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EWKR
Environmental Water Knowledge and Research

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29/08/2018

Australian Government
Commonwealth Environmental Water Office

EWKR is a collaboration

EWKR

- The EWKR Project is a six-year project established by the Australian Government to give water agencies the information they need to confidently and continually adjust the volume and timing of water flowing in streams, rivers and floodplains in tune with changing environmental conditions, to protect and restore healthy and productive aquatic ecosystems.

EWKR Aims to

- Improve capacity to predict outcomes of environmental flow allocations over 1-5 years.
- Develop predictive tools and conceptual models to inform environmental watering regimes.
- Improve water management and complementary natural resource management.
- Build capacity to set realistic objectives and targets for water management and complementary natural resource management as the climate changes.
- Improve monitoring, evaluation and reporting on progress toward the Basin Plan environmental objectives and targets.
- Build capacity to report progress on Basin Plan environmental objectives and targets.

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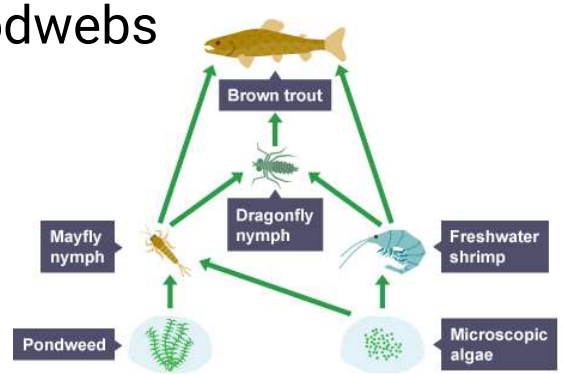
EWKR is designed to target key knowledge gaps

- Water Birds

- Vegetation

- Fish

- Foodwebs



EWKR Themes- Vegetation

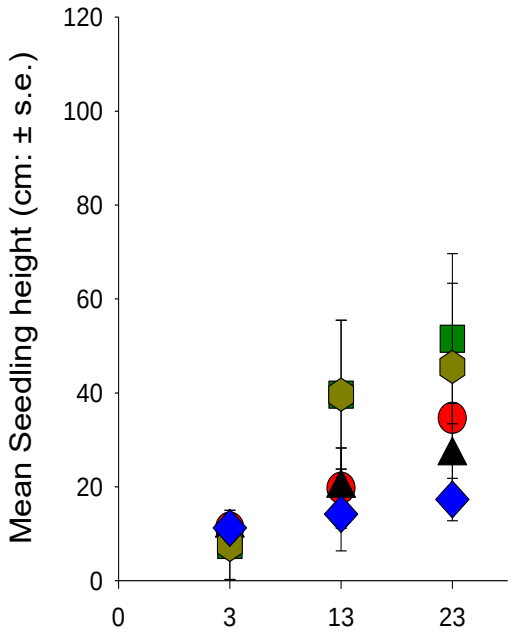
1. How do sequential flooding and drying events affect seedling growth of long-lived species?
2. How important are patterns of root development to overall growth and survival in changing conditions?
3. How does the initial condition of seedlings (Phase 1) affect their response to a subsequent flooding /

EWKR Themes- Vegetation

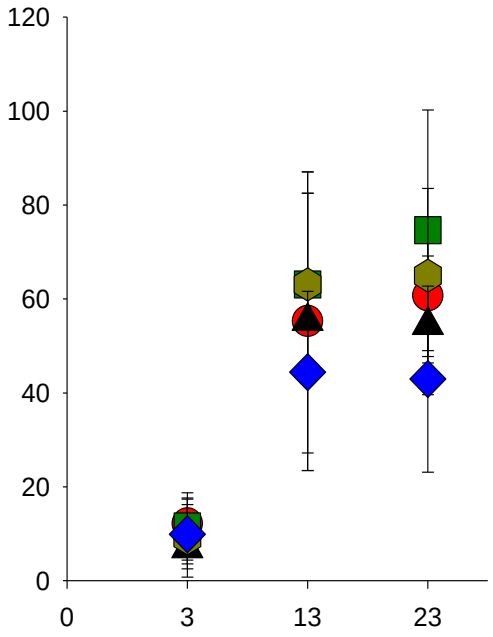
Seedling experiments

- Mesocosm experiments
- 3 Eucalypt species (Red Gum, Coolibah, Black Box)
- 5 flooding treatments

