

*Science, Service, Stewardship*



# SEFSC Research Activities

**2013 Spring Species Working Groups Meeting  
of the Advisory Committee to the U.S. Section to ICCAT  
April 4<sup>th</sup>–5<sup>th</sup>, 2013 Silver Spring, MD**

**Craig Brown**

**NOAA  
FISHERIES  
SERVICE**



ICCAT CICTA CICAA





## Pelagic Observer Program 2012 Gulf of Mexico Enhanced Observer Coverage

### ***Results: (NON-Experimental)***

- Coverage period was April 2<sup>nd</sup> – June 15<sup>th</sup>
- 53 observed trips, 403 sets, 41 different vessels, 601 sea days
- Landings: 1580 YFT, 1302 SWO, 129 BET
- BFT catch/bycatch: 17 landed, 30 released alive, 66 released dead, 9 lost (122 total)

### ***Results: (Experimental)***

- 8 observed trips, 71 sets, 2 distinct vessels, 108 sea days.
- Landings: 671 YFT, 12 SWO, 3 BET
- BFT catch/bycatch: 2 landed, 44 released alive, 37 released dead, 6 lost (89 total)
- Weak hook/strong hook research (TDR's and hook timers), and tagging effort



## Pelagic Observer Program 2012 Gulf of Mexico Enhanced Observer Coverage

Samples made available to researchers in 2012:

<u>Tissue Type</u>	<u>#Samples</u>
Gonads	37
Liver	37
Skin	37
Otolith	24
Dorsal spine	36
Vert	35



## Pelagic Observer Program 2012 Gulf of Mexico Enhanced Observer Coverage

### ***2013 Project Objectives:***

- Use available funding to target a 50% observer coverage level. This will produce an expected CV for BFT discard estimates of approximately  $\leq 0.2$  (***see NOAA Technical Memorandum NMFS-SEFSC-588***)
- Continue collecting data regarding spatial and temporal patterns of BFT bycatch
- Continue collecting biological samples from landed fish or dead discards
- Satellite tagging of yellowfin catch (reimbursed) and bluefin tuna bycatch (reimbursed).



## Pelagic Observer Program

- Targeting 50% coverage will fully accommodate research objectives of POP **AND** additional funding will allow expanded research programs for BFT, including:
  - Continue required training and equipment purchases to build capacity for production ageing at the SEFSC
  - Augment existing sampling programs to obtain BFT tissues (e.g. otoliths, tissue) for production ageing, natal origin, movement and other purposes
  - Conduct ongoing survival studies using electronic tagging and appropriate release techniques (PLL)
  - Continue research on bycatch mitigation



## Pelagic Observer Program

- ***This additional research is of enormous value to stock assessment and will enable marked improvements in stock assessment data and methodologies.***

# Larval bluefin tuna gear selectivity and habitat modeling

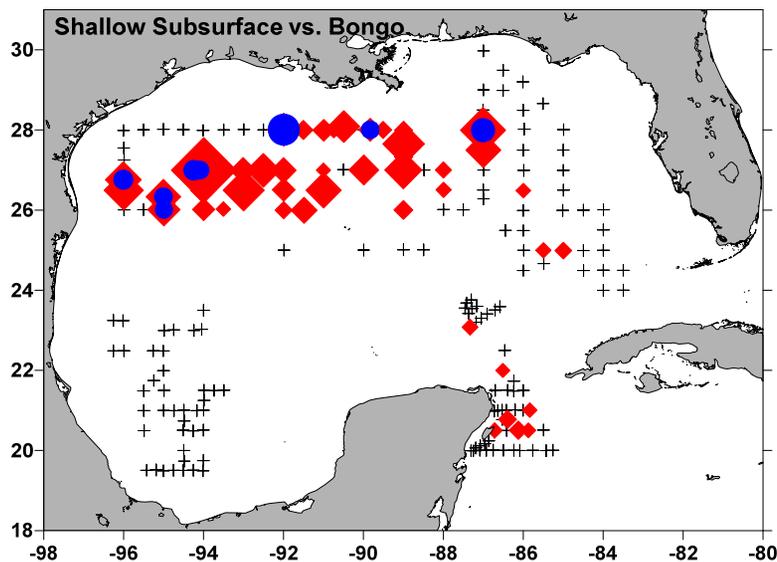
A new plankton sampling method trialed in 2009 has been more widely applied during 2010 – 2012

- This gear has a larger mouth, coarser mesh and fishes shallower depths (0 → 10m) than traditional bongo nets
- Larval occurrences and abundances are significantly higher with this new gear
- This has allowed us to develop more accurate models of potential spawning grounds, and may lead to the development of an improved larval index
- An improved index would allow the more accurate assessment of adult spawning stock biomass in the Gulf of Mexico

