

Blackwater and Fish Kills

The Where, Why, How, What Has Been Done and What Can be Done!



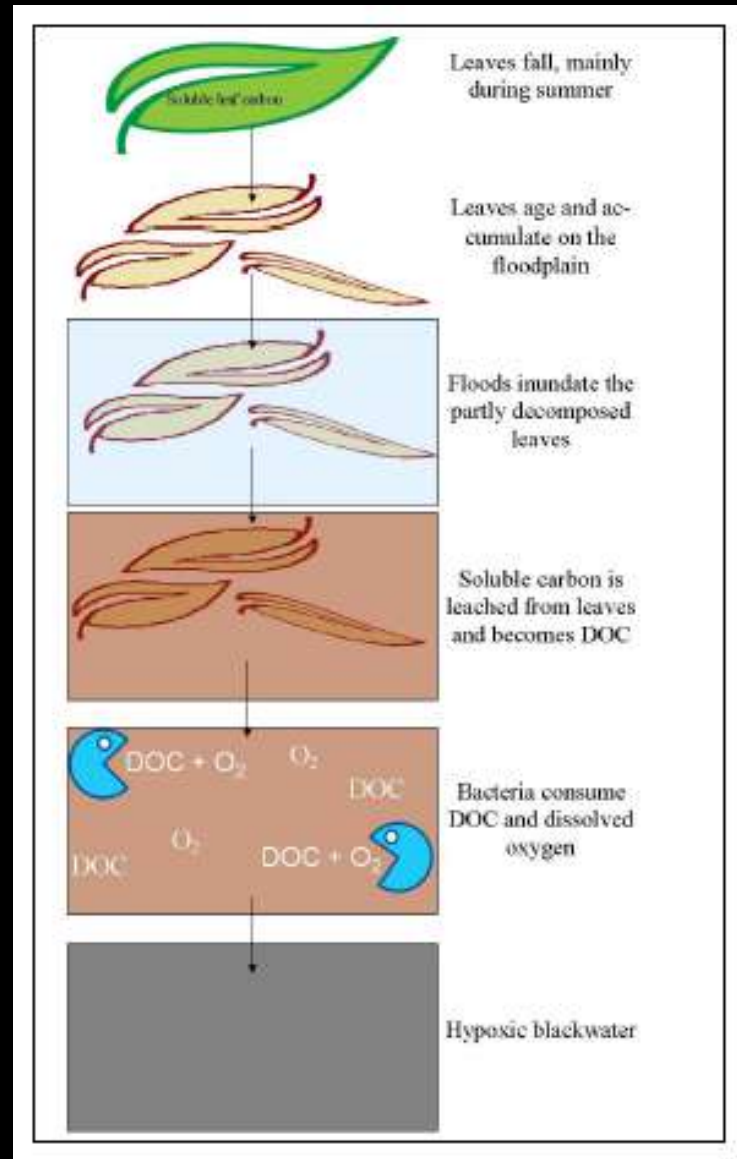
Luke Pearce Fisheries Manager

NSW DPI Fisheries

Are These Events Natural

- Blackwater and fish kills did happen historically
- Not to the scale and extent we are now seeing
- I don't believe you can have a natural event in a managed system
- What we are seeing is the result of how the system is managed
- If we wish to improve things going forward we need to improve and influence management

What is Black Water



Blackwater is Not Bad



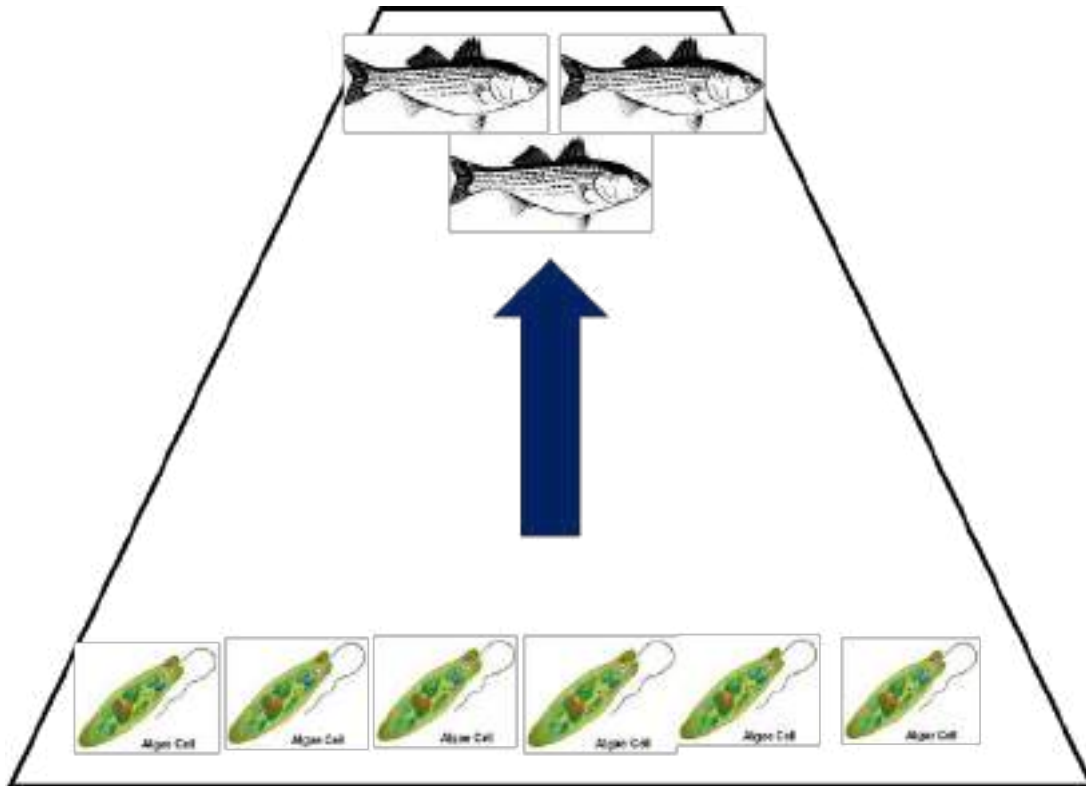
Cod are made up largely of carbon from the floodplain

Floodplain Carbon Feeds our Rivers

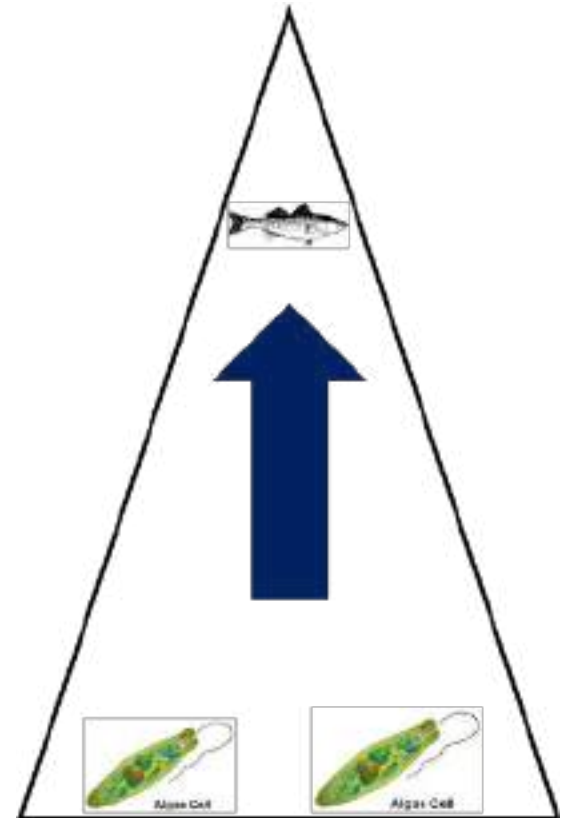
- Instream food web fuelled by terrestrial carbon
- Low flow = low nutrient status, metabolic activity & productivity
- Floods = high nutrient status, increased metabolic activity & productivity
- 2010/11 BM flood contributed significant amounts of carbon & nutrients to the river
 - >280 tonne Carbon per day
 - >15 tonne Nutrients per day (Nielsen et al 2016)

