DRAFT – Awaiting SEFSC Review

Science, Service, Stewardship

Species groupings for ACL/AM management in the Gulf of Mexico

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Southeast Regional Office
St. Petersburg, Florida

June 1, 2010

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Presentation for SAFMC

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WHY SPECIES GROUPINGS?

Traditionally, management measures are implemented based upon species-specific stock assessment results.

Limitations on time, finances, and/or data will require the Gulf Council to establish ACLs for ~28 unassessed finfish species without the benefit of an assessment.

One possible approach for these unassessed species would be to assign them to assemblages that would be managed as units.

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STOCK COMPLEXES

"The <u>vulnerability of stocks to the fishery</u> should be evaluated when determining if a particular stock complex should be established or reorganized, or if a particular stock should be included in a complex."

ACL Final Rule

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STOCK COMPLEXES

"Stock complexes may be comprised of:

1) One or more indicator stocks, each of which has SDC and ACLs, and several other stocks;

2) Several stocks without an indicator stock, with SDC and an ACL for the complex as a whole; or

3) One of more indicator stocks, each of which has SDC and management objectives, with an ACL for the complex as a whole…"

ACL Final Rule

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SETTING ABCs AND ACLs

"…ABC control rule means a specified approach to setting the ABC for a stock or stock complex as a function of the scientific uncertainty in the estimate of OFL and any other scientific uncertainty..."

ACL Final Rule

"Every managed species needs to be covered by an ABC and ACL…but the individual species need not have species-specific ABC and ACL."

SERO General Counsel

NOAA FISHERIES SERVICE

GOALS AND OBJECTIVES

GOAL: Provide guidance for Gulf Council in establishing species groupings for ACL/AM management.

OBJECTIVES:

1. To determine whether species assemblages can be identified in the Gulf of Mexico.
2. To determine if these assemblages are consistent between commercial and recreational fisheries.
3. To develop species complexes that are "…sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar." (NS1)

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METHODS

1. Life history, vulnerability
2. Percent landings and percent trips by dataset
3. Principal components analysis
    - ***PCA*** *on root-root transformed landings*
    - ***PCA*** *on binary transformed landings*
4. Hierarchical cluster analysis
    - ***Ward's Minimum Variance*** *on root-root transformed landings*
    - ***Sorenson Average Linkage*** *on binary transformed landings*
5. Median correlation matrices
6. Nodal analysis
7. Weighted mean cluster association index
8. Maps of species distribution

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DATA OVERVIEW

1. **Commercial Logbook (2005-2009)**
   - 27,566 longline records (5904 trips)
   - 121,767 vertical line records (35,217 trips)
   - Trip-level, self-reported landings in weight
   - By Gear
   - Aggregated Year, Month, Area, Depth

2. **Reef Fish Observer Program (2006-2009)**
   - 140,204 set-level records (9031 sets)
   - Trained observer landings in numbers

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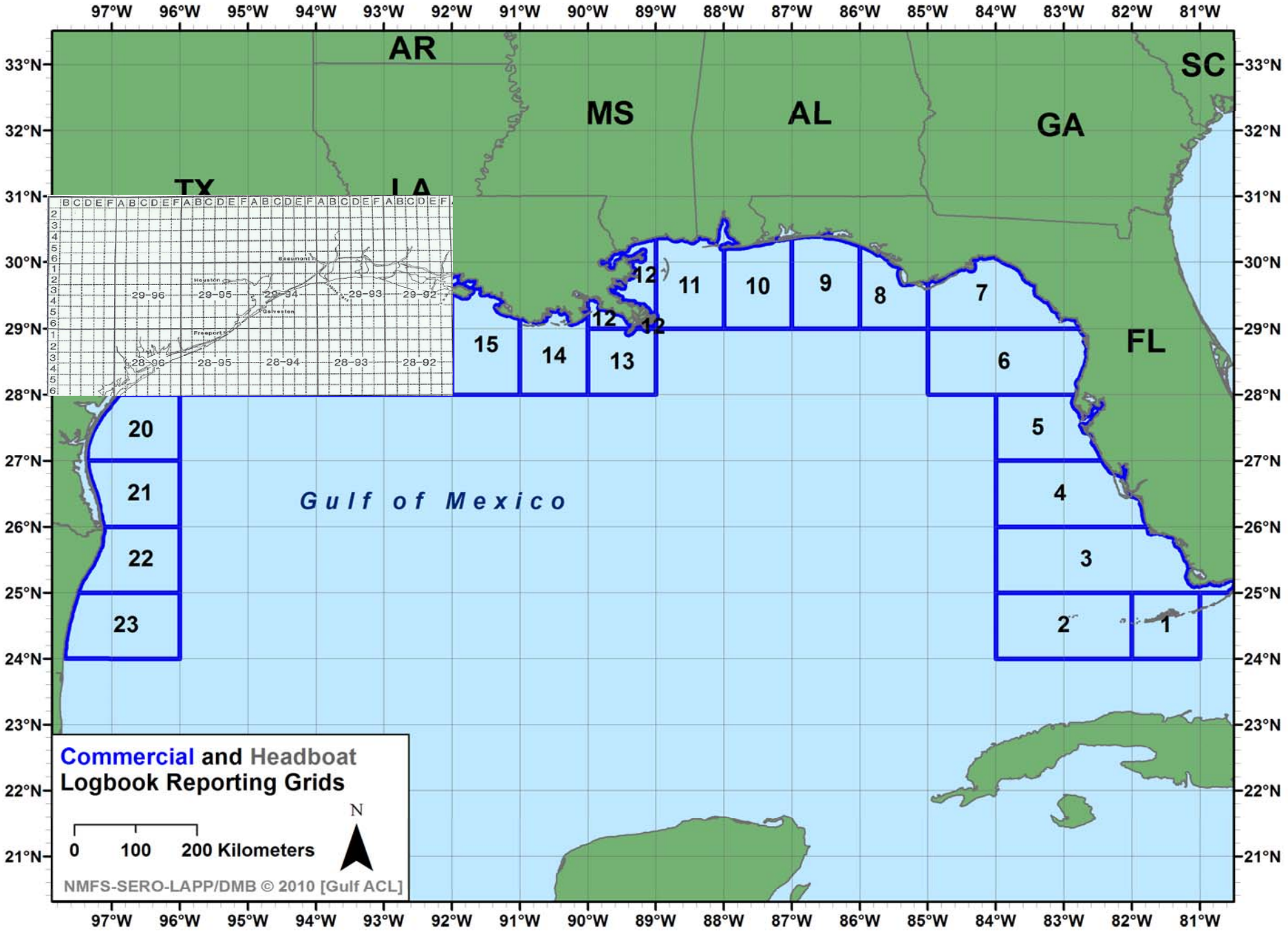
DATA OVERVIEW (con't)

3. **Headboat Logbook (2004-2009)**
   - 121,334 trip-level records (10,893 trips)
   - Self-reported encounters (landings+releases) in numbers
   - Aggregated by Year, Month, Area, Trip Duration

4. **MRFSS (2000-2009)**
   - 64,782 dockside intercept records (430 intercepts)
   - Trip-level, self-reported catch-per-angler (*A+B1+B2 catch*)
   - Aggregated Year, Wave, Mode, Area Fished

5. **NMFS Bottom Longline Survey (1995-2009)**
   - 831 set-level, fishery-independent records (684 sets)


AR
MS
AL
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Gulf of Mexico
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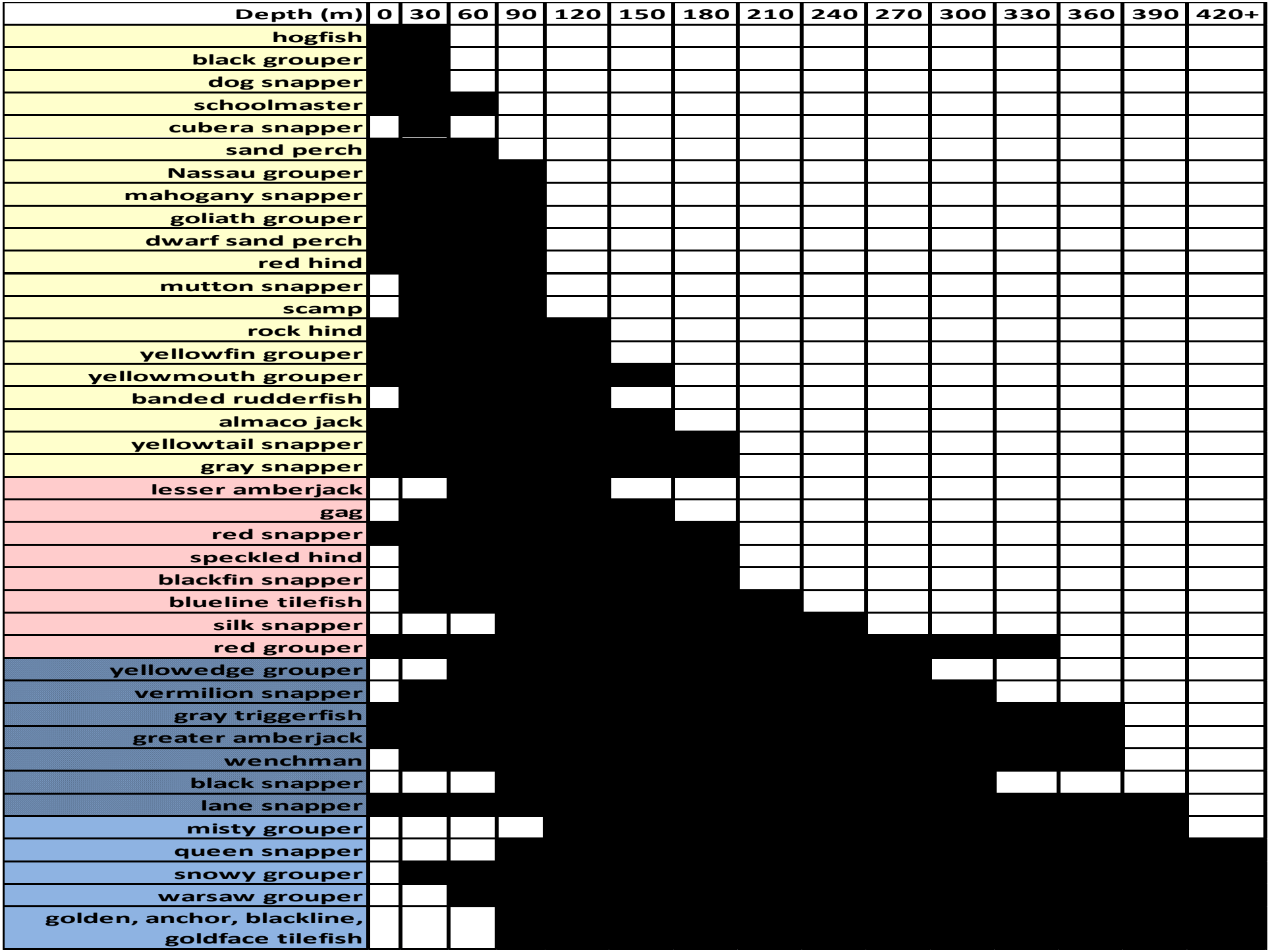
Commercial and Headboat
Logbook Reporting Grids
N
0 100 200 Kilometers
NMFS-SERO-LAPP/DMB © 2010 [Gulf ACL]