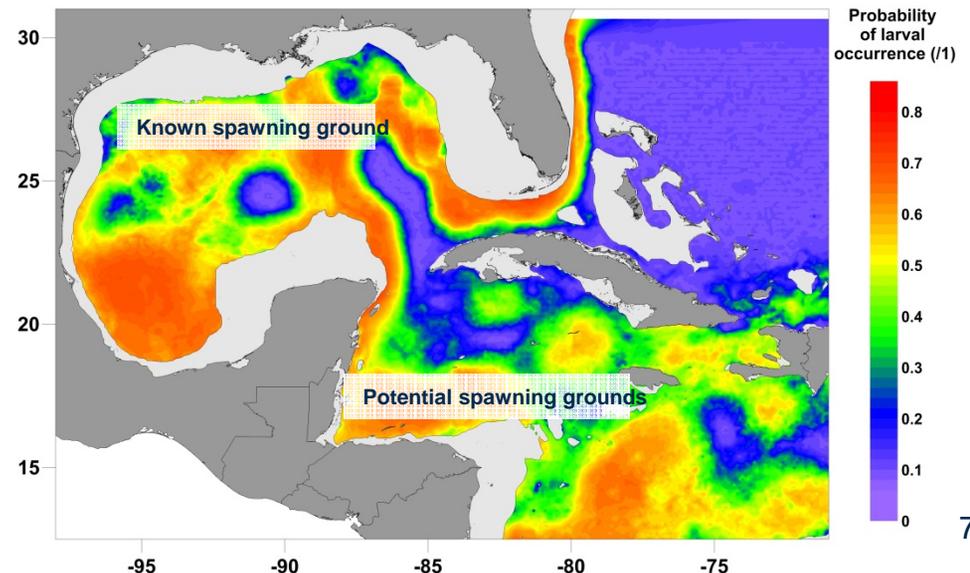
The new shallow subsurface net



Catches from bongo (blue) and subsurface (red) tows, 2010



Experimental model of larval occurrence from new shallow subsurface gear



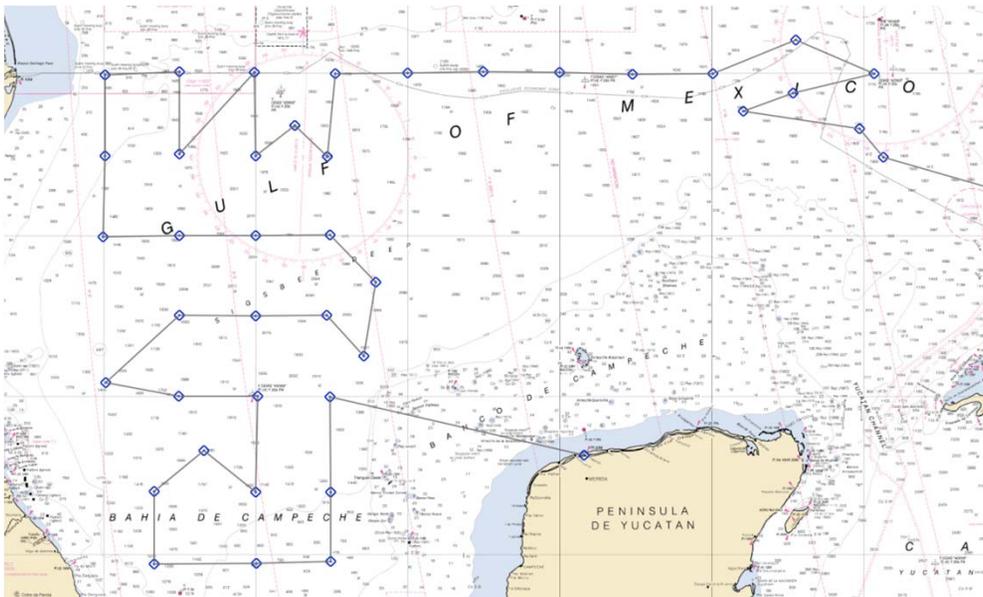
# 2013 spring larval bluefin tuna cruise

Our 2013 research cruise will target the southwestern Gulf of Mexico in May concurrently with the spring survey in the northern Gulf

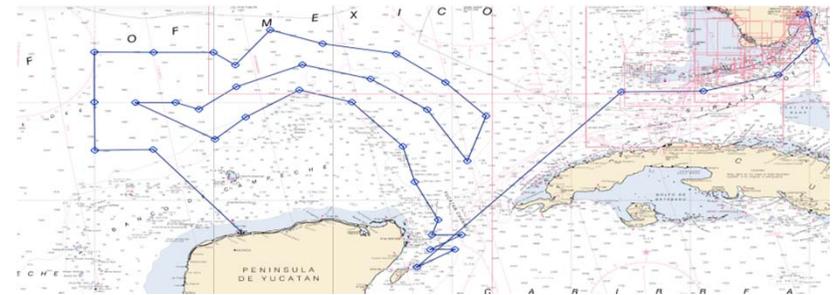
Utilizing plankton sampling gear including discrete depth sampling, and CTD casts, along with predictions from ocean models and satellites we will sample specific oceanographic features beginning north of Cozumel in the western Caribbean and the sw Gulf of Mexico.

In addition to traditional sampling methods, we plan to continue collect bluefin tuna larvae for stable isotope analysis and aging studies. we will also collect depth-stratified samples in the south western Gulf of Mexico, during the late May peak in spawning, to investigate larval ecology and dispersal

**Proposed area to be sampled during 2013 spring research cruise,**



**Sampling methods and oceanographic conditions from spring 2012 cruise**

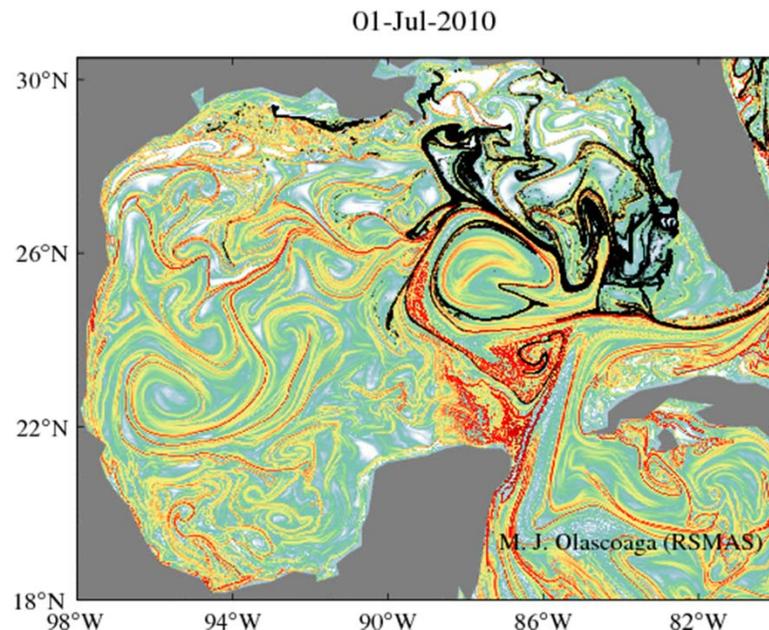


# 2013 spring larval bluefin tuna cruise

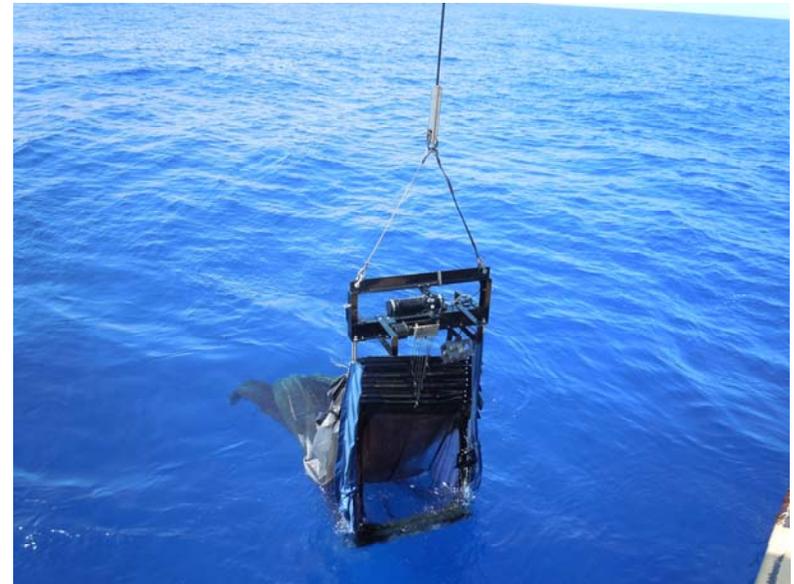
In 2013 we will add an additional research objective aimed at understanding the role of Lagrangian Coherent Structures on tuna spawning and larval distributions. These structures form a barrier to exchange between watermasses and can be regarded as a material line such that fluid particles straddling it either diverge or converge in forward time. LCSs thus delineate the boundary between fluid domains with quite distinct advection characteristics

