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Framework for Integrated Stock and Habitat Evaluation (FISHE)

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Environmental Defense Fund

IATTC Climate Strategy Meeting

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Multi-stakeholder goals for fisheries management

1. Sustainability and resilience of food security
2. Sustainable economic growth and improved livelihoods
3. Abundant stocks to support healthy ecosystems

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Climate impacts are not evenly distributed

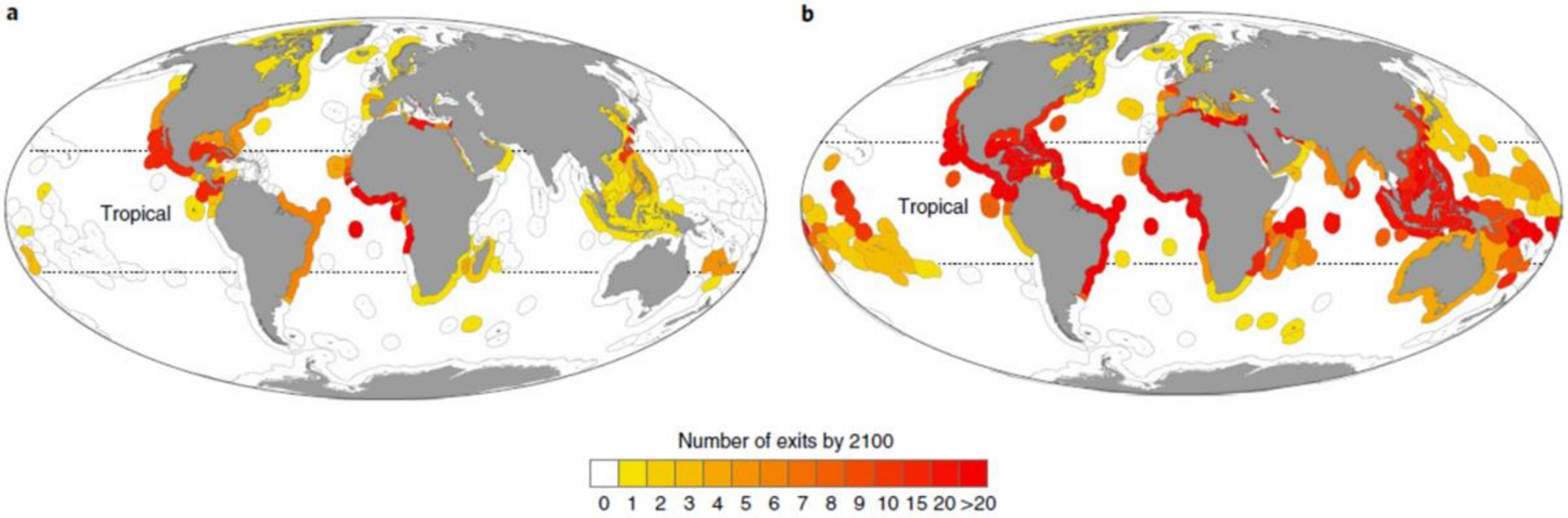

Fig. 1 | National loss of species. a,b, The number of species shifting out of each EEZ by 2100 under RCP 4.5 (**a**) and RCP 8.5 (**b**).

Oremus *et al.* (2020) *Nature Sustainability*

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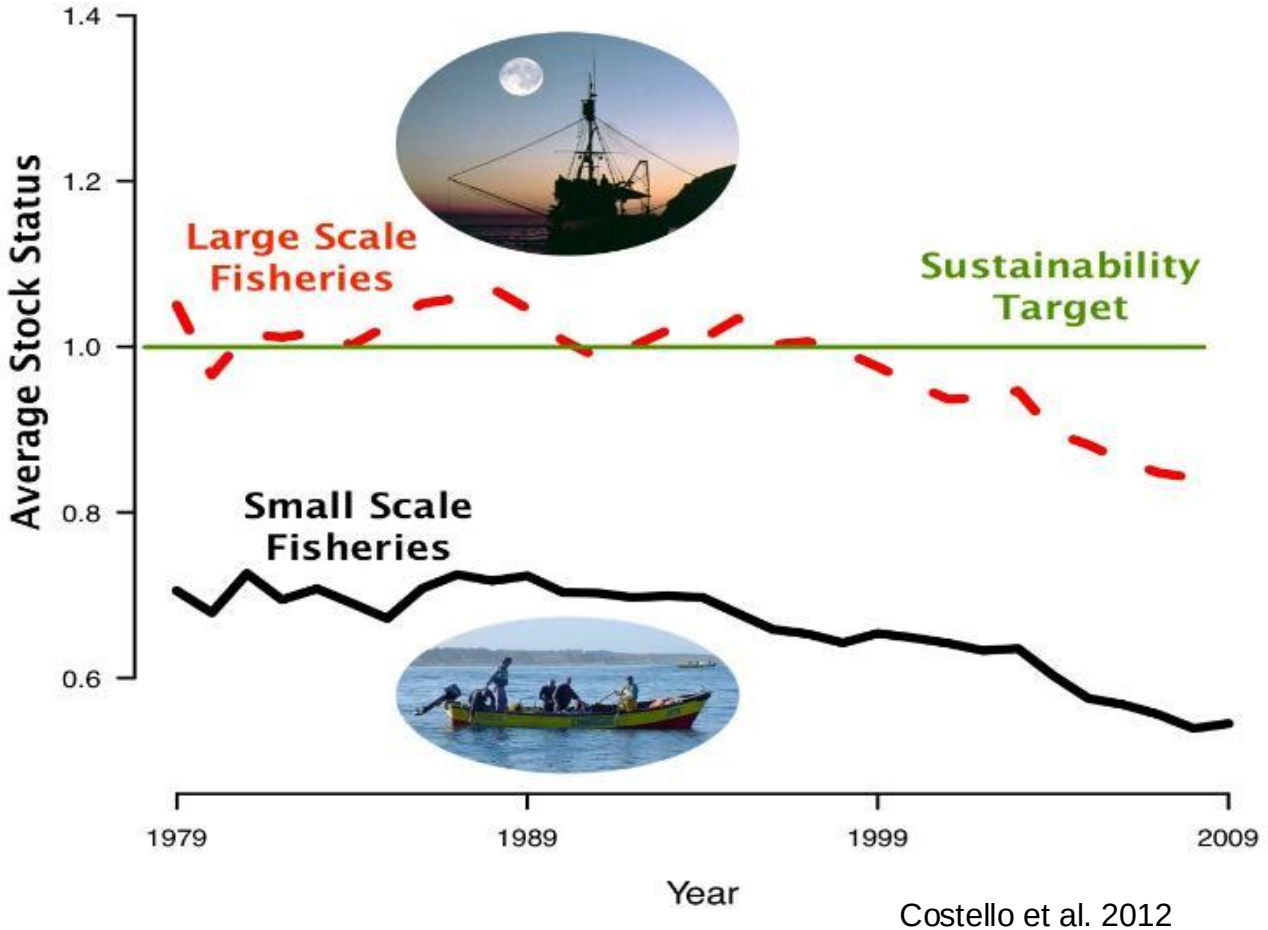
Management is critical even when **data is limited**

- >80% of fisheries in the world are unassessed; likely underperforming
  - 90% of SSFs.
- Understanding stock and ecosystem health can help overcome challenges in data-limited fisheries.



