Presentation given at the Marine Katoomba meeting

Katoomba XVI:
Building a Blueprint to Harness New Investment for the Protection of Marine and Coastal Ecosystem Services

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Moore Foundation, Palo Alto, CA

Hosted by the Katoomba Group

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Ecosystem connections across seascapes in the context of services

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MSEL
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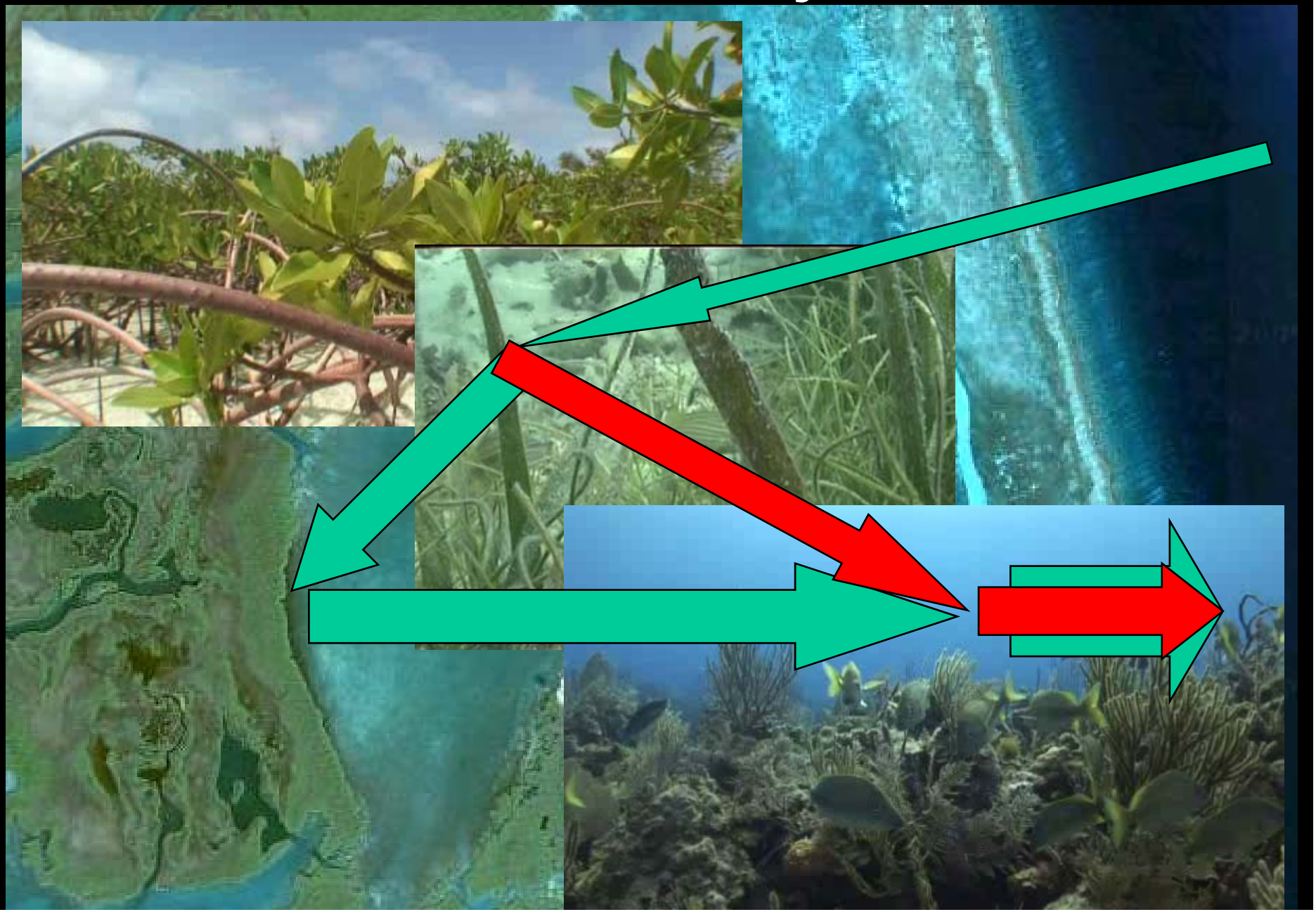
Connected ecosystems



Fish species

65% - 214%

obligate

42%

0-737%

55% - 2600%

116%

0-210%

Services of individual ecosystems

	Mangroves	Seagrass beds	Coral reefs
Carbon sequestration	✓	✓	

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Coastal defence	✓	✓	✓
Building materials	✓		✓

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Coastal defence	✓	✓	✓
Building materials	✓		✓
Fisheries		✓	✓

