

Community-level migration patterns of fish throughout the Mitchell River, Queensland, Australia

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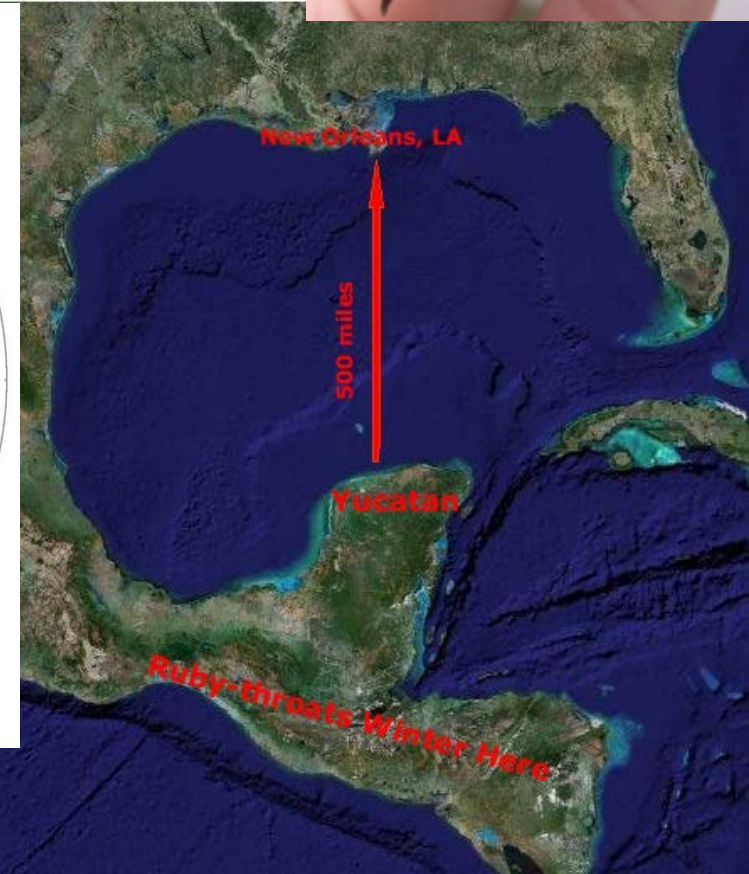
Migration

Found in all major branches of the animal kingdom: flying, swimming, walking, drifting (via water and air)

Often think of “heroic” long-distance mass migrations

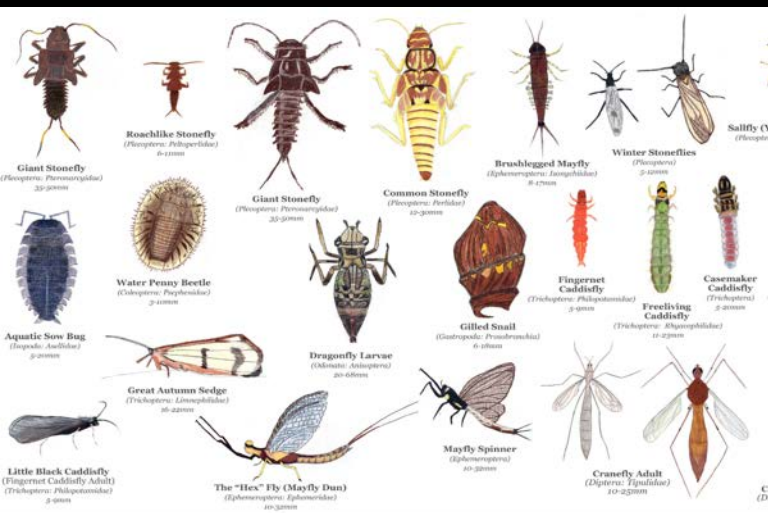
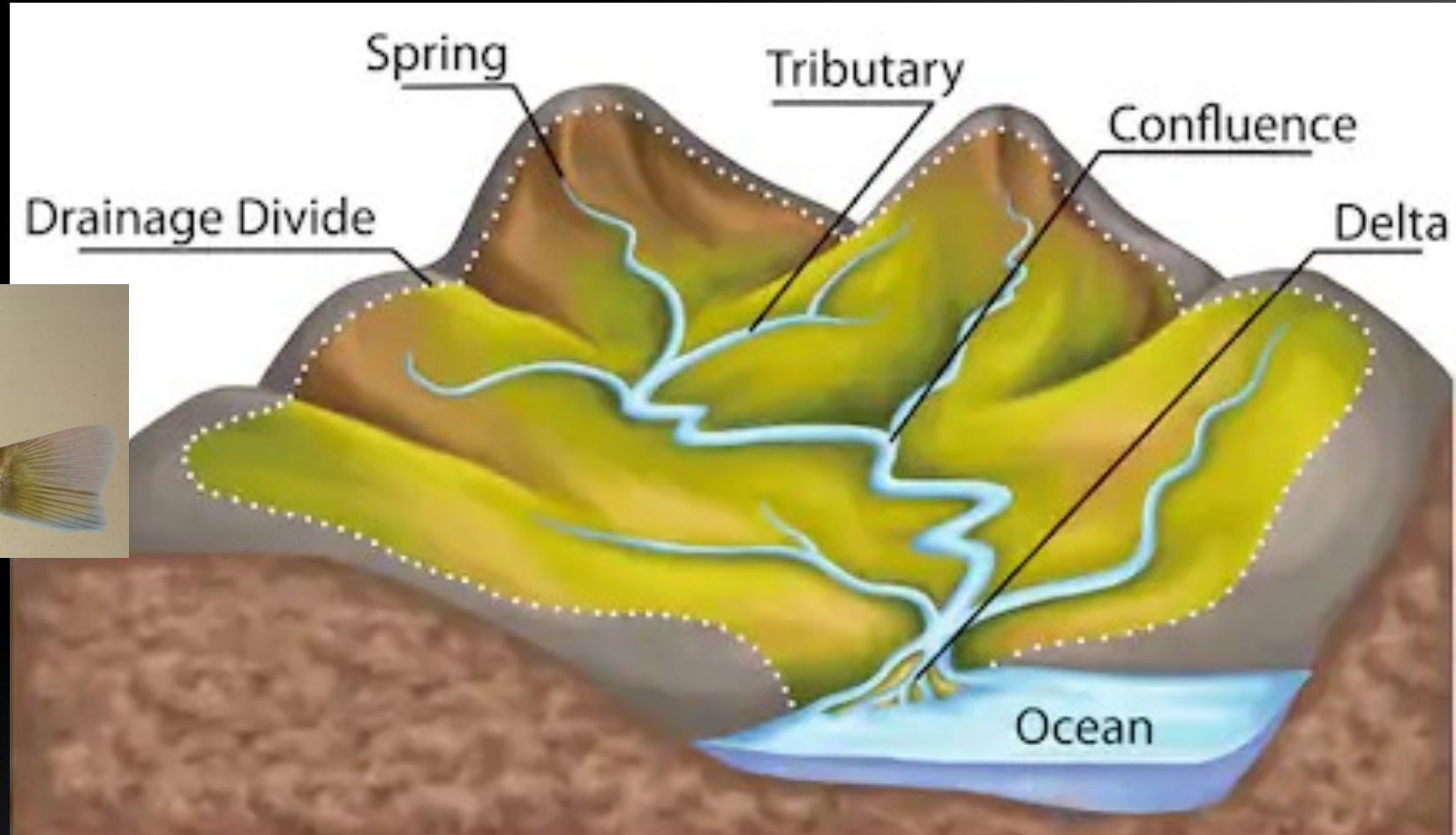


