

NE Gulf Reserves

Reef Fish Population Changes During Five Years of Closure 2001 - 2005



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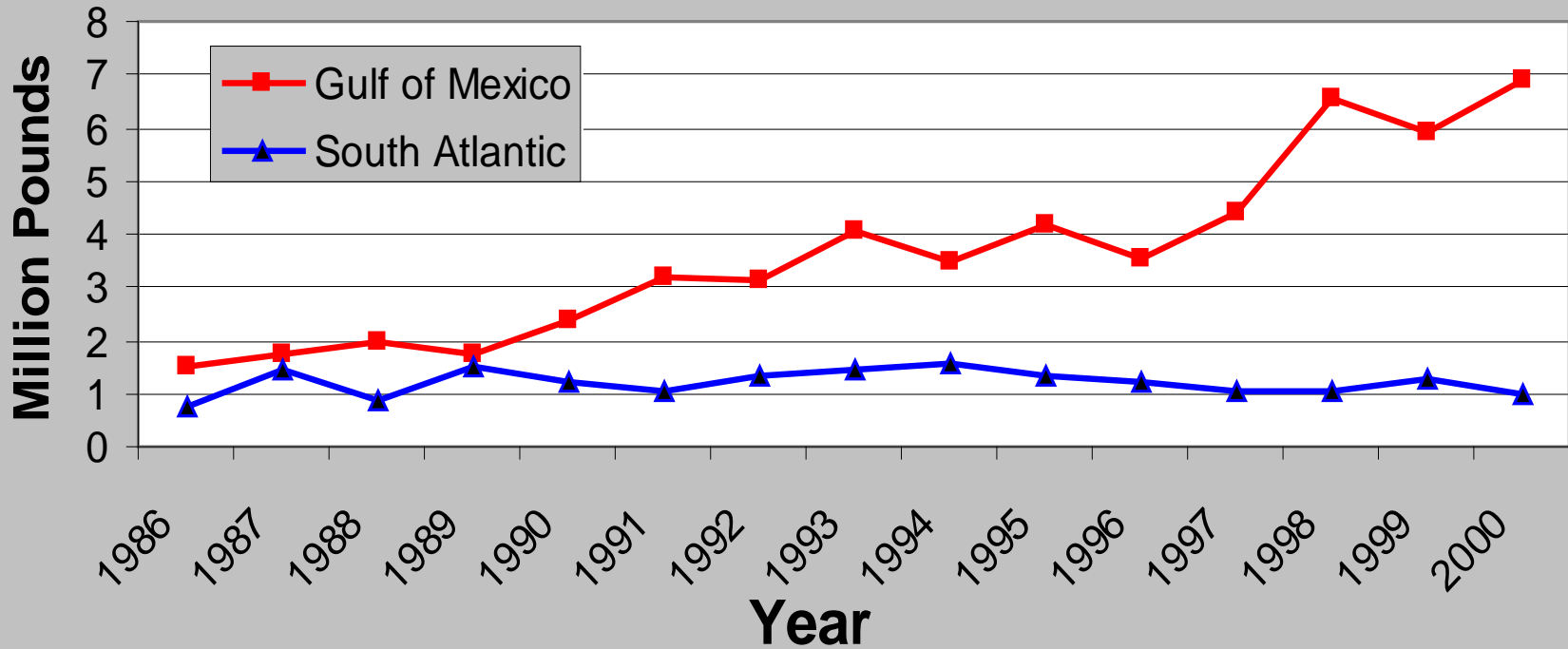
Christopher Gledhill
NOAA Fisheries - Pascagoula

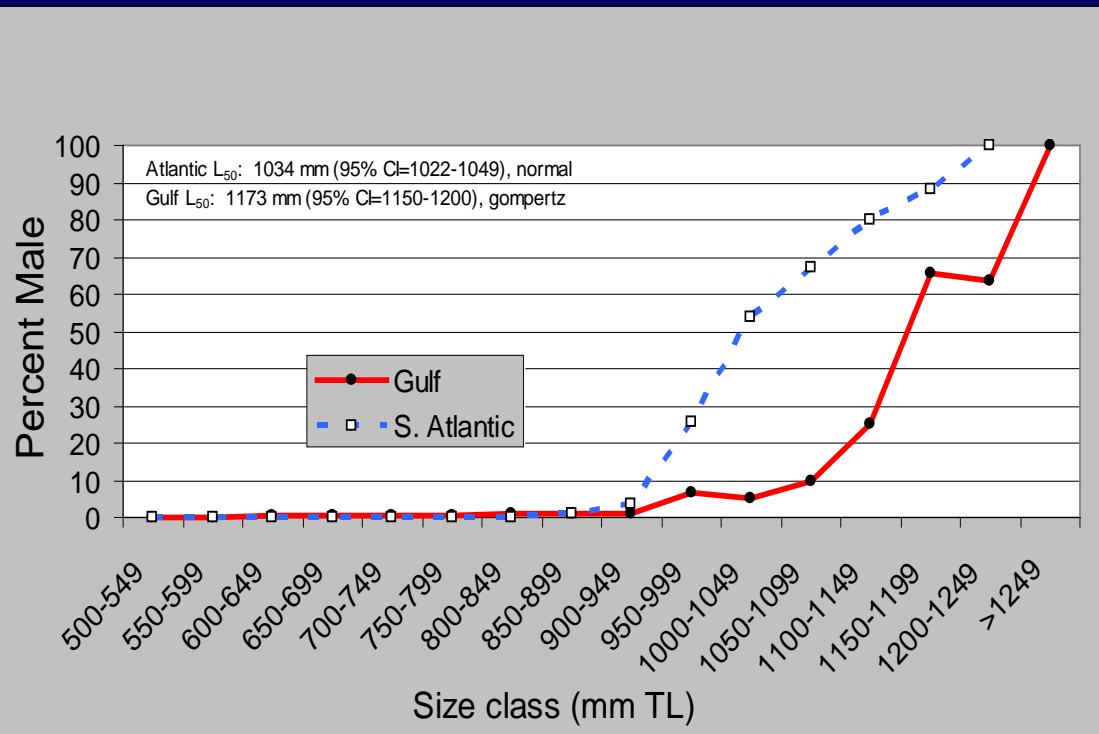


Landings for GAG

1986 – 2001

Commercial and Recreational Combined

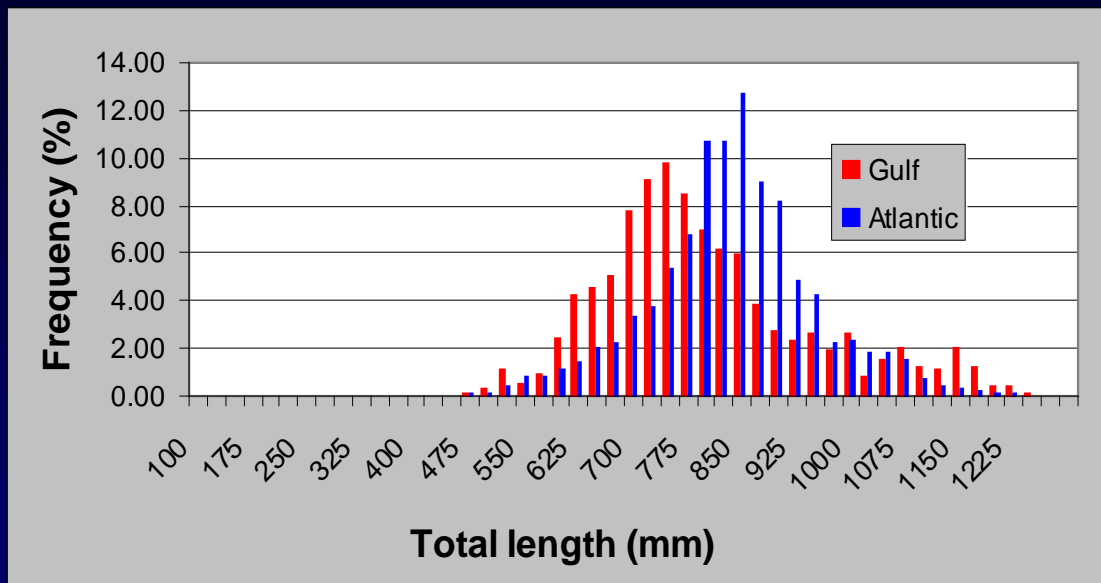




Percent male by size.

In the Gulf, 50% of gag are male at 1173 mm TL

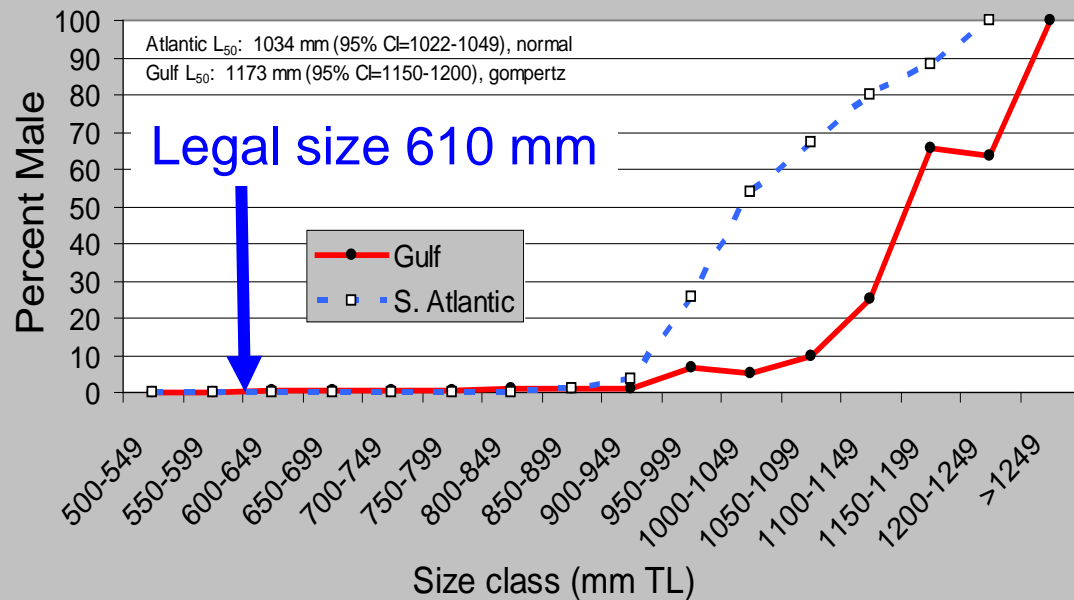
Hook and line collections, 1993 - 2000



Size frequency.

