

# The state of aquatic biodiversity, and current and emerging management challenges

Michael Douglas,  
*Charles Darwin University*

# How important is Northern Australia for aquatic biodiversity?

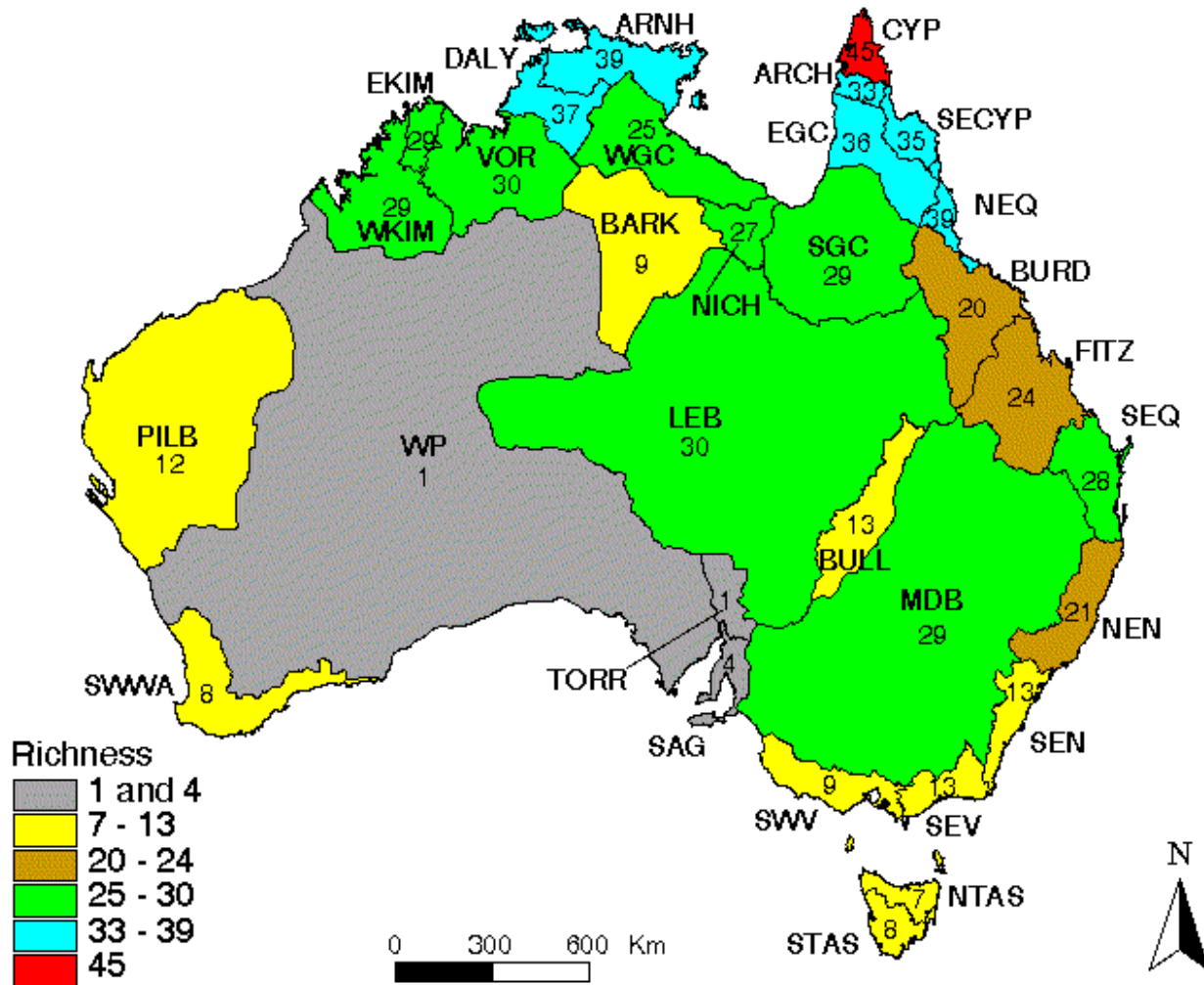






# How many freshwater fish species in our major river systems?

17% of Australian land:  
>50% of fish,  
65% of waterbird,  
35% of frog species



