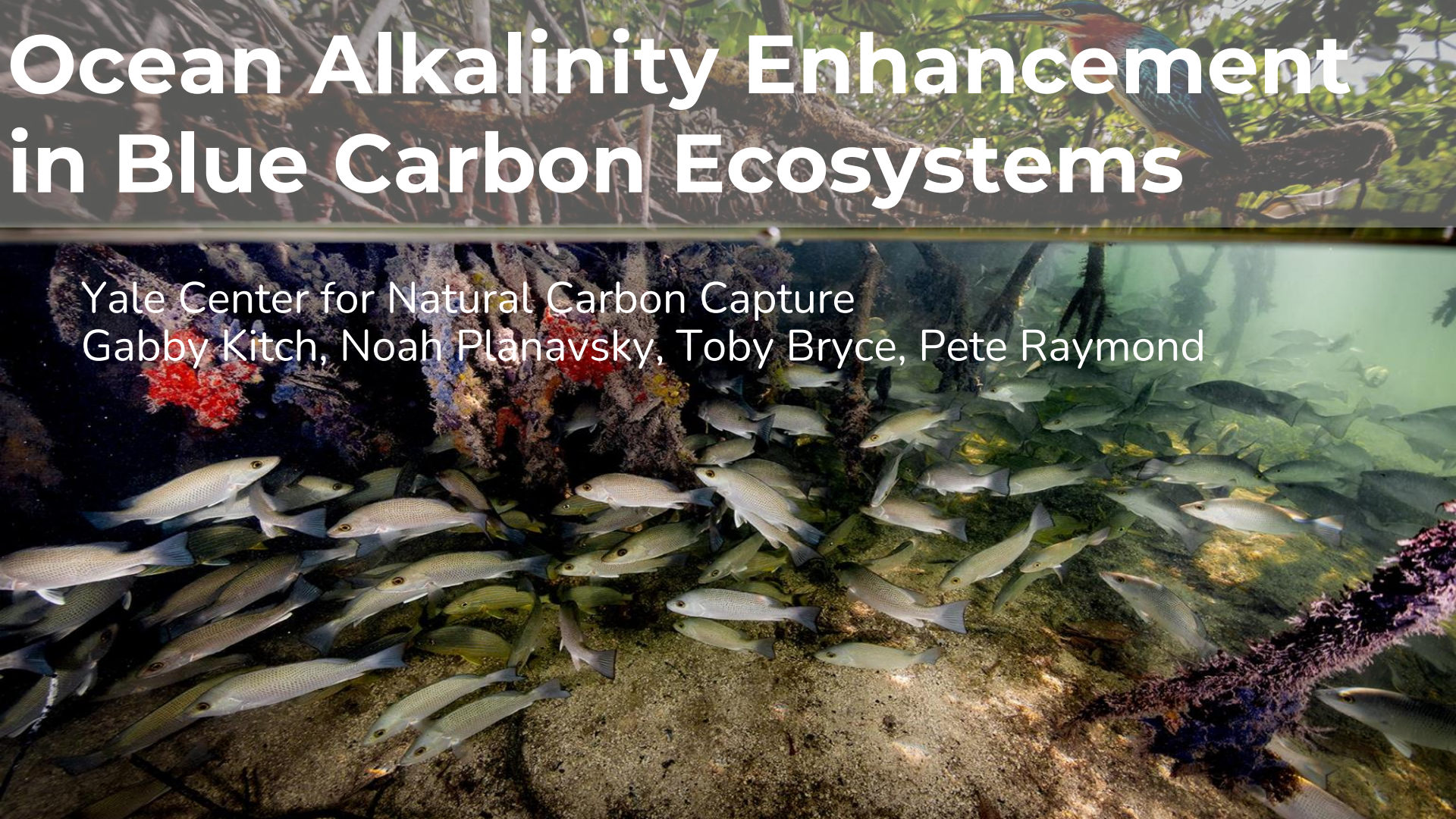
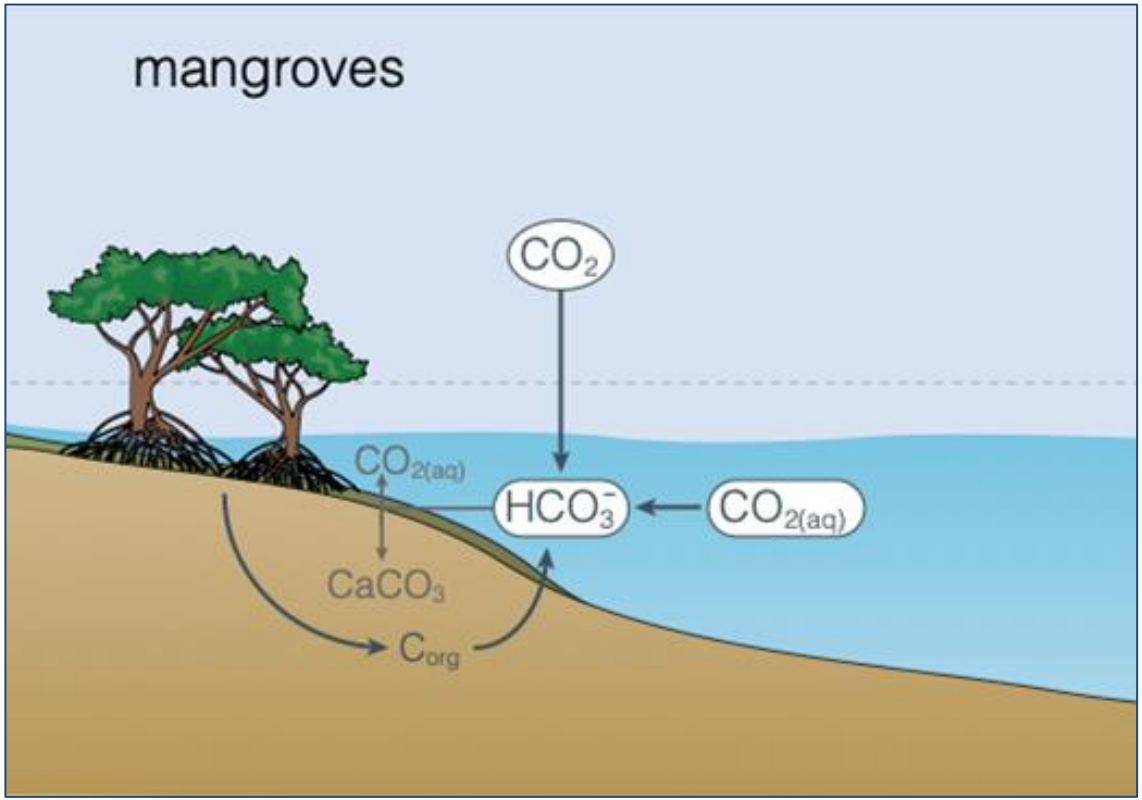
Ocean Alkalinity Enhancement in Blue Carbon Ecosystems