Costello et al. 2012

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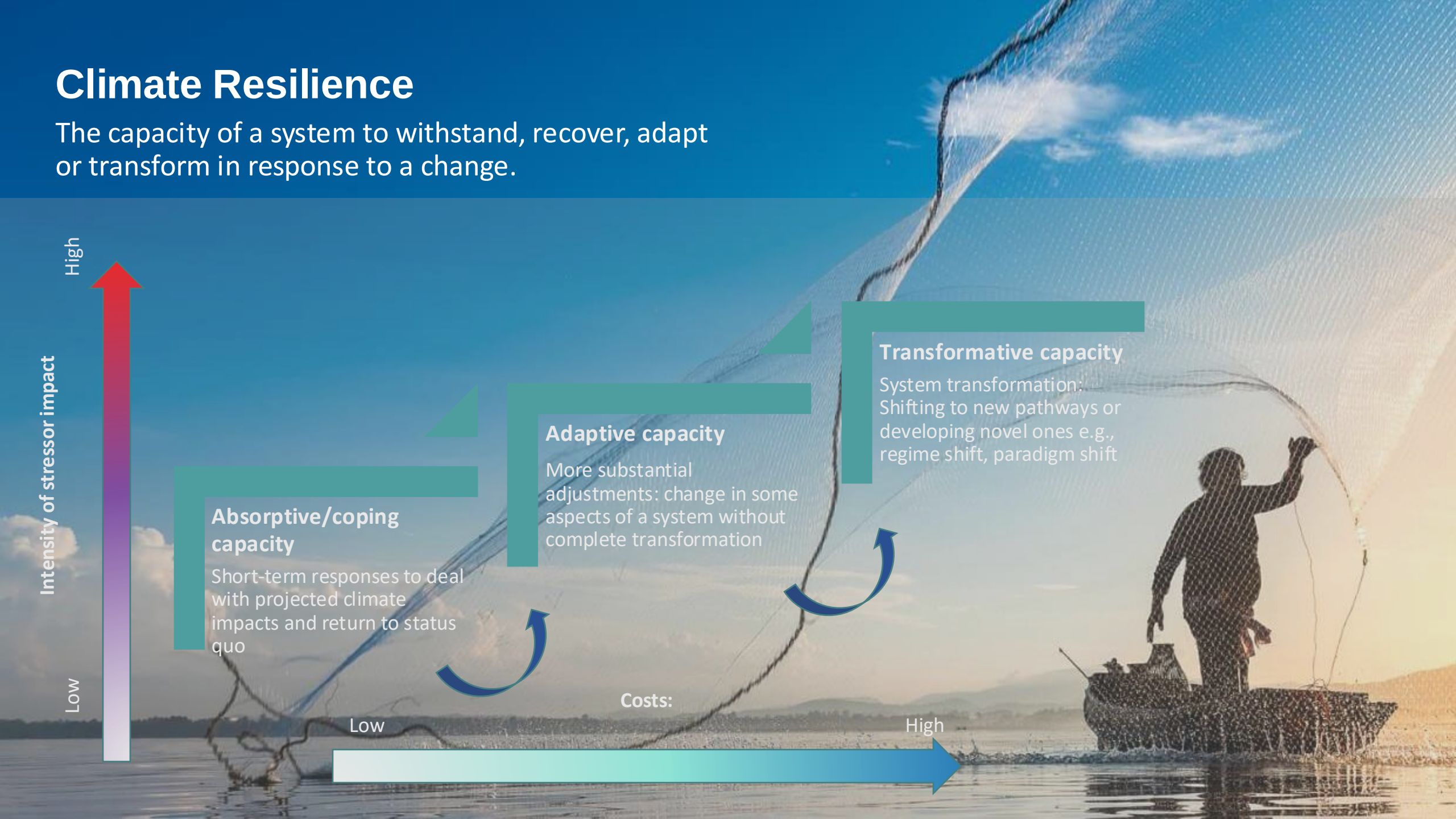
Resilience: living with climate change

Our key fishery science and management challenge:

How to assess and manage fisheries such that **good yields**, **food production**, and **livelihoods** can be maintained even in the face of these changes.

Climate Resilience

The capacity of a system to withstand, recover, adapt or transform in response to a change.



Enabling climate-resilient fisheries

SNAPP Science for Nature and People PARTNERSHIP

Climate Resilient Fisheries Working Group

ORIGINAL ARTICLE | Open Access

Attributes of climate resilience in fisheries: From theory to practice

Julia G. Mason, Jacob G. Eurich, Jacqueline D. Lau, Willow Battista, Christopher M. Free, Katherine E. Mills, Kanae Tokunaga, Lily Z. Zhao, Mark Dickey-Collas, Mireia Valle, Gretta T. Pecl, Joshua E. Cinner, Tim R. McClanahan, Edward H. Allison, Whitney R. Friedman, Claudio Silva, Eleuterio Yáñez, María Á. Barbieri, Kristin M. Kleisner **... See fewer authors**

ORIGINAL ARTICLE | Open Access

Diverse pathways for climate resilience in marine fishery systems

Jacob G. Eurich, Whitney R. Friedman, Kristin M. Kleisner, Lily Z. Zhao, Christopher M. Free, Meghan Fletcher, Julia G. Mason, Kanae Tokunaga, Alba Aguion, Andrea Dell'Apa, Mark Dickey-Collas, Rod Fujita, Christopher D. Golden, Anne B. Hollowed, Gakushi Ishimura, Kendra A. Karr, Stephen Kasperski, Yuga Kisara, Jacqueline D. Lau, Sangeeta Mangubhai, Layla Osman, Gretta T. Pecl, Jörn O. Schmidt, Edward H. Allison, Patrick J. Sullivan, Joshua E. Cinner, Roger B. Griffis, Timothy R. McClanahan, Richard C. Stedman, Katherine E. Mills

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Enabling climate-resilient fisheries through knowledge co-production

SNAPP
Science for Nature and People PARTNERSHIP

Climate Resilient Fisheries Working Group

ICES JOURNAL OF MARINE SCIENCE

Co-production of knowledge and strategies to support climate resilient fisheries

Katherine E Mills ✉, Derek Armitage, Jacob G Eurich, Kristin M Kleisner, Gretta T Pecl, Kanae Tokunaga

frontiers | Frontiers in Marine Science

A participatory climate vulnerability assessment for recreational tidal flats fisheries in Belize and The Bahamas

Gemma Carroll[1†], Jacob G. Eurich[2,3*†], Krista D. Sherman[4], Robert Glazer[5], Michael T. Braynen[6], Karlisa A. Callwood[4], Adriel Castañeda[7], Craig Dahlgren[4], Kendra A. Karr[8,9], Kristin M. Kleisner[10], Virginia Burns-Perez[11], Sarah E. Poon[8], Nicanor Requena[12], Victor Sho[13], Shervin N. Tate[14] and Sepp Haukebo[15]

CSIRO PUBLISHING

PERSPECTIVE
https://doi.org/10.1071/PC22050

PACIFIC CONSERVATION BIOLOGY

Resilience of a giant clam subsistence fishery in Kiribati to climate change

Jacob G. Eurich[A,B,*], Aranteiti Tekiau[C], Katherine L. Seto[D], Erietera Aram[C], Toaea Beiateuea[C], Christopher D. Golden[E,F], Bwebwenikai Rabwere[C] and Douglas J. McCauley[B,G]