Depth (m)
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420+
hogfish
black grouper
dog snapper
schoolmaster
cubera snapper
sand perch
Nassau grouper
mahogany snapper
goliath grouper
dwarf sand perch
red hind
mutton snapper
scamp
rock hind
yellowfin grouper
yellowmouth grouper
banded rudderfish
almaco jack
yellowtail snapper
gray snapper
lesser amberjack
gag
red snapper
speckled hind
blackfin snapper
blueline tilefish
silk snapper
red grouper
yellowedge grouper
vermilion snapper
gray triggerfish
greater amberjack
wenchman
black snapper
lane snapper
misty grouper
queen snapper
snowy grouper
warsaw grouper
golden, anchor, blackline, goldface tilefish

% LANDINGS

HIGHEST % <5% <1%

COMMON NAME	CLL	CVL	RFOP	HBS	MRFSS	BLL
red snapper	3%	31%	20%	26%	44%	29%
red grouper	51%	19%	36%	1%	2%	29%
vermilion snapper	0%	24%	21%	47%	6%	0%
yellowedge grouper	15%	0%	5%	0%	0%	16%
golden tilefish	8%	0%	2%			14%
gag	9%	10%	3%	2%	8%	2%
gray snapper	0%	2%	1%	3%	27%	0%
gray triggerfish	0%	1%	2%	7%	7%	
sand perch			0%	4%	2%	
greater amberjack	1%	4%	1%	1%	3%	2%
blueline tilefish	2%	0%	2%	0%		3%
scamp	2%	2%	3%	0%	0%	1%
lane snapper	0%	1%	0%	6%	1%	0%
yellowtail snapper	0%	4%	1%	0%	0%	
snowy grouper	2%	0%	1%	0%	0%	1%
warsaw grouper	1%	1%	0%	0%	0%	1%
mutton snapper	2%	0%	0%	0%	0%	0%
black grouper	1%	1%	0%	0%	0%	0%
speckled hind	1%	0%	1%	0%	0%	1%
almaco jack	0%	0%	1%	0%	0%	0%
banded rudderfish	0%	0%	0%	1%	0%	

COMMON NAME	CLL	CVL	RFOP	HBS	MRFSS	BLL
silk snapper	0%	0%	0%	0%		
dwarf sand perch			0%			0%
goliath grouper			0%	0%	0%	0%
misty grouper	0%	0%			0%	
lesser amberjack	0%	0%	0%	0%	0%	0%
rock hind			0%	0%	0%	
queen snapper	0%	0%	0%	0%		0%
yellowfin grouper	0%	0%	0%	0%		
wenchman	0%	0%	0%		0%	0%
blackfin snapper	0%	0%	0%	0%		
red hind	0%	0%	0%	0%	0%	
goldface tilefish			0%			0%
yellowmouth grouper		0%	0%	0%	0%	0%
hogfish	0%	0%	0%	0%	0%	
cubera snapper	0%	0%	0%	0%	0%	
dog snapper	0%	0%	0%	0%	0%	
anchor tilefish			0%			
schoolmaster snapper	0%	0%				
Nassau grouper		0%			0%	
blackline tilefish			0%			
mahogany snapper		0%				

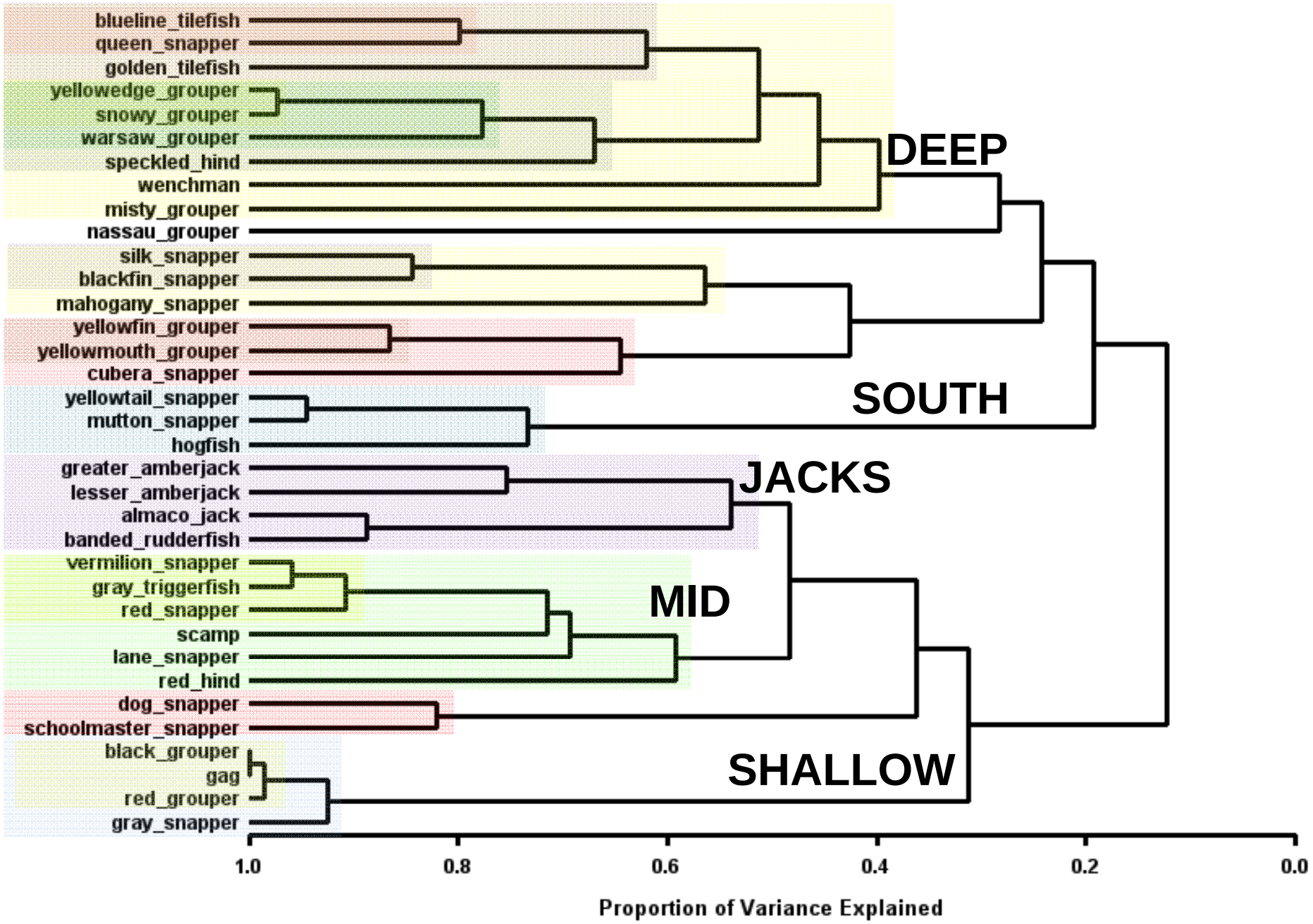
% RECORDS

HIGHEST % <5% <1%

COMMON NAME	CLL	CVL	RFOP	HBS	MRFSS	BLL
red grouper	74%	53%	51%	74%	29%	28%
gag	73%	53%	17%	72%	75%	4%
red snapper	14%	40%	36%	78%	60%	33%
gray snapper	31%	32%	5%	53%	84%	1%
gray triggerfish	12%	24%	11%	76%	42%	
vermilion snapper	9%	34%	24%	73%	30%	1%
scamp	55%	28%	17%	35%	18%	2%
sand perch			1%	44%	30%	
lane snapper	10%	18%	4%	67%	43%	0%
black grouper	73%	53%	1%	4%	5%	0%
greater amberjack	24%	12%	7%	31%	31%	2%
yellowedge grouper	30%	3%	6%	1%	2%	24%
golden tilefish	17%	1%	1%			14%
almaco jack	1%	6%	6%	19%	13%	0%
snowy grouper	25%	3%	4%	2%	3%	3%
goliath grouper			0%	0%	24%	0%
yellowtail snapper	2%	12%	0%	10%	4%	
warsaw grouper	9%	4%	1%	7%	7%	3%
mutton snapper	18%	5%	1%	2%	3%	0%
banded rudderfish	1%	2%	2%	14%	4%	
blueline tilefish	12%	3%	3%	0%		4%