Basal Energy

Historical

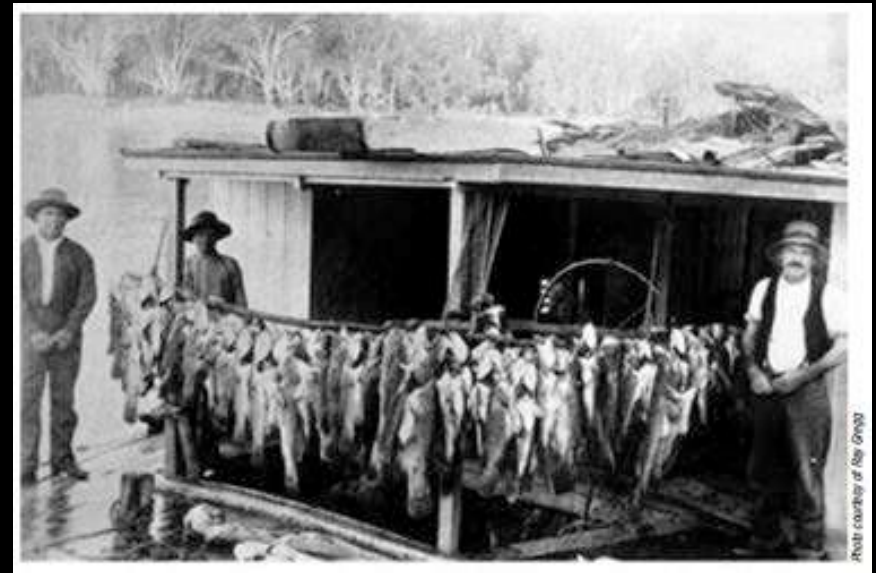


Current



Decline in Native Fish in the MDB

- Modelling by Nick Bond and others suggest that there was 3.5 to 4 times the basal resources available to native fish under historical flow regimes than under current flow regimes.
- Carp and floods

