

Conceptual Models Development Update

EBFM TAP Meeting, March 2022

Lenfest Funded Project: Building a Fishery Ecosystem Plan for the U.S. Caribbean
Region as a Guide for Implementing
Ecosystem-based Fishery Management

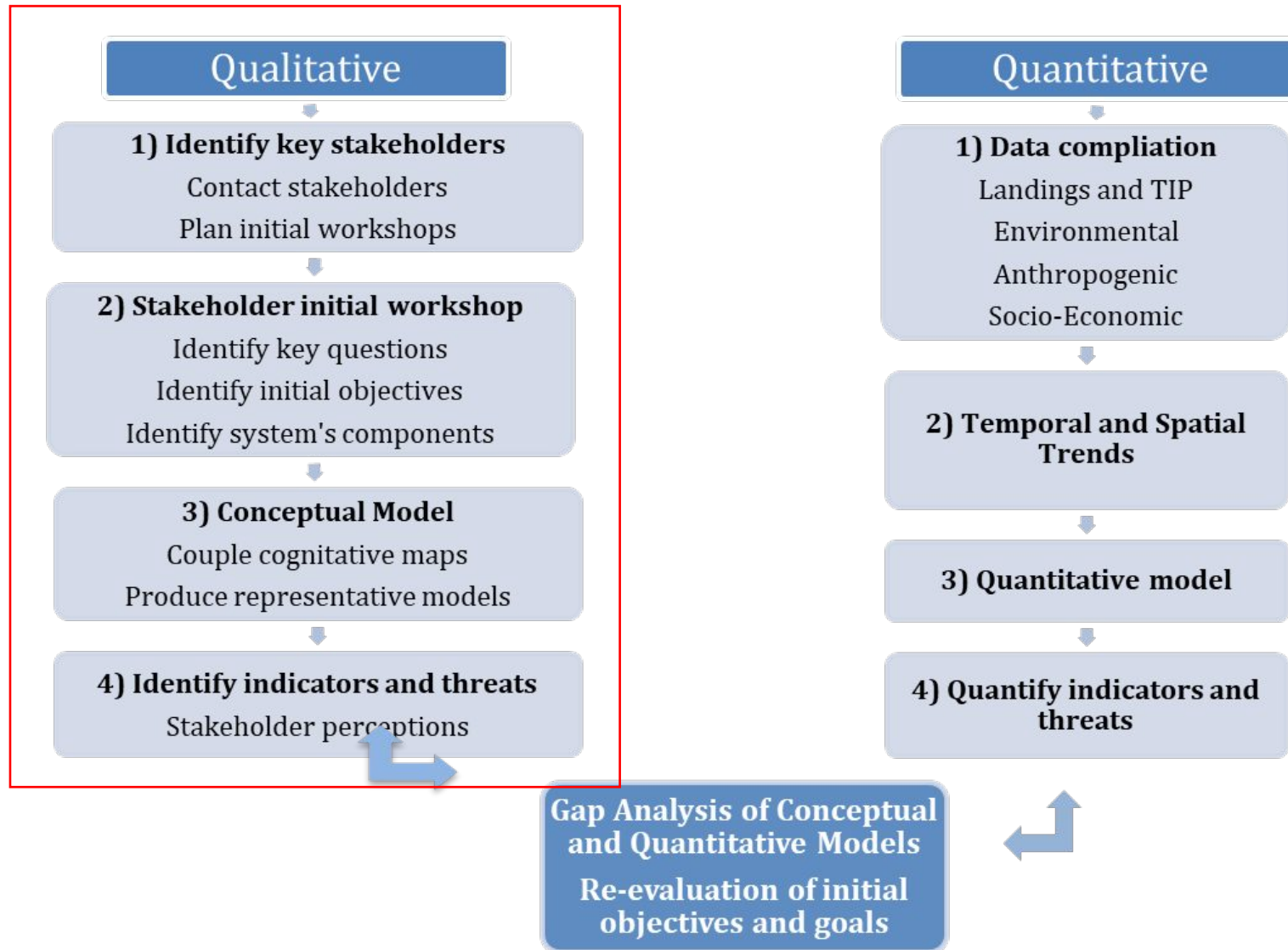
PIs: JJ Cruz-Motta, Stacey Williams, Tarsila Seara

Project Objectives

- 1) To develop conceptual and quantitative models of Caribbean ecosystems within a fisheries context.
- 2) To select and estimate indicators of the performance of the model.
- 3) To integrate results from both models to identify threats.