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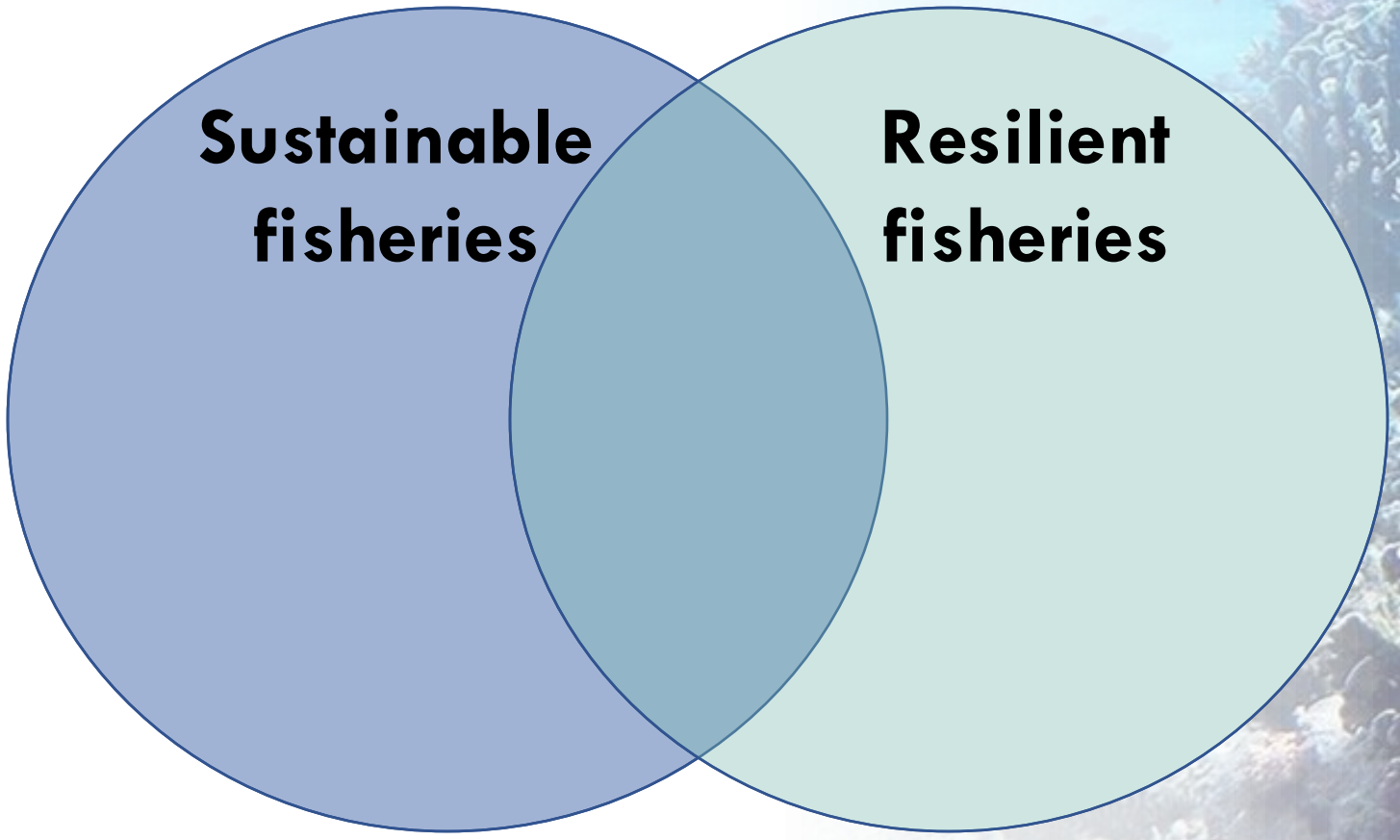
EDF developed 5 climate resilience principles to guide fisheries reforms at the intersection between sustainability and resilience

Sustainable fisheries

Sustainability

1. Clear goals
2. Good monitoring
3. Scientific assessment
4. Participatory and transparent process
5. Secure access to a sustained yield

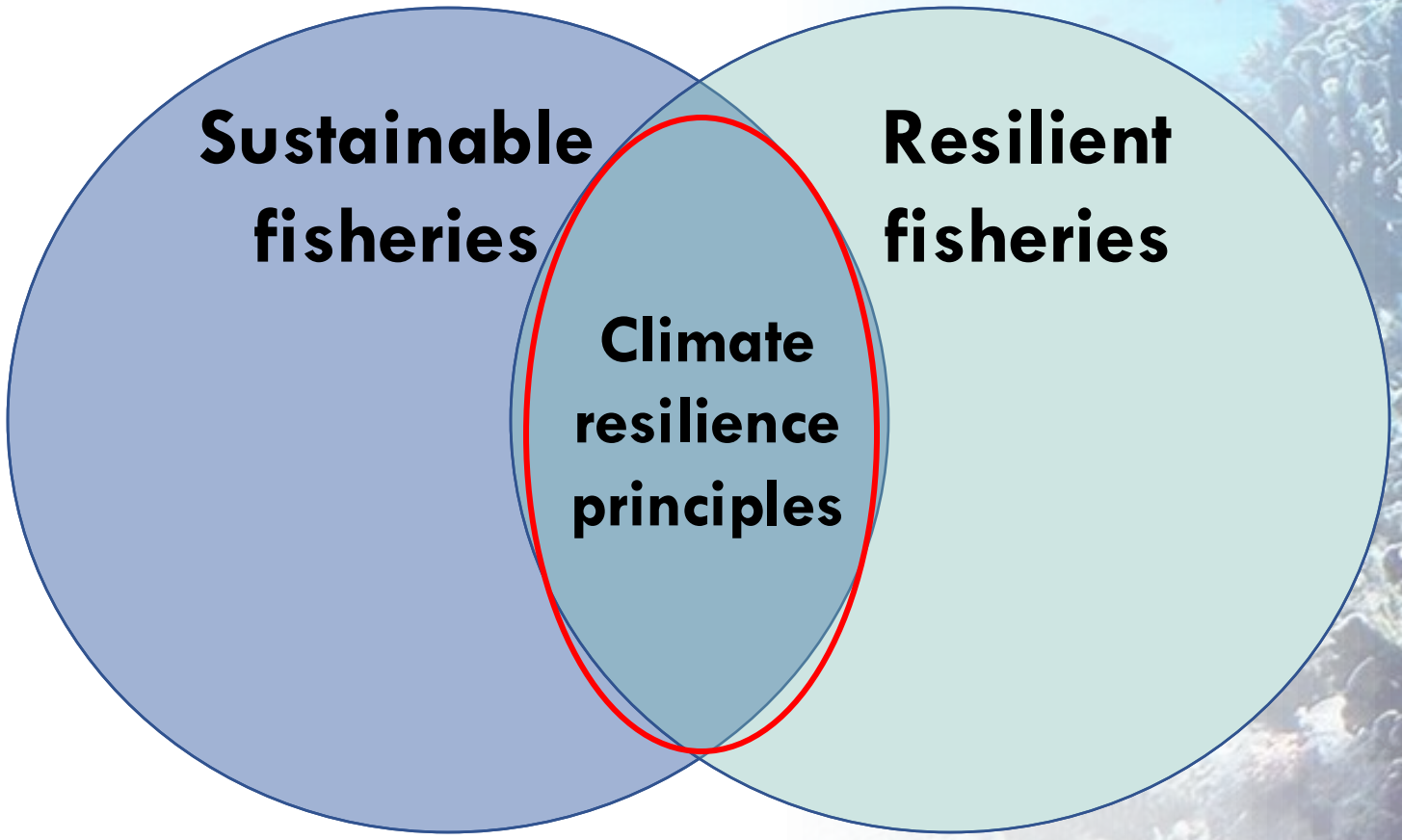
EDF developed 5 climate resilience principles to guide fisheries reforms at the intersection between sustainability and resilience



Resilience

1. Healthy habitats and population connectivity
2. Reserve capacity
3. Acceptance of change
4. Humility and learning mindset
5. Avoid destructive feedback loops

EDF developed 5 climate resilience principles to guide fisheries reforms at the intersection between sustainability and resilience



Climate resilient principles

1. Establish & promote effective management & governance
2. Plan ahead for change
3. Enhance cooperation
4. Improve ecosystem & institutional health
5. Promote fairness & equity

Better decisions

Scientific assessment is one of the keys to sustainable fisheries management.

