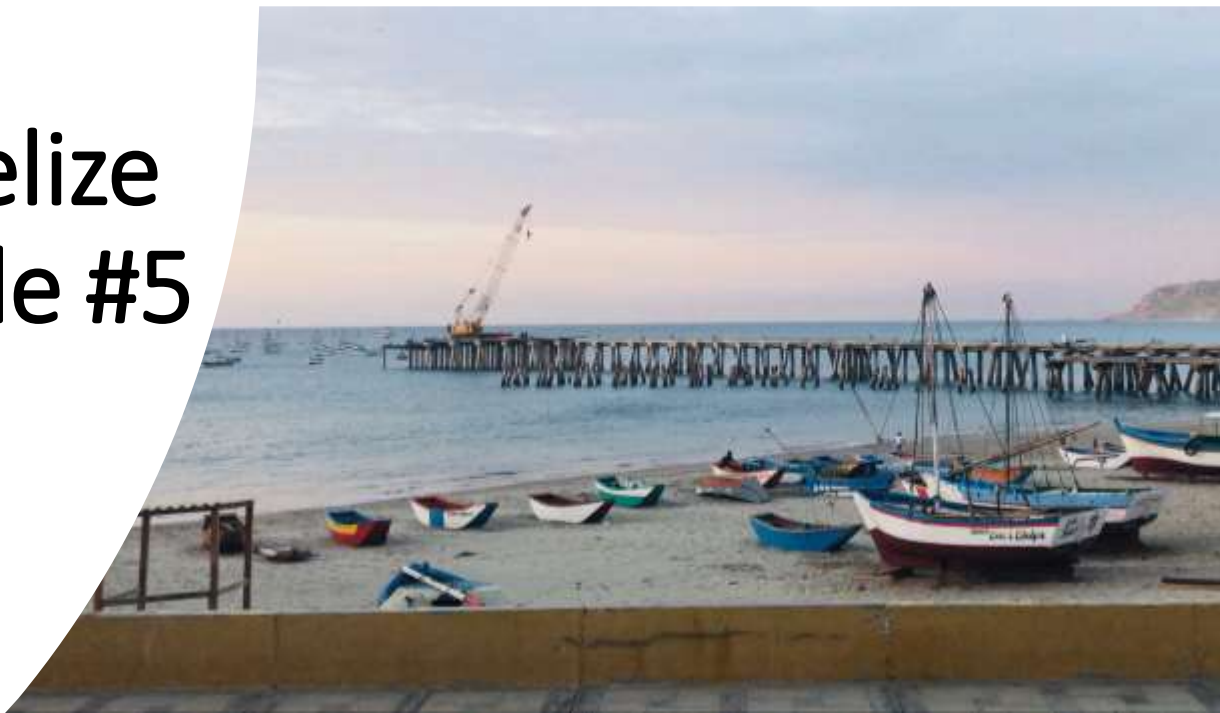
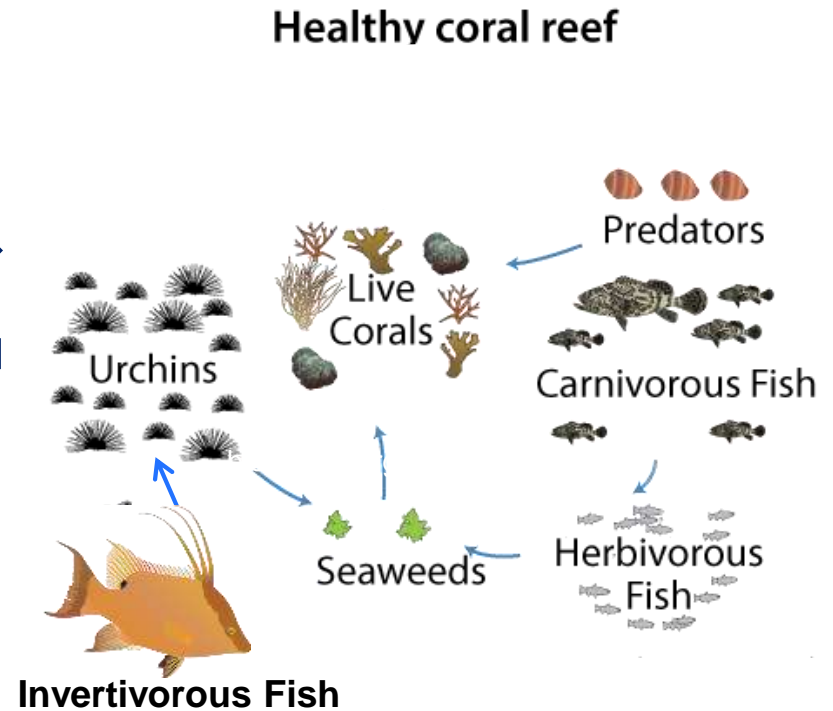


Sustainable multispecies management for co-managed resources in Belize Training Module #5