Source: Unmack (2001) *J. Biogeog.*,  
Pusey et al 2011, Kyne and Dostine 2011



# New species still being discovered!

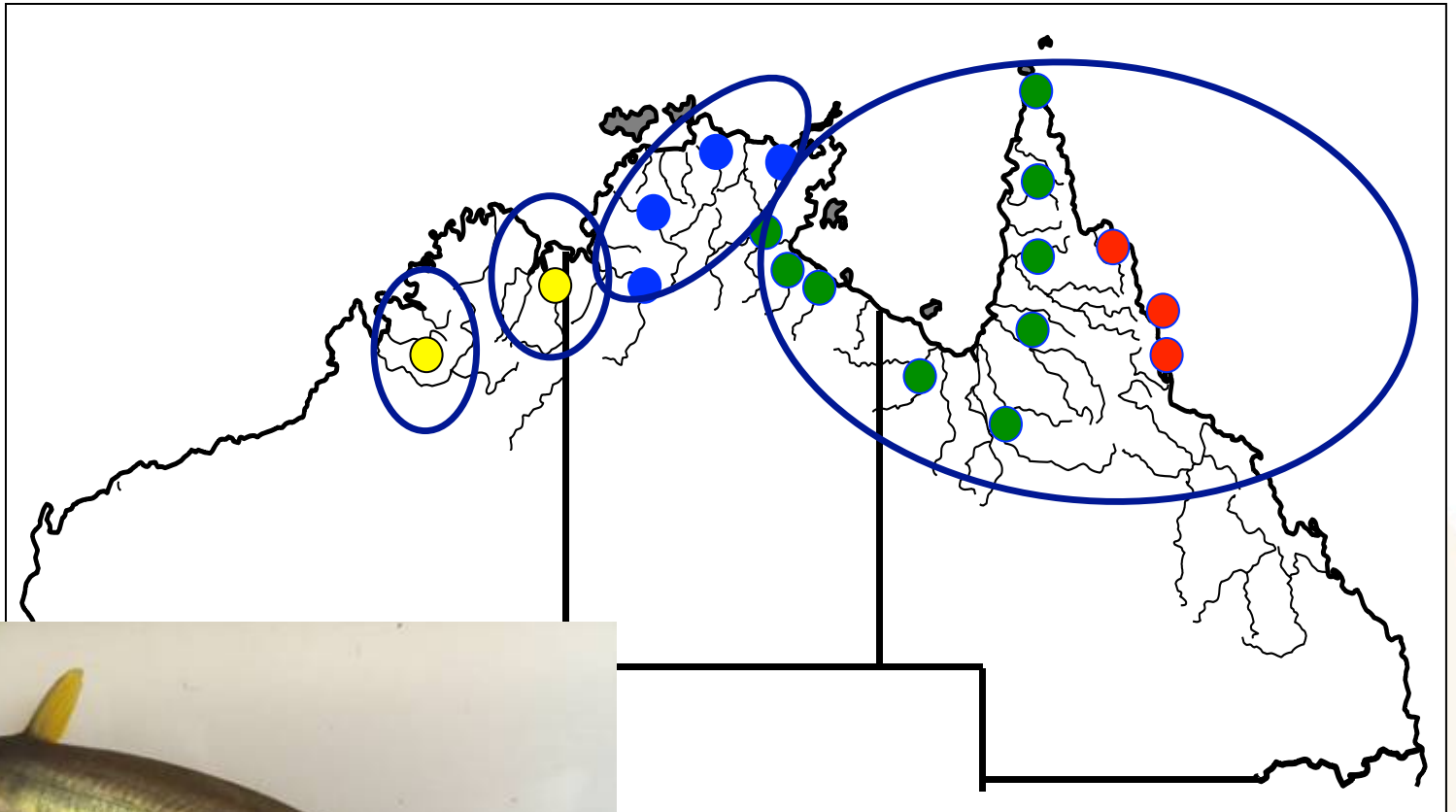


Tiny toadlet  
(*Uperoleia micra*)



Kimberley froglet  
(*Crinia fimbriata*)

# “New species” – Hyrtl’s Catfish



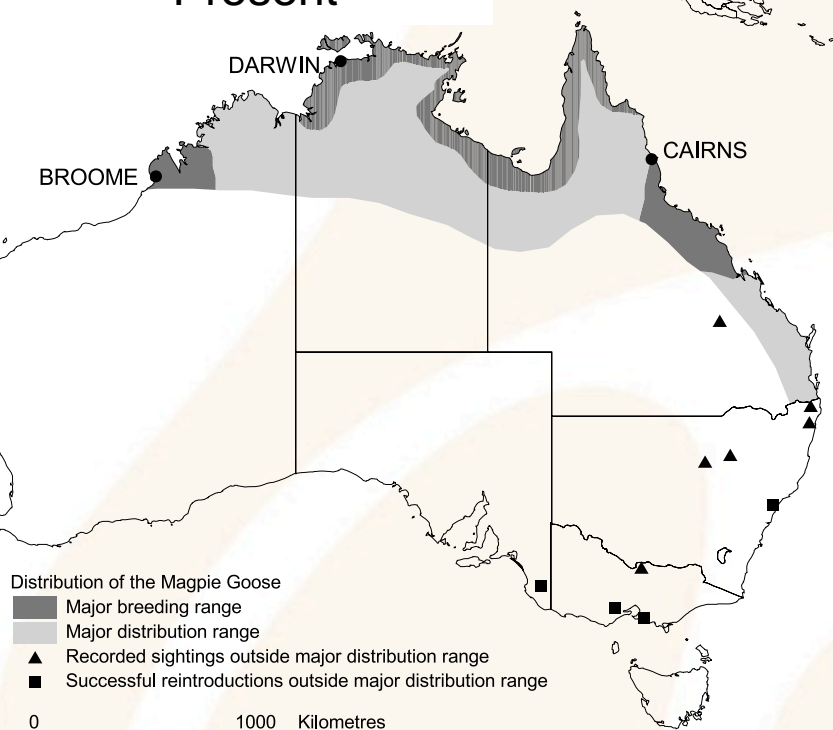
(Cook et al 2011)



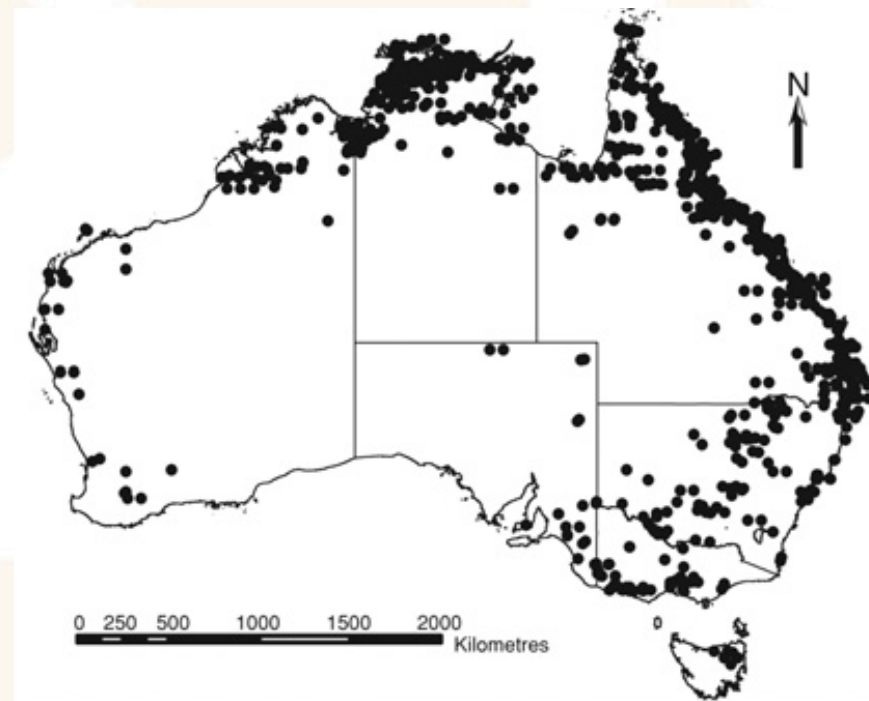
# Magpie goose distribution



Present



Past and present



(Nye et al 2007, Delaney et al 2009)

