

Biodiversity influences on mangrove forest ecosystem services delivery



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LIVING CONSERVATION

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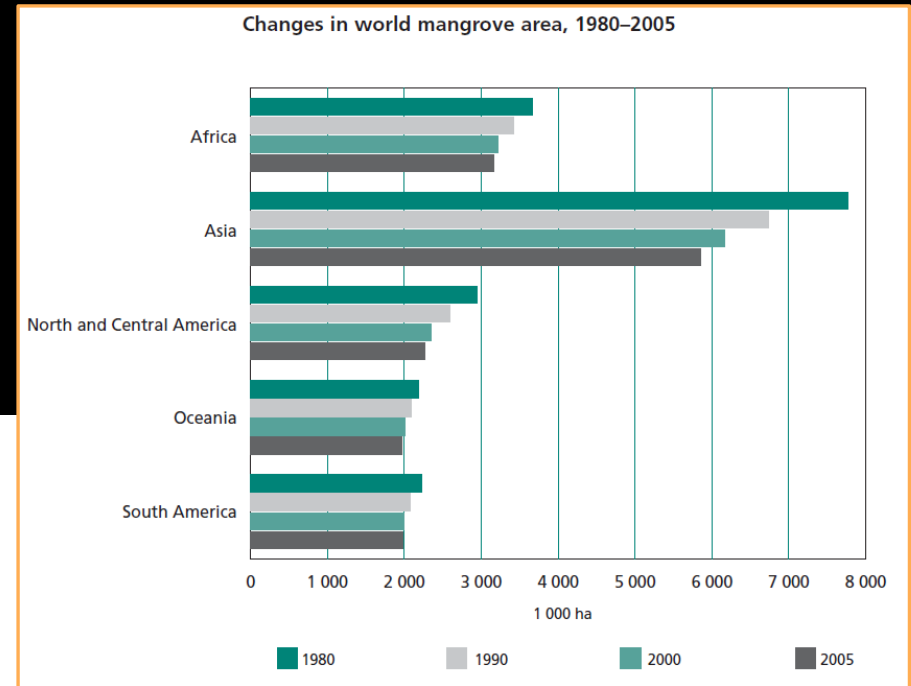
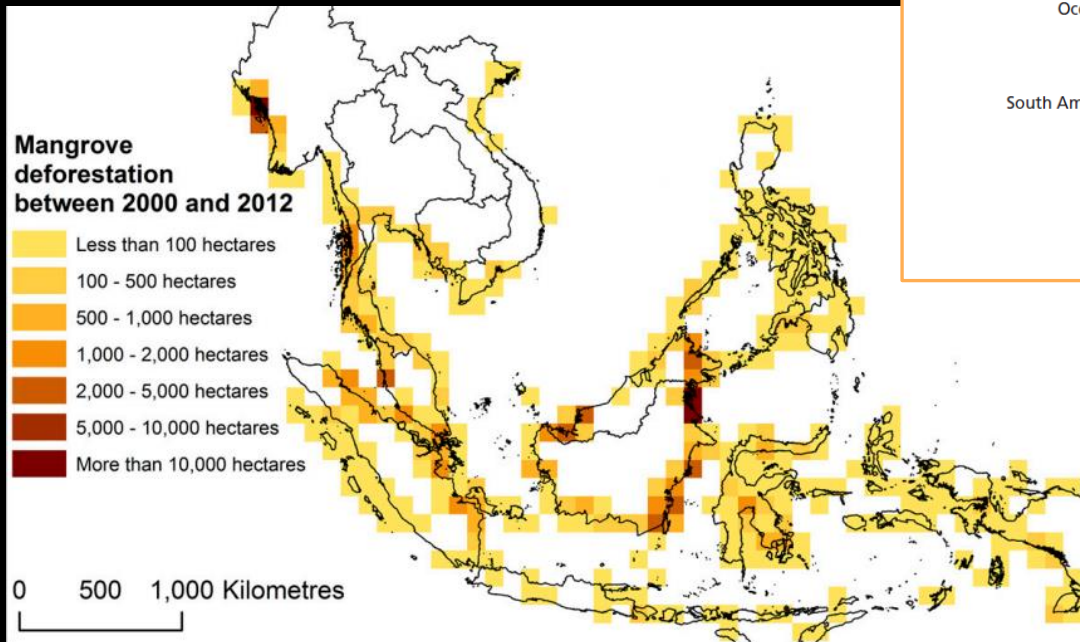


UCL

Current state of play...



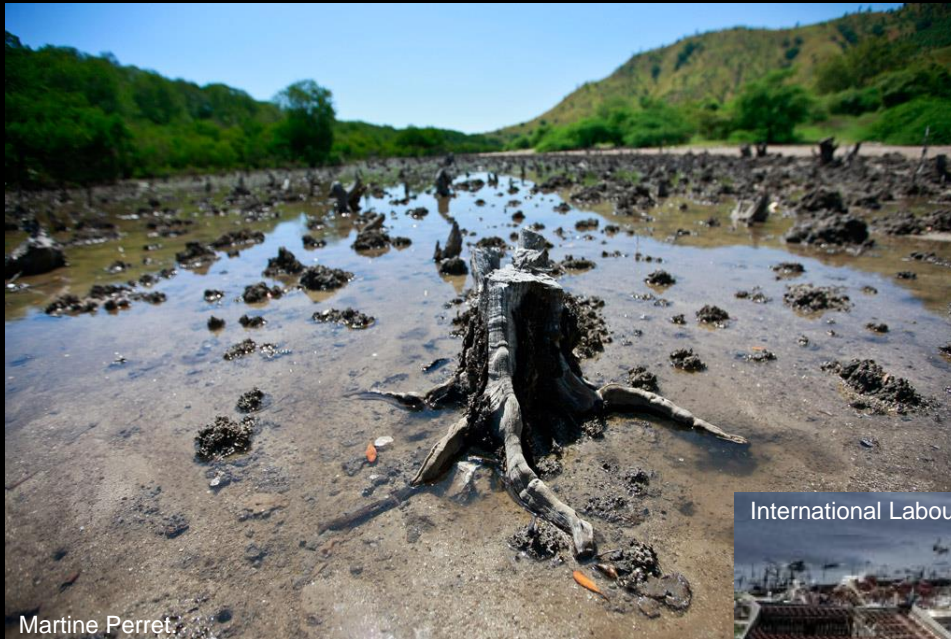
- Mangroves are in global decline



FAO (2005).

