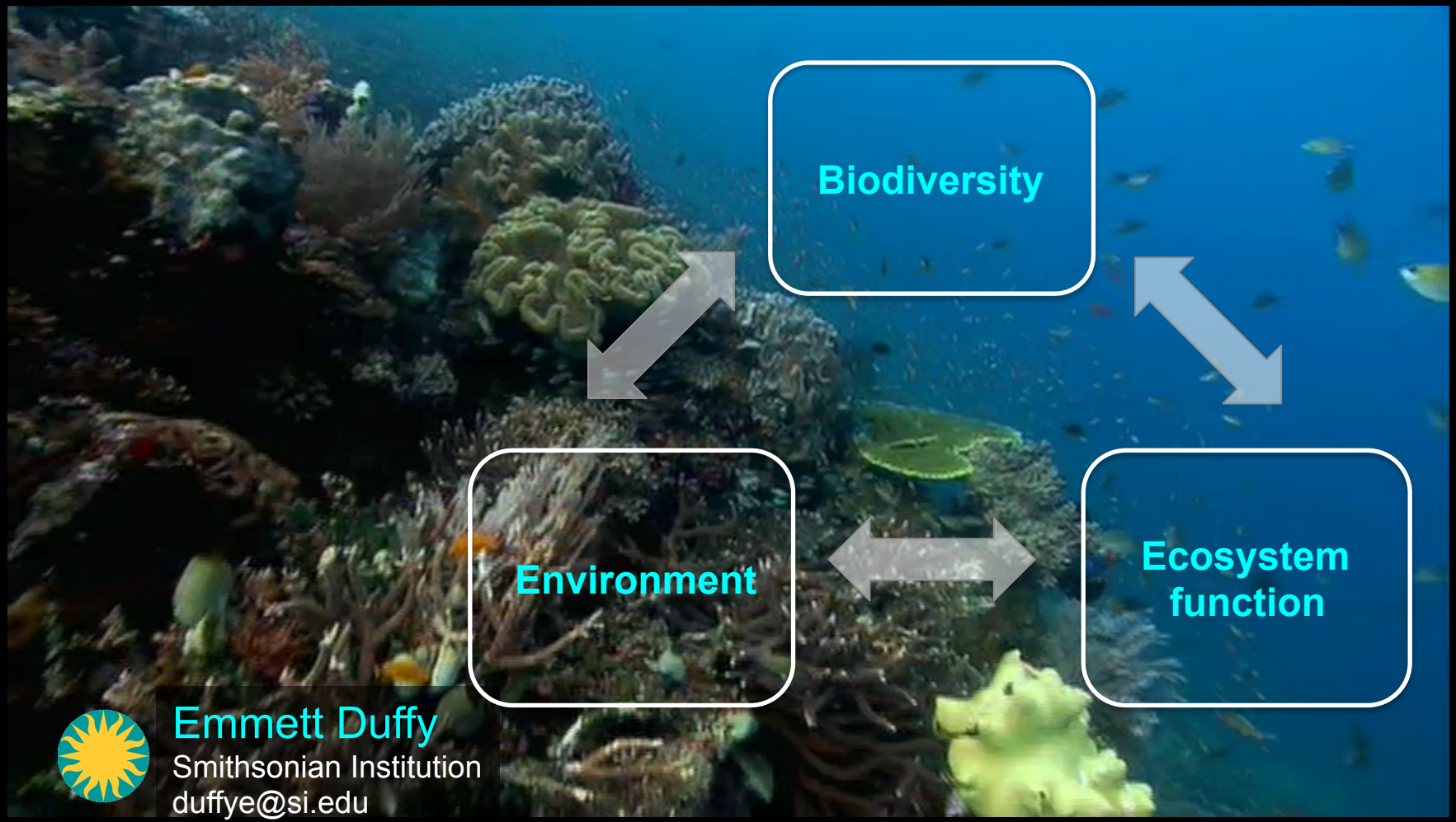
The Tennenbaum Marine Observatories Network

Marine Global Earth Observatory (MarineGEO)



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MarineGEO Core research: *Implementation*

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Annual	(Semi)annual	Periodic
Biodiversity Quantitative surveys *Foundation species* *Associated species* *Fishes*	**Ecosystem stocks and processes** *Production* *Recruitment (plates)* *Consumption (assays)* *Decomposition (assays)*	**Coordinated experiments** *Stressor impacts* *Bottom-up control* *Top-down control*

Seascape map
Satellite, drone

Water quality **Weather**	*T, S, DO, pH, fluorescence* *Air temp, precipitation,*

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MarineGEO Core research: *Business model*

- Keep it simple
- “Just do it”
  - begin work
  - revisit goals and protocols
- Crowdsource where possible
  - integrate students
  - citizen scientists
- Adopt best practices and emulate
- Add value to local efforts