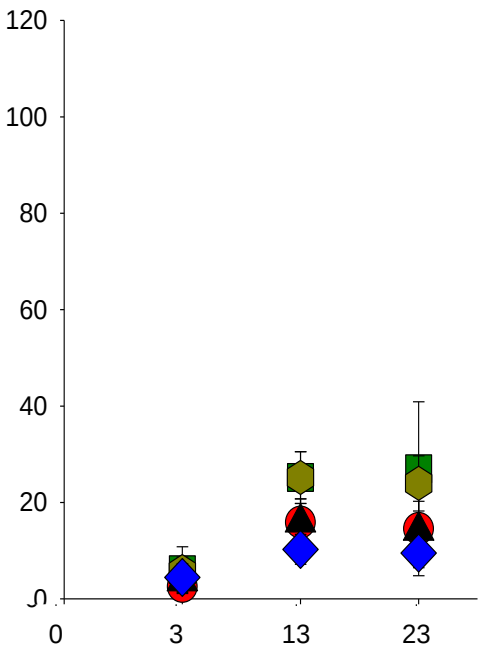
Black Box



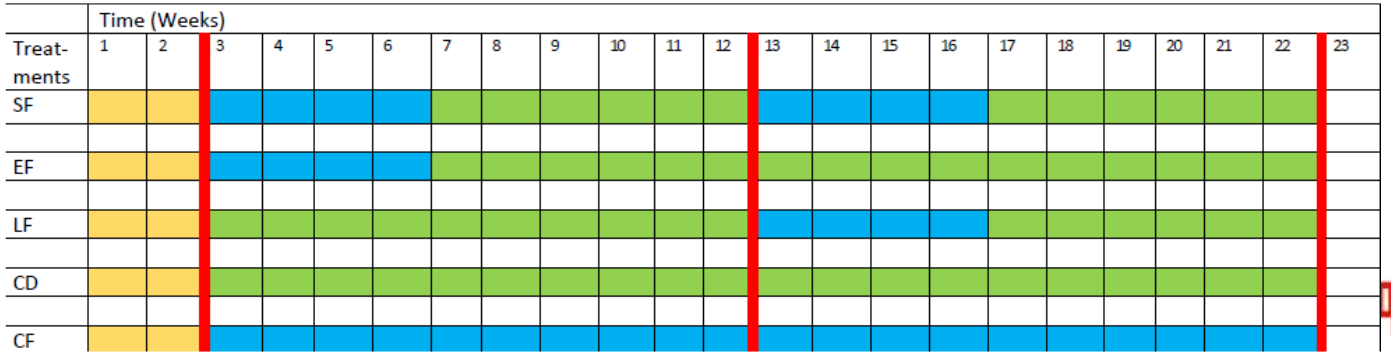
River Red Gum



Coolibah



- SF Sequential flooding
- EF Early flood
- LF Late flood
- CD Constant dry
- CF Constant flood



EWKR Themes- Waterbirds

Research components 2015/16 – 2018/19

Foraging habitats and movements

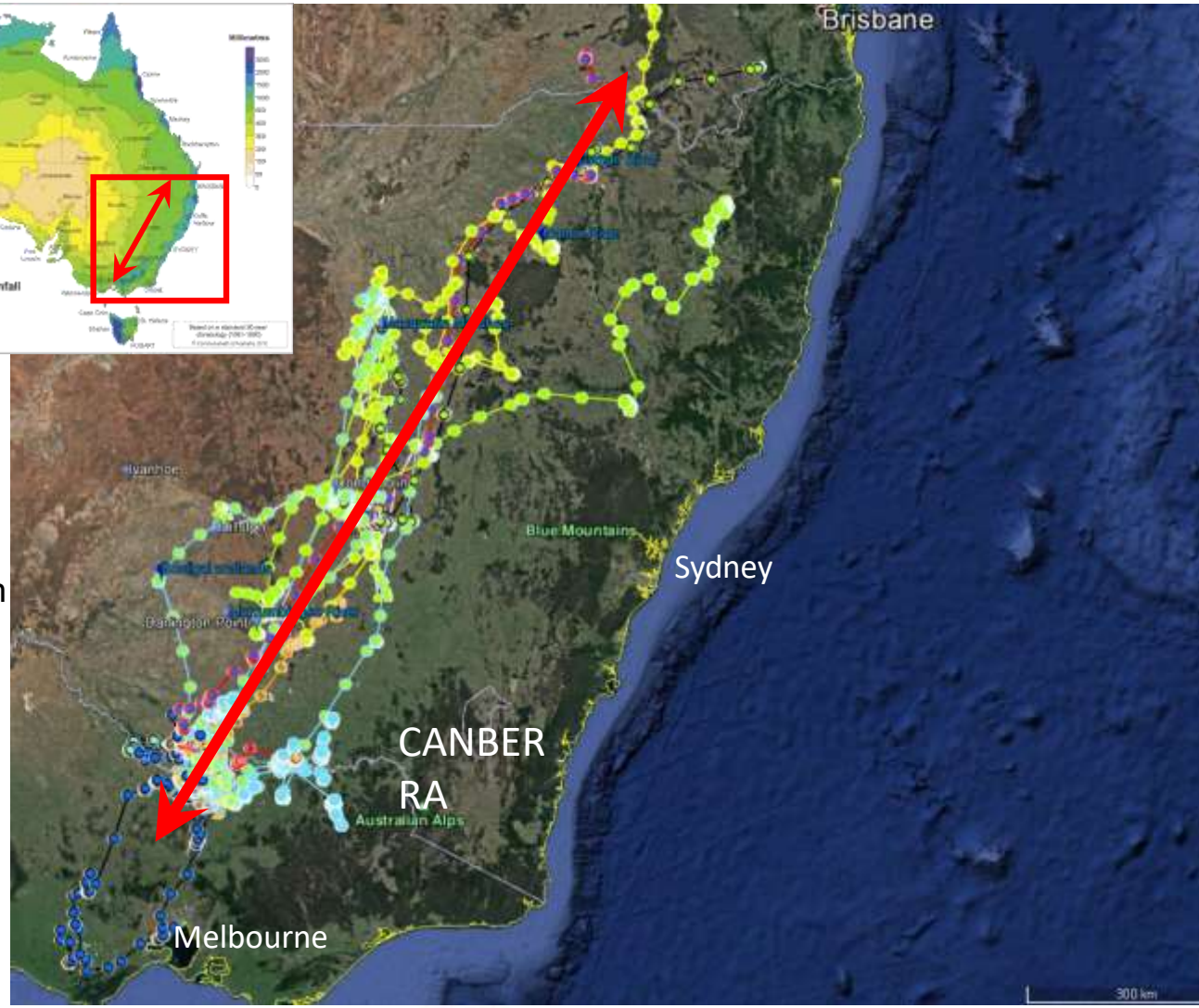
- Where and what are the critical foraging habitats that support recruitment?
- How might these be affected by water and land management and threats such as habitat loss?