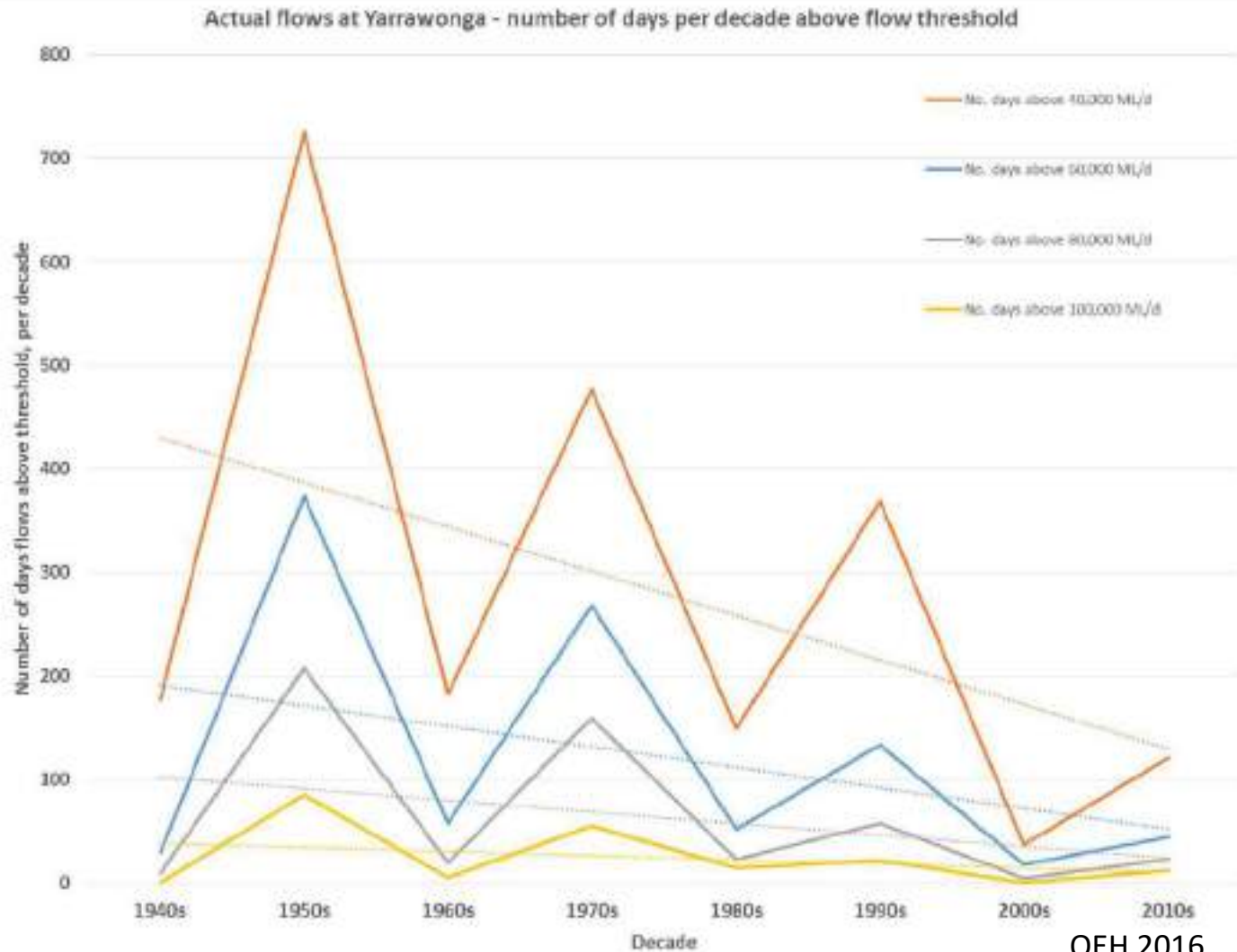


So why has something that should be good for our rivers and fish turned so bad

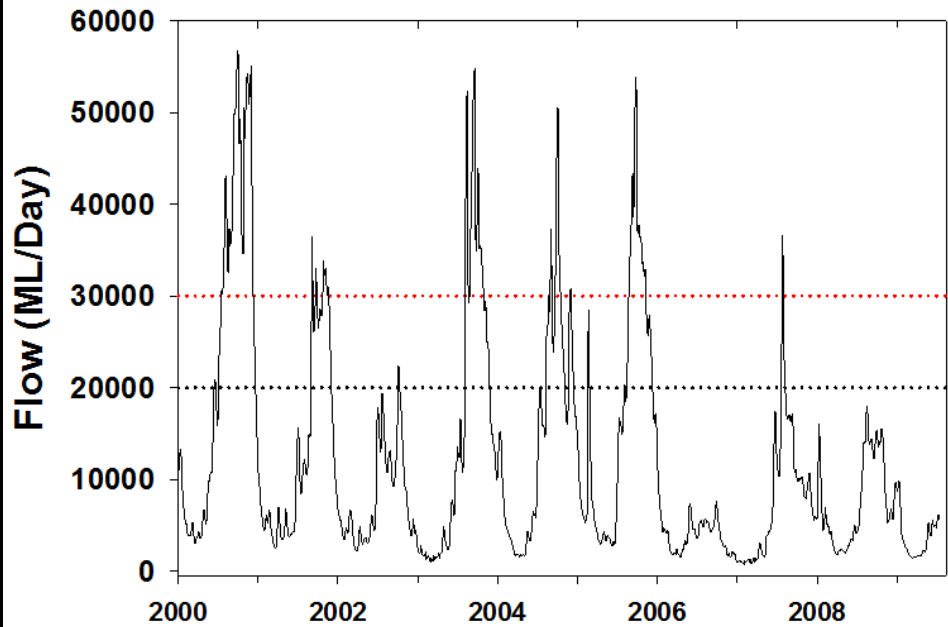
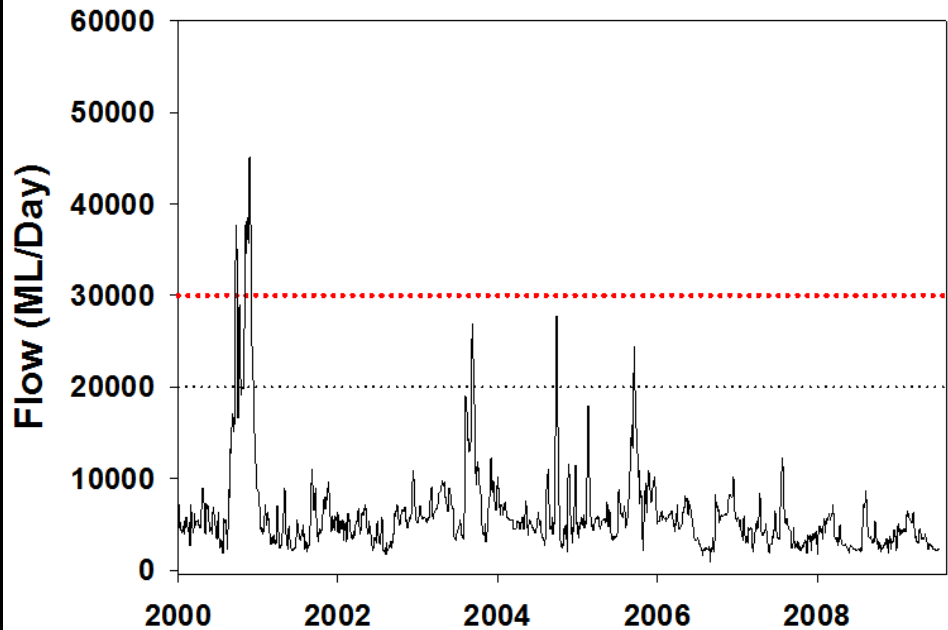
- Unfortunately the answer is not simple
- Major changes to the river how its managed and the catchment that are contributing.
- The 2010 flood of the Barmah Forest returned 22 tonnes of fish food to the river, but what was left to eat it?



Major Changes to our River Systems and how they are Managed



Baldwin 2016



Vegetation Changes

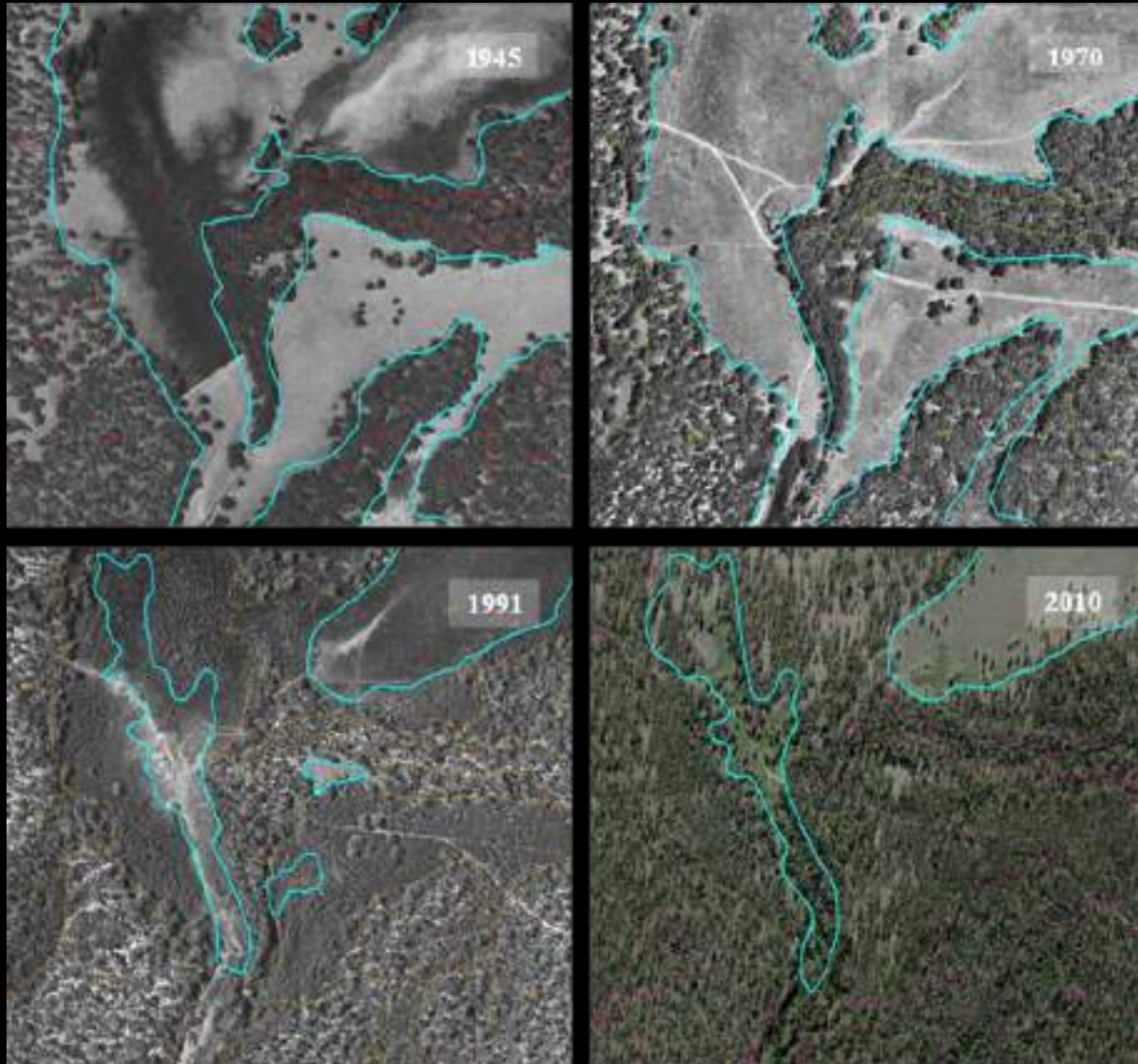




Photo credits Barren Baldwin



Photo credits Barren Baldwin

Land use change



Loss of sites of Transformation

1500 snags per river km removed from the Murray this = an equivalent surface of 195000m² river km or almost 20ha river km (Baldwin et al 2016)



Where did the fish die

2010/11



2016



What was done

- Dilutions flows delivered via several irrigation escapes in the Edward/Wakool system
- 74,000ML was delivered at a cost of \$829,170
- 270,000ML was delivered in the Bidgee, continue until Jan to provide dilution and slow recession.
- Aerators utilised by local community