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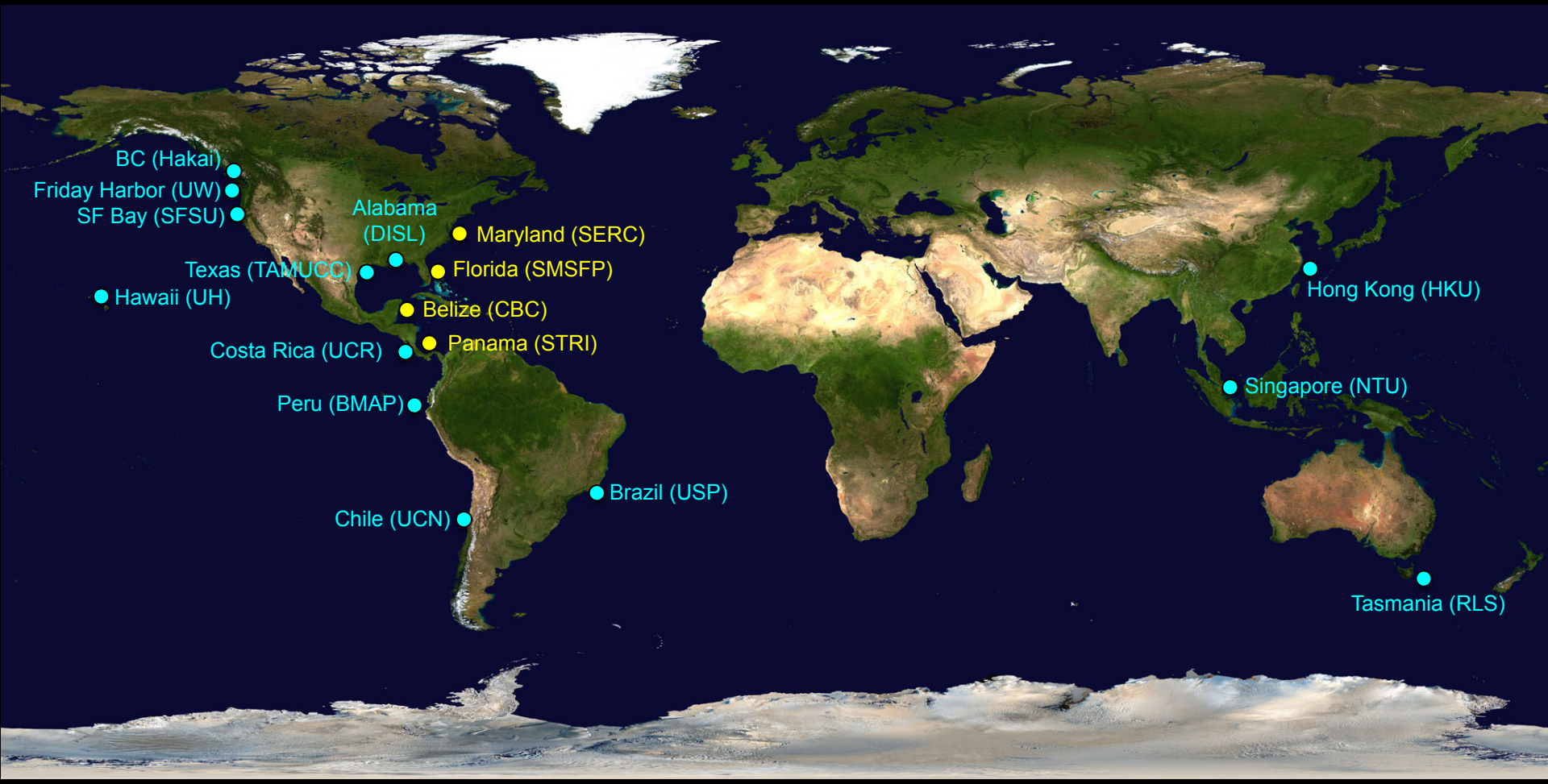
Tennenbaum Marine Observatories Network



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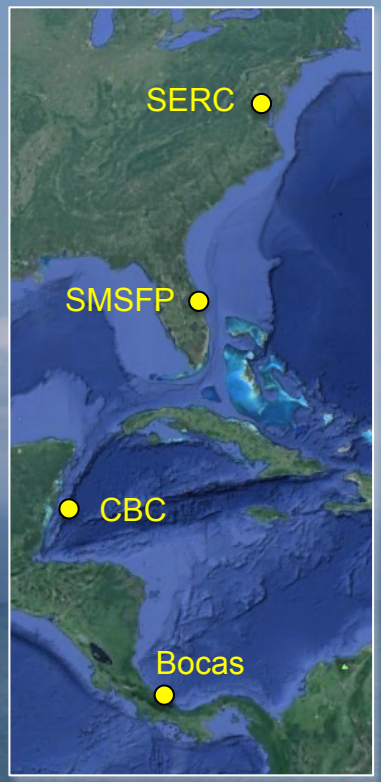
Environment: *Weather and water quality*



