

# Understanding risks to shorebirds & fisheries from reduced Gulf river flows

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Griffith University



National Environmental Science Programme

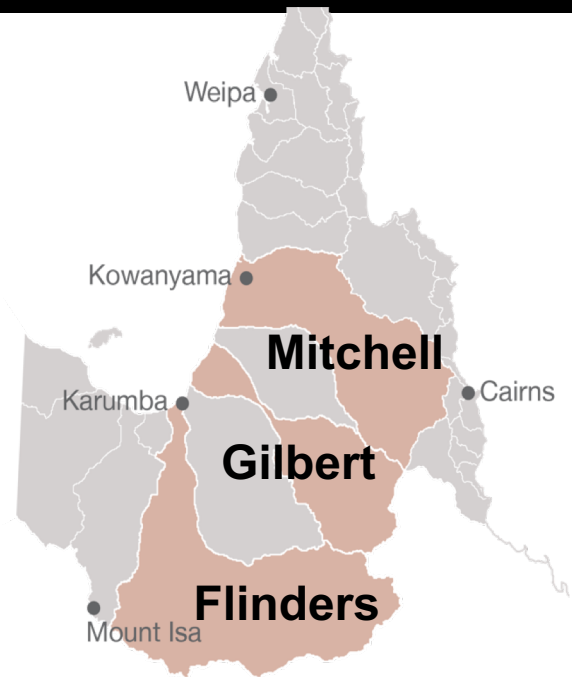
# Water development is occurring in Gulf rivers – Flinders, Gilbert and Mitchell Rivers

- How will this affect estuaries and floodplains?
- What are the tradeoffs with agriculture?





# Mitchell River



# Gilbert River



# Flinders River



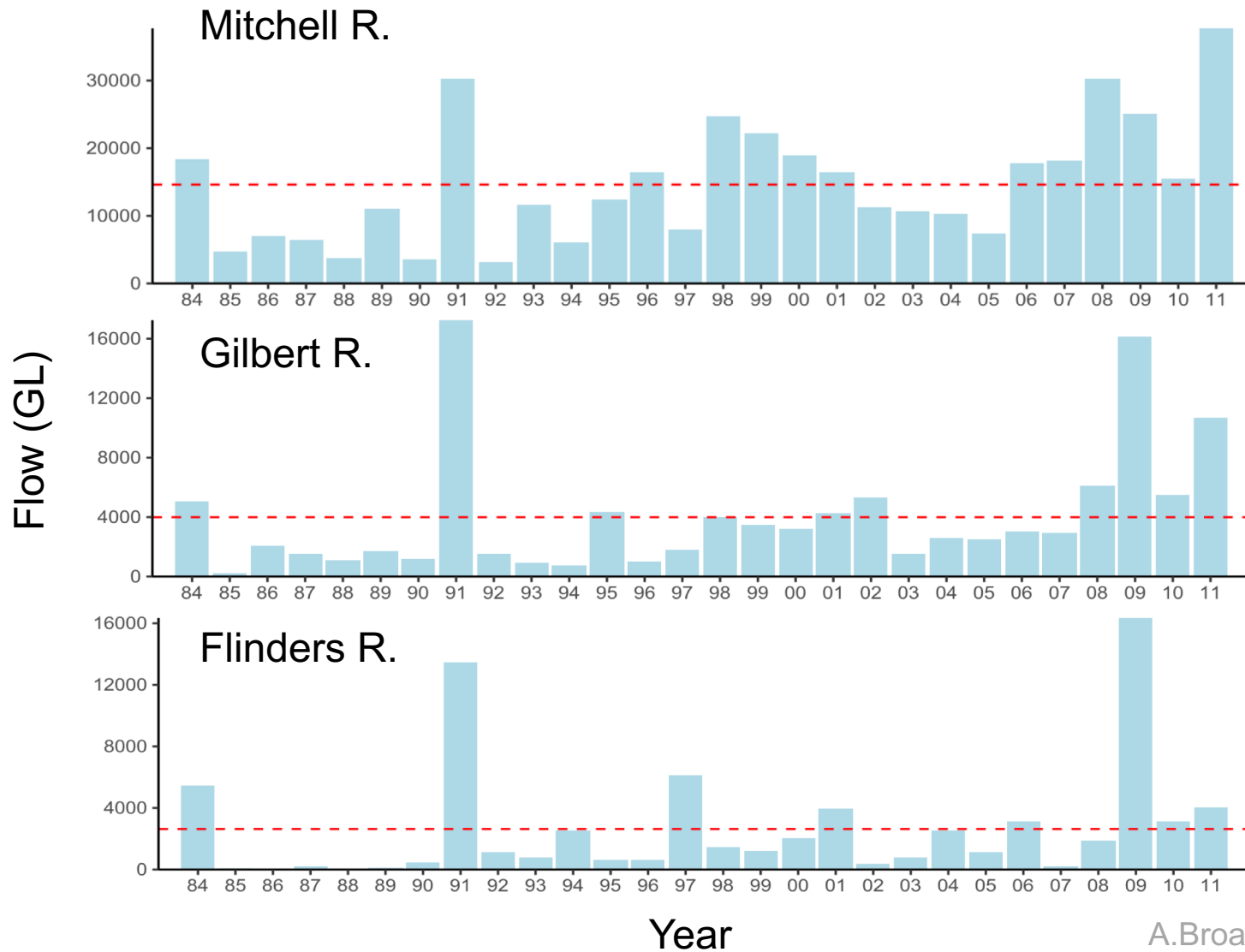
# Importance of southern Gulf for shorebirds

- 2<sup>nd</sup> most important Shorebird Site of International Importance in Australia
- 50% (ca. 2,000,000) use Gulf from Oct–March
- Endangered & critically endangered species