Fig. 1. Mangrove deforestation between 2000 and 2012. Deforestation is summarized within each 1 decimal degree square.

Current state of play...



Martine Perret

- Loss of climate change mitigation & adaptation (CCMA) ES

International Labour.

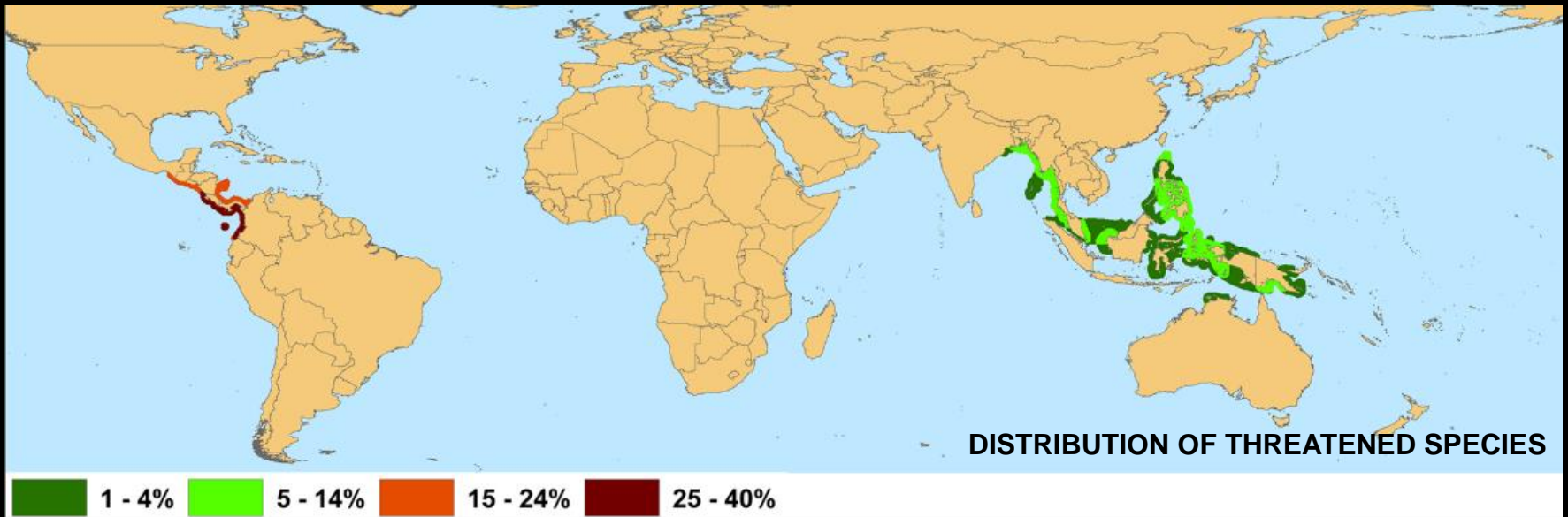


Current state of play...



- Diversity is also declining

Polidoro et al. (2010).



- Mid- to upper-intertidal; selective cutting

Current state of play...



ADRI...
SEPTEMBER 27, 2014
BRGY. ERMITA, DUMANGAS, ILOILO



Jurgenne H. Primavera.

- Rehabilitation efforts often species-poor or monoculture



What does this mean for mangrove ES?

Does floristic diversity drive climate change mitigation and adaptation ecosystem services (ES) of mangrove forests?

Biodiversity & ES

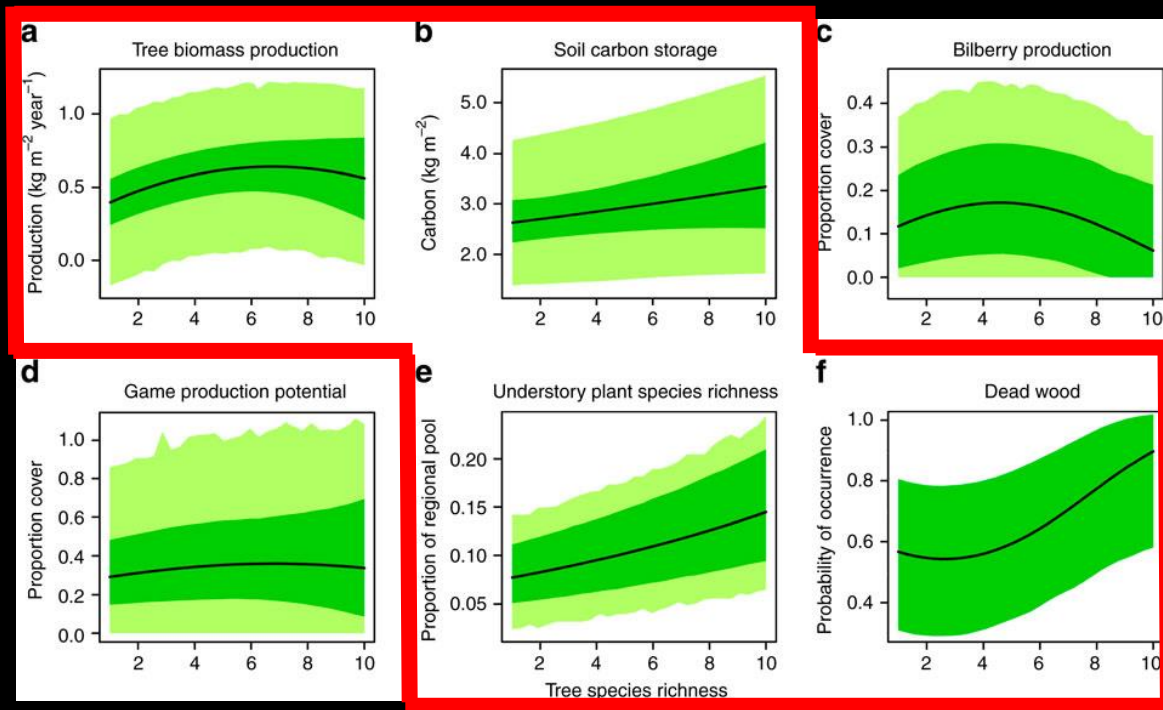


- Terrestrial forests: flora richness can increase ecosystem functioning

Gamfeldt *et al.* (2013).