Australasian Flyway



Migration

Most short distance migrations: freshwater-marine, within stream reach or river

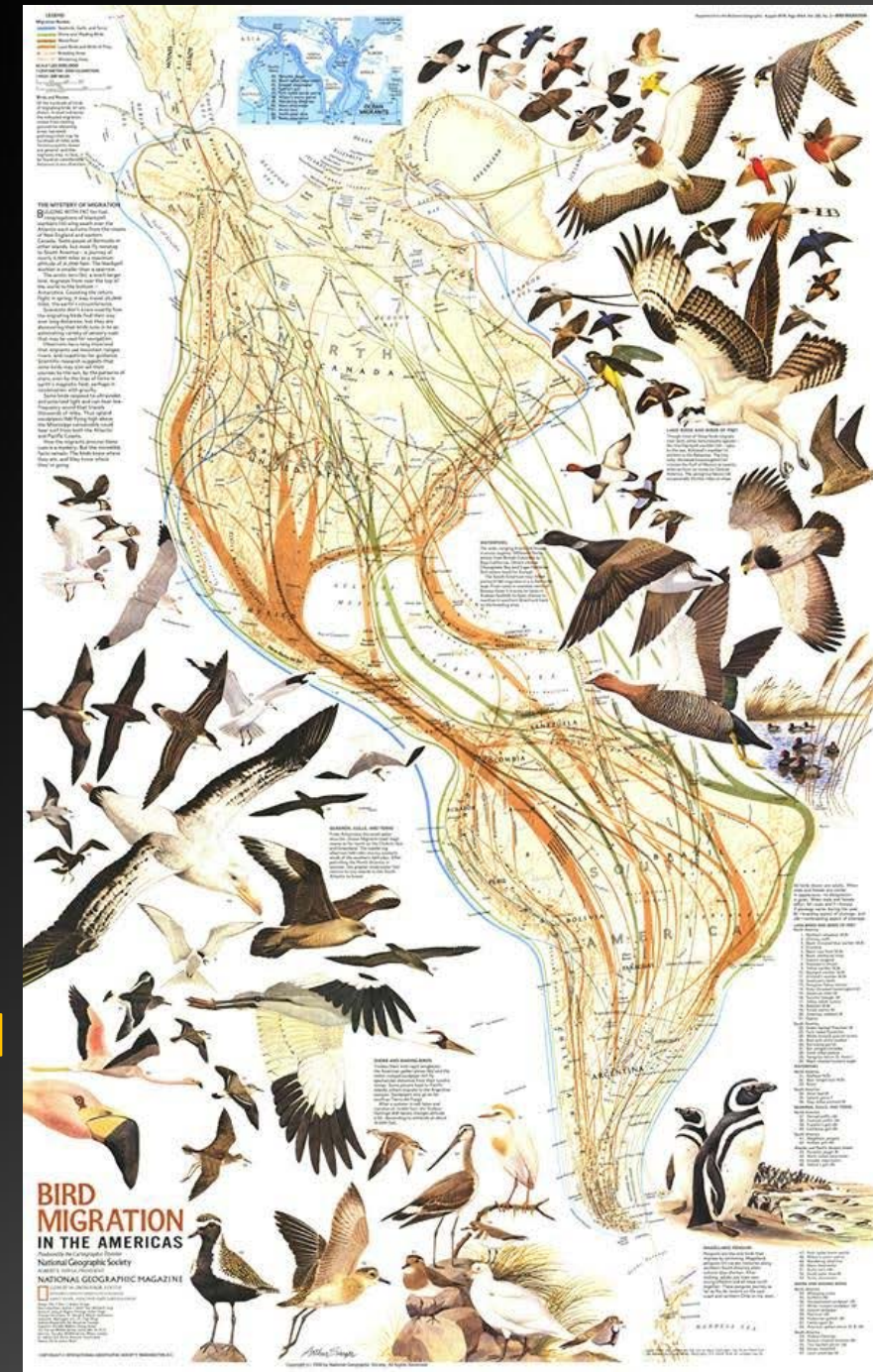


Migration

- I. Spatial extent – local, regional, global
- II. Temporal extent – annual, seasonal, life history stage
- III. Triggers – food, reproduction, habitat quality, range expansion, density-dependent/independent
- IV. Limiting factors – weather, obstacles (mountains, dams), fragmentation via habitat loss

Why is this important?

- i. define a population, subpopulation, or patch
- ii. factors that drive population demographics: survival, recruitment, source-sink dynamics
- iii. where, when, and how many resources should be allocated for conservation



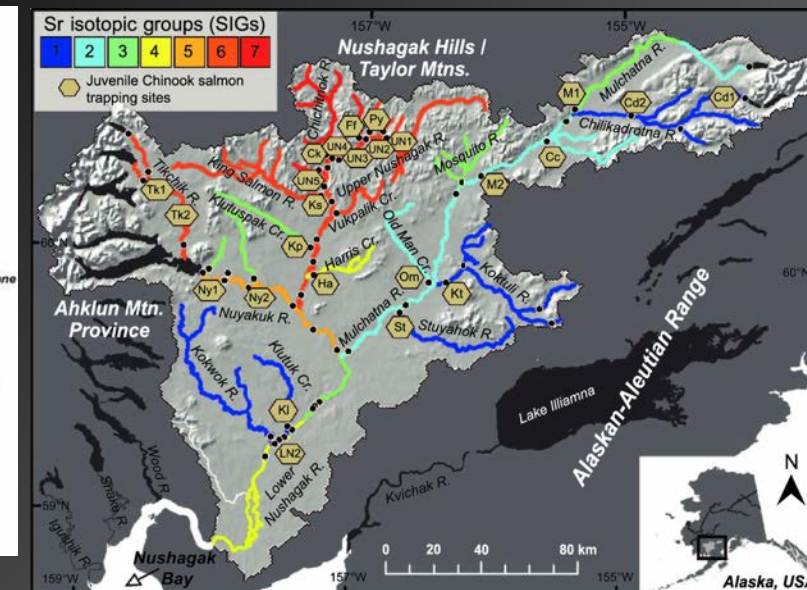
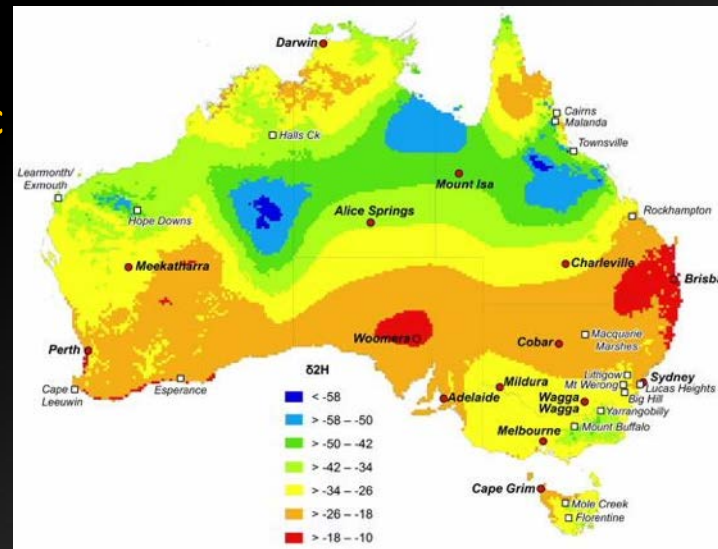
Migration

Methods

- Mark-recapture – banding, radio/GPS/PIT tags
- Genetic – mitochondrial, microsatellites, nuclear markers
- Biogeochemical – Carbon, Hydrogen, Nitrogen, Sulfur, Strontium, metals, organic pollutants

Limits

- Spatial variability
 - Temporal variability
 - Uptake kinetics – tissue and tracer specific
- How does animal integrate chemicals into different tissues at different life stages



Mitchell River, QLD

River during wet season, series of waterholes during dry season

Floodplains critical to fish productivity

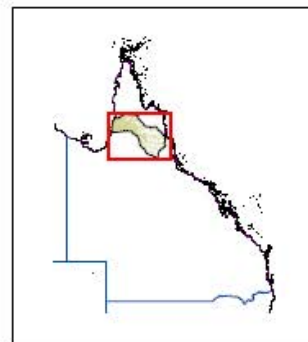
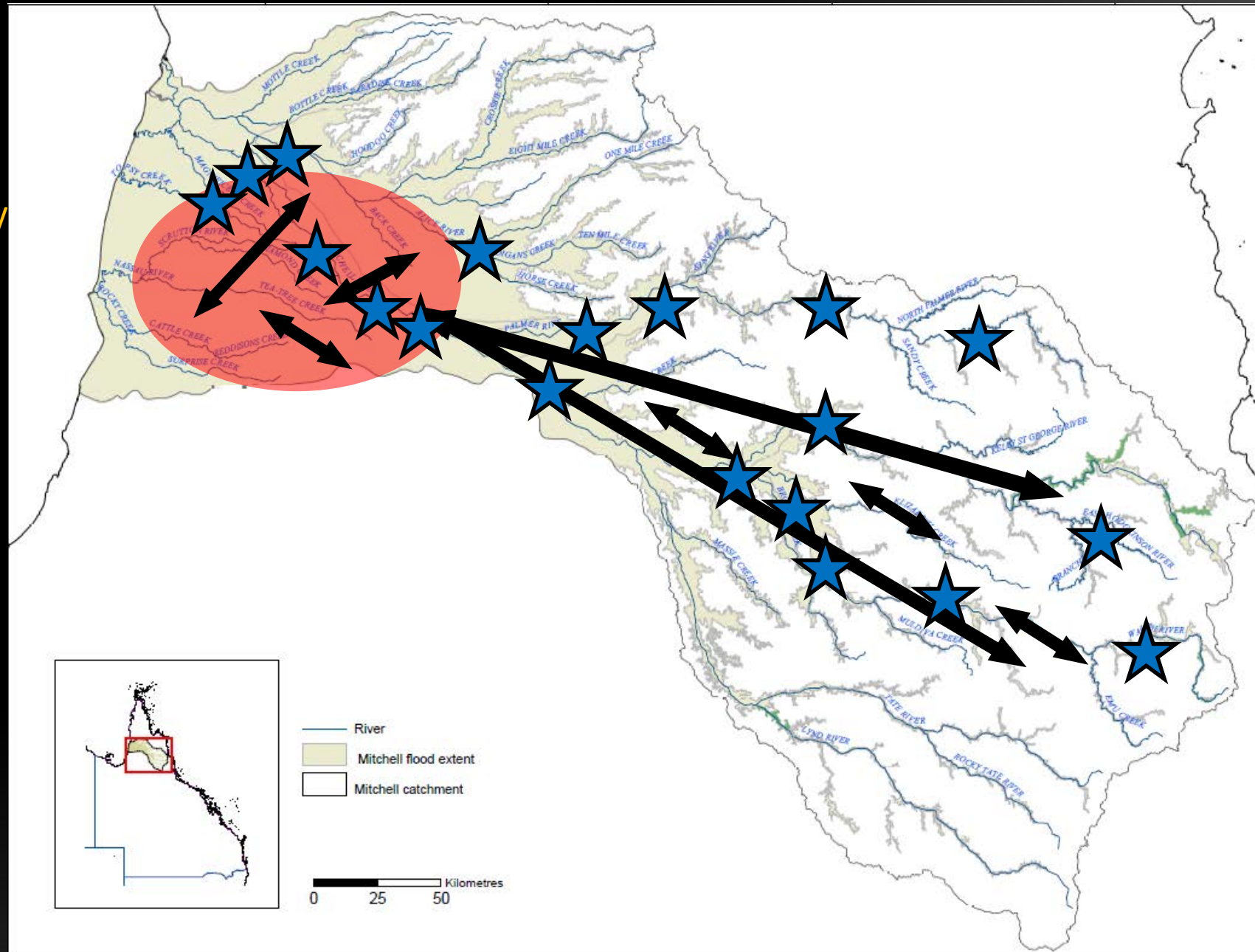
Are fish migrating to floodplains from other areas of the catchment?

