

Clawing their way through the tropics: Drivers and impacts of the redclaw crayfish spread in Singapore



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SCOPE

BACKGROUND

REDCLAW CRAYFISH INVASION IN SINGAPORE

DRIVERS AND IMPACTS

TROPHIC INTERACTIONS

SHELTER COMPETITION

FUTURE WORK

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Singapore

A tiny red dot in the tropics



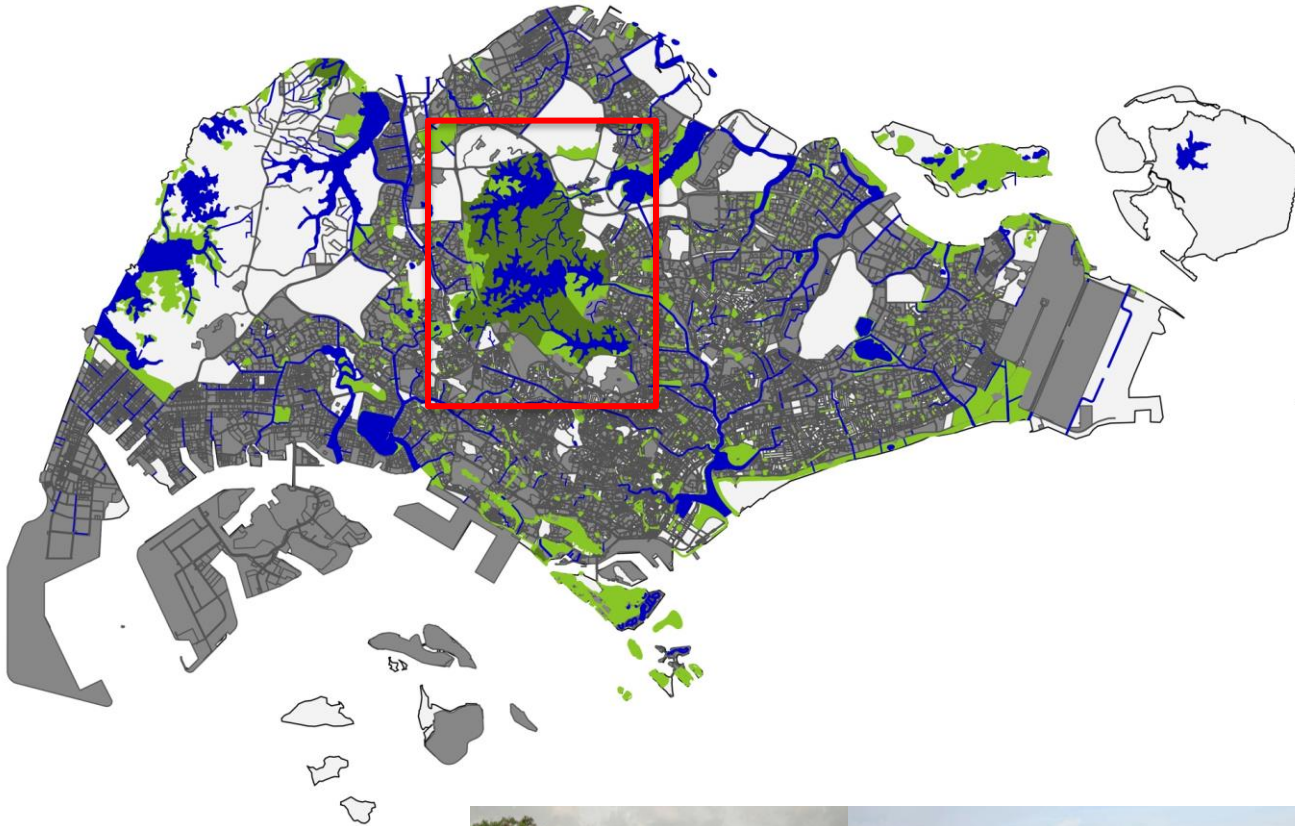
Singapore

A tiny red dot in the tropics



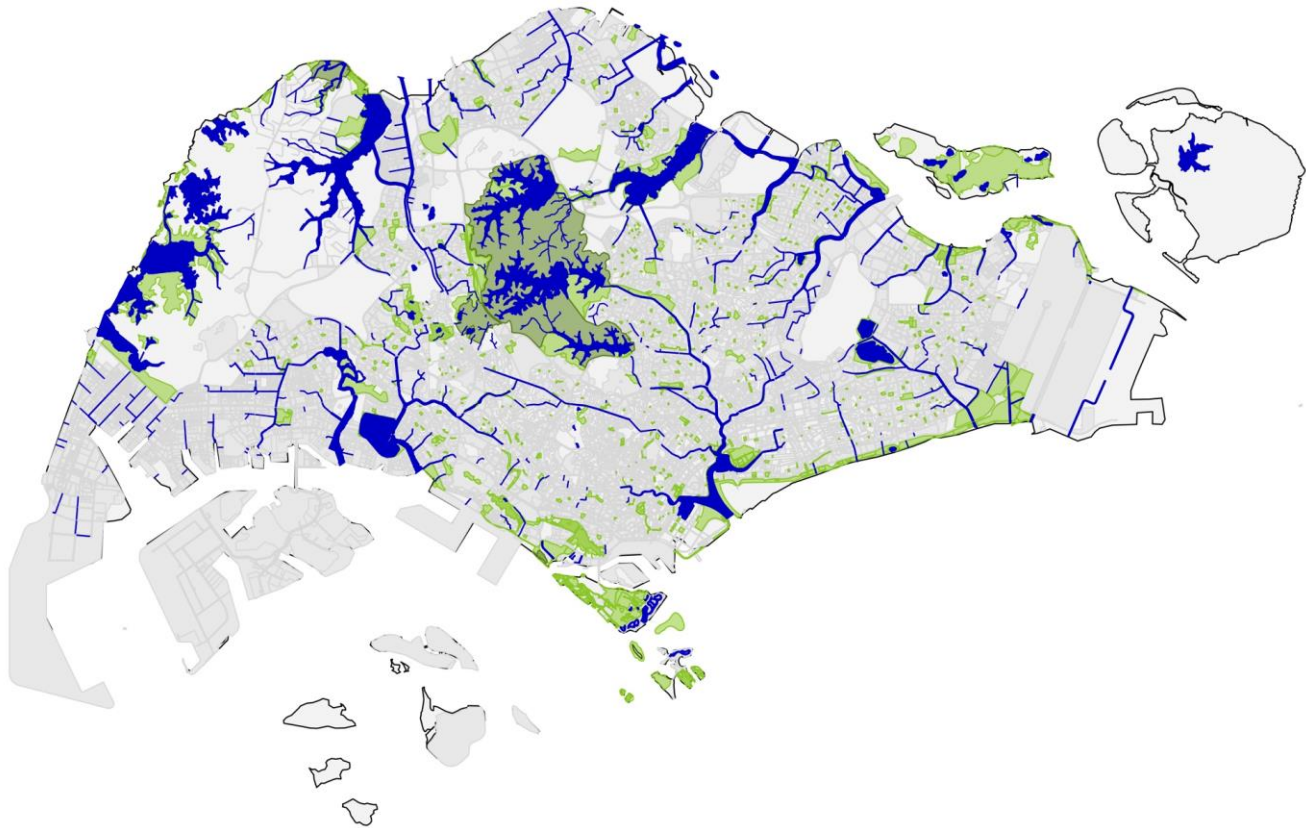
Singapore

Highly urbanized city... with some green and blue



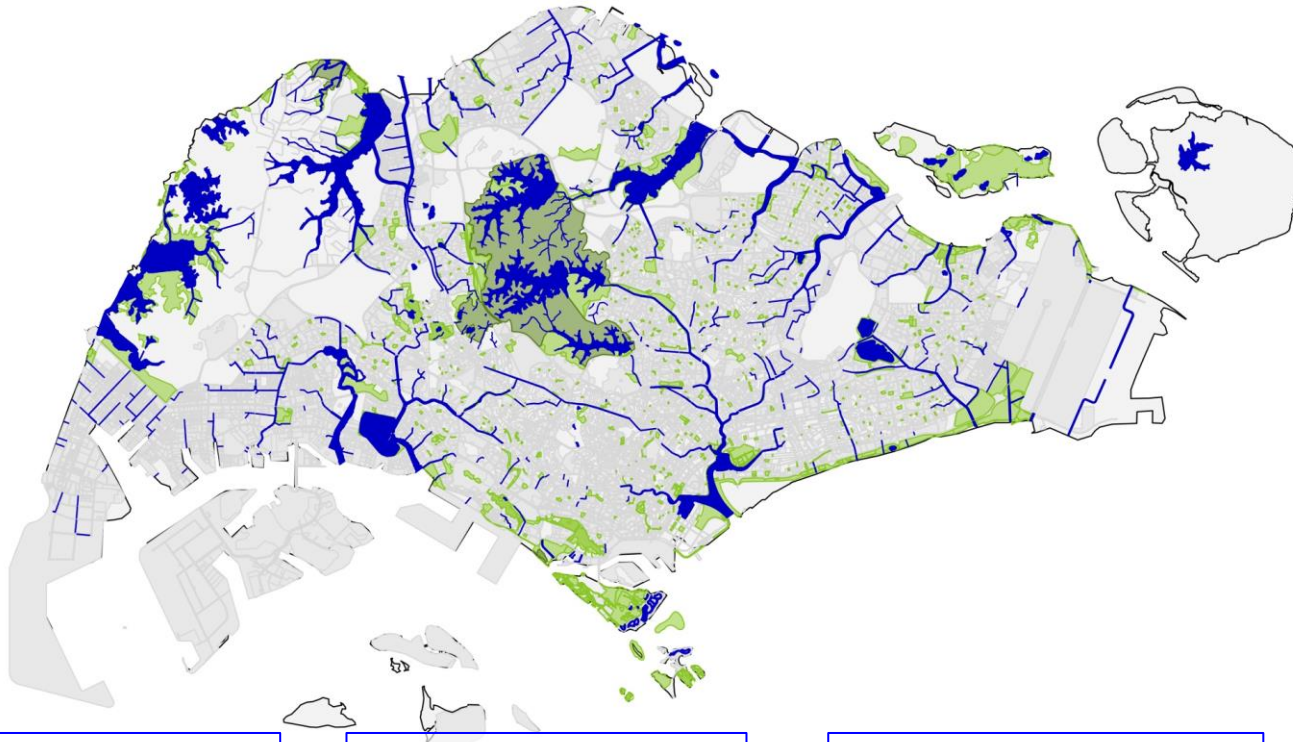
Singapore

The blue... a lot of it



Singapore