Methods

instrument platrforms (fixed)
sonde surveys

Data

Weather (wind, precipitation, barometric P)
Water quality (T, S, DO, pH, chl, DOM, light)
Sea level (NOAA sentinel site standards)
Tides (NOAA sentinel site standards)

Challenges

Instrumentation costs
Maintenance
Expertise

Established at 4 SI nodes, partnering with others

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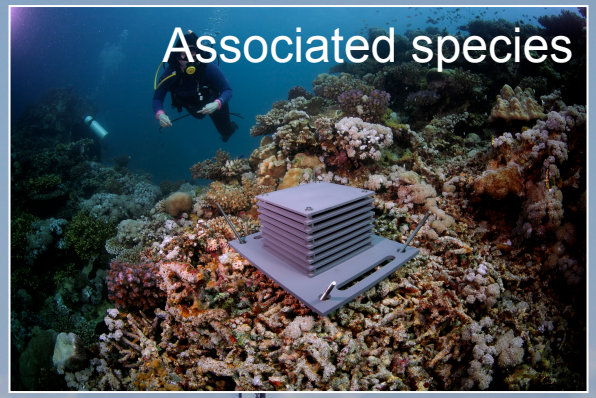
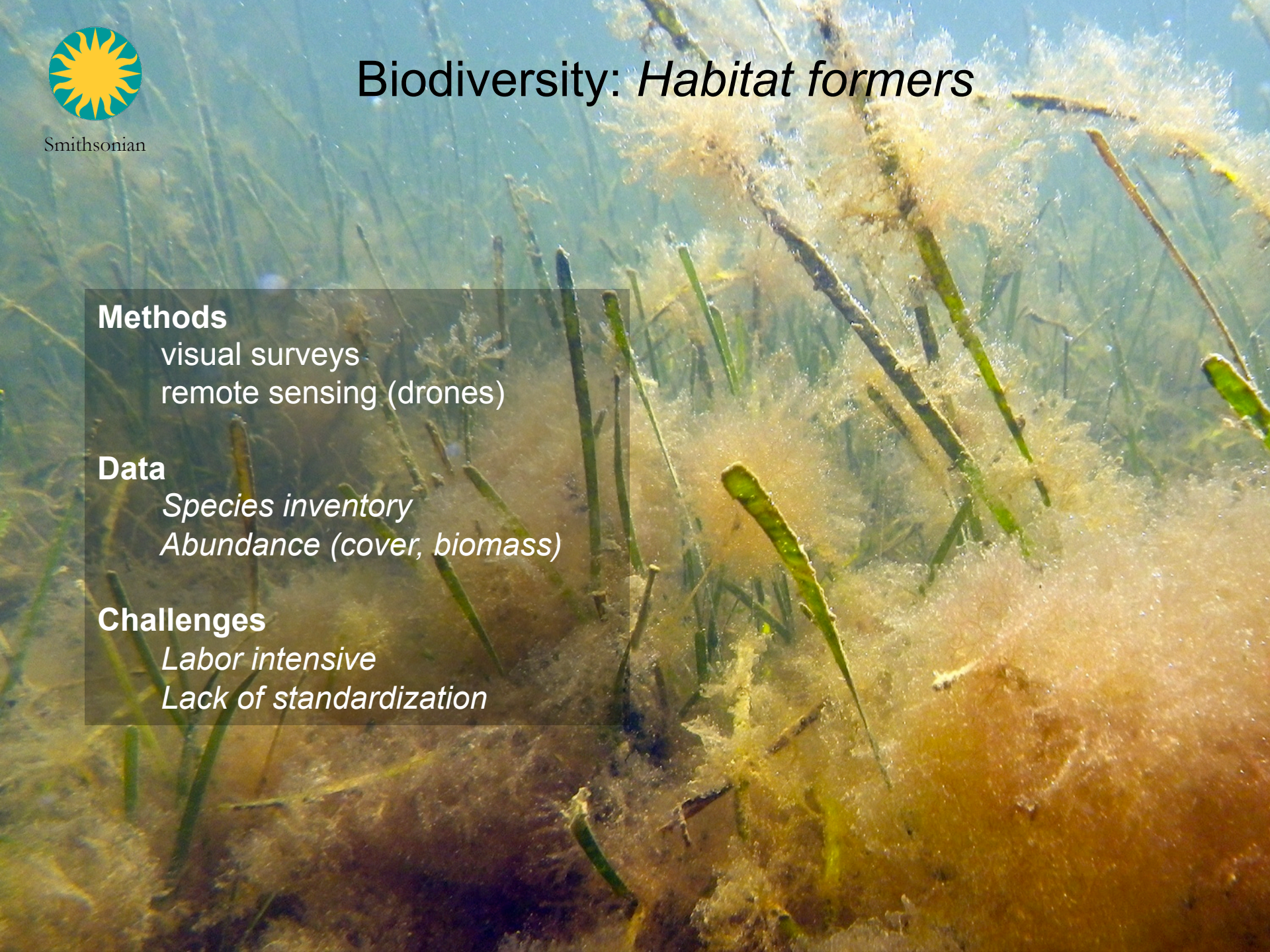
Biodiversity: *Major components*