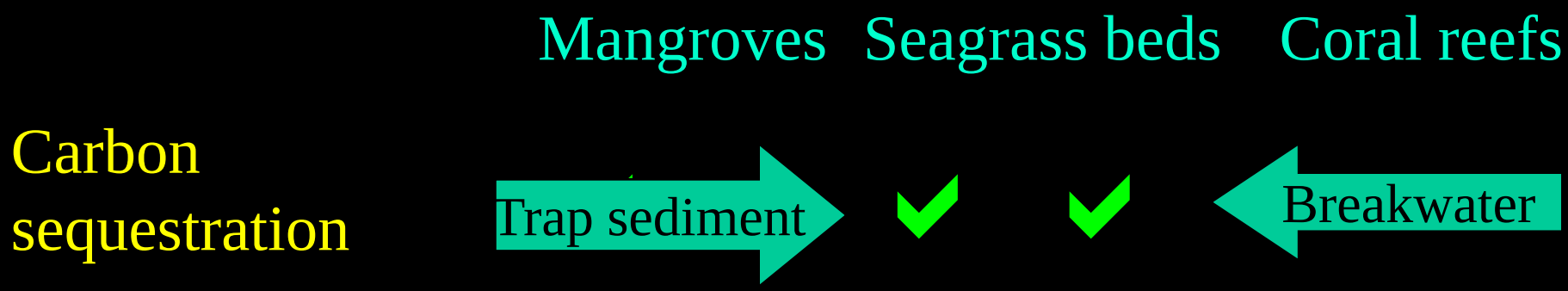
Services of individual ecosystems

	Mangroves	Seagrass beds	Coral reefs
Carbon sequestration	✓	✓	
Coastal defence	✓	✓	✓
Building materials	✓		✓
Fisheries		✓	✓
Tourism			✓

Benefits of ecosystem connectivity

	Mangroves	Seagrass beds	Coral reefs
Carbon sequestration	✓	✓	
breakwater	←		

Benefits of ecosystem connectivity



Benefits of ecosystem connectivity

	Mangroves	Seagrass beds	Coral reefs
Coastal defence			
Trap Sediment & Nursery	✓		✓

Benefits of ecosystem connectivity

Mangroves Seagrass beds Coral reefs

Fisheries

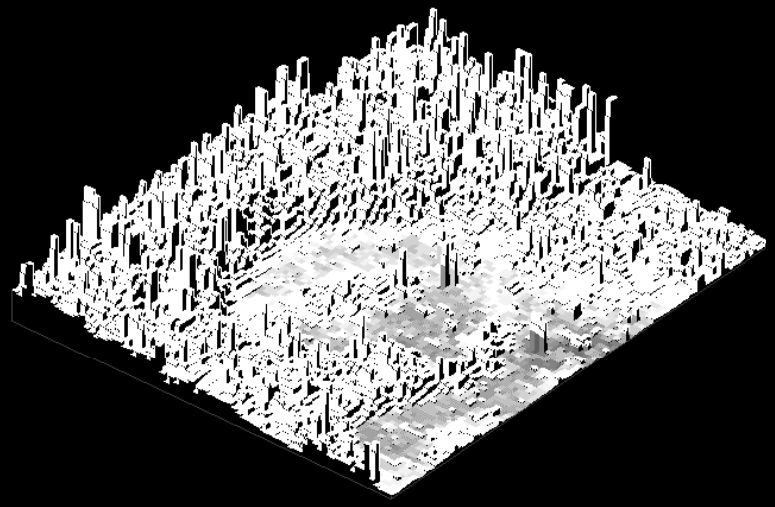
Mapping ecological production functions

- Spatially explicit to distinguish supply and demand of services
- Guide ecosystem vulnerability analyses
- Guide siting of ecosystem restoration

