Assessing the outcomes of native fish stocking in the MDB

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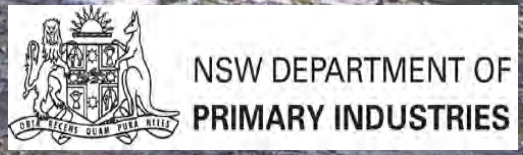
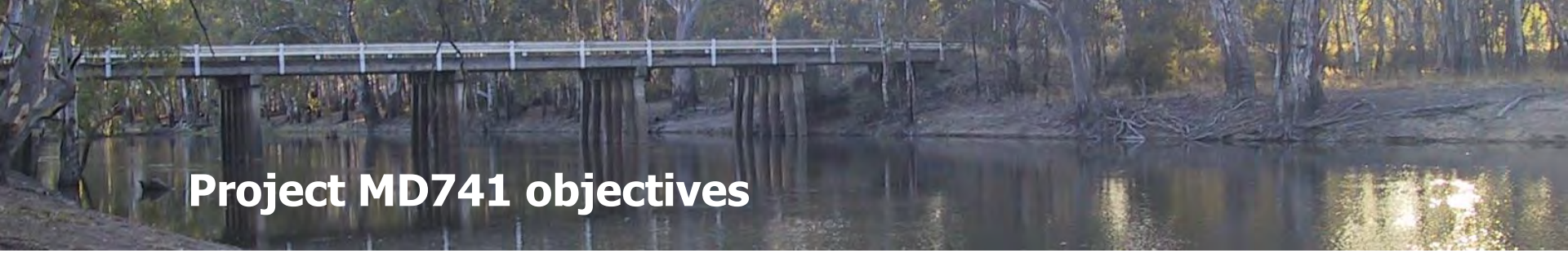


Introduction

- More than 60 million native fish stocked in the MDB in last 30 years
- The fate of these fish is largely unknown
  - Success of stocking
  - Effects on ecology
- Outcomes of stocking identified as key research need in NFS



Project MD741 objectives

- Test and refine protocols for marking fish at hatchery scale
- Gain approvals for use of marking techniques
- Develop non-lethal field detection methods
- Undertake experimental stockings of marked fish to determine the outcomes of native fish stocking in rivers
- Document findings and implications for conservation and rec. fishing

Methods for discriminating hatchery fish

Golden perch as model species:

1. Broodstock injection
2. Natural otolith chemical signatures
3. Isotope immersion
4. Osmotic induction marking

Golden perch fingerling (40 mm)

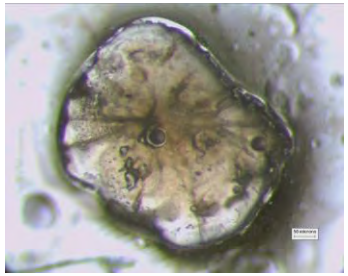
Brood stock injection and natural otolith signatures

- Brood stock injection
  - Female brood fish injected with stable isotope of barium
  - Otoliths (earstones) of progeny chemically analysed to detect mark

- Natural otolith chemical signatures
  - Analyse microchemistry in the core of otoliths to discriminate between hatchery and wild signatures

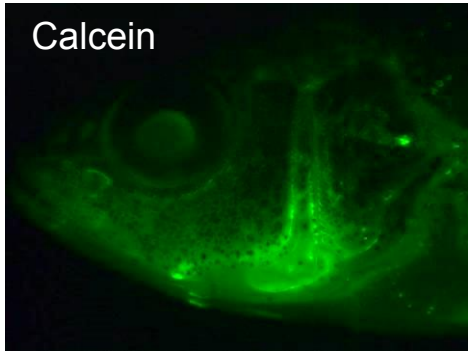
Isotope immersion

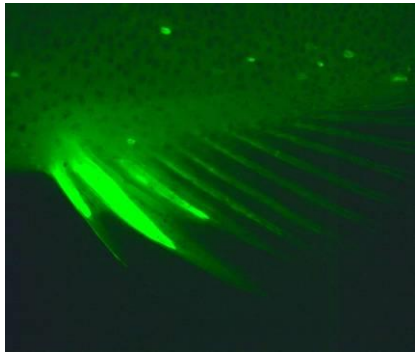
- Larvae immersed in solutions of stable Ba and Sr isotopes
- Otoliths of recaptured fish chemically analysed to detect mark
- Cheap and easy to administer, permanent hatchery-specific mark