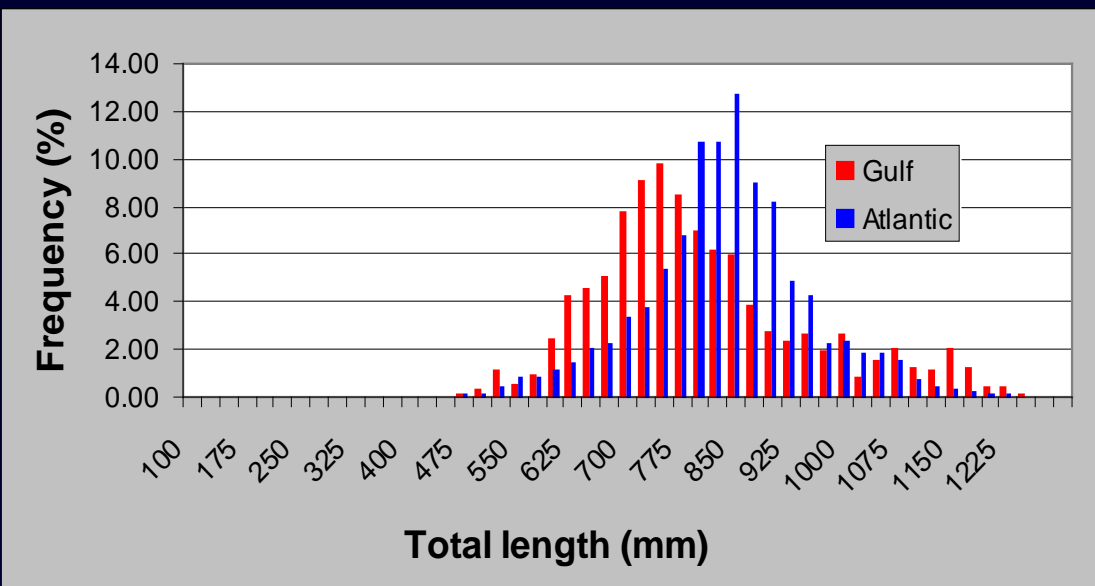
Gulf catches are smaller on average than those in the Atlantic

Commercial hook and line collections, 1994 - 1995



Percent male by size.

In the Gulf, 50% of gag are male at 1173 mm TL



Size frequency.

Gulf catches are smaller on average than those in the Atlantic

Faced with:

Increasing landings

Catch with smaller size structure

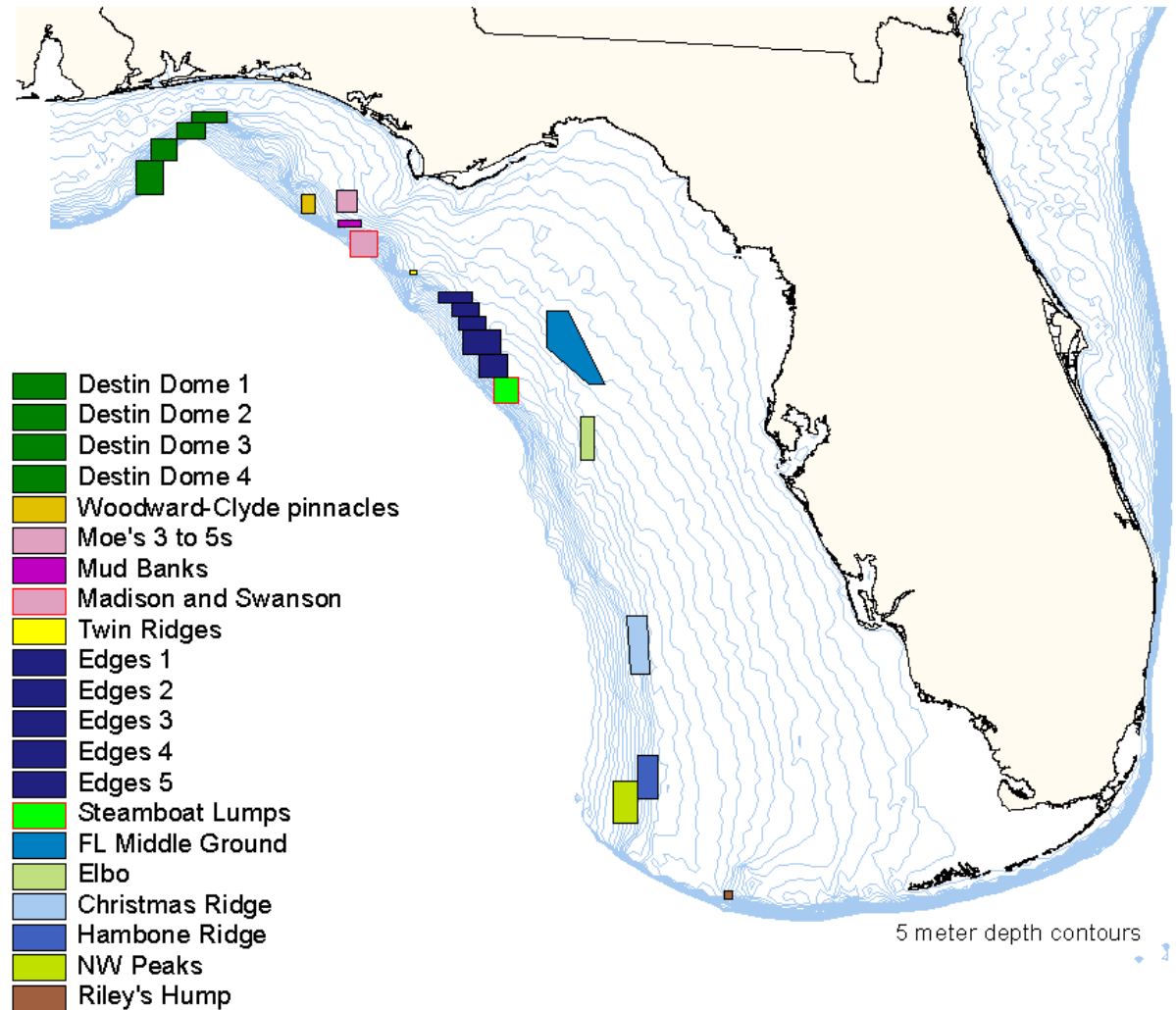
Protogynous hermaphrodite

Haremic spawning with strong site fidelity

Sex ratio reduced below historical levels

GMFMC selected partial closure of shelf-edge spawning sites as a management strategy

At least 24 potential MPA sites were considered



Two sites were selected:
Madison-Swanson and Steamboat Lumps



EXPECTATIONS

Increases in size and number of adult local populations
Increased reproductive output and recruitment
Enhanced fishery yields in adjacent fishing areas

Results of SE US closures

In the Tortugas Bank Reserve, significantly greater abundances and larger individuals of exploited species were observed. Increases and decreases in nonexploited species were also detected. These results could be confounded by regional fishery management (Ault et al. 2006).

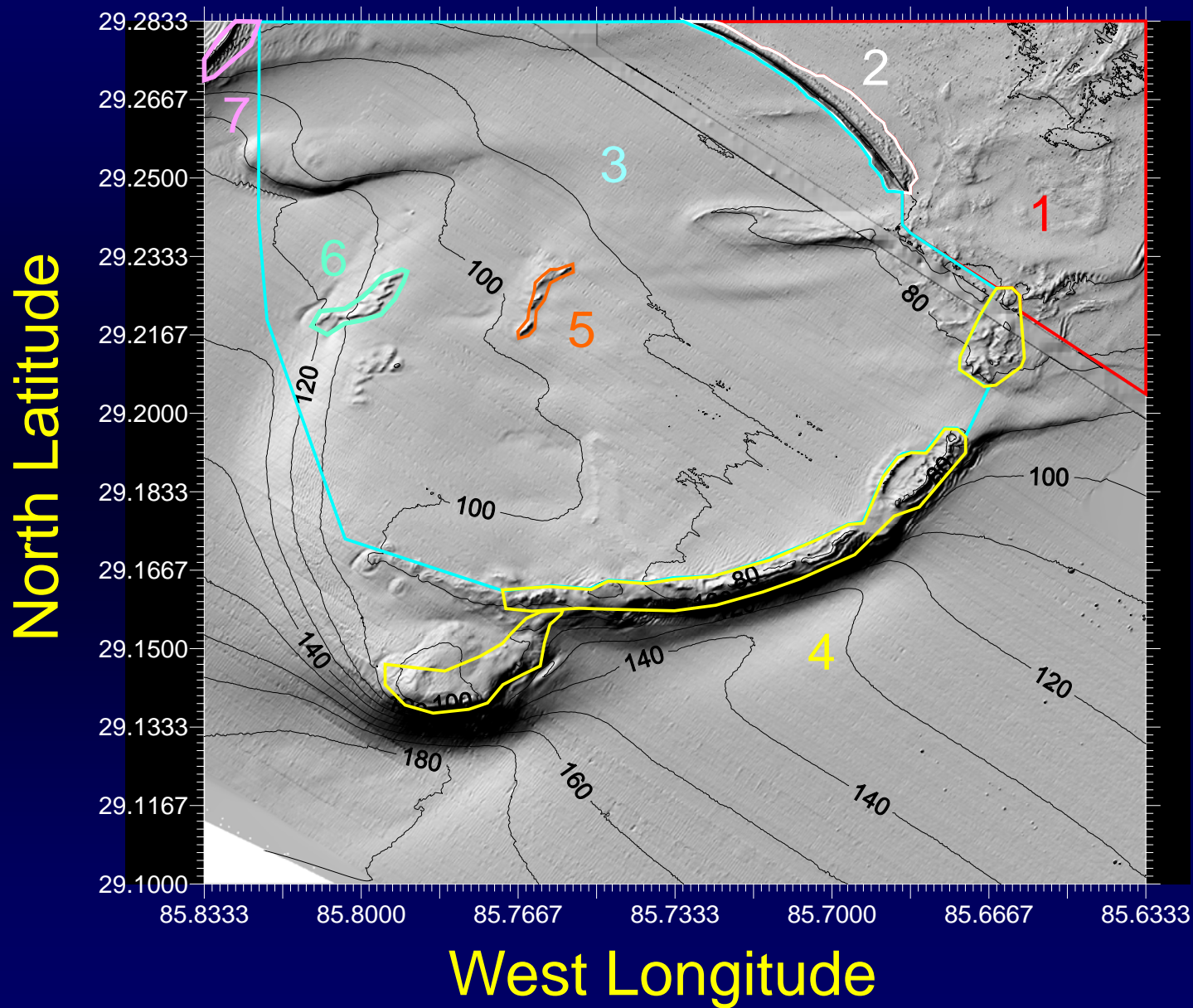
OBJECTIVES

- Establish baseline estimates of fish abundance, especially for species of groupers and snappers
- Describe significant habitat features in the Madison-Swanson and Steamboat Lumps MPAs
- Analyze the relationship between habitat and species assemblages
- Track changes in fish abundance and distribution within the MPAs during the closure period