COMMON NAME	CLL	CVL	RFOP	HBS	MRFSS	BLL
rock hind			2%	8%	2%	
speckled hind	14%	1%	4%	2%	0%	1%
silk snapper	8%	2%	0%	0%		
blackfin snapper	5%	1%	0%	0%		
hogfish	0%	1%	0%	3%	3%	
lesser amberjack	4%	3%	1%	1%	1%	0%
red hind	1%	1%	1%	1%	2%	
queen snapper	3%	1%	0%	0%		0%
misty grouper	2%	0%			0%	
dog snapper	1%	0%	0%	0%	2%	
dwarf sand perch			0%			1%
cubera snapper	1%	0%	0%	1%	0%	
yellowmouth grouper		0%	1%	1%	0%	0%
wenchman	0%	0%	0%		0%	1%
yellowfin grouper	0%	0%	0%	0%		
Nassau grouper		0%			0%	
goldface tilefish			0%			0%
schoolmaster	0%	0%				
anchor tilefish			0%			
blackline tilefish			0%			
mahogany snapper		0%				

Principle Components Clustering of BINARY Gulf Commercial Vertical Line Landings Partitioned by Depth and Area



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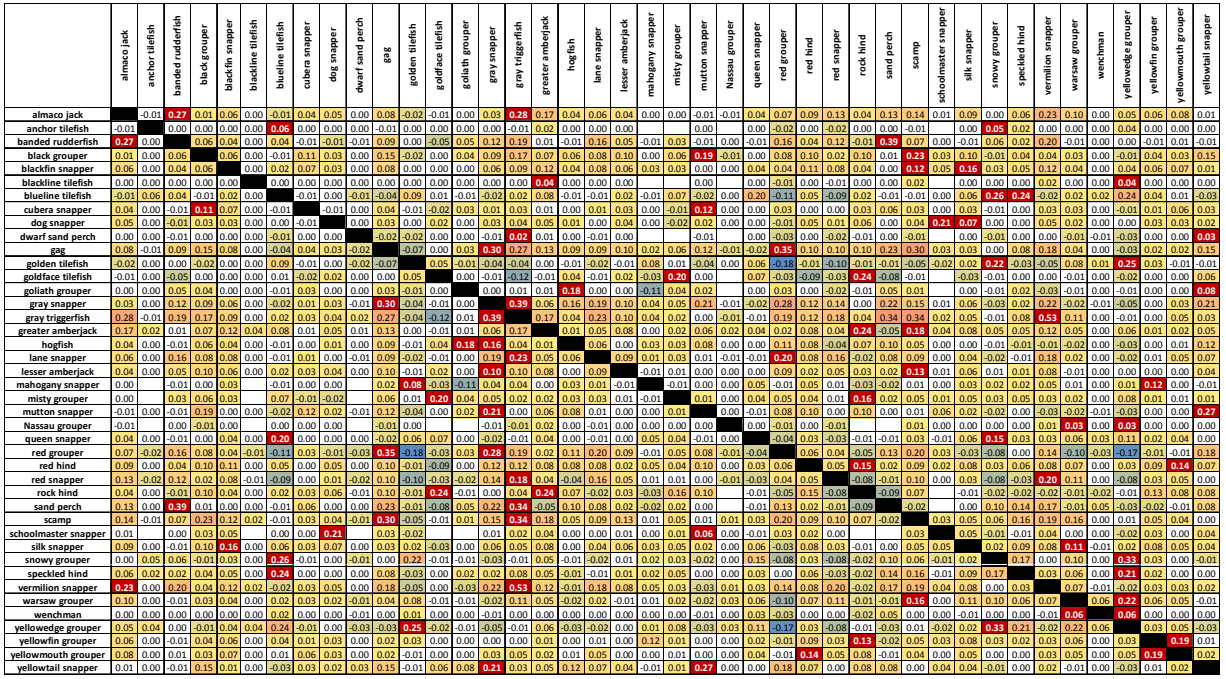
MEDIAN PEARSON CORRELATION MATRIX & NODAL ANALYSIS