# Freshwater Sawfish

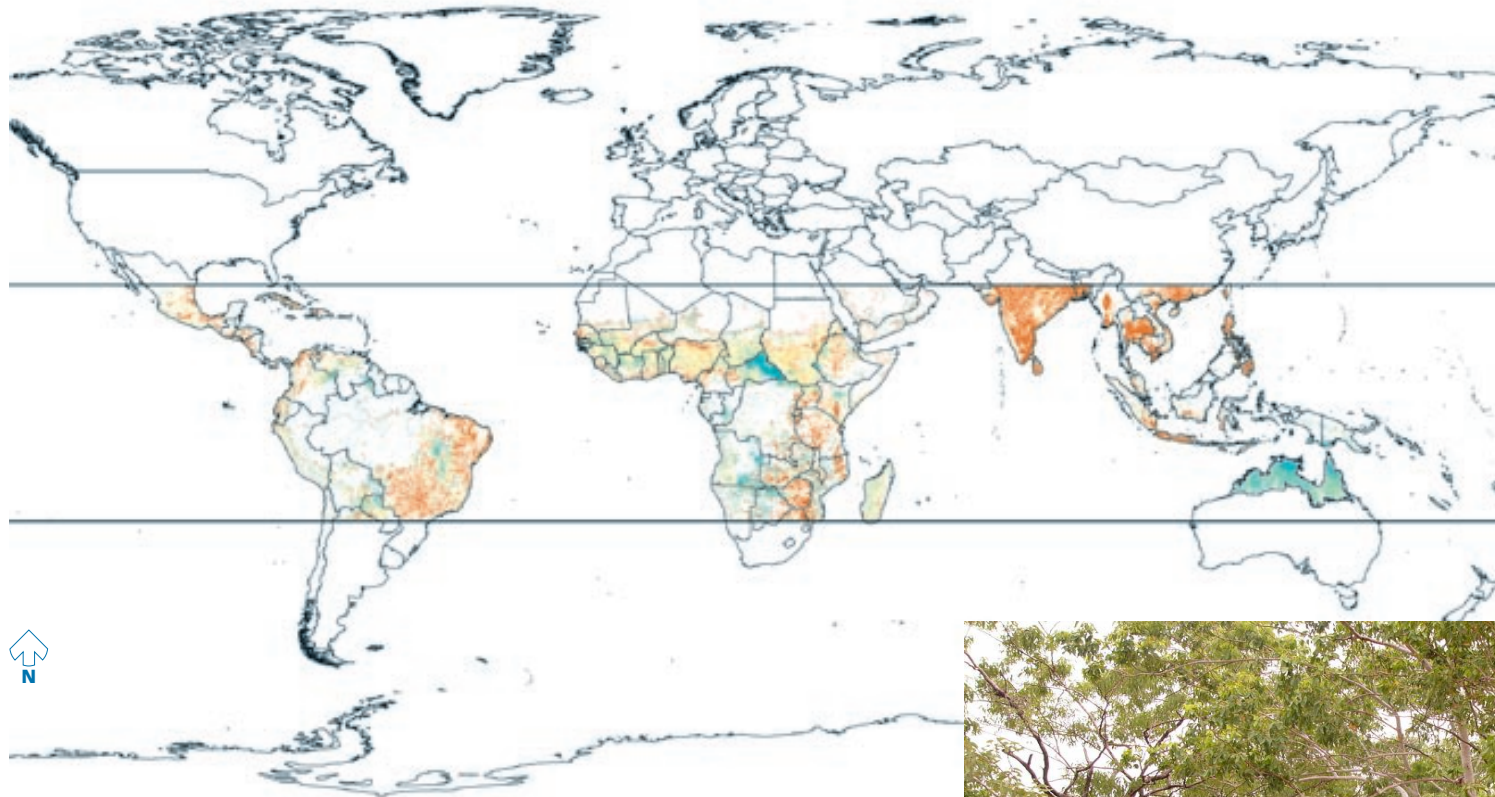




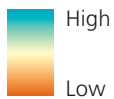
# How secure is northern Australia's freshwater biodiversity?



# World's largest area of high quality tropical savanna



**LEGEND**  
Integrity index



(Woinarski et al. 2007)