# Mean annual flow



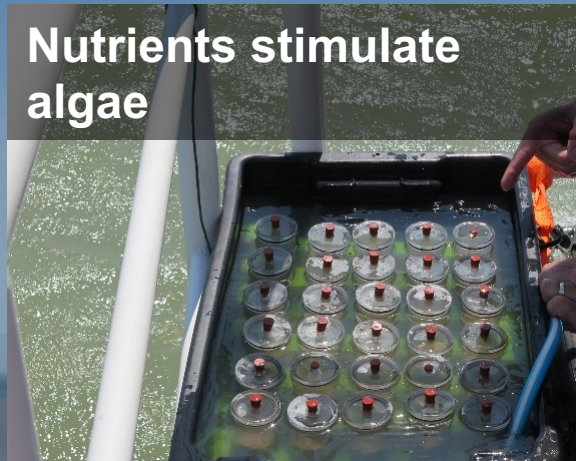
A. Broadley PhD student  
CSIRO data

# What do floods bring to estuaries?





# Floods bring nutrients & sediment which fuel productivity



**Longer term  
Months – years**

**Short term  
Weeks – months**

**Water, nutrients &  
sediment loads**





# Food for prawns and shorebirds



Bivalves



Crustaceans



Forams



Gastropods



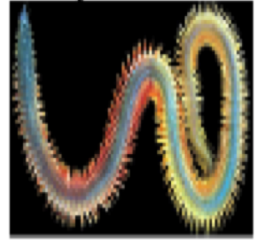
Nematodes



Ostracods

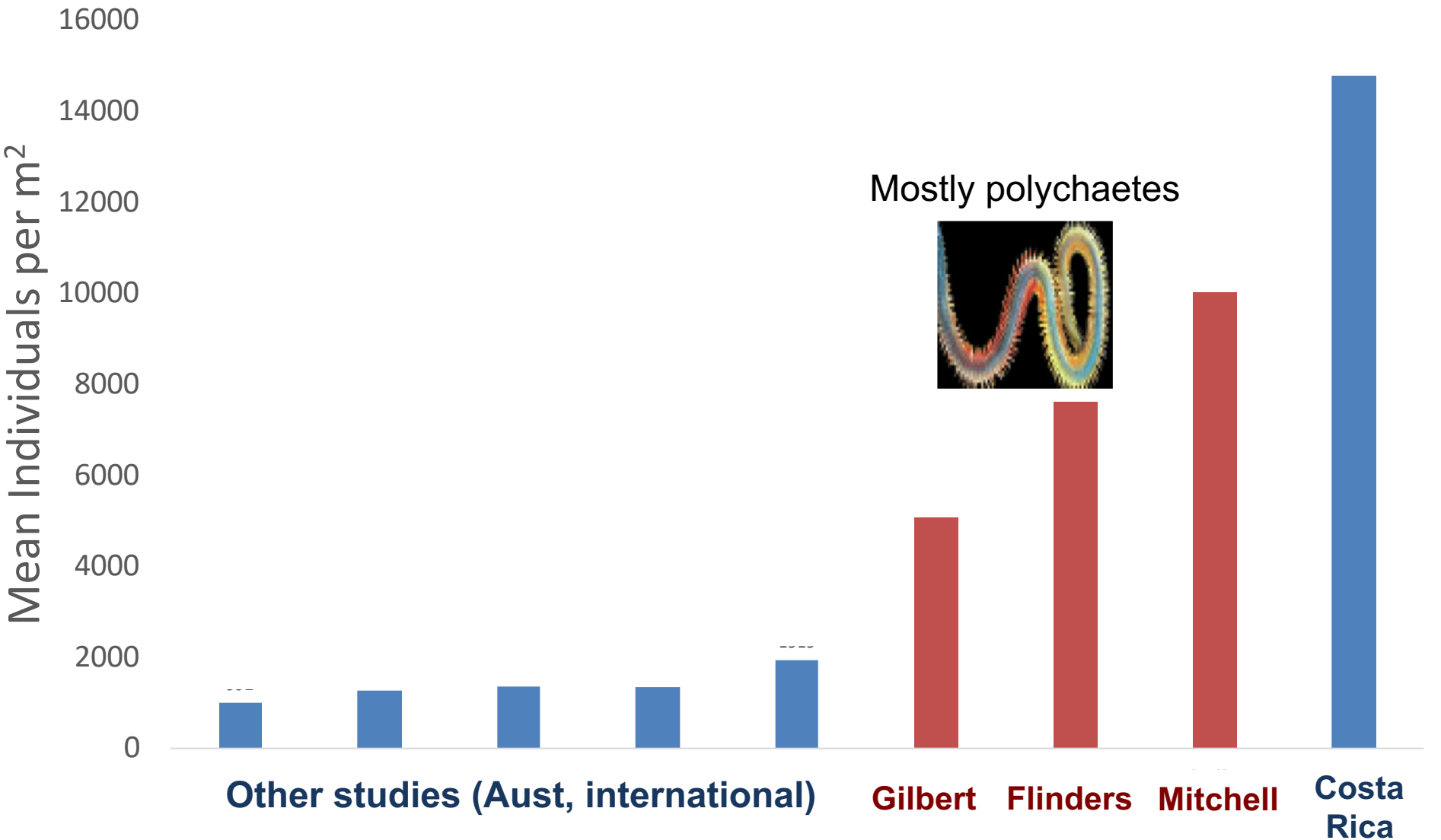


Polychaetes





# High abundance of benthic animals in Gulf rivers



V. Lowe, honours student

# Can we link food supplies with shorebirds?

- Surveys across estuaries
  - Qld Wader Study Group (QWSG)
  - March 2019
- Surveys in Flinders River
  - Carpentaria Land Council Aboriginal Corporation (CLCAC)
  - Jan, April, Sept 2019



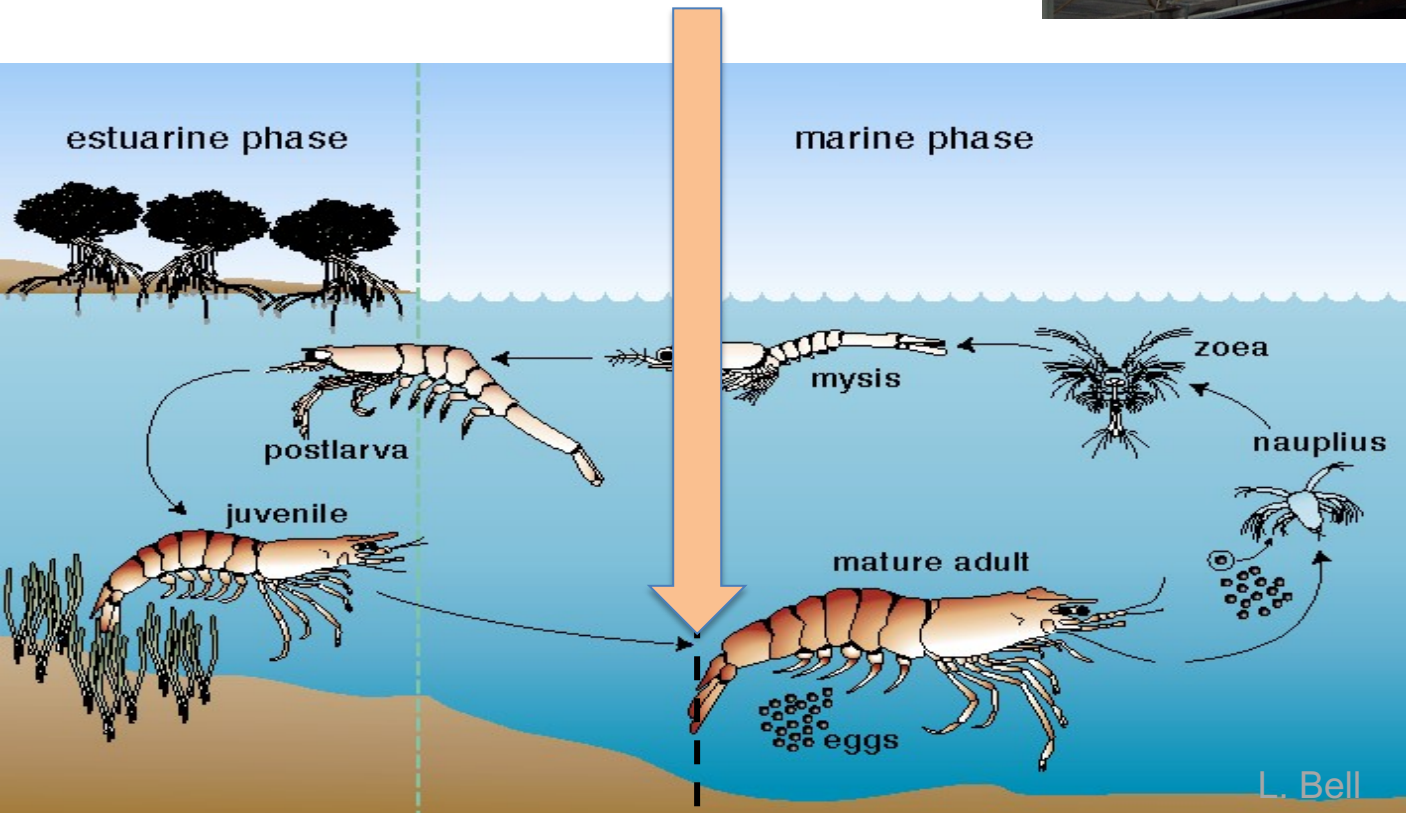
Photo: Carpentaria LCAC



# Banana prawn fishery is major industry in Gulf



Freshwater flows

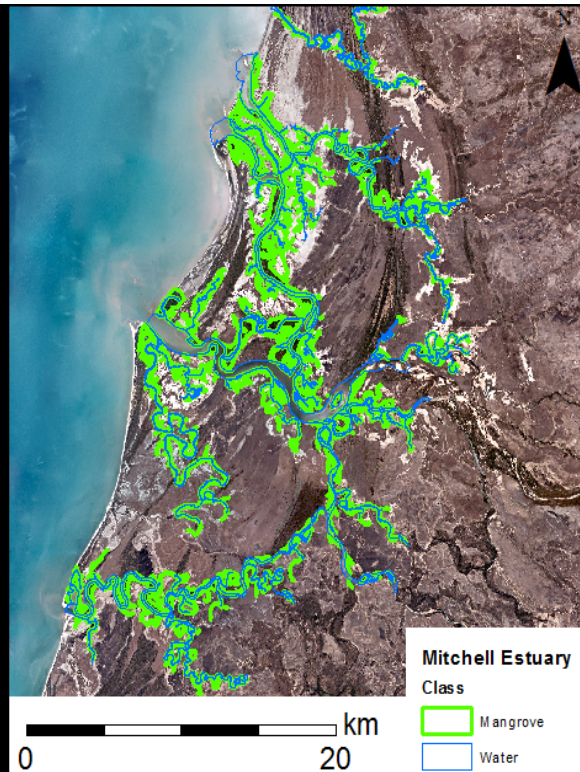




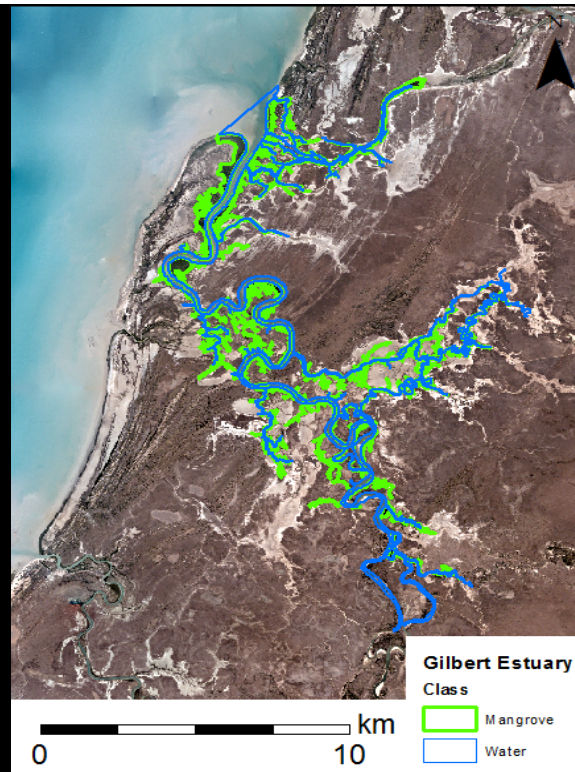
# How much mangrove habitat in each estuary?