Nesting habitat requirements

- What are critical nesting habitat characteristics we need to maintain and how do these affect recruitment?
- How do water and land management and threats such as predation interact with nesting habitat characteristics to affect recruitment?

Highlights and trends

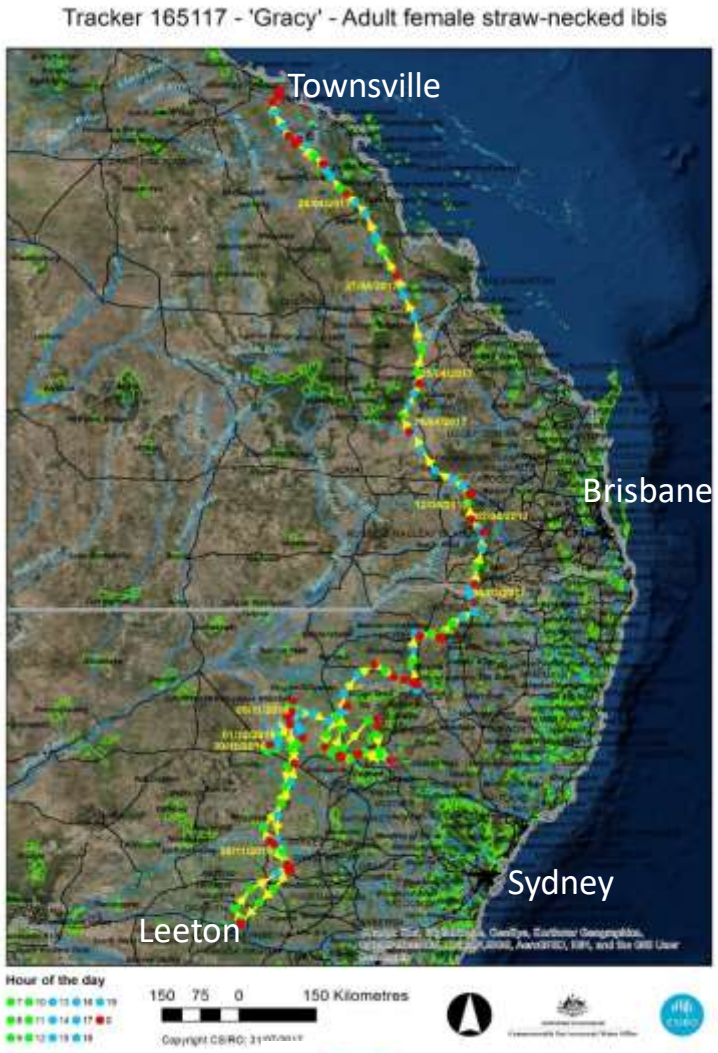
Common 'flyways' or movement corridors for separate birds/groups



- The same NE-SW route has been used in <u>both years</u> by SNI juveniles and adults – juveniles are using it immediately after leaving the natal site
- NE-SW route used in different directions up and down the MDB
- This route corresponds to zones / boundary lines in average climatic conditions and topography, e.g. rainfall, evapotranspiration, etc.
- Birds avoid high and forested areas – prefer following low open areas with watercourses

EWKR Themes- Birds

Detailed satellite-tracking movement studies. Identification and characterisation of important foraging and roosting habitats and their locations.