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Biodiversity: *Habitat formers*

Methods

visual surveys
remote sensing (drones)

Data

Species inventory
Abundance (cover, biomass)

Challenges

Labor intensive
Lack of standardization

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Biodiversity: *Fishes*

Methods

diver visual surveys
baited video
seine nets, etc.

Data

Species inventory
Abundance
Body size

Challenges

Unstandardized among habitats

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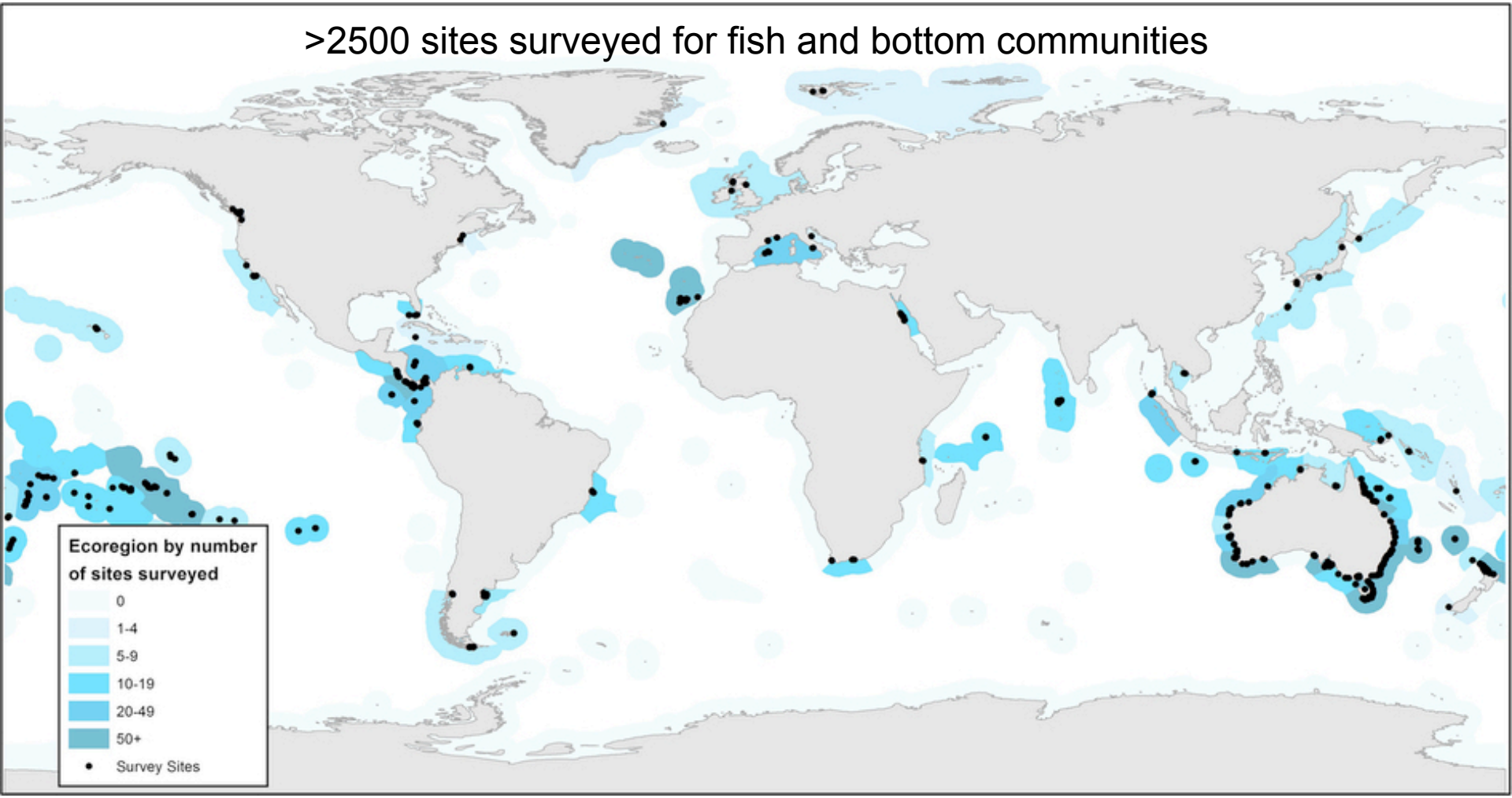
Biodiversity: *Fishes*