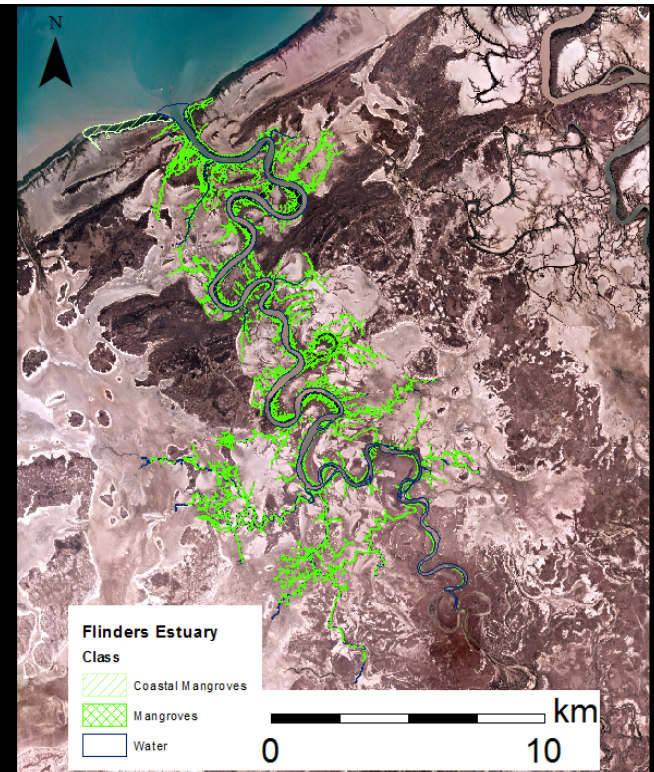
Mitchell River  
5833 ha



Gilbert River  
723 ha



Flinders River  
939 ha





# How many prawns in each estuary in Nov 2016?

## Mitchell

80.5 million ( $\pm 27$  million)



## Gilbert

13.4 million ( $\pm 8$  million)



## Flinders

15.9 million ( $\pm 10.9$  million)



R. Kenyon/S. Faggotter



# Nov 2017?

## Mitchell

80.5 million

30.9 million ( $\pm 9.3$  million)



## Gilbert

13.4 million

32.7 million ( $\pm 14.7$  million)



## Flinders

15.9 million

5.7 million ( $\pm 2.2$  million)



R. Kenyon/S. Faggotter



# Linking floods to floodplain production and barramundi fisheries

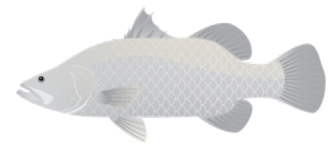
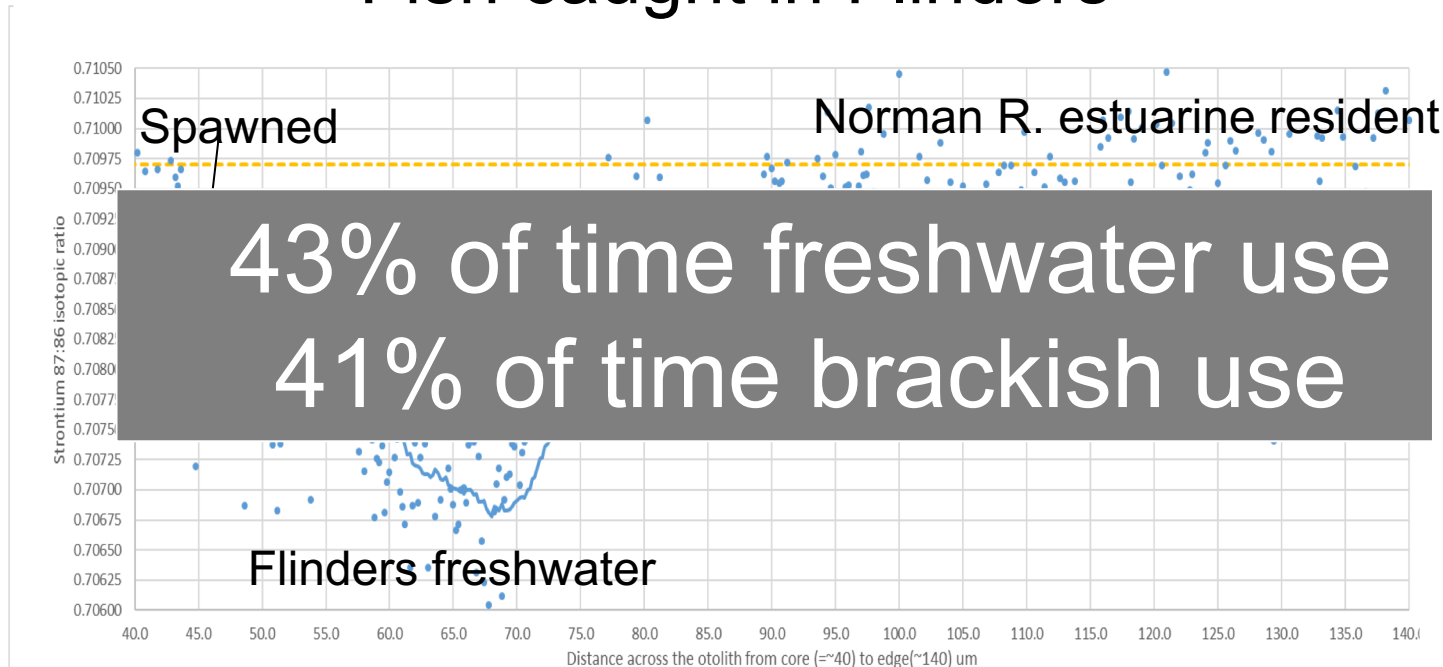




# How do barramundi use the rivers?



## Fish caught in Flinders



Julie Robins DAF (Agri-Science Qld)



# What are we delivering?

- How does flow affect species with different life histories in estuaries, coastal area, floodplains across three systems?
  - Freshwater
  - Nutrients
- What are the long and short term effects of flow?
- What are the implications of changing flow?



# Planned outputs

- Conceptual models of flow-ecology relationships
- Research summaries for government and industry
- Products to raise stakeholder understanding of Gulf's flow-dependent assets
- Wrap-up factsheet
- Scientific publications
- Projects wrapping up June 2020







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# Investigating economic trade-offs from reduced Gulf of Carpentaria river flows