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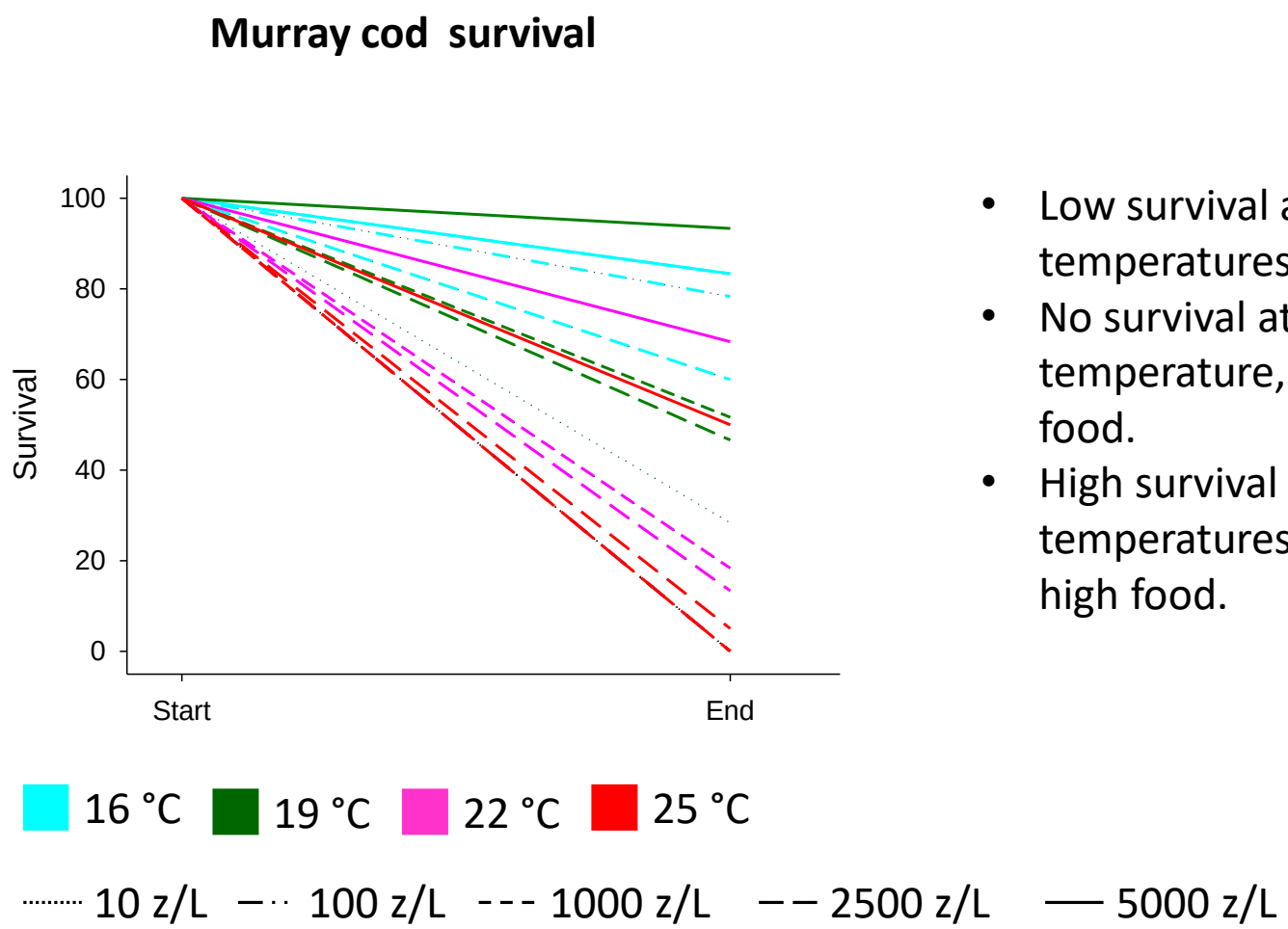
EWKR Themes- Fish

Examination of the relationship between food density, temperature and early-life stage growth and survival

- laboratory experiments to investigate the relationship between food density and temperature on the growth and survival of the early life-stages Murray cod.