Finfish are economically, socially and ecologically important



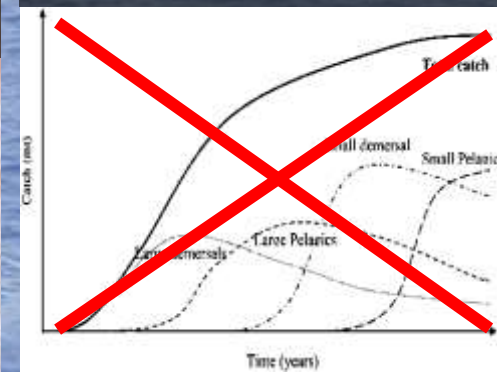
Fish contribute significantly to the structure and functioning of coral reefs

Multiple species, multiple goals

Goals for economic, social and trade value



Avoid serial depletion



Protect ecosystems

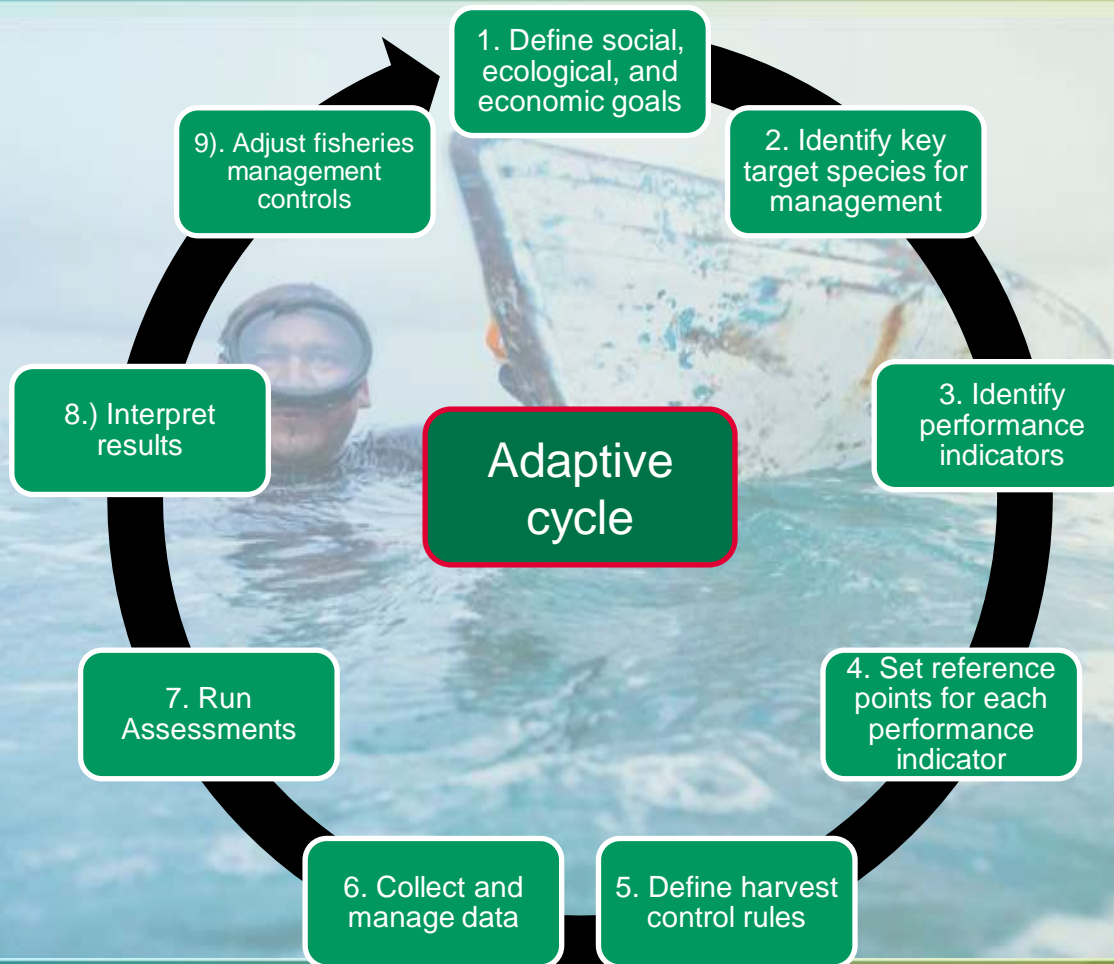


Economic, social and trade value of good multispecies management

- 1) Sustainability and resilience of food security;
- 2) sustainable economic growth and improved livelihoods; and
- 3) abundant finfish populations to support healthy ecosystems.

Happy fishers, happy people, happy fish!

Adaptive Fishery Management in Belize



2. Identify Targets

1. Define social, ecological, and economic goals

2. Identify key target species for management

3. Select performance indicators, reference points, and assessment methods

4. Define harvest control rules

44 species

5. Collect and manage data

6. Perform assessment methods

7. Interpret assessment results

8. Adjust fisheries management controls

Mahi mahi
Wahoo

Marlin - white/ stripe

Swordfish

White grunt

Gray snapper

Bluestrip grunt

Great barracuda

Mojarra (yellowfin)

Mojarra (pompano)