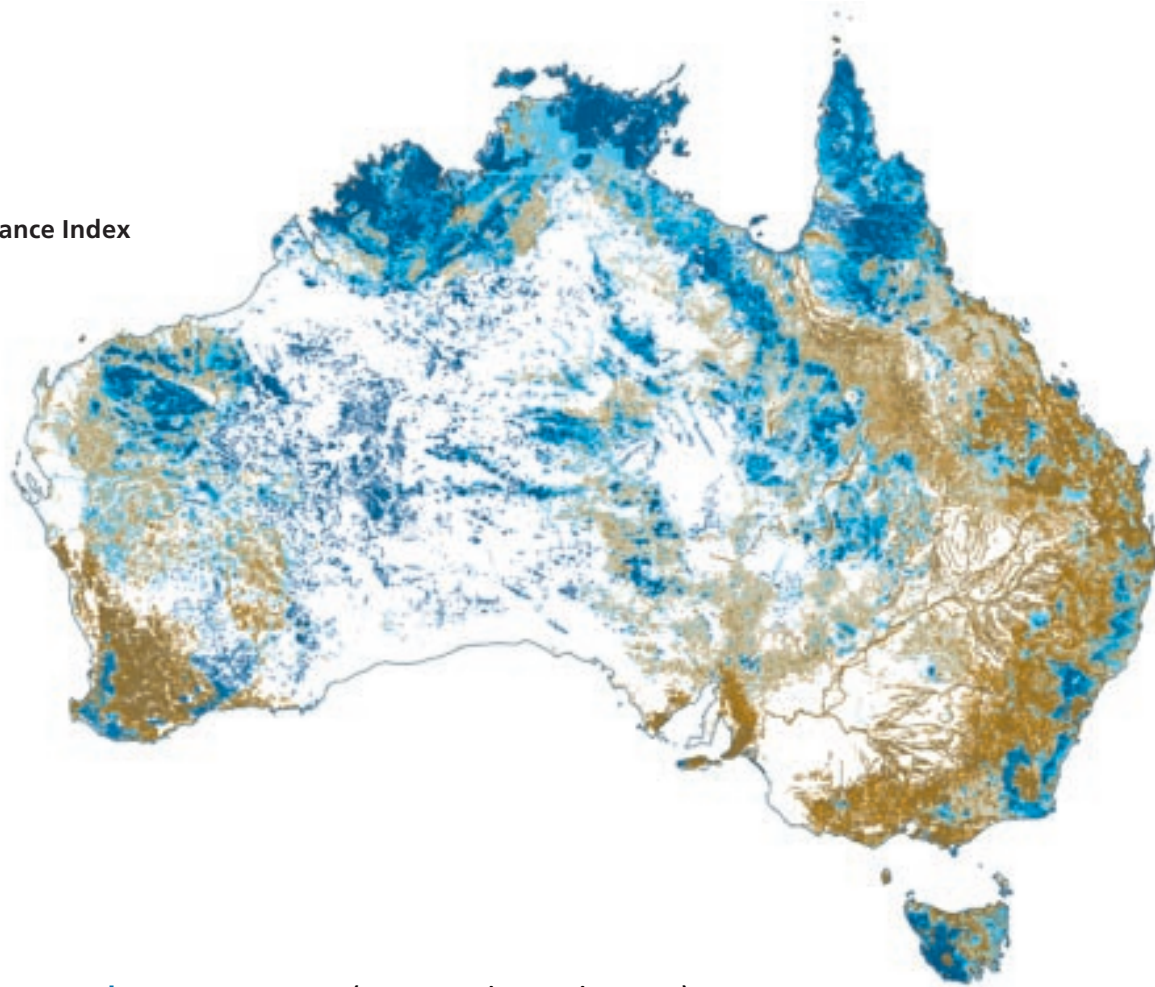


# Least disturbed rivers in Australia

## LEGEND

River Disturbance Index

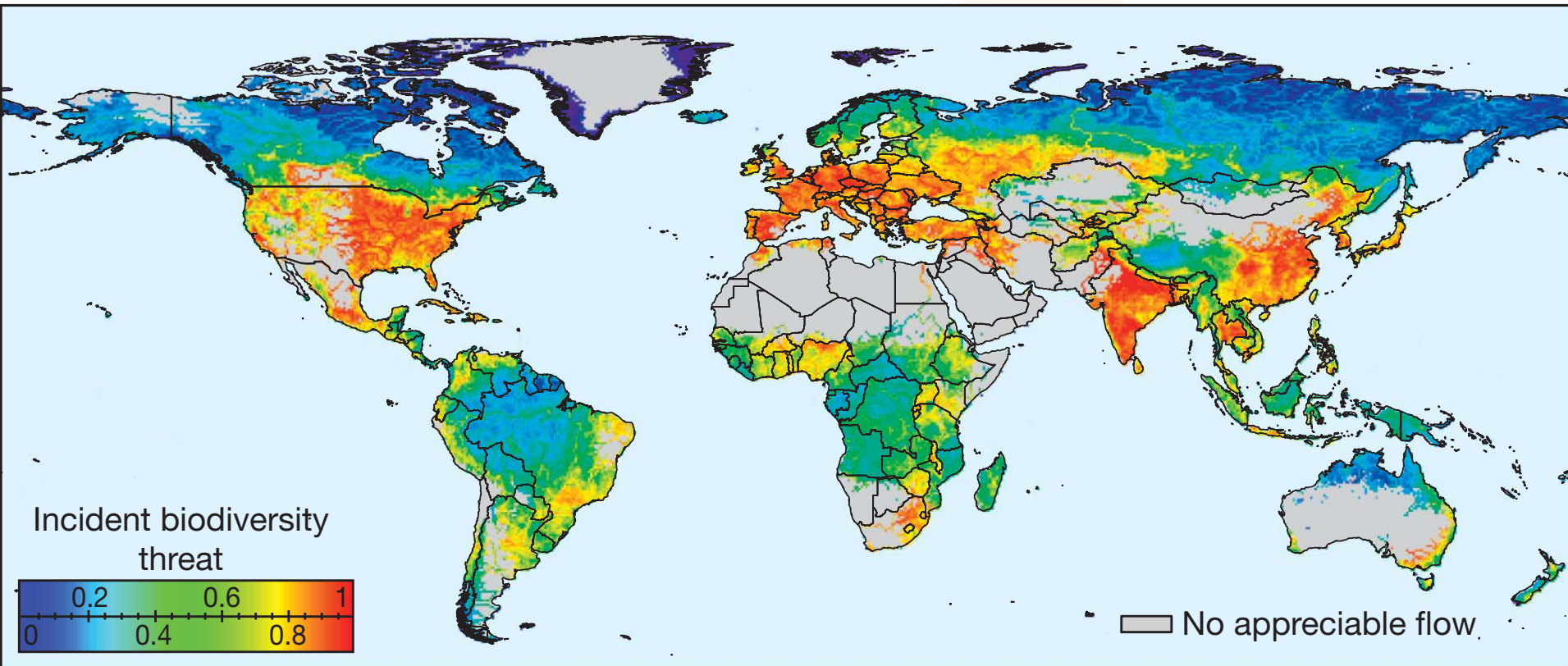
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10



0 250 500 1000 km

(Woinarski et al. 2007)

# Limited threats to biodiversity



(Vorosmarty et al 2010 *Nature*)



# Established threats: Exotics



**Feral pigs**



**Cane toad**



**Para grass**



**Exotic fish**



# Emerging issues: Sea level rise





# Emerging issues



Mining



Coastal development



- 
- A photograph of a river flowing through a rocky gorge. In the foreground, a waterfall cascades over dark, wet rocks, creating white foam. The river continues into the distance, flanked by steep, rocky hills covered in green vegetation. The sky is clear and blue.
- 55 catchments
  - 50% of Australia's river flow
  - $<0.02\%$  of water diverted



# The Cairns Post

TUESDAY, MAY 8, 2007 • \$1.10

Down the drain: An aerial view of an overflowing Lake Tinaroo after heavy rains. The lake is now at 92 per cent capacity.

**While the nation is gripped by drought,  
almost a billion litres of water a day is  
released from Lake Tinaroo out to sea**

## What a waste

TABLELAND irrigators are outraged the State Government is dumping almost a billion litres of water a day from Lake Tinaroo in the midst of a national water crisis.

Growers told *The Cairns Post* the Government's Barron River Operations Resource Plan, which ensured the river maintained an environmental flow, was "grossly flawed" and labelled it "environmental madness".

In seven days, Tinaroo dam levels have dropped 1.5 per cent to 92 per cent and growers fear

Jennifer Elliot

elliottj@tcp.news1td.com.au

the 31-day dumping program could drop dam levels another 10 per cent.

In June, water would also be released but at half the current rate.

Late last month, *The Cairns Post* revealed that Cairns received 20 per cent less rain than average during the first four months of the year.

Angry irrigators will today launch a phone protest campaign targeting members of par-

liament in an attempt to force an immediate review of the plan.

Mareeba grower Ray Olufson said all water users supported maintaining an environmental flow but to have wet season flows in May after a month without rain was ludicrous and an unnecessary waste of a precious resource.

"The Government is wasting water and if we have a failed wet season, the dam has been down to 28 per cent before, it could have a huge impact on announced allocations," he said.

"The inflow into the dam is

much less than the current outflow and, at the moment, it is not mimicking nature."

Mango grower Charlie Nastasi called the plan environmental madness.

"It's just a waste of water," he said.

"But it is also impacting on growers."

"The water is dirty, which couldn't be good for the environment anyway, and it is clogging up irrigators' systems and washing pump sites out."

► Continued Page 2



Not happy: Mareeba farmer Ray Olufson.



# Rudd touts Ord River expansion as 'new food basket'

Posted Tue Dec 16, 2008 2:10pm AEDT

Updated Tue Dec 16, 2008 3:05pm AEDT

**The Prime Minister, Kevin Rudd, has described the Ord River expansion in the Kimberley as a bold step towards securing a potential new food basket for Australia.**

Mr Rudd toured the Ord Valley this morning and met farmers to discuss the expansion.

He outlined the detail of the \$200 million commitment the Federal Government made to expanding the Ord River Irrigation Scheme.

The funding was announced as part of the Federal Government's \$4.7 billion infrastructure package.