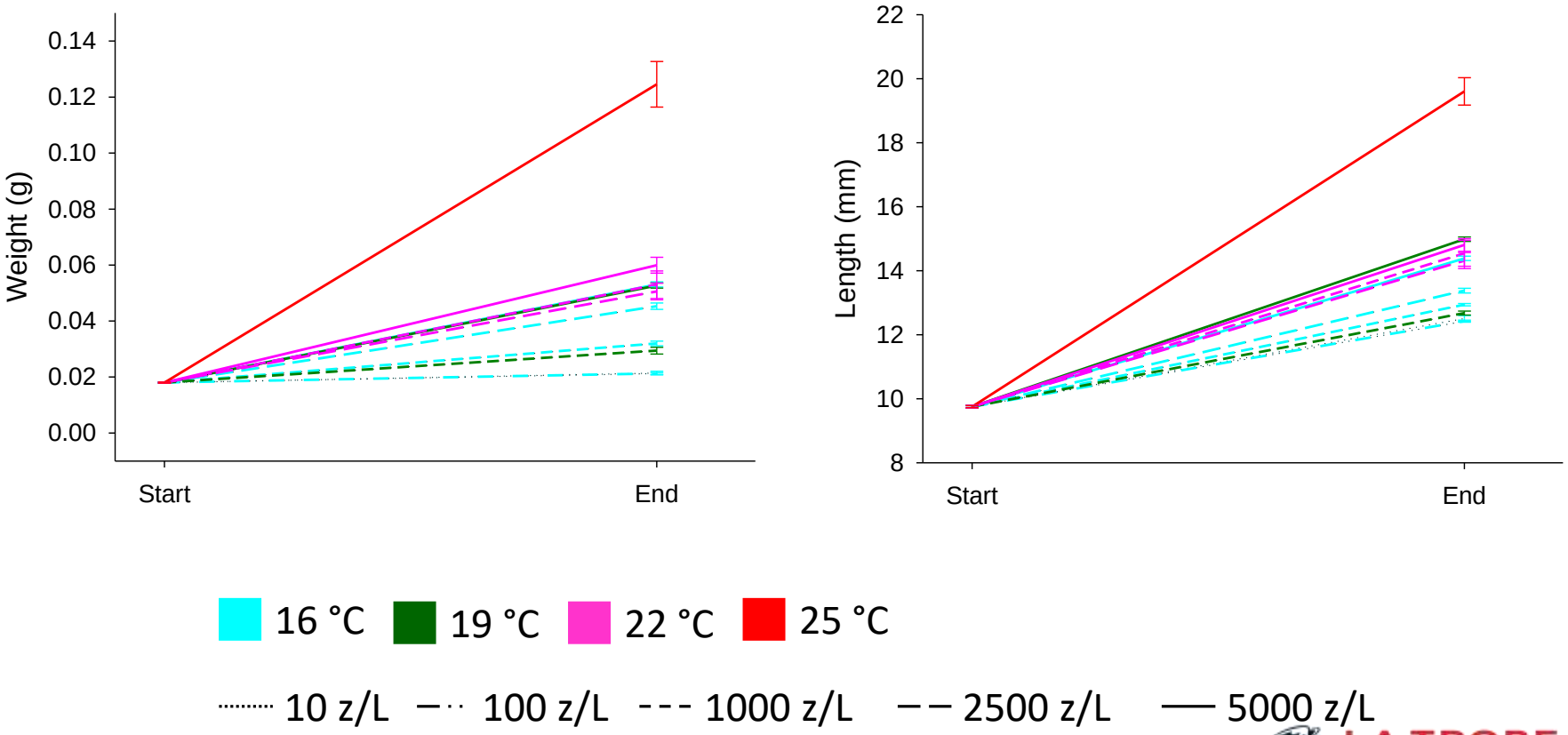
Examination of the relationship between food density, temperature and early-life stage growth and survival



- Low survival at higher temperatures
- No survival at high temperature, low-moderate food.
- High survival at low temperatures with moderate to high food.

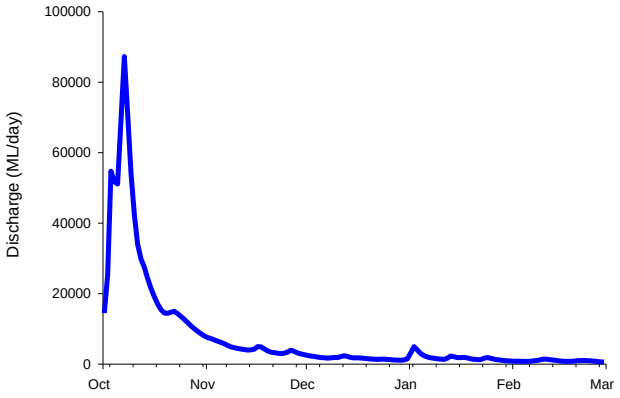
Examination of the relationship between food density, temperature and early-life stage growth and survival