Yale Center for Natural Carbon Capture
Gabby Kitch, Noah Planavsky, Toby Bryce, Pete Raymond

A natural reactor for alkalinity



Fakhraee et al. [2023]

C_{org} = organic matter produced by mangroves

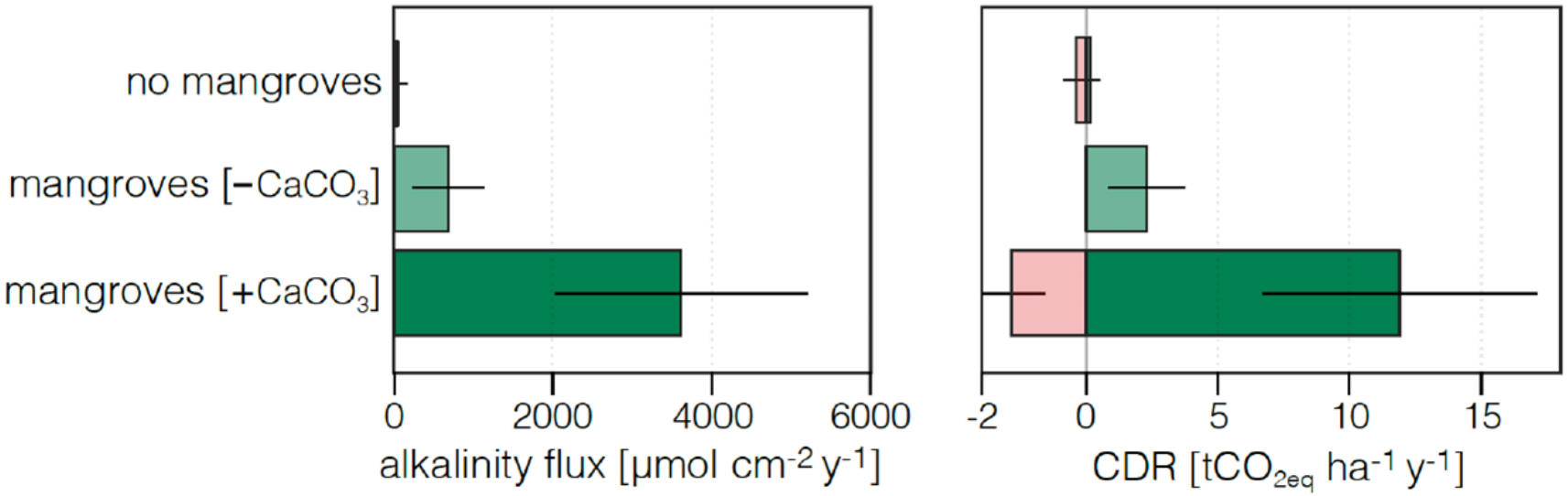
$CaCO_3$ = calcium carbonate that exists in sediments in tropical settings