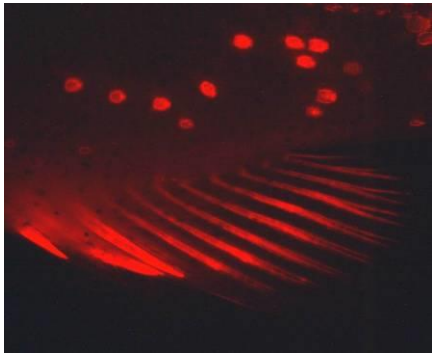


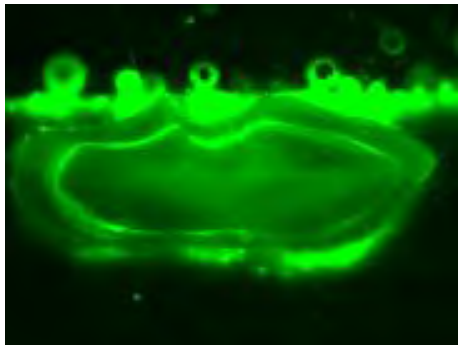
Osmotic induction marking

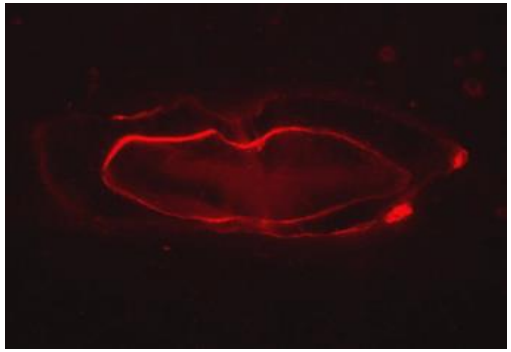
- Fingerlings immersed in solutions of fluorescent chemicals
- Long lasting external (non-lethal) mark, plus permanent otolith mark
- Cost effective and practical in hatchery





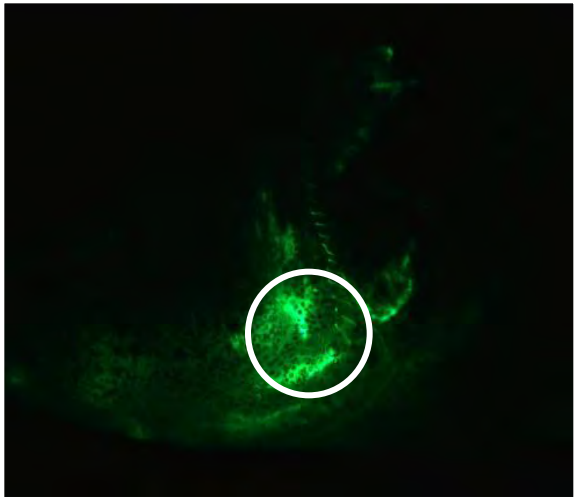






Photos taken using fluorescence dissecting microscope

Osmotic induction marking - non-lethal field detection



- Trial use of GFP fluorometer to detect calcein marks
- Practical and objective way of identifying marks on live fish
- Effective for >2 years in lab, 4 months in field (so far)

Large scale trials at Narrandera hatchery

- 2007/08: 6,000 golden perch larvae marked by isotope immersion
- 2008: 20,000 golden perch fingerlings marked with calcein and released into Billabong Creek
  - 9 recaptures, 100% detection using fluorometer 4 months post-release

Proposed hatchery protocol for golden perch

Induce spawning & raise larvae in hatchery for ~5 days

Isotope marking of larval otoliths with unique hatchery signature

↓

Grow out larvae in ponds until 30-40 mm fingerlings

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Osmotic induction marking with calcein