- Migration patterns unknown for most fish

Multiple potential dam sites

Migration data will allow us to understand to what degree dams will potentially influence fish productivity

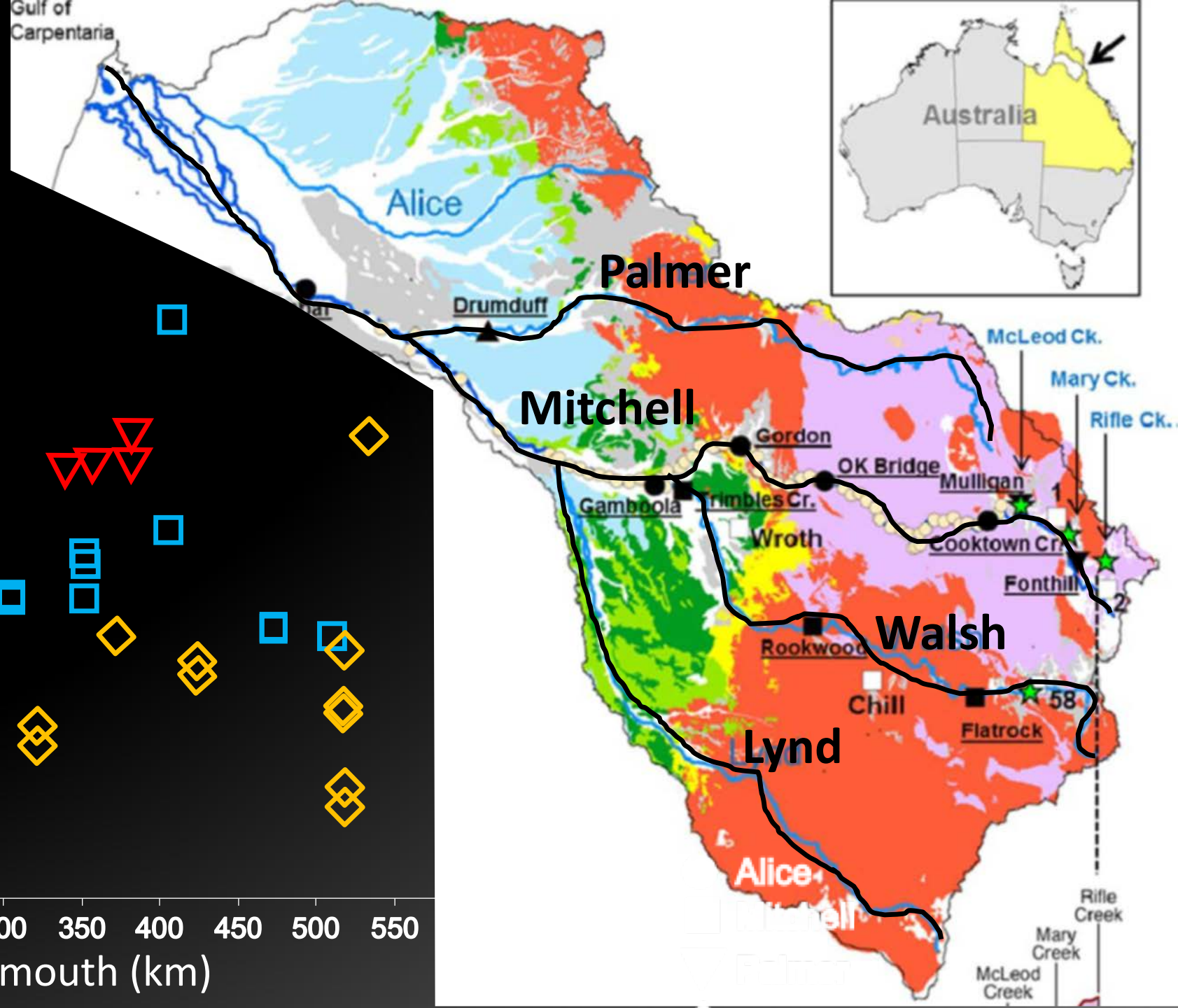
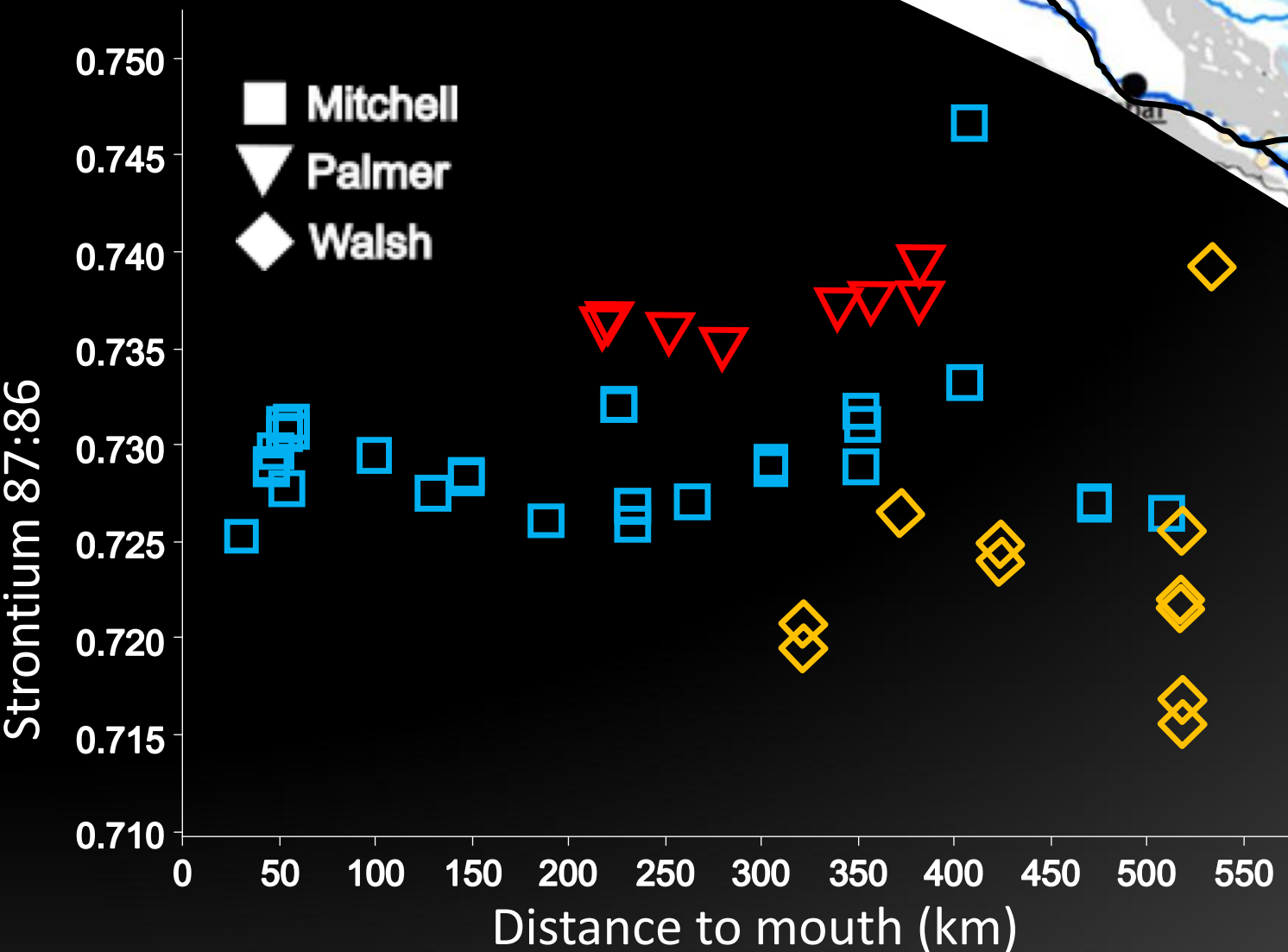
Sampled sites throughout the catchment



Mitchell River, QLD

Strontium (87:86 ratio)