Types of freshwater habitats



Freshwater
swamps



Forest streams



Reservoirs



Urban Ponds



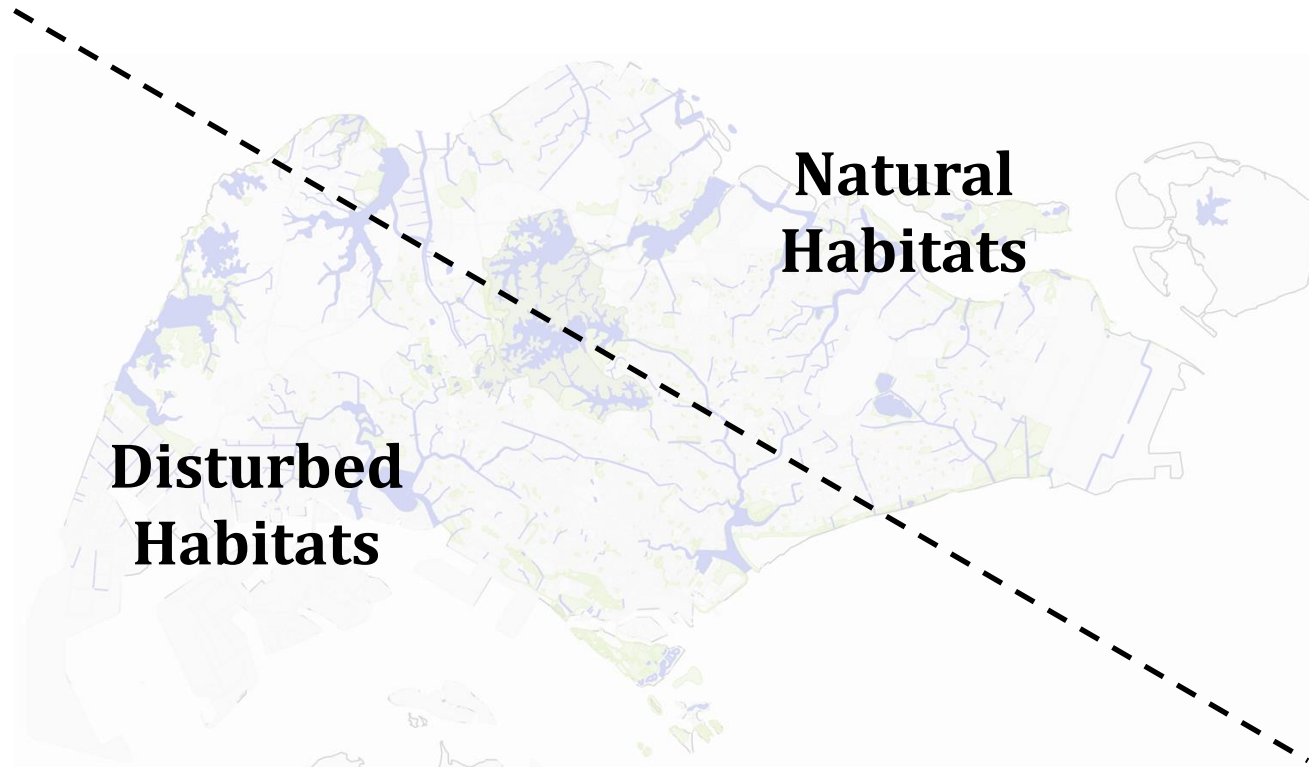
Drains/Canals



Rural streams

Singapore

Types of freshwater habitats



Freshwater swamps



Forest streams



Reservoirs



Urban Ponds



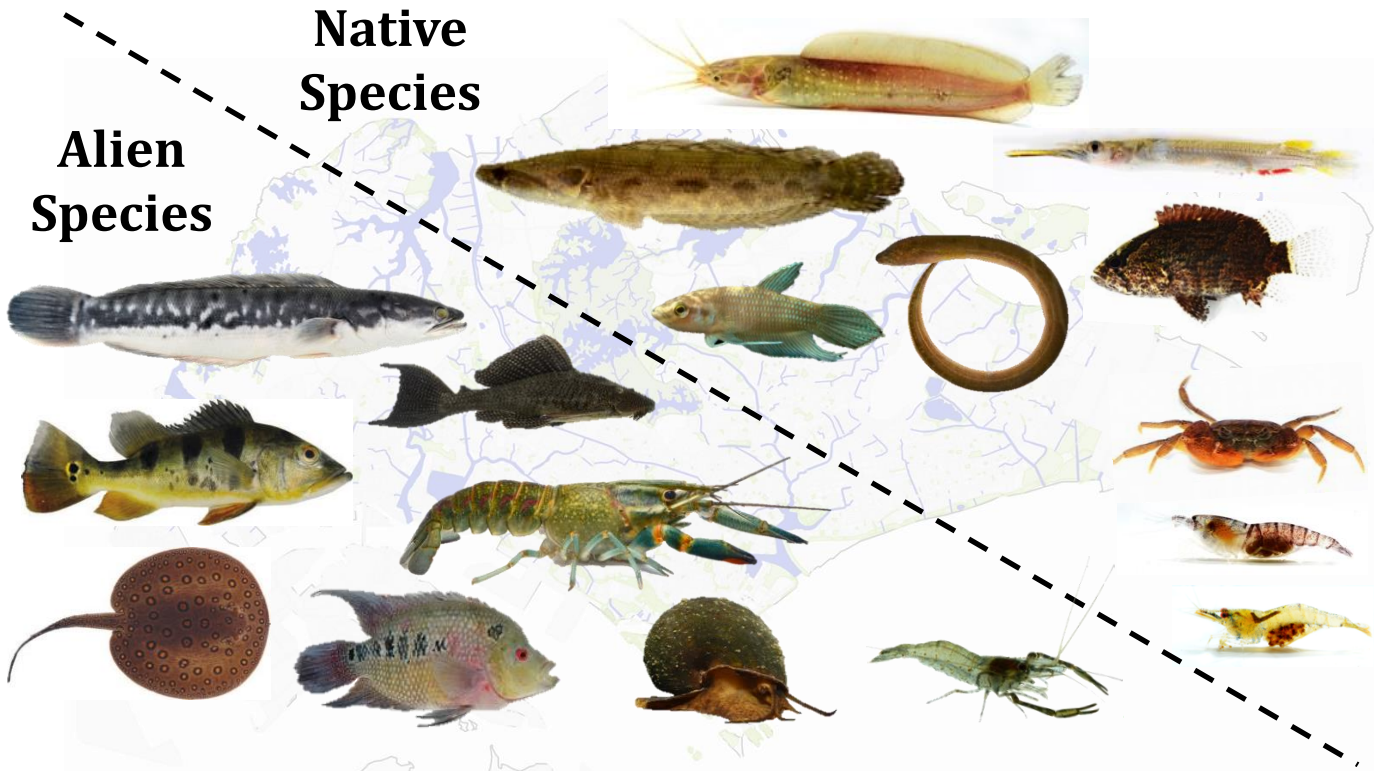
Drains/Canals