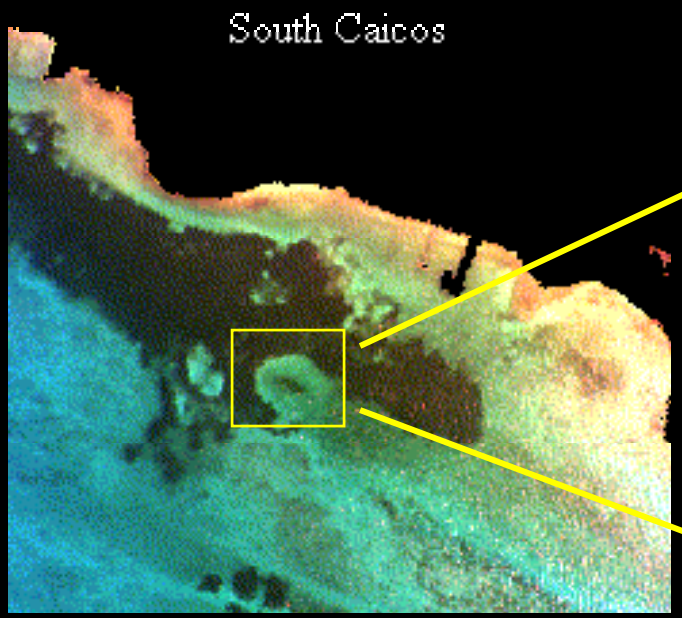
Carbon sequestration

Mapping state of ecosystems: Seagrass standing crop

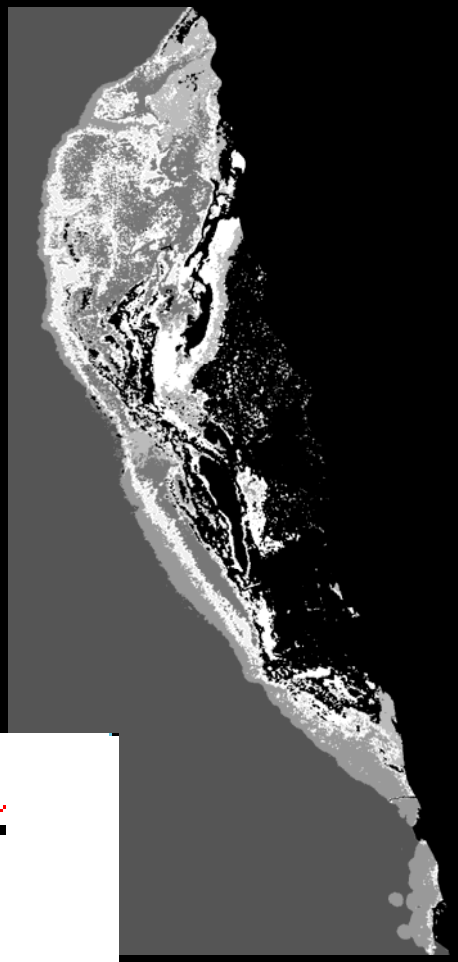
2-dimensional GIS

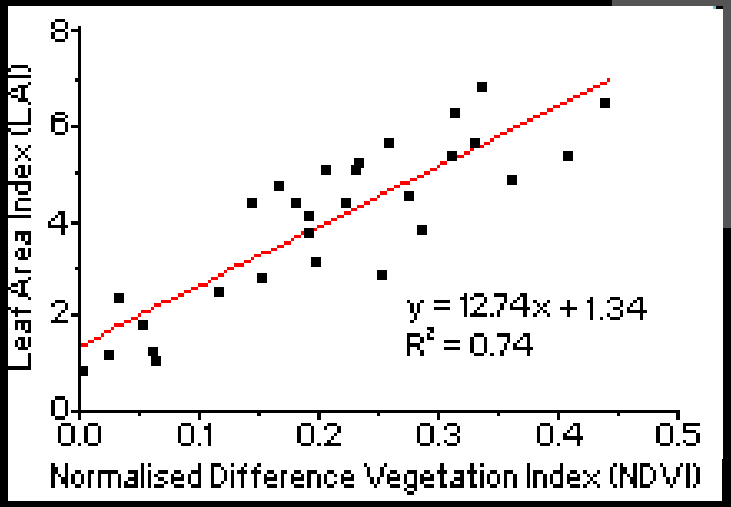