- Mechanism = functional differences (complementarity in resource use or facilitation)

- Species richness not important?



Biodiversity & ES

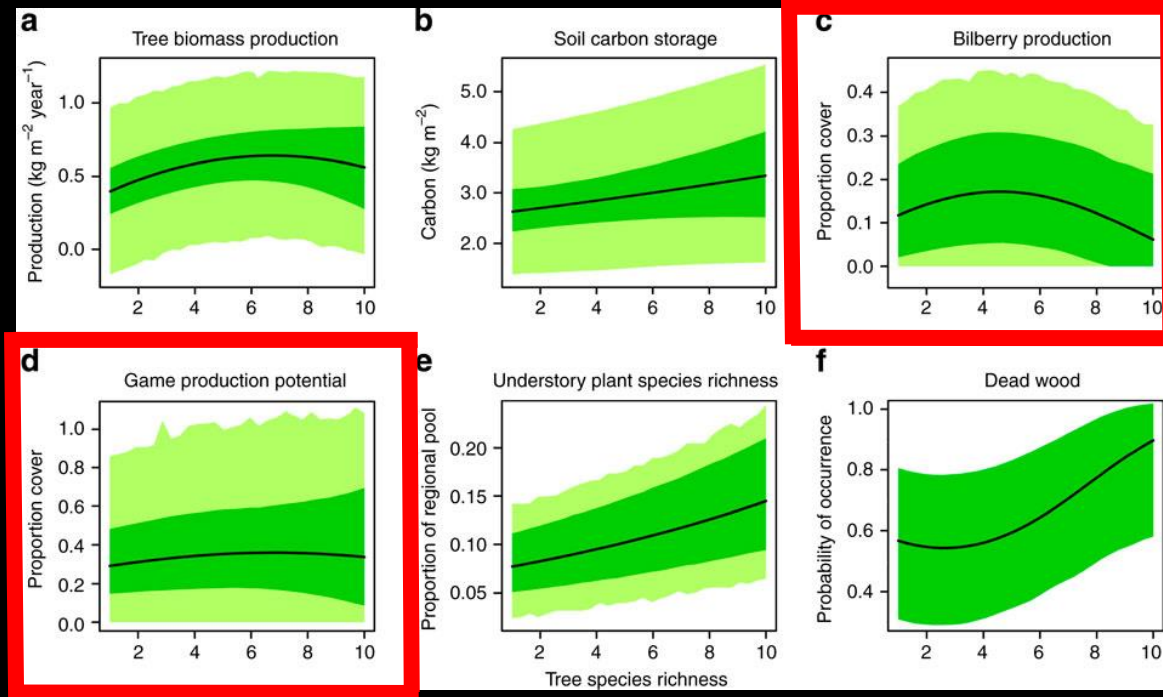


- Terrestrial forests: saturating or mixed relationships

Gamfeldt *et al.* (2013).

- Mechanism = functional identity of the most dominant species

- Could these mechanisms = ES trade-offs?



Complementarity in Mangroves...?

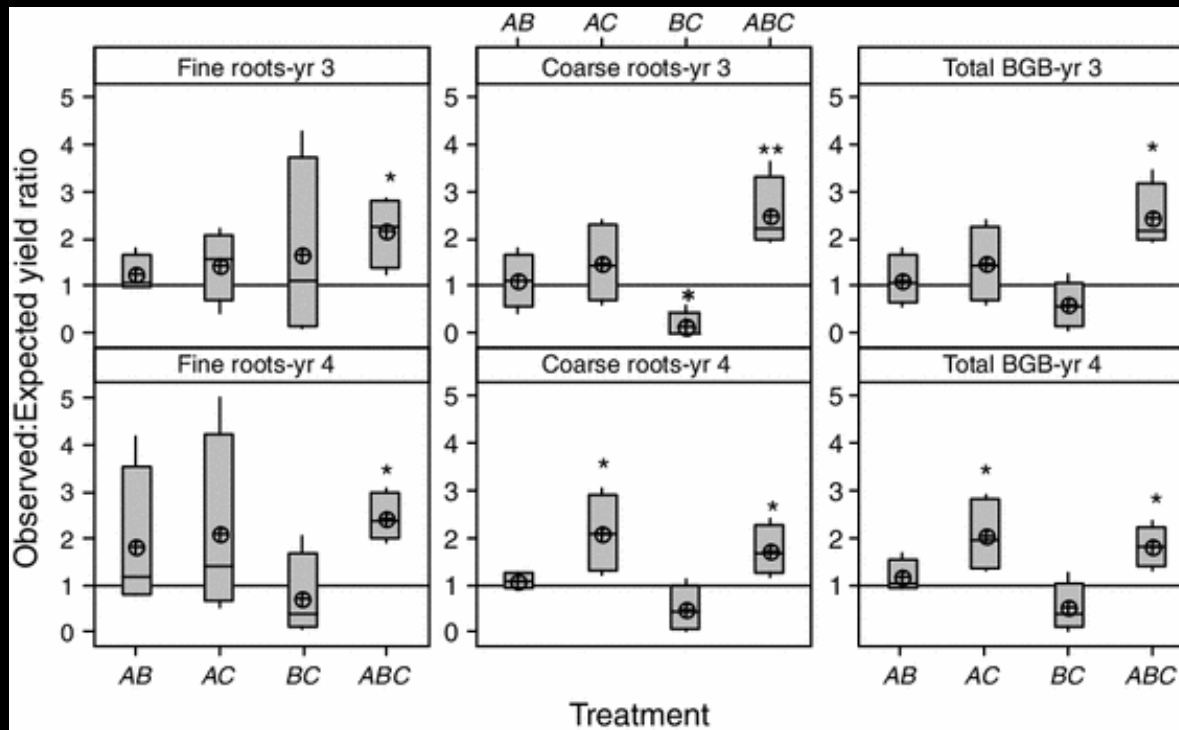


- Species-poor systems – complementarity/facilitation may be strong?¹

Complementarity in Mangroves...?