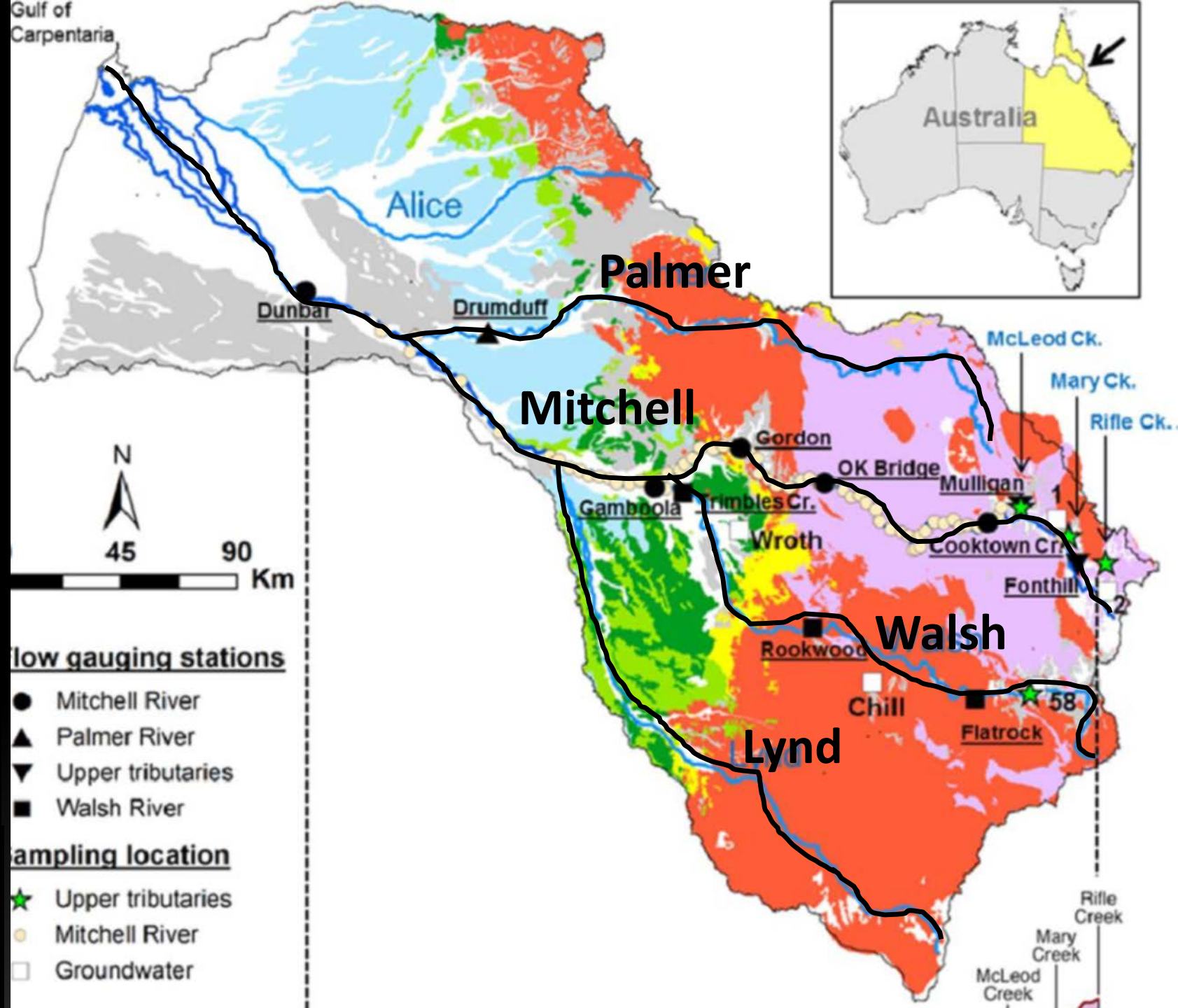
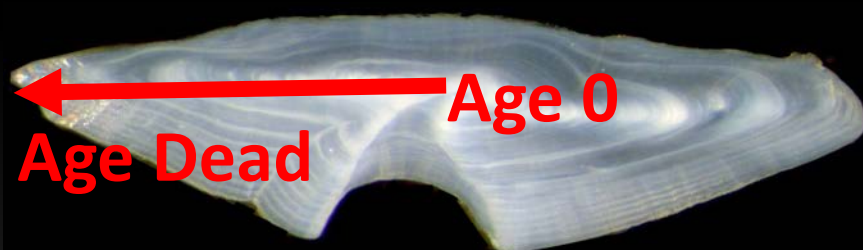
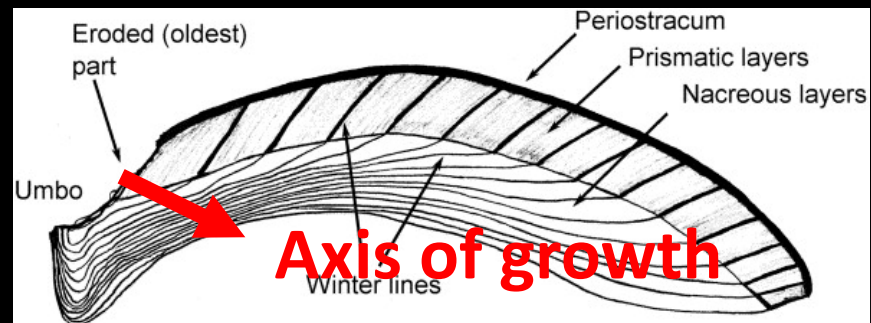
- Spatial variability controlled by geology



Mitchell River, QLD

Strontium (87:86 ratio)

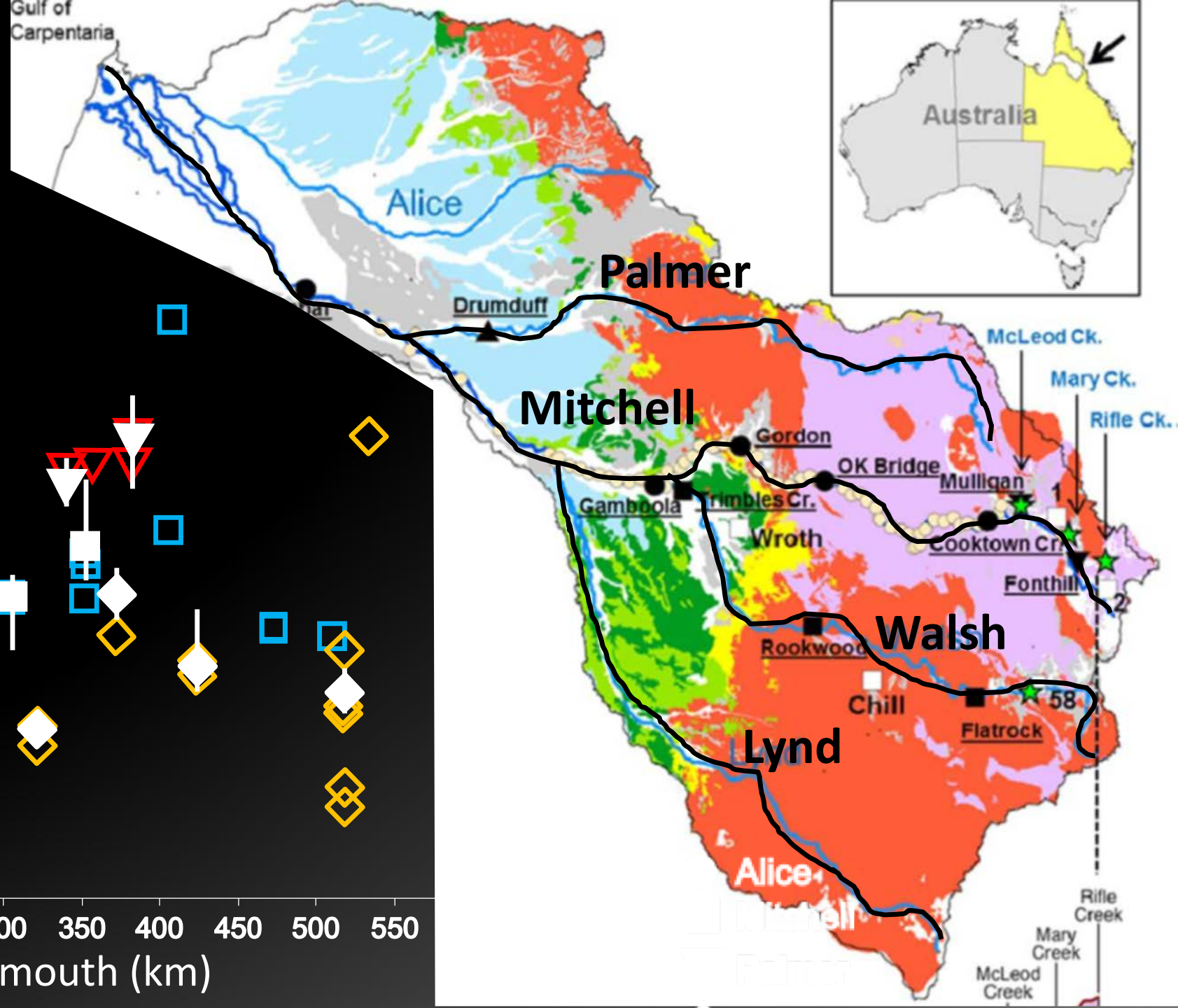
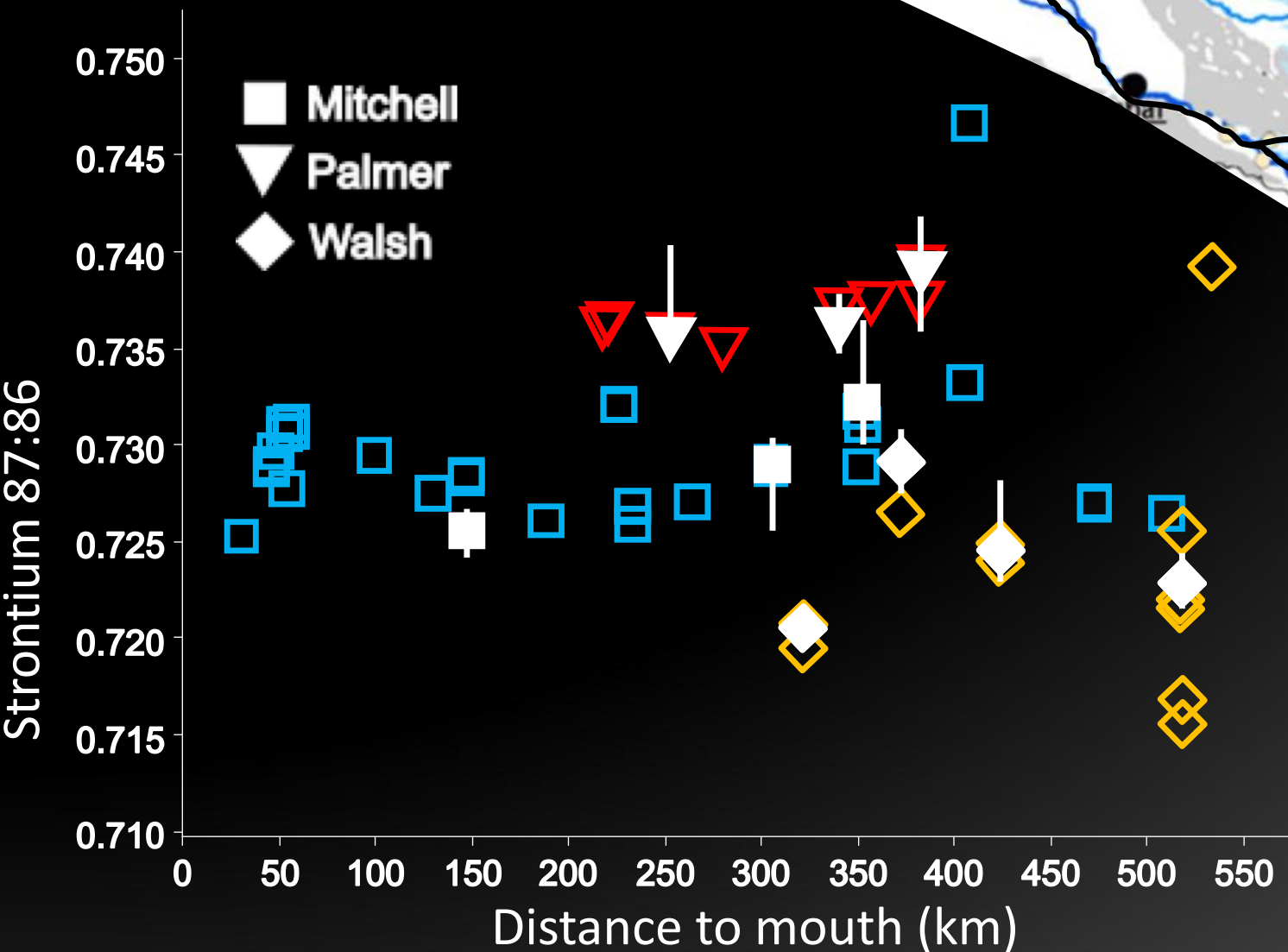
- Spatial variability controlled by geology
- Uptake kinetics
 - Strontium acts like calcium in the body
 - The axis of growth thus has a record of the strontium ratio of the water
- Variable flow regime can influence strontium ratio