CASI imagery



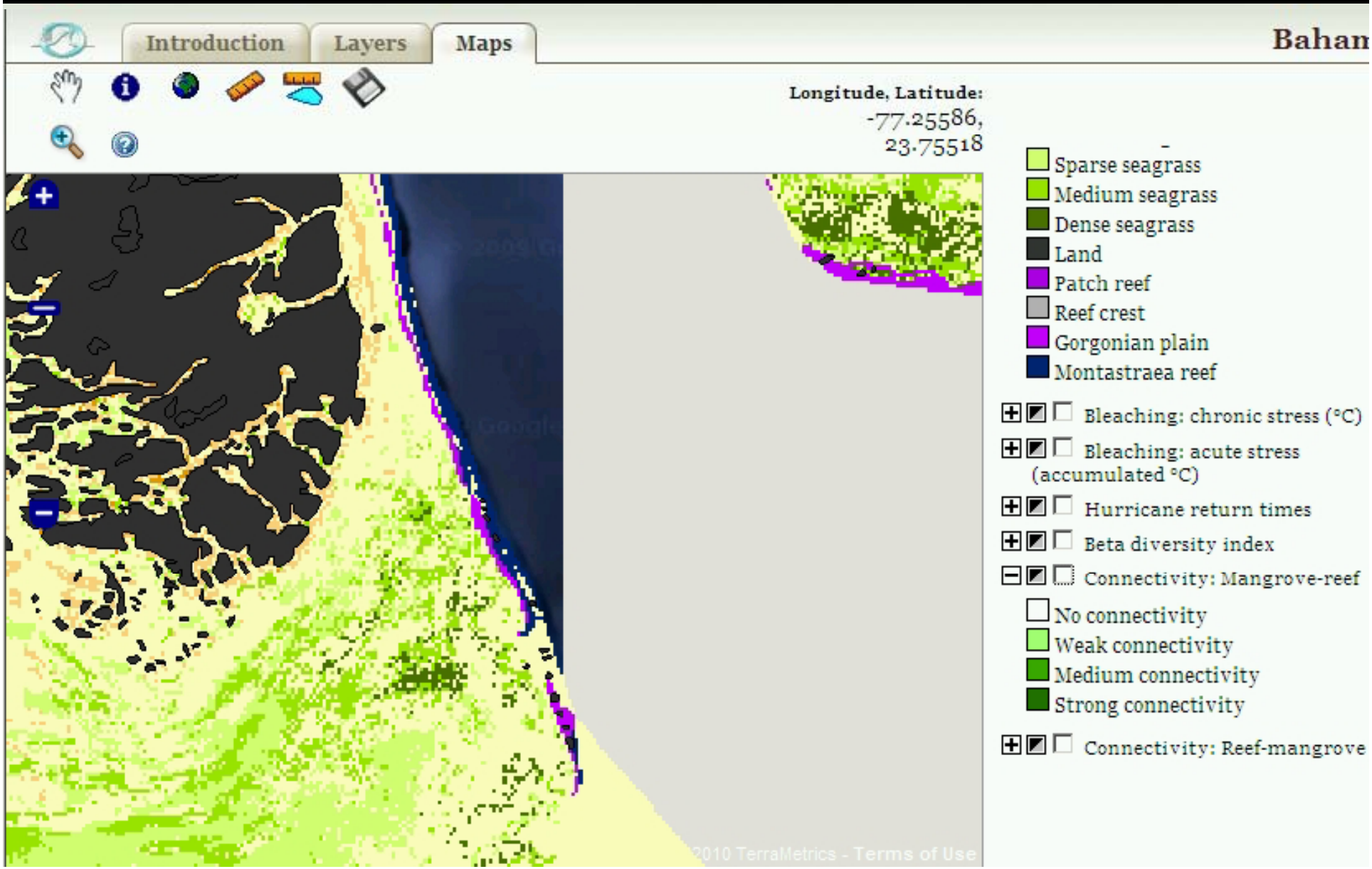
Leaf Area Index of Mangroves





Fisheries production 1
effects of nursery habitats

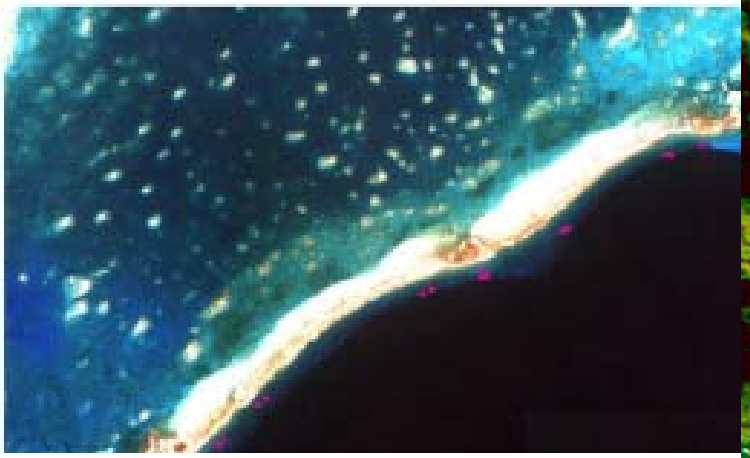