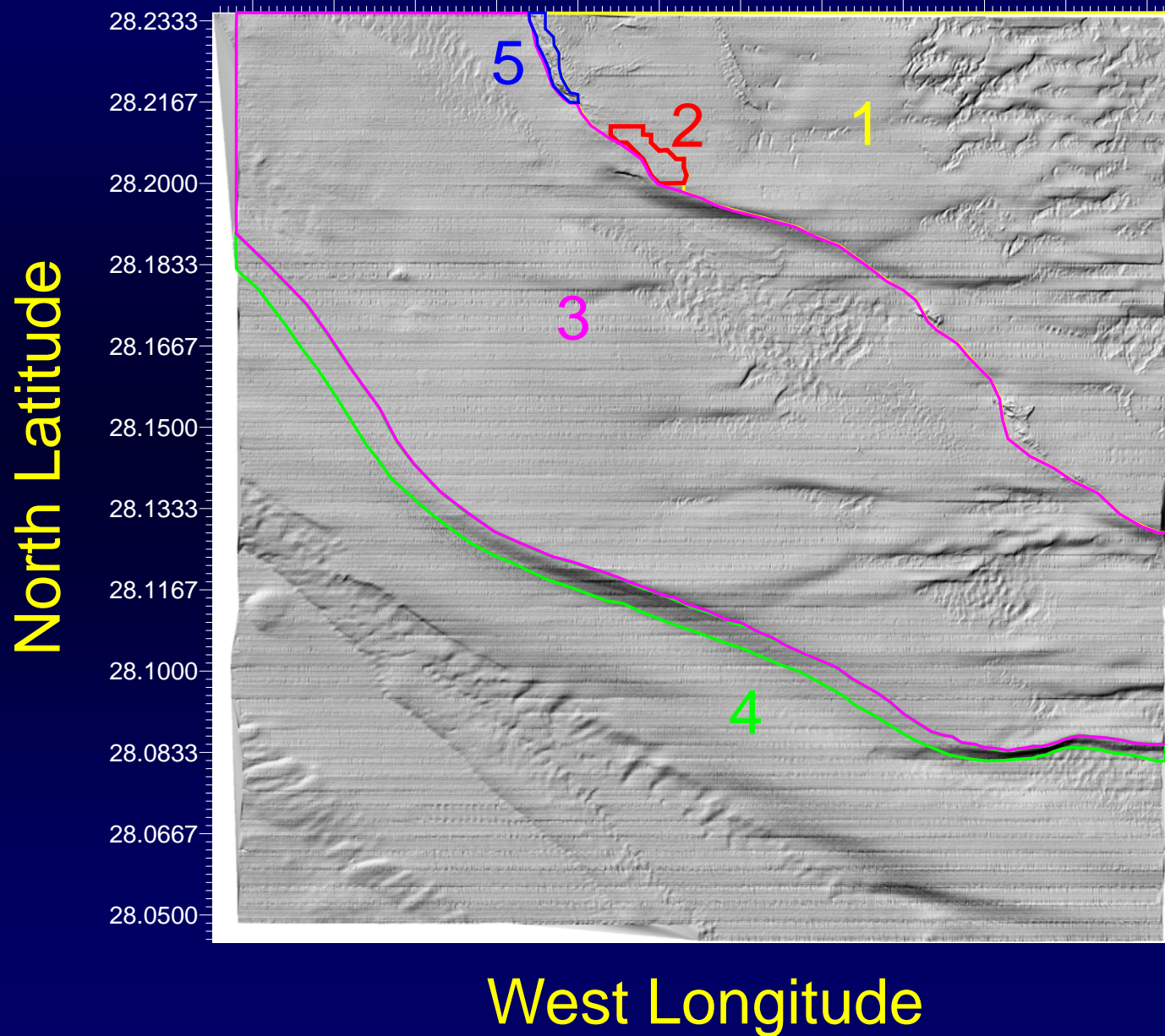
METHODS

- Stratify areas using multibeam bathymetry and acoustic backscatter imagery
- Randomly select sites within each stratum (7 strata within Madison-Swanson, 5 in Steamboat Lumps)
- Conduct annual video surveys with seasonal uniformity to assess habitat and fish assemblages
- Compare MPAs with adjacent open-to-fishing area as well as Gulf-wide SEAMAP survey

Site Stratification within Madison-Swanson



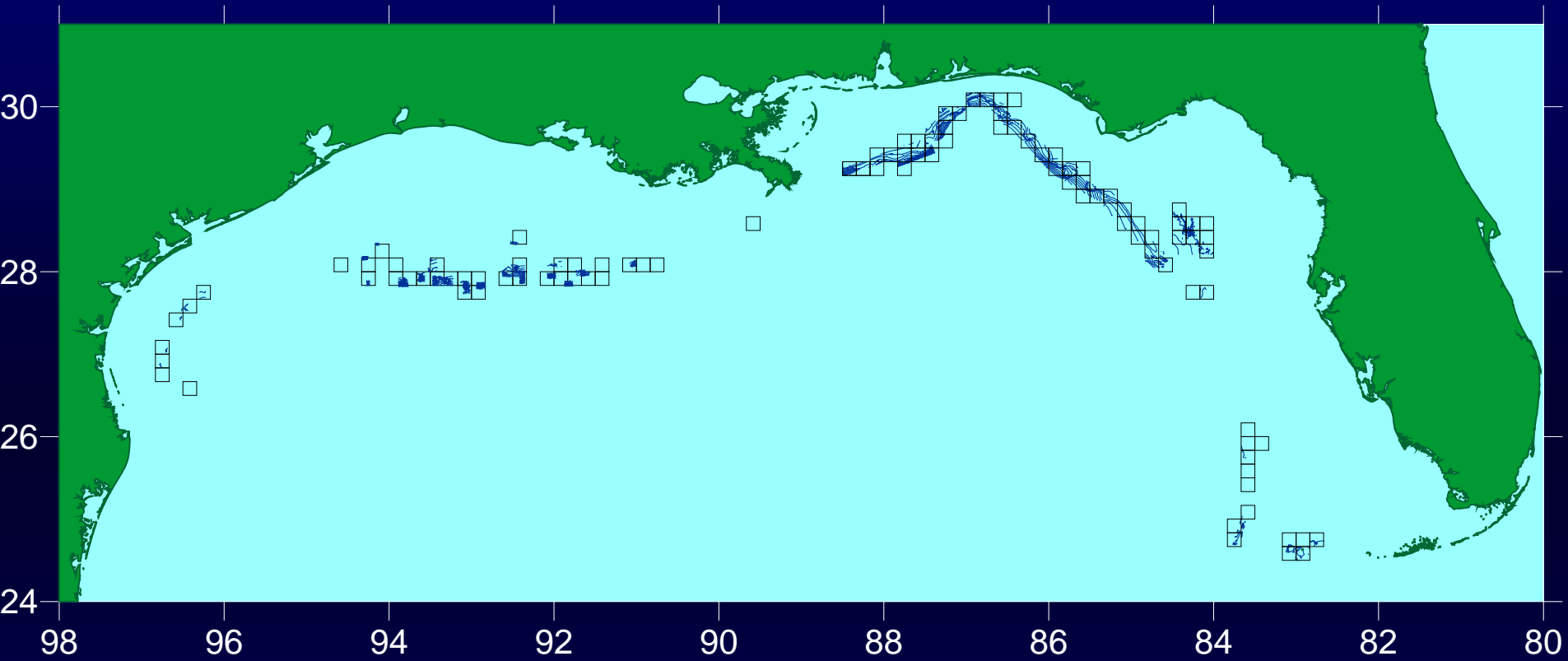
Site Stratification within Steamboat Lumps MPA



Twin Ridges Control Area

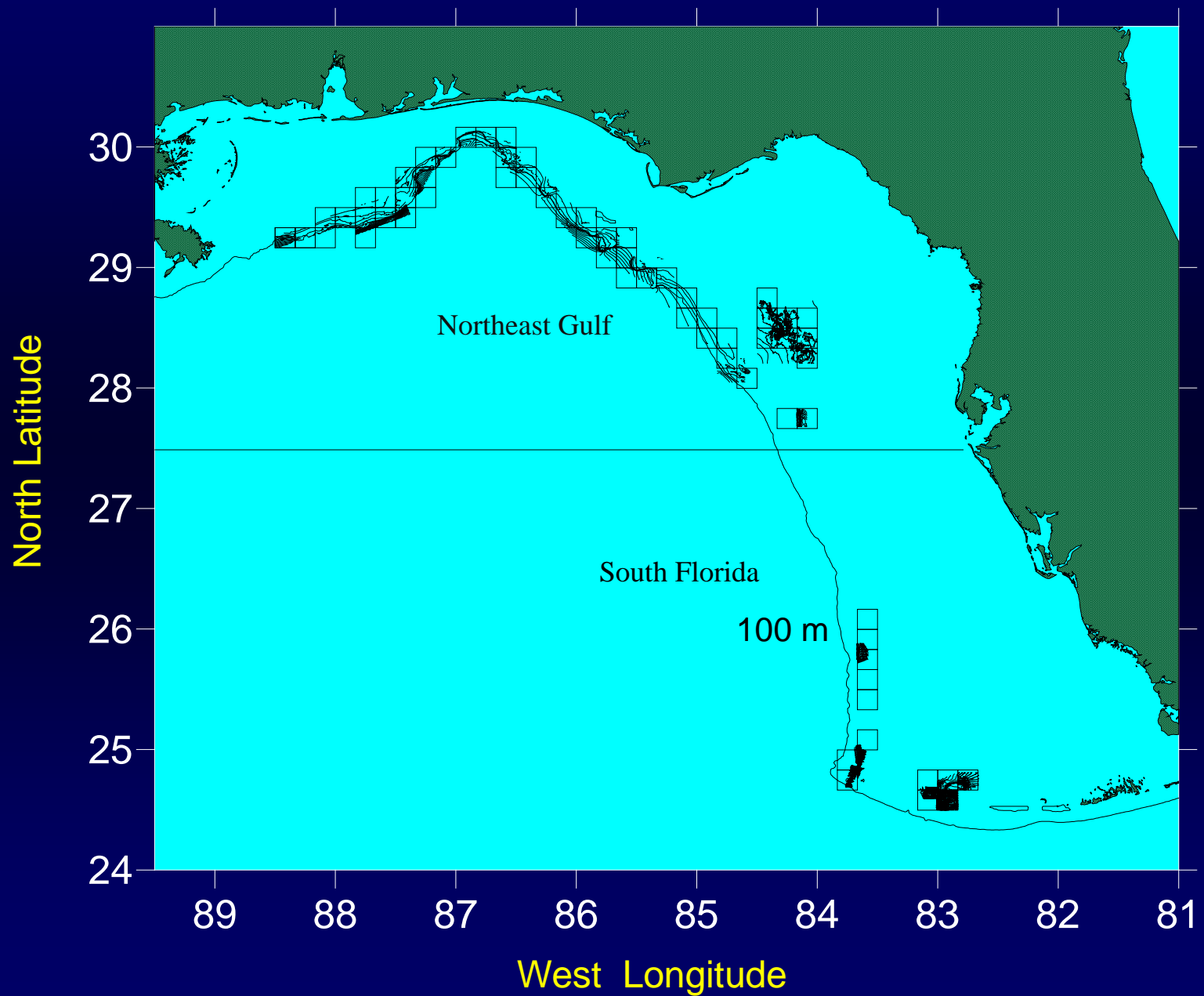


SEAMAP sampling blocks



- Survey years: 1992-1997, 2001*, 2002, 2004, and 2005
- Targets groupers, snappers, gray triggerfish, amberjacks and red porgy.
- Two stage sampling. Primary Units are 10' Blocks of latitude and longitude.
- Ultimate sample units are reef sites.