Rural streams

Singapore

... and the freshwater species within



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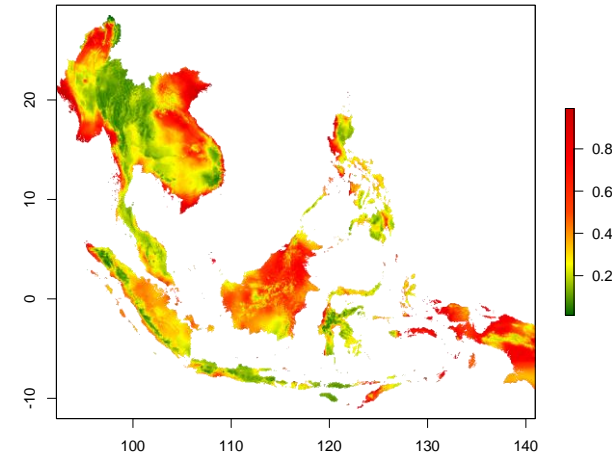
FUTURE WORK

Redclaw Crayfish

(*Cherax quadricarinatus*)



Establishment Likelihood in SEA

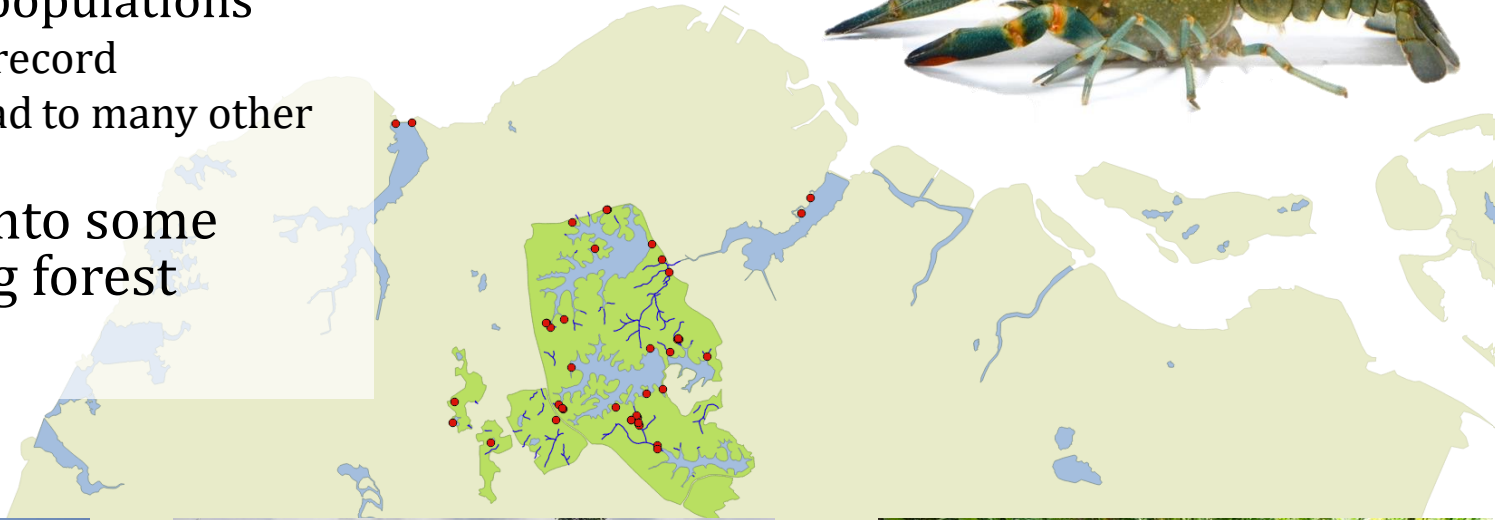
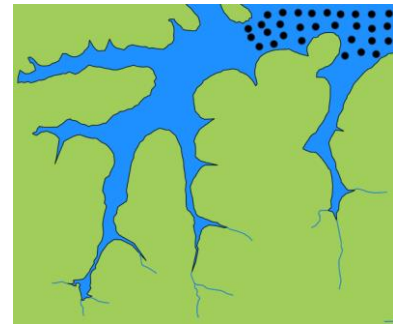