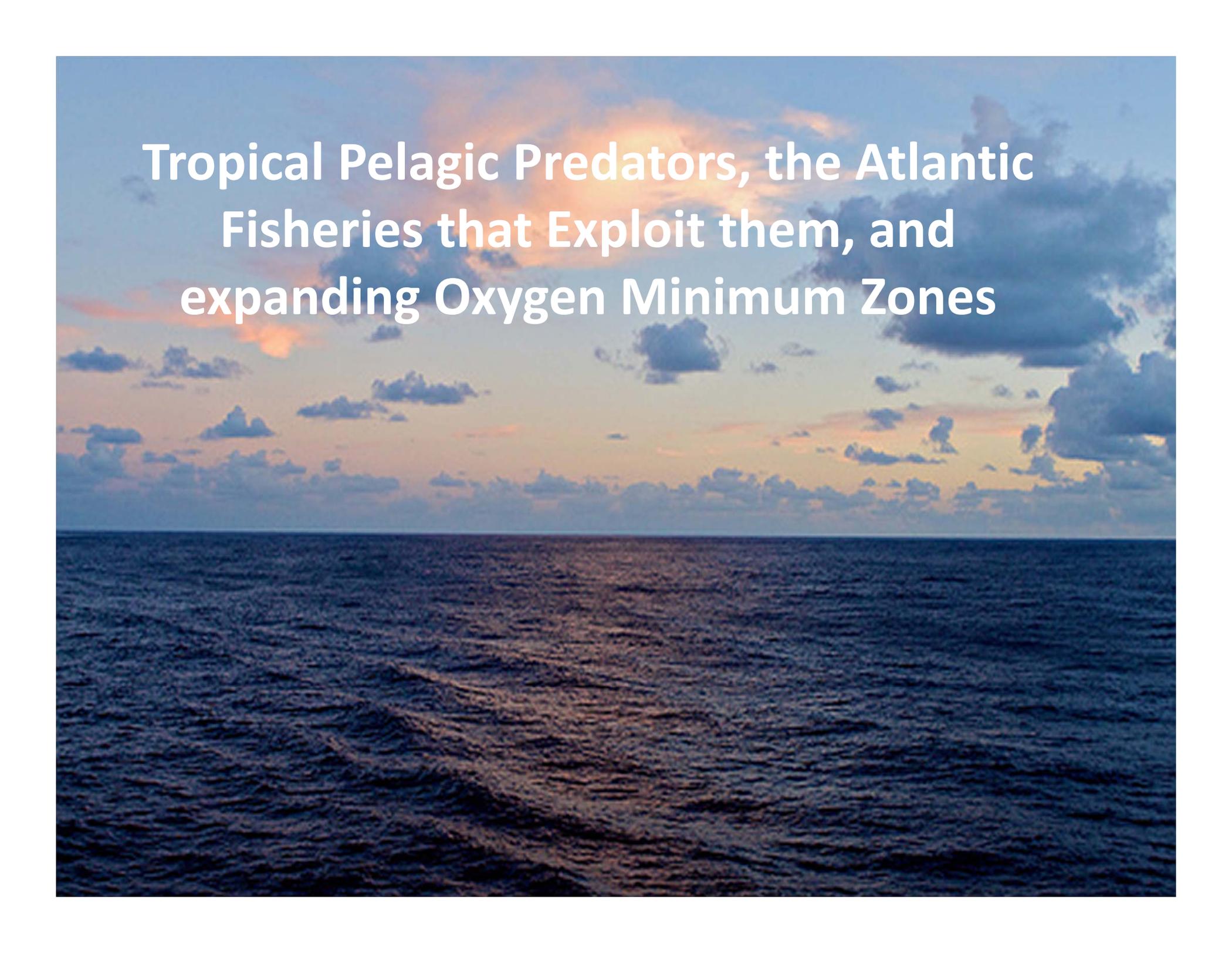
We will sample across and along these structures using discrete depth sampling gear to characterize the larval fish assemblages associated with these structures.

**LCS structure in the Gulf of Mexico 2010,**



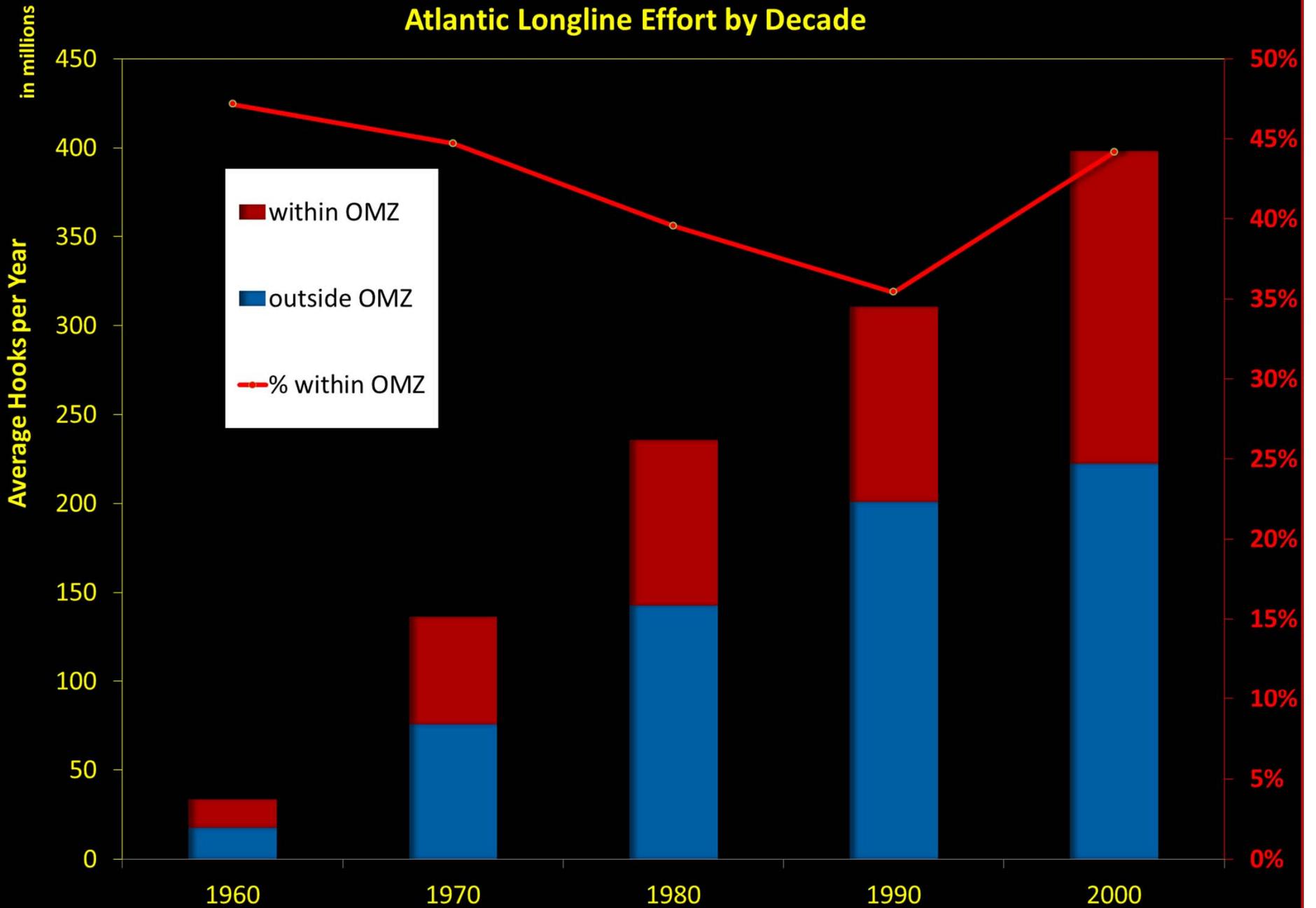
**Discrete depth sampling gear (MOCNESS)  
Samples will be collected in 10 meter bins  
from 50 meters to the surface**