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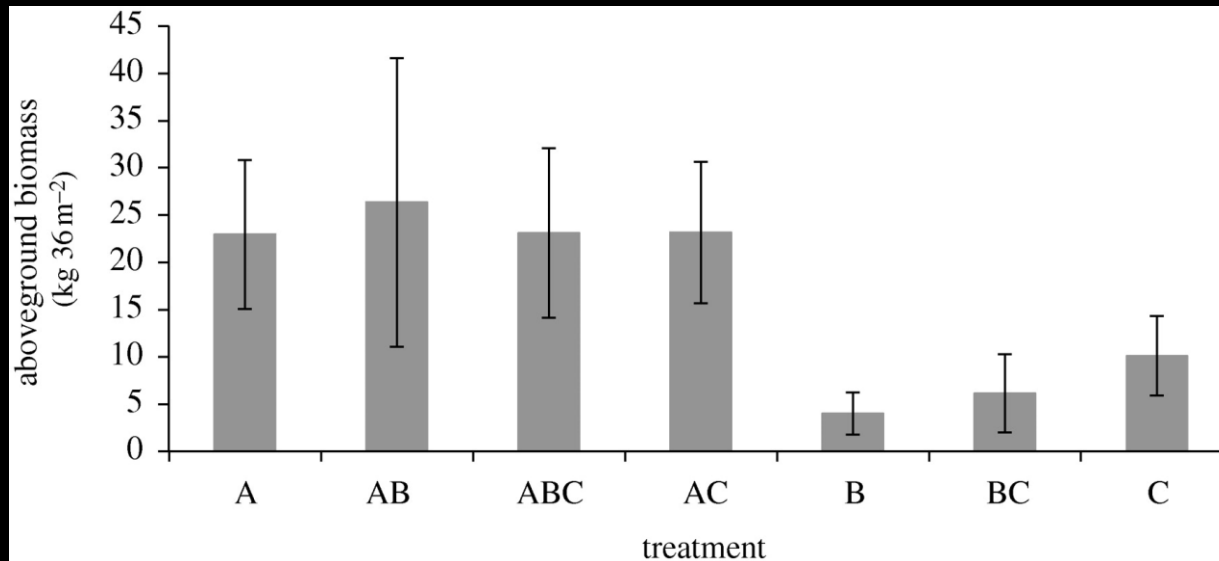


Lang'at *et al.* (2011).

Complementarity in Mangroves...?



- Species-poor systems – complementarity/facilitation may be strong?¹
- Many forests monospecific & still function fine – dominant species?



Huxham *et al.* (2010).

Complementarity in Mangroves...?



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- Species-poor mangroves: genetic diversity - plasticity?
- Hyperdiverse mangroves: functional traits vary between and within zones²

CCMA ES in Diverse Mangroves...

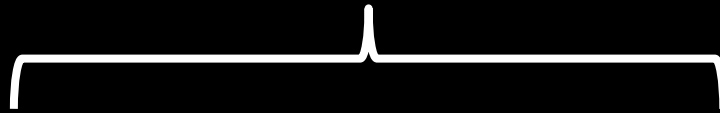


- Does species richness matter for C stocks & storm surge attenuation?
- Does complementarity or dominant functional identity drive these?
- Are there mechanism- or functional trait-based trade-offs between delivery of different mangrove CCMA ES?

Methodology - Which Traits?



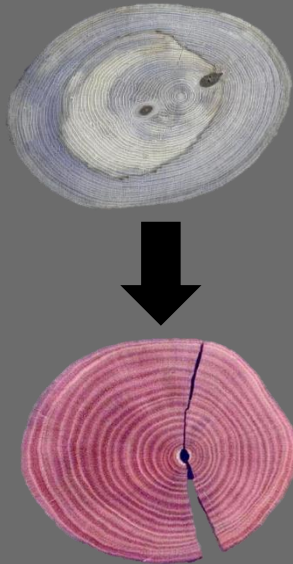
RESOURCE USE STRATEGY



Specific leaf area (SLA)



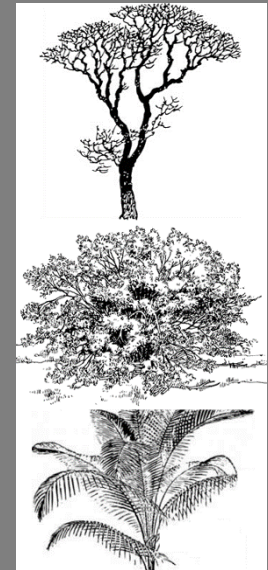
Wood density



Maximum height



Aerial roots



Growth form

Methodology - Which Traits?



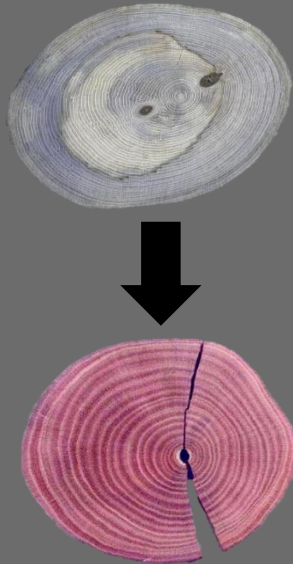
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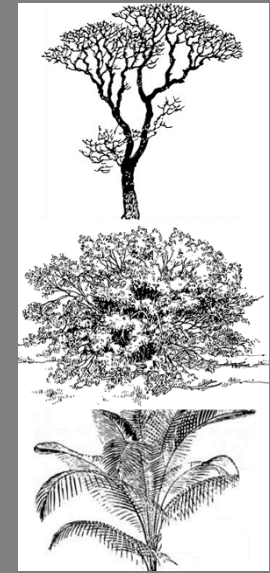
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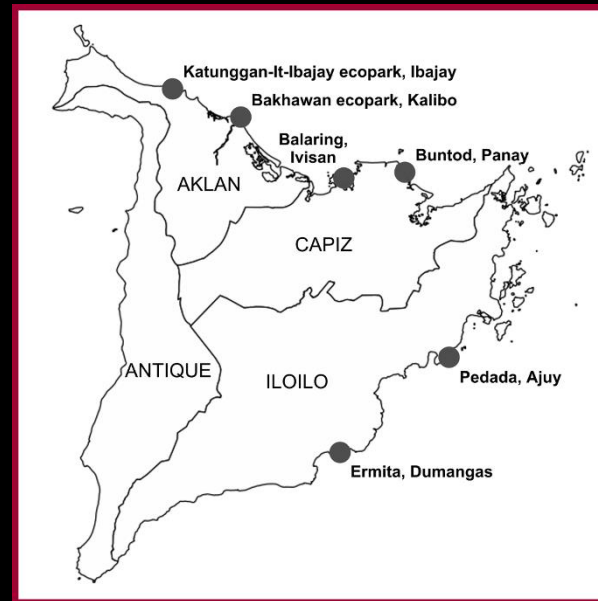