Dog snapper

Schoolmaster

Mangrove/Mahogany snapper

Sailor choice

Margate

Queen Silk Snapper

Deep water blackfin snapper

Champagne

Queen Silk Snapper

Yellow-eye Snapper

Vermillion Snapper

Cubera snapper

Great Amberjack

Mullet

Sardine

Sprat

Snook

Bay snook

Crana

Tuba

Spanish mackeral

Crevalle

King fish/mackeral

Cerro mackeral

Black grp

Goliath

Tiger

Yellowfin grouper

Mutton

Red hind

Hogfish

Nassau grouper

Yellowtail snapper

Lane snapper

Fish Baskets

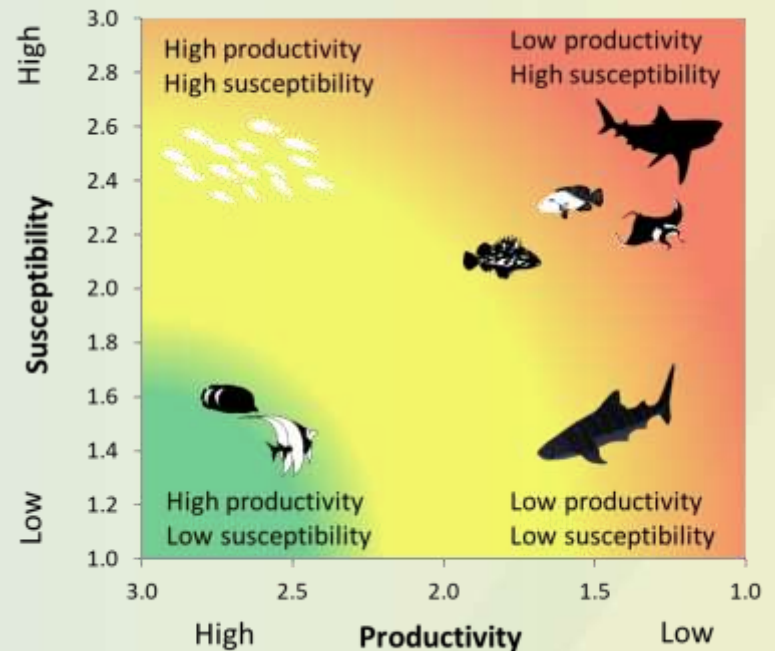
- Create baskets of species with similar relative **vulnerability** to fishing and current **status**
- Fishing mortality targets for each basket
- Harvest control rules and measures to achieve the targets



Vulnerability

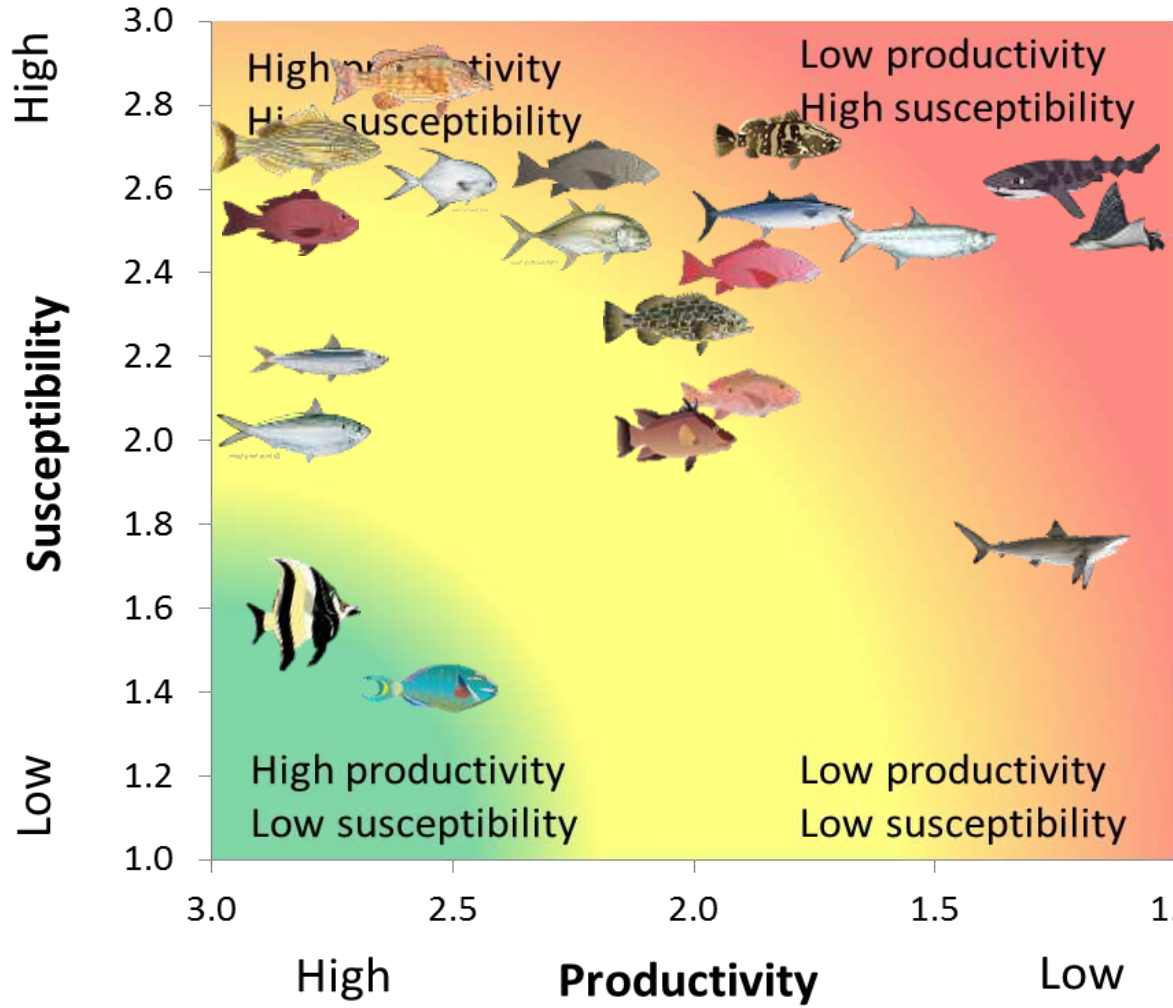
The relative **vulnerability** of a stock to becoming overfished is: potential for the productivity of the stock to be diminished by direct and indirect fishing pressure.