- Native to Papua New Guinea and NE Australia
- Introduced to many tropical habitats:
 - Aquaculture
 - Aquarium trade
- Recent tropical invader
- No known impacts yet!



Singapore

- First introduced in 1980s
- 1990-2000s first reported
- Established populations
 - 2007 first record
 - 2011 spread to many other reservoirs
- Spreading into some surrounding forest streams



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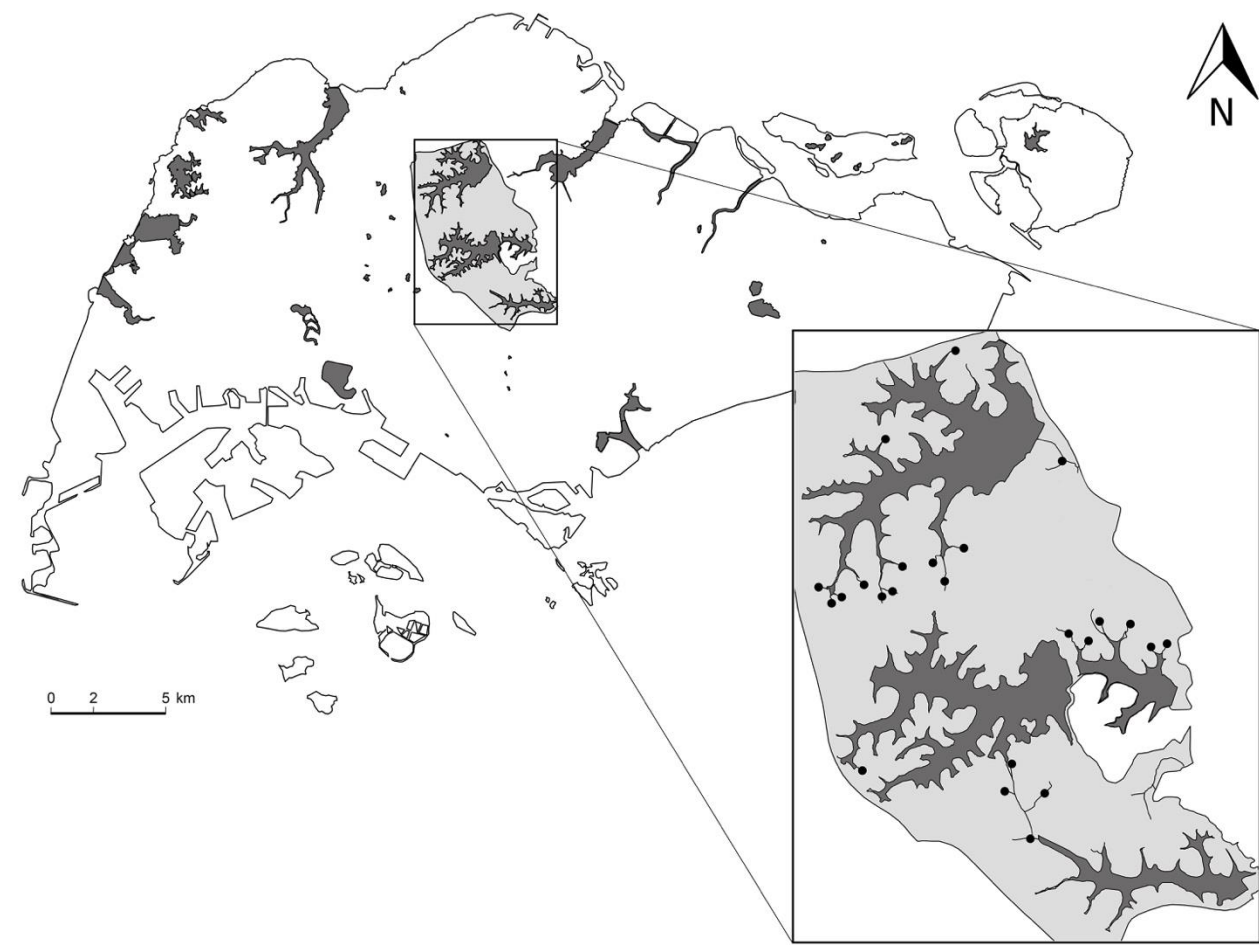
DRIVERS AND IMPACTS