- Integrate across data sources
- Useful for placing rare species



	almaco jack	anchor tilefish	banded rudderfish	black grouper	blackfin snapper	blackline tilefish	blueline tilefish	cubera snapper	dog snapper	dwarf sand perch	gag	golden tilefish	goldface tilefish	goliath grouper	gray snapper	gray triggerfish	greater amberjack	hogfish	lane snapper	lesser amberjack	mahogany snapper	misty grouper	mutton snapper	Nassau grouper	queen snapper	red grouper	red hind	red snapper	rock hind	sand perch	scamp	schoolmaster snapper	silk snapper	snowy grouper	speckled hind	vermilion snapper	warsaw grouper	wenchman	yellowedge grouper	yellowfin grouper	yellowmouth grouper	yellowtail snapper
almaco jack		-0.01	0.27	0.01	0.06	0.00	-0.01	0.04	0.05	0.00	0.08	-0.02	-0.01	0.00	0.03	0.28	0.17	0.04	0.06	0.04	0.00	0.00	-0.01	-0.01	0.04	0.07	0.09	0.13	0.04	0.13	0.14	0.01	0.09	0.00	0.06	0.23	0.10	0.00	0.05	0.06	0.08	0.01
anchor tilefish	-0.01		0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.02	0.00	0.00	0.00			0.00		0.00	-0.02	0.00	-0.02	0.00	0.00	-0.01		0.00	0.05	0.02	0.00	0.00	0.00	0.04	0.00	0.00	0.00
banded rudderfish	0.27	0.00		0.06	0.04	0.00	0.04	-0.01	-0.01	-0.01	0.09	0.00	-0.05	0.05	0.12	0.19	0.01	-0.01	0.16	0.05	-0.01	0.03	-0.01	0.00	-0.01	0.16	0.04	0.12	-0.01	0.39	0.07	0.00	-0.01	0.06	0.02	0.20	-0.01	0.00	0.00	-0.01	0.01	-0.01
black grouper	0.01	0.00	0.06		0.06	0.00	-0.01	0.11	0.03	0.00	0.15	-0.02	0.00	0.04	0.09	0.17	0.07	0.06	0.08	0.10	0.00	0.06	0.19	-0.01	0.00	0.08	0.10	0.02	0.10	0.01	0.23	0.03	0.10	-0.01	0.04	0.04	0.03	0.00	-0.01	0.04	0.03	0.15
blackfin snapper	0.06	0.00	0.04	0.06		0.00	0.02	0.07	0.03	0.00	0.08	0.00	0.00	0.00	0.06	0.09	0.12	0.04	0.08	0.06	0.03	0.03	0.00	0.00	0.04	0.04	0.11	0.08	0.04	0.00	0.12	0.05	0.16	0.03	0.05	0.12	0.04	0.00	0.04	0.06	0.07	0.01
blackline tilefish	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00			0.00		0.00	-0.01	0.00	-0.01	0.00	0.00	0.02		0.00	0.00	0.00	0.02	0.00	0.00	0.04	0.00	0.00	0.00
blueline tilefish	-0.01	0.06	0.04	-0.01	0.02	0.00		-0.01	0.00	-0.01	-0.04	0.09	0.01	-0.01	-0.02	0.02	0.08	-0.01	-0.01	0.02	-0.01	0.07	-0.02	0.00	0.20	-0.11	0.05	-0.09	0.02	-0.01	-0.01	0.00	0.06	0.26	0.24	-0.02	0.02	0.02	0.24	0.04	0.01	-0.03
cubera snapper	0.04	0.00	-0.01	0.11	0.07	0.00	-0.01		-0.01	0.00	0.04	-0.01	-0.02	0.03	0.01	0.03	0.01	0.00	0.01	0.03	0.00	-0.01	0.12	0.00	0.00	0.03	0.00	0.00	0.03	0.06	0.03	0.00	0.03	-0.01	0.00	0.03	0.03	0.00	-0.01	0.01	0.06	0.03
dog snapper	0.05	0.00	-0.01	0.03	0.03	0.00	0.00	-0.01		0.00	0.03	0.00	0.02	0.00	0.03	0.04	0.05	0.01	0.00	0.04	0.00	-0.02	0.02	0.00	0.00	-0.01	0.05	0.01	0.06	0.00	0.04	0.21	0.07	0.00	0.00	0.05	0.02	0.00	0.00	0.03	0.03	0.02
dwarf sand perch	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00		-0.02	-0.02	0.00	0.00	-0.01	0.02	0.01	0.00	-0.01	0.00			-0.01		0.00	-0.03	0.00	-0.02	-0.01	0.00	-0.01		0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.03	0.00	0.00	0.03
gag	0.08	-0.01	0.09	0.15	0.08	0.00	-0.04	0.04	0.03	-0.02		-0.07	0.00	0.03	0.30	0.27	0.13	0.09	0.09	0.10	0.02	0.06	0.12	-0.01	-0.02	0.35	0.10	0.10	0.10	0.23	0.30	0.03	0.03	0.00	0.08	0.18	0.04	0.00	-0.03	0.02	0.02	0.15
golden tilefish	-0.02	0.00	0.00	-0.02	0.00	0.00	0.09	-0.01	0.00	-0.02	-0.07		0.05	-0.01	-0.04	-0.04	0.00	-0.01	-0.02	-0.01	0.08	0.01	-0.04	0.00	0.06	-0.18	-0.01	-0.10	-0.01	-0.01	-0.05	-0.02	0.02	0.22	-0.03	-0.05	0.08	0.01	0.25	0.03	-0.01	-0.01
goldface tilefish	-0.01	0.00	-0.05	0.00	0.00	0.00	0.01	-0.02	0.02	0.00	0.00	0.05		0.00	-0.01	-0.12	-0.01	0.04	-0.01	0.02	-0.03	0.20	0.00		0.07	-0.03	-0.09	-0.03	0.24	-0.08	-0.01		-0.03	-0.01	0.00	0.00	-0.01	0.00	-0.02	0.00	0.00	0.06
goliath grouper	0.00	0.00	0.05	0.04	0.00	0.00	-0.01	0.03	0.00	0.00	0.03	-0.01	0.00		0.00	0.01	0.01	0.18	0.00	0.00	-0.11	0.04	0.02		0.00	0.03	0.00	-0.02	-0.01	0.05	0.01		0.00	-0.01	0.02	-0.03	-0.01	0.00	-0.01	0.00	0.00	0.08
gray snapper	0.03	0.00	0.12	0.09	0.06	0.00	-0.02	0.01	0.03	-0.01	0.30	-0.04	-0.01	0.00		0.39	0.06	0.16	0.19	0.10	0.04	0.05	0.21	-0.01	-0.02	0.28	0.12	0.14	0.00	0.22	0.15	0.01	0.06	-0.03	0.02	0.22	-0.02	-0.01	-0.05	0.00	0.03	0.21
gray triggerfish	0.28	-0.01	0.19	0.17	0.09	0.00	0.02	0.03	0.04	0.02	0.27	-0.04	-0.12	0.01	0.39		0.17	0.04	0.23	0.10	0.04	0.02	0.00	-0.01	-0.01	0.19	0.12	0.18	0.04	0.34	0.34	0.02	0.05	-0.01	0.08	0.53	0.11	0.00	-0.01	0.00	0.05	0.03
greater amberjack	0.17	0.02	0.01	0.07	0.12	0.04	0.08	0.01	0.05	0.01	0.13	0.00	-0.01	0.01	0.06	0.17		0.01	0.05	0.08	0.00	0.02	0.06	0.02	0.04	0.02	0.08	0.04	0.24	-0.05	0.18	0.04	0.08	0.05	0.05	0.12	0.05	0.00	0.06	0.01	0.02	0.05
hogfish	0.04	0.00	-0.01	0.06	0.04	0.00	-0.01	0.00	0.01	0.00	0.09	-0.01	0.04	0.18	0.16	0.04	0.01		0.06	0.00	0.03	0.03	0.08	0.00	0.00	0.11	0.08	-0.04	0.07	0.10	0.05	0.00	0.00	-0.01	-0.01	-0.01	-0.02	0.00	-0.03	0.00	0.01	0.12
lane snapper	0.06	0.00	0.16	0.08	0.08	0.00	-0.01	0.01	0.00	-0.01	0.09	-0.02	-0.01	0.00	0.19	0.23	0.05	0.06		0.09	0.01	0.03	0.01	-0.01	-0.01	0.20	0.08	0.16	-0.02	0.08	0.09	0.00	0.04	-0.02	-0.01	0.18	0.02	0.00	-0.02	0.01	0.05	0.07
lesser amberjack	0.04	0.00	0.05	0.10	0.06	0.00	0.02	0.03	0.04	0.00	0.10	-0.01	0.02	0.00	0.10	0.10	0.08	0.00	0.09		-0.01	0.01	0.00	0.00	0.00	0.09	0.02	0.05	0.03	0.02	0.13	0.01	0.06	0.01	0.01	0.08	-0.01	0.00	0.00	0.00	0.00	0.04
mahogany snapper	0.00		-0.01	0.00	0.03		-0.01	0.00	0.00		0.02	0.08	-0.03	-0.11	0.04	0.04	0.00	0.03	0.01	-0.01		-0.01	0.00	0.00	0.05	-0.01	0.05	0.01	-0.03	-0.02	0.01	0.00	0.03	0.02	0.02	0.05	0.01	0.00	0.01	0.12	0.00	-0.01
misty grouper	0.00		0.03	0.06	0.03		0.07	-0.01	-0.02		0.06	0.01	0.20	0.04	0.05	0.02	0.02	0.03	0.03	0.01	-0.01		0.01	0.00	0.04	0.05	0.04	0.01	0.16	0.02	0.05	0.01	0.05	0.03	0.05	0.03	0.02	0.00	0.08	0.01	0.01	0.01
mutton snapper	-0.01	0.00	-0.01	0.19	0.00	0.00	-0.02	0.12	0.02	-0.01	0.12	-0.04	0.00	0.02	0.21	0.00	0.06	0.08	0.01	0.00	0.00	0.01		0.00	-0.01	0.08	0.10	0.00	0.10	0.00	0.01	0.06	0.02	-0.02	0.00	-0.03	-0.02	-0.01	-0.03	0.00	0.00	0.27
Nassau grouper	-0.01		0.00	-0.01	0.00		0.00	0.00	0.00		-0.01	0.00			-0.01	-0.01	0.02	0.00	-0.01	0.00	0.00	0.00	0.00		0.00	-0.01	0.00	-0.01		0.01	0.00	0.00	0.00	0.00	0.01	0.05	0.00	0.03	0.00	0.00	0.00
queen snapper	0.04	0.00	-0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	-0.02	0.06	0.07	0.00	-0.02	-0.01	0.04	0.00	-0.01	0.00	0.05	0.04	-0.01	0.00		-0.04	0.03	-0.03	-0.01	-0.01	0.03	-0.01	0.06	0.15	0.03	0.03	0.06	0.03	0.11	0.02	0.04	0.00
red grouper	0.07	-0.02	0.16	0.08	0.04	-0.01	-0.11	0.03	-0.01	-0.03	0.35	-0.18	-0.03	0.03	0.28	0.19	0.02	0.11	0.20	0.09	-0.01	0.05	0.08	-0.01	-0.04		0.06	0.04	-0.05	0.13	0.20	0.03	-0.03	-0.08	0.00	0.14	-0.10	-0.03	-0.17	-0.01	-0.01	0.18
red hind	0.09	0.00	0.04	0.10	0.11	0.00	0.05	0.00	0.05	0.00	0.10	-0.01	-0.09	0.00	0.12	0.12	0.08	0.08	0.08	0.02	0.05	0.04	0.10	0.00	0.03	0.06		0.05	0.15	0.02	0.09	0.02	0.08	0.03	0.06	0.08	0.07	0.00	0.03	0.09	0.14	0.07
red snapper	0.13	-0.02	0.12	0.02	0.08	-0.01	-0.09	0.00	0.01	-0.02	0.10	-0.10	-0.03	-0.02	0.14	0.18	0.04	-0.04	0.16	0.05	0.01	0.04	0.00	-0.01	-0.03	0.04	0.05		-0.08	-0.01	0.10	0.00	0.03	-0.08	-0.03	0.20	0.11	0.00	-0.08	0.03	0.05	0.00
rock hind	0.04	0.00	-0.01	0.10	0.04	0.00	0.02	0.03	0.06	-0.01	0.10	-0.01	0.24	-0.01	0.00	0.04	0.24	0.07	-0.02	0.03	-0.03	0.16	0.10		-0.01	-0.05	0.15	-0.08		-0.09	0.07		-0.01	-0.02	-0.02	-0.02	-0.01	-0.02	-0.01	0.13	0.08	0.08
sand perch	0.13	0.00	0.39	0.01	0.00	0.00	-0.01	0.06	0.00	0.00	0.23	-0.01	-0.08	0.05	0.22	0.34	-0.05	0.10	0.08	0.02	-0.02	0.02	0.00		-0.01	0.13	0.02	-0.01	-0.09		-0.02		0.00	0.10	0.14	0.17	-0.01	0.05	-0.03	-0.02	-0.01	0.08
scamp	0.14	-0.01	0.07	0.23	0.12	0.02	-0.01	0.03	0.04	-0.01	0.30	-0.05	-0.01	0.01	0.15	0.34	0.18	0.05	0.09	0.13	0.01	0.05	0.01	0.01	0.03	0.20	0.09	0.10	0.07	-0.02		0.03	0.05	0.06	0.16	0.19	0.16	0.00	0.01	0.05	0.04	0.00
schoolmaster snapper	0.01		0.00	0.03	0.05		0.00	0.00	0.21		0.03	-0.02			0.01	0.02	0.04	0.00	0.00	0.01	0.00	0.01	0.06	0.00	-0.01	0.03	0.02	0.00			0.03		0.05	-0.01	-0.01	0.04	0.00	0.00	-0.02	0.03	0.00	0.04
silk snapper	0.09	0.00	-0.01	0.10	0.16	0.00	0.06	0.03	0.07	0.00	0.03	0.02	-0.03	0.00	0.06	0.05	0.08	0.00	0.04	0.06	0.03	0.05	0.02	0.00	0.06	-0.03	0.08	0.03	-0.01	0.00	0.05	0.05		0.02	0.09	0.08	0.11	-0.01	0.02	0.08	0.05	0.04
snowy grouper	0.00	0.05	0.06	-0.01	0.03	0.00	0.26	-0.01	0.00	-0.01	0.00	0.22	-0.01	-0.01	-0.03	-0.01	0.05	-0.01	-0.02	0.01	0.02	0.03	-0.02	0.00	0.15	-0.08	0.03	-0.08	-0.02	0.10	0.06	-0.01	0.02		0.17	0.00	0.10	0.00	0.33	0.03	0.00	-0.01
speckled hind	0.06	0.02	0.02	0.04	0.05	0.00	0.24	0.00	0.00	0.00	0.08	-0.03	0.00	0.02	0.02	0.08	0.05	-0.01	-0.01	0.01	0.02	0.05	0.00	0.00	0.03	0.00	0.06	-0.03	-0.02	0.14	0.16	-0.01	0.09	0.17		0.03	0.06	0.00	0.21	0.02	0.00	0.00
vermilion snapper	0.23	0.00	0.20	0.04	0.12	0.02	-0.02	0.03	0.05	0.00	0.18	-0.05	0.00	-0.03	0.22	0.53	0.12	-0.01	0.18	0.08	0.05	0.03	-0.03	0.01	0.03	0.14	0.08	0.20	-0.02	0.17	0.19	0.04	0.08	0.00	0.03		0.07	-0.01	-0.02	0.03	0.03	0.02
warsaw grouper	0.10	0.00	-0.01	0.03	0.04	0.00	0.02	0.03	0.02	-0.01	0.04	0.08	-0.01	-0.01	-0.02	0.11	0.05	-0.02	0.02	-0.01	0.01	0.02	-0.02	0.03	0.06	-0.10	0.07	0.11	-0.01	-0.01	0.16	0.00	0.11	0.10	0.06	0.07		0.06	0.22	0.06	0.05	-0.01
wenchman	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.03	-0.03	0.00	0.00	-0.02	0.05	0.00	0.00	-0.01	0.06		0.06	0.00	0.00	0.00	0.00	0.00	0.00
yellowedge grouper	0.05	0.04	0.00	-0.01	0.04	0.04	0.24	-0.01	0.00	-0.03	-0.03	0.25	-0.02	-0.01	-0.05	-0.01	0.06	-0.03	-0.02	0.00	0.01	0.08	-0.03	0.03	0.11	-0.17	0.03	-0.08	-0.01	-0.03	0.01	-0.02	0.02	0.33	0.21	-0.02	0.22	0.06		0.03	0.05	-0.03
yellowfin grouper	0.06	0.00	-0.01	0.04	0.06	0.00	0.04	0.01	0.03	0.00	0.02	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.12	0.01	0.00	0.00	0.02	-0.01	0.09	0.03	0.13	-0.02	0.05	0.03	0.08	0.03	0.02	0.03	0.06	0.00	0.03		0.19	0.01
yellowmouth grouper	0.08	0.00	0.01	0.03	0.07	0.00	0.01	0.06	0.03	0.00	0.02	-0.01	0.00	0.00	0.03	0.05	0.02	0.01	0.05	0.00	0.00	0.01	0.00	0.00	0.04	-0.01	0.14	0.05	0.08	-0.01	0.04	0.00	0.05	0.00	0.00	0.03	0.05	0.00	0.05	0.19		0.02
yellowtail snapper	0.01	0.00	-0.01	0.15	0.01	0.00	-0.03	0.03	0.02	0.03	0.15	-0.01	0.06	0.08	0.21	0.03	0.05	0.12	0.07	0.04	-0.01	0.01	0.27	0.00	0.00	0.18	0.07	0.00	0.08	0.08	0.00	0.04	0.04	-0.01	0.00	0.02	-0.01	0.00	-0.03	0.01	0.02	