The Framework for Integrated Stock and Habitat Evaluation (FISHE) is a **step-by-step process** for providing scientific guidance for the sustainable, climate-resilient management of fisheries.

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Framework for Integrated Stock and Habitat Evaluation (FISHE)

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Framework for Integrated Stock and Habitat Evaluation (FISHE)

It includes:

- Projecting future conditions and adapting accordingly.
- Articulating clear fishery goals or objectives
- Assessing ecosystem and stock status (or risk) using available data and local knowledge
- Choosing appropriate indicators, targets, and limits
- Creating harvest control rules to maintain sustainable yields,
- Choosing appropriate harvest control measures to achieve fishery goals and targets

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Key features of this framework

- Process of designing the framework is collaborative and stakeholder-driven
- Local stakeholder knowledge is incorporated into each step of the framework
- Flexibility to use multiple performance indicators appropriate for species, available data, and technical capacity for data analysis
- FISHE process is adaptive to meet the fishery where it is

FISHE in Action

Belize
- Caribbean Spiny Lobster
- Queen Conch
- Multispecies Finfish

Chile
- Los Rios Multispecies Finfish
- Juan Fernández Multispecies Finfish
- Chiloe Marmola Crab

Cuba
- Multispecies Finfish

French Polynesia
- Recreational Fly Fishing

Indonesia
- Lampung BSC
- *Kaimana Multispecies*

Philippines
- FMA 8 Multispecies
- *FMA 1 Multispecies*

Mexico
- Sinaloa Multispecies
- Mero Multispecies
- El Corredor Multispecies
- Corvina

Portugal
- Octopus

Spain
- Gerret

*Fisheries in *italics* are in the early stages of the FISHE process

Belize multispecies finfish case study

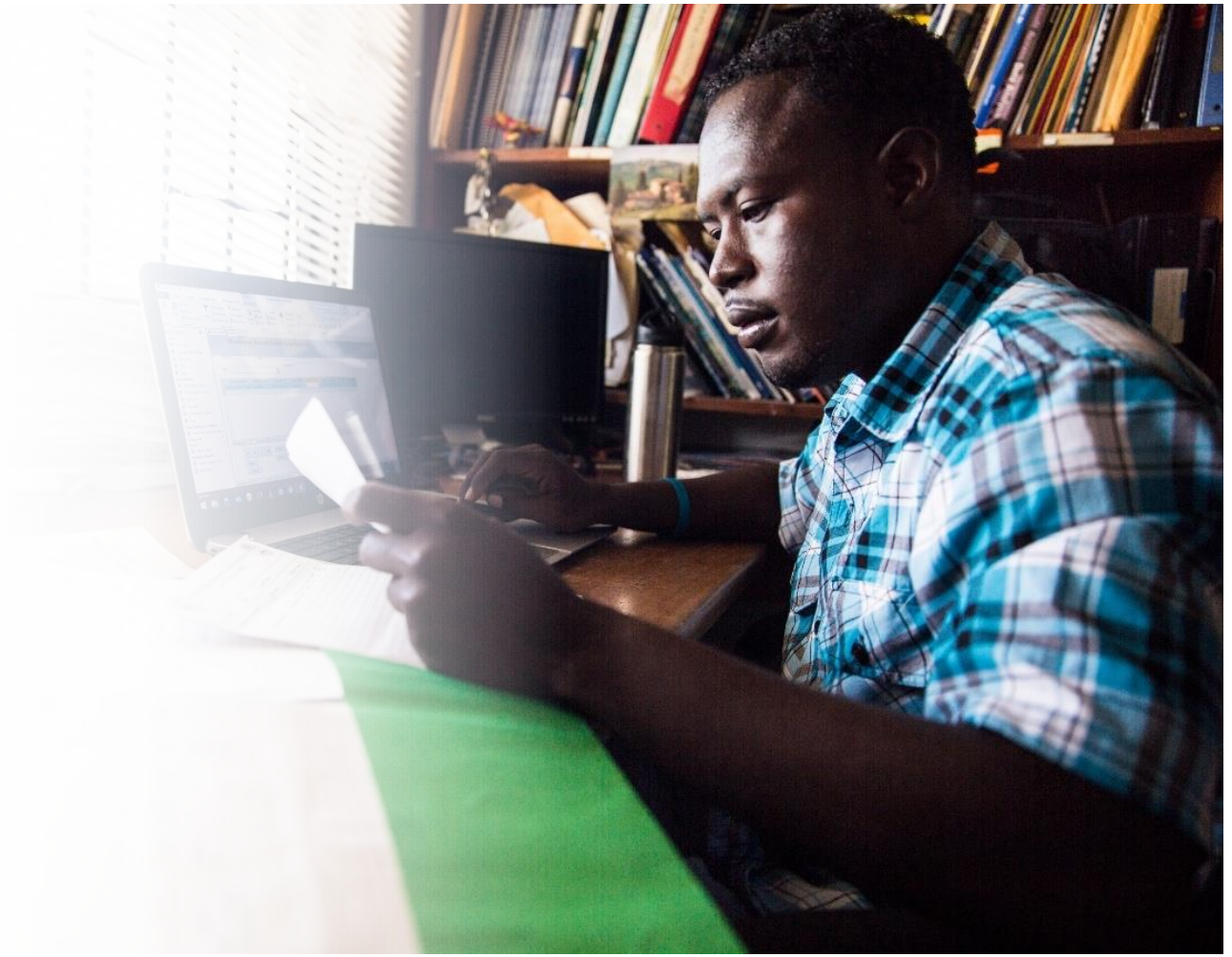

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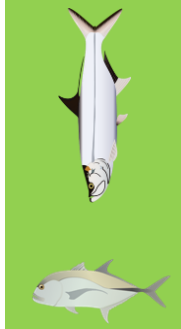
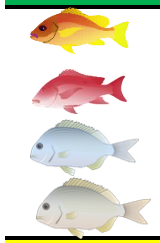
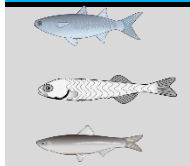
Image	Group ID	Common name	Species name	Group Identity
	1	**Mahi mahi**	***Coryphaena hippurus***	pelagic/migratory/ gear
		Wahoo	*Acanthocybium solandri*	
		Marlin - white/ stripe	*Kajikia albida/ Kajikia audax*	
		Swordfish	*Xiphias gladius*	
		Yellowfin tuna	*Thunnus albacares*	
		Cobia	*Rachycentron canadum*	
		Great amberjack	*Seriola dumerili*	
	2	White grunt	*Haemulon plumieri*	beach traps
		Gray snapper	*Lutjanus griseus*	
		Bluestrip grunt	*Haemulon sciurus*	
		Great barracuda	*Sphyraena barracuda*	
		Mojarra (yellowfin)	***Gerres cinereus***	
		Mojarra (pompano)	*Diapterus auratus*	
	3	**Schoolmaster**	***Lutjanus apodus***	opportunistic sling
		Mangrove/Mahogany snapper	*Lutjanus mahogoni*	
		Sailor choice	*Haemulon parra*	
		Margate	*Haemulon album*	
	4	Yellow-eyed snapper	*Lutjanus vivanus*	deep-slope fishery
		Deep water blackfin snapper	*Lutjanus buccanella*	
		Southern red snapper	***Lutjanus purpureus***	
		Queen snapper	*Etelis oculatus*	
		Vermillion snapper	*Rhomboplites aurorubens*	
		Misty grouper	*Hyporthodus mystacinus*	
	5	**Cubera snapper**	***Lutjanus cyanopterus***	forereef/open/ handline
		Dog snapper	*Lutjanus jocu*	
	6	Mullet	*Muguil spp.*	bait for other fisheries
		Sardine	*Sardinella spp.*	
		Sprat	***Sprattus spp.***	
	7	**Snook**	***Centropomus undecimalis***	habitat/traps/lines/nets
		Bay snook	*Petenia splendida*	
		Crana	*Cichlosomas urophthalmus*	
		Tuba	*Cichlasoma synspilum*	
		Blue-eye catfish (baca)	*Ictalurus furcatus*	
	8	Spanish mackeral	*Scomberomorus maculatus*	pelagic/migratory/gear -- handline
		Crevalle	*Caranx hippos*	
		King mackeral	***Scomberomorus cavalla***	
		Cerro mackeral	*Scomberomorus regalis*	
	9	**Black grouper**	***Mycteroperca bonaci***	large groupers
		Goliath grouper	*Epinephelus itajara*	
		Tiger grouper	*Mycteroperca tigris*	
		Yellowfin grouper	*Mycteroperca venenosa*	
	10	**Mutton snapper**	***Lutjanus analis***	fished together, mutton needs to be managed
		Red hind	*Epinephelus guttatus*	
	11	**Hogfish**	***Lachnolaimus maximus***	needs to be rebuilt
	12	**Nassau grouper**	***Epinephelus striatus***	special considerations
	13	Yellowtail snapper	*Ocyurus chrysurus*	resilient and rebuild
		Lane snapper	***Lutjanus synagris***	