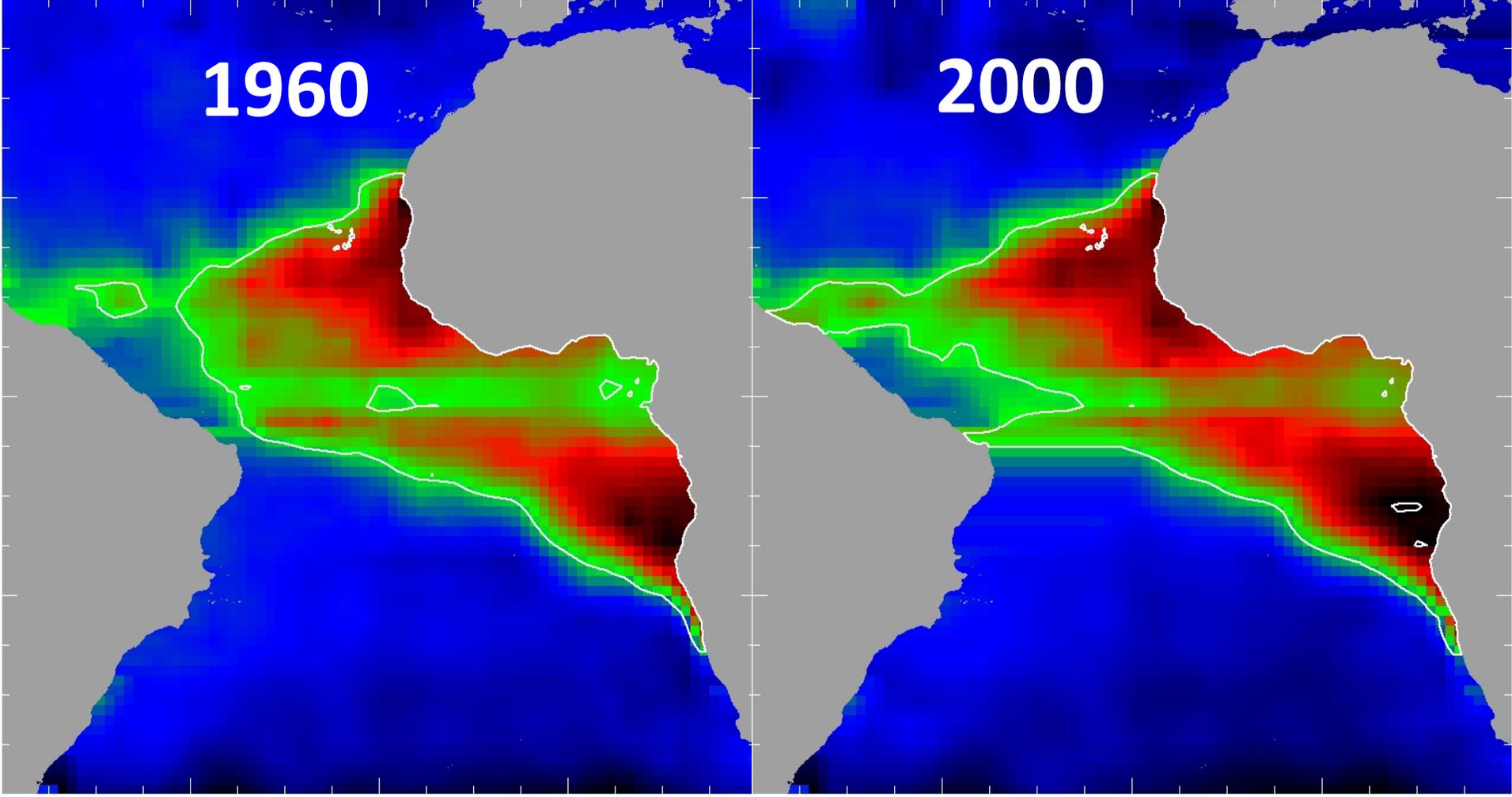




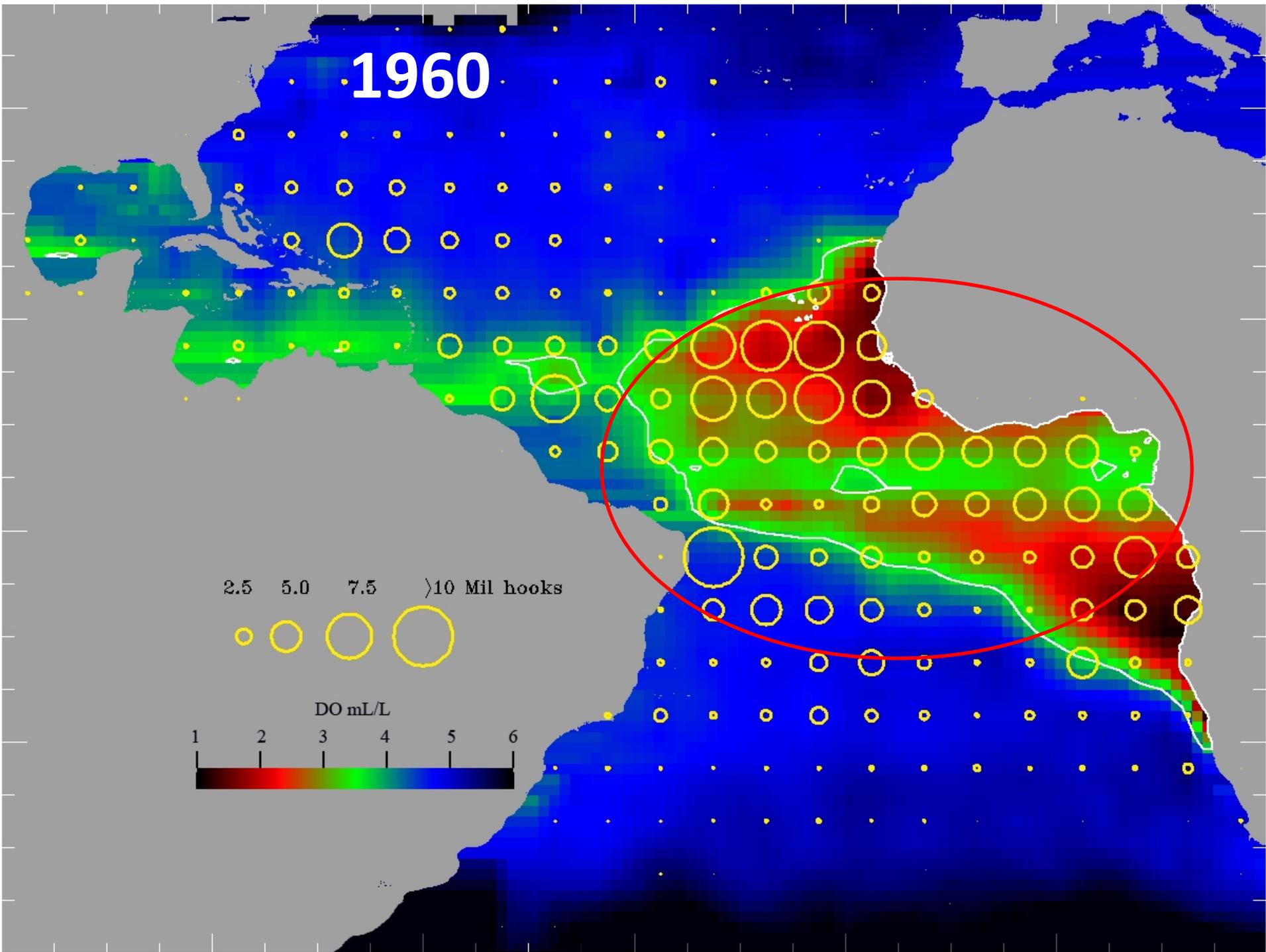
**Tropical Pelagic Predators, the Atlantic Fisheries that Exploit them, and expanding Oxygen Minimum Zones**