HCO_3^- = bicarbonate most common type of carbon in the ocean

CO_2 = carbon dioxide

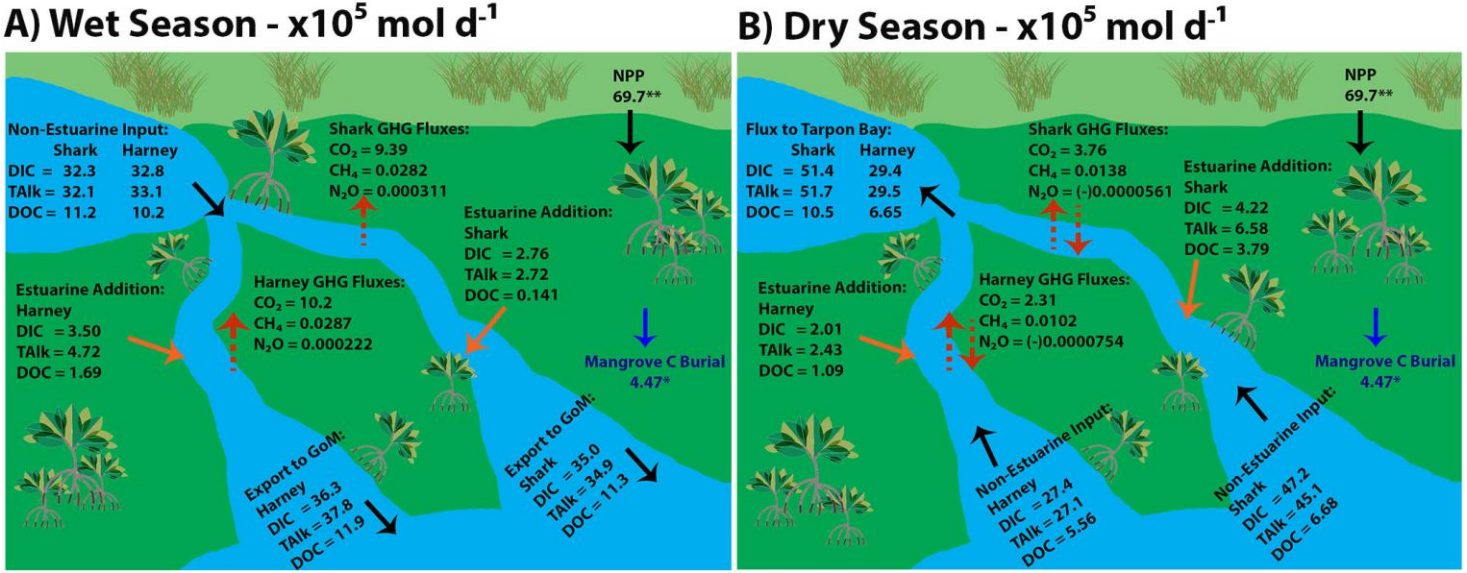
$CO_{2(aq)}$ = carbon dioxide in water

Alkalinity and CDR potential of blue carbon ecosystems



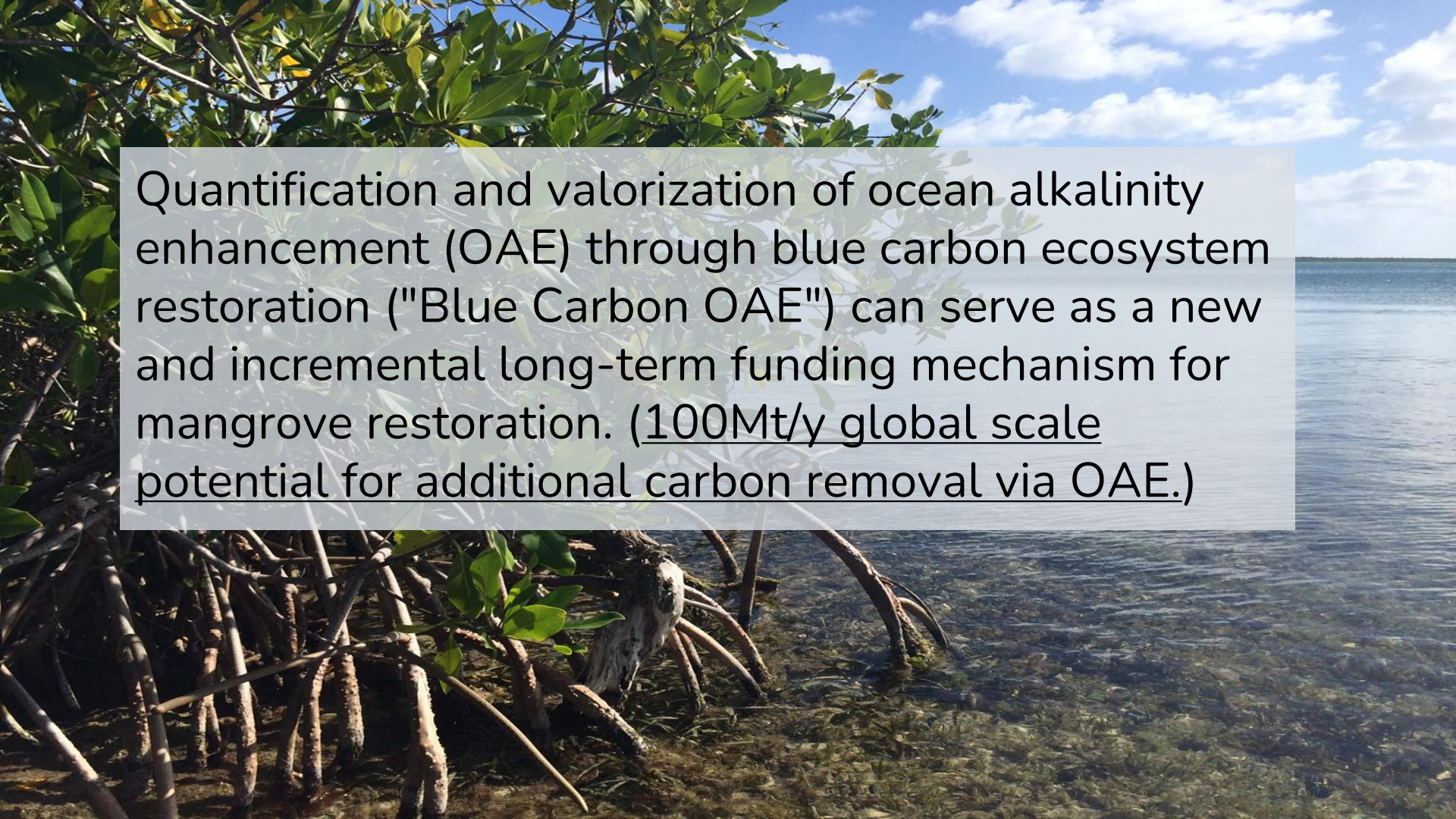
Fakhraee et al. [2023]

Case study (Florida Everglades)



* = Breithaupt et al., 2014; ** = Castañeda-Moya et al., 2013

Vaughn et al. in review



Quantification and valorization of ocean alkalinity enhancement (OAE) through blue carbon ecosystem restoration ("Blue Carbon OAE") can serve as a new and incremental long-term funding mechanism for mangrove restoration. (100Mt/y global scale potential for additional carbon removal via OAE.)

Site selection

Photo credit: Yale EPS

In active conversation with global mangrove restoration partners to find an ideal first site.

Key criteria:

1) Highly suitable for restoration
2) Hosts $CaCO_3$ substrate
3) Maintained by project partners that work closely and have trust with local community

Monitoring, reporting, and verification in the site

YCNCC MRV Capacity
Innovative solutions built on best practices

MRV at a site can be measured from a point source or a regionally integrated signal

Field monitoring:
- carbonate chemistry
- carbon outwelling from blue carbon systems

Modeling:
- near-field
- far field dynamic
- sedimentary processes

Photo credit: Yale School of Environment

YCNCC blue carbon OAE initiative

Timeline (Phases I and II)

Phase I (now)

- Spring 2025 seed funding from Builders Initiative
- Summer 2025 part-time hire for development
- Present until October 2025:
    a. Engage with high-functioning mangrove restoration projects for pilot site
    b. Develop research partnership with registry (Isometric) for commercial protocol development
    c. Secure philanthropic capital for Phase II and III