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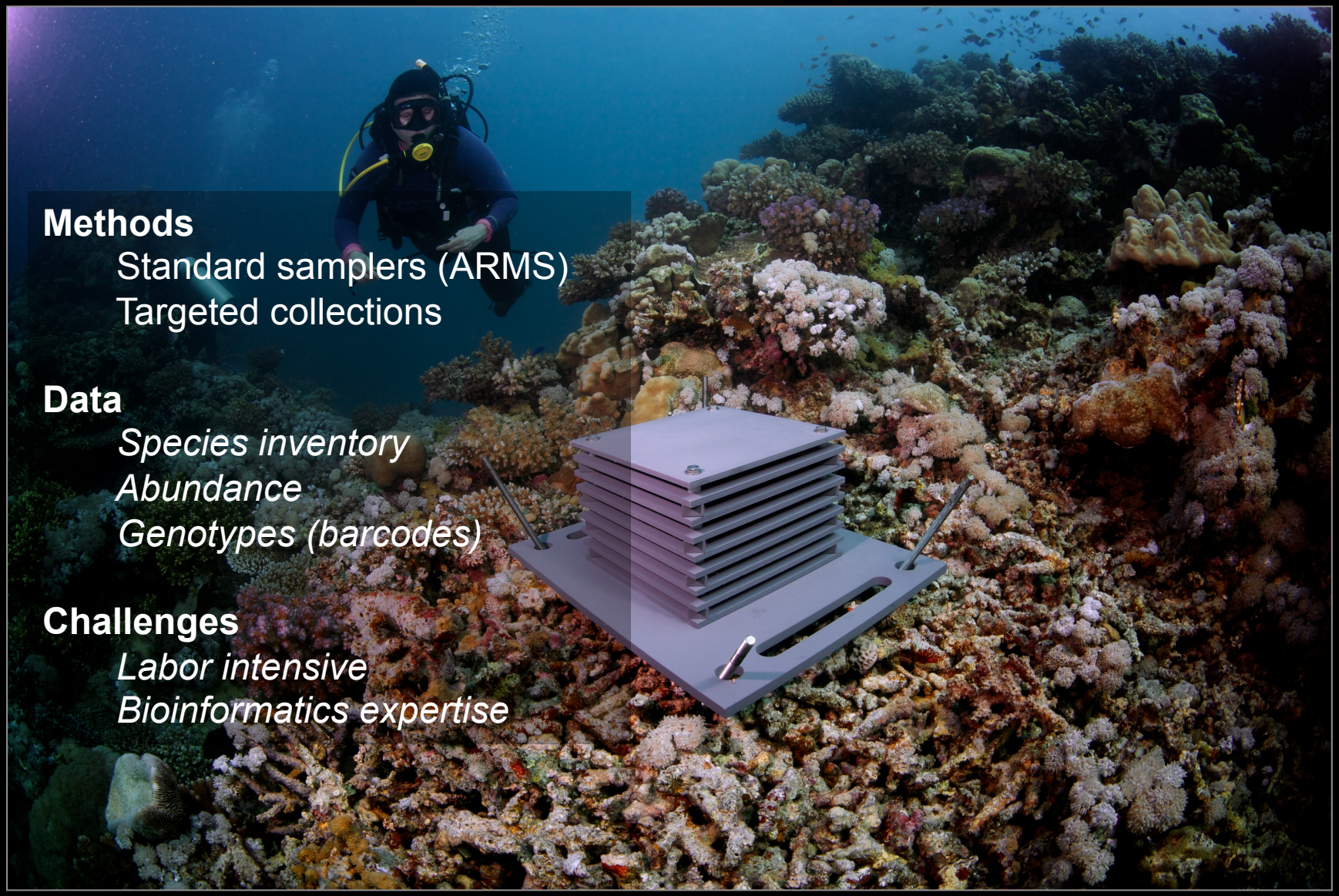
Biodiversity: *The other 95%*