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Stock fingerlings

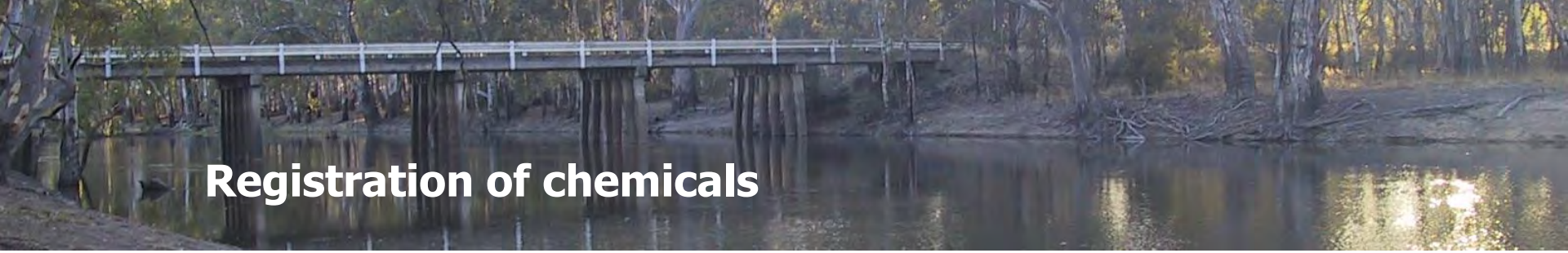
Other species

- Murray cod
  - 3,700 successfully marked with calcein in 2008
    - external marks not as good as golden perch
  - isotope immersion trials to begin in 2008/09 (Skye Woodcock)

- Australian bass
  - Trials underway for marking hatchery fish with calcein
    (Leo Cameron and Lee Baumgartner, NSW DPI)

- Carp gudgeon and pygmy perch
  - Calcein marking evaluated for use in ecological studies
    (Zoe Squires and Nick Bond, Monash University)

- Atlantic salmon trial of fluorometer
  (Jerré Mohler, US Fish and Wildlife Service, Pennsylvania, USA)