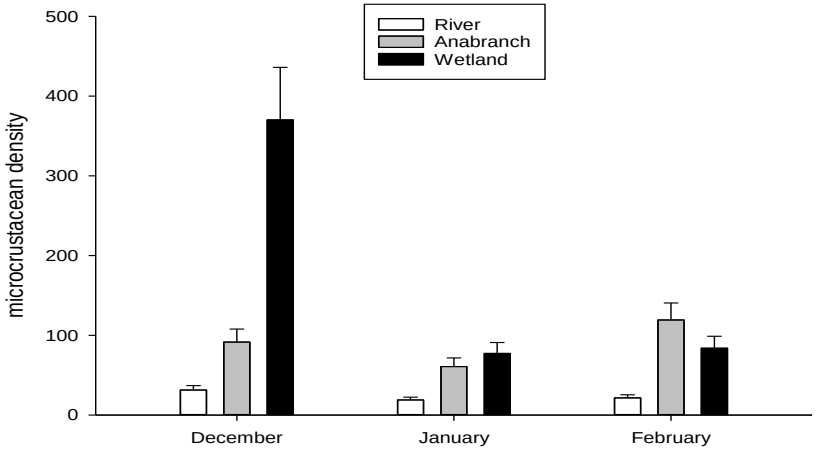
Murray cod growth



EWKR Themes- Fish

Applications to water management in a changing climate

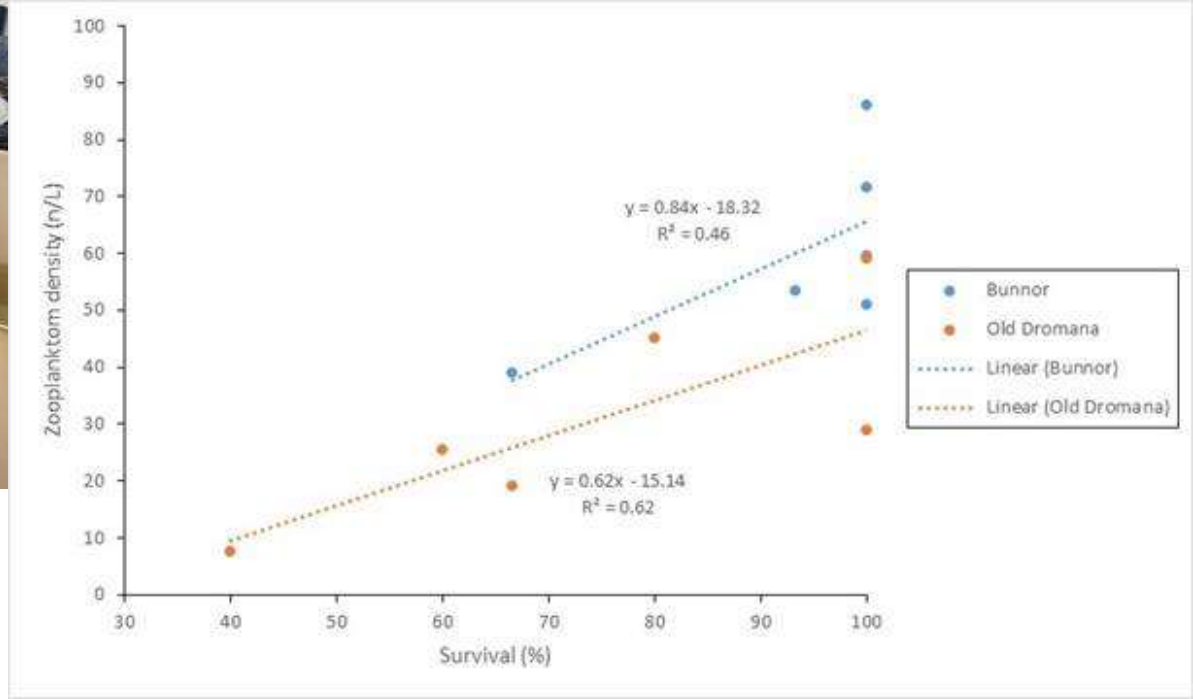




Food resources and temperatures higher but more variable in wetland habitats.
Anabranches represent intermediate habitat, which may be easier to manage.

EWKR Themes- Food Webs

What effects whom?