Dr Jim Smart, Australian Rivers Institute  
Griffith University

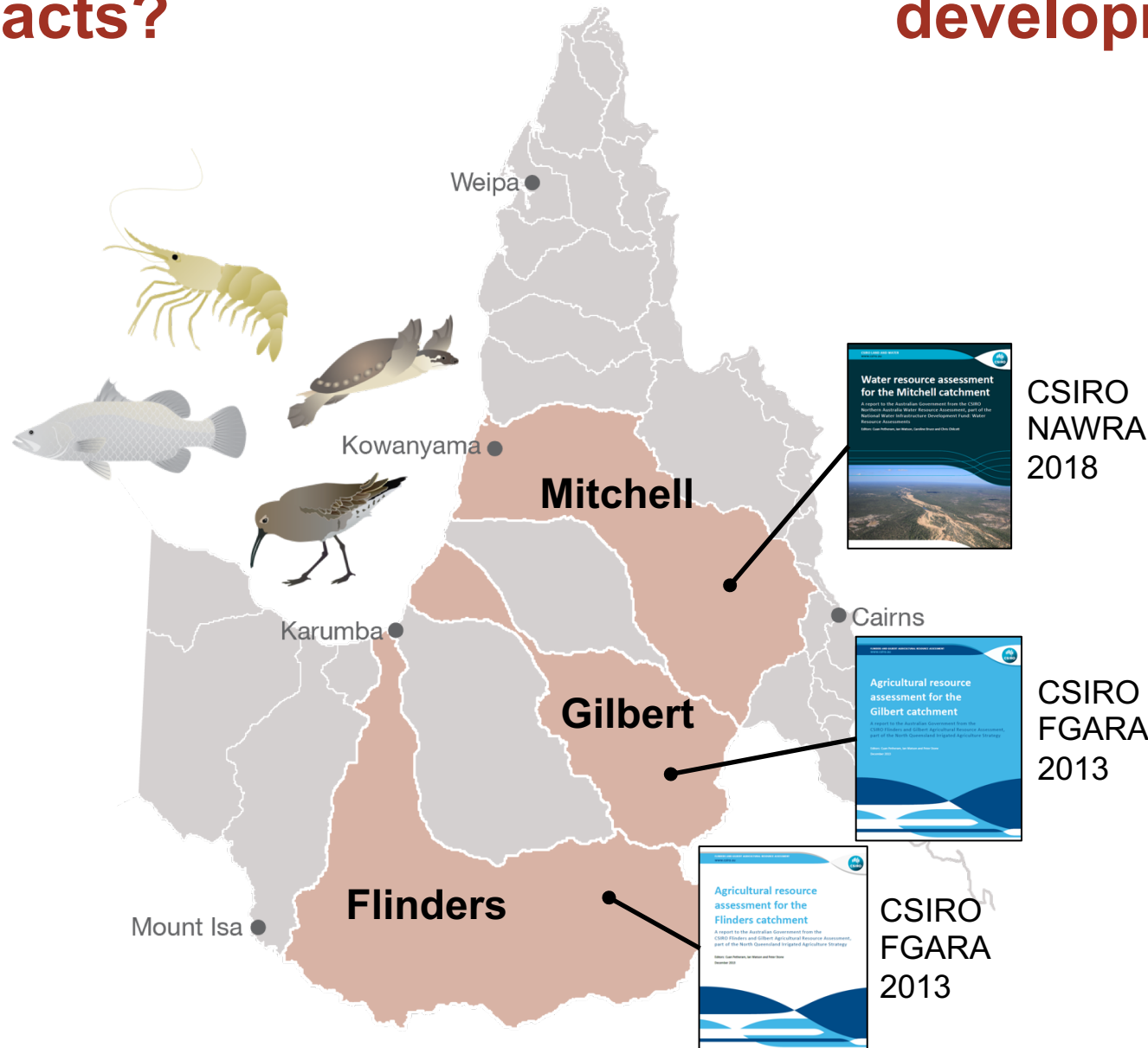


Joe McMahon



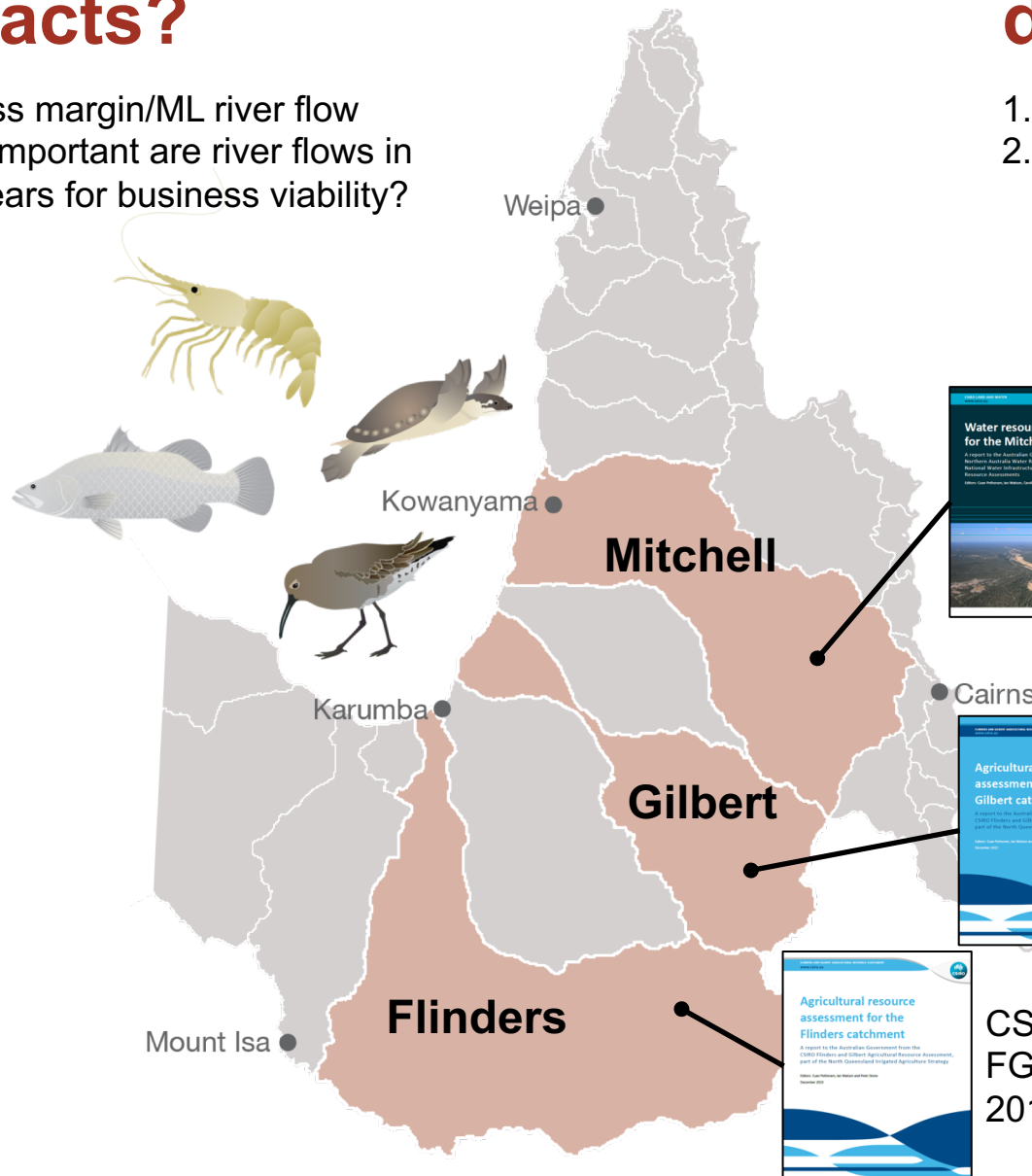
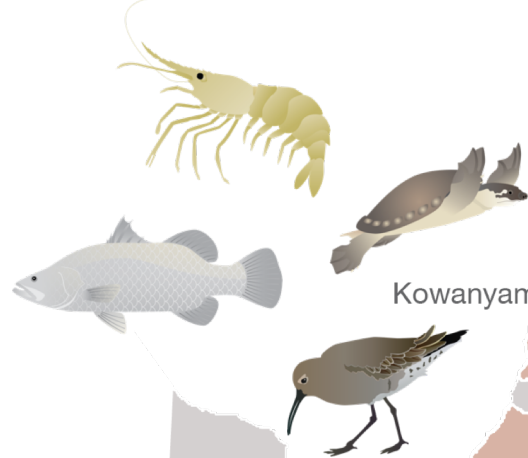
# Flow-related impacts?

# Agricultural development?



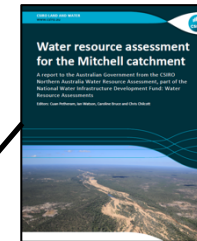
# Flow-related impacts?

1. \$ gross margin/ML river flow
2. How important are river flows in dry years for business viability?



# Agricultural development?

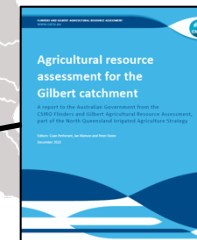
1. \$ gross margin/ML extracted
2. How important are extractions in dry years for business viability?



**CSIRO  
NAWRA  
2018**

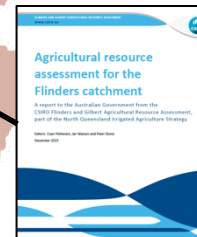
**Mitchell**  
Dams (4): up to 2800GL/yr released from dam walls.  
Sugar cane: gross margin \$140/ML extracted

Farm ring tanks (500): up to 2000GL/yr extracted.  
Cotton (dry season): gross margin \$320/ML extracted



**CSIRO  
FGARA  
2013**

**Gilbert**  
Dams (2): up to 450GL/yr released from dam walls  
Mixed cropping: gross margin \$130/ML extracted



**CSIRO  
FGARA  
2013**

**Flinders**  
Farm ring tanks: up to 350GL/yr extracted.  
Mixed cropping: gross margin \$120/ML extracted



# Northern Prawn Fishery: banana prawns

- \$217 million catch revenue in 2017 (AFMA)
- 52 boats with fishing rights

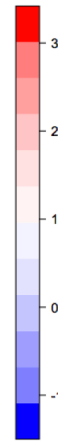
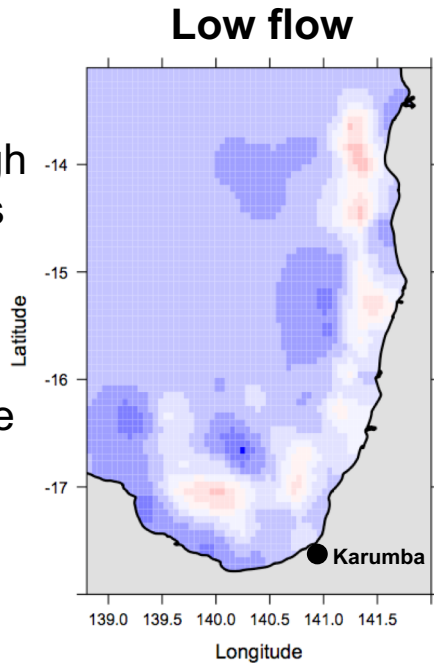


# Spatial fields from flow, climate and catch model (1984-2011)



\$ gross margin/ML is high in low flow years

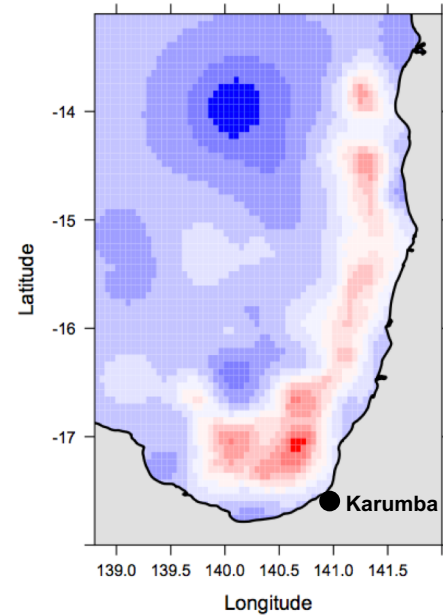
This is where concerns about extractions come from