Mr Rudd said the money would begin flowing



Kevin Rudd says the Federal Government is committed to developing long term solutions for the nations agricultural industry. (AFP: Greg Wood, file photo)

**Map:** [Kununurra 6743](#)





# Tony Abbott's plan for northern foodbowl

- by: Sid Maher
- From: **The Australian**
- September 17, 2011 12:00AM

## TARGET RIVERS IN COALITION PUSH FOR DAMS







# Is it just a matter of time?

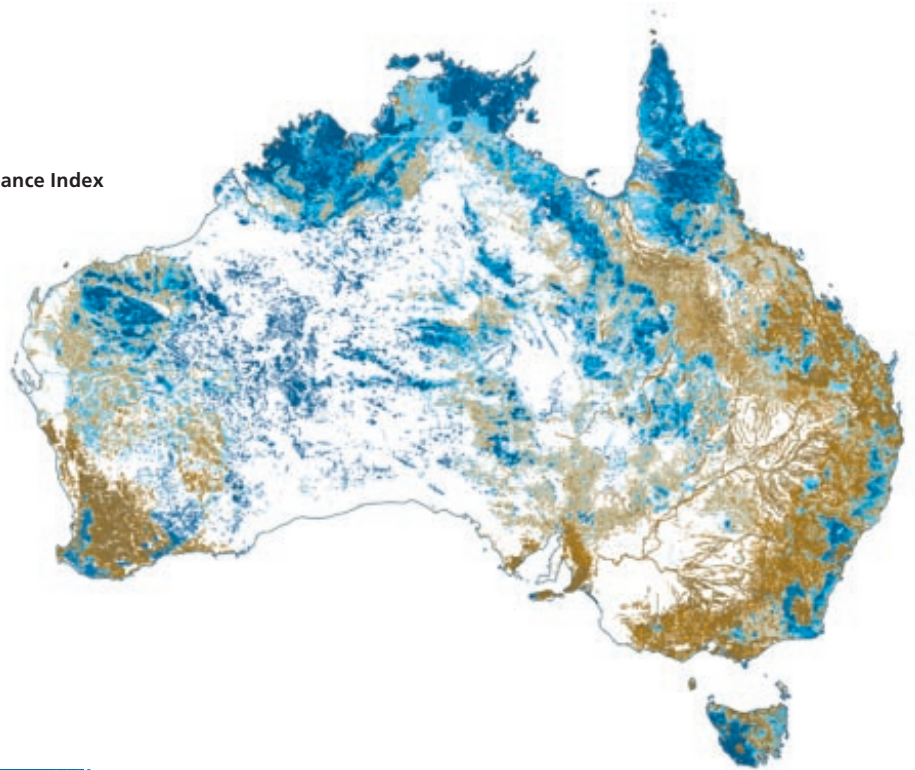
## LEGEND

River Disturbance Index

- 1
- 2
- 3
- 4
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- 9
- 10



0 250 500 1000 km



Limitless potential =>

Over-development =>

Degradation =>

Restoration

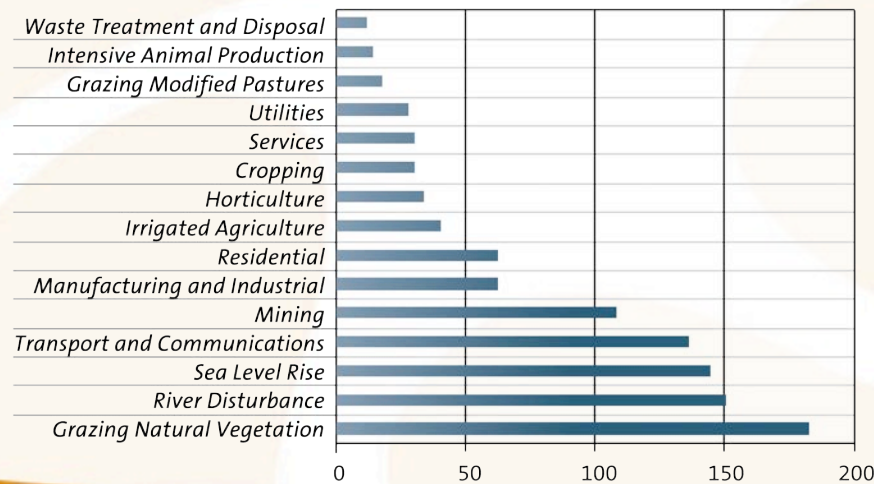
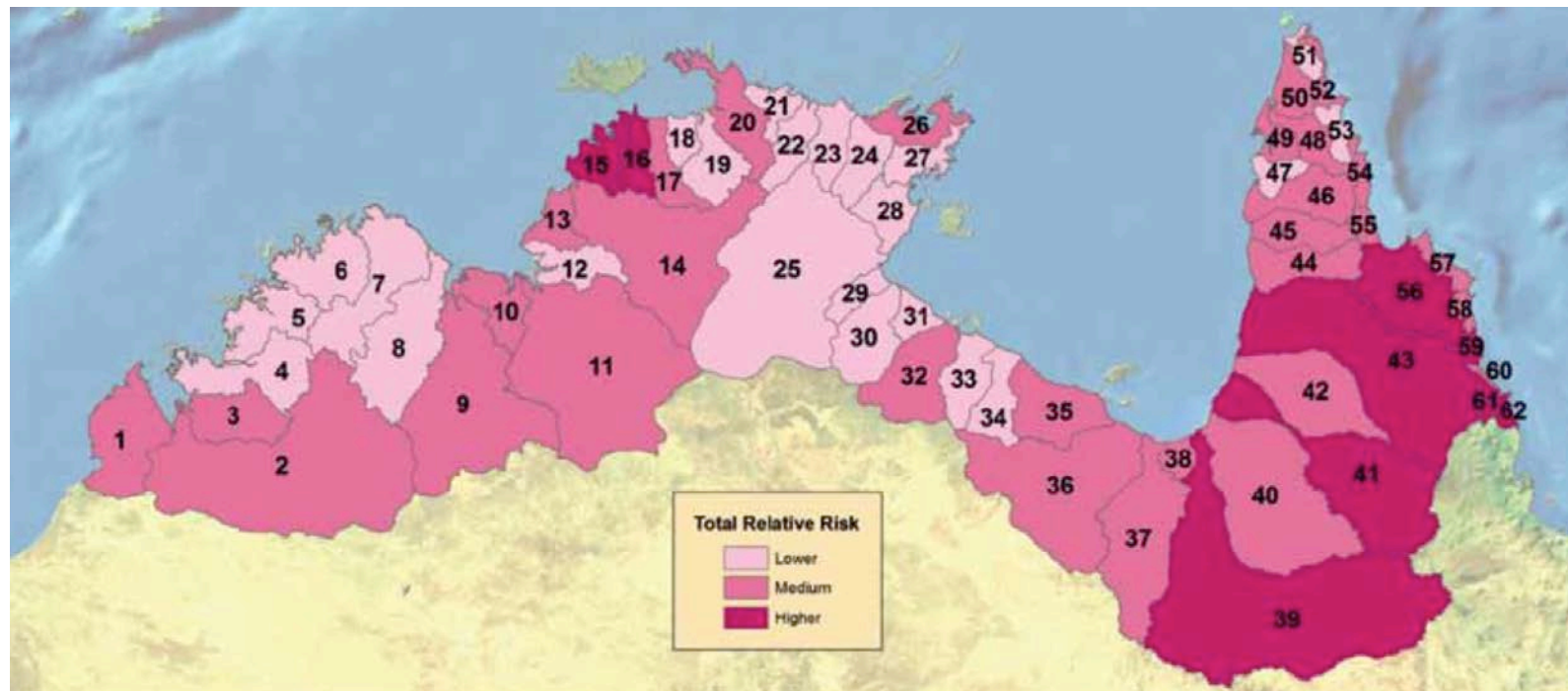
# Will we make the same mistakes?