Aerators

- Did they Work???
- The impact of aerators was limited at best



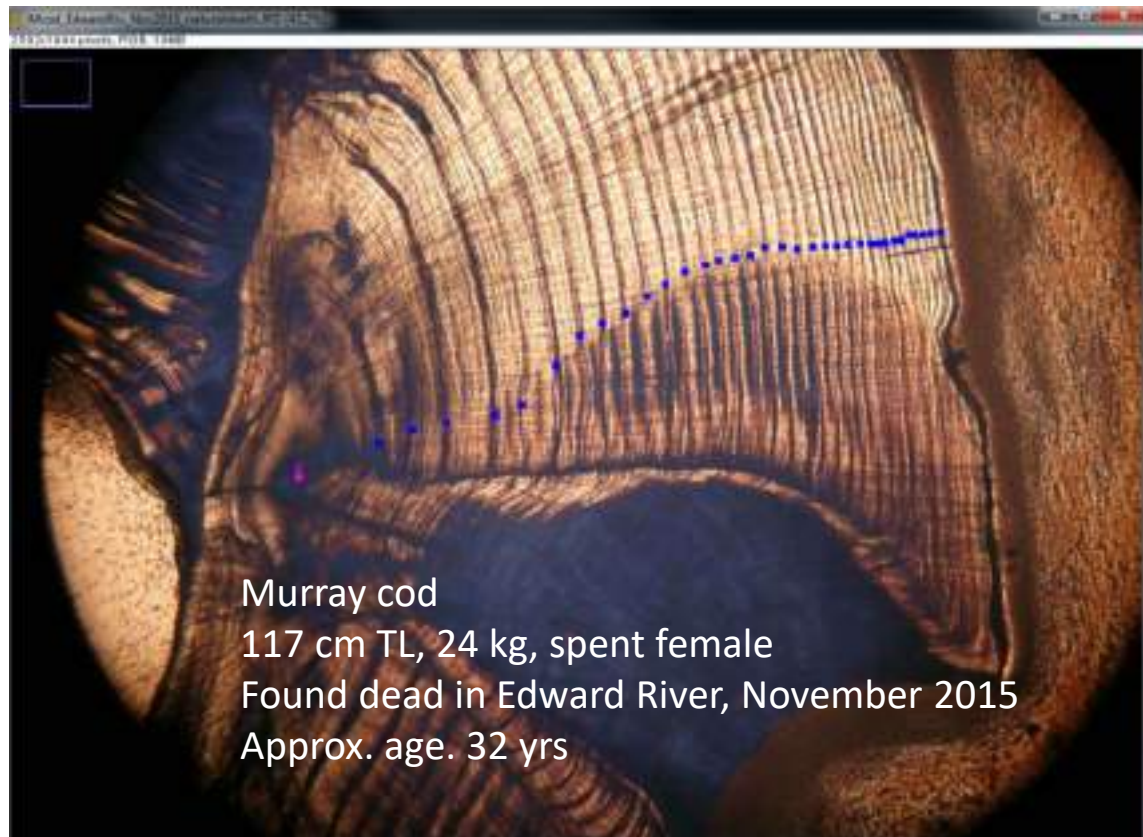
Otoliths Collected

- Predominantly Murray cod
- N= 135 samples collected (+13 GP & 3 SP)
- Data will be used to recreate growth histories
- Match growth to environmental conditions