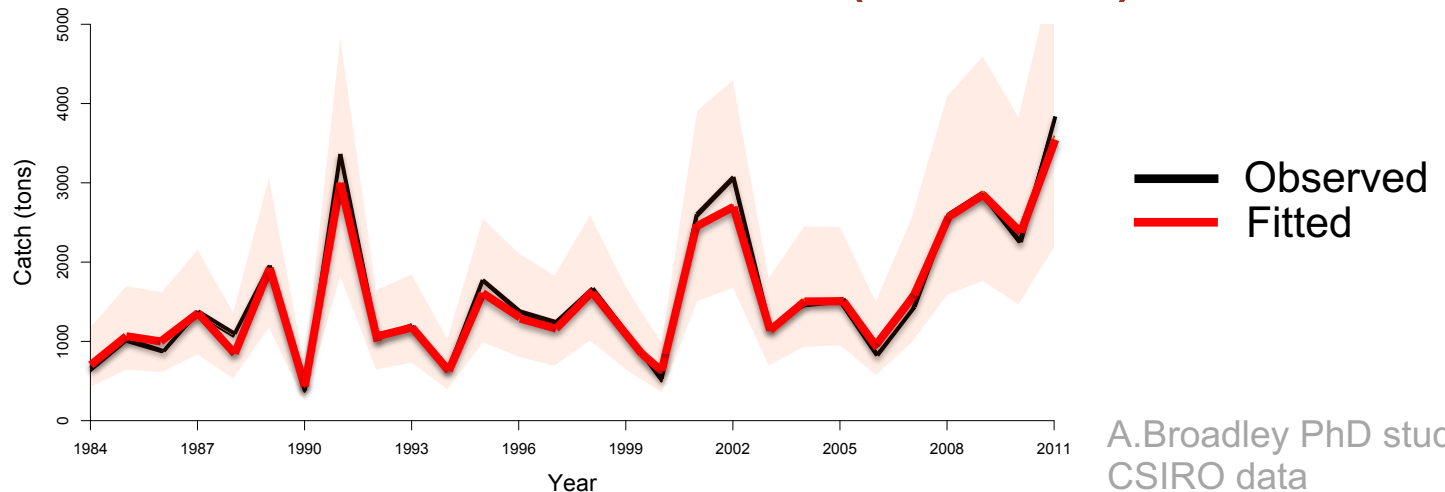
**High flow**

\$ gross margin/ML is very low in high flow years

No concerns about extractions in this situation

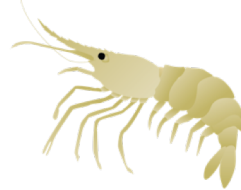


## Banana prawn: flow, climate and catch model (1984-2011)

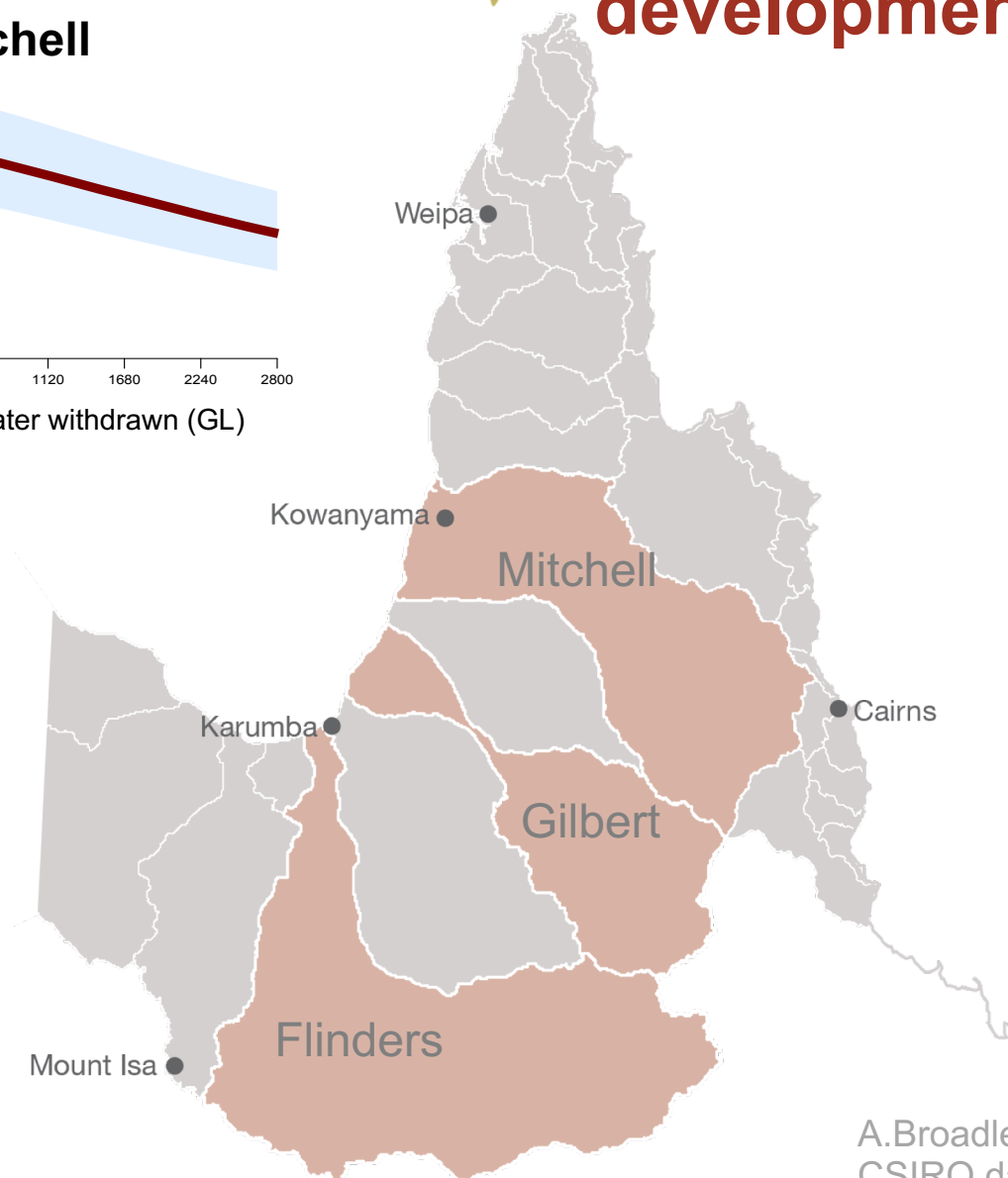
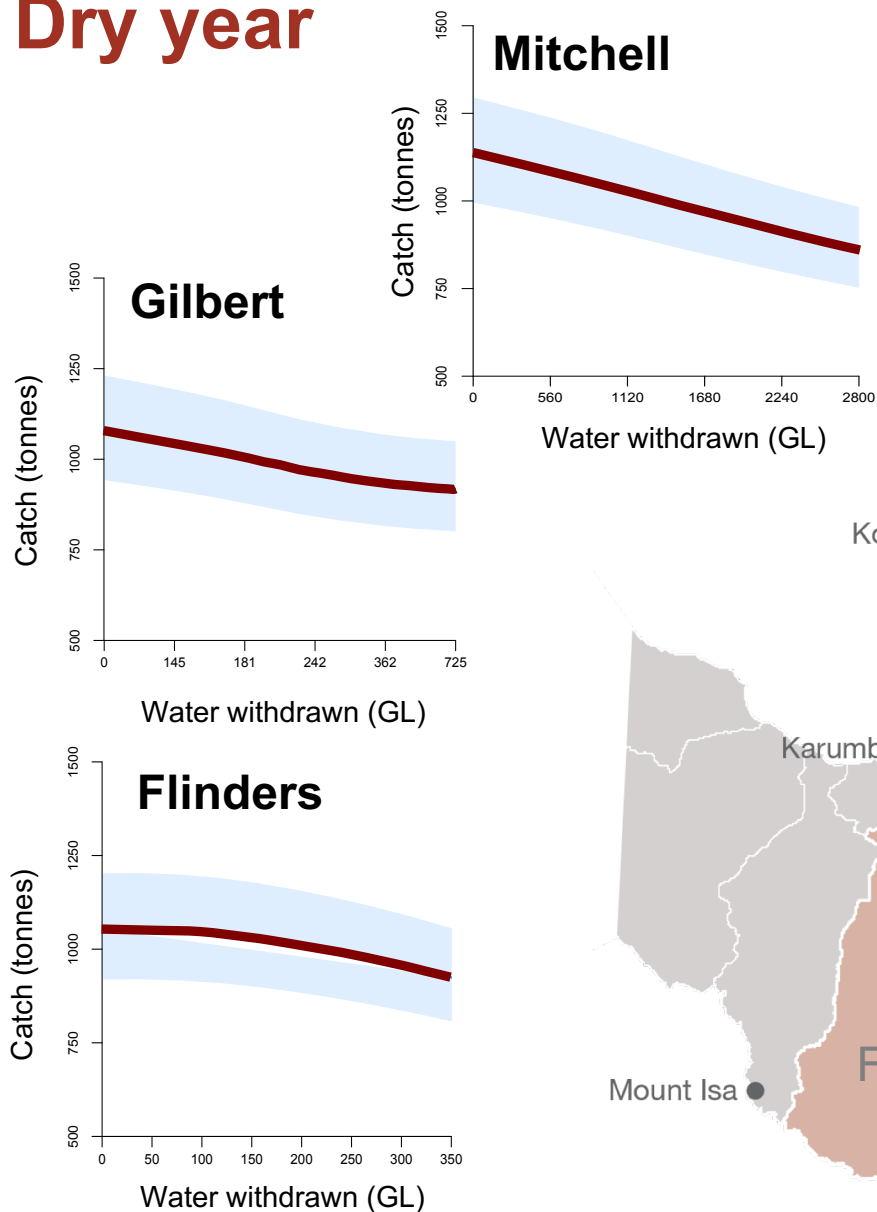