Phase II (~3 months)

- Develop field campaign for pilot site including:
    a. Purchase equipment
    b. Build human capacity
    c. Continued partner development with restoration site

YCNCC blue carbon OAE initiative

Timeline (Phases III and IV)

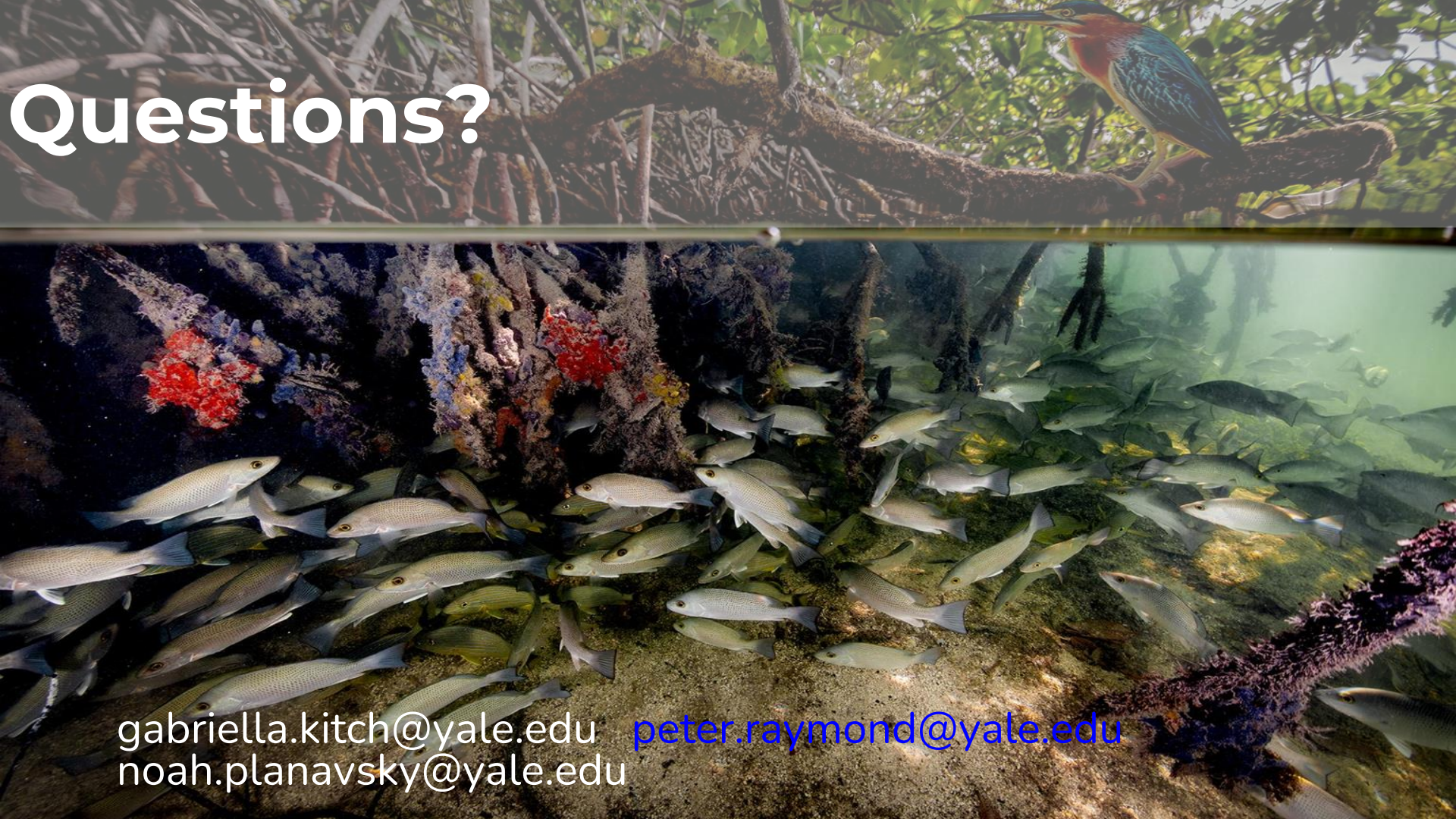
Phase III (1H26)

- Pilot site monitoring, modeling, and training
- Finalize commercial protocol with registry (Isometric)
- Advance relationships with CDR buyer(s)

Phase IV (2H26=>)

- "Research Through Deployment"
- Partner with catalytic CDR credit buyer(s) to execute initial round of commercial projects

Questions?



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