Eastern GOM SEAMAP sampling blocks



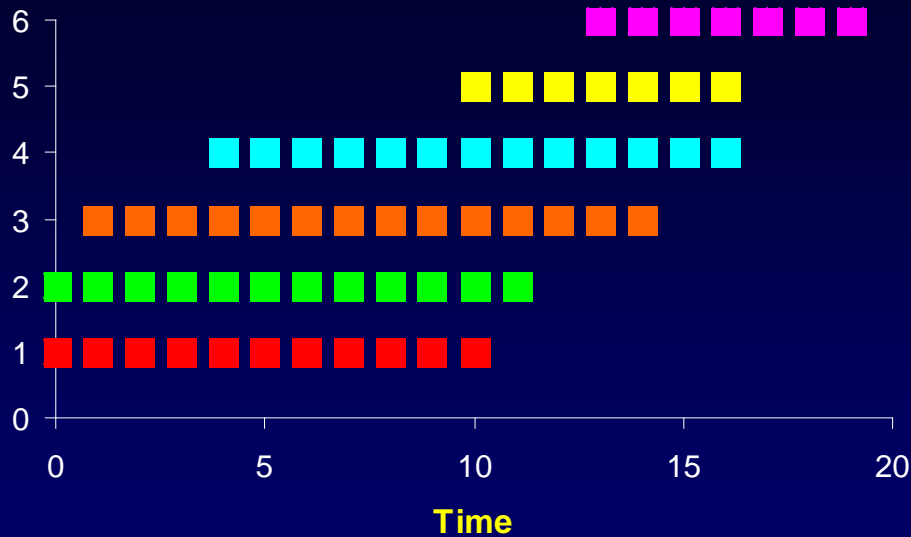


Five camera array using 4 Sony VX1000 digital camcorders in Gates housings, and a single, down-looking Sony PC110 or PC120 digital camcorder in a Gates housing



Viewing Methodology

Taxon	Time In	Time Out
Red snapper	00:00	00:10
	00:00	00:11
	00:01	00:14
	00:04	00:16
	00:10	00:16
	00:13	00:19



- For the segment of tape viewed, a total of 6 red snapper entered and left the field of view. The total would be 6 fish.
- Five red snapper were all in the field of view at one time. The minimum number of red snapper present would be 5 fish.
- Time in and time out entered into data base.

MPA SURVEY DATES

30 cruise legs 609 stations

Madison-Swanson MPA

Feb - Apr 2001

Feb - Mar, May 2002

Feb - Mar 2003

Feb - Mar, May 2004

Feb - Mar 2005

Feb - Mar 2006

Steamboat Lumps MPA

Jun - Jul 2001

May 2002

Mar 2003

May 2004

Mar 2005

Mar 2006

Twin Ridges

Apr 2001

May 2002

Mar 2003

Mar, May 2004

Feb - Mar 2005

Mar 2006

MADISON-SWANSON

Stratified mean number of fish per site

Year	n	Gag Mean \pm SE	Scamp Mean \pm SE	Red Grouper Mean \pm SE	Red Snapper Mean \pm SE	Vermilion Snapper Mean \pm SE
2001	34	0.198 \pm 0.186	0.983 \pm 0.751	0.292 \pm 0.001	1.063 \pm 0.855	0.040 \pm 0.030
2002	45	0.844 \pm 0.017	3.320 \pm 0.067	0.811 \pm 0.060	0.257 \pm 0.125	0.170 \pm 0.054
2003	61	0.215 \pm 0.105	0.821 \pm 0.197	0.062 \pm 0.036	0.139 \pm 0.036	0.162 \pm 0.142
2004	50	0.099 \pm 0.029	0.490 \pm 0.099	0.157 \pm 0.047	0.340 \pm 0.217	0.427 \pm 0.255
2005	58	0.185 \pm 0.053	0.940 \pm 0.038	0.204 \pm 0.043	0.633 \pm 0.403	2.012 \pm 1.769

STEAMBOAT LUMPS

Stratified mean number of fish per site*

Year	n	Gag Mean \pm SE	Scamp Mean \pm SE	Red Grouper Mean \pm SE	Red Snapper Mean \pm SE	Vermilion Snapper Mean \pm SE
2001	43	0.001 \pm 0.001	0.007 \pm 0.006	0.003 \pm 0.003	0.001 \pm 0.001	0.108 \pm 0.044
2002	19	0.001 \pm 0.001	1.112 \pm 1.104	0.157 \pm 0.157	0	1.090 \pm 1.082
2003	5	-	-	-	-	-
2004	5	-	-	-	-	-
2005	14	0.009 \pm 0.002	0.021 \pm 0.001	0.009 \pm 0.001	0.005 \pm 0.003	0

* Only stratum 5 was sampled in 2003 and strata 2 and 5 were sampled in 2004

TWIN RIDGES

Mean number of fish per site

Year	n	Gag Mean \pm SE	Scamp Mean \pm SE	Red Grouper Mean \pm SE	Red Snapper Mean \pm SE	Vermilion Snapper Mean \pm SE
2001	15	0	1.200 \pm 0.518	0.200 \pm 0.145	1.800 \pm 0.751	0
2002	7	0.429 \pm 0.202	2.857 \pm 0.738	0.143 \pm 0.143	0.286 \pm 0.286	5.571 \pm 4.151
2003	14	1.571 \pm 0.590	4.000 \pm 0.938	0.429 \pm 0.137	1.357 \pm 0.700	0.071 \pm 0.071
2004	12	0.417 \pm 0.260	3.750 \pm 0.962	0.750 \pm 0.218	1.250 \pm 0.509	1.000 \pm 0.769
2005	16	0.250 \pm 0.144	6.188 \pm 1.085	1.125 \pm 0.352	2.125 \pm 0.735	2.688 \pm 2.051

MADISON-SWANSON

Mean abundance of fish estimated under simple random sampling*

Year	n	Gag Mean \pm SE	Scamp Mean \pm SE	Red Grouper Mean \pm SE	Red Snapper Mean \pm SE	Vermilion Snapper Mean \pm SE
2001	30	0.067 \pm 0.046	0.700 \pm 0.221	0.267 \pm 0.095	1.400 \pm 0.937	0.733 \pm 0.668
2002	44	1.091 \pm 0.197	3.477 \pm 0.388	0.114 \pm 0.048	1.955 \pm 0.511	4.136 \pm 1.556
2003	55	1.182 \pm 0.201	4.800 \pm 0.641	0.364 \pm 0.079	1.982 \pm 0.709	0.982 \pm 0.862
2004	43	0.721 \pm 0.164	4.116 \pm 0.797	0.465 \pm 0.102	1.512 \pm 0.436	0.907 \pm 0.391
2005	47	1.213 \pm 0.239	5.489 \pm 0.965	0.660 \pm 0.119	2.553 \pm 0.596	2.489 \pm 1.474