- among stocks based on the life history characteristics or **productivity**
- and **susceptibility** to the fishery to overfishing.



Fish baskets: Results of vulnerability assessments

-  Aguají - Black Grouper
-  Pargo Criollo - Mutton Snapper
-  Pez Perro - Hogfish
-  Cherna - Nassau Grouper
-  Pez Loro - Stoplight Parrotfish
-  Sardina - Sardine
-  Sierra - King Mackerel
-  Biajaiba - Lane Snapper
-  Mojarra - Mojarra
-  Machuelo - Threadfin Herring
-  Tiburón Arrecife - Reef Shark
-  Tiburón Gata - Nurse Shark
-  Obispo - Spotted Eagle Ray
-  Caballerote - Grey Snapper
-  Sabalo - Tarpon
-  Pez Angel - Angelfish
-  Cubera - Cubera Snapper
-  Palometa - Permit
-  Jiguaga - Crevalle Jack
-  Ronco Amarillo - Blue Stripped Grunt



Fish Baskets:





















In order to developed a relatively quick assessment of the status of the multispecies fishery targets:

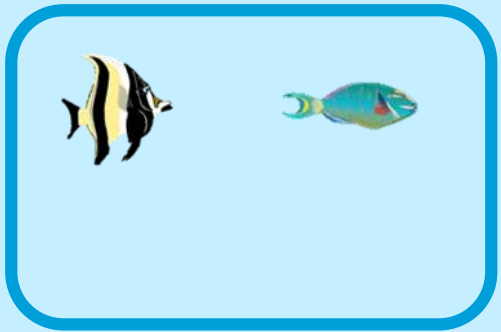





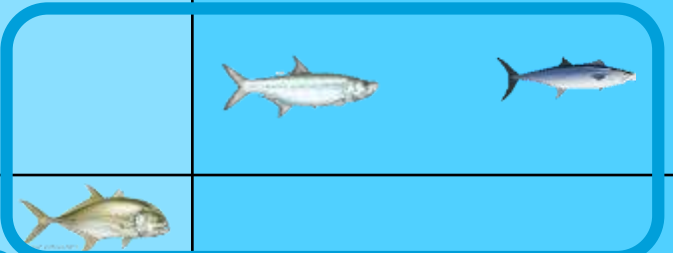
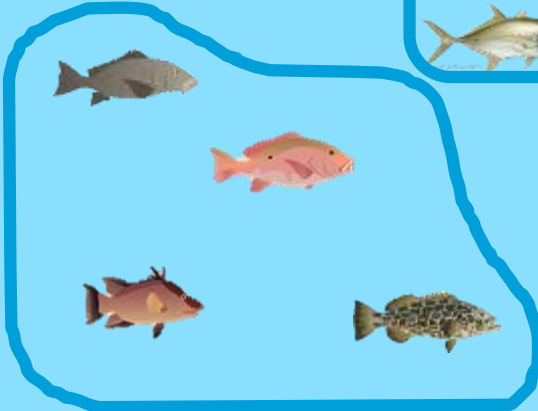


- Fishing Mortality
- CPUE
- Captura-MSY
- SPR
- MPA density ratio
- Many other methods