Mapping dependencies among ecosystems

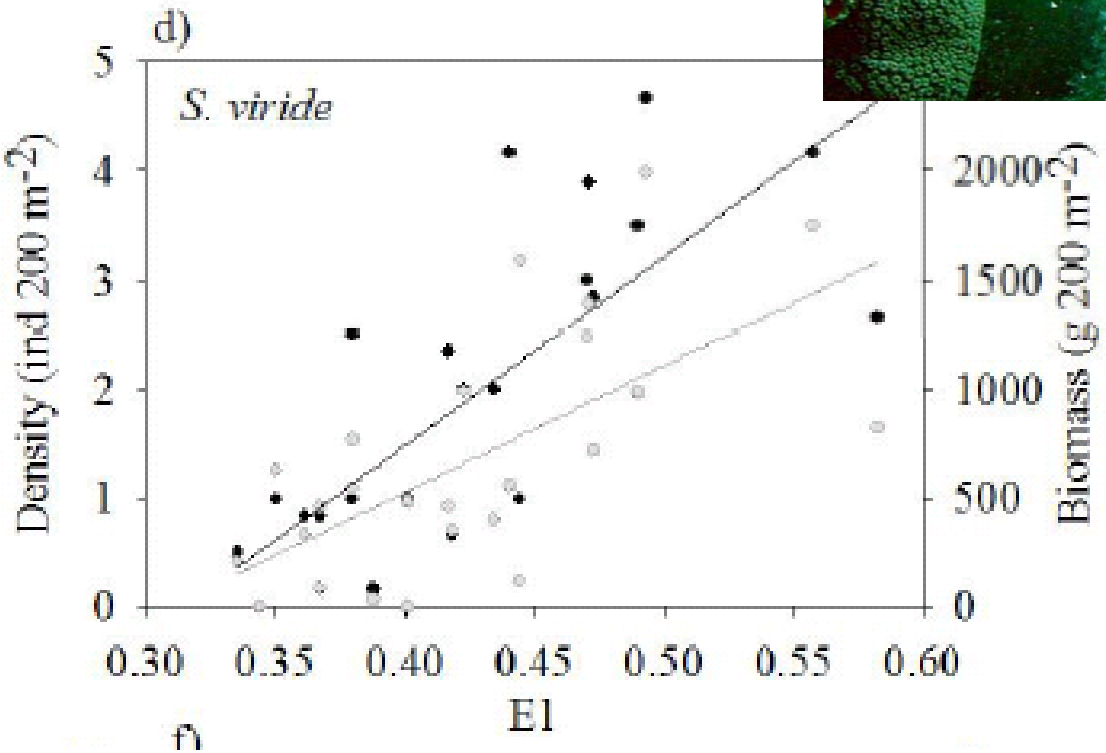


Reef fisheries production 2

patterns on the reef

Reef structural complexity & fish biomass