Ex:

Anchor→Blueline, Snowy

Blackline→Yellowedge

Goldface→Misty, Rock Hind

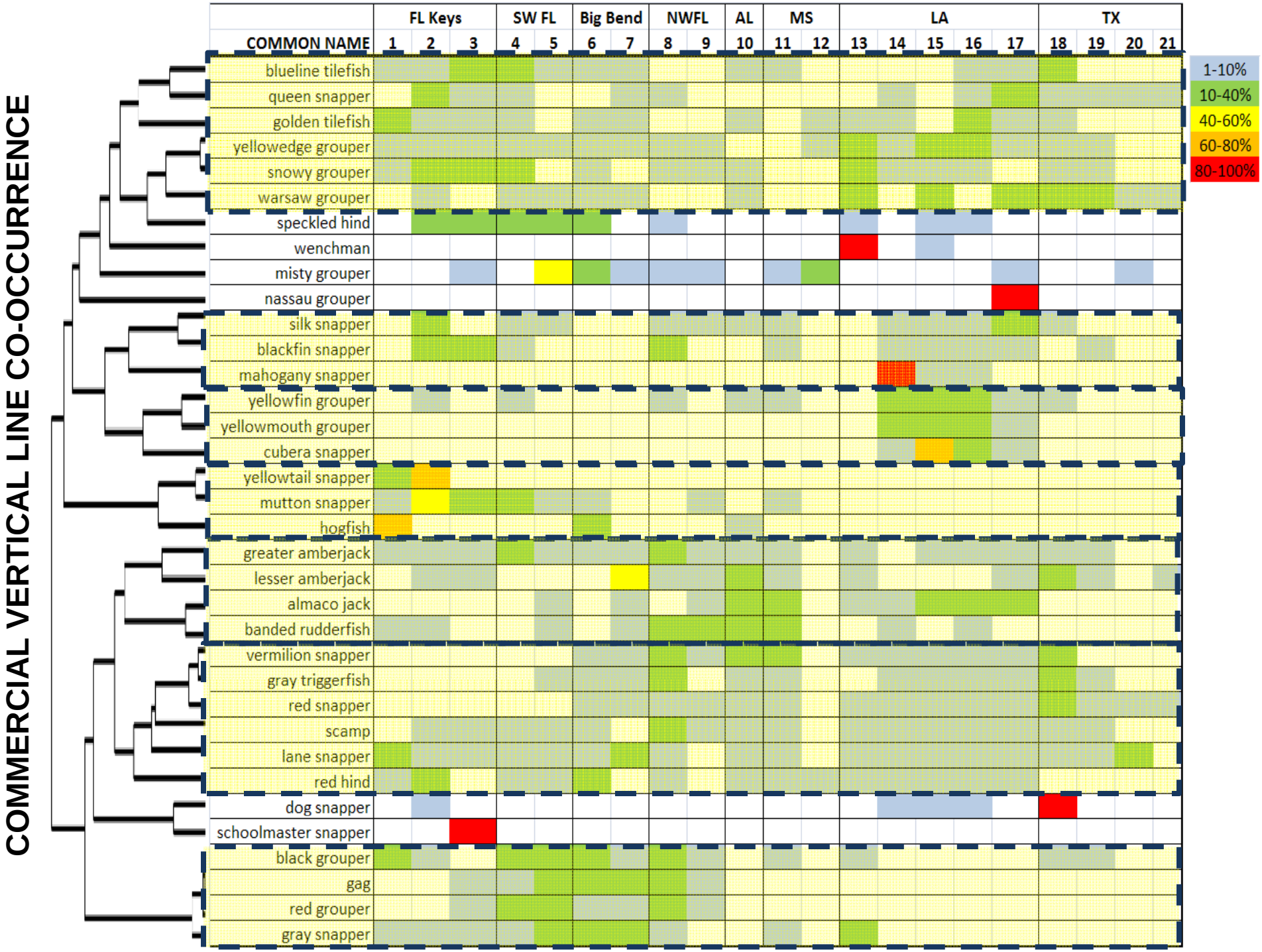
Queen→Blueline, Snowy

Wenchman→Warsaw, Yellowedge

Blackfin→Silk; Silk→Blackfin

Cubera→Mutton

Dog→Schoolmaster


COMMERCIAL VERTICAL LINE CO-OCCURRENCE
COMMON NAME
FL Keys
SW FL
Big Bend
NWFL
AL
MS
LA
TX
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
blueline tilefish
queen snapper
golden tilefish
yellowedge grouper
snowy grouper
warsaw grouper
speckled hind
wenchman
misty grouper
nassau grouper
silk snapper
blackfin snapper
mahogany snapper
yellowfin grouper
yellowmouth grouper
cubera snapper
yellowtail snapper
mutton snapper
hogfish
greater amberjack
lesser amberjack
almaco jack
banded rudderfish
vermilion snapper
gray triggerfish
red snapper
scamp
lane snapper
red hind
dog snapper
schoolmaster snapper
black grouper
gag
red grouper
gray snapper
1-10%
10-40%
40-60%
60-80%
80-100%