# Atlantic Longline Effort by Decade





1960



2.5 5.0 7.5 >10 Mil hooks



DO mL/L

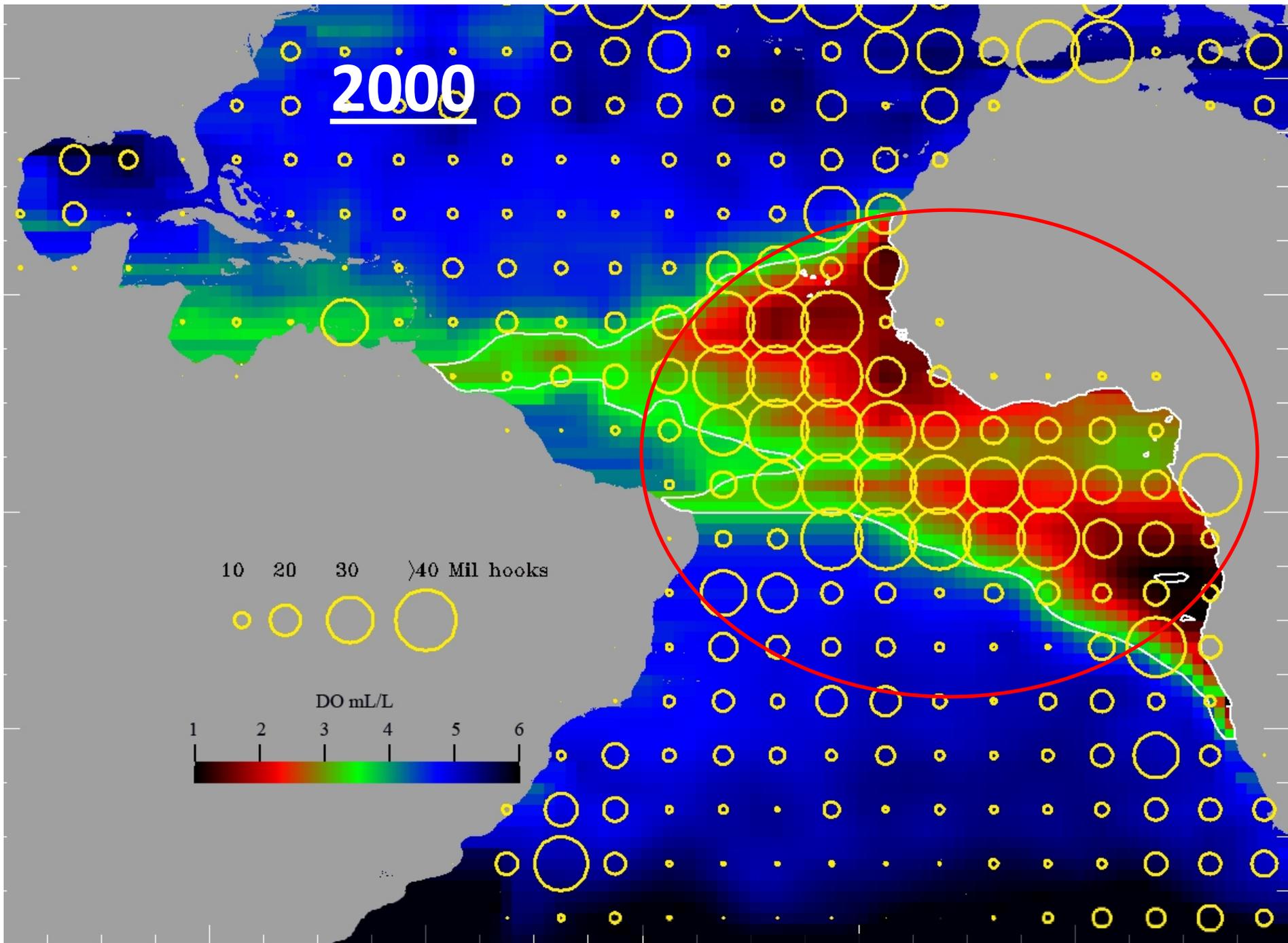
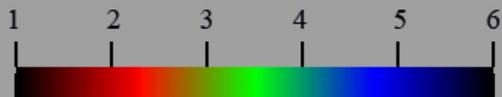