A. Broadley PhD student  
CSIRO data

# Flow-related impacts? Dry year



# Agricultural development?



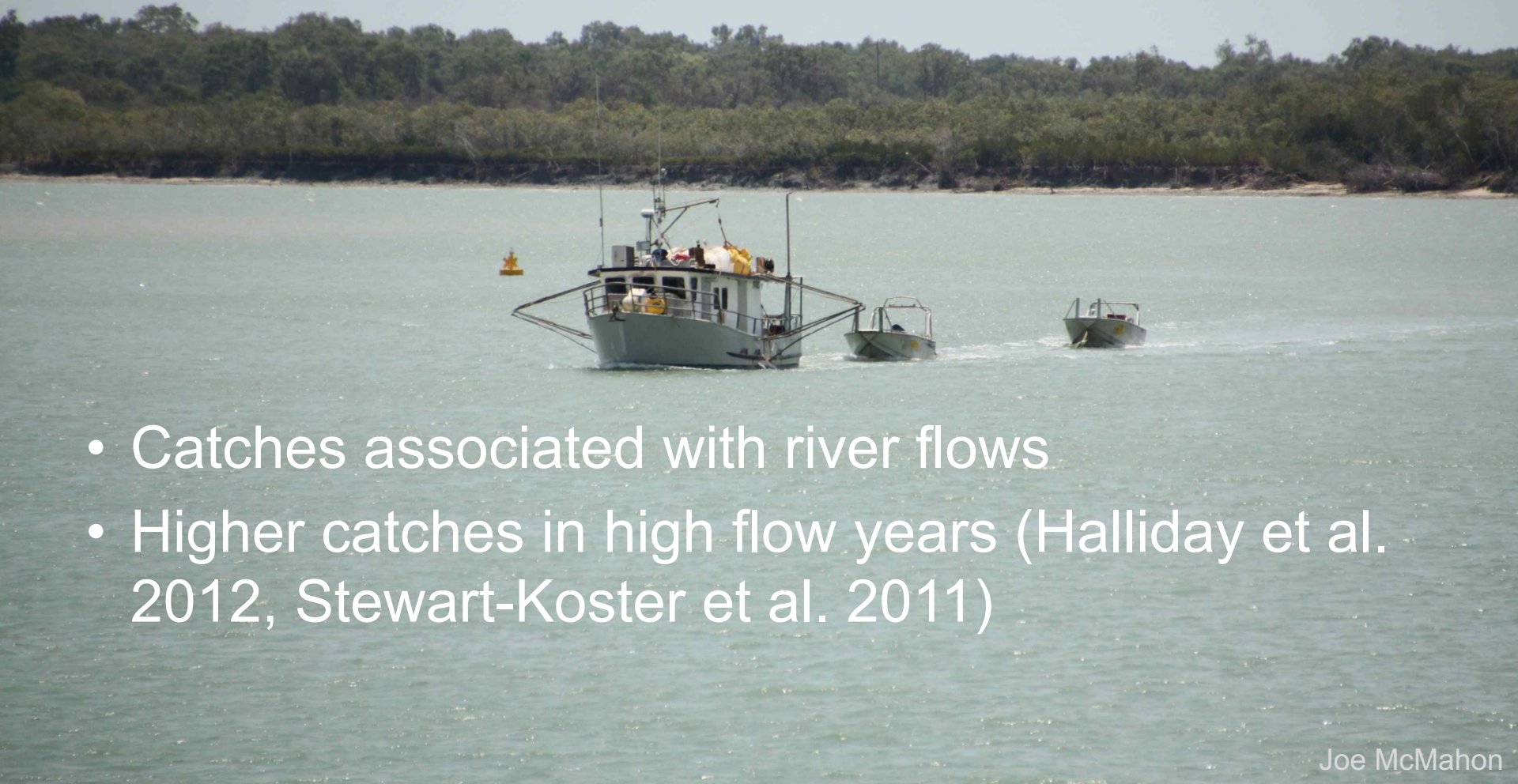
A. Broadley PhD student  
CSIRO data



# Commercial barramundi fishery

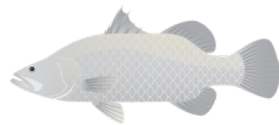


- \$6 million catch revenue in 2017 (Qld DAF)
- 73 licences in 2018

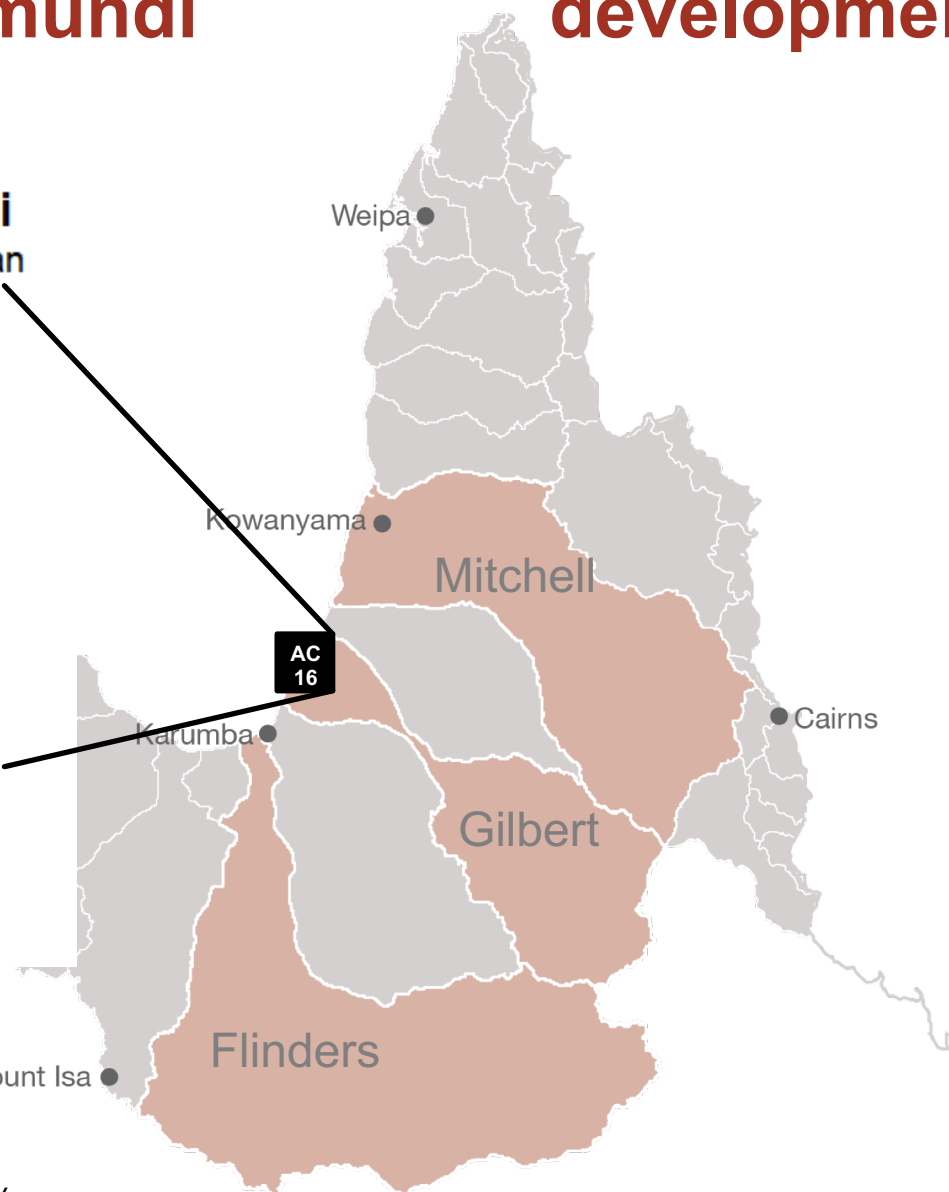
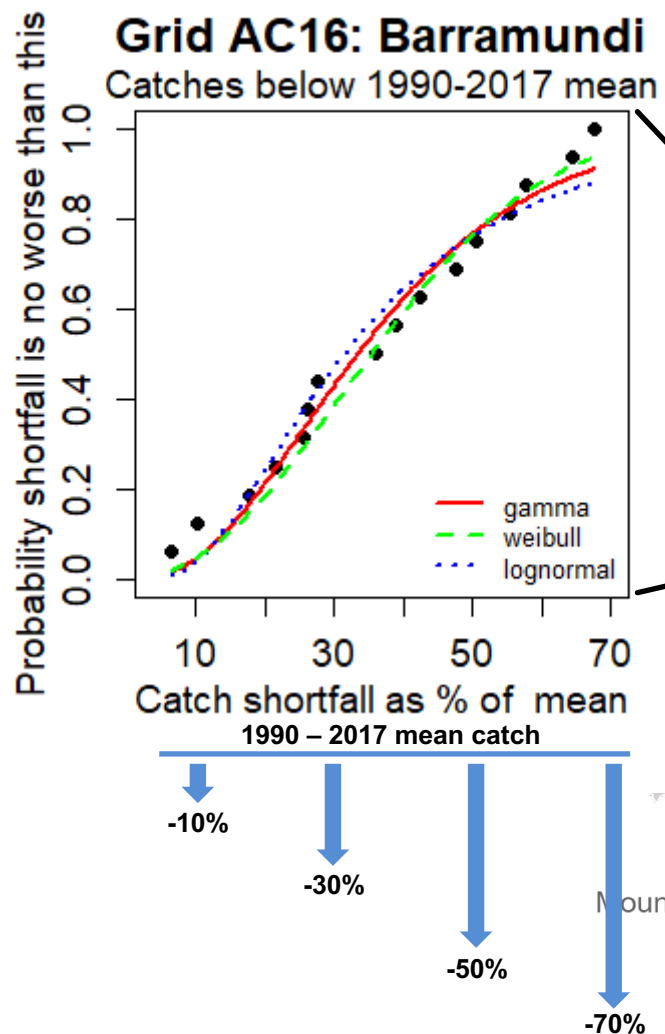


- Catches associated with river flows
- Higher catches in high flow years (Halliday et al. 2012, Stewart-Koster et al. 2011)

# Flow-related impacts? Bad years: barramundi



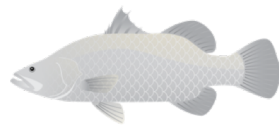
# Agricultural development?