TROPHIC INTERACTIONS

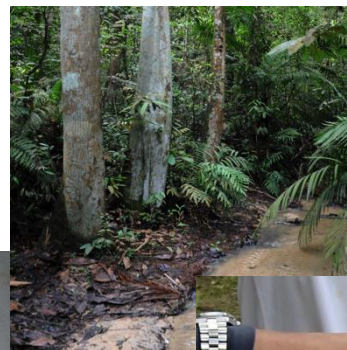
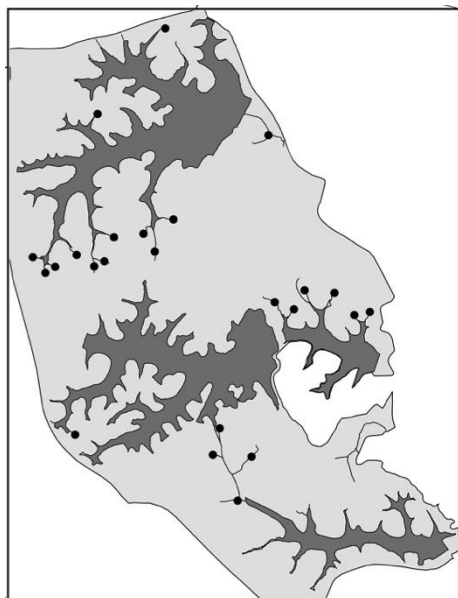
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What we did

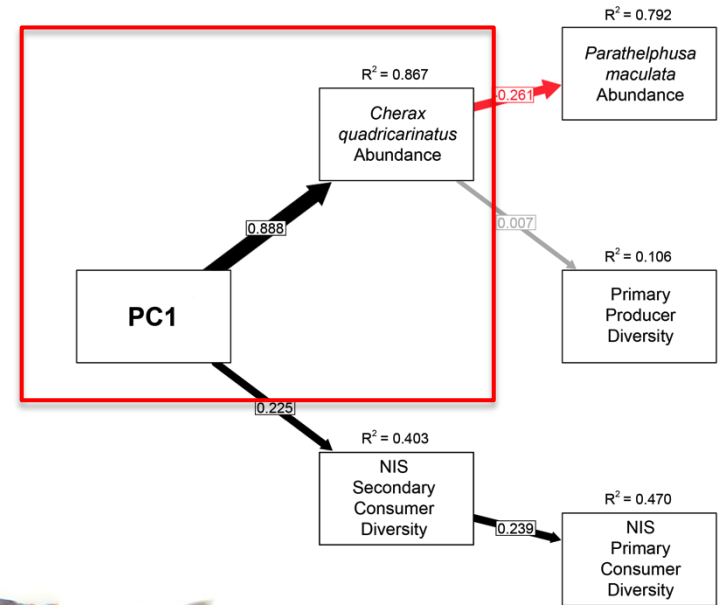


What we did



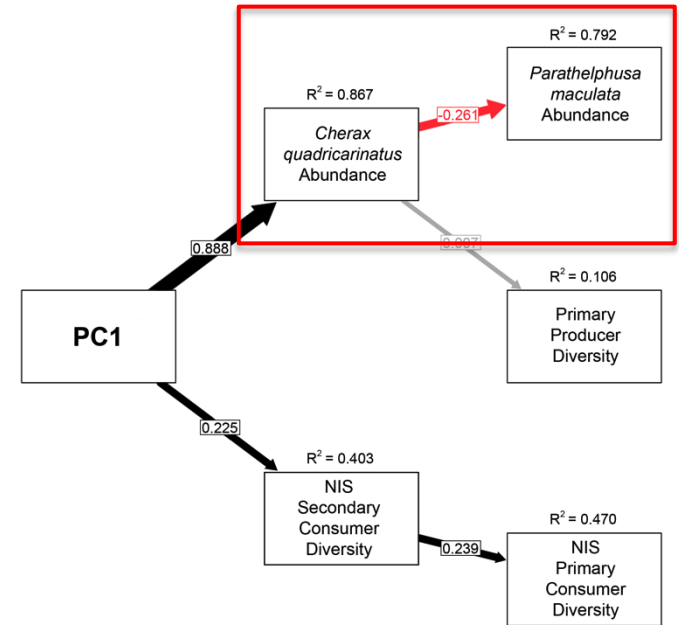
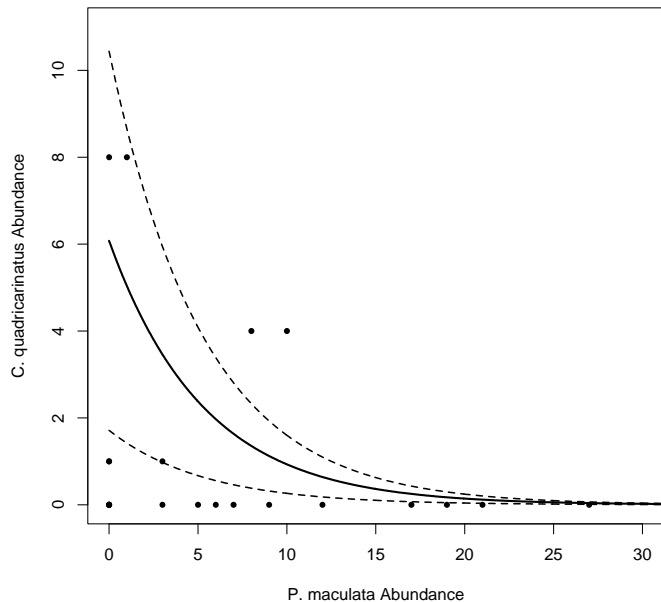
Drivers of spread

- Structural equation models
- PC1 = environmental conditions
- Larger populations in more disturbed forest streams



Impacts of the redclaw crayfish

- Negatively affect lowland freshwater crab
 - *Parathelphusa maculata*
 - Most widespread freshwater crab
- How???