2000

10 20 30 >40 Mil hooks

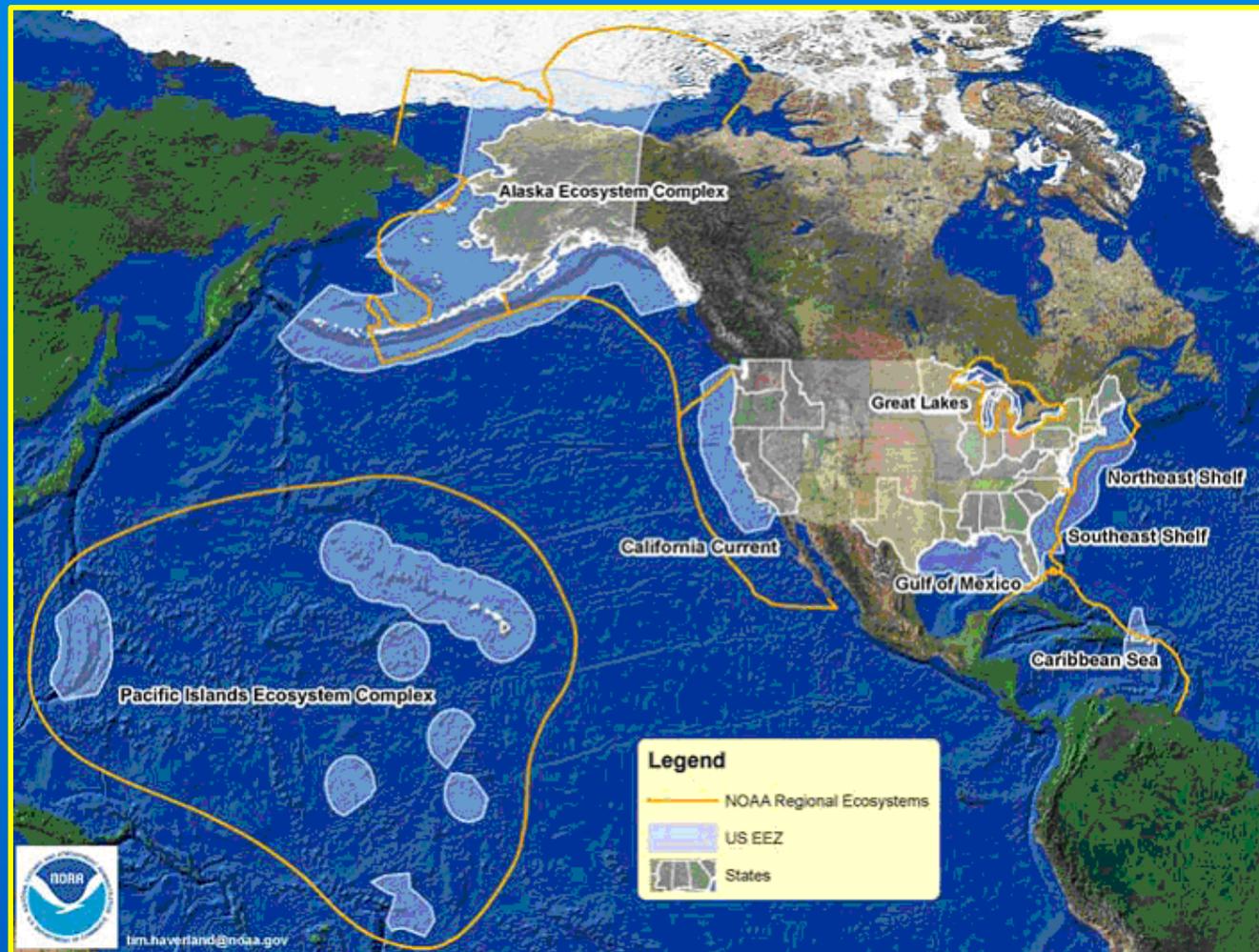


DO mL/L



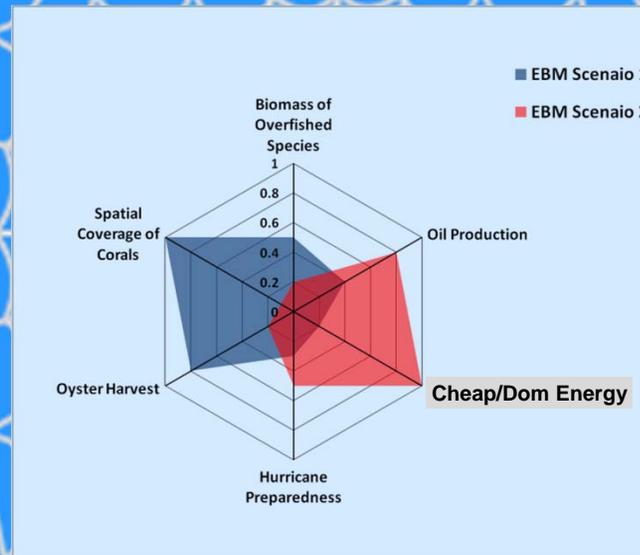
# NOAA's Integrated Ecosystem Assessment Program

*IEA's Regions are Based on NOAA's Eight Large Marine Ecosystems*



*The Gulf of Mexico IEA will be unique, just like all the others*

**Management Strategy Evaluation involves assessing the consequences of a range of management options and making obvious the trade-offs in performance across a range of management objectives.**



# Tier I-II-III Ecosystem Products

**Tier I products are designed specifically to support single-species assessment effort by bringing in eco considerations**

- Estimates of variance and trends in historical (1950-2009) natural mortality and most recent recruitment deviations
- Ecosystem Status Report for the Gulf of Mexico and associated ecosystem indicators
- Analyses of unintended ecological consequences of management options

**Tier II products are designed to address broader Ecosystem Based Fisheries Management approach**

- Tradeoffs in Optimal Harvest Policies
- Evaluate Marine Protected Areas options
- Management Strategy Evaluation

**Tier III products are designed to ensure that the momentum continues and gives the work the justification to continue to grow**

- Well defined (verbally and mathematically) ecosystem Goals, Objectives, and Products
- Review of the work; should consider SEDAR 33 having a Center of Independent Experts (CIE) reviewer with ecosystem background
- Review of the ecosystem models: A SEDAR devoted solely to the review of the ecosystem models we are proposing to use (Ecopath-Ecosim, OSMOSE, Atlantis)

## **Gulf of Mexico Fishery Management Council's Scientific and Statistical Committee's (SSC) Motions**

- **"The Standing and Ecosystem SSCs recommend that the Gulf of Mexico IEA Program, state, and academic partners continue working with the Gulf Standing and Ecosystem SSCs to expand the integration of ecosystem components into the assessment and management of fishery resources in the Gulf of Mexico. (Motion passed 18-0)."**
- **"The Standing and Ecosystem SSCs recommend that the Gulf of Mexico IEA Program, state, and academic partners work in collaboration with the SEDAR Steering Committee, and data and assessment working groups, to develop products that integrate ecosystem analyses into the SEDAR stock assessments. (Motion passed 18-0)."**



# NOAA Sponsored BFT Research

## ***Direct contribution to GBYP:***

- 2011 \$175,000
- 2012 ~\$225,000

## ***External funding- Bluefin Research Program Grants***

- 2011 \$510,000 Bluefin Research Grants
- 2011 \$506,000 Juvenile BFT tagging contract UMASS
- 2012 \$730,000 Bluefin Research Grants
- 2013 (see detail on next slide)