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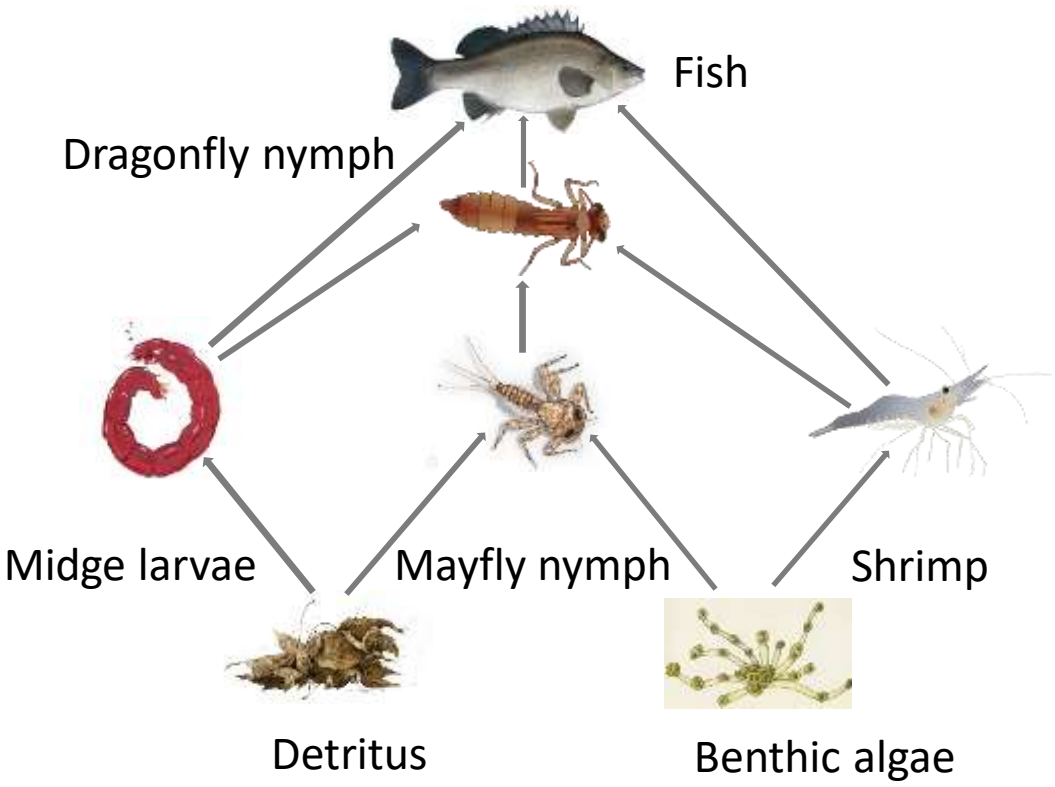
Food web theme

- *What flow regimes best support food webs that transfer energy to support recruitment of native fish and waterbirds?*



Food web theme research components

Laboratory studies to determine energy production and transfer through the food web

- Mesocosms (University of New England)

Field sampling to identify critical energy pathways

- Identification of critical basal resources Ovens River (Centre for Freshwater Ecosystems)
- Basin scale fish resource use (Charles Sturt University)

Modelling bioenergetics within identified production sites

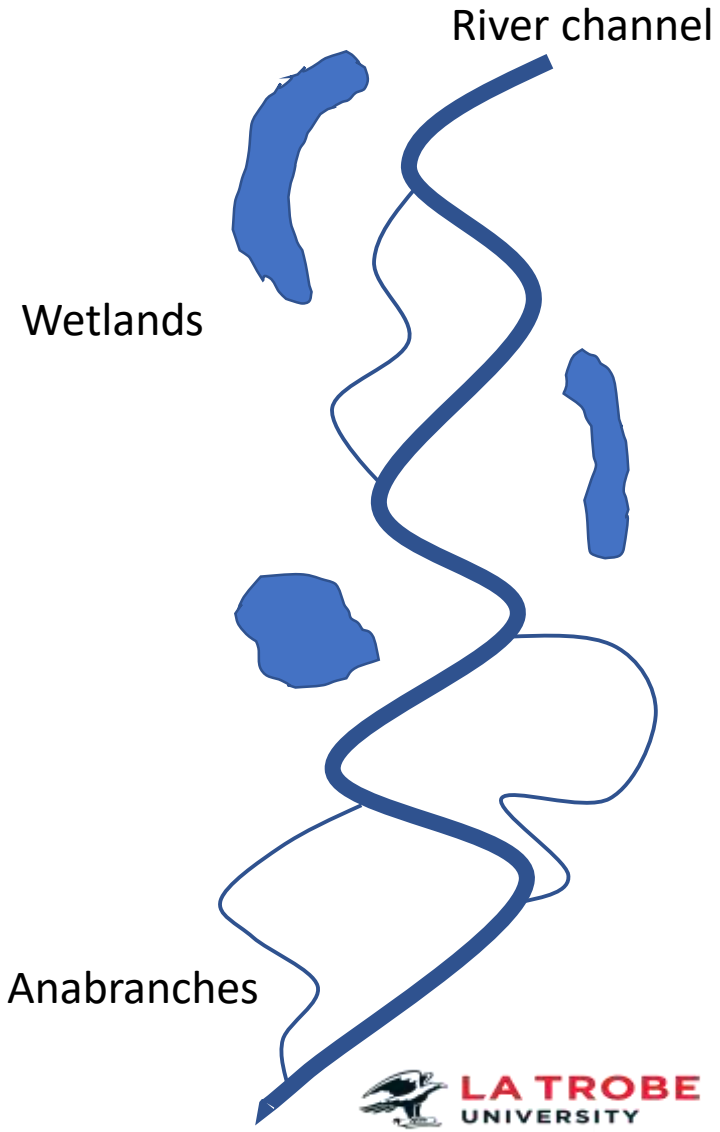
- Development of a flow-food-web response model (Deakin University)