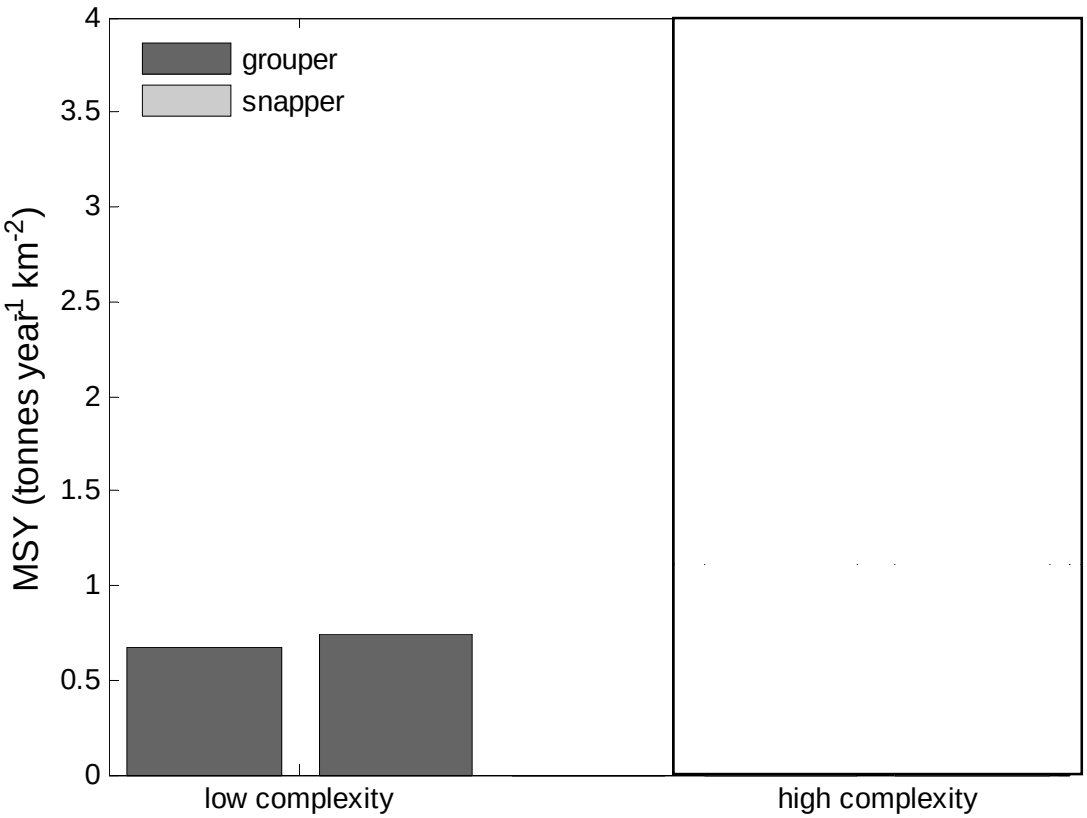


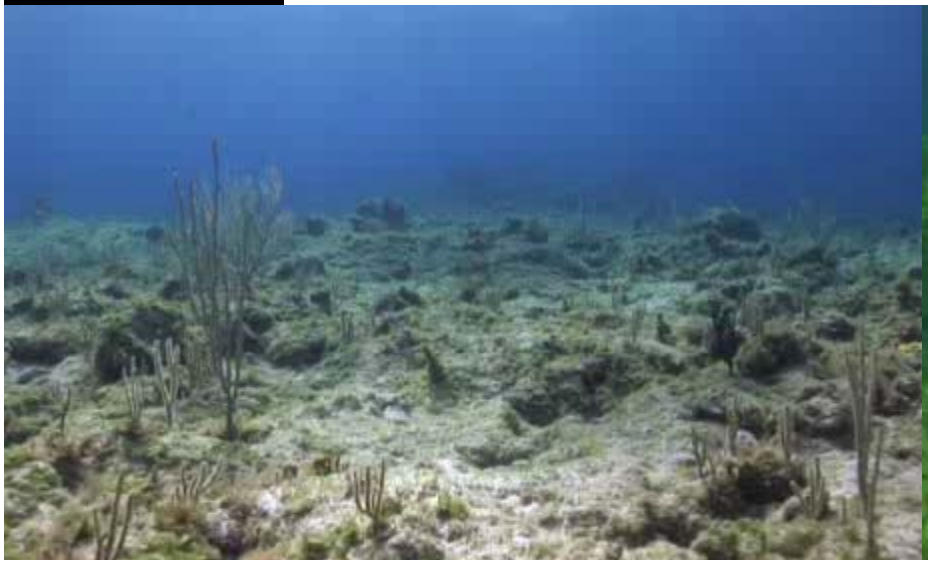


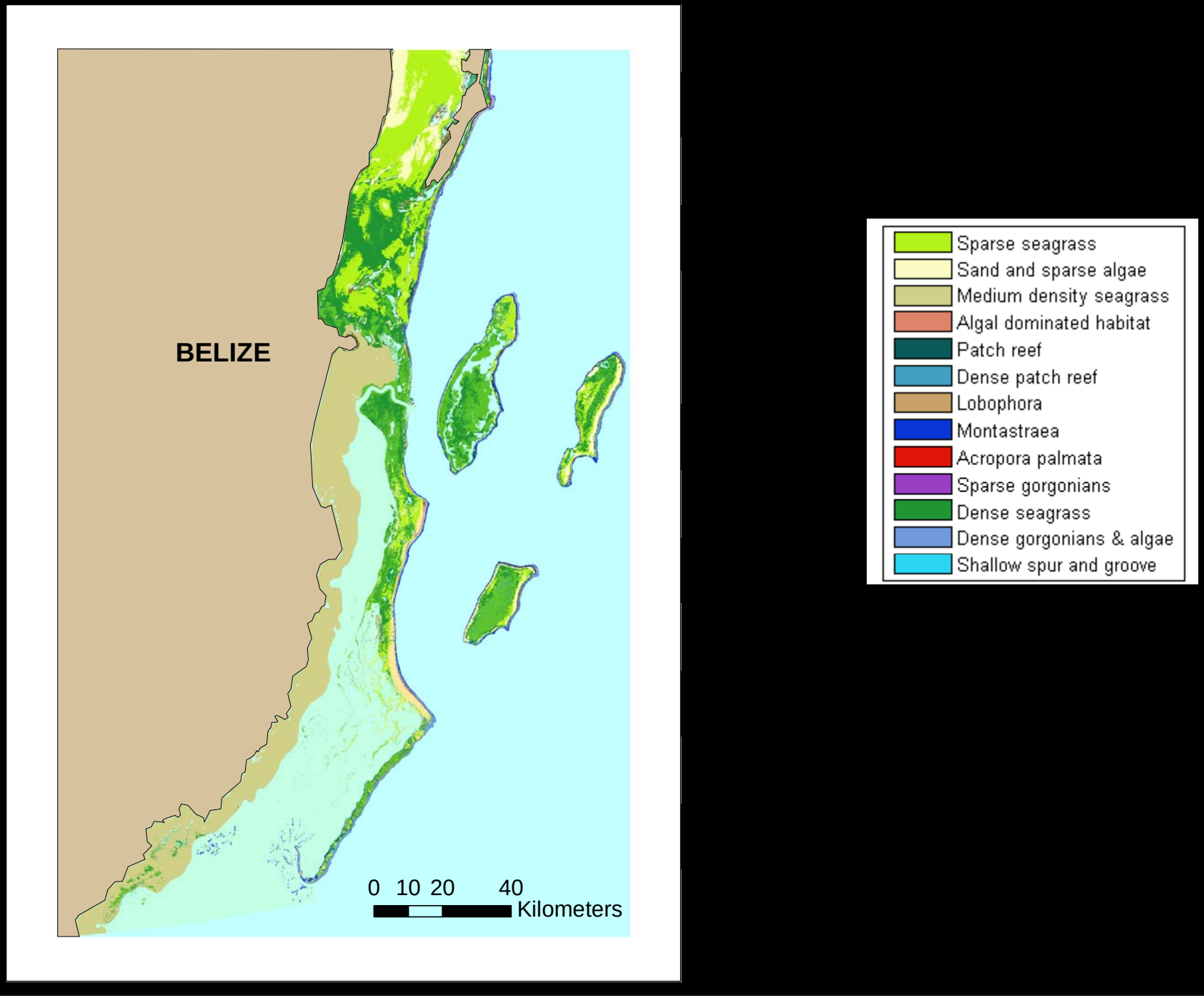
Coral Reef Targeted Research &

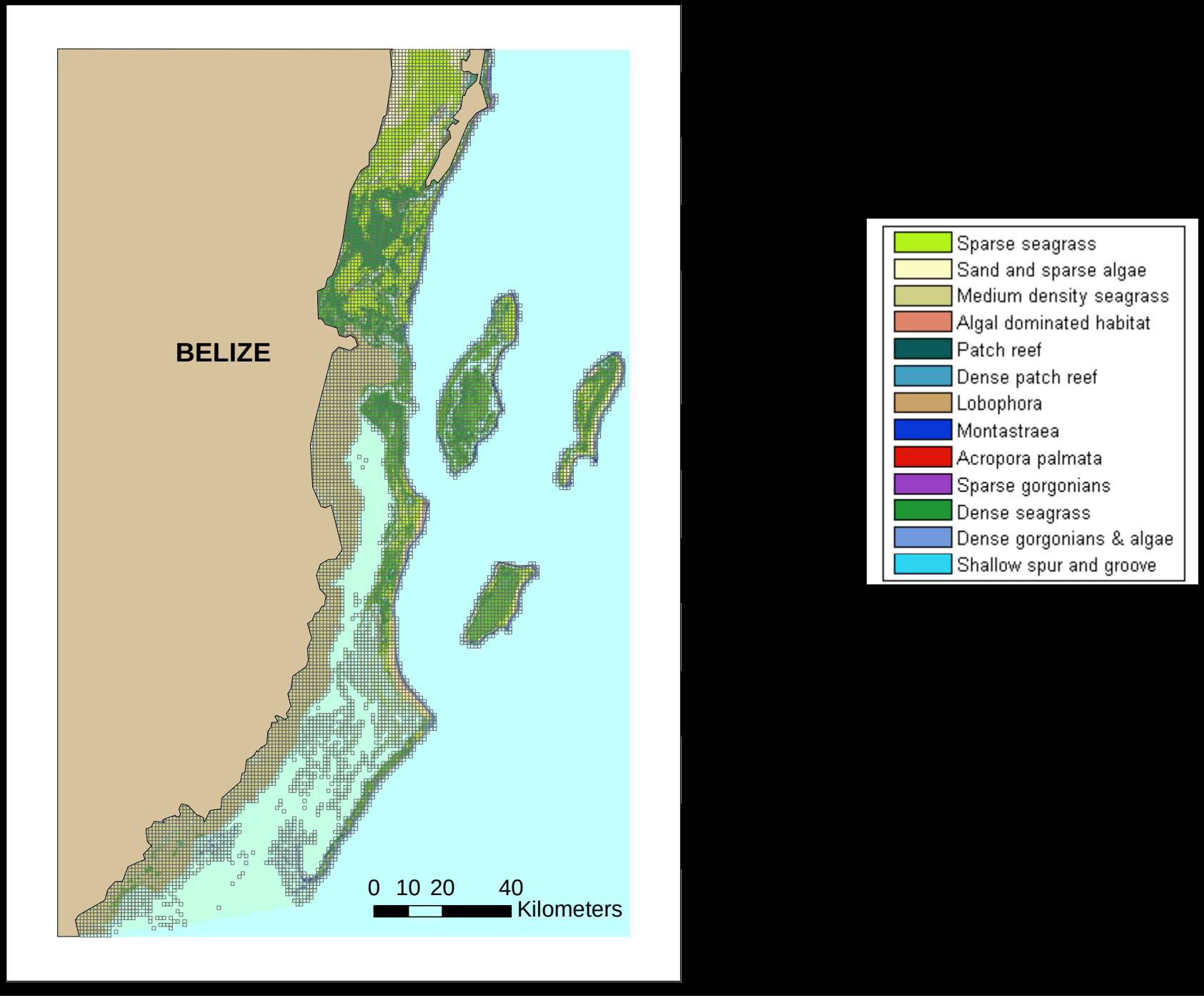
Impact on service:

Potential fisheries yield






BELIZE
0 10 20 40
Kilometers
Sparse seagrass
Sand and sparse algae
Medium density seagrass
Algal dominated habitat
Patch reef
Dense patch reef
Lobophora
Montastraea
Acropora palmata
Sparse gorgonians
Dense seagrass
Dense gorgonians & algae
Shallow spur and groove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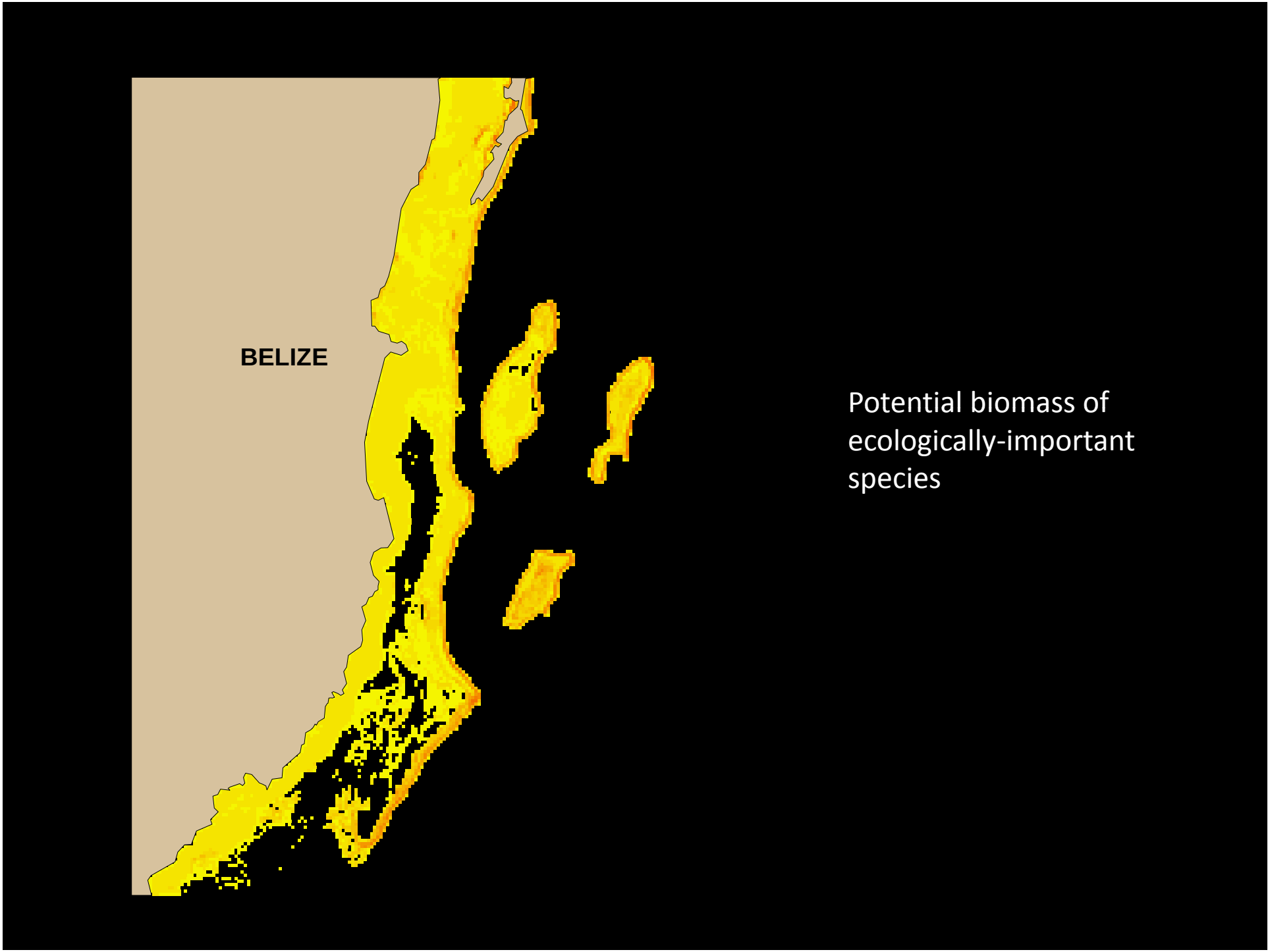
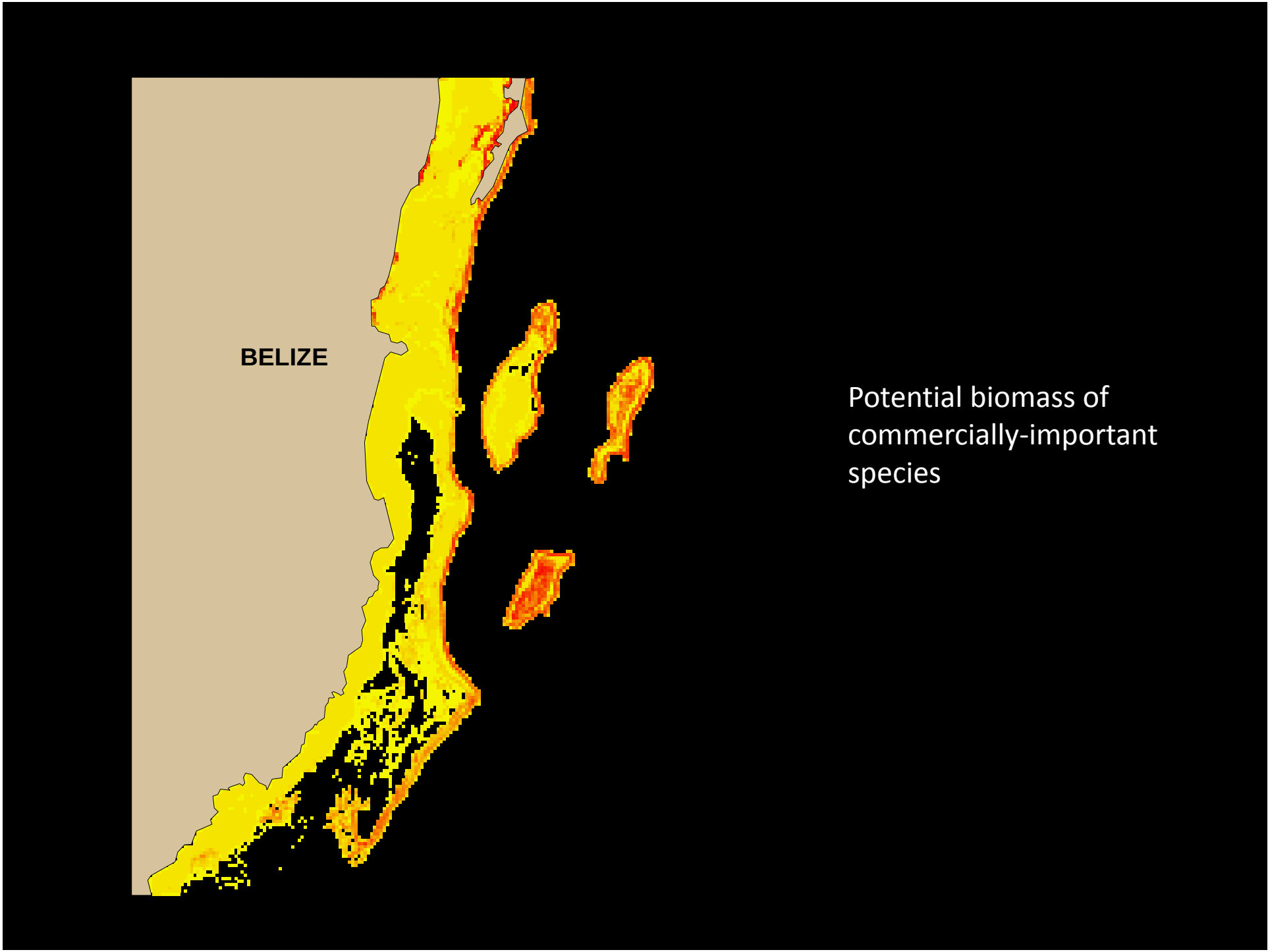


Potential biomass of ecologically-important species



Potential biomass of commercially-important species

Constraints: Marginal values of services

- Spatial scale: e.g., effect of losing 1 ha of mangrove on offshore fisheries production?

- Incremental change in system state: e.g., How does drop from 15% to 5% coral cover affect coastal defence and fisheries production over time?

Overcoming constraints

- Spatial scale: coupled ecological and economic theory emerging (e.g., Barbier et al. 2008; Sanchirico & Mumby 2009) but needs field parameterisation

- Incremental change in system state: Ecosystem modelling at a fairly advanced state for some services (e.g., fisheries production) but less so for others (e.g., coastal defence). Maybe seek collaboration with insurance industries?

Conclusions

- Ecosystem connectivity strongly influences some services
- Carbon sequestration likely to be mappable
- Marginal losses in tourism revenue with reef health unclear but very important
- Given assumptions, overall patterns of potential fisheries production mappable BUT marginal changes need parameterisation
- Overall patterns of coastal defence feasible but accuracy and marginal changes unclear
- How accurate do we have to be?
- Better valuation extremely important irrespective of market success

Sources

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