Growth form

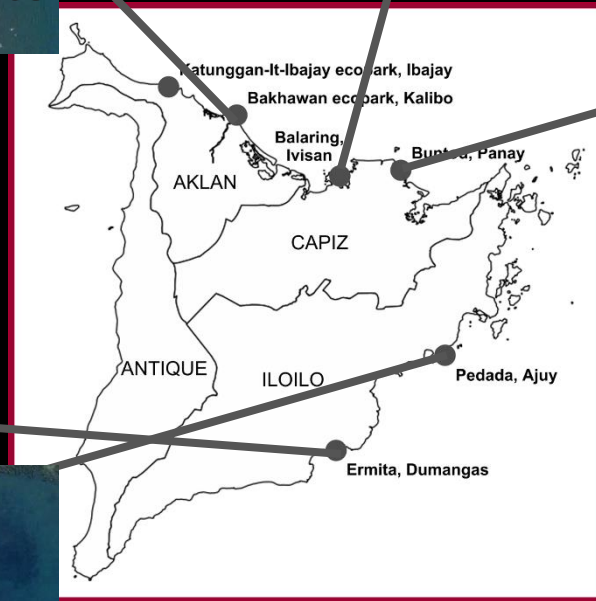
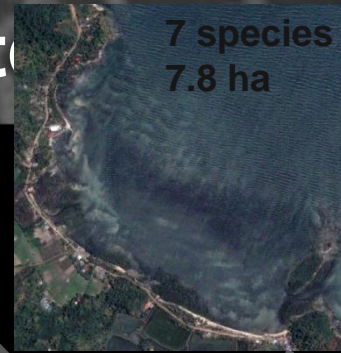
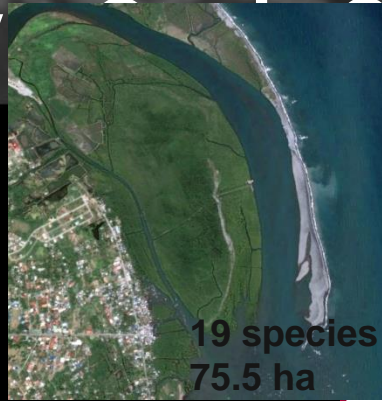
STRUCTURAL