VULNERABILITY

COMMON NAME	SPECIES NAME	ASSESSED	PSA
golden tilefish (tilefish)	*Lopholatilus chamaeleonticeps*	2010	3.33
blueline tilefish	*Caulolatilus microps*	2010	3.4*
anchor tilefish	*Caulolatilus intermedius*		-
blackline tilefish	*Caulolatilus cyanops*		-
goldface tilefish	*Caulolatilus crysops*		-
yellowedge grouper	*Epinephelus flavolimbatus*	2010	3.64
snowy grouper	*Epinephelus niveatus*		3.54
warsaw grouper	*Epinephelus nigritus*		3.89
speckled hind	*Epinephelus drummondhayi*		3.42*
misty grouper	*Epinephelus mystacinus*		3.66
queen snapper	*Etelis oculatus*		3.08*
wenchman	*Pristipomoides aquilonaris*		-
gray triggerfish	***Balistes capriscus***	**2006**	**2.46***
red snapper	***Lutjanus campechanus***	**2010**	**3.37**
vermilion snapper	***Rhomboplites aurorubens***	**2006**	**3.07**
lane snapper	*Lutjanus synagris*		2.99
blackfin snapper	*Lutjanus buccanella*		3.36*
silk snapper	*Lutjanus vivanus*		3.52
gray (mangrove) snapper	*Lutjanus griseus*		3.17
yellowtail snapper	***Ocyurus chrysurus***	**2003**	**2.84**
hogfish	***Lachnolaimus maximus***	**2004**	**3.05**
mutton snapper	***Lutjanus analis***	**2008**	**3.27**
cubera snapper	*Lutjanus cyanopterus*		3.92*
dog snapper	*Lutjanus jocu*		3.29*
schoolmaster	*Lutjanus apodus*		3.49*
mahogany snapper	*Lutjanus mahogoni*		3.55*

VULNERABILITY

COMMON NAME	SPECIES NAME	ASSESSED	PSA
greater amberjack	***Seriola dumerili***	**2006**	**3.23**
almaco jack	*Seriola rivoliana*		3.35*
banded rudderfish	*Seriola zonata*		3.26*
lesser amberjack	*Seriola fasciata*		3.64
black grouper	***Mycteroperca bonaci***	**2010**	**3.48**
gag	***Mycteroperca microlepis***	**2006**	**3.52**
red grouper	***Epinephelus morio***	**2007**	**3.28**
scamp	*Mycteroperca phenax*		3.25
dwarf sand perch	*Diplectrum formosum*		-
sand perch	*Diplectrum bivattatum*		-
red hind	*Epinephelus guttatus*		3.05
rock hind	*Epinephelus adscensionis*		3.23*
yellowfin grouper	*Mycteroperca venenosa*		3.39*
yellowmouth grouper	*Mycteroperca interstitialis*		3.2*
goliath grouper	***Epinephelus itajara***	**2004**	**3.42**
Nassau grouper	*Epinephelus striatus*		3.3

NOAA FISHERIES SERVICE

ADVANTAGES OF STOCK COMPLEXES

Stock complexes achieve management goals:

1. Avoids AMs associated with exceeding ACL for species whose landings fluctuate widely due to rarity / ID issues
2. Allow primary data collection and enforcement focus on economically-important species
3. Promotes regulations considering multispecies context; prelude to ecosystem-based management

Ideally, stock complexes would:

1. Be adaptive management, modified by new data/assessment
2. Use indicator species to trigger AMs

NOAA FISHERIES SERVICE

DISADVANTAGES OF STOCK COMPLEXES

- Main goal of a stock complex is to place rarely caught species with some indicator, but these species are the most difficult to cluster.
- Use of assessed species as indicator species may be only practical way to set ACL, but assessed species may not be the most vulnerable species in the complex.
- Most vulnerable species in complex may still be prone to overfishing, although no SDC exists to determine this.
- Current assemblages may not be natural, as overexploitation may alter community structure.

DEEPWATER GROUPER

YELLOWEDGE GROUPER$_1$
WARSAW GROUPER$_2$
SNOWY GROUPER
MISTY GROUPER
SPECKLED HIND
QUEEN SNAPPER
WENCHMAN

1A

YELLOWEDGE GROUPER

1B

WARSAW GROUPER
SNOWY GROUPER
MISTY GROUPER
SPECKLED HIND
QUEEN SNAPPER
WENCHMAN

Assessed Species$_1$
Most Vulnerable Species$_2$

Vulnerability based on MRAG PSA 'Overall Risk' Scores (Gulf when available)

TILEFISH

TILEFISH (GOLDEN)$_1$
BLUELINE TILEFISH$_2$
ANCHOR TILEFISH
GOLDFACE TILEFISH
BLACKLINE TILEFISH

1A

TILEFISH (GOLDEN)

1B

BLUELINE TILEFISH
ANCHOR TILEFISH
GOLDFACE TILEFISH
BLACKLINE TILEFISH

JACKS

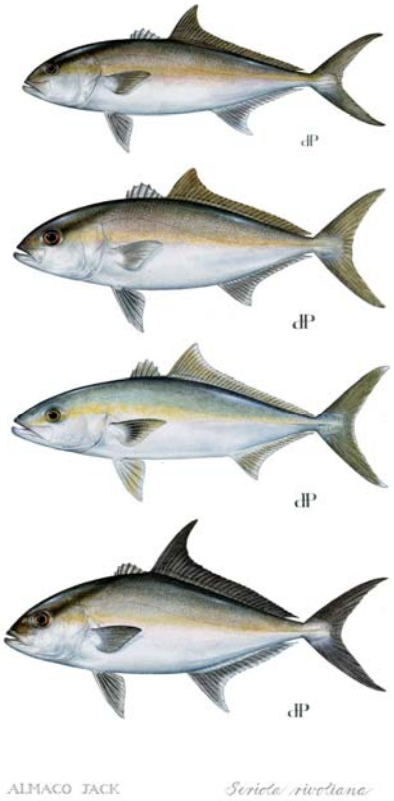
GREATER AMBERJACK$_1$
LESSER AMBERJACK$_2$
BANDED RUDDERFISH
ALMACO JACK

1A

GREATER AMBERJACK

1B

LESSER AMBERJACK
BANDED RUDDERFISH
ALMACO JACK



MID/DEEPWATER

GRAY TRIGGERFISH$_1$
RED SNAPPER$_1$
VERMILION SNAPPER$_1$
LANE SNAPPER
SILK SNAPPER$_2$
BLACKFIN SNAPPER
QUEEN SNAPPER
WENCHMAN