Mitchell River, QLD

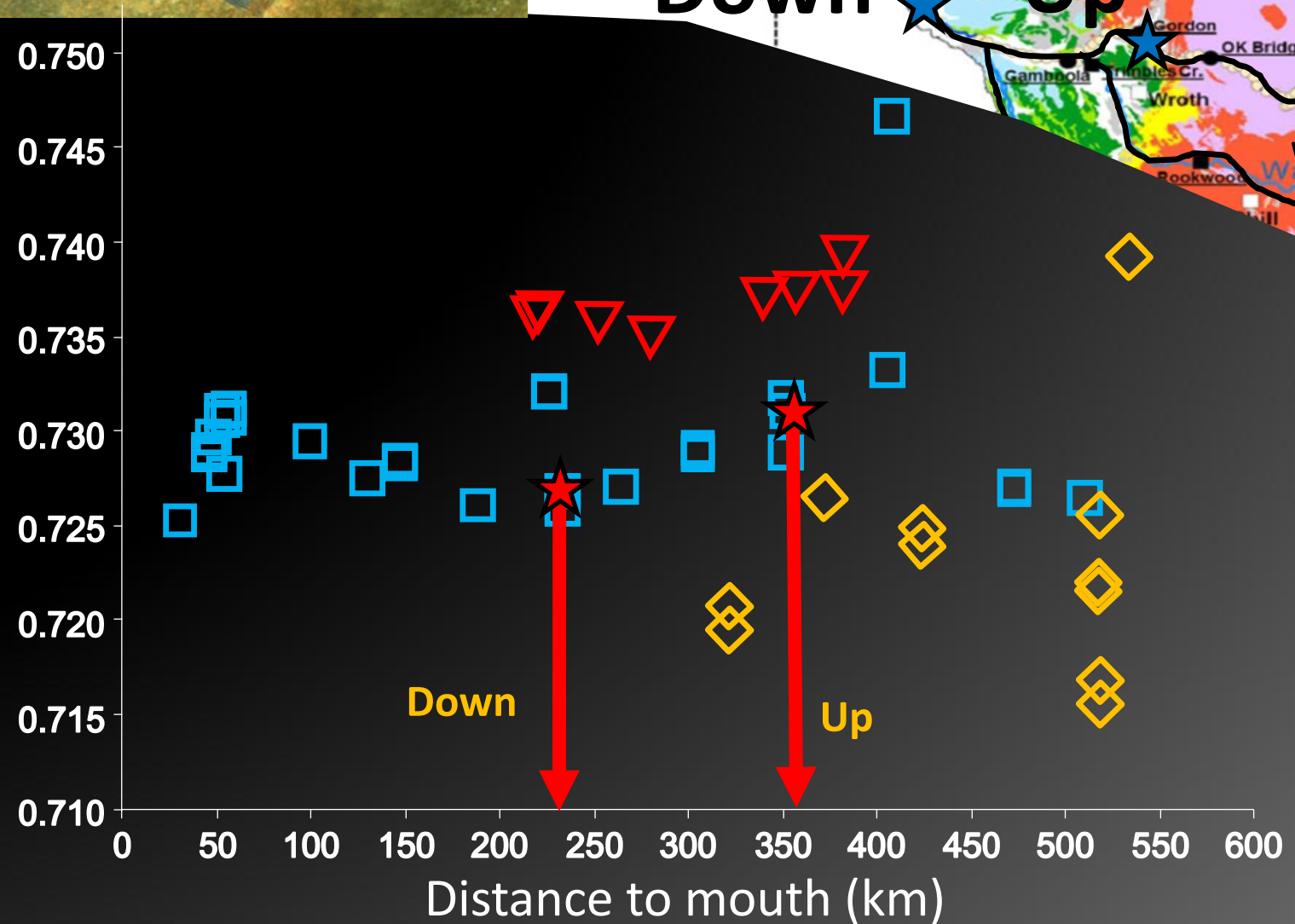
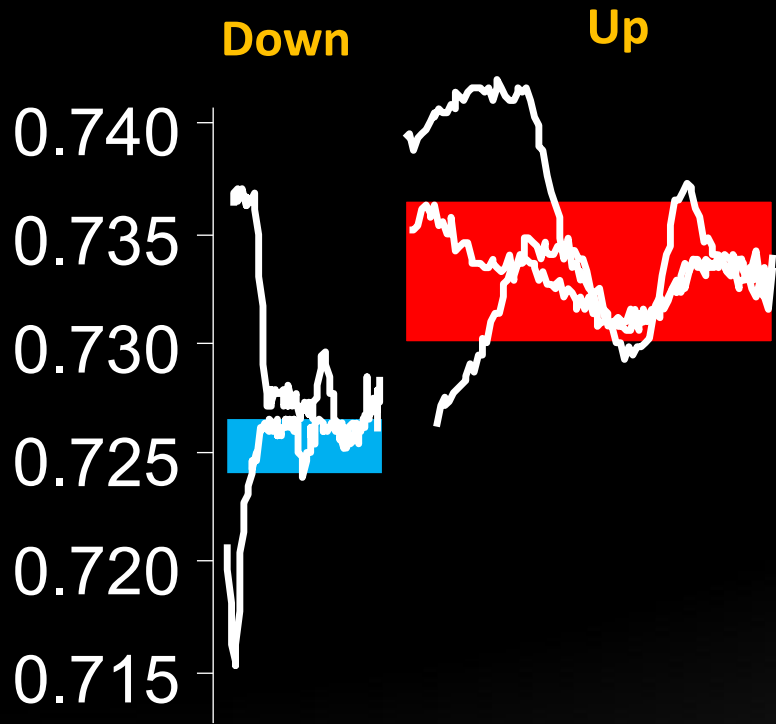
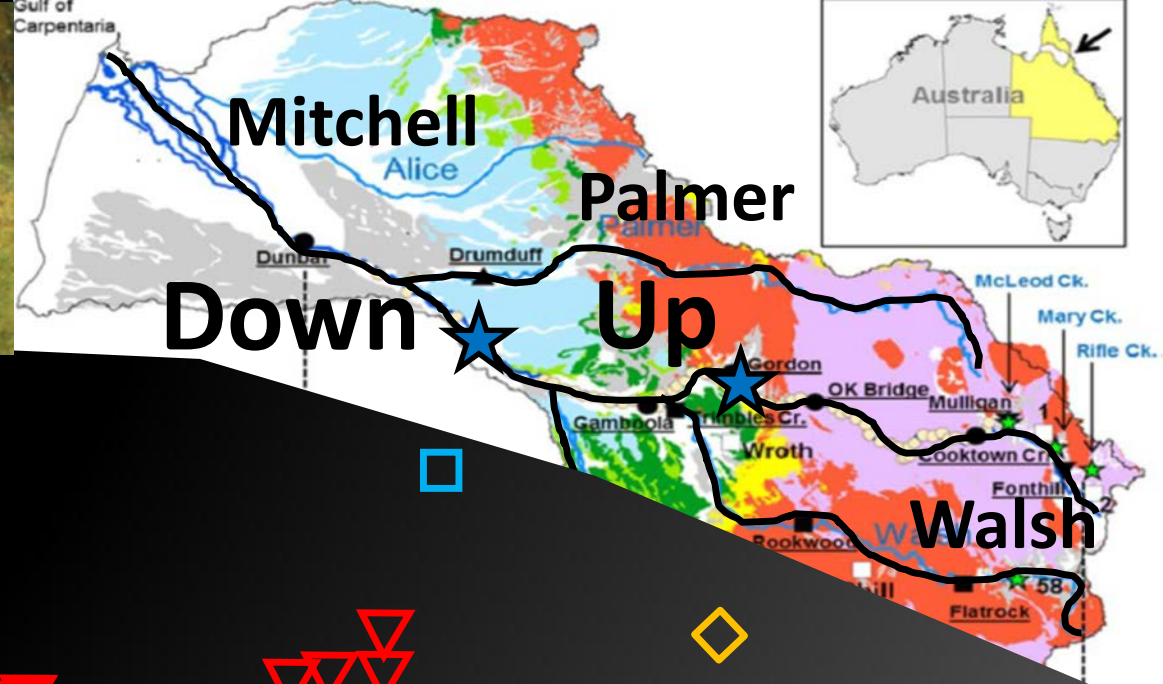