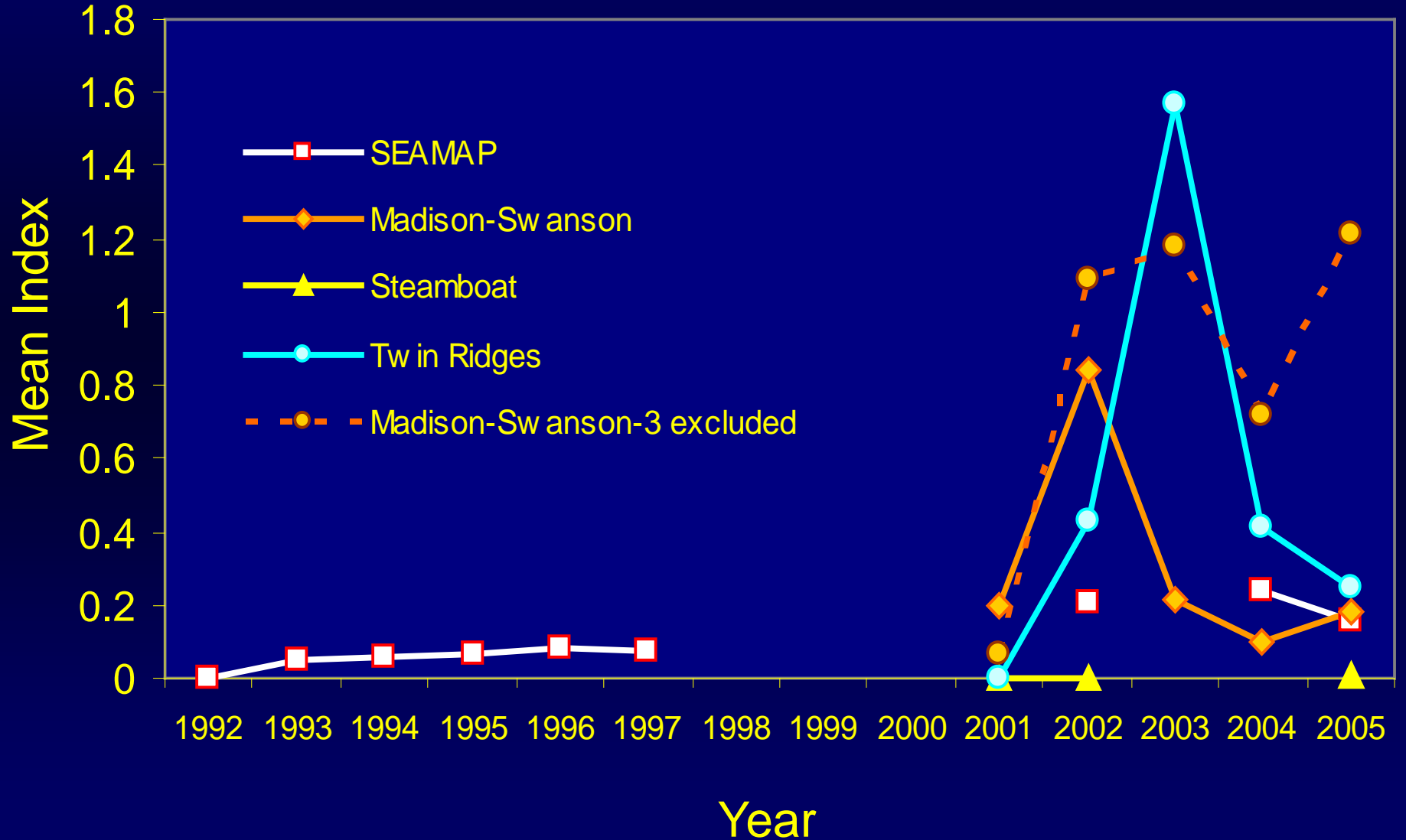
* Stratum 3 excluded

SEAMAP Eastern Gulf

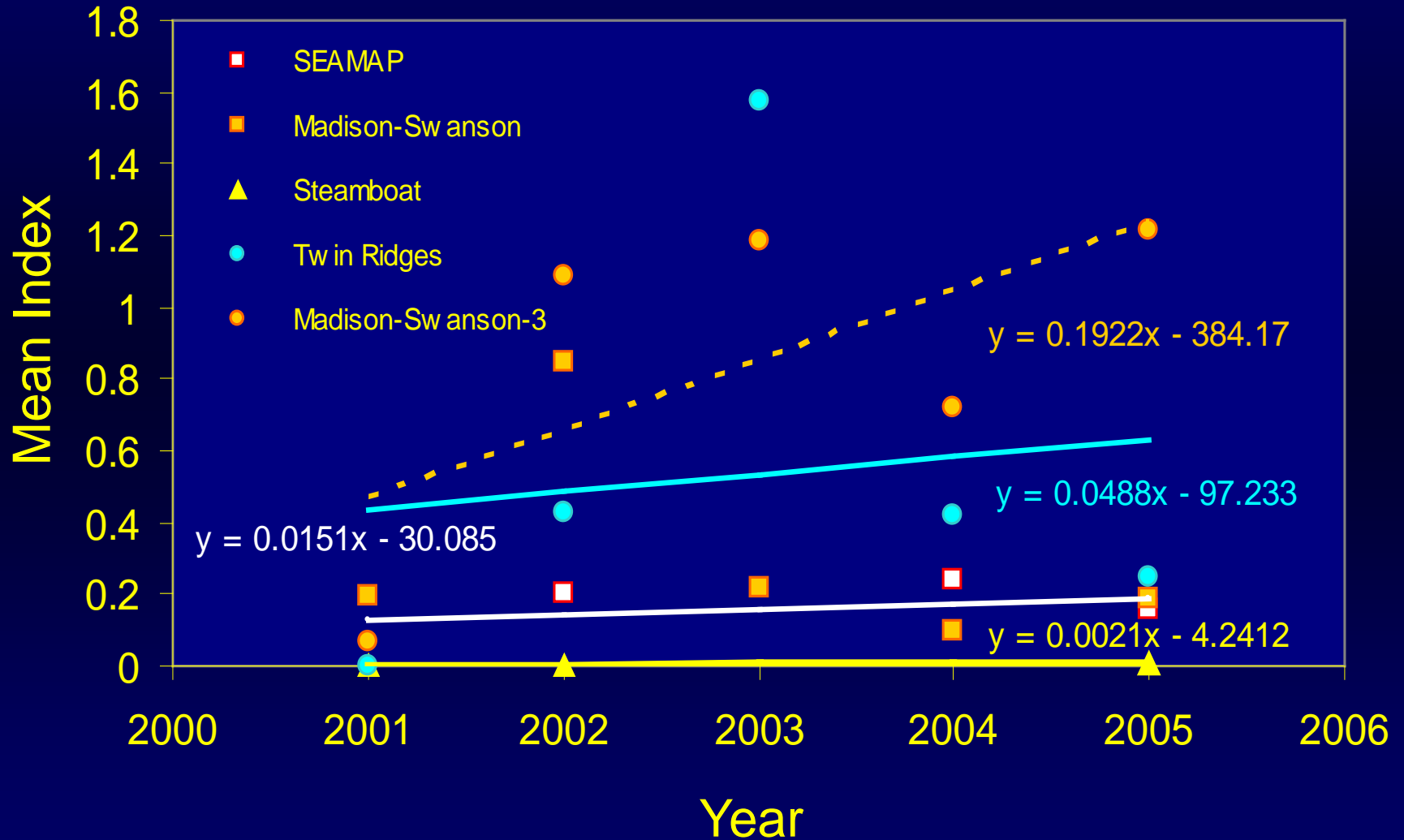
Stratified mean number of fish per site

Year	n	Gag Mean \pm SE	Scamp Mean \pm SE	Red Grp Mean \pm SE	Red Snap Mean \pm SE	Vermilion Mean \pm SE
1992	12	0	-	0	0.044 \pm 0.062	2.147 \pm 2.744
1993	18	0.052 \pm 0.089	-	0.323 \pm 0.267	0.108 \pm 0.140	2.093 \pm 3.571
1994	14	0.056 \pm 0.121	-	0.241 \pm 0.185	0.179 \pm 0.167	4.227 \pm 3.642
1995	13	0.066 \pm 0.115	-	0.420 \pm 0.265	0.066 \pm 0.057	1.538 \pm 1.626
1996	21	0.083 \pm 0.125	0.083 \pm 0.125	0.277 \pm 0.227	0.083 \pm 0.125	0.758 \pm 1.210
1997	20	0.076 \pm 0.099	0.075 \pm 0.099	0.424 \pm 0.220	0.156 \pm 0.251	2.232 \pm 2.190
2002	19	0.206 \pm 0.196	0.206 \pm 0.196	0.423 \pm 0.267	0.305 \pm 0.218	3.120 \pm 4.037
2004	18	0.243 \pm 0.232	0.243 \pm 0.232	0.567 \pm 0.317	0.243 \pm 0.232	1.032 \pm 1.161
2005	28	0.157 \pm 0.163	1.092 \pm 0.863	0.465 \pm 0.291	0.627 \pm 0.661	-