status

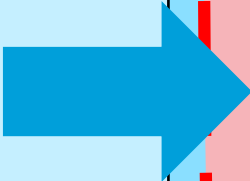


Fish baskets: Status assessment

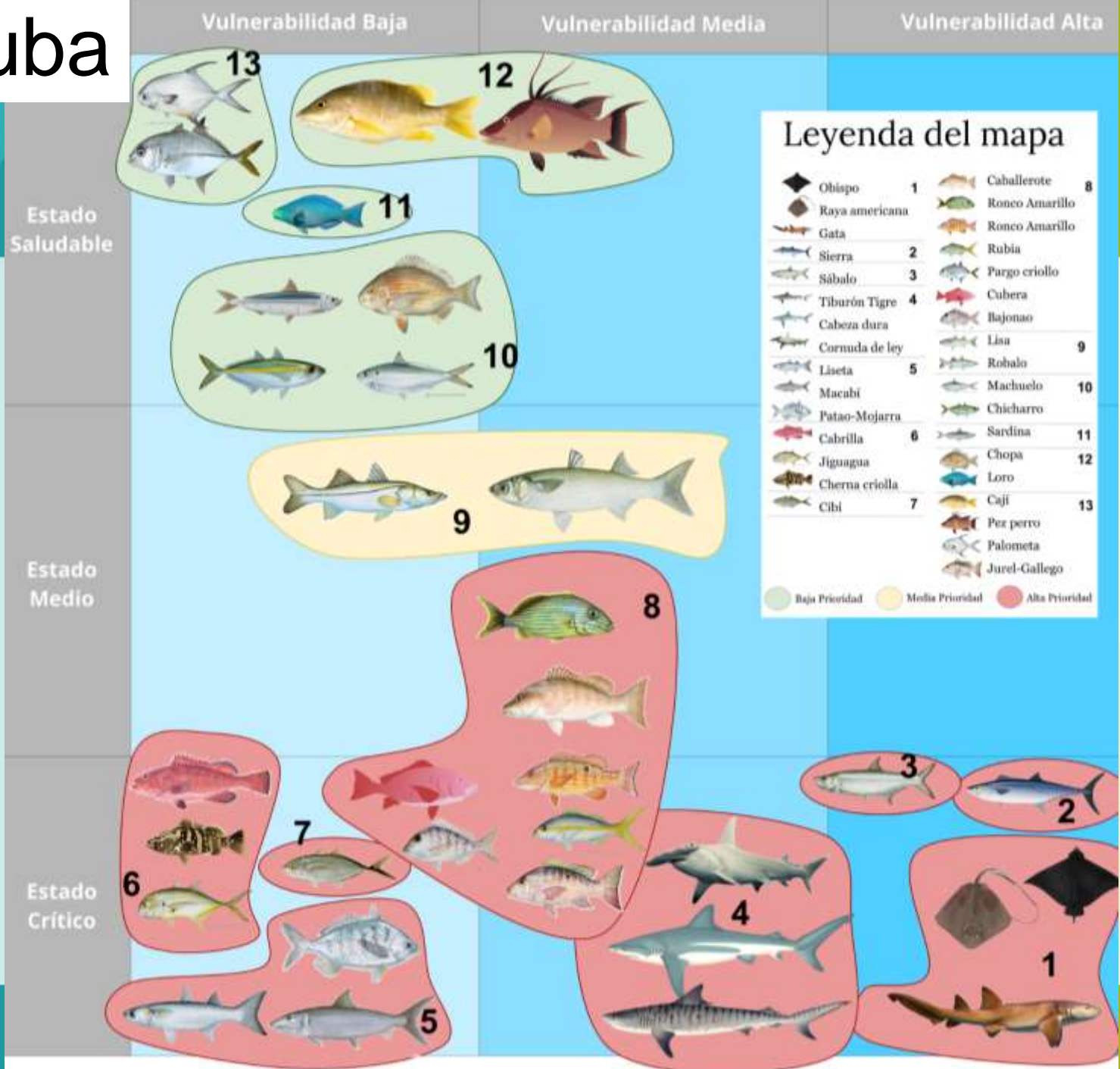
	Species	Local Name	C MSY	Status
1	Black Grouper	Aguají	 Decendiendo	CRÍTICO
2	Mutton Snapper	Pargo Criollo	 Decendiendo	CRÍTICO
3	Hogfish	Pez Perro	 Estable	MEDIO
4	Nassau Grouper	Cherna	 Estable	MEDIO
5	Spotlight Parrotfish	Pez Loro	 Aumentando	SANO
6	Sardine	Sardina	 Aumentando	SANO
7	King Mackerel	Sierra	 Decendiendo	MEDIO
8	Lane Snapper	Biajaiba	 Estable	MEDIO
9	Mojarra	Mojarra	 Aumentando	SANO
10	Atlantic Thread Herring	Machuelo	 Aumentando	SANO
11	Reef shark	Tiburón Arrecife	 Aumentando	SANO
12	Nurse shark	Tiburón Gata	 Decendiendo	CRÍTICO
13	Spotted Eagle Ray	Obispo	 Decendiendo	CRÍTICO
14	Grey Snapper	Caballerote	 Decendiendo	CRÍTICO
15	Tarpon	Sabalo	 Estable	MEDIO
16	Cubera snapper	Cubera	 Estable	MEDIO
17	Permit	Palometa	 Estable	MEDIO
18	Crevalle Jack	Jiguaga	 Decendiendo	CRÍTICO
19	Blue-striped grunt	Ronco amarillo	 Aumentando	SANO
20	Angelfish	Pez Angel	 Aumentando	SANO

	Low Vulnerability	Moderate Vulnerability	High Vulnerability
Healthy Status		 	
Medium Status			 
Poor Status			 

	Low Vulnerability	Moderate Vulnerability	High Vulnerability
Healthy Status	 <p>Low Priority</p>	 <p>Medium Priority</p>  <p>Medium Priority</p>	 <p>Medium Priority</p>
Medium Status		 <p>Medium Priority</p>	 <p>High Priority</p>  <p>High Priority</p>
Poor Status		 <p>High Priority</p>	 <p>High Priority</p>  <p>High Priority</p>







