- A better understanding of the impacts





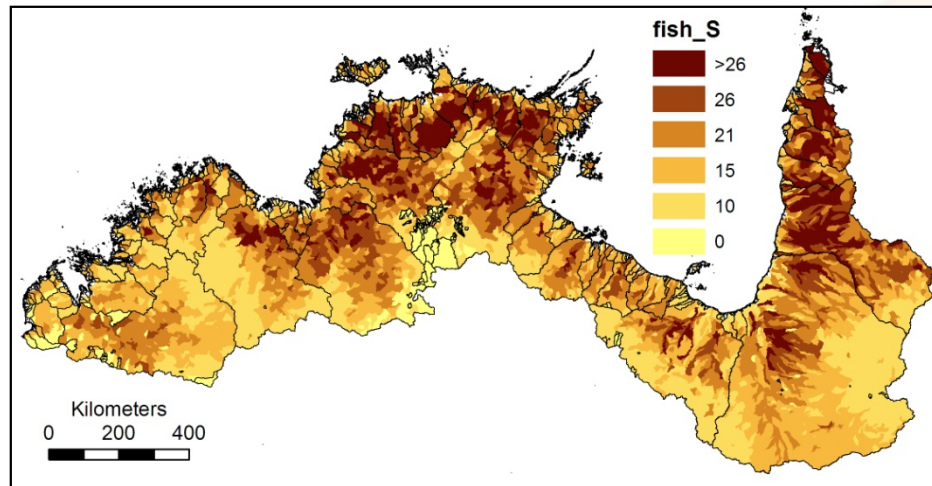
# Total risk from threats to rivers



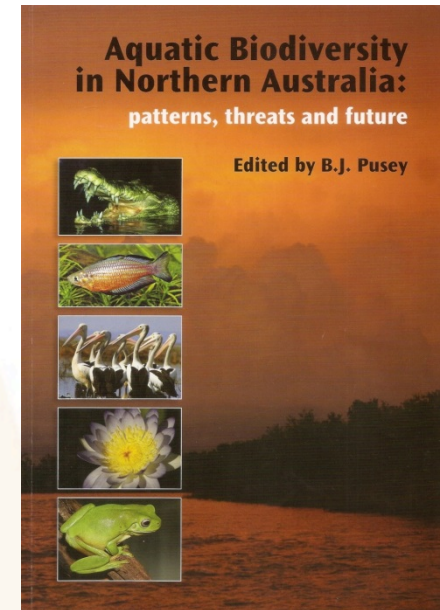
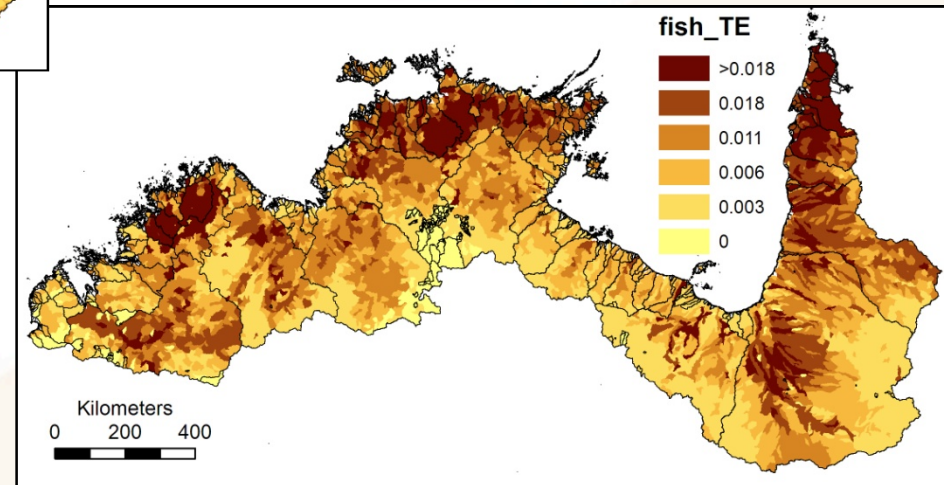
(Close et al. 2011)