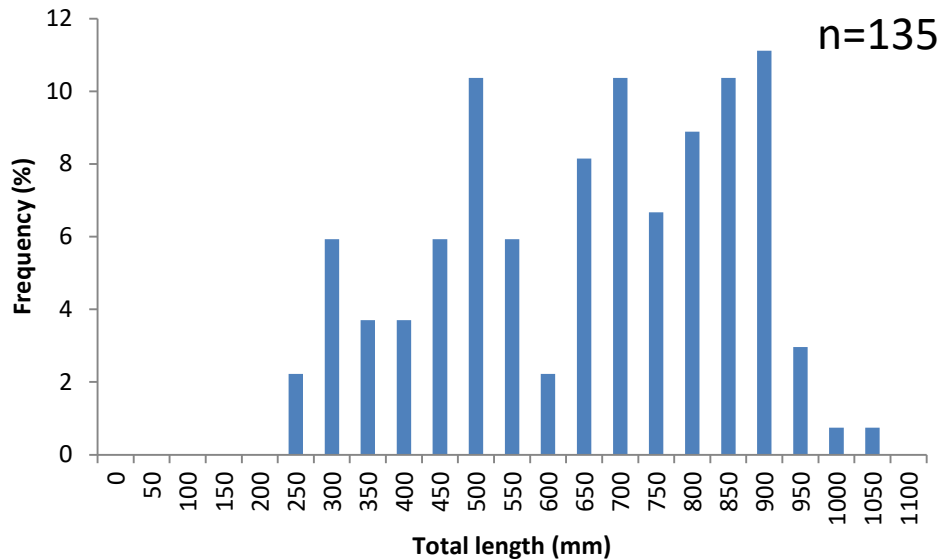
Data, data and data

- Age
- Growth
- Source
- Movement
- ...all in the ears



2016 fish kills

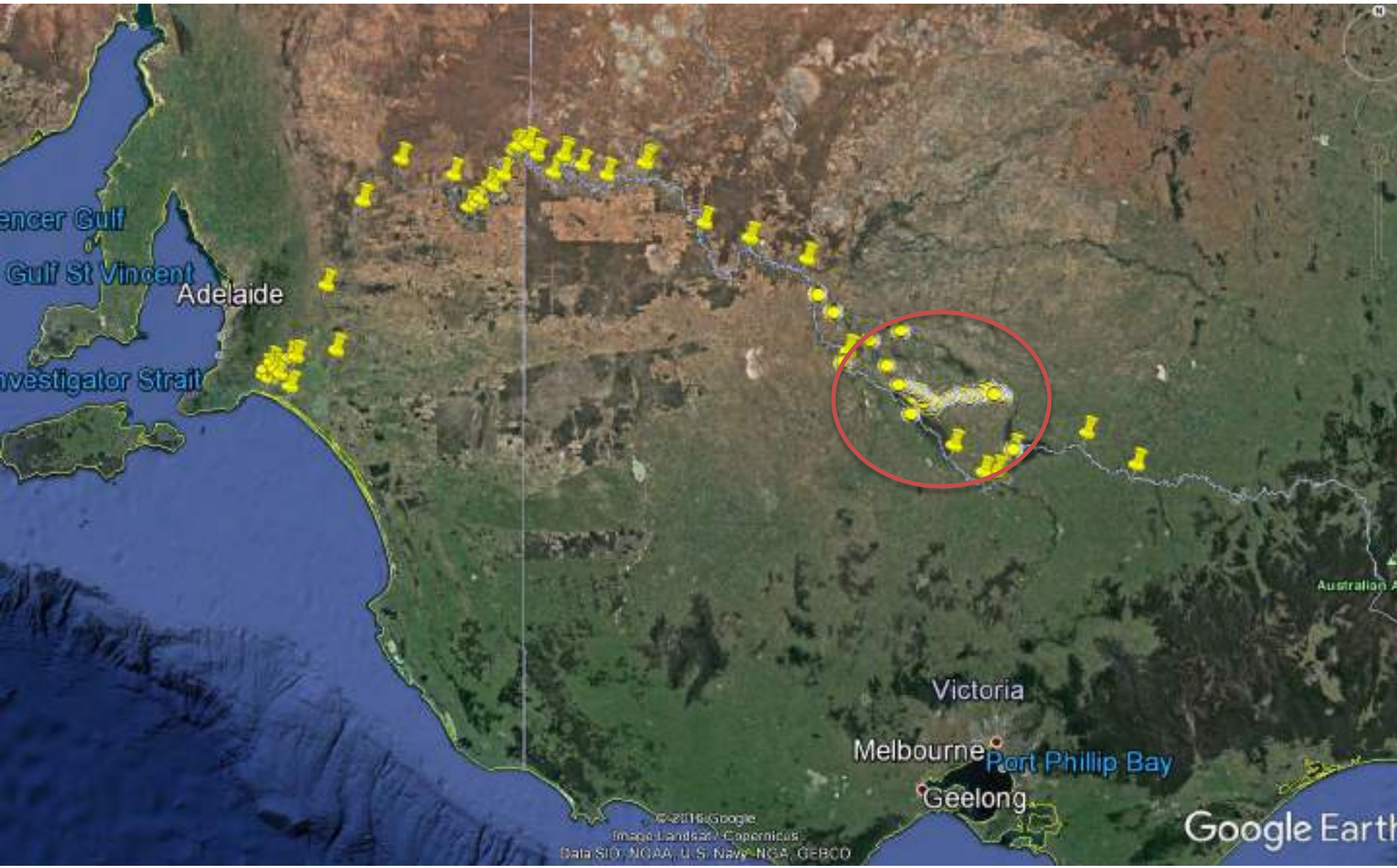
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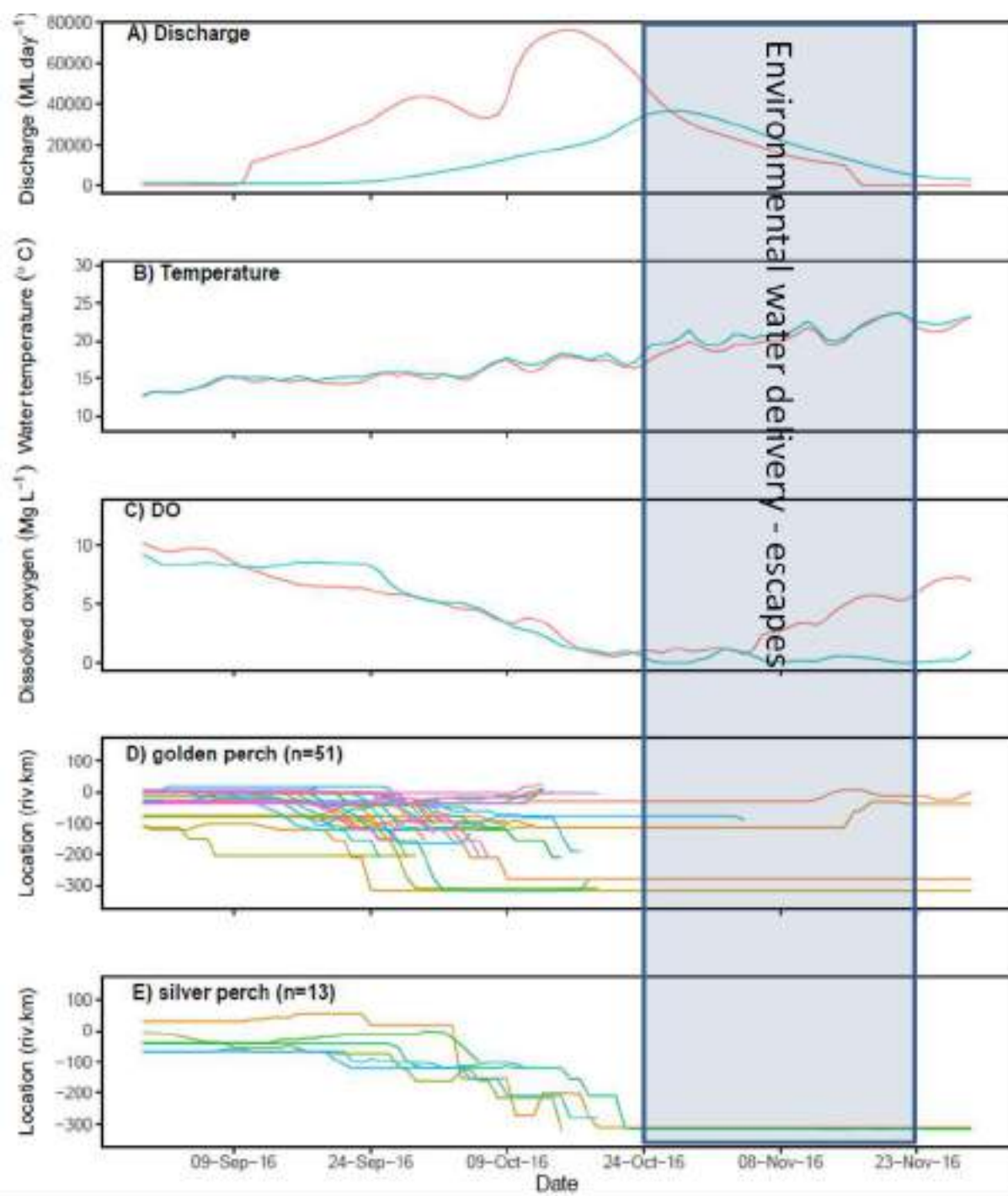


Did Any Fish Survive and Where did they go?