En Cuba



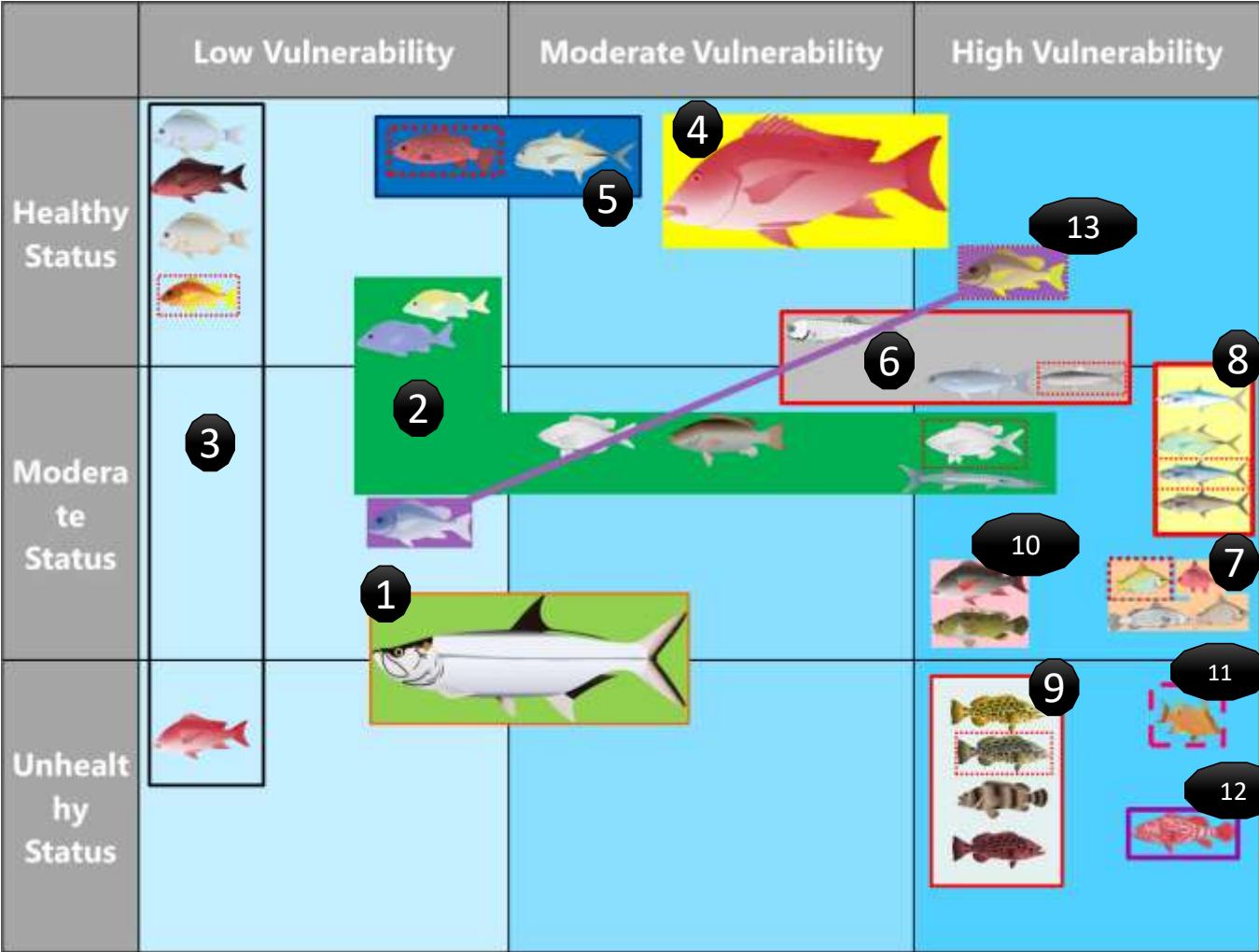


Collaborative Multispecies Finfish Fish Workshop (March 2020)

Species ID	Image	Common name+D:	Species name	Habitat	Vulnerability	Health Status
1		Mahi mahi	Coryphaena hippurus	Pelagics/Sport	Medium	Medium
2		Wahoo	Acanthocybium solandri	Pelagics	Medium	Medium
3		Marlin - white/ str	Kajikia albida/ Kajikia audax	Pelagics/Sport	Low	Medium
4		Swordfish	Xiphias gladius	Pelagics	Low	Medium
5		White grunt	Haemulon plumieri	reef	Low	High
6		Gray snapper	Lutjanus griseus	reef/SPAG	Medium	Medium
7		Bluestrip grunt	Haemulon sciurus	reef	Low	High
8		Great barracuda	Sphyraena barracuda	reef/migratory	High	Medium
9		Mojarra (yellowfin)	Gerres cinereus	Estuarine	High	Medium
10		Mojarra (pompano)	Diapterus auratus	Estuarine	Medium	Medium
11		Dog snapper	Lutjanus jocu	reef/SPAG	Low	High
12		Schoolmaster	Lutjanus apodus	reef/SPAG	Low	High
13		Mangrove/Mahog	Lutjanus mahogoni	reef/SPAG	Low	High
14		Sailor choice	Haemulon parra	Estuarine	Low	High
15		Margate	Haemulon album	Estuarine	Low	High
16		Queen Silk Snapp	Lutjanus vivanus	Deep-slope	Medium	High
17		Deep water black	Lutjanus buccanella	Deep-slope	Medium	High
18		Champagne snapp	Lutjanus purpureus	Deep-slope	Medium	High
19		Queen Silk Snapp	Etelis oculatus	Deep-slope	Medium	High
20		Yellow-eye Snapp	Ocyurus chrysurus	Deep-slope	Medium	High
21		Vermillion Snapp	Rhomboplites aurorubens	Deep-slope	Medium	High
22		Cubera snapper	Lutjanus cyanopterus	reef/SPAG	Low	High