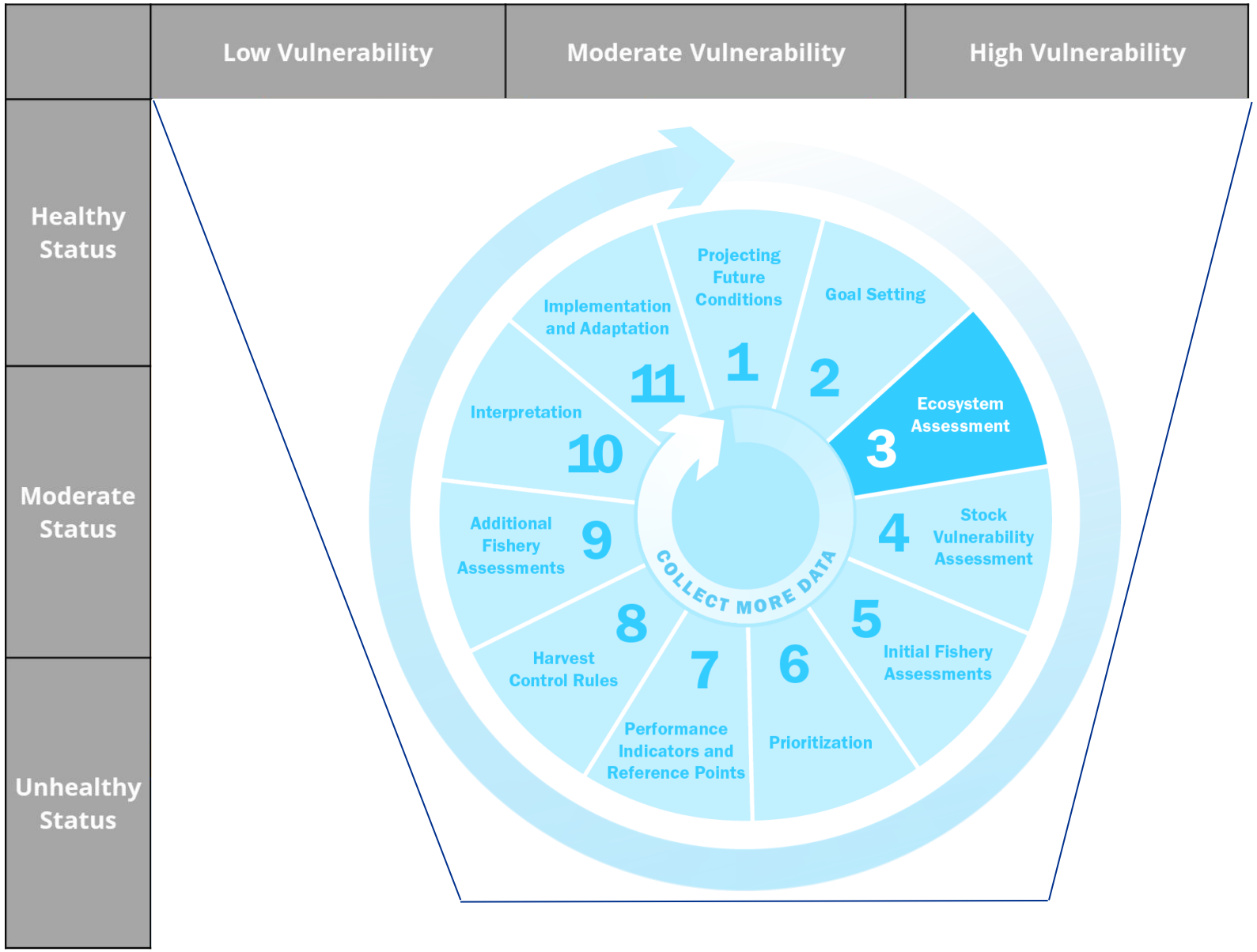
Fish baskets

A method of **Prioritization:**

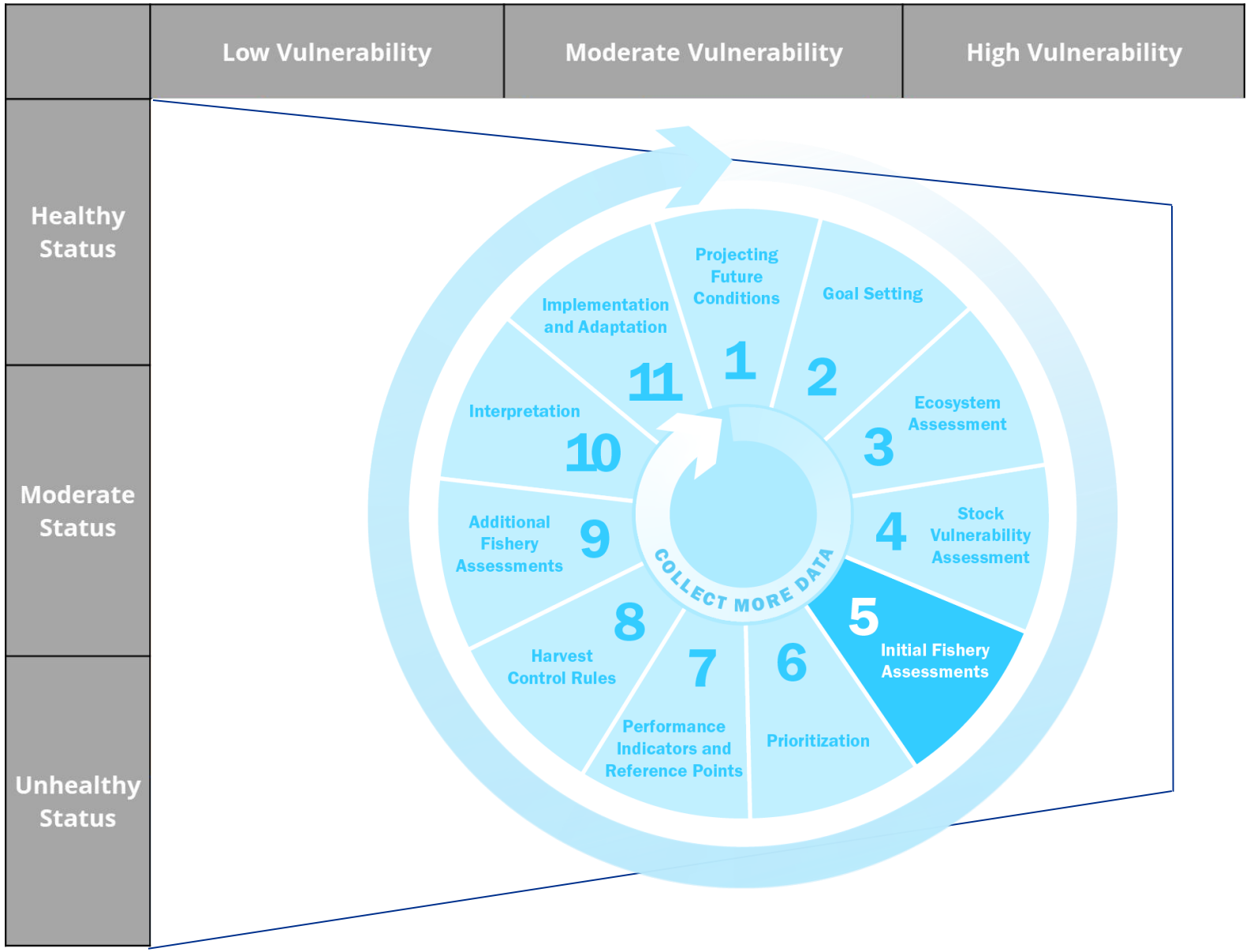
- Create baskets of species with similar relative **vulnerability** to fishing and current **status**
- Identify fishing mortality targets for each basket
- Design harvest control rules and measures to achieve the targets