1A-B

GRAY TRIGGERFISH

RED SNAPPER

1C-E

VERMILION SNAPPER
LANE SNAPPER

BLACKFIN SNAPPER
SILK SNAPPER

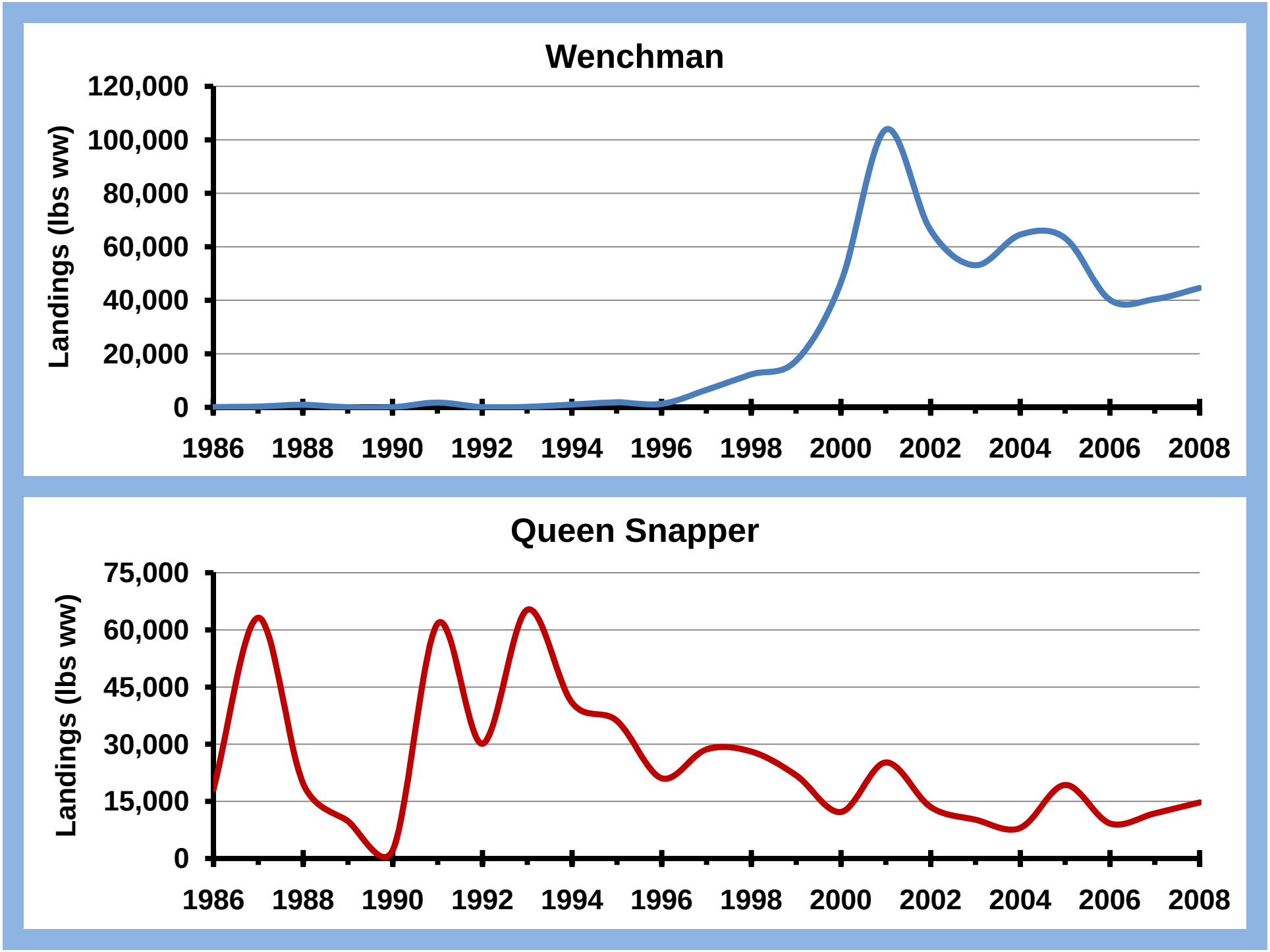
QUEEN SNAPPER
WENCHMAN

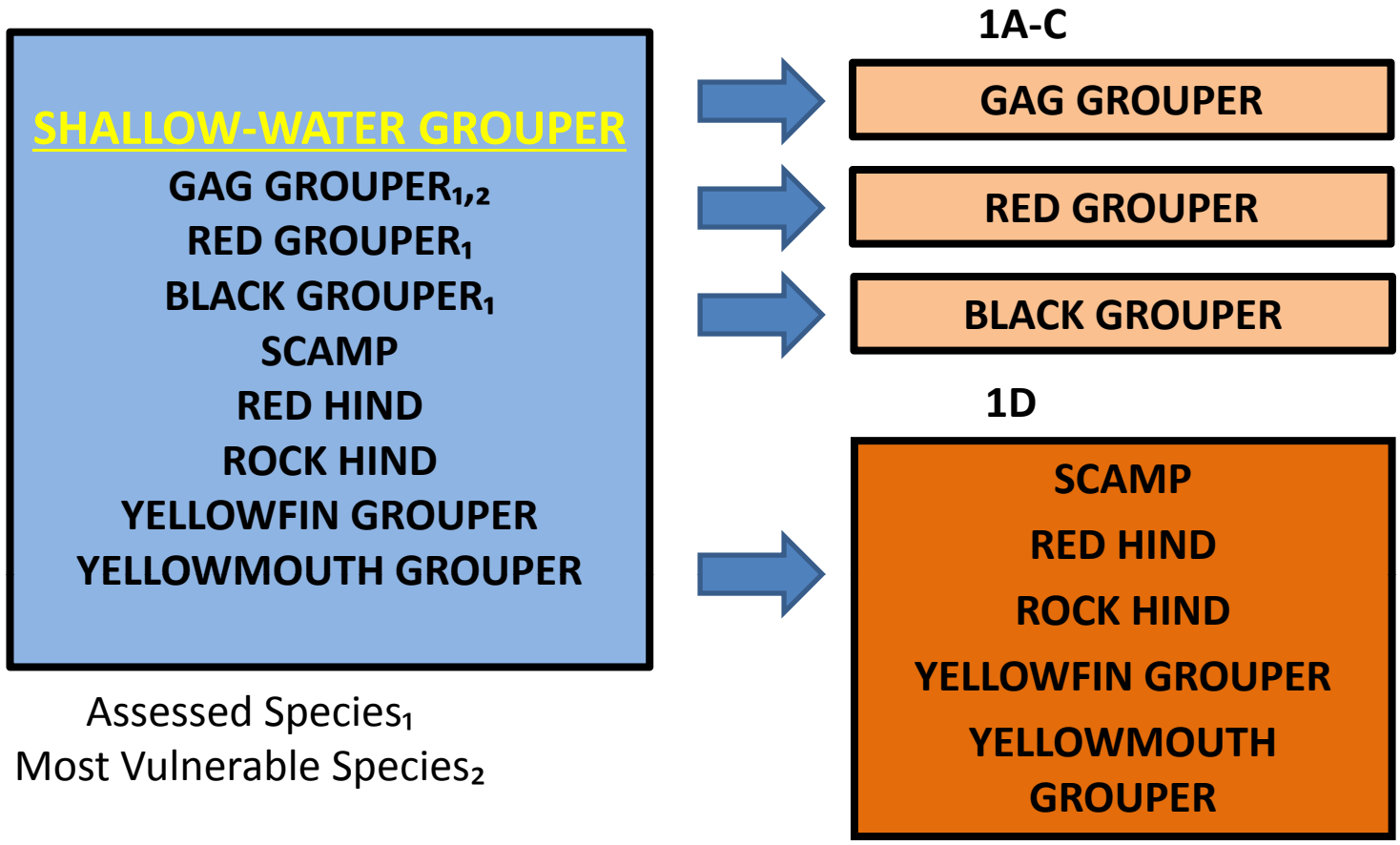
OR

1C-D

VERMILION SNAPPER
LANE SNAPPER
BLACKFIN SNAPPER
SILK SNAPPER

QUEEN SNAPPER
WENCHMAN

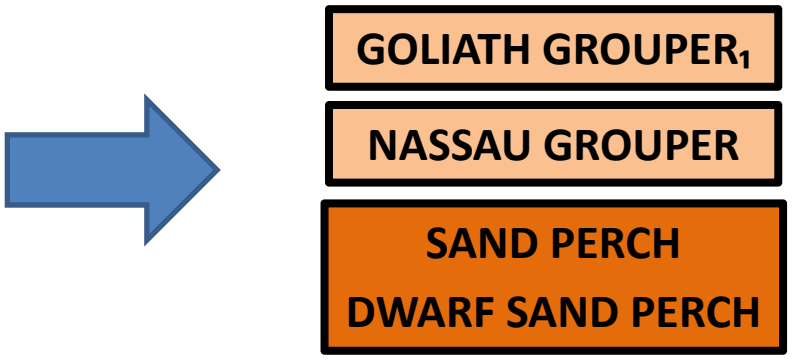

Wenchman
Landings (lbs ww)
120,000
100,000
80,000
60,000
40,000
20,000
0
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
Queen Snapper
Landings (lbs ww)
75,000
60,000
45,000
30,000
15,000
0
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008



Assessed Species$_1$
Most Vulnerable Species$_2$

Vulnerability based on MRAG PSA 'Overall Risk' Scores (Gulf when available)

ADDITIONAL COMPLEXES



SHALLOW-WATER SNAPPER

MUTTON SNAPPER$_1$

CUBERA SNAPPER$_2$

DOG SNAPPER

MAHOGANY SNAPPER

SCHOOLMASTER

1A

MUTTON SNAPPER

1B

CUBERA SNAPPER

DOG SNAPPER

MAHOGANY SNAPPER

SCHOOLMASTER

Assessed Species$_1$
Most Vulnerable Species$_2$

Vulnerability based on MRAG PSA 'Overall Risk' Scores (Gulf when available)

ADDITIONAL COMPLEXES

YELLOWTAIL SNAPPER$_1$

HOGFISH$_1$

GRAY SNAPPER

NOAA FISHERIES SERVICE

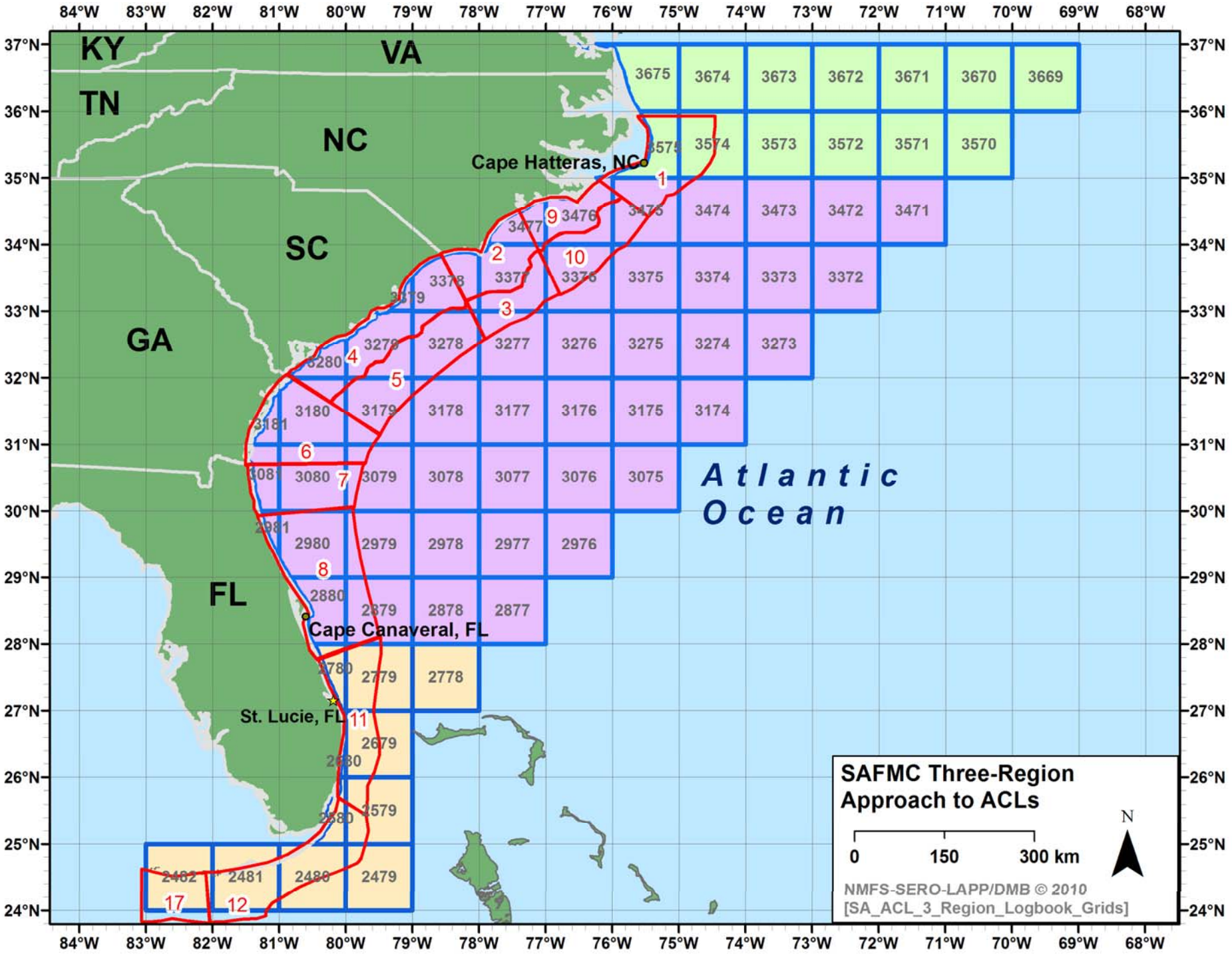
FUTURE GOALS

- Management using stock complexes is a temporary solution; however, single-species management should not be the end goal.
- Ecosystem-based management that seeks to understand linkages between communities and environmental forces should be next step.