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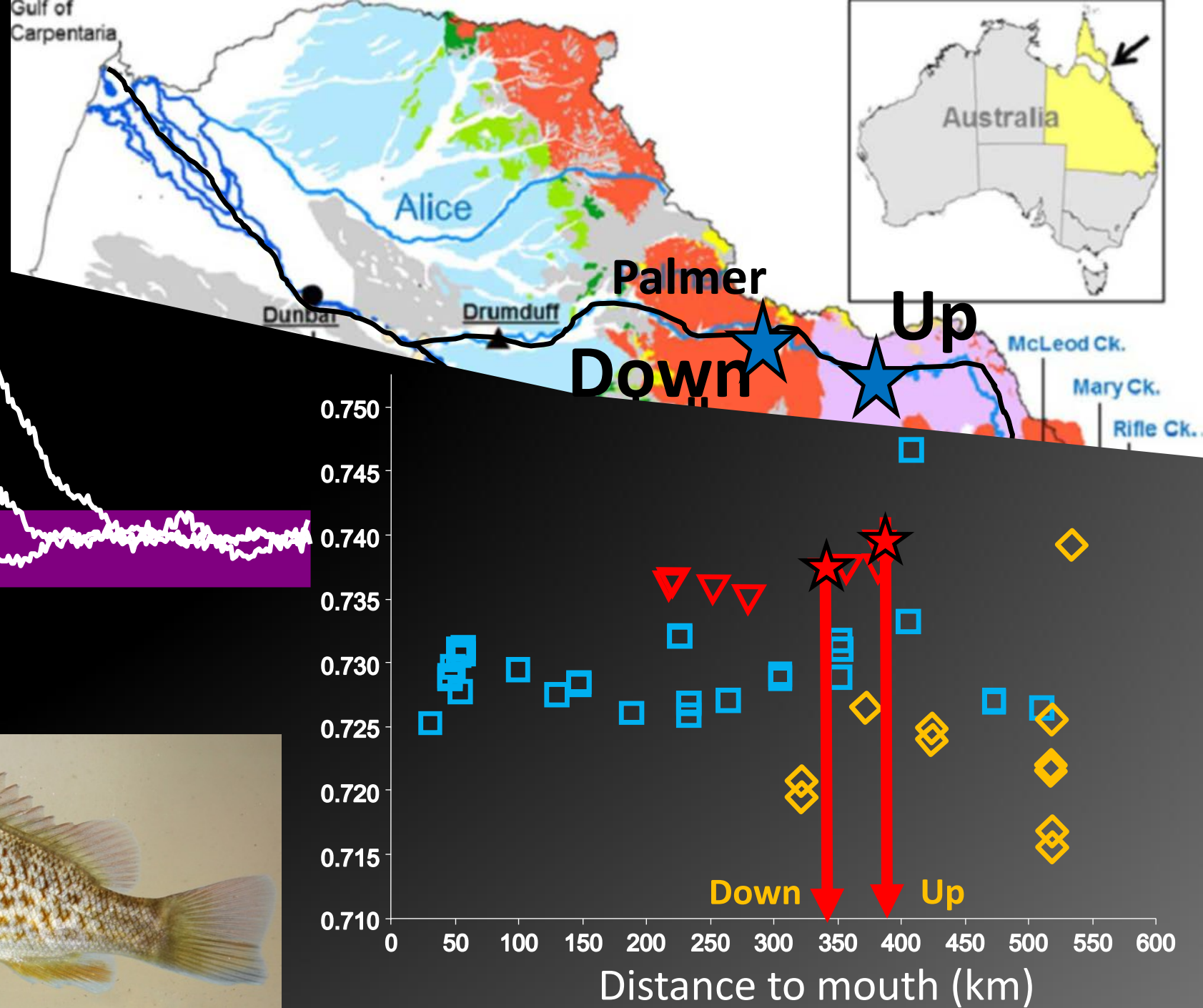
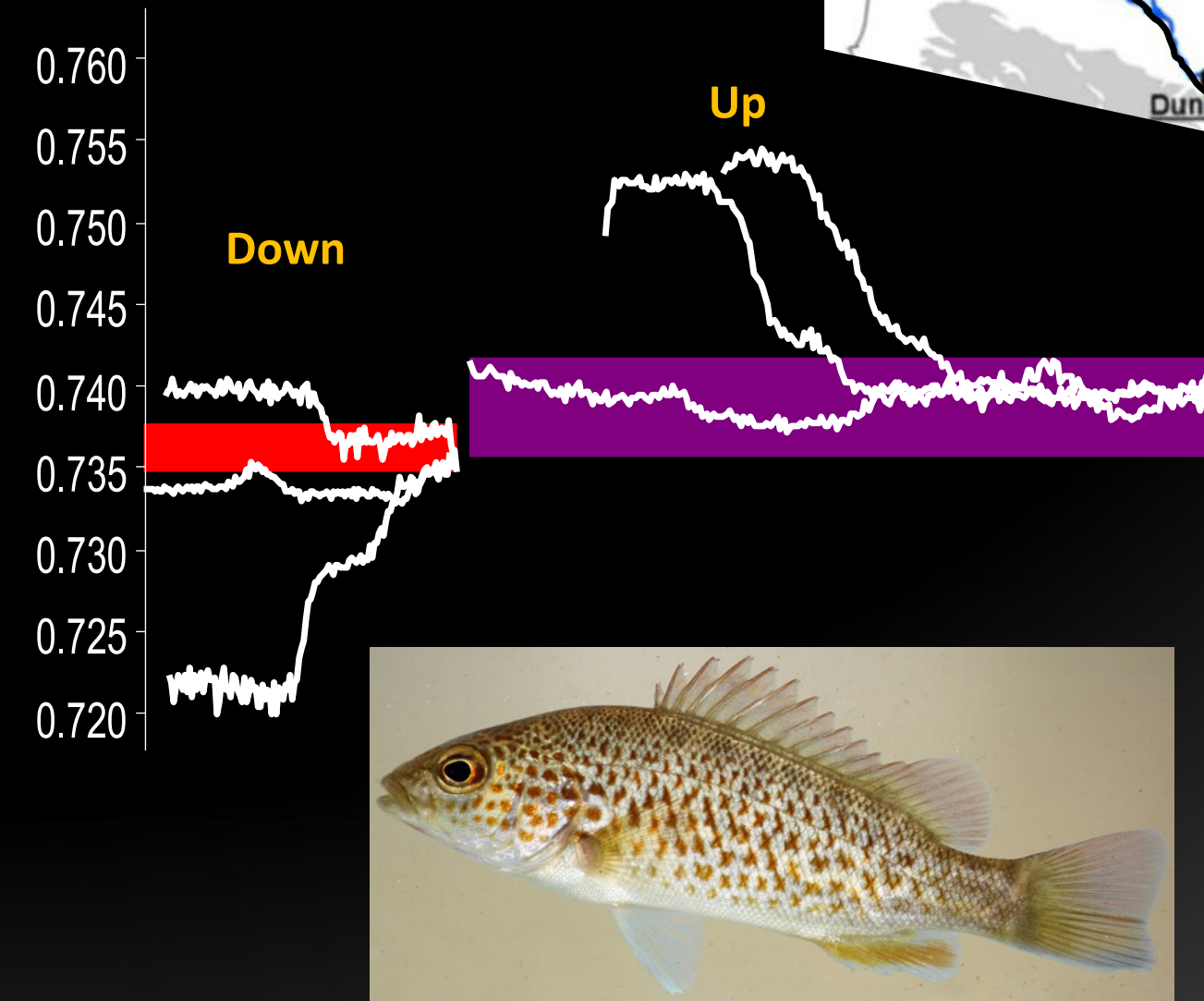
Mitchell River, QLD