	Low Vulnerability	Moderate Vulnerability	High Vulnerability
Healthy Status			
Moderate Status			
Unhealthy Status			

Fish baskets



Fish baskets



Method Matrix page 1

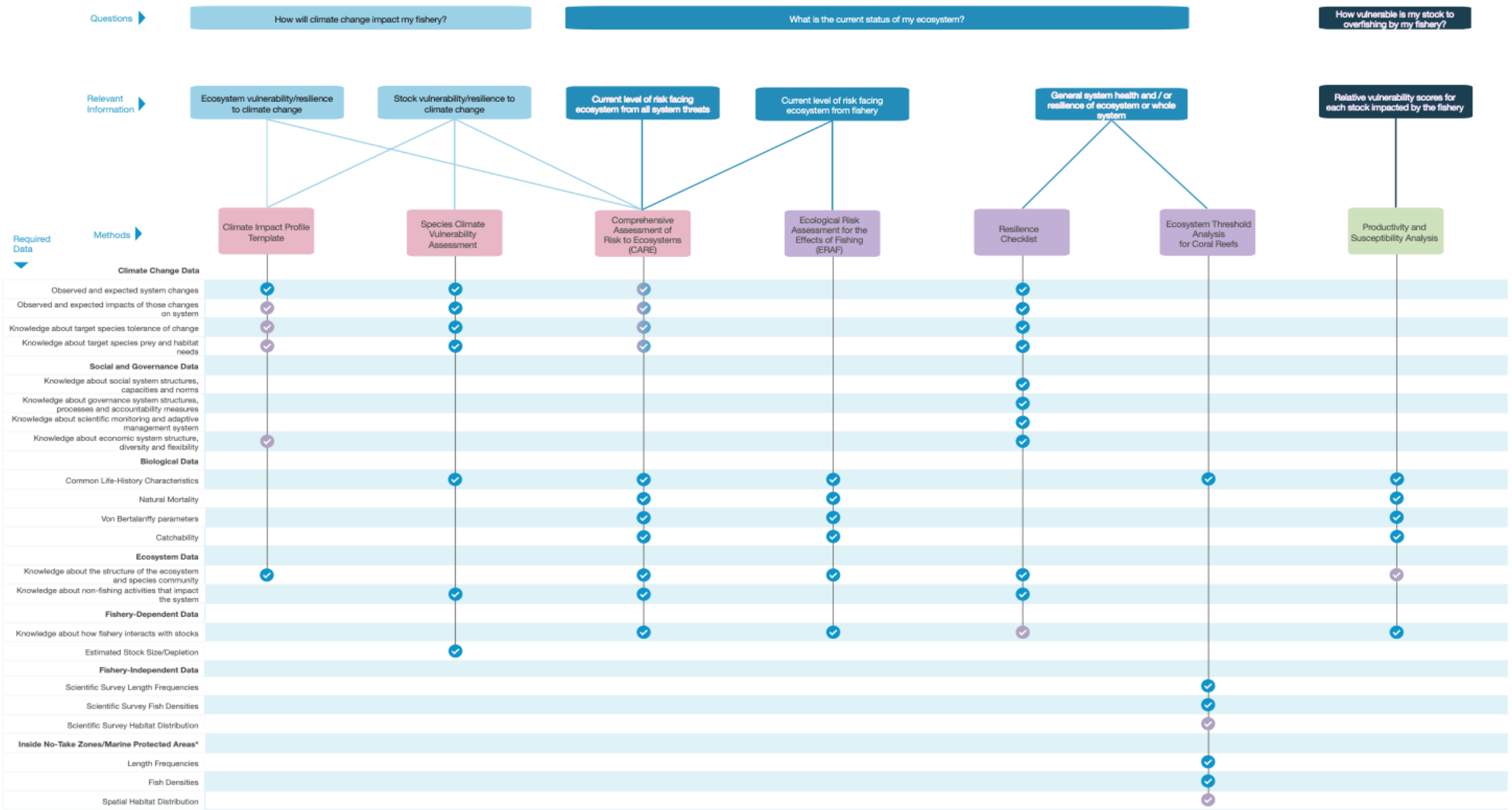
FISHE Step 1 3 4

- Need to Have Data (data that is necessary to conduct a given method)
- Nice to Have Data (data that can be used with the given method to answer additional questions)
- Data could be Need to Have or Nice to Have depending on relevant information

* Marine Protected Area must be appropriately cited, to ensure habitats are comparable with corresponding fished areas, appropriately designed and managed to ensure efficacy in allowing stocks to rebuild, and old enough to infer that populations inside are representative of unfished populations.