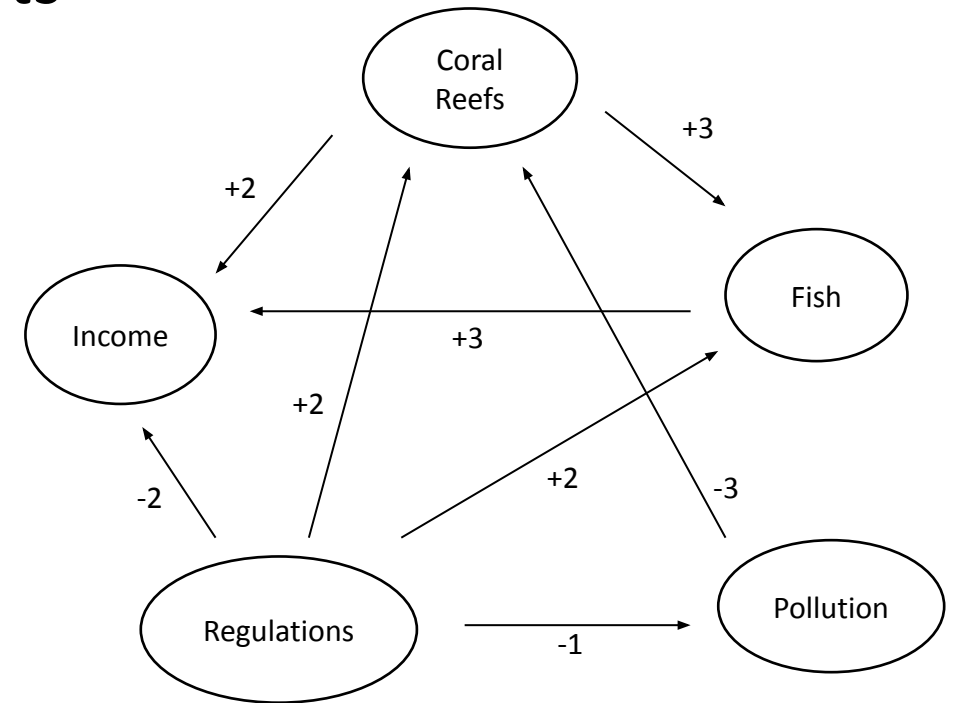
Methodology



Conceptual Models Development

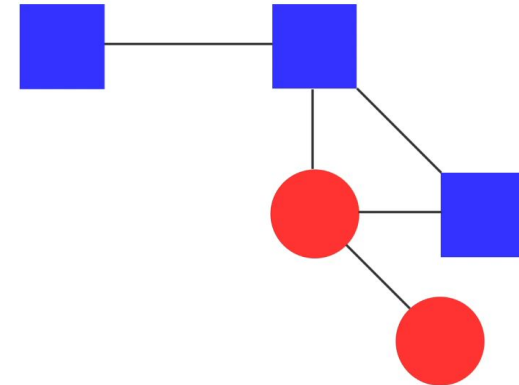
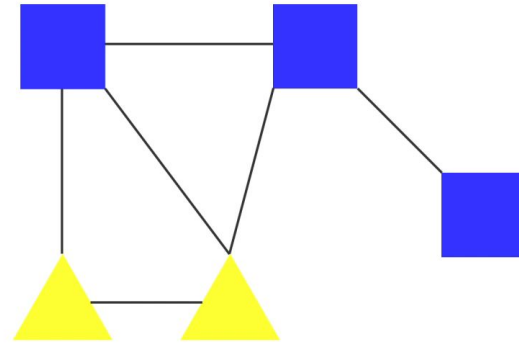
Conceptual Models (Fuzzy Cognitive Maps):