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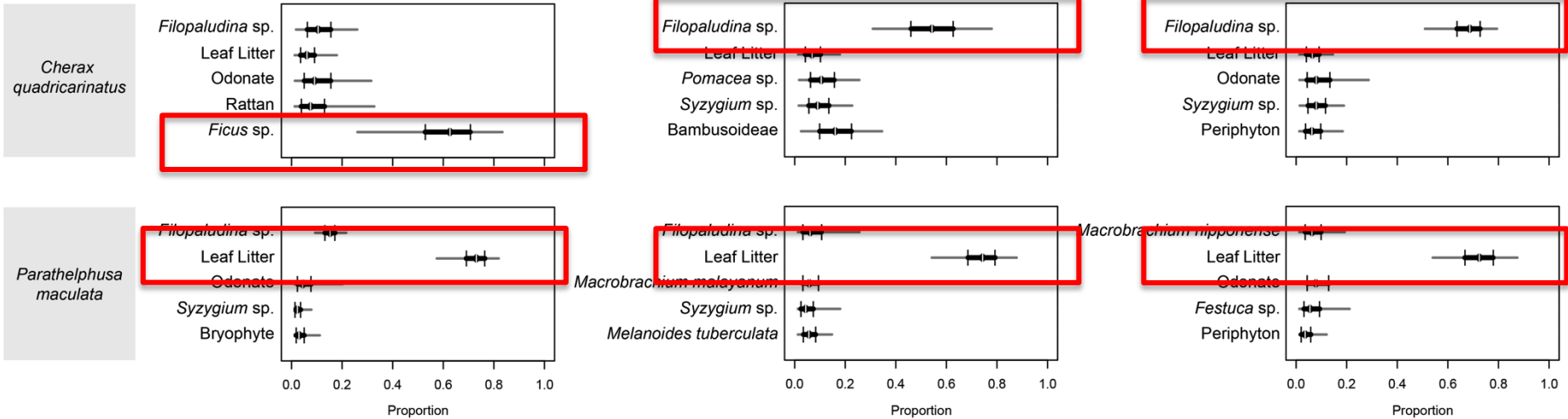
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Mechanisms of impacts

- Interactions: Predation or competition?
- Stable isotope analyses



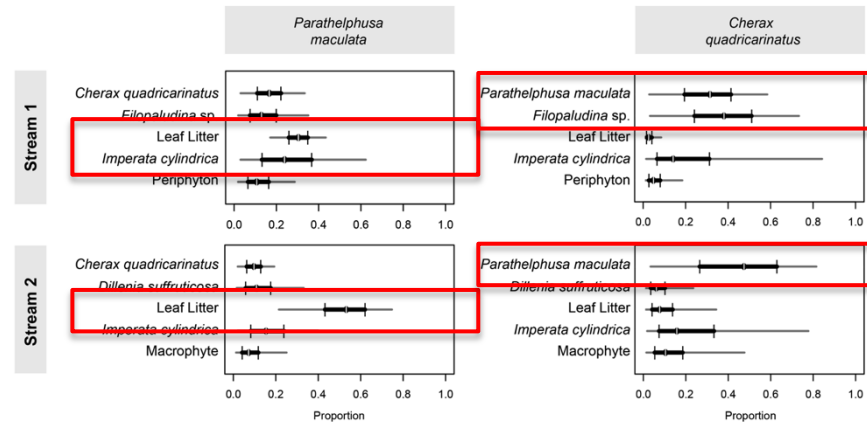
Sites with either crabs or crayfish only



Mechanisms of impacts

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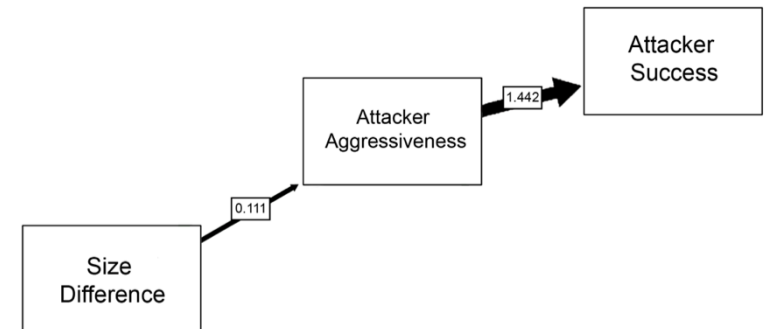
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Mechanisms of impacts