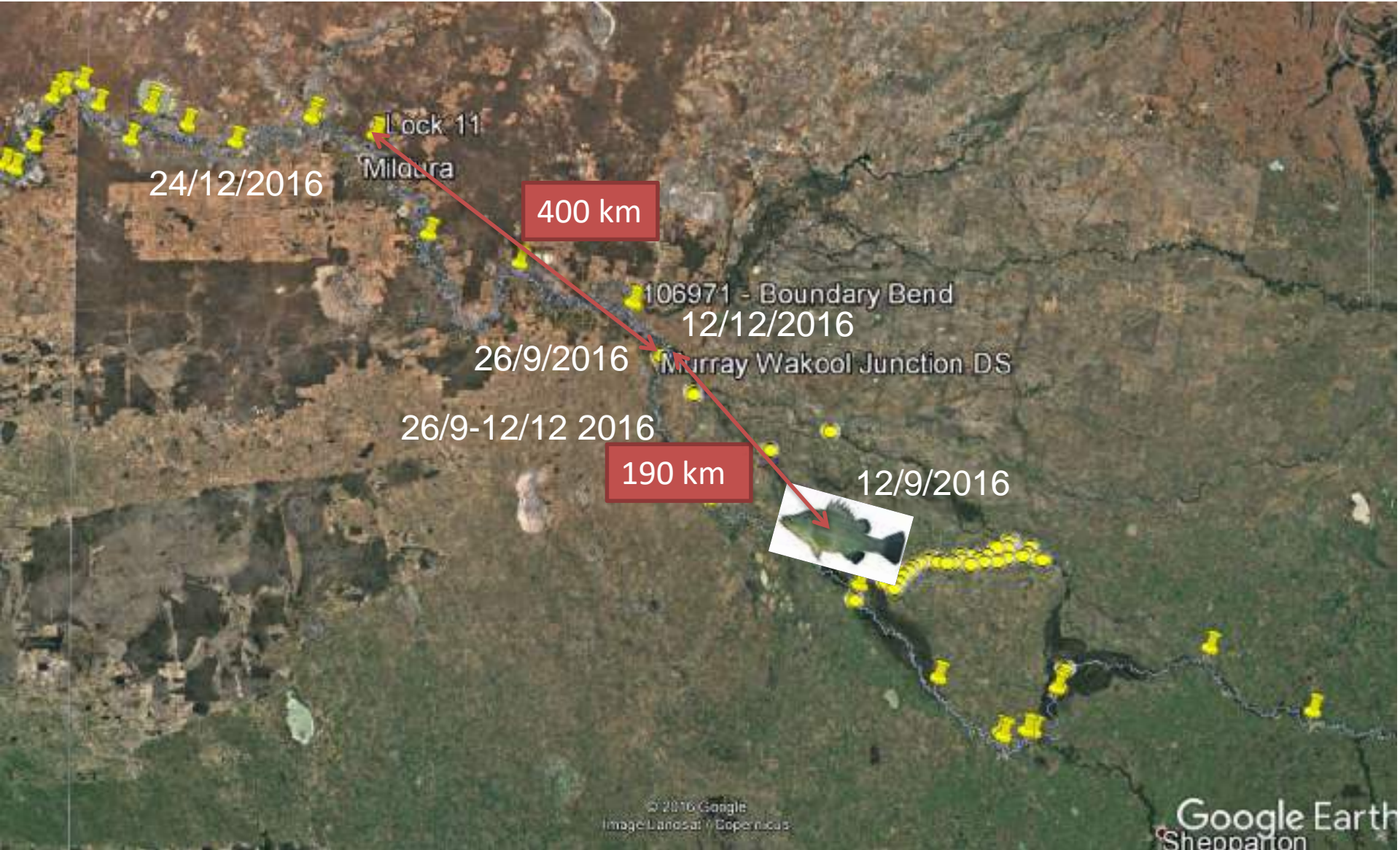


Southern MDB telemetry array

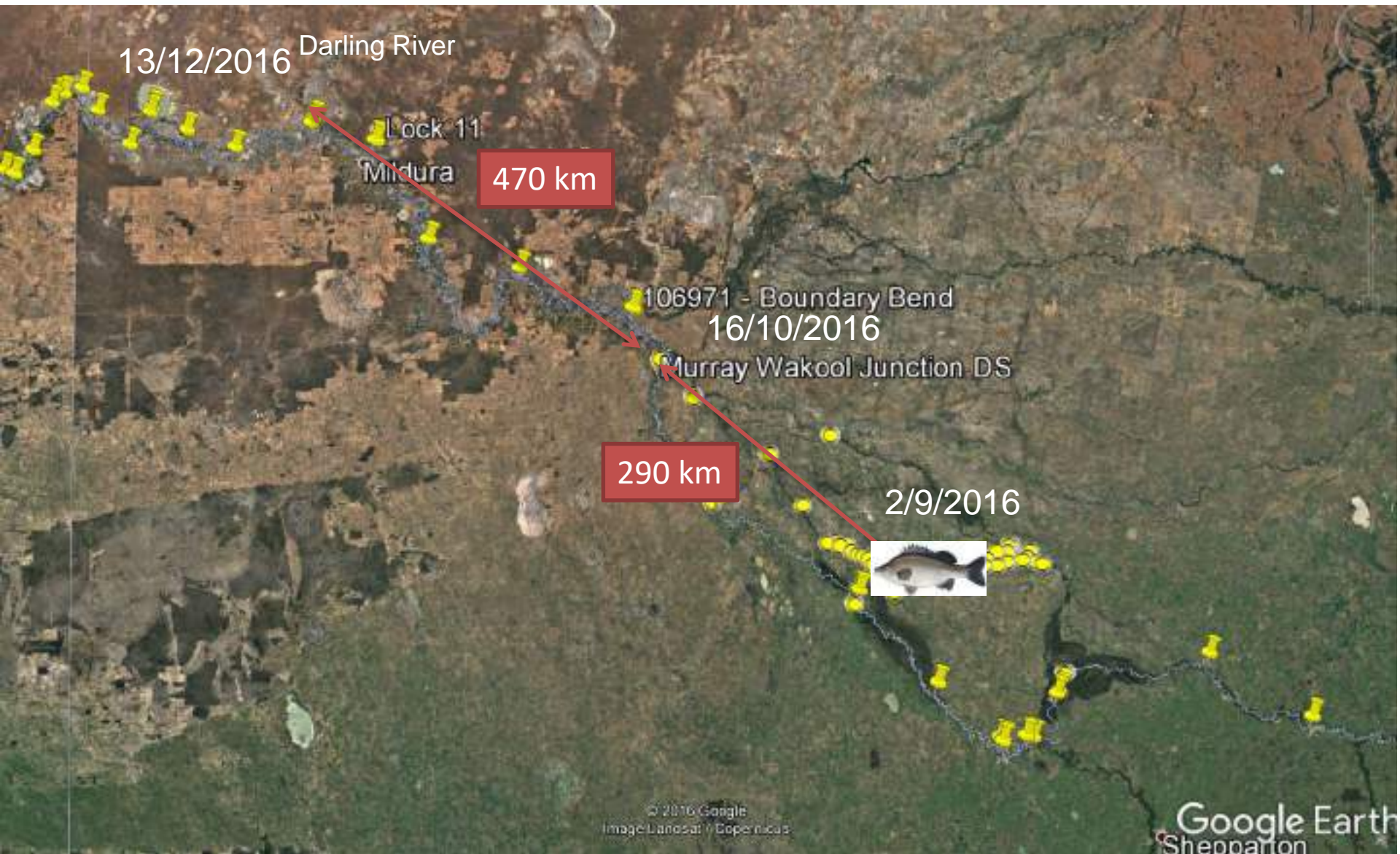




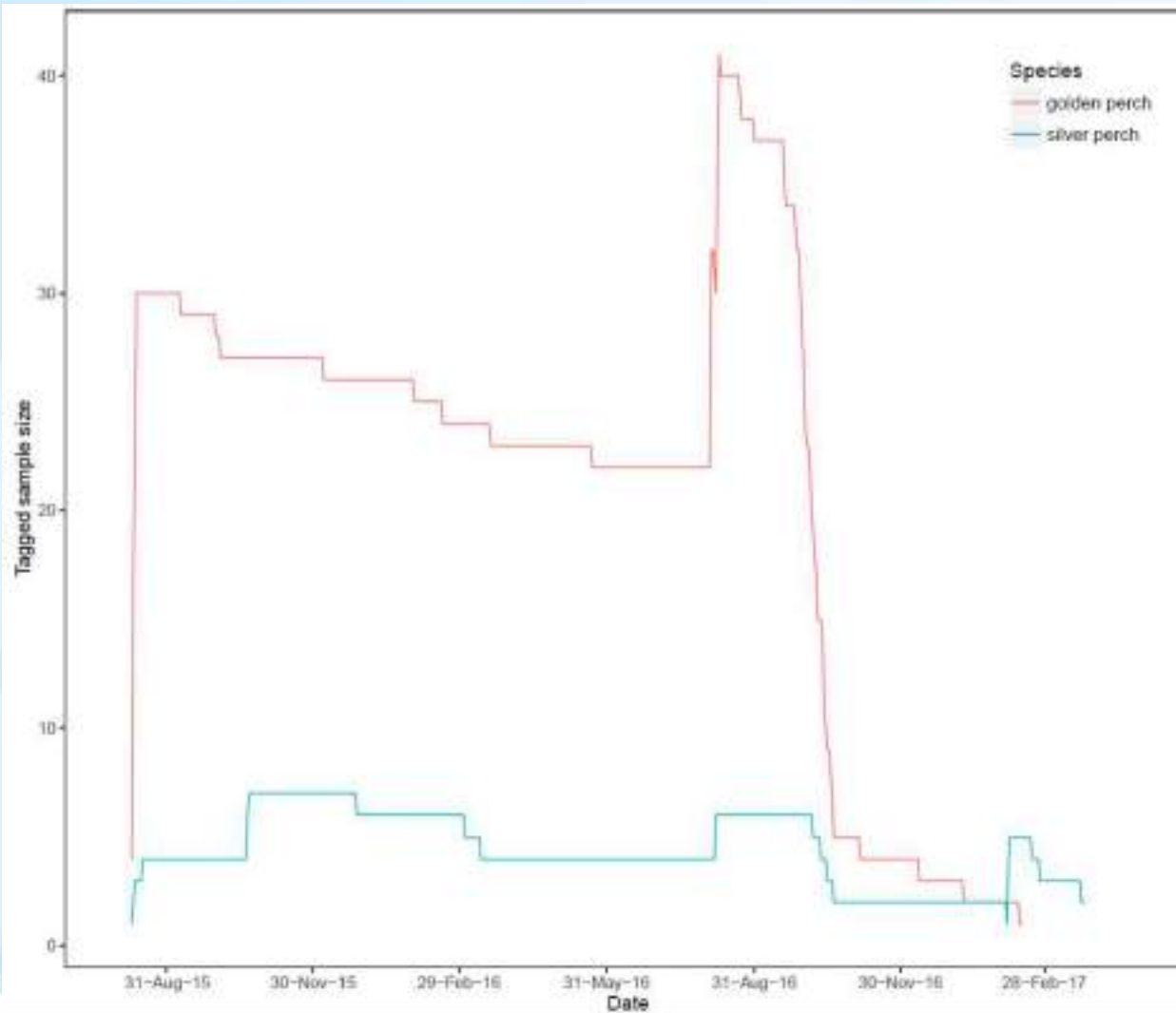
Golden perch - 37212