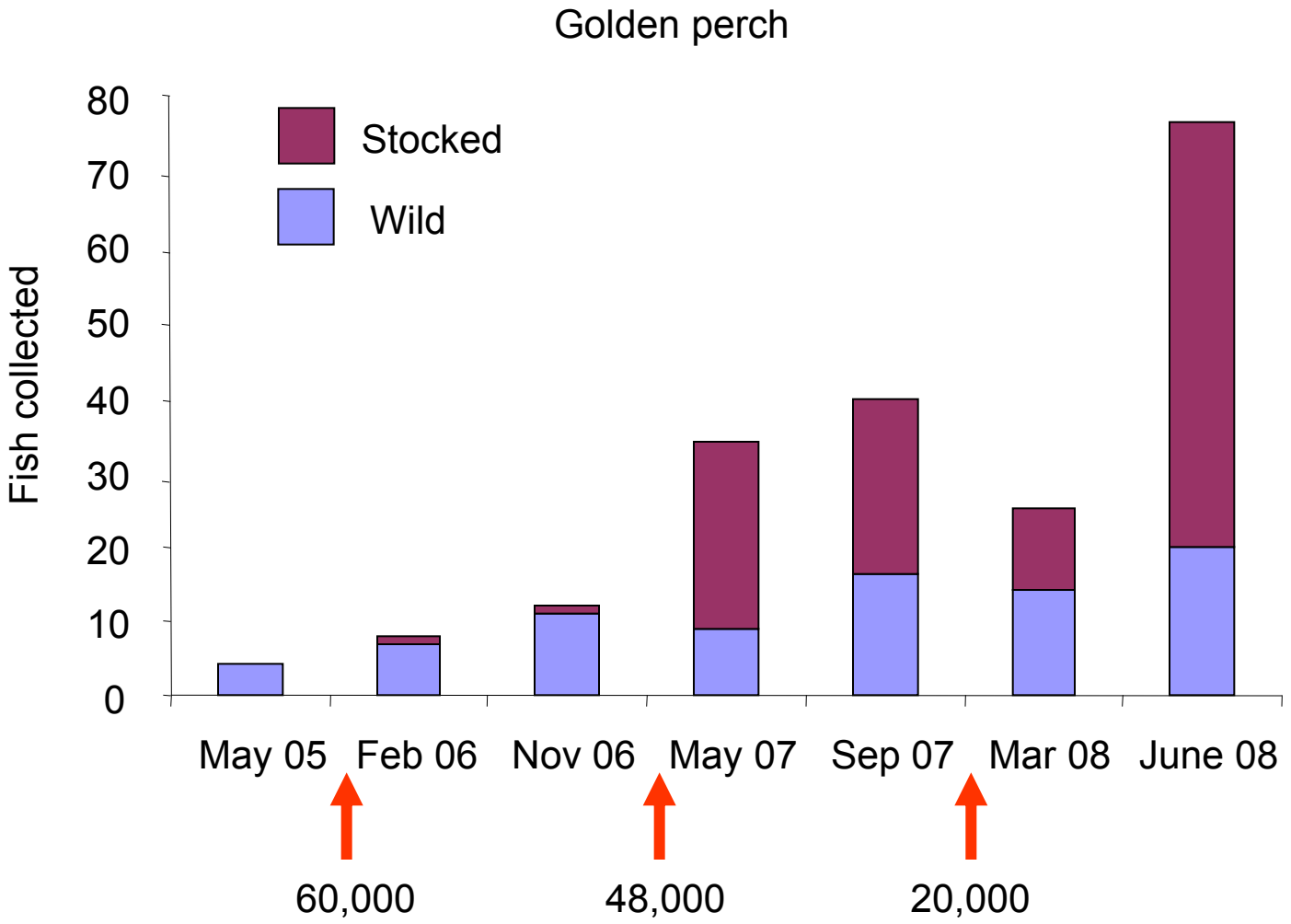
Registration of chemicals

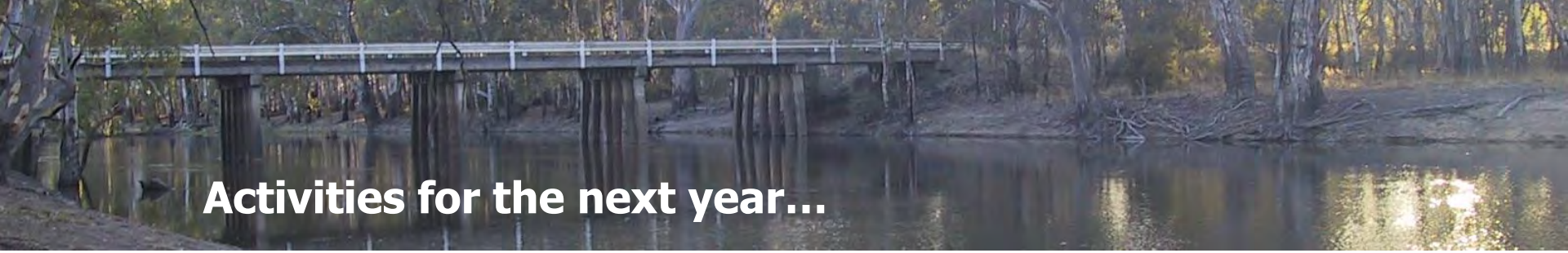
- Only relevant for osmotic induction marking
- Australian Pesticides and Veterinary Medicines Authority (APVMA)
  - Advice: use of chemicals for fish marking not required to be registered as veterinary chemical on Agvet code
- Food Standards Australia New Zealand (FSANZ)
  - Listing on Australia New Zealand Food Standards Code only required if quantifiable residues present
  - Residue test for calcein and alizarin red S developed by consulting laboratory
  - All tests below limits of detection (0.02 mg kg^{-1})
  - Advice: no amendment to code required

Experimental stockings – survey results

River	Year class	# stocked	% stocked
Murrumbidgee R	2002	50,000	37% (n=30)
	2004	50,000	32% (n=38)
Edward R	2004	50,000	20% (n=74)
	2005	50,000	66% (n=3)
Billabong Ck	2006	60,000	100% (n=54)
	2007	48,000	100% (n=7[#])
	2008	20,000	100% (n=9[#])

Experimental stockings – Billabong Creek





Activities for the next year…

- Implement full marking protocol at commercial scale at Narrandera
  - 50,000 golden perch to be stocked into Murrumbidgee (08/09)
- Further develop and implement communication strategy
  - liaison with agencies and hatchery managers
- Begin process of rolling-out marking protocol in private hatcheries
- Continue sampling of stocked rivers
  - assess longevity of calcein marks under field conditions
  - begin analysis of stocked rivers data

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- Brett Ingram (Vic DPI)
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- Noel Penfold (Murray Darling Fisheries)
- Greg Semple (Murray Cod Hatcheries)

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