Species ID	Image	Common name+D.	Species name	Habitat	Vulnerability	Health Status
23		Great Amberjack	<i>Seriola dumerili</i>	Deep-slope	Medium	High
24		Mullet	<i>Muguil spp.</i>	Estuarine	High	Medium
25		Sardine	<i>Sardinella spp.</i>	Forage Fish	Medium	High
26		Sprat	<i>Sprattus spp.</i>	Forage Fish	High	Medium
27		Snook	<i>Centropomus undecimalis</i>	Estuarine	High	Medium
28		Bay snook	<i>Petenia splendida</i>	Fresh water	High	Medium
29		Crana	<i>Cichlosomas urophthalmus</i>	Fresh water	High	Medium
30		Tuba	<i>Cichlasoma synspilum</i>	Fresh water	High	Medium
31		Spanish mackeral	<i>Scomberomorus maculatus</i>	Migratory	High	Medium
32		Crevalle	<i>Caranx hippos</i>	Migratory	High	Medium
33		King fish/mackera	<i>Scomberomorus cavalla</i>	Migratory/Pelagics	High	Medium
34		Cerro mackeral	<i>Scomberomorus regalis</i>	Migratory	High	Medium
35		Black grp - highly	<i>Mycteroperca bonaci</i>	reef/SPAG	High	Low
36		Goliath - high co	<i>Epinephelus itajara</i>	reef	High	Low
37		Tiger	<i>Mycteroperca tigris</i>	reef/SPAG	High	Low
38		Yellowfin grouper	<i>Mycteroperca venenosa</i>	reef/SPAG	High	Low
39		Mutton	<i>Lutjanus analis</i>	reef/SPAG	High	Medium
40		Red hind	<i>Epinephelus guttatus</i>	reef/SPAG	High	Medium
41		Hogfish	<i>Lachnolaimus maximus</i>	reef	High	Low
42		Nassau grouper	<i>Epinephelus striatus</i>	reef/SPAG	High	Low
43		Yellowtail snappe	<i>Ocyurus chrysurus</i>	reef/SPAG	Low	Medium
44		Lane snapper	<i>Lutjanus synagris</i>	reef/SPAG	High	High

Draft: Collaborative Multispecies Finfish Fish Workshop (March 2020)