silver perch - 37202

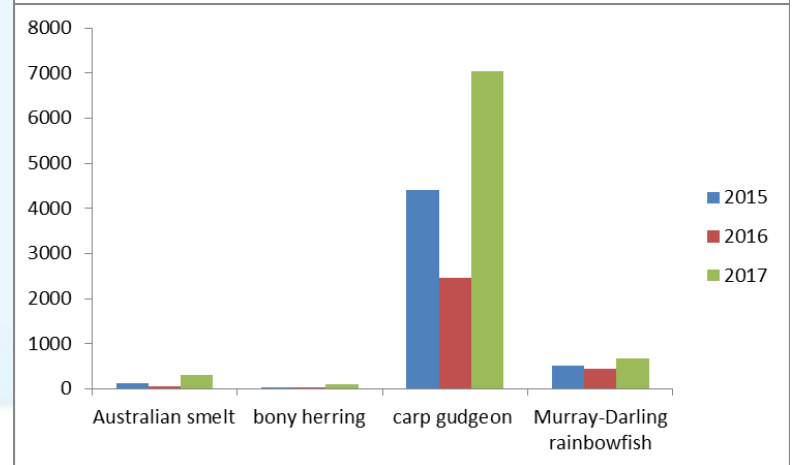
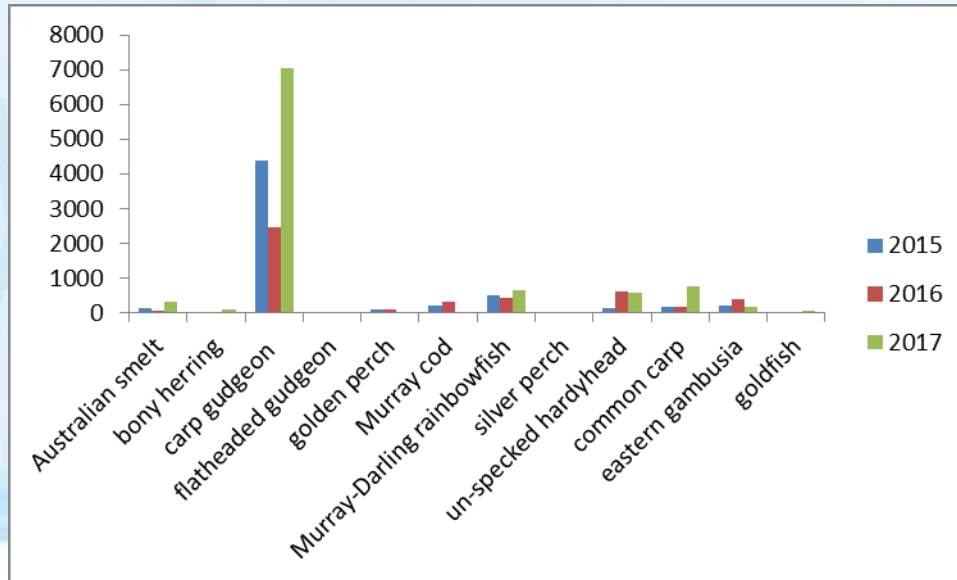
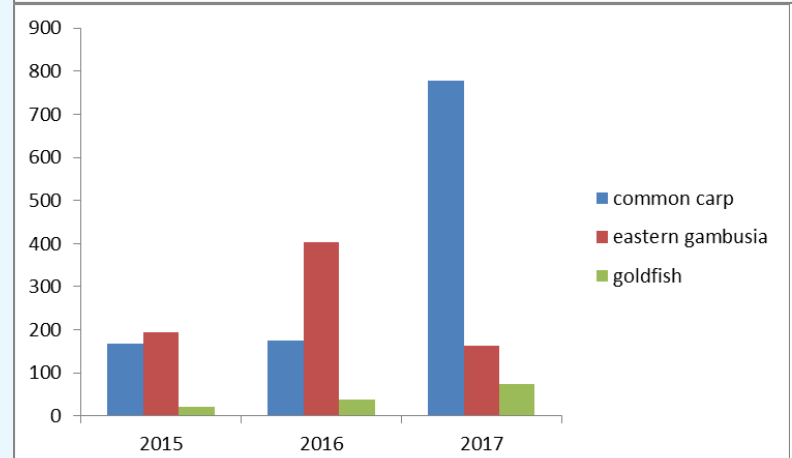
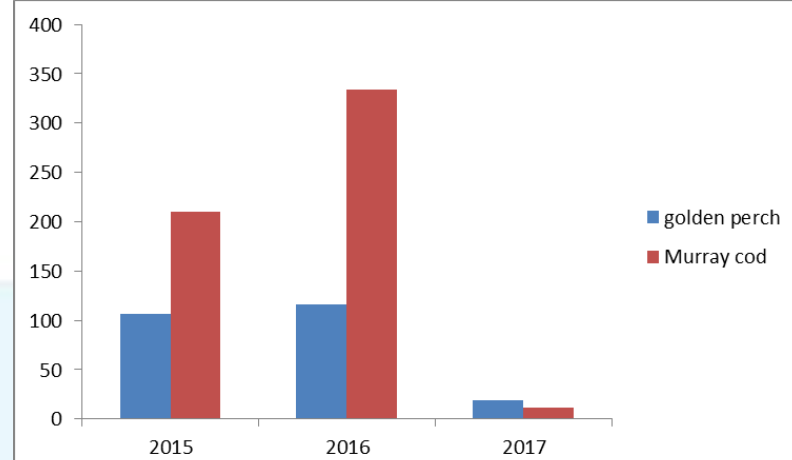