Agonistic interactions between crabs and crayfish

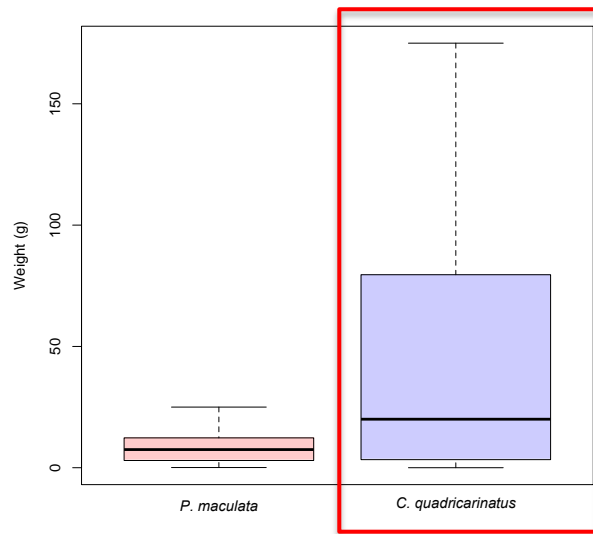
- Competition over limited shelter
 - Attacker success = winning shelter from defender
- Determine roles of:
 - Aggressiveness
 - Size
 - Species
- Results:
 - Size (not species) is important
 - Aggression important



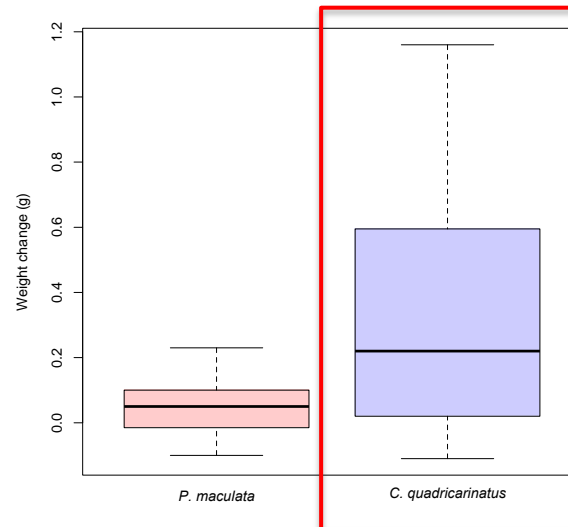
What's the **BIG** deal?

- SIZE MATTERS!
- Main contributor to competition success: SIZE
- Who will win in the wild?

In-situ size of decapods



Ex-situ growth rates (2 weeks)



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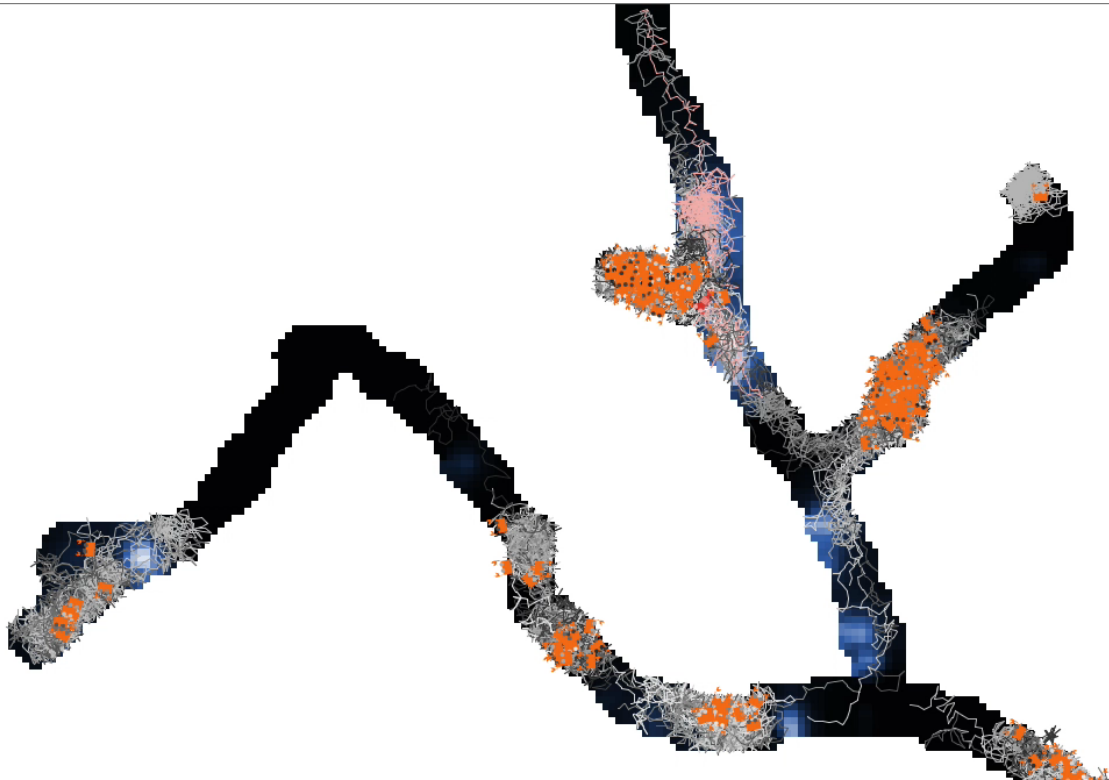
TROPHIC INTERACTIONS

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FUTURE WORK

What's next?

- Consider all these impacts and drivers together?
- Virtual simulations:
 - Agent based modelling



Thank you

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