0.92 m
  » Maximum increase 1.0 m
Upper Yarra River - conclusions

- Reach 1 - Risks of higher than recommended flows are disturbances to:
  - Geomorphology (e.g. erosion)
  - Macroinvertebrates
  - Native fish (particularly River Blackfish)
  - Platypus
Upper Yarra River - conclusions

- Reach 1 - Geomorphology (e.g. erosion)
  - Increased turbidity
  - Silt areas & other microhabitats remained
  - No major changes in river channel
Upper Yarra River - conclusions

- Reach 1 - Macroinvertebrates
  - Some decreases in abundances
  - No change to community composition
  - Refuge habitat inundated
  - Recovery post-flows
Upper Yarra River - conclusions

- Reach 1 - Fish
  - Minor abundance changes
  - No change to community composition
  - Some indication larger River Blackfish persisted
  - Refuge habitat inundated

![Fish](image1.png)

![Fish](image2.png)

![Fish](image3.png)
Upper Yarra River - conclusions

- Reach 1 - Platypus
  - Up to 1 m increase in depth
  - Medium risk
  - Releases not made during critical Jan to Mar period
  - Refuge habitat inundated
Upper Yarra River - conclusions

- Reach 1 – High flow releases
  - Low to medium ecological risks
  - Consider timing of releases
  - Consider time between releases