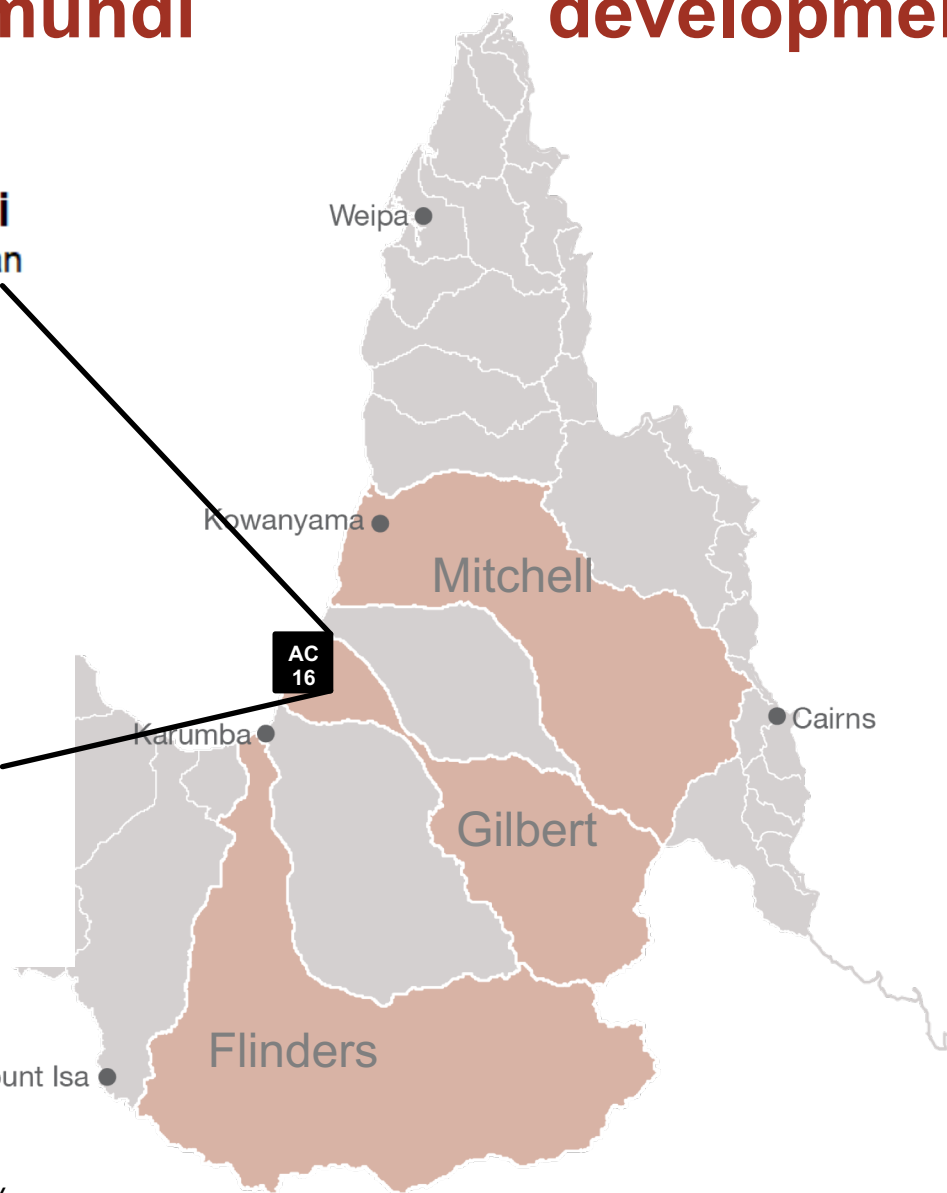
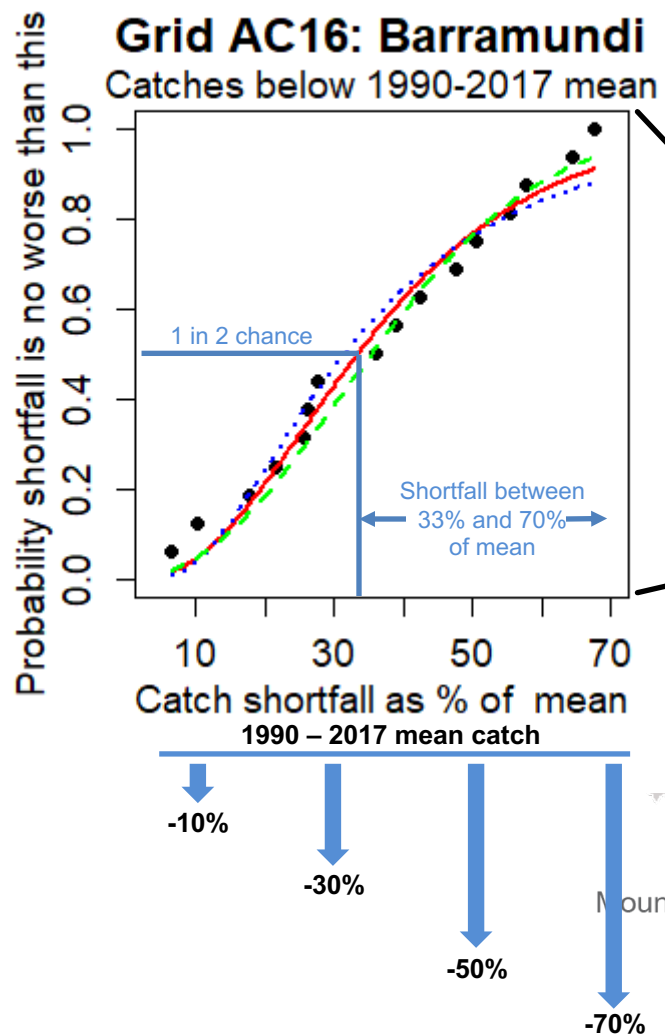
Julie Robins  
Qld DAF data