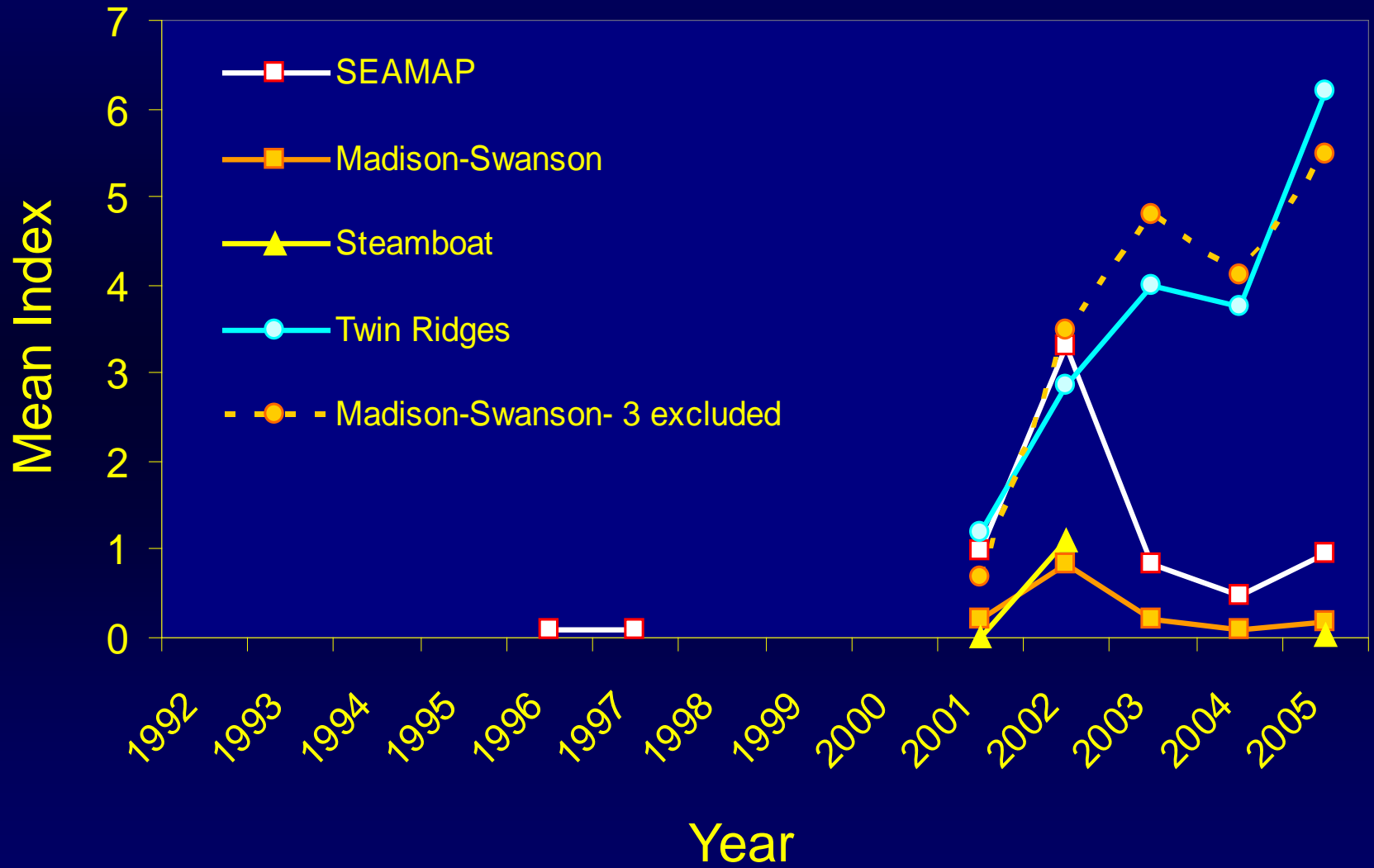
GAG



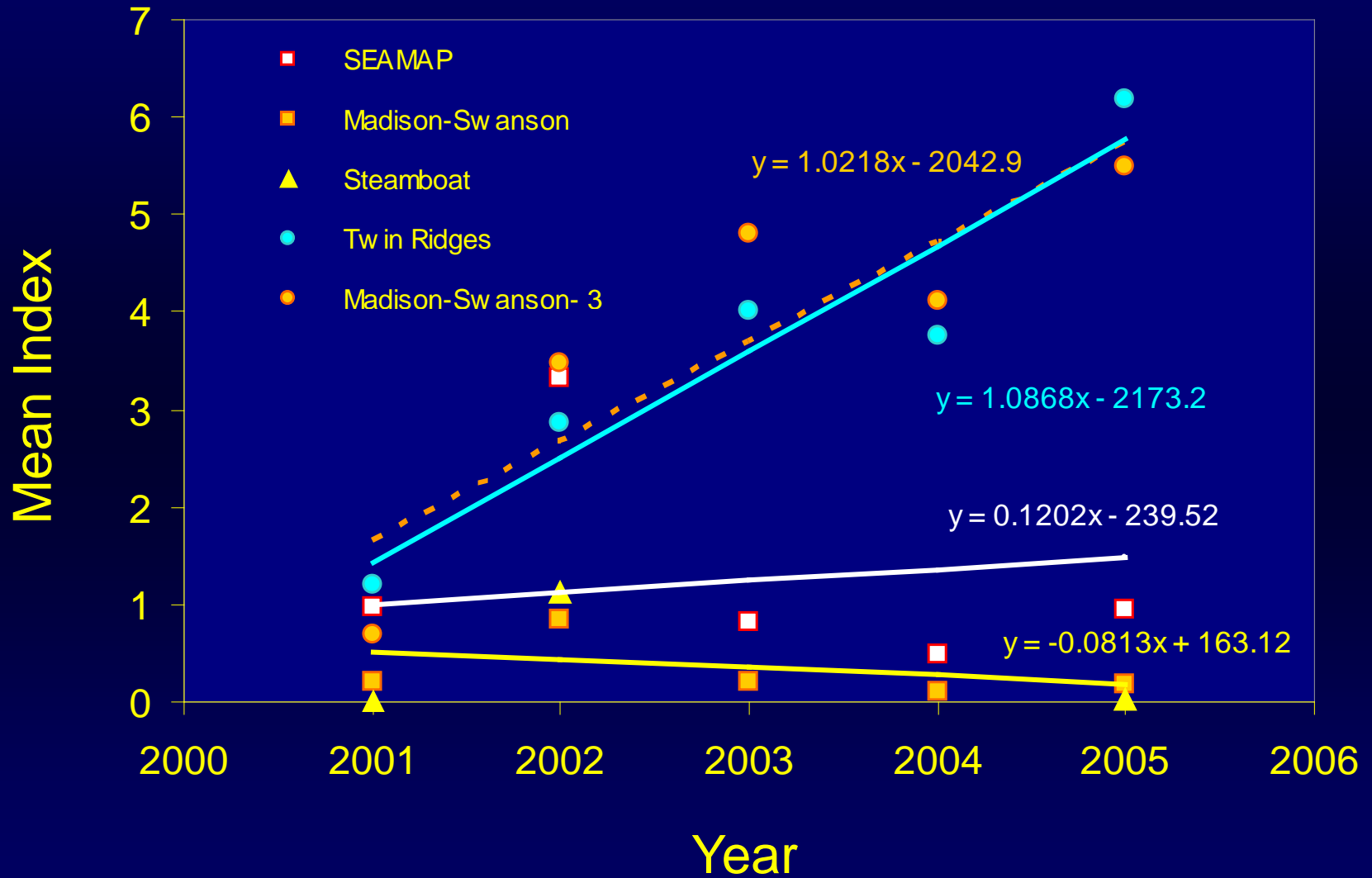
GAG



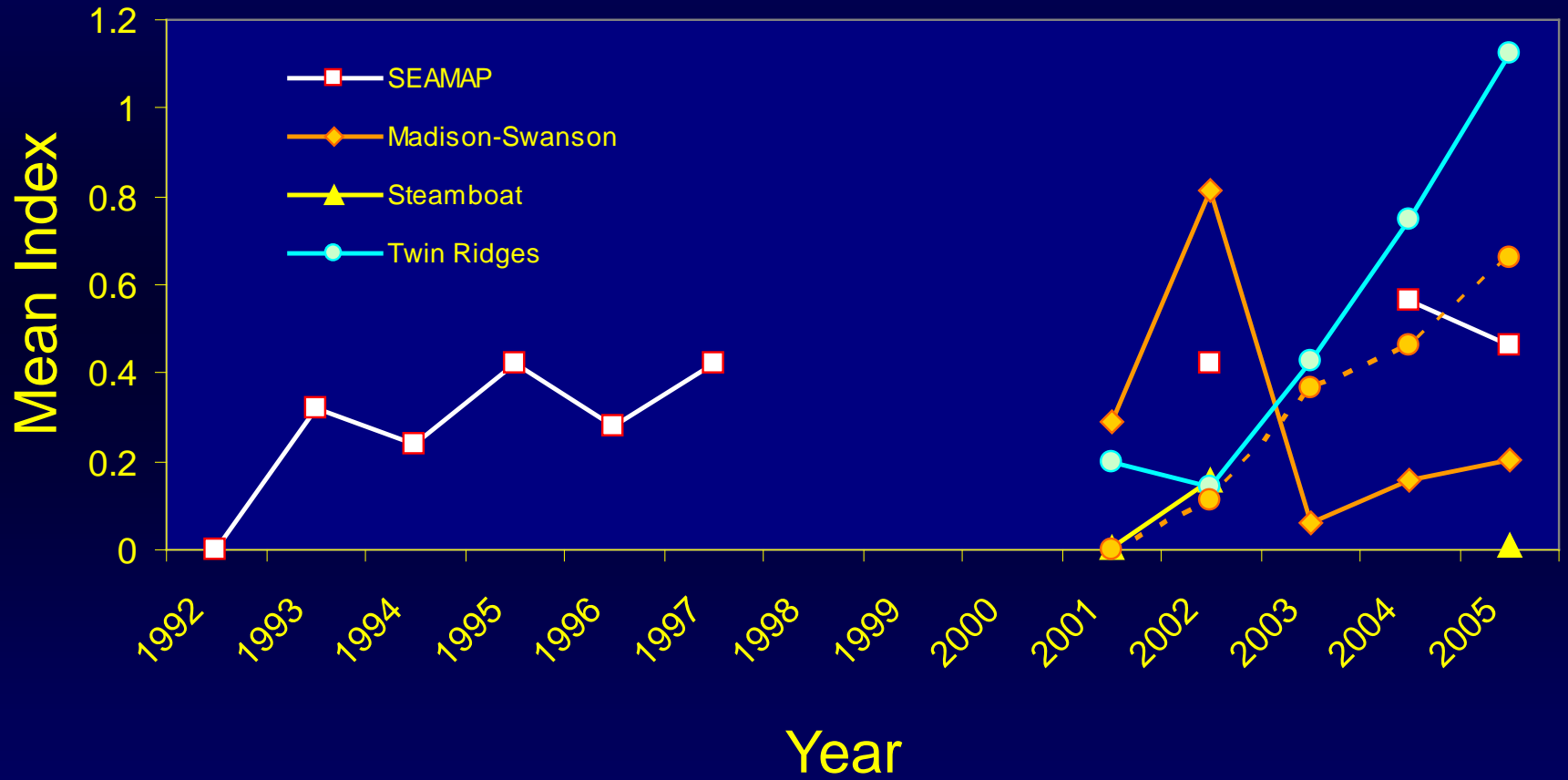
SCAMP



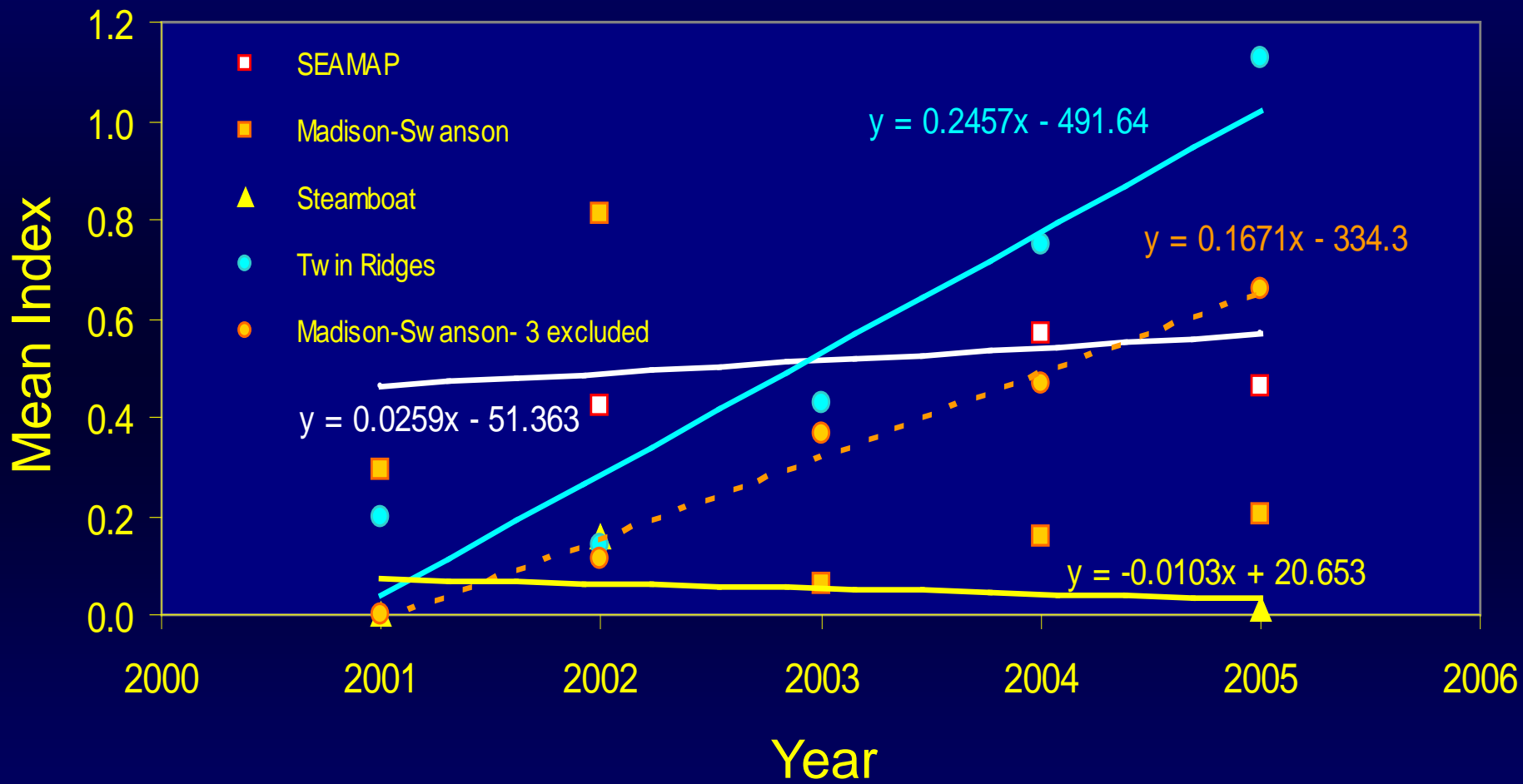
SCAMP