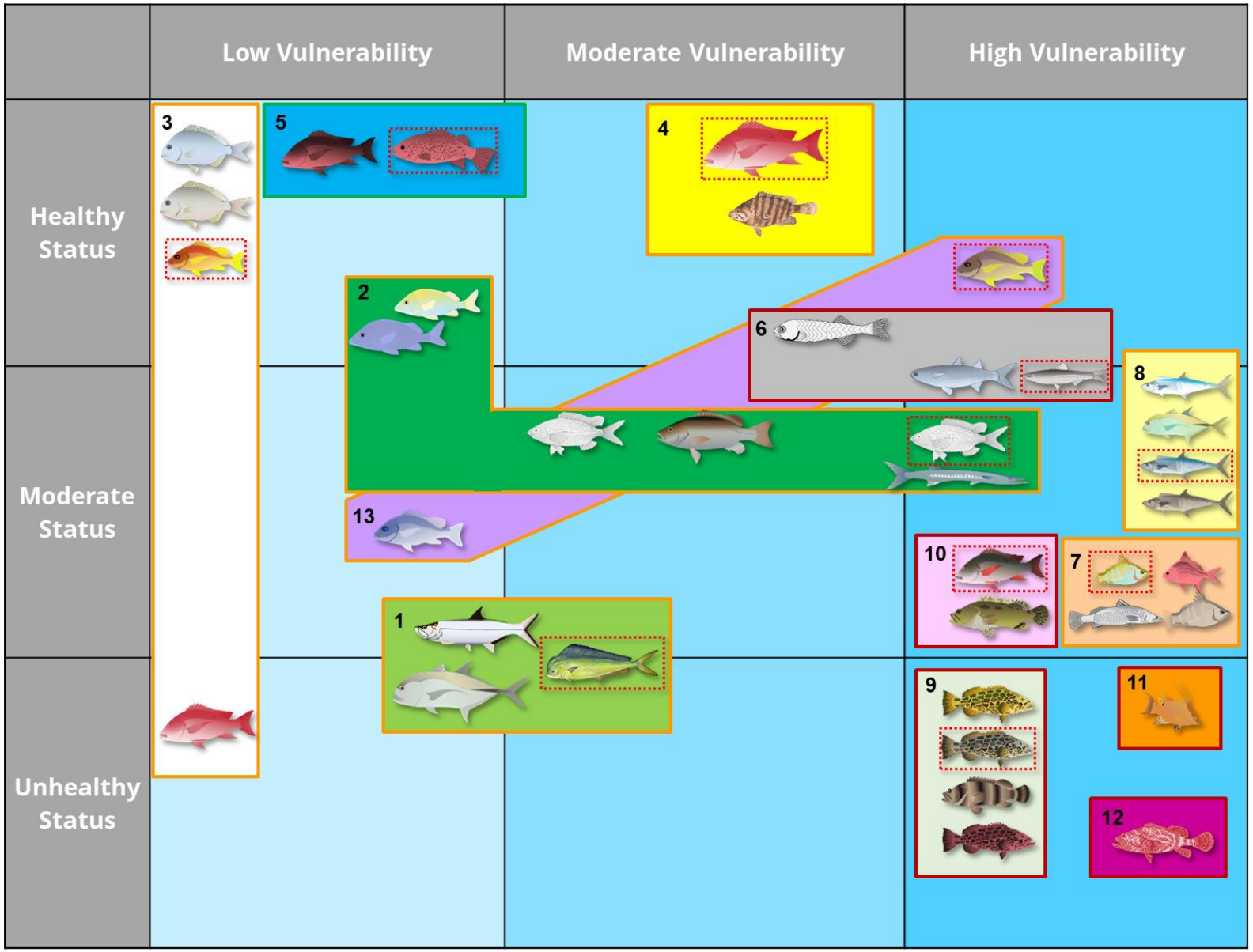
Use the answers from your species data worksheets to determine which assessment method(s) are most appropriate for your fishery.

Visit http://fishe.edf.org/method-matrix



Fish baskets

- 47 species
- 13 baskets
- Defined through a collaborative approach
- UNCTAD 2022. Towards a climate resilient multispecies finfish management plan for Belize.



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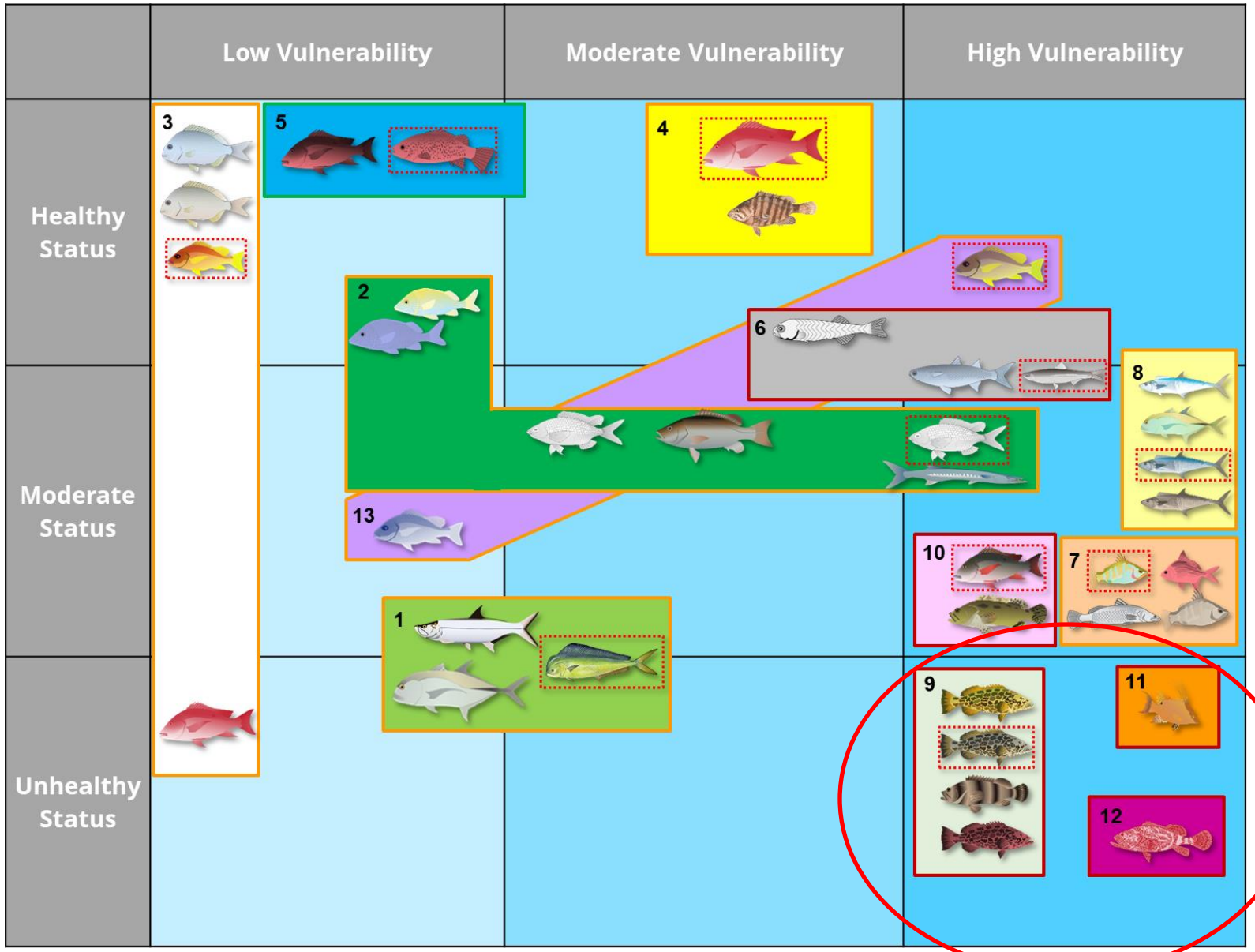