- DAPs, SSC, and additional CFCM efforts
- PEW
- **Lenfest Project**



Conceptual Models Development

Social Cognitive Maps



Conceptual Models Developed to Date

Stakeholder Group: Experts, 4 in total

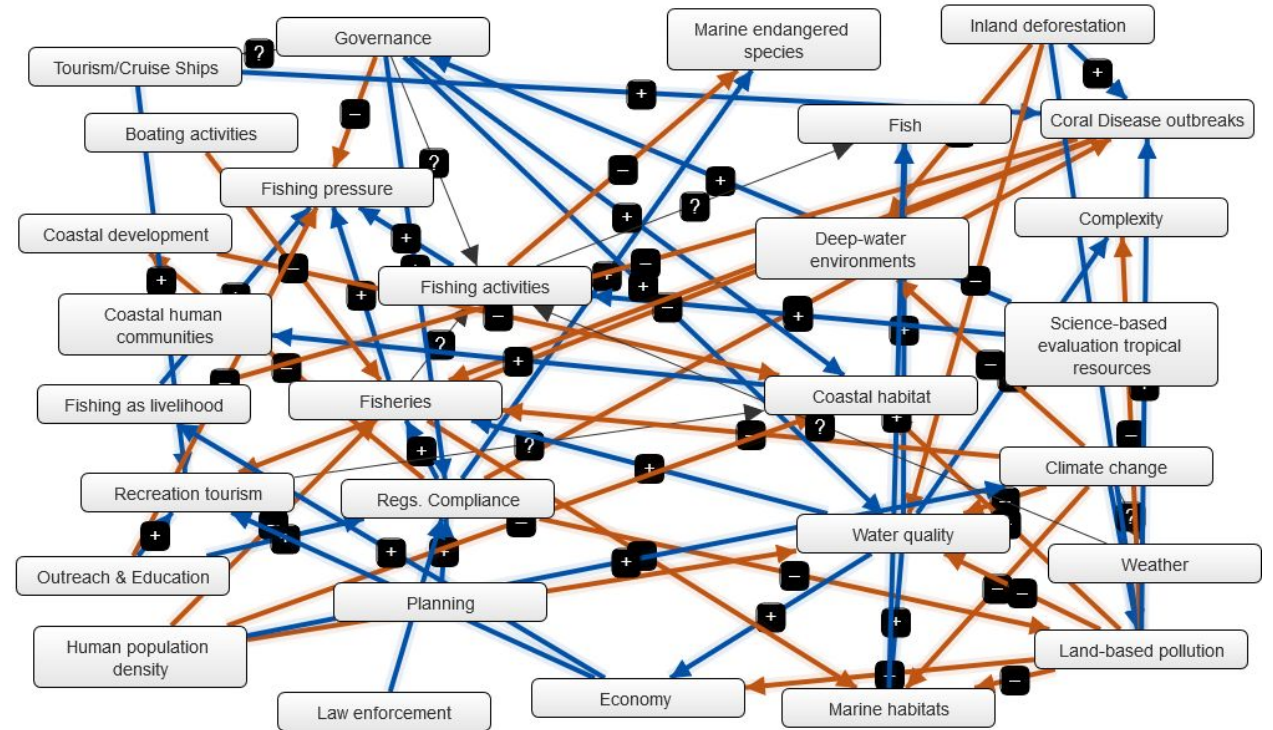
1. June 14 (Puerto Rico), 6 participants
2. June 16 (USVI), 5 participants
3. June 18 (Puerto Rico), 8 participants
4. June 21 (Puerto Rico), 5 participants