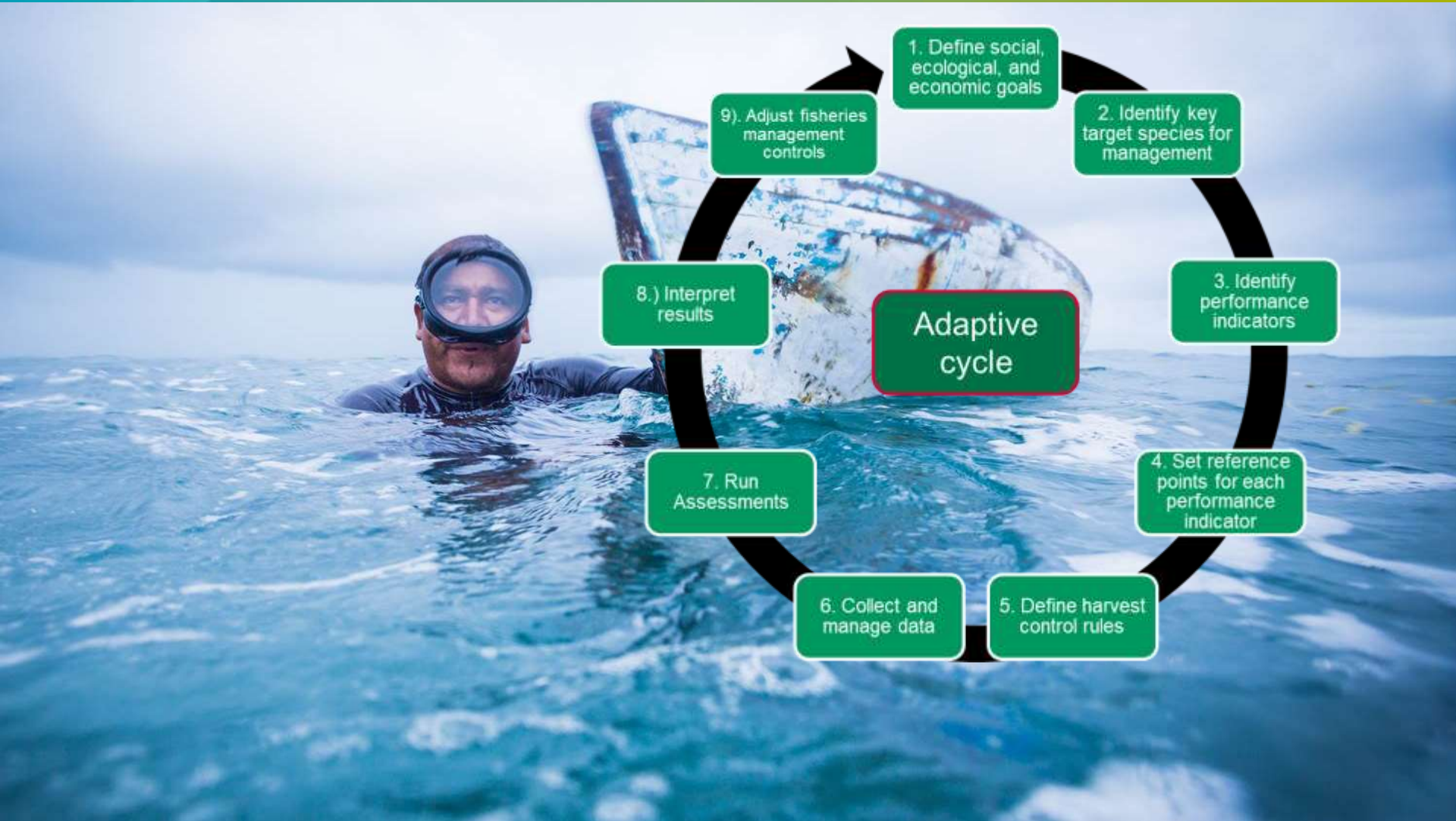
Collaborative work in Belize

- Both single and multispecies **fish baskets**,
 - pelagic/migratory/gear,
 - beach traps,
 - opportunistic sling,
 - emergent deep-slope fishery,
 - forereef/open/handline,
 - bait for other fisheries,
 - habitat/traps/lines/nets,
 - pelagic/migratory/gear – handline,
 - large groupers,
 - fished together, mutton needs to be managed,
 - needs to be rebuilt,
 - special considerations,
 - resilient and rebuilt.

Group ID	Common name	Species name	Group Identity	Priority
1	Mahi mahi	<i>Coryphaena hippurus</i>	pelagic/migratory/gear	Moderate
	Wahoo	<i>Acanthocybium solandri</i>		Moderate
	Marlin - white/ stripe	<i>Kajikia albida/ Kajikia audax</i>		Moderate
	Swordfish	<i>Xiphias gladius</i>		Moderate
2	White grunt	<i>Haemulon plumieri</i>	beach traps	Moderate
	Gray snapper	<i>Lutjanus griseus</i>		Moderate
	Bluestrip grunt	<i>Haemulon sciurus</i>		Moderate
	Great barracuda	<i>Sphyraena barracuda</i>		Moderate
	Mojarra (yellowfin)	<i>Gerres cinereus</i>		Moderate
	Mojarra (pompano)	<i>Diapterus auratus</i>		Moderate
3	Dog snapper	<i>Lutjanus jocu</i>	opportunistic sling	Moderate
	Schoolmaster	<i>Lutjanus apodus</i>		Moderate
	Mangrove/Mahogany snapper	<i>Lutjanus mahogoni</i>		Moderate
	Sailor choice	<i>Haemulon parra</i>		Moderate
	Margate	<i>Haemulon album</i>		Moderate
4	Queen Silk Snapper	<i>Lutjanus vivanus</i>	deep-slope fishery	Moderate
	Deep water blackfin snapper	<i>Lutjanus buccanella</i>		Moderate
	Champagne	<i>Lutjanus purpureus</i>		Moderate
	Queen Silk Snapper	<i>Etelis oculatus</i>		Moderate
	Yellow-eye Snapper	<i>Ocyurus chrysurus</i>		Moderate
	Vermillion Snapper	<i>Rhomboplites aurorubens</i>		Moderate
5	Cubera snapper	<i>Lutjanus cyanopterus</i>	forereef/open/ handline	Low
	Great Amberjack	<i>Seriola dumerili</i>		Low
6	Mullet	<i>Muguil spp.</i>	bait for other fisheries	High
	Sardine	<i>Sardinella spp.</i>		High
	Sprat	<i>Sprattus spp.</i>		High

Group ID	Common name	Species name	Group Identity	Priority
7	Snook	<i>Centropomus undecimalis</i>		Moderate
	Bay snook	<i>Petenia splendida</i>	habitat/traps/lines/nets	Moderate
	Crana	<i>Cichlosomas urophthalmus</i>		Moderate
	Tuba	<i>Cichlasoma synspilum</i>		Moderate
8	Spanish mackeral	<i>Scomberomorus maculatus</i>		High
	Crevalle	<i>Caranx hippos</i>	pelagic/migratory/gear -- handline	High
	King fish/mackeral	<i>Scomberomorus cavalla</i>		High
	Cerro mackeral	<i>Scomberomorus regalis</i>		High
9	Black grp	<i>Mycteroperca bonaci</i>		High
	Goliath	<i>Epinephelus itajara</i>	large groupers	High
	Tiger	<i>Mycteroperca tigris</i>		High
	Yellowfin grouper	<i>Mycteroperca venenosa</i>		High
10	Mutton	<i>Lutjanus analis</i>	fished together, mutton needs to be managed	High
	Red hind	<i>Epinephelus guttatus</i>		High
11	Hogfish	<i>Lachnolaimus maximus</i>	needs to be rebuilt	High
12	Nassau grouper	<i>Epinephelus striatus</i>	special considerations	High
13	Yellowtail snapper	<i>Ocyurus chrysurus</i>	resilient and rebuild	Moderate
	Lane snapper	<i>Lutjanus synagris</i>		Moderate

Science to action



Questions?