Methods

Standard samplers (ARMS)
Targeted collections

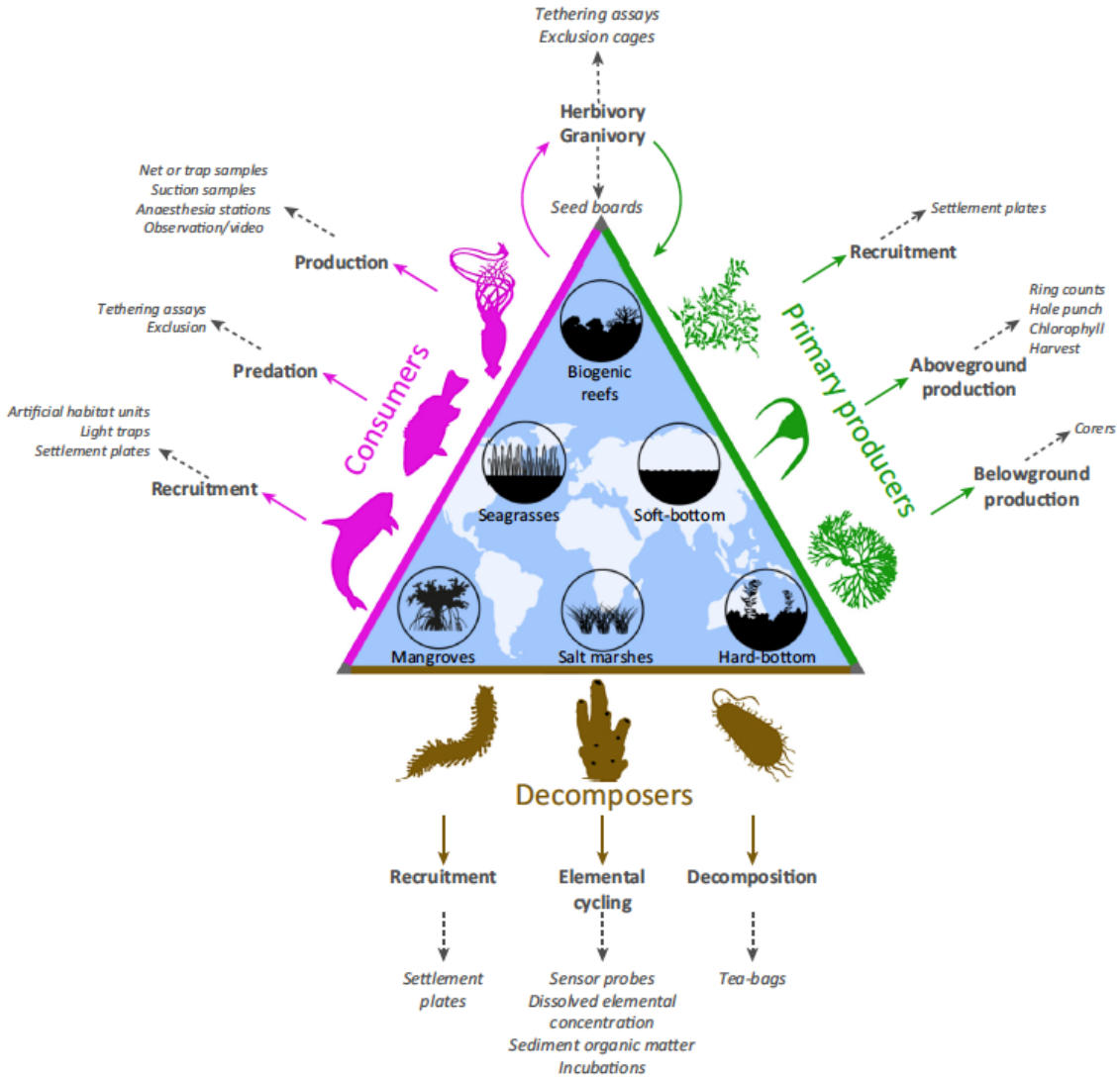
Data

Species inventory
Abundance
Genotypes (barcodes)

Challenges

Labor intensive
Bioinformatics expertise

Ecosystem processes: *Standardization*



Lefcheck, J. S., S. J. Brandl, P. L. Reynolds, A. R. Smyth, and S. T. Meyer. 2016. Extending Rapid Ecosystem Function Assessments to Marine Ecosystems: A Reply to Meyer. Trends in ecology & evolution, *in press.*

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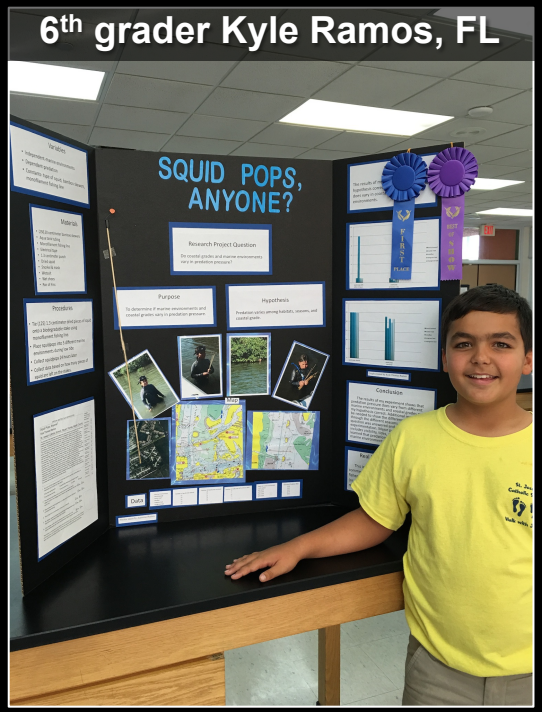
Ecosystem processes: *Predation*