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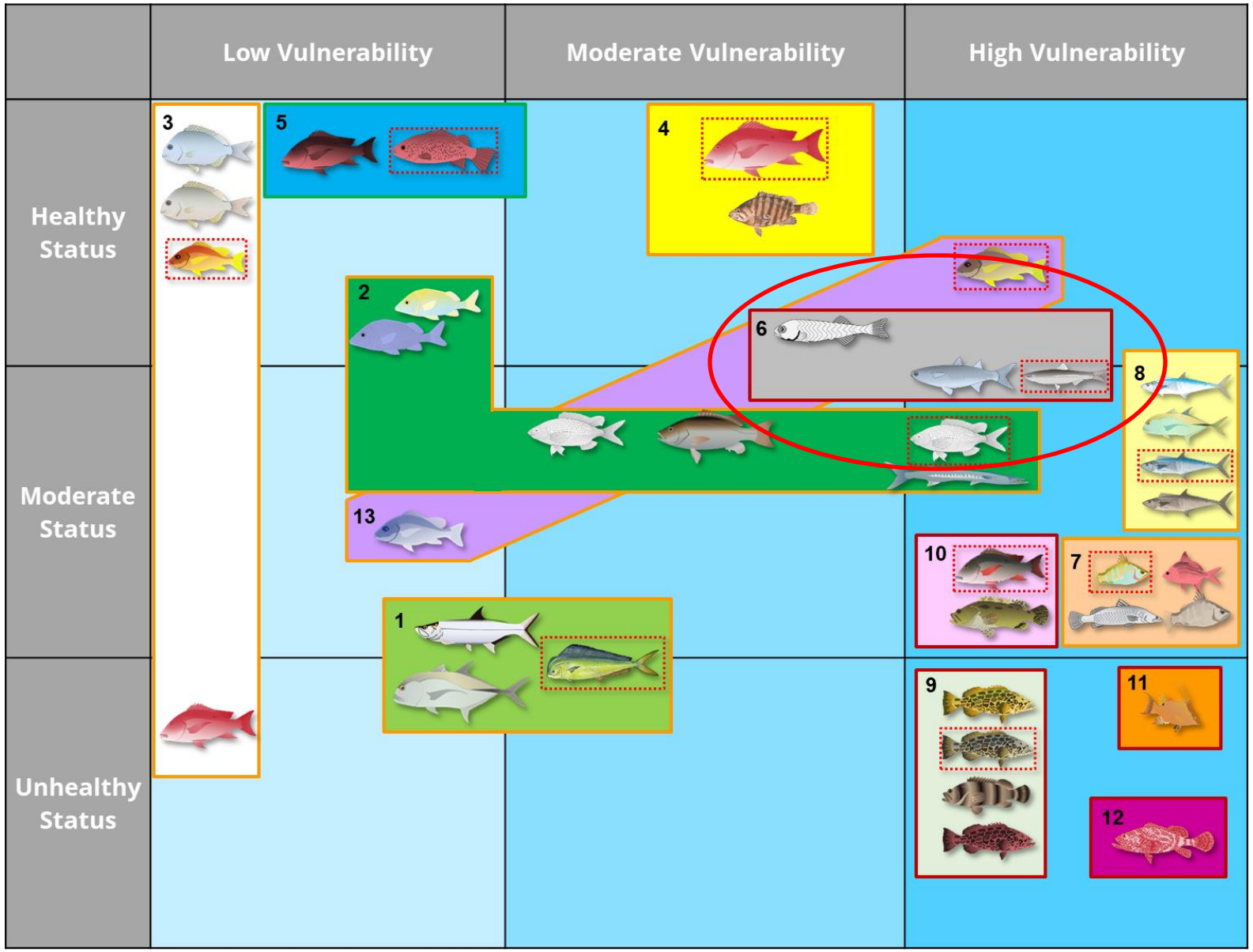

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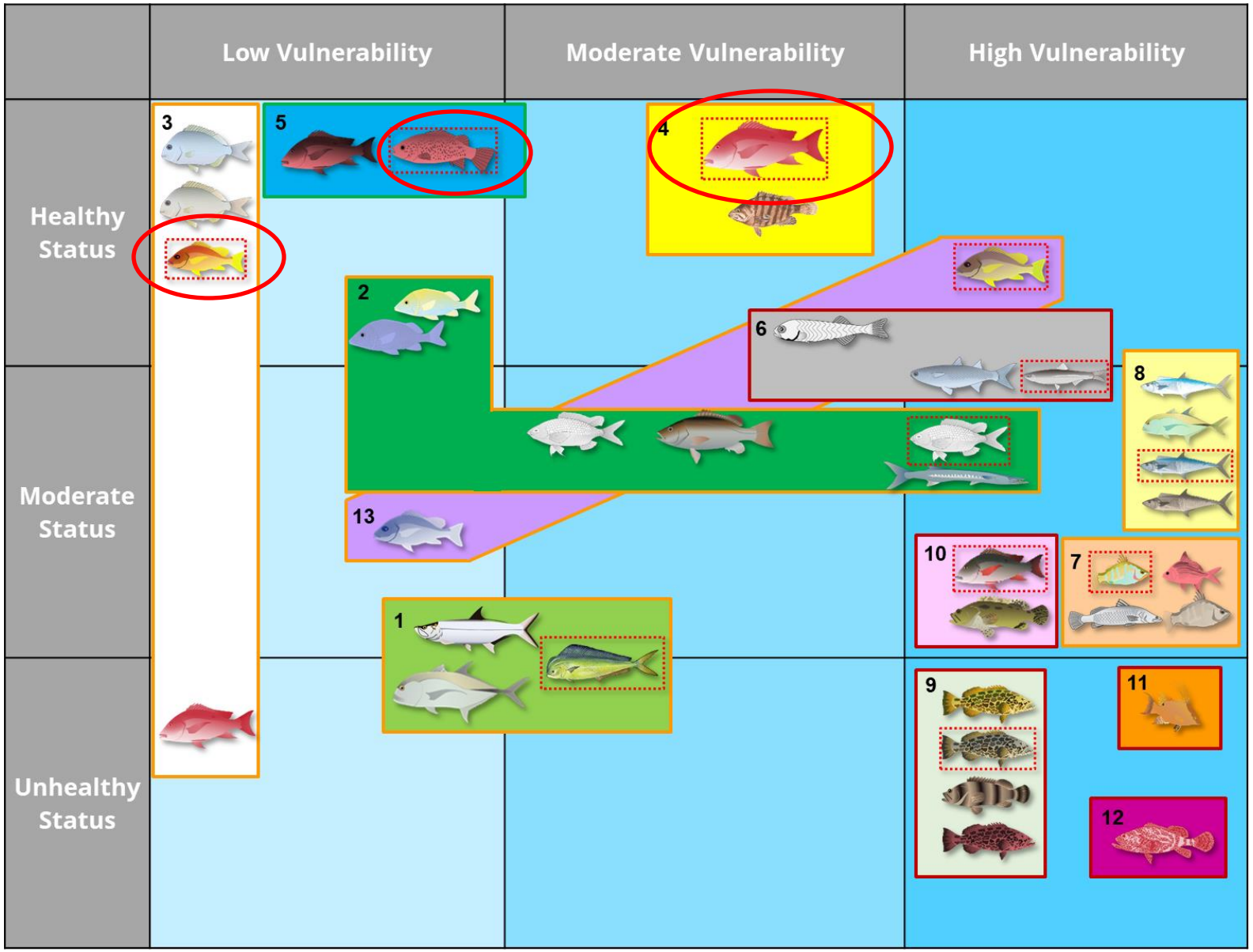

Each basket has designated harvest controls

- **Input controls**: Temporary ban, closed seasons, license limits, gear restrictions, and expansion of no-take zones
- **Output controls**: Catch limits, bag limits, size limits (minimum and/or slot)

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Belize: Stakeholder identified scenarios for harvest control rules

	Scenario	Interpretation	Management response
1	**Average Total Length** ≥ 5-year average Total Length **Previous season's catch** ≥ 5-year average Total Length	Stock productivity and fishery performance is increasing Fishery is **stable**	Maintain harvest controls & measures
2	**Average Total Length** < 5-year average Total Length **Previous season's catch** ≥ 5-year average Total Length	Fishery is performing, **continue monitoring** Consider **precautionary management**	Maintain harvest controls, Reassess measures
3	**Average Total Length** < 5-year average Total Length **Previous season's catch** < 5-year average Total Length	Overfishing Fishery is in **danger**	Close the fishery

Framework for Integrated Stock and Habitat Evaluation (FISHE)
www.fishe.edf.org

A framework that helps address gaps in our knowledge about fisheries via **participatory action** and **knowledge co-production**

Framework for Integrated Stock and Habitat Evaluation (FISHE)

Thank you!

Kristin Kleisner

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