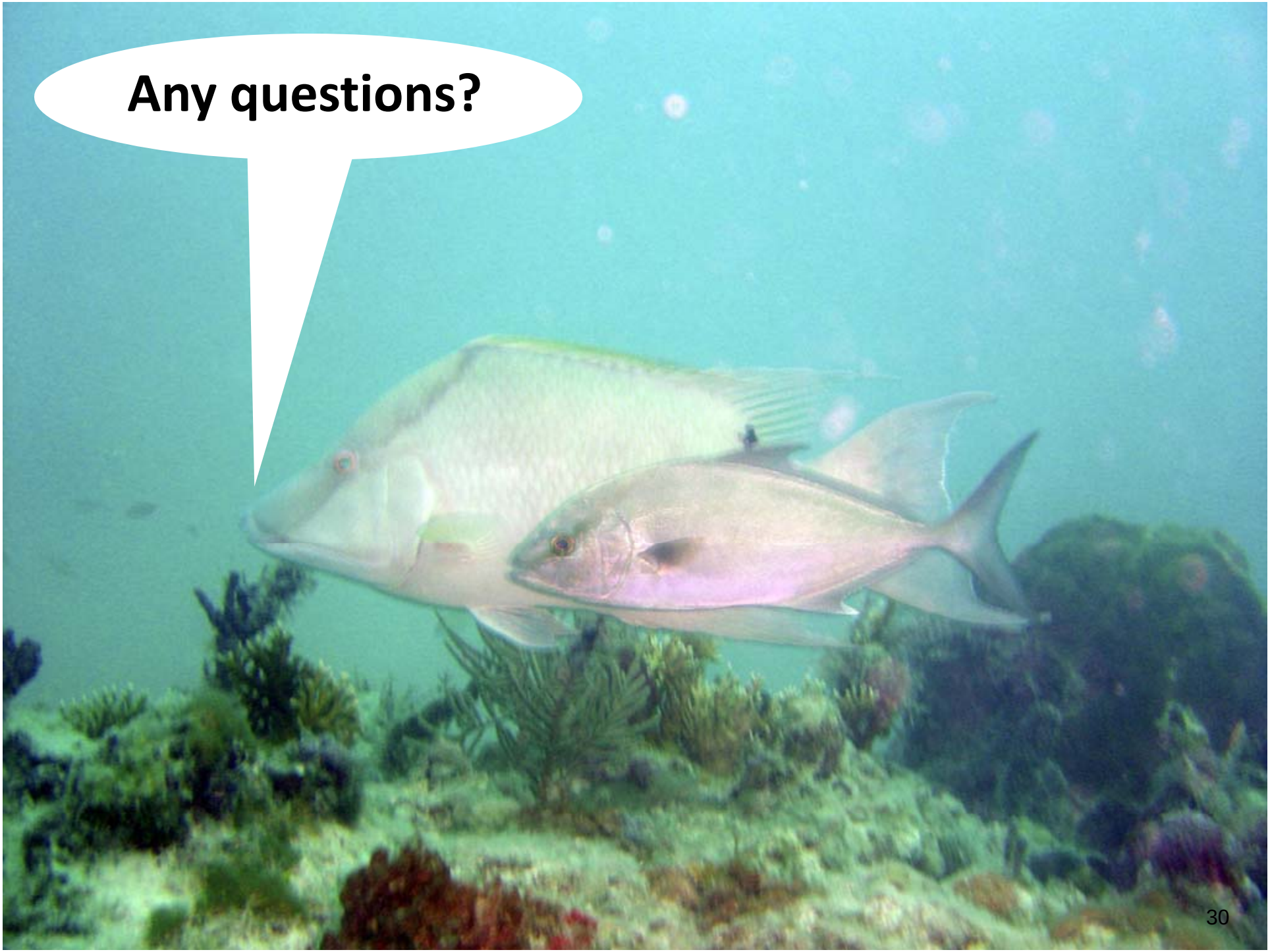
NOAA FISHERIES SERVICE

SAFMC Differences

- SAFMC manages **73** finfish species under the Snapper-Grouper FMU, as opposed to **42** finfish species managed by Gulf Reef Fish FMP.
- SAFMC jurisdiction covers broad range of latitudes with 2-3 biogeographic regions.
- Bathymetric slope on continental shelf in SAFMC waters is extreme, results in broad depth range available to fishers on a single trip – may not see the distinct depth separation in fisheries and stocks observed in Gulf.


KY
VA
TN
NC
SC
GA
FL
Cape Hatteras, NC
Cape Canaveral, FL
St. Lucie, FL
Atlantic Ocean
SAFMC Three-Region Approach to ACLs
0 150 300 km
N
NMFS-SERO-LAPP/DMB © 2010
[SA_ACL_3_Region_Logbook_Grids]

SOUTH OF CANAVERAL		CANAVERAL TO HATTERAS		NORTH OF HATTERAS	
almaco jack	mutton snapper	almaco jack	queen triggerfish	almaco jack	vermilion snapper
Atlantic spadefish	ocean triggerfish	Atlantic spadefish	red grouper	Atlantic spadefish	warsaw grouper
banded rudderfish	porkfish	banded rudderfish	red hind	banded rudderfish	white grunt
bank sea bass	puddingwife	bank sea bass	red porgy	bank sea bass	whitebone porgy
bar jack	queen snapper	bar jack	red snapper	black grouper	yellowedge grouper
black grouper	queen triggerfish	black grouper	rock hind	black margate	yellowfin grouper
black margate	red grouper	black margate	rock sea bass	black sea bass	yellowtail snapper
black sea bass	red hind	black sea bass	sand tilefish	blue runner	
black snapper	red porgy	blackfin snapper	saucereye porgy	blueline tilefish	
blackfin snapper	red snapper	blue runner	scamp	crevalle jack	
blue runner	rock hind	blueline tilefish	schoolmaster	cubera snapper	
blueline tilefish	sailors choice	bluestriped grunt	scup	gag	
bluestriped grunt	sand tilefish	coney	sheepshead	golden tilefish	
coney	saucereye porgy	crevalle jack	silk snapper	gray triggerfish	
cottonwick	scamp	cubera snapper	snowy grouper	graysby	
crevalle jack	schoolmaster	dog snapper	speckled hind	greater amberjack	
cubera snapper	schoolmaster snapper	french grunt	tomtate	grunts	
dog snapper	sheepshead	gag	unc amberjack	jolthead porgy	
french grunt	silk snapper	golden tilefish	unc groupers	knobbed porgy	
gag	snowy grouper	gray snapper	unc jacks	lesser amberjack	
golden tilefish	speckled hind	gray triggerfish	unc scup or porgies	margate	
grass porgy	tomtate	graysby	unc snappers	misty grouper	
gray snapper	unc groupers	greater amberjack	unc tilefish	ocean triggerfish	
gray triggerfish	unc jacks	grunts	unc triggerfish	porkfish	
graysby	unc scup or porgies	hogfish	vermilion snapper	queen triggerfish	
greater amberjack	unc snappers	jewfish	warsaw grouper	red grouper	
grunts	unc tilefish	jolthead porgy	white grunt	red hind	
hogfish	unc triggerfish	knobbed porgy	whitebone porgy	red porgy	
jewfish	vermilion snapper	lane snapper	wreckfish	red snapper	
jewfish	warsaw grouper	lesser amberjack	yellowedge grouper	rock sea bass	
jolthead porgy	white grunt	longspine porgy	yellowfin grouper	sand tilefish	
knobbed porgy	whitebone porgy	mahogany snapper	yellowjack	scamp	
lane snapper	yellow jack	margate	yellowmouth grouper	scup	
lesser amberjack	yellowedge grouper	misty grouper	yellowtail snapper	sheepshead	
longspine porgy	yellowfin grouper	mutton snapper		silk snapper	
mahogany snapper	yellowjack	ocean triggerfish		snowy grouper	
margate	yellowmouth grouper	porkfish		speckled hind	
misty grouper	yellowtail snapper	queen snapper		tomtate	
70 SPECIES		65 SPECIES		45 SPECIES	


Any questions?