Sooty Grunter



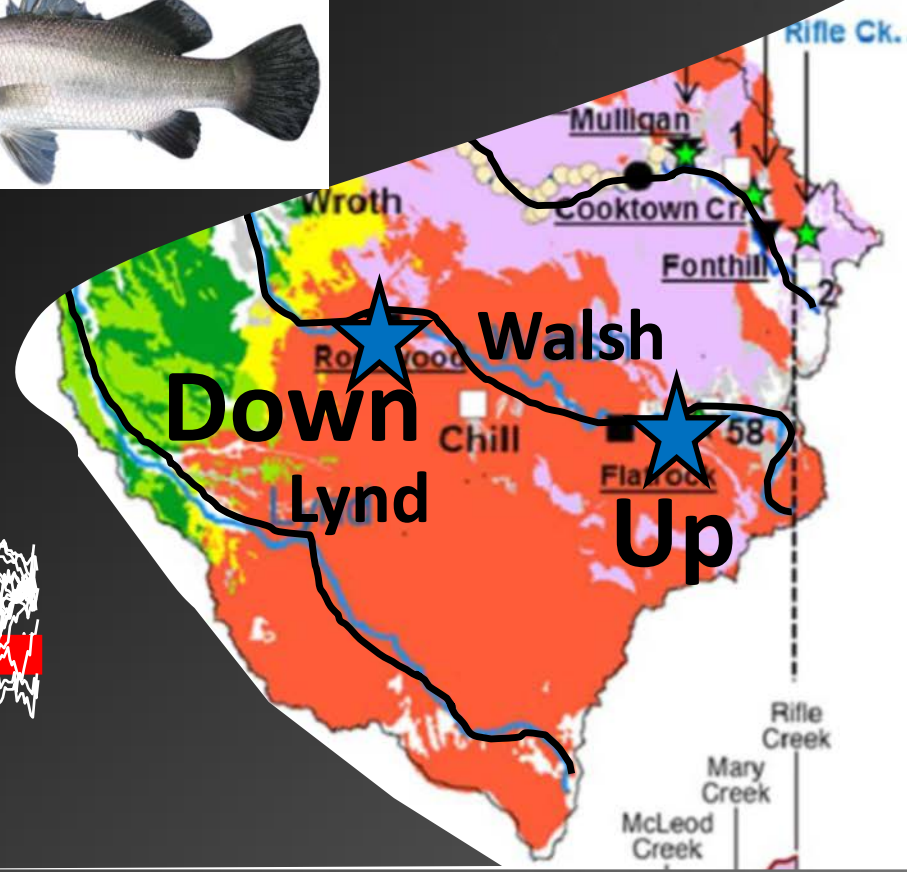
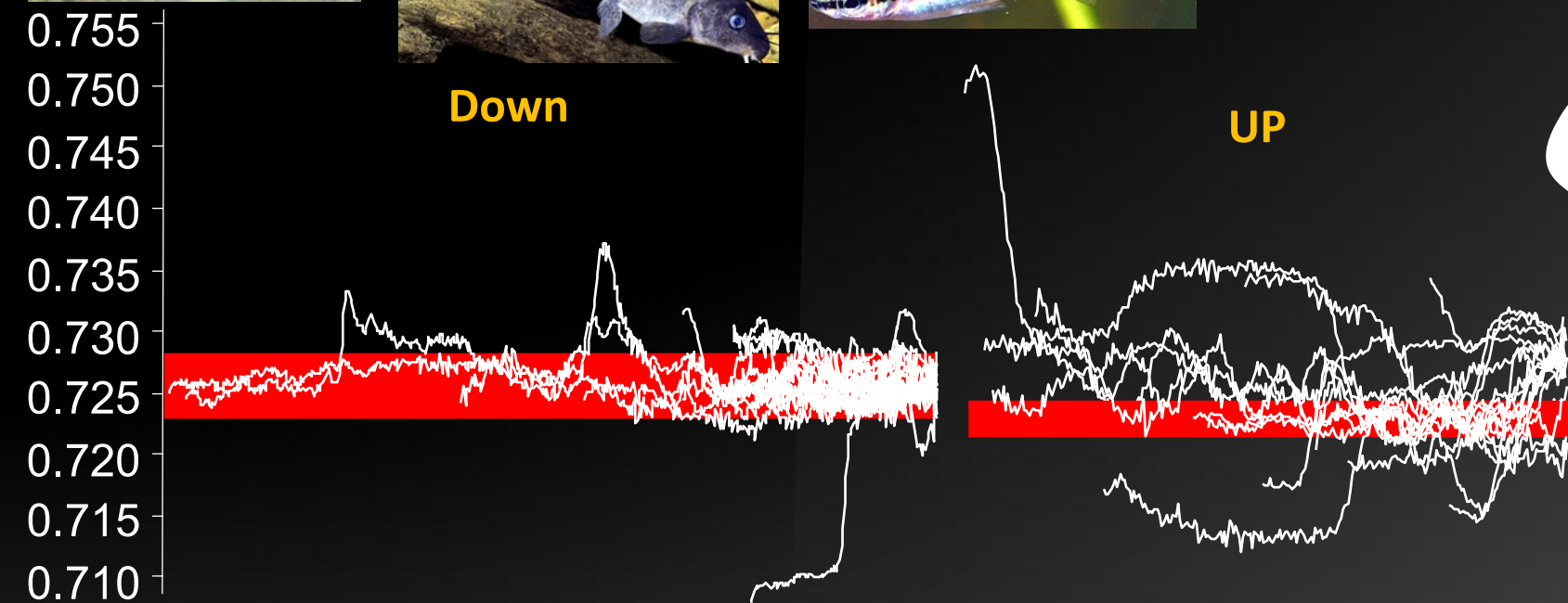
Mitchell River, QLD

Spangled Perch



Mitchell River, QLD

Community-level



Mitchell River, QLD

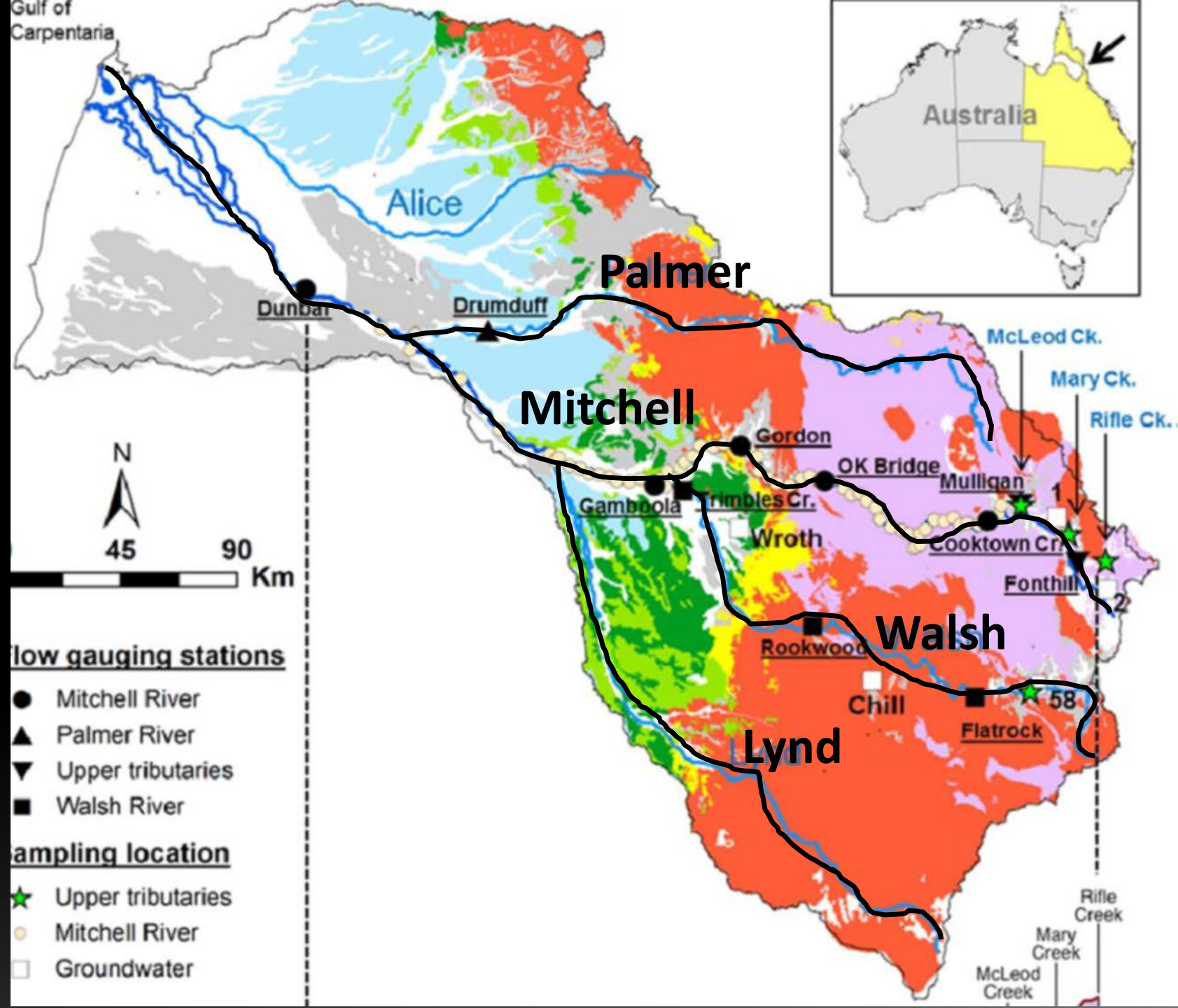
- ~950 fish, 26 species (~1 to 90 cm)
- Analyzed ~341 otoliths and 10 shells; have ~600 otoliths and ~20 shells left to analyze