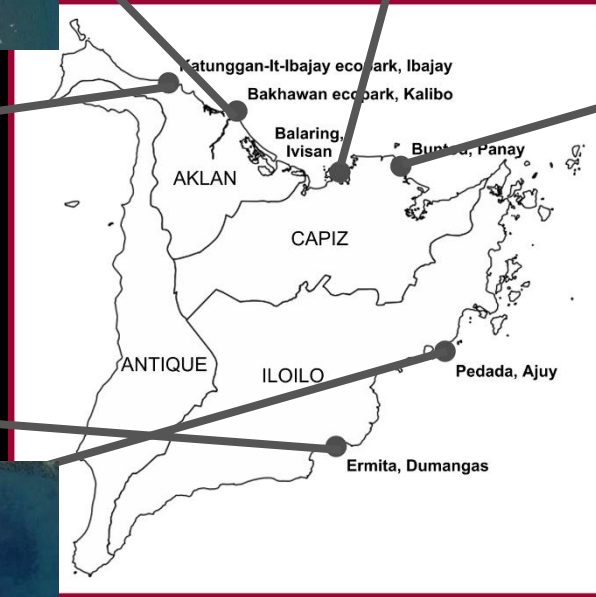
Methodology – Study Sites



Methodology



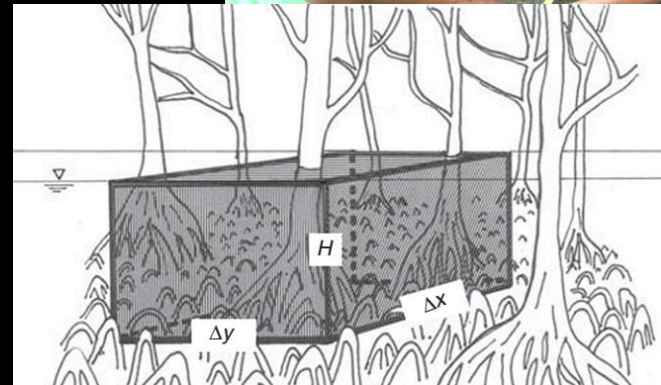
Methodology



Methodology – Field + Lab



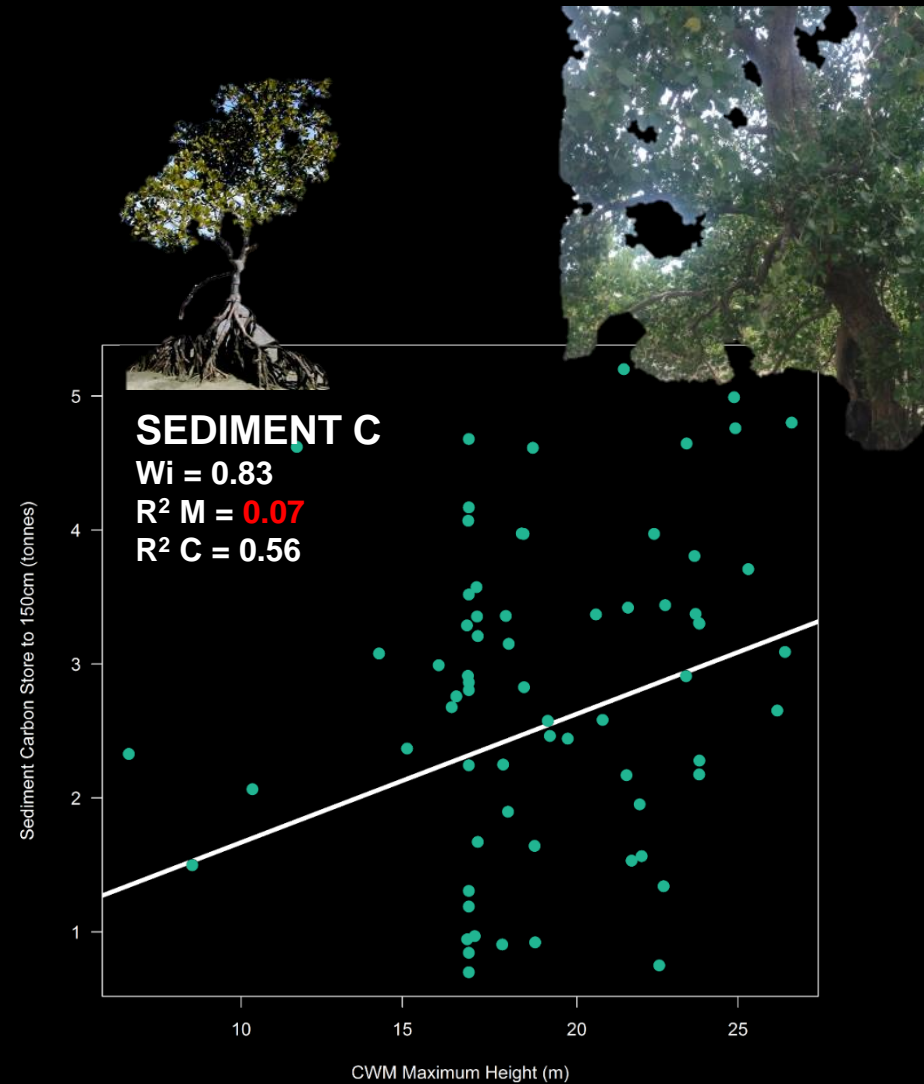
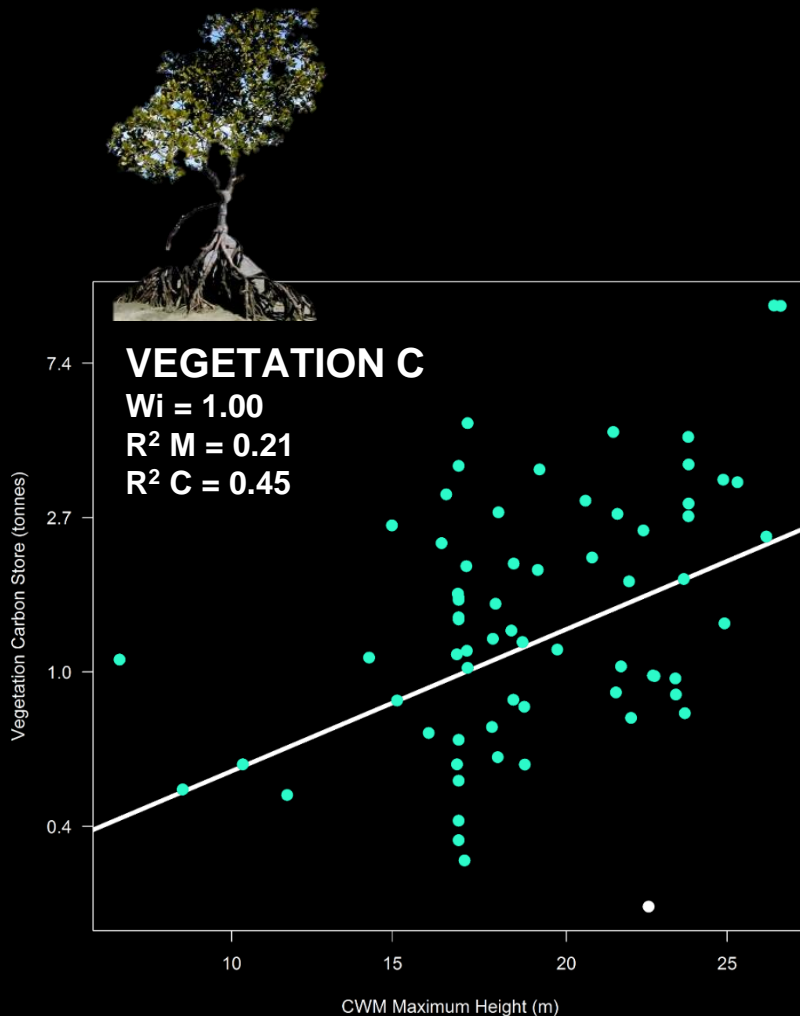
- Temporary field plots – N = 79
- C stock & veg structure¹⁻³
- Storm surge attenuation = Le^4 at 2.7 m
- Species-specific wood density, SLA, max height, growth form, aerial roots⁵⁻⁷
- SR & functional trait indices^{8,9}
- Control for site & zonation
- Model averaging – relative variable importance