## ***Internal funding (Southeast Fisheries Science Center)***

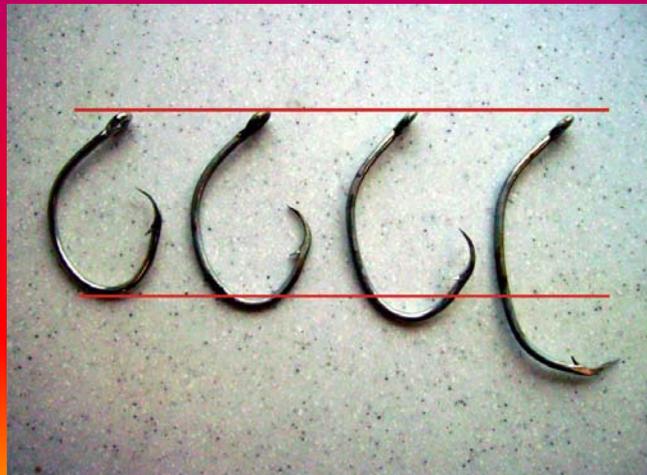
- Expanded observer coverage (GOM bluefin spawning season)
- Weak-hook study
- GOM LL release mortality study (on going)
- Pilot biological sampling program (on going)
- Adaptive larval sampling



## Additional Details on FY13 Funding

- Funding of about \$730K was budgeted in the previous year, to be made available through NOAA grants to fund extramural bluefin tuna research. However, grants are subject to reduction or elimination as a consequence of the sequester. Therefore, the actual amount of FY13 funding is currently unavailable.
- Reviews of proposals in response to the Fiscal Year 2013 opportunity have been completed. While a high proportion of these were highly ranked by the reviewers, the number of proposals that can be supported will depend on the available level of funding. Final selections have not been announced .
- **Funding levels for FY14 are not currently known**

Expanded Experiments in the Gulf of Mexico to Evaluate  
Bluefin Tuna Bycatch Mitigation Measures in the Yellowfin  
Tuna Fishery  
and  
Conduct Tuna Electronic Archival Tagging





## Objectives:

- Improve estimates of precision for weak hook effect on indices of abundance (needed larger sample sizes)
- Evaluate time/effort for BFT to straighten weak hooks (using TDRs)
- Continue ongoing post-release mortality study of BFT (PSATs)
- Facilitate broad deployment of PSATs on YFT for ongoing study



## Research Effort

### 2012 Research

- 2 Vessels
- 111 Sets
- 51,067 Hooks

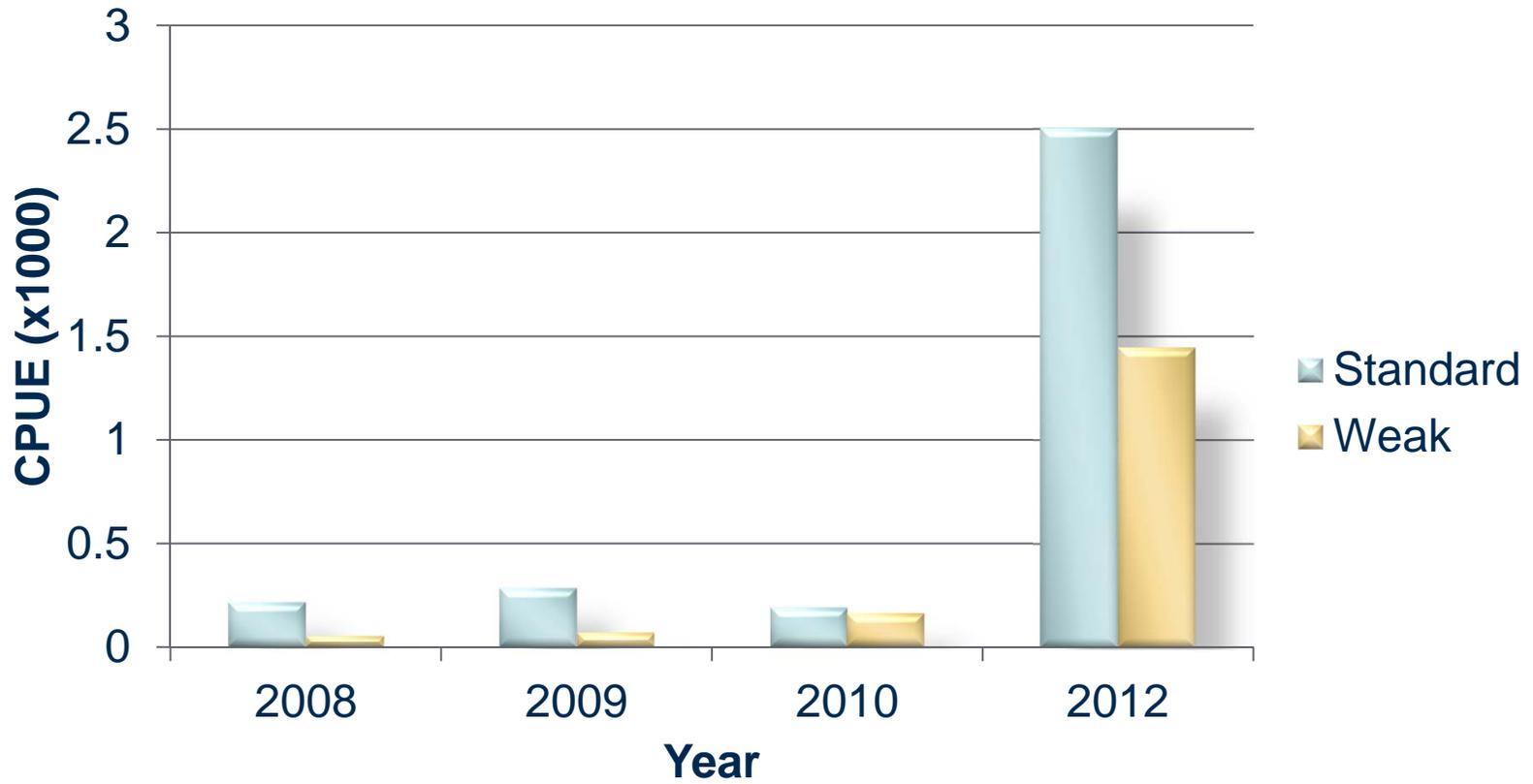
### 2008 – 2012 Research

- 8 Vessels
- 418 Sets
- 245,881 Hooks





## Bluefin CPUE





## 2008 – 2012 Results

	n	CPUE (x1000)		311 sets	
		Control	Exp.	% Reduction	<i>P-value</i>
Bluefin Tuna	134	0.71	0.38	46.0	0.0007
Yellowfin Total Count	3312	13.68	13.26	3.1	0.3723
Yellowfin Kept	2547	10.68	10.04	6.0	0.1203
Swordfish Total Count	290	1.139	1.22	-7.1	0.597
Swordfish kept	69	0.325	0.24	27.5	0.2283
Dolphin Fish	918	3.93	3.54	9.9	0.1201
Wahoo	375	1.72	1.33	22.3	0.0173