# Fine-scale patterns of fish species richness and endemism in northern Australia

Fish species richness

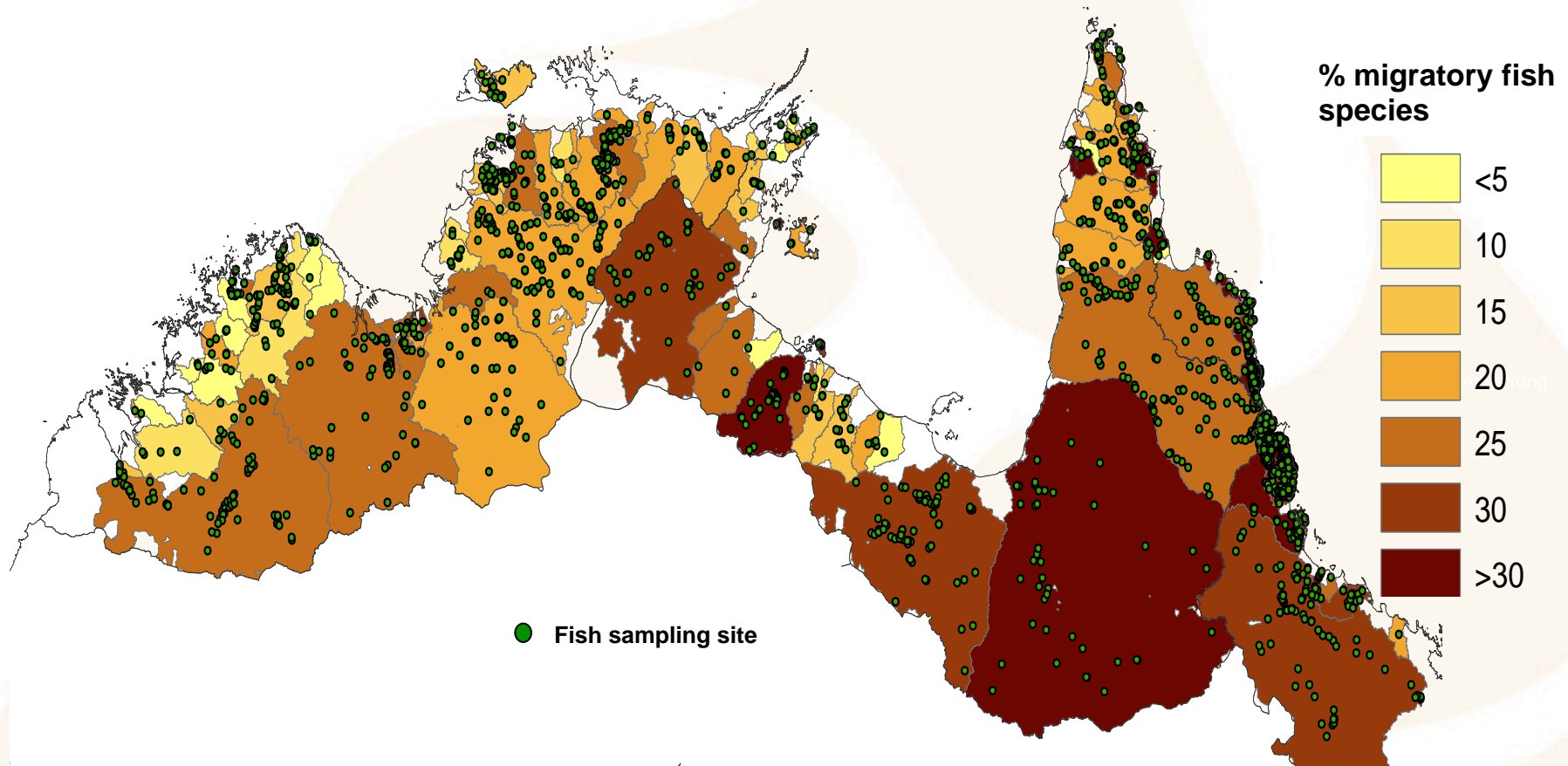


Fish species endemism





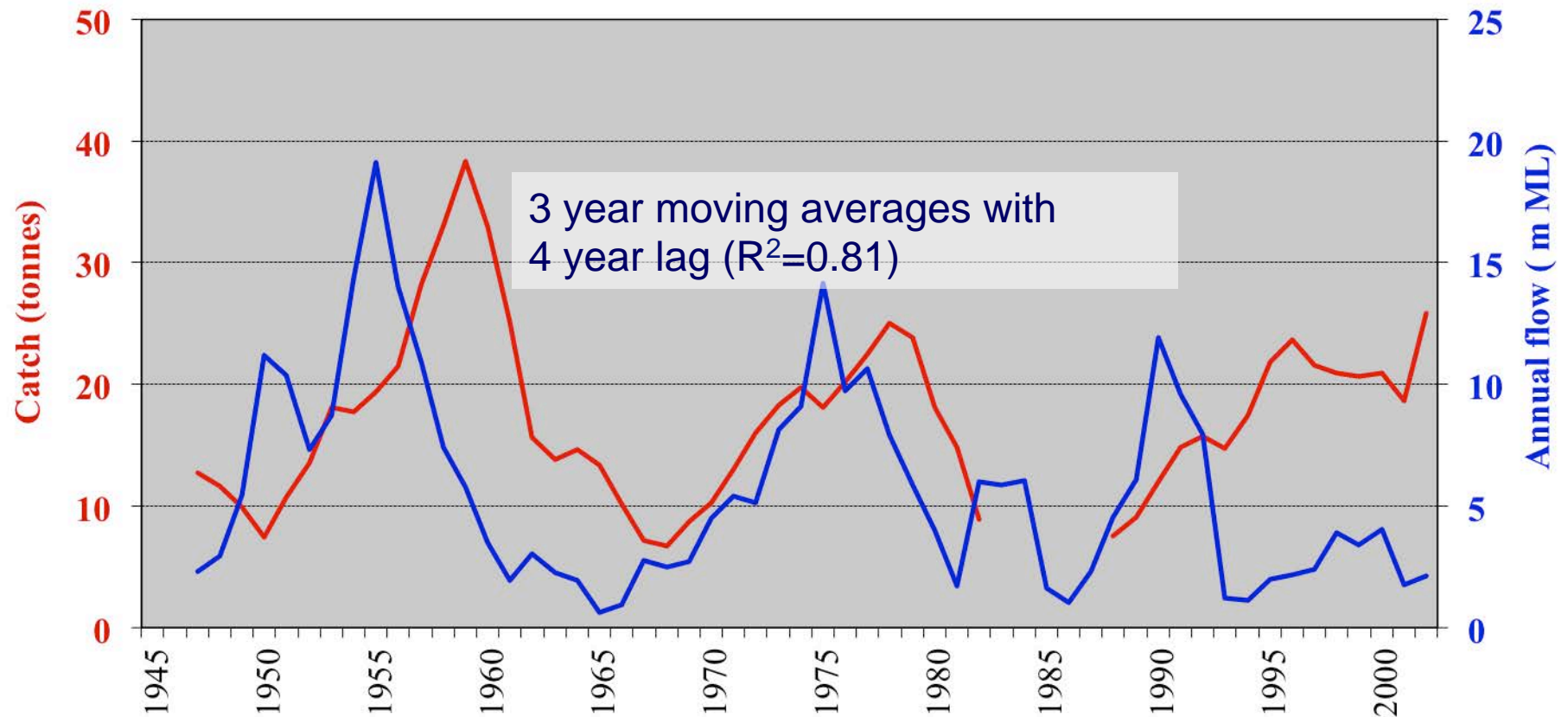
# Which river systems would be most affected by dams?



# Barramundi catch and annual flow



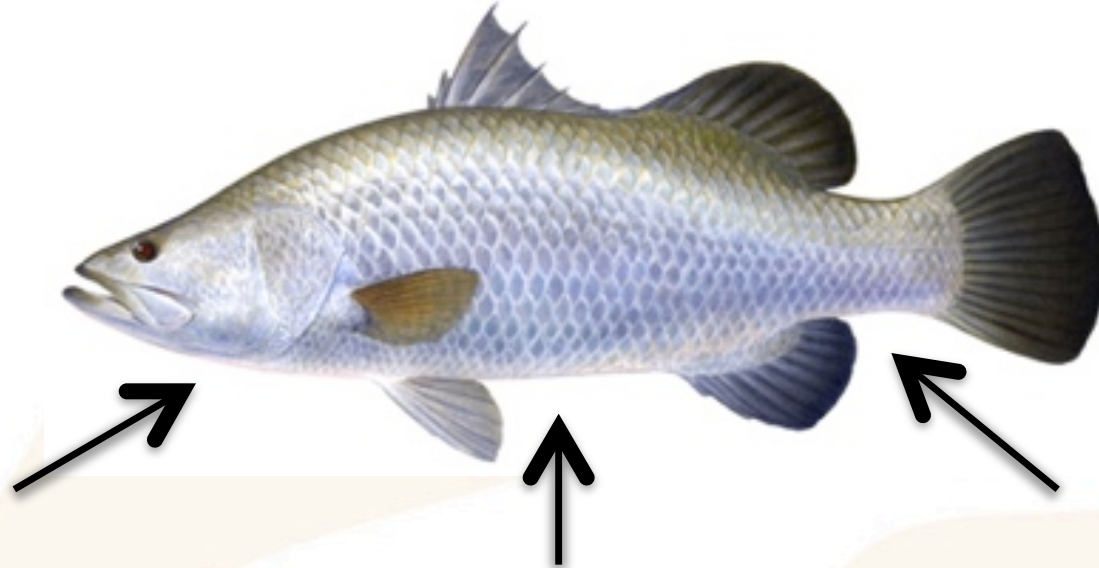
**Barramundi catch and Fitzroy River flow (5yr moving avg)**