Results



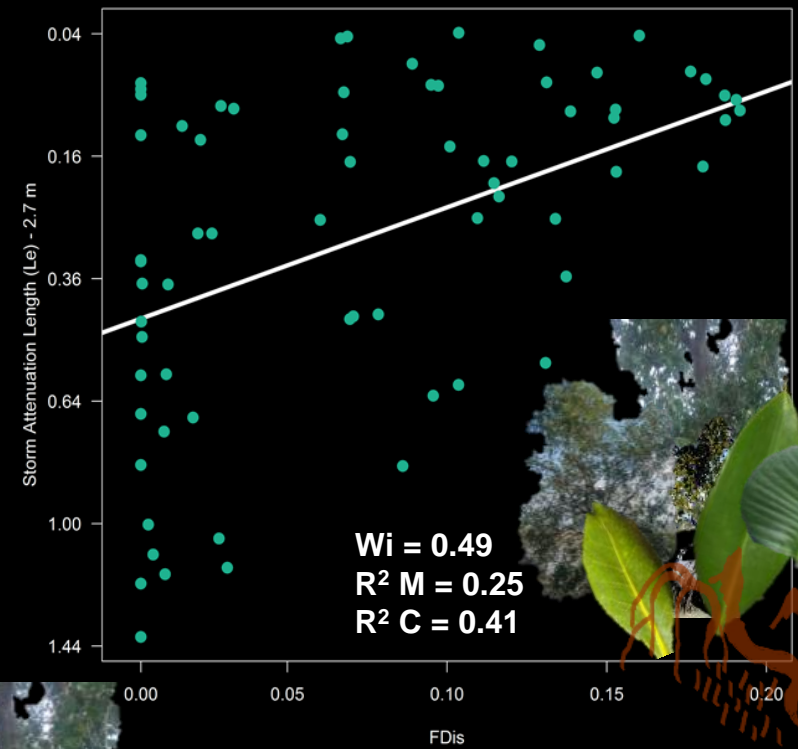
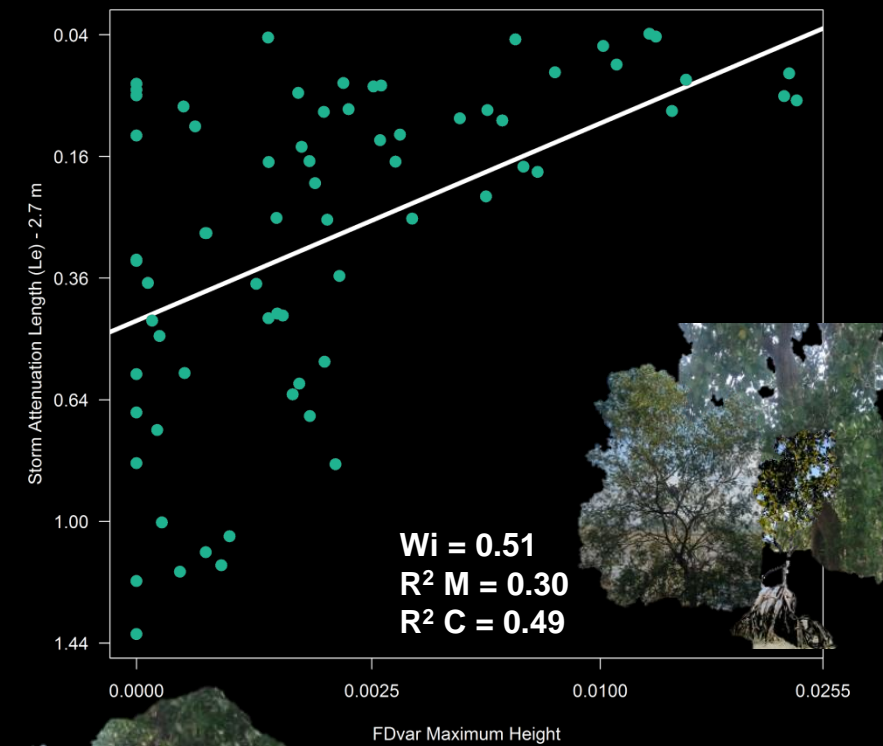
- DOMINANCE of taller species = increased *carbon stock*



Results



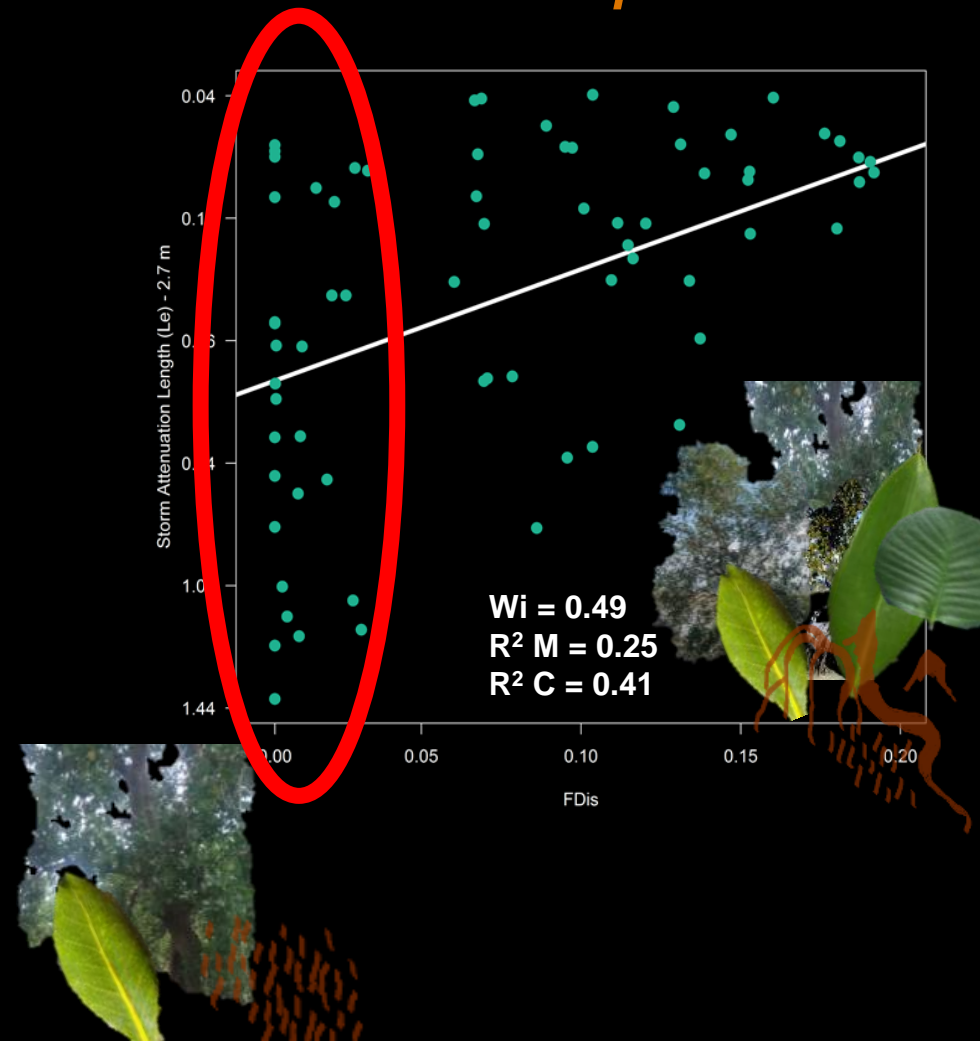
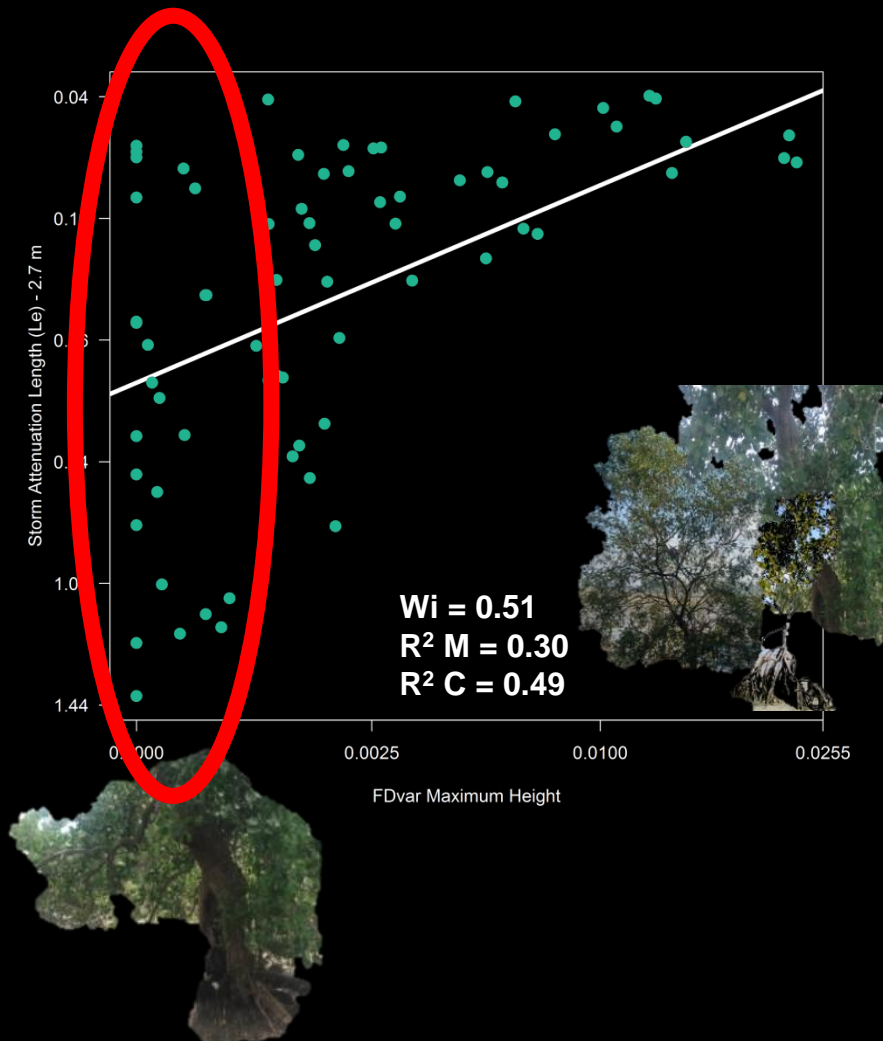
- DIVERSITY of height & all traits = increased *storm surge attenuation potential*