\* Negative value denotes increase

Fisher's Exact Test

# 2008 - 2012 Bycatch Results



	n	CPUE (x1000)		311 Sets	
		Control	Exp.	% Reduction	<i>P-value</i>
Blue Marlin	157	0.64	0.63	1.3	1
White Marlin/ Roundscale Spearfish	172	0.57	0.83	-45.7*	0.0178
Sailfish	62	0.28	0.22	22.9	0.3741
Large Coastal Sharks	108	0.48	0.40	16.9	0.3865
Pelagic Sharks	33	0.14	0.13	5.9	1

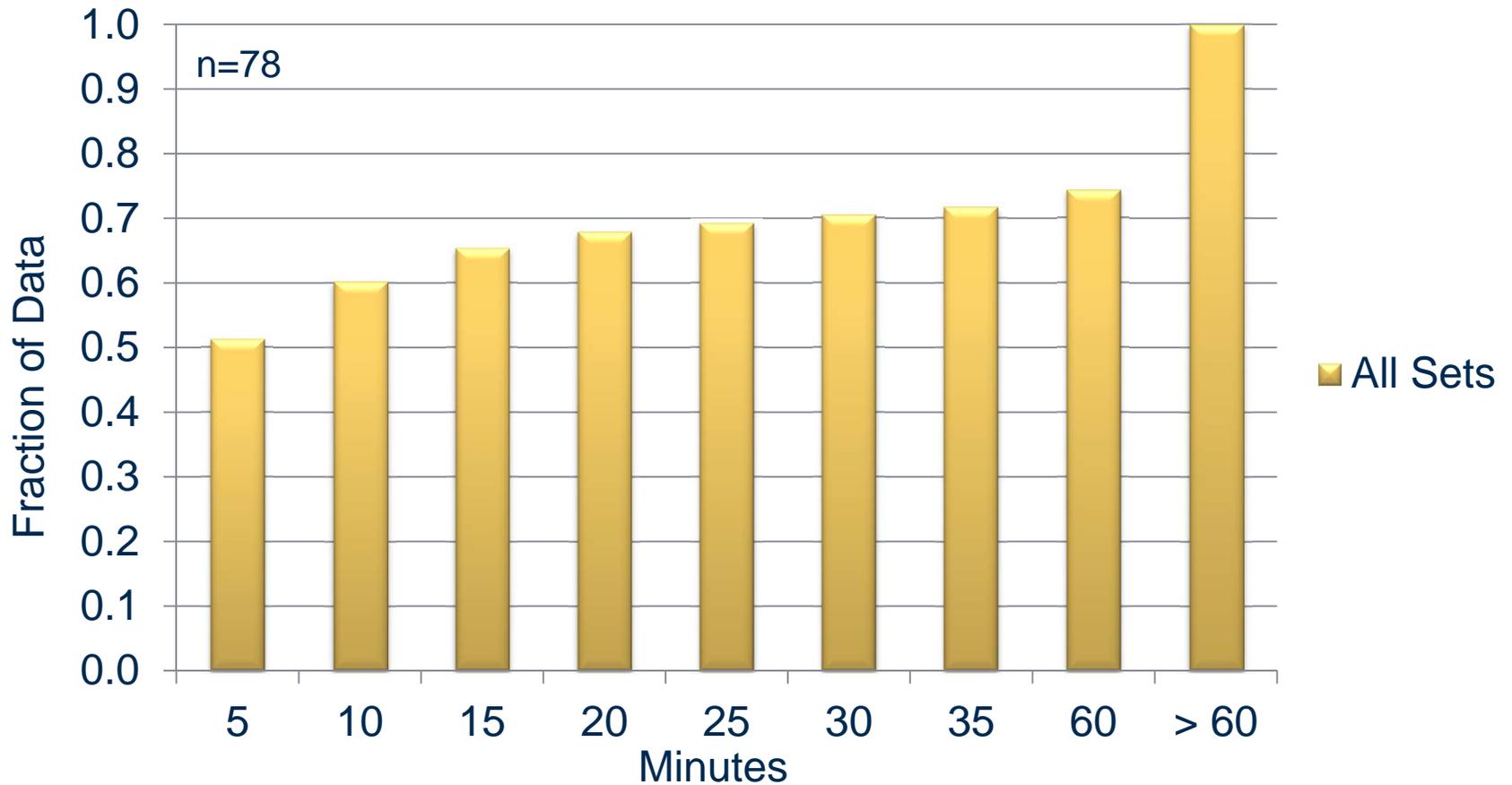


\* Negative value denotes increase

Fisher's Exact Test



## Straightened Hook Interaction Times (quartile plot)





## Summary

Updated bluefin reduction estimate for weak hooks is  
46%,  $p=0.0007$

No significant reduction in yellowfin tuna or swordfish

Significant increase in white marlin and roundscale  
spearfish (45.7%,  $p=0.0178$ )

The majority of the escapes with weak hooks take place  
with 5 minutes of becoming hooked

During 2012, PSAT tags were placed on 34 yellowfin  
and 30 bluefin tuna



## Biological Sampling Program: Commercial and Recreational fisheries

- Primary Objective – Collect BFT otoliths representative of the fisheries, to permit assignment of stock origin and direct ageing
  
- Secondary Objectives –
  - collect additional hard parts (spines, vertebrae) from BFT
  - collect reproductive and muscle tissues from BFT/evaluate reproductive status
  - collect biological samples from other tunas



## Biological Sampling Program: Commercial and Recreational fisheries

- The program achieved improved sampling levels beginning in 2011. Reasons for this included:
  - Earlier start
  - Observers were now trained
  - Improved coordination of sampling effort
  - Opportunistic sampling initiated for recreational component (samplers could respond to info on BFT landings)
  - Retention of the most available recreational size category had not been permitted for much of the previous year
  - Large coolers placed at key sites where anglers could leave fish after cleaning
- Further improvements could be gained by increased outreach, involvement of dealers/fisherman, collaborations with researchers, etc.



## 2010 & 2011 Sampling Results

NMFS-NER Port Biological Sampling Program / REMSA Inc.

Year	No. Fish	OTOs	Spines	Vertebra
2010	160	26	149	18
2011	262	75	196	65
Grand Total	422	101	345	83

Sampled fish landed primarily in Gloucester MA  
(North Atlantic Traders)

Small number from other ports

Sampling discontinued in 2012, coinciding with increased coverage by academic researchers



## 2010 - 2012 Sampling Results

### NMFS Large Pelagics Biological Survey

Year	No. Fish	OTOs	Spines	Vertebra	Gonad
2010	32	13	29	27	13
2011	234	218	217	212	58
2012	235	220	206	185	55
Grand Total	501	451	452	424	126

2010: 7 school, 25 large school

2011: 1 young school, 146 school, 69 large school, 17 small med., 1 lrg. med.

2012: 131 school, 83 large school, 20 small med., 1 lrg. med.

Sampled fish 2010-2012 landed in Maryland (38%), Massachusetts (46%), Virginia (8%), New Jersey (5%), New York (2%), and Delaware (1%)