# Connected river systems support fisheries

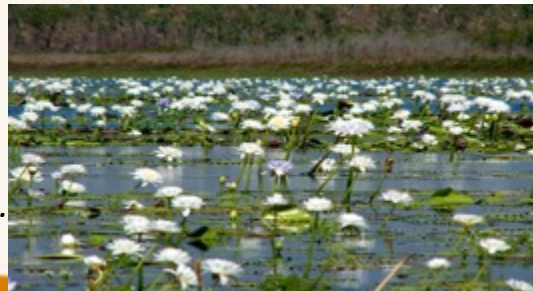
Where did that fish grow?



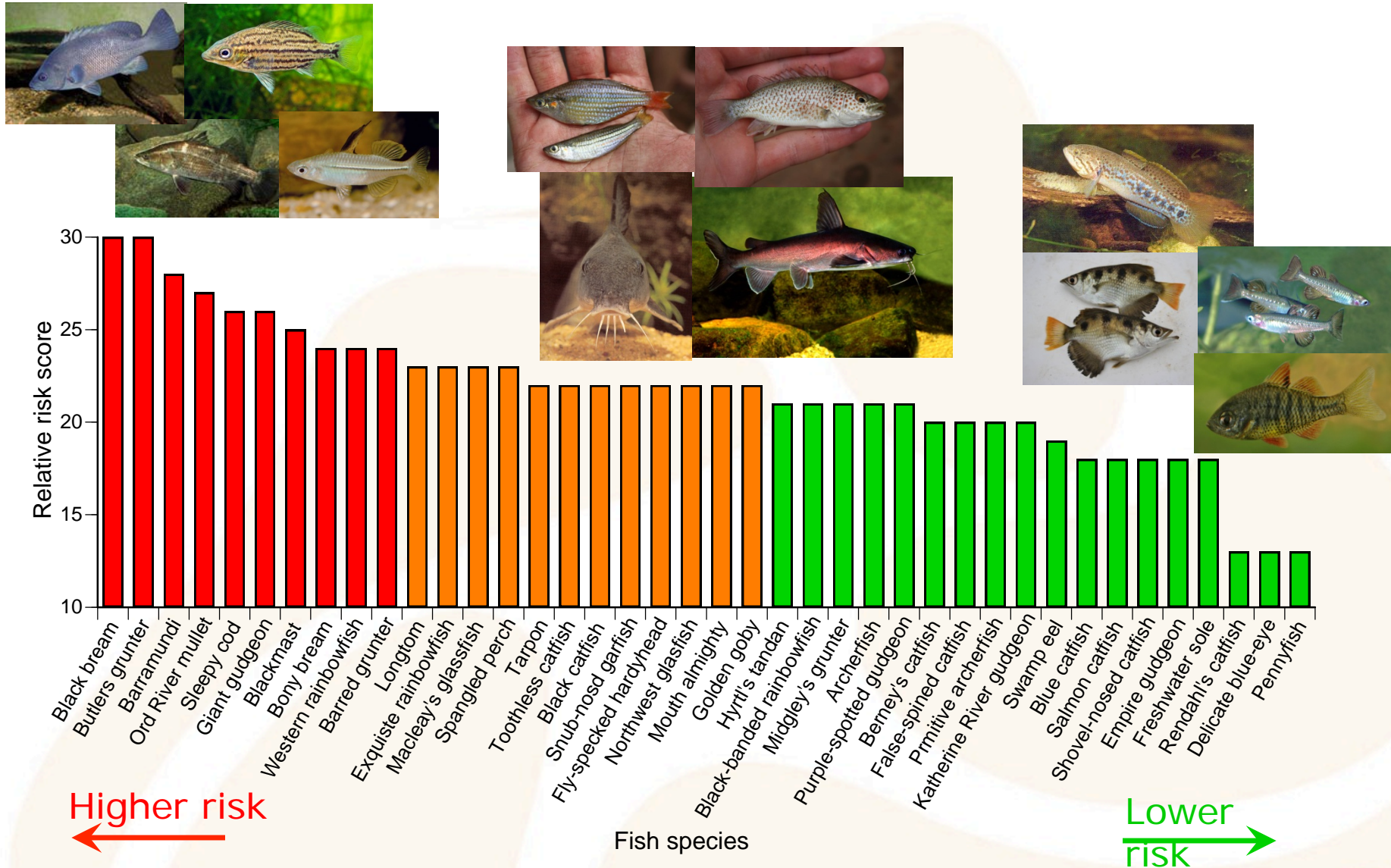
River  
20%

Floodplain  
35%

Estuary  
45%



# Relative risks of freshwater fish species to dry season water extraction





# Will we make the same mistakes?

- A better understanding of the range of values















# People value tropical rivers for many reasons

Most important management issue	Responses (%)
Preserving for biodiversity & natural habitat	40
Preserving rivers for the people who live there and visitors	20
Producing food for Australia	30
Developing northern Australia	6
Providing food for the world	4

Zander and Straton (2010) *Ecological Economics*

Zander et al. (2010) *Journal of Environmental Management*

Zander et al. (2013) *PLOS ONE*

# Will we make the same mistakes?

- A better understanding of the trade-offs





# Future development scenarios (30 years)

## Management Strategy Evaluation, Daly River

Indicator (c.f. to 2006)	5% Agriculture	
Indigenous income	↑	6%
Non-Indigenous income	↑	12%
Discharge	↓	65%
Optimal fish habitat/ wild harvest	↓	89%

# Will we make the same mistakes?

- A better understanding of the impacts
- A better understanding of the range of values
- A better understanding of the trade-offs
- There is still time to get it right!



# Will we make the same mistakes?

- A better understanding of the impacts
- A better understanding of the range of values
- A better understanding of the trade-offs
- There is still time to get it right!
- **Will we have the political will to make better decisions?**



Kakadu & climate change