What Remains



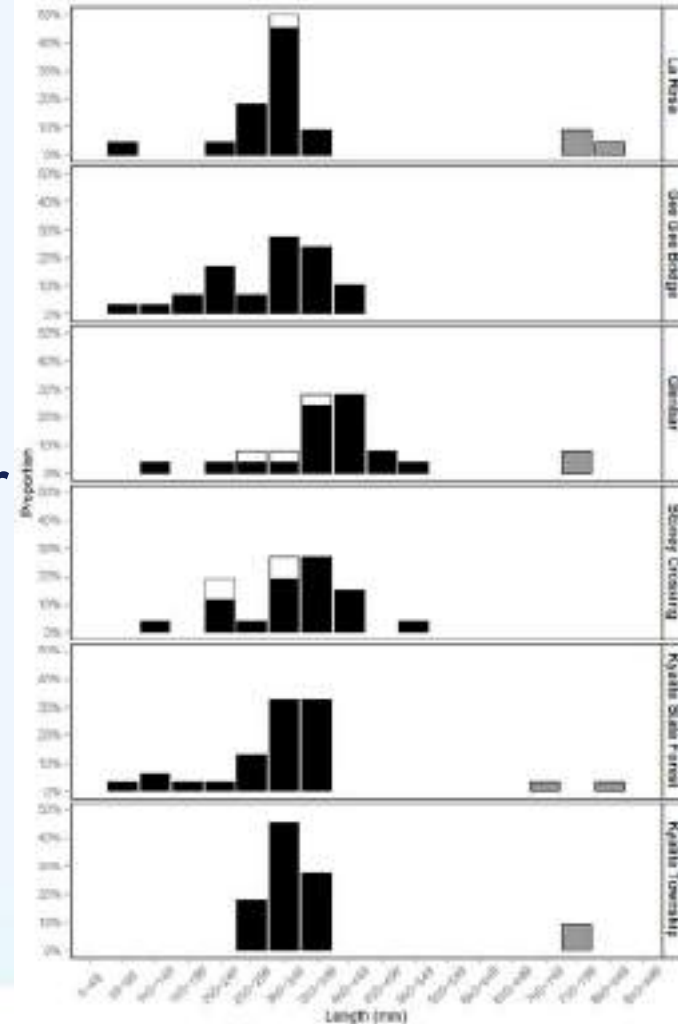
What Remains

Fish species	2015				2016				2017			
	BE	SFN	BT	Total	BE	SFN	BT	Total	BE	SFN	BT	Total
<i>native species</i>												
Australian smelt	129	2	-	131	52	1	-	53	293	10	-	303
bony herring	31	-	-	31	27	-	-	27	108	-	-	108
carp gudgeon	47	4302	51	4400	68	2367	15	2450	165	6814	66	7045
flatheaded gudgeon	-	-	1	1	-	-	3	3	-	-	-	0
golden perch	107	-	-	107	116	-	-	116	19	-	-	19
Murray cod	210	-	-	210	333	1	-	334	12	-	-	12
Murray-Darling rainbowfish	339	168	-	507	353	77	5	435	650	19	-	669
silver perch	5	-	-	5	5	-	-	5	3	-	-	3
un-specked hardyhead	86	64	-	150	565	35	-	600	510	72	-	582
<i>alien species</i>												
common carp	167	-	-	167	176	-	-	176	735	40	3	778
eastern gambusia	18	175	-	193	36	366	1	403	31	125	8	164
goldfish	21	-	-	21	38	-	-	38	73	2	-	75



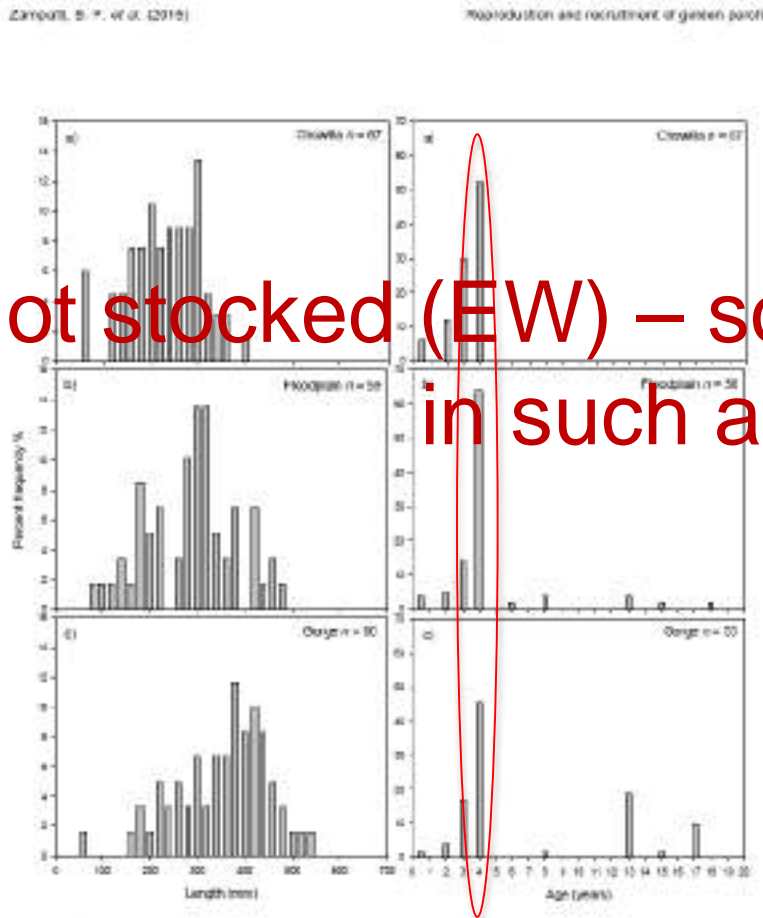
What now for recovery

- Still some large cod in the system
- Should see local recruitment for cod
- No spawning or recruitment of Goldens and Silvers
- Need to create attractant flows for Goldens and Silvers



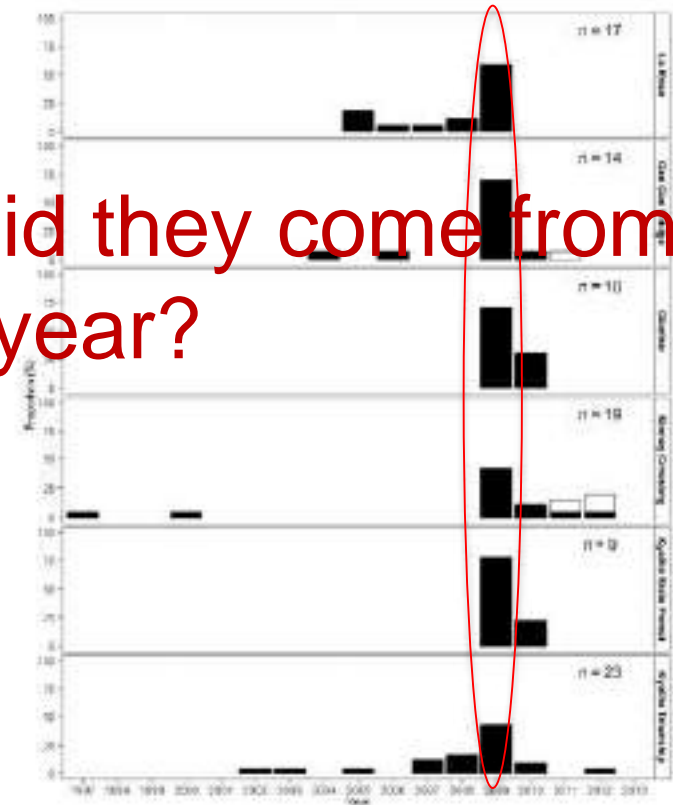
Identifying recruitment hotspots – Darling GP example

lower Murray



Edward-Wakool

J. D. THIEM ET AL.



Not stocked (EW) – so where did they come from in such a low flow year?

Identifying recruitment hotspots – Darling GP example

- GP spawning occurred on a high flow event in the Darling in 2009/10 – drought in the southern MDB
- Strong survival and YOY recruitment
- This year class turned up in areas with low flows that season (i.e. lower Murray)
- Years later (2013 & 2014) the 2009/10 year-class of GP were dominant (>40%) throughout the Murray



Flows are important to trigger more than just spawning migrations

Torrumbarry fishway captures during high flow events



What Can Be Done

- Under current management and constraint scenarios this may be the new normal!!
- Given climate change predications it is going to get worse
- We need new ways of thinking about how we manage our systems
- Greater input and voice from interest groups
- Better engagement, information and support

What Else Can Be Done

- Focus on improving the overall health of our river systems
- Improved fish passage
- Increased habitat (particularly snags)
- Restore vegetation
- Restore flows for movement breeding and recruitment
- Reintroduce local extinct native fish

Where to From Here

- Our ability to manage impacts during the events is extremely limited
- Management to prevent or limit these events needs to occur between flood events.