Total of 24 experts in the region

Stakeholder Group: Managers, 3 in total

1. June 28 (Puerto Rico), 2 participants
2. June 30 (Puerto Rico), 2 participants
3. July 1 (USVI), 5 participants

Total of 9 managers in the region



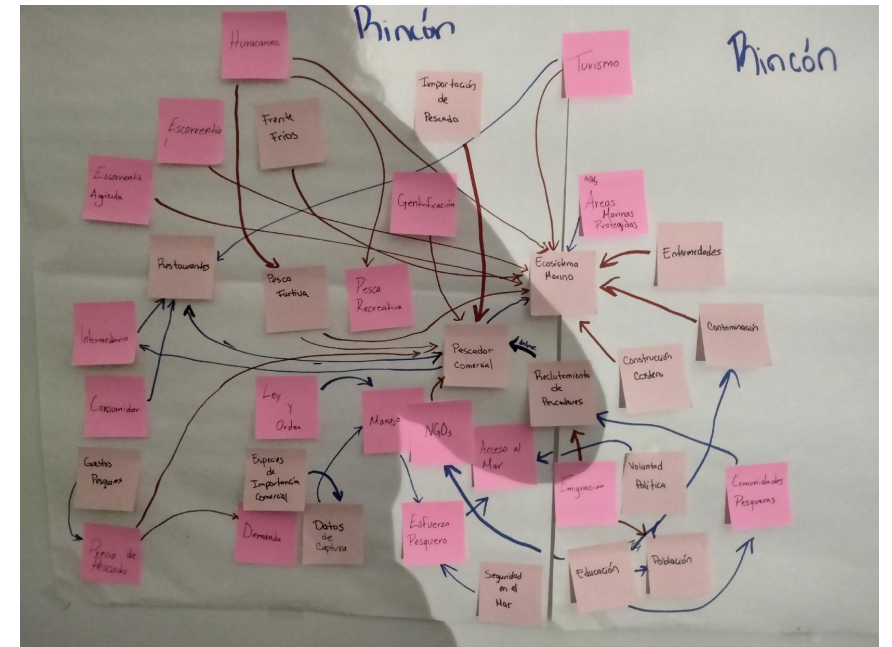
Conceptual Models Developed to Date

Stakeholder Group: Fishers, 8 to date

1. August 19, Puerto Real, Cabo Rojo (west), 24 participants
2. September 24, Combate, Cabo Rojo (west), 11 participants
3. October 21, Boqueron, Cabo Rojo (west), 8 participants
4. October 22, Añasco, Añasco (west), 7 participants
4. October 15, Playa Santa, Guanica (southwest,) 6 participants
6. November 5, Aguada, Aguada (northwest), 4 participants
7. March 4, Rincón (northwest), 5 participants
8. March 11, San Juan (north), 9 participants

Total of 74 fishers in Puerto Rico so far

We are planning to do 7 additional workshops in PR (mostly in the southeast and east) and 2 workshops in the USVI (1 in STT and 1 in STX) between March – June 2022.



Conceptual Models in FEP Process

Stakeholder Conceptual Models/Social Cognitive Maps will be used to:

- Allow visualization and in-depth analyses of stakeholder perceptions (e.g., using graph theoretical approach).
- **Help identify priorities and risk factors to guide management decisions.**
- **Identify data gaps.**
- Guide the development of hypotheses to be tested using the quantitative approach □ *JJ's presentation*

(Very) Preliminary Analysis and Examples

PR & USVI Experts

Examples of top Drivers:

- Management (MSP, Regulations, Plans)
- Gentrification
- Education
- Compliance
- Water Quality/Pollution
- Climate Change
- Hurricanes
- Ciguatera
- Mangroves
- Marine Diseases (coral)

Examples of top Receivers:

- Fishers
- Fisheries
- Fishing Pressure
- Fish & Invertebrate Abundance
- Habitat
- Coral Reefs
- Mangrove
- Seagrass
- Water Quality
- Recreation/Tourism

(Very) Preliminary Analysis and Examples

PR & USVI Managers

Examples of top Drivers:

- Management
- Restoration
- Marine Protected Areas
- Habitat Quality
- NPS Pollution
- Tourism
- Climate Change
- Sargassum

Examples of top Receivers:

- Fishery catch/Commercial catch
- Commercial Fisheries
- Biomass
- Habitat Quality/Habitat
- Water Quality
- Imported Marine Species

(Very) Preliminary Analysis and Examples

PR Fishers

Examples of top Drivers:

- Pollution
- Water Quality
- Coastal/Marine Development
- Sargassum
- Invasive Species
- Weather/Climate/Water Temperature/Climate Change
- Recreational Fishers
- Hurricanes
- Government
- Management/Government
- Fishery Closures
- Education

Examples of top Receivers:

- Fishers/Commercial Fishers
- Fisheries
- Catch
- Entry
- Fish/Commercially Important Species
- Grouper Species
- Sales
- Habitat
- Marine Ecosystem
- Coral Reefs
- Pollution
- Restaurants

(Very) Preliminary Analysis and Examples

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- **Pollution**
- Restaurants

Conceptual Models Development Next Steps

- Finalize data collection (fisher workshops).
- Analysis and development of social cognitive maps – including CMs from previous and ongoing efforts.
- Terminology

	A	B	C	D	E	F	G	H	I	J
1				Fishers				Managers		
2	Playa Santa	Boquerón	Añasco	Combate	Agüada	Puerto Real	June 28 2021	June 30 2021	July 1 2021	June 14 2021
3	Aid to Fishers	Boat	Bait	Access to Decompression Chamber	Abuse of Power	Algae	Coastal Waters	Active Fisher Participation	Bait Fish	Access to Fish Populations
4	Bureaucracy	Bureaucracy	Control/Oversight	Anchorage	Access to the Coast	Anchorage	Commercial Catch	Anthropogenic Impacts	Biomass	Carrying Capacity
5	Capture Report	Coast	Corals	Bacteria in Water	Beaches	Anchoring Technique	Consumer	Bathymetry Shifts	Climate Change	Climate Change
6	Coasts	Commercial Fishers	Current	Beach	Commercial Fishing	Boat Pollution	Coral Reef	Climate Change	Coastal Development	Commercial Fishers
7	Collective Organization	Corals	Disclosure	Boat Maintenance	Construction on Coasts	Boat Regulation	Fertilizer Contamination	Commercial Fishers	Coastal Erosion	Coral Disease
8	Commercial Fish	Costs	DNER	Bureaucracy	Decision Making	Boats	Imported Marine Species	Commercial Important Species	Commercial Fishers	Covid-19
9	COVID	Currents	Ecosystem	Communication When They Go Fishing	Distribution	Commercial Fishing License	Marine Habitat	Compliance	Compliance/Law Enforcement	Environmental Education
10	Current	Fisheries Statistics	Education	Community Engagement	Environmental Protection	Competition	Marine Species	Coral Disease	Connectivity	Extreme Weather Events
11	Customer	Fishes	Expenses	Consensus	Erosion	Competition Hoarders	Oceanic Waters	Coral Reef	Coral Disease	Fishers
12	Data Interpretation	Fishing	Fisheries Statistics	Coral Disease	Family Market	Conch	Rain	Decision Making	Culture/Tradition of Fishers	Fishing
13	Ecosystem	Fishing Gear	Fishes	Corals	Family Suffering	Consumer	Recreational Fisheries	Education/Outreach	Disturbances	Gentrification
14	Expenses	Fishing License	Fishing	Currents	Fish Market	Coral	Restaurants	Fishery Catch	Environmental/Oceanographic Variables	Greenhouse Gas Emission
15	Fisher	Government (DNER)	Fishing Gear	Demand	Fish Quality	Crab	River	Fishing Grounds	Fish Market Demand	Habitat