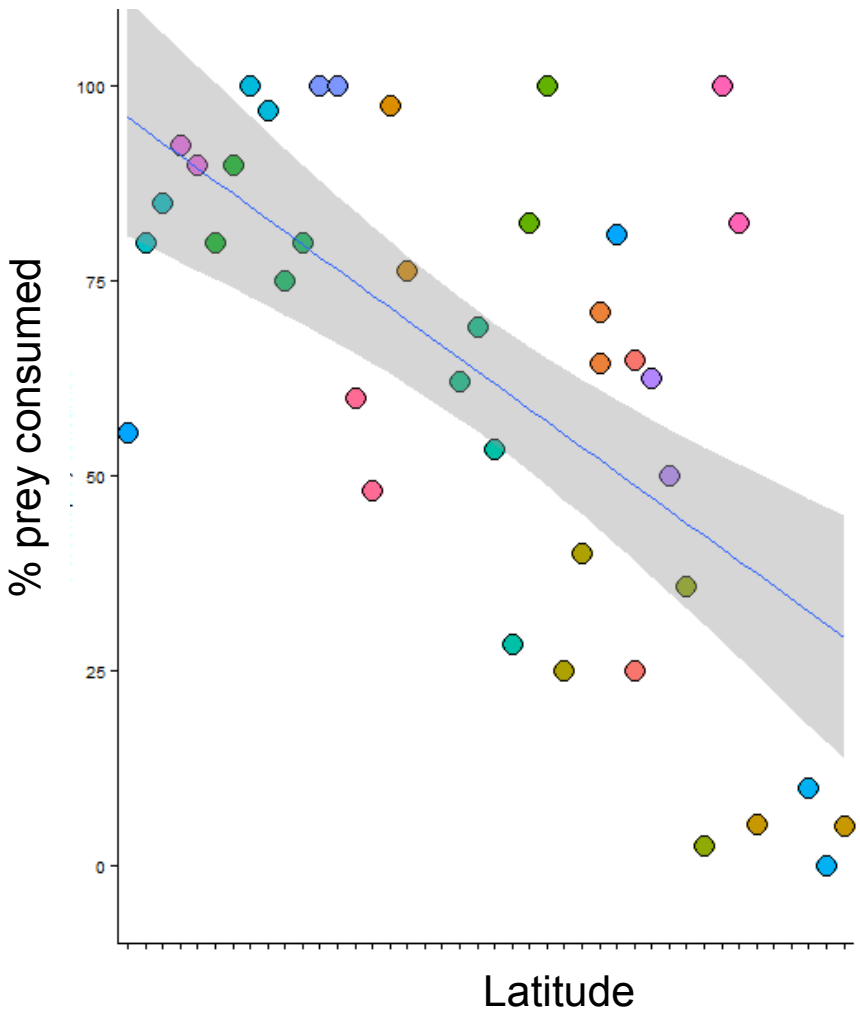


Squidpops won science fair!

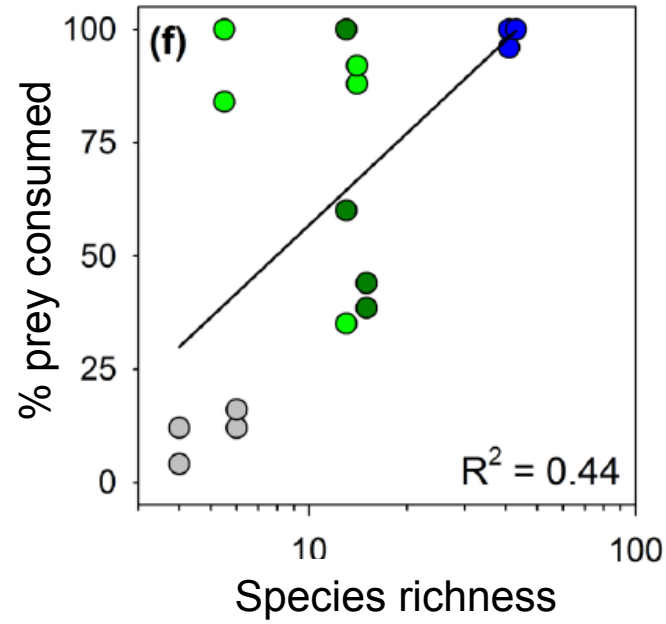
Duffy, J. E., S. L. Ziegler, J. E. Campbell, P. M. Bippus, and J. S. Lefcheck. 2015. Squidpops: A Simple Tool to Crowdsource a Global Map of Marine Predation Intensity. PLoS ONE 10:e0142994.