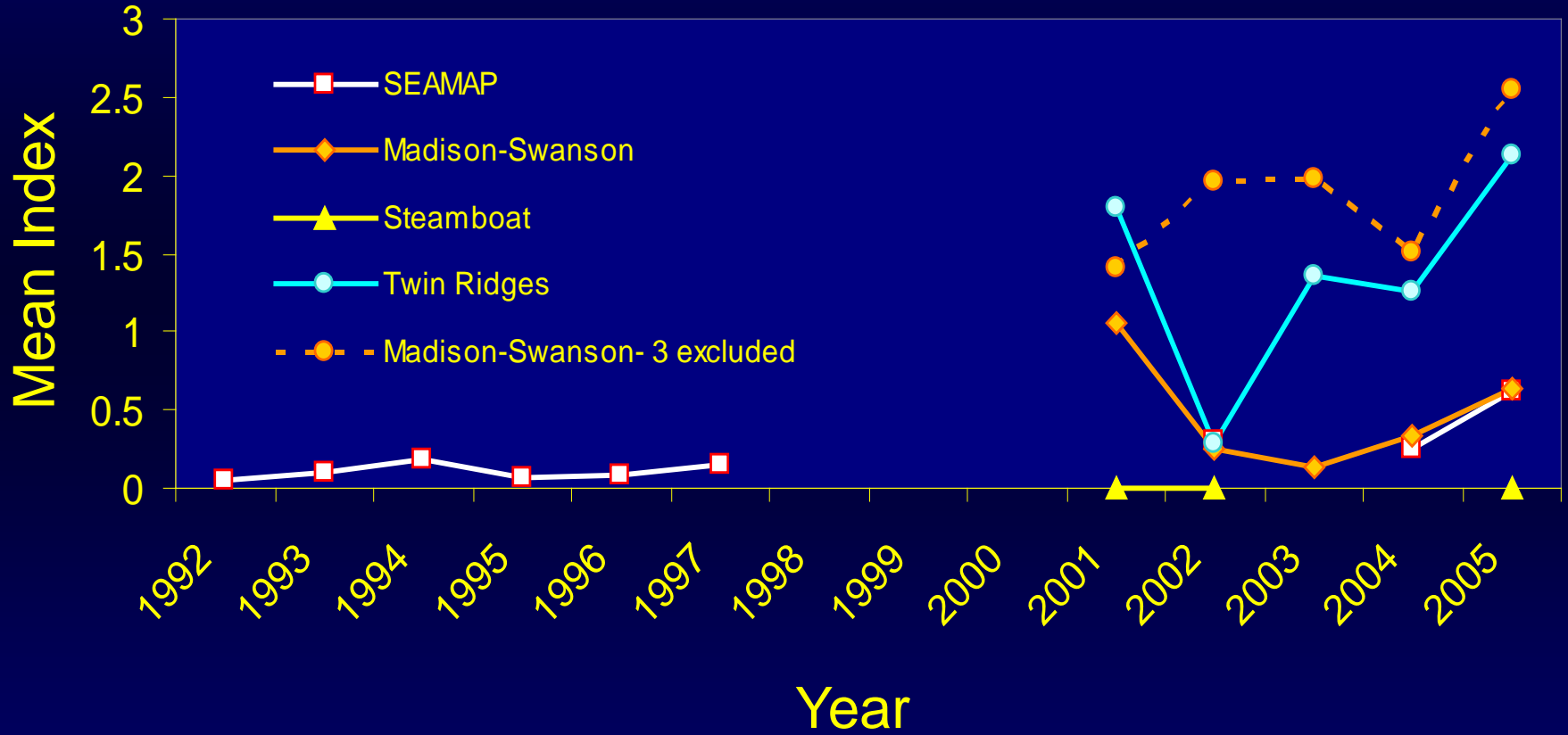
RED GROUPER



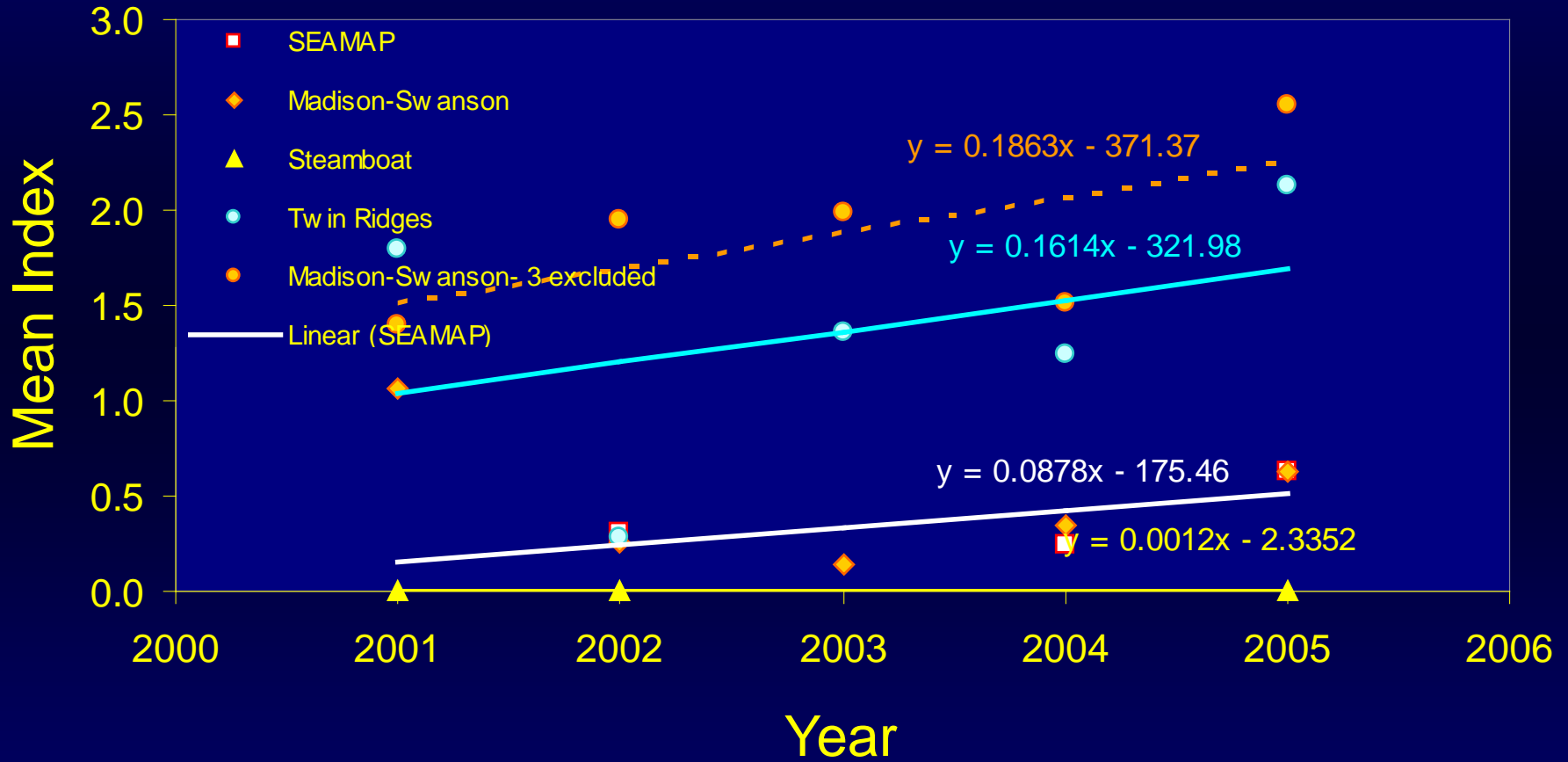
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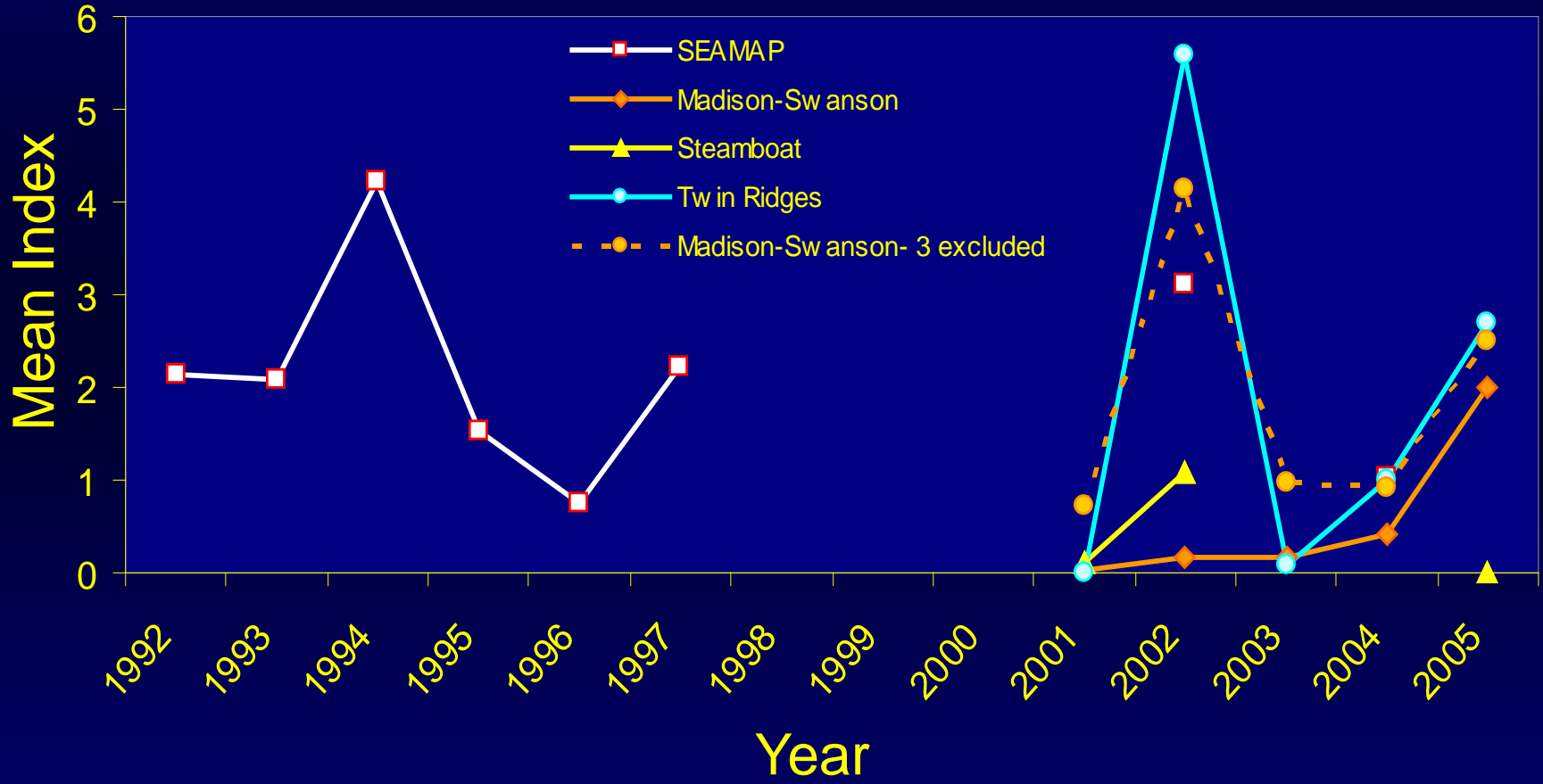
RED SNAPPER