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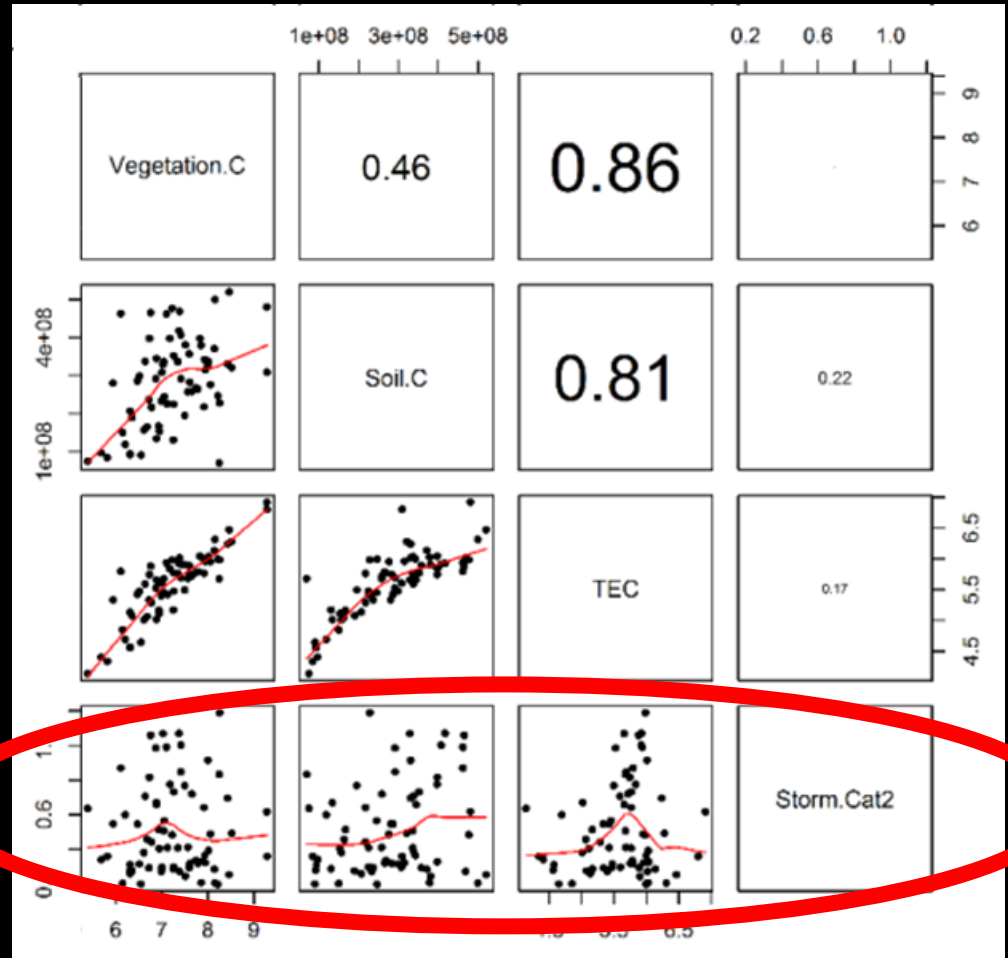
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Results



- No correlation between storm surge attenuation potential & C stocks
- Real trade-off in mechanisms driving CCMA ES?



Summary



IMPLICATIONS:

- No evidence species richness is important for mangrove CCMA ES



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- Plasticity in low diversity mangroves?
- Wider trophic interactions?



Thanks!



Municipalities of Dumangas, Ajuy, Panay, Ivisan, Kalibo and Ibaday

Field assistants

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