Questions we can potentially answer:

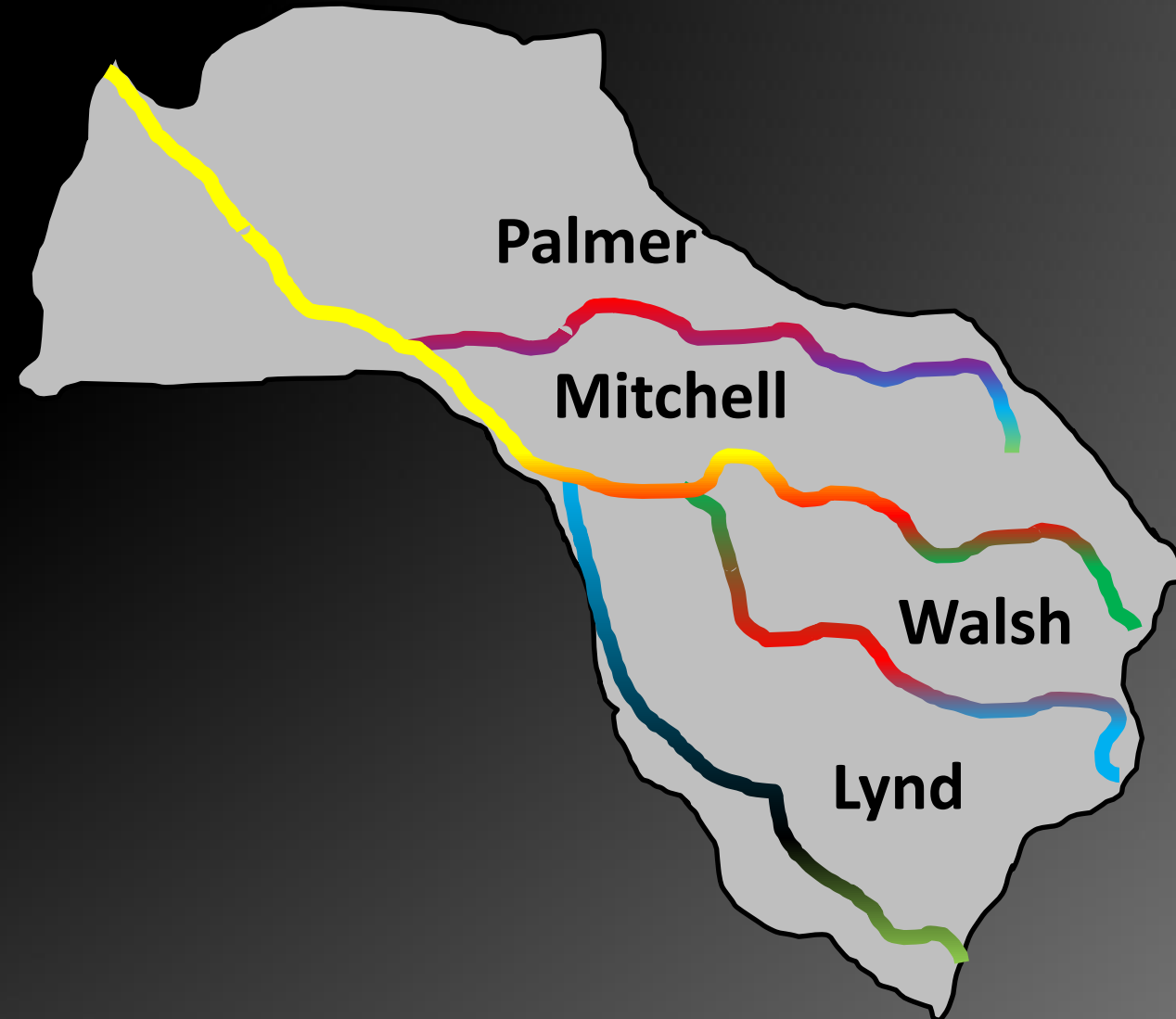
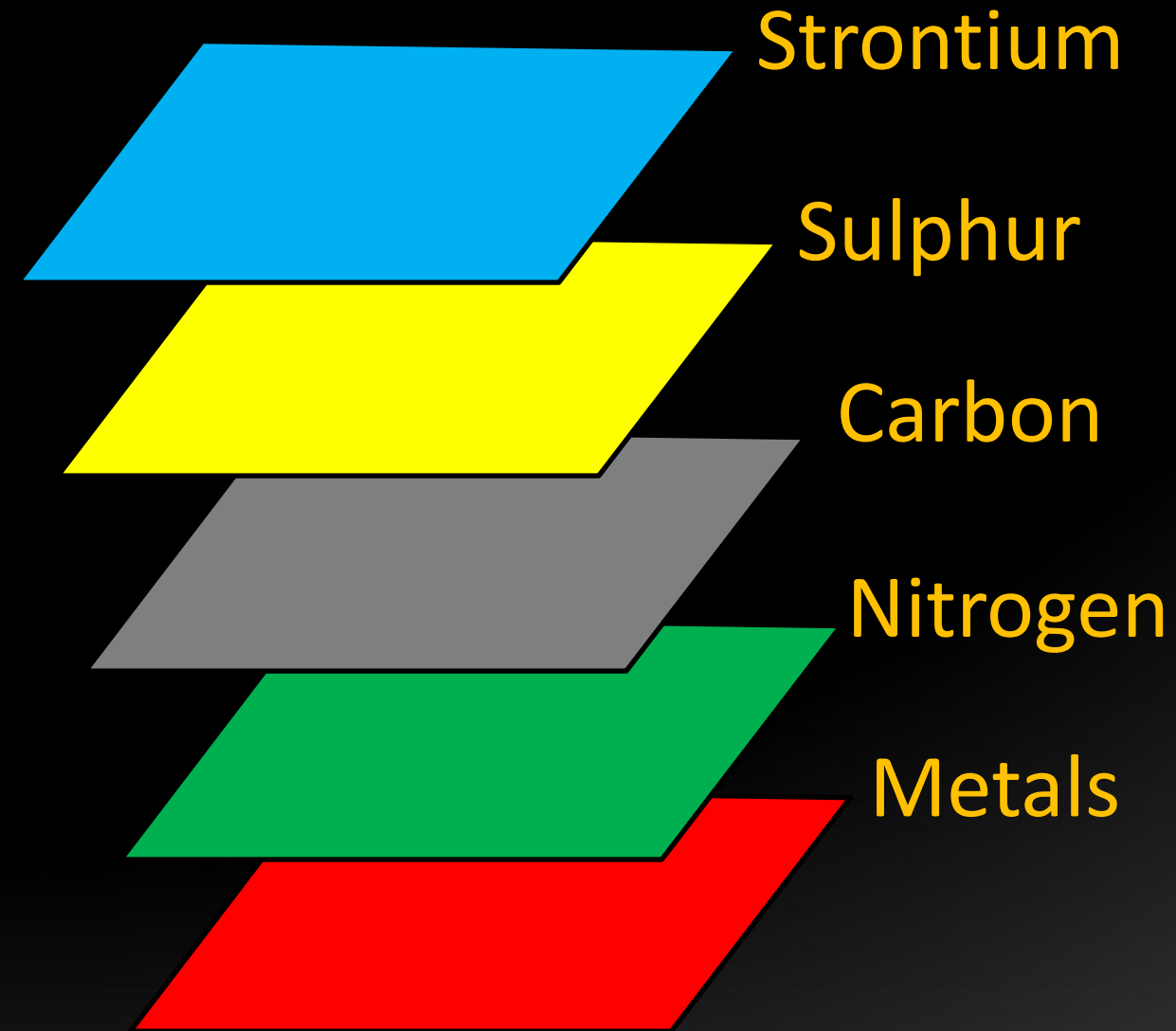
- Which species migrate? **Yes**
- Source-sink dynamics? **Yes**
- What are source populations?
Maybe: up- vs down-stream or sub-catchments
- Do migratory patterns vary spatially? **Yes**
- Dispersal kernels per species? **Yes**

Migration plus community structure:

- How much biomass is moving through the catchment? **Yes**
- Where is most of fish biomass being built? **Yes**



Multiple tracer isoscape - similar to ecological niche models



Acknowledgments

Traditional owners throughout the Mitchell River catchment

Kokominjena, Kokoberra, Kunjen, Western Gugu Yalanji, Mulliridgee, Barbarum, Kuku Djunkan
Gugu Mini

Fieldwork

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