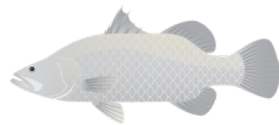
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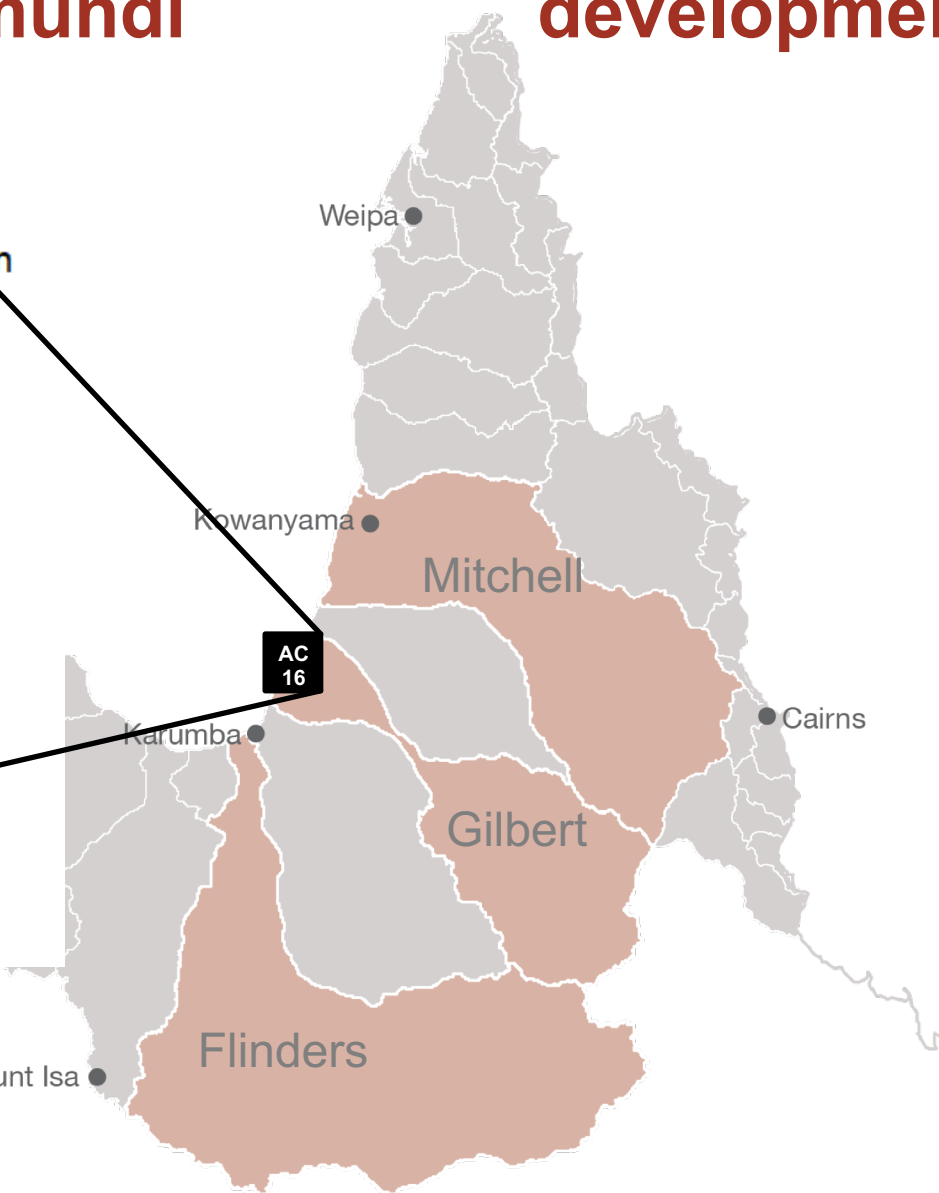
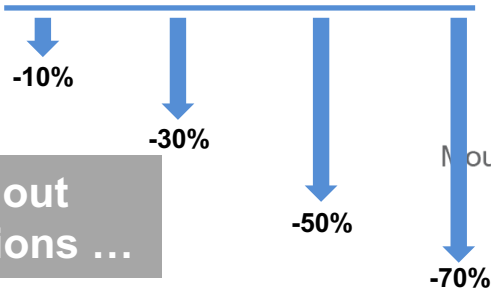
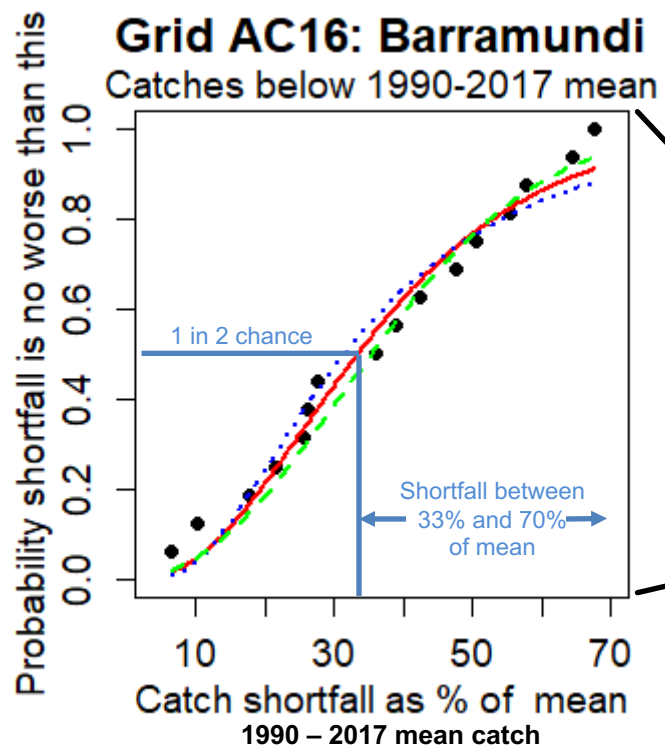
# Agricultural development?



# Flow-related impacts? Bad years: barramundi

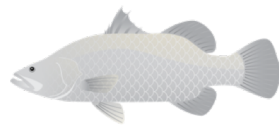


# Agricultural development?

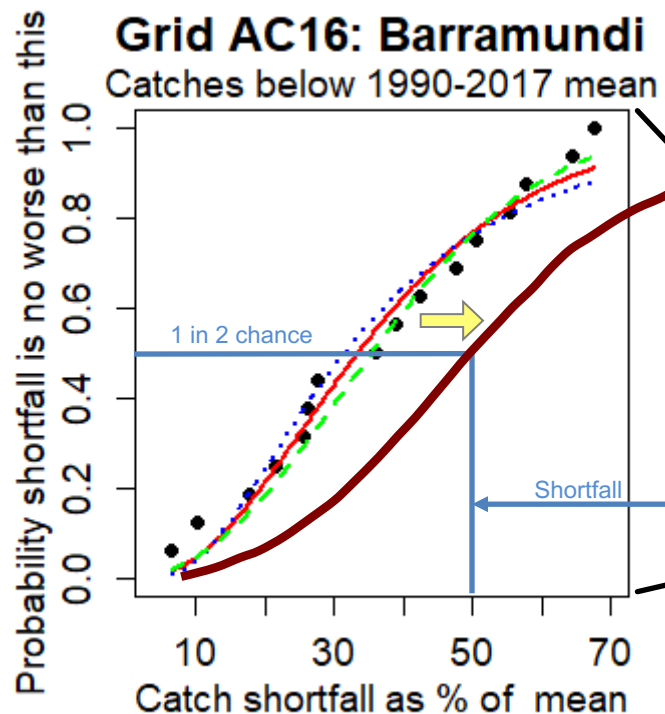




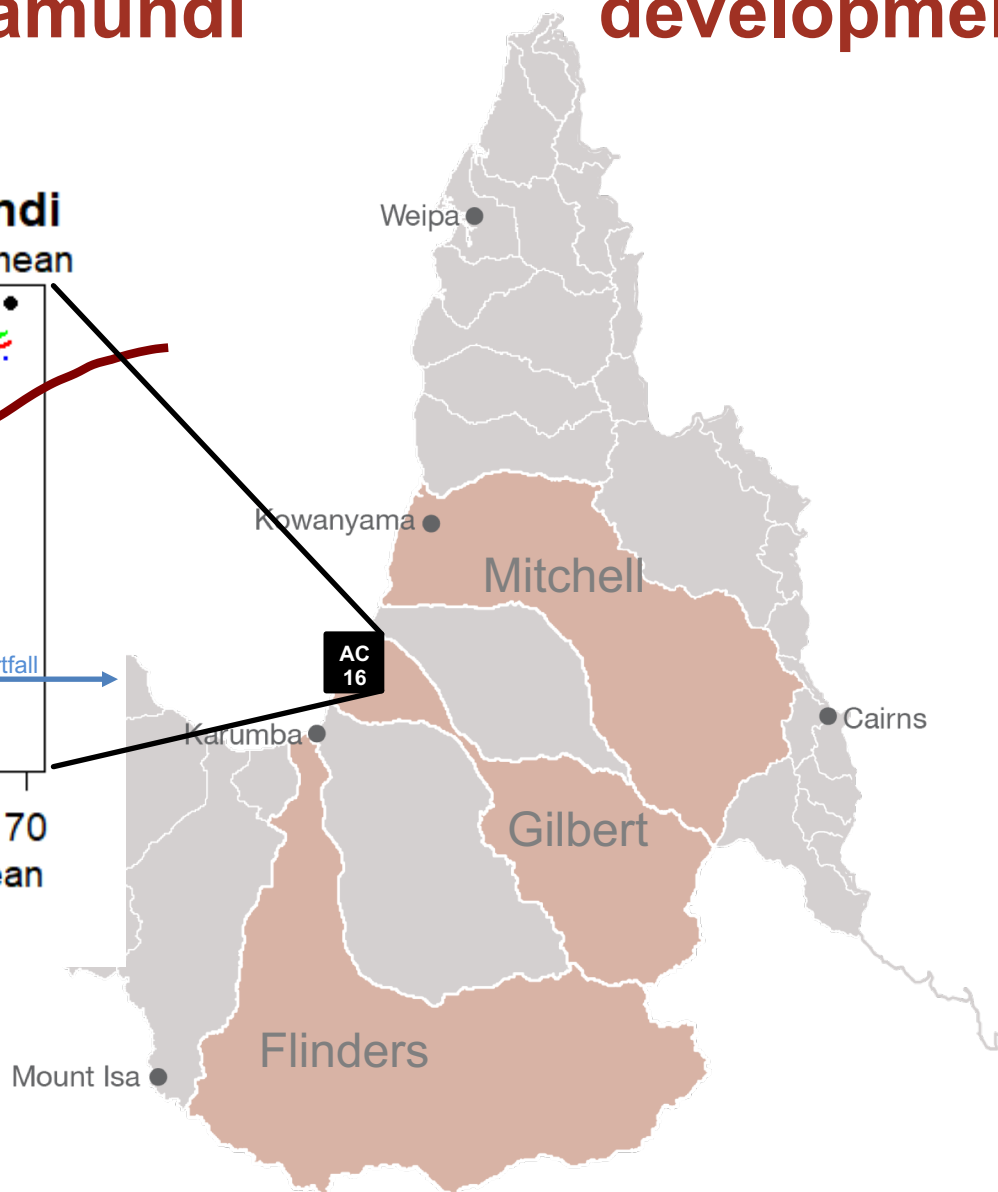
# Flow-related impacts? Bad years: barramundi



# Agricultural development?



with  
extractions ...



# Anticipated impact & planned outputs

- Request for this work from regional NRM forum
- Gulf is a unique environmental asset (= Key Ecological Feature in Nth Marine Plan)
- Field visit to Karumba
- Commercial barramundi fisher:  
*“We need this .... We need politicians to know what these dams will do to our businesses and our future.”*
- Infographic or similar
- Summary infosheet targeted to key users
- Technical report & scientific papers



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