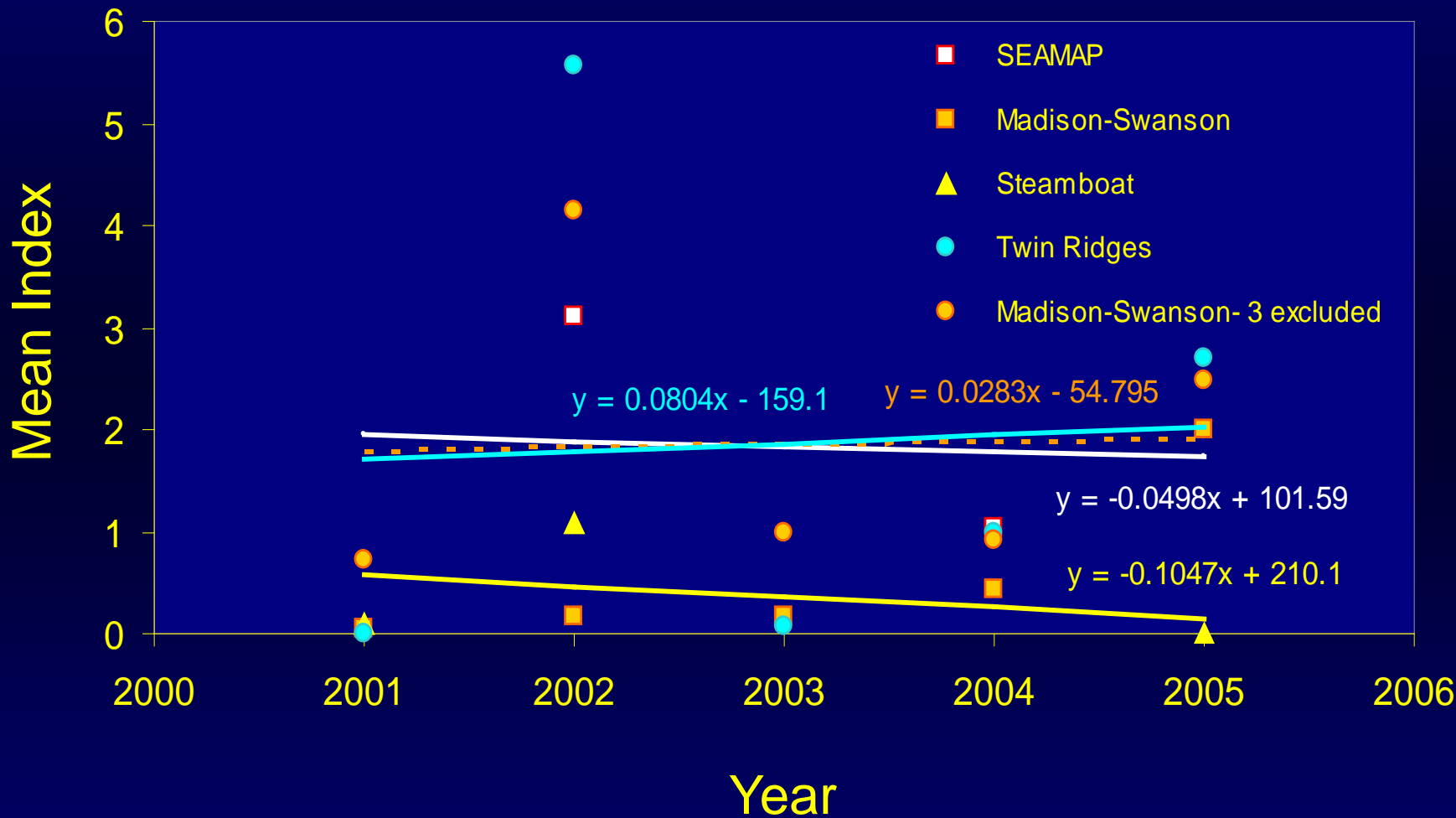
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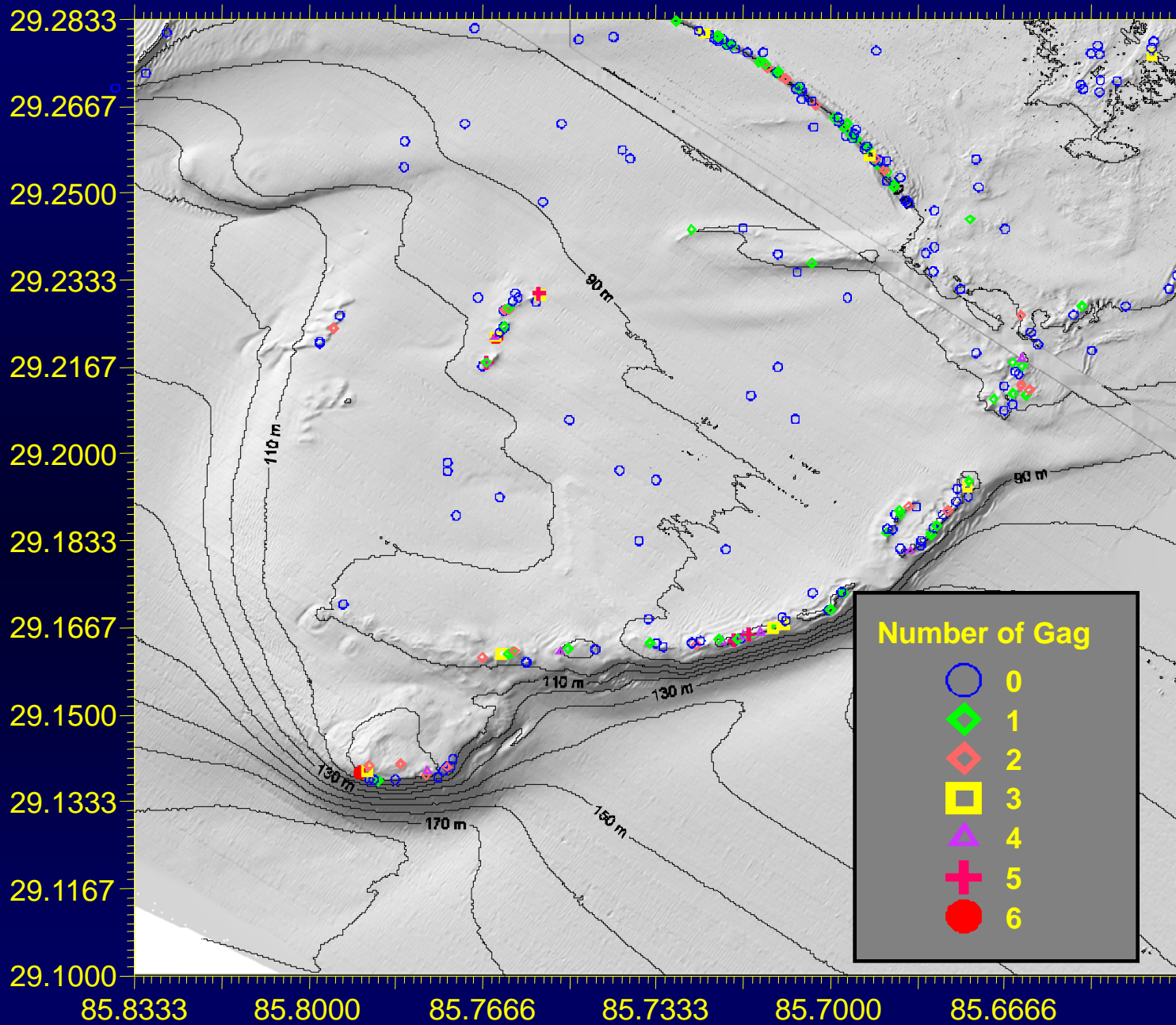
VERMILION SNAPPER



VERMILION SNAPPER



North Latitude



West Longitude

Trends in Population Indices

	Madison-Swanson	Steamboat Lumps	Twin Ridges	Eastern GOM
Gag	Increase	Level	Increase	Increase
Scamp	Increase	Level	Increase	Increase
Red Grouper	Increase	Level	Increase	Increase
Red Snapper	Increase	Level	Increase	Increase
Vermilion Snapper	Level	Level	Level	Level

SUMMARY

- Steamboat Lumps MPA does not contain significant grouper/snapper habitat.
- Grouper/snapper abundances were low and did not change over time within the Steamboat Lumps MPA.
- A general increase in groupers and red snapper was observed in the Madison-Swanson MPA, Twin Ridges and along the eastern Gulf of Mexico shelf.
- Increases within the Madison-Swanson MPA were higher than in the eastern Gulf.

SUMMARY

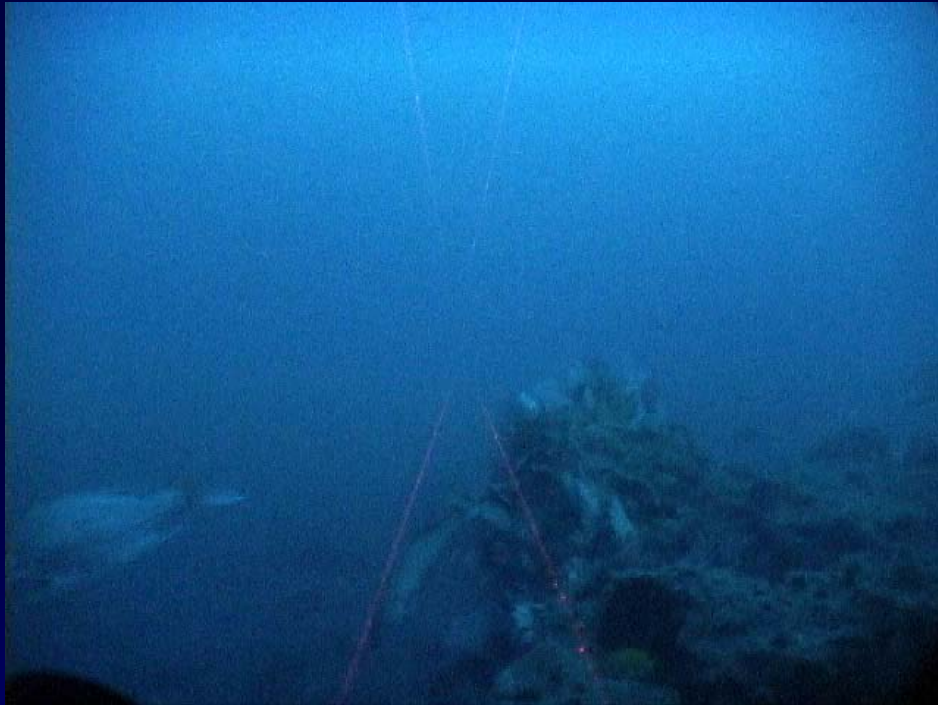
- Difficult to determine at this time if change in grouper/snapper abundance was due to the no-take reserve or other management actions.
- Reef fish size and age increased in the Madison-Swanson MPA for all species except gag – Koenig & Coleman
- Percentage of male gag in the Madison-Swanson MPA population increased after closure then decreased, due to poaching – Koenig & Coleman

ACKNOWLEDGEMENTS

- Funding provided by MARFIN (2001) and Coral Reef Conservation Program (2001-2006)
- R/V Caretta, R/V Gandy, NOAA Ship OREGON II
- John Brusher, Paul Felts, Chris Gardner, Stacey Harter, Linda Lombardi, Chris Palmer, Kevin Rademacher, Marta Ribera, Brandi Trigg, Bill Walling

Change in habitat Madison-Swanson Mounds Strata

2005



2006



Sediment shifts after passage of Hurricanes Dennis, Katrina, and Rita have altered habitat