16	Fishing Effort	Habitat	Global Warming	Erosion	Fishers	Current	Runoff Contamination	Fishing Tradition	Fishing Eligibility	Human & Financial Resource
17	Fishing Season	Hurricanes	Habitat	Fisheries Law	Fishers' Cooperatives	Demand	Sargassum	Habitat Quality	Fishing Gear Types	Law Enforcement
18	Fishing Zone	Import	Hurricanes	Fishes	Fishers' Safety	Fish Market	Targeted Commercial Marine Species	Health of Coastal Forests	Fishing Grounds	Marine Spatial Planning
19	Intermediary	Law and Order	Illegal Sales	Fishing Gear (Fishing Art)	Gentrification of Coastal Community	Fish Market (Sale)	Tourism	Fishing Interest	Fishing Interest	Natural Resource Management
20	Invasive Species	Legislation	Income	Fishing Sites	Government (Federal, State)	Fisher Regulation		Invasive Seagrass	Funding & Capacity	Natural Resource Population
21	Lack of Representation	Lobster and Conch	Incompatibility of Laws	Garbage	Implementation of Law and Order	Fishers		Management	Habitat	Pollution
22	Lunar Cycle	Mahi Mahi (Dorado)	Intermediary	Gasoline	Knowledge of Fishing Gear	Fishers Safety		Mangroves	Intergovernmental Relations	Public Support Conservation & Management
23	Market	Pandemic	Law Enforcement	Global Warming	Managers of Fishing Villages	Fishes		Marine Currents	Management of Fisheries	Recreation
24	Marketing	Poacher And Recreational Fisher	Mangrove	Illegal Discharge	Marine Fauna	Fishing		Natural Disturbances	Marine Biodiversity	Recreational Participants
25	Non-Commercial Fishers	Pollution (Garbage)	Moon	Import	Marine Flora	Fishing Equipment		Nutrients	Marine Disease	Religious Festivities
26	Price Regulation	Price	Poacher/Recreational Fisher	Infrastructure Maintenance and Cleanin	Orientation	Fraudulent License		Plankton Health	Marine Recreation (Boating & Touring)	Sports Fishers
27	Regionalism	Profit	Pollution	Juvenile Fishes	Permits	Gasoline Price		Recreational Fishers	MPA	Temperature
28	Regulations	Rain	Price	Law Implementation	Poaching	Law and Order		Regulations	Non-Point Source Pollution	Tourism
29	Sales	Recreational Activities (Includes Fisher	Restaurants	Lionfish	Pollution (Agricultural Substances)	Lobster		Restoration	Nurseries	User Conflict
30	Sargassum	Restrictions on Commercial Fishing	Seagrass Meadows	Longliners (Industrial Ships)	Pollution (Sewage)	Manatee		Sargassum	Recruitment	Water Quality
31	Schedule (Day/Night)	Rivers (Runoff)	Seasonal Prohibition	Mark Visibility	Pollution of Boats	Mangroves		Scientific Data Collection	Sports Fishing	
32	Seasonal Prohibition	Sales	Species- (Pargo Profundus)	Masks	Poverty in the Fishing Community	Market		Sea Level Rise	Subsistence Fishing	
33	Tourism	Sargassum	Weather	Moon	Prices	Octopus		Sea Surface Temperature	Water Quality	
34	Tremors (Earthquakes)	Seasonal Prohibition	Wind	Poaching (Pirates)	Purchase	Offar		Seagrass Health		
35	Type of Fishing	Sediment		Prices	Recreational Opportunity (Diving)	Plastic		Traditional Fishing Knowledge		
36	Weather Conditions	Temperatures		Ramp	Resources for Fishers	Pollution (all)		User Behavior		
37	Weather Season	Tidal Waves		Recreational User (Recreational Fisher	Restaurants	Price		Water Quality		
38		Warming Water		Regulation	Sale	Production				
39		Weather		Relationship between Fishers	Subsistence Fishing	Recycling				
40		Wind		Restaurants (Waste)	Tourism	Reef				
41				Risk of Life	Training	Restaurant				
42				Safety		Rivers (Quality)				

Questions?