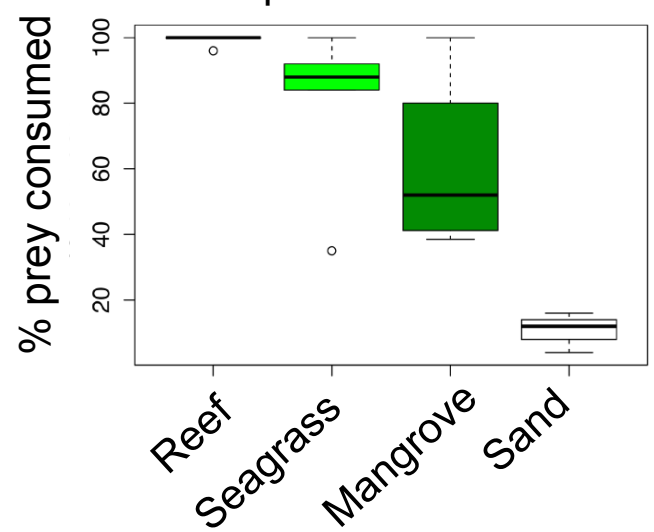
Ecosystem processes: *Predation*

Across regions, within habitats



Within region, across habitats





Coordinated experiment: *Resilience*

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Methods

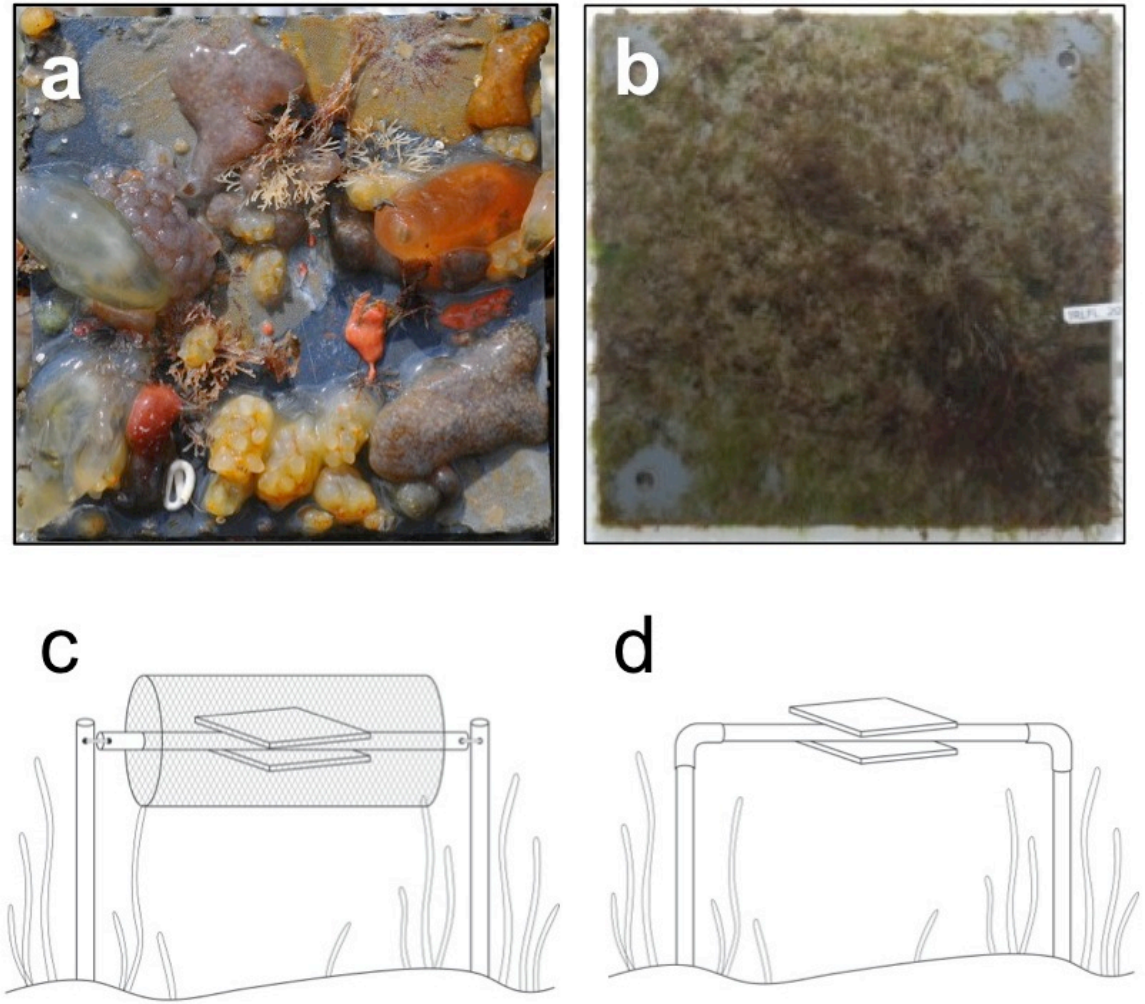
Cage experiment
feeding assays

Data

Algal production
Herbivory
Predation
Recruitment

Challenges

Labor-intensive



Thank you