Field sampling

Identification of critical basal resources supporting fish recruitment and flow of energy

- δN and δC to determine origin of food resources

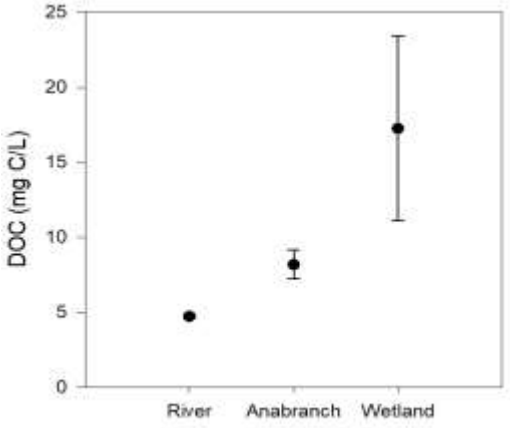
- Fatty acid profiles to determine food quality and energy pathways

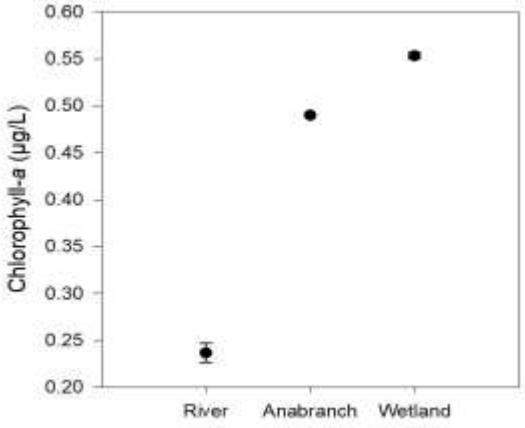


Sources

- Litter (terrestrial and benthic)
- Macrophytes
- Biofilm from hard surfaces (usually *E. camadulensis* leaves)
- Seston (filtered at 54 µm to remove zooplankton)
- Chlorophyll–*a* and DOC

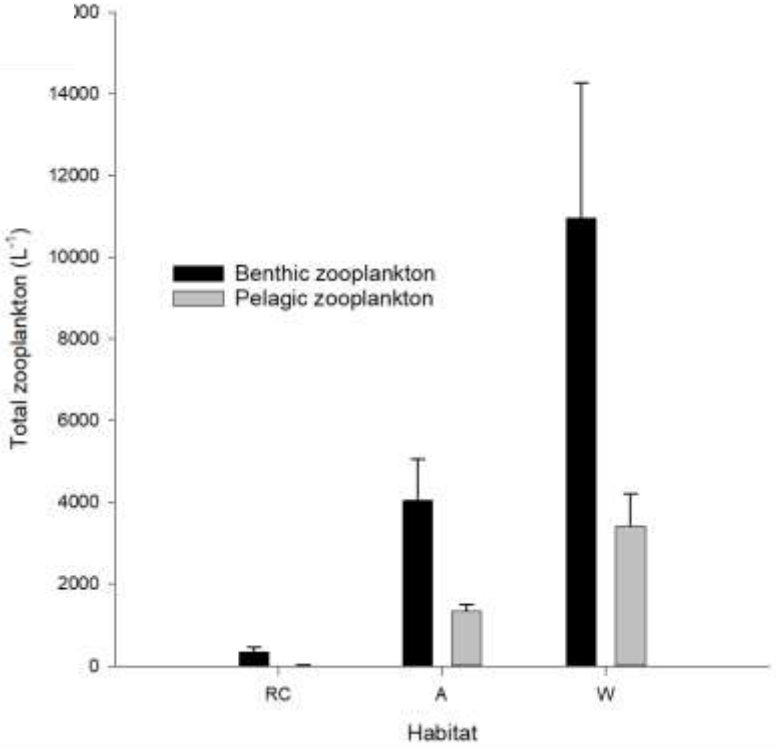
Results – DOC, Chlor-*a* and zooplankton density





Habitat

- DOC, Chlor-a concentration and zooplankton density increase from river channel to wetland
- DOC fueling bacteria for SFA and MUFA synthesis
- Phytoplankton synthesizing PUFAs in wetlands
- Supports higher zooplankton density (habitat driver too)



Implications

- We know that floodplains inundation is good for river productivity due to mobilization of C, N and P back to the river channel (e.g. FPC, Junk et al. 1989).

- Our results show that food quality of wetland seston is higher and supports a higher density of zooplankton than in the river channel

- We know zooplankton are important for fish recruitment

- The use of e-flows to increase connectivity between river channels and floodplains could supply fish larvae with a richer source of essential fatty acids

EWKR provides information for water managers

What flows are optimal for different taxa?

Where are critical refuge areas?

When is the optimal time to release water?

How can we overcome issues such as black water?

What are the benefits to Australia?

https://www.mdfrc.org.au/projects/ewkr/about/

http://ewkr.com.au/

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