Linking western bluefin tuna (*Thunnus thynnus*) incidental Catches with oceanographic conditions in the Gulf of Mexico

by

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BACKGROUND INFORMATION

A U.S. longline fleet operates in the Gulf of Mexico (GOM)
Targeting swordfish (YFT) and yellowfin tuna (YFT)

Bluefin tuna are incidentally caught in these fisheries while they present in the GOM during their spawning season (March-June).

The last bluefin stock assessment (ICCAT, 2006) indicated that the stock is *overfished* and undergoing *overfishing*

100% observer coverage of the fleet during April 15th-June 15th, 2007.

Data collected by observers during this period and satellite oceanographic data (*i.e.,* SST, SHA, and color) were used to link catches to environmental observation.

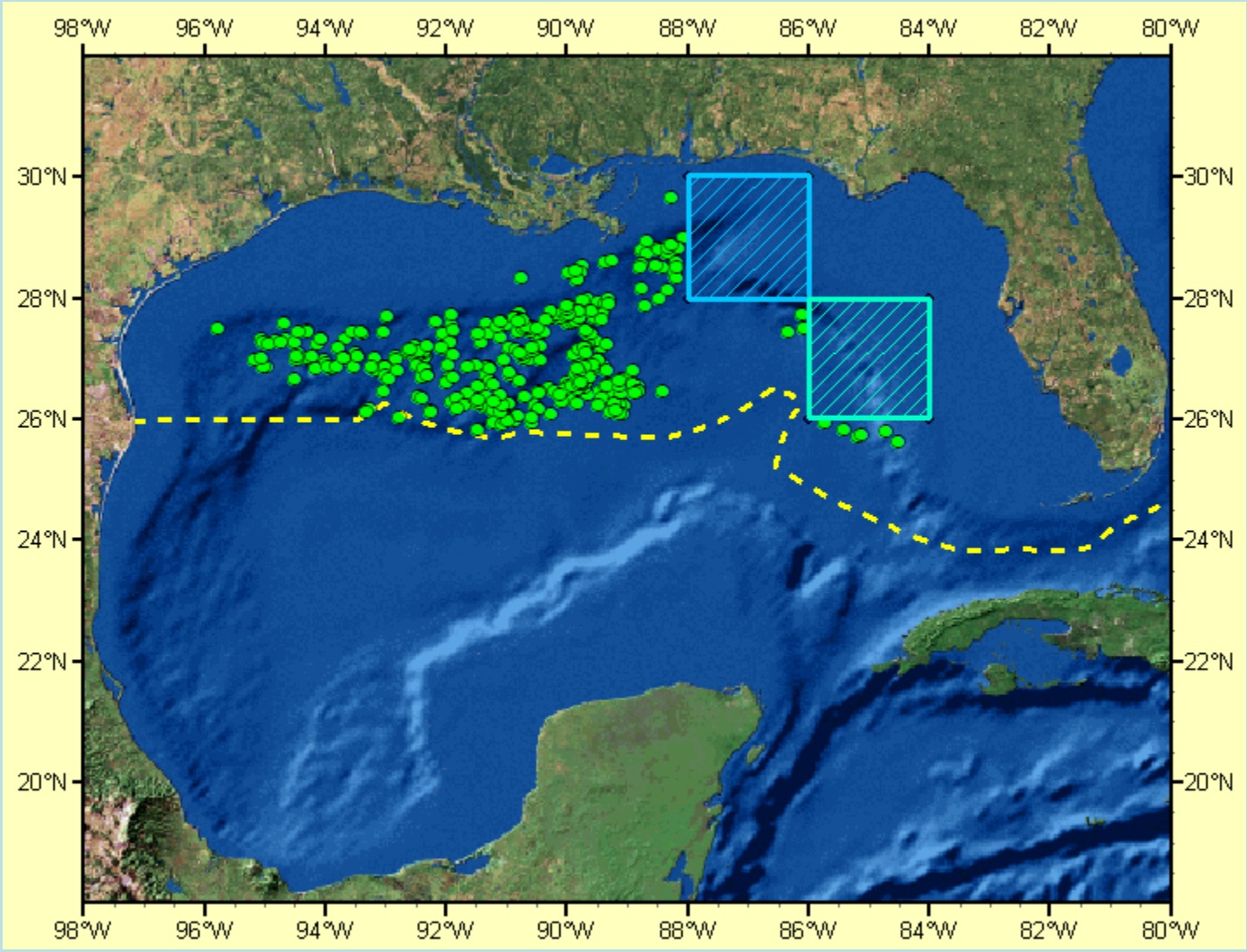
Total number of vessels: **30**
Total number of pelagic longline sets: **415**
Total number of hooks fished: **302,886**

Average length of mainline: **30.6 miles** (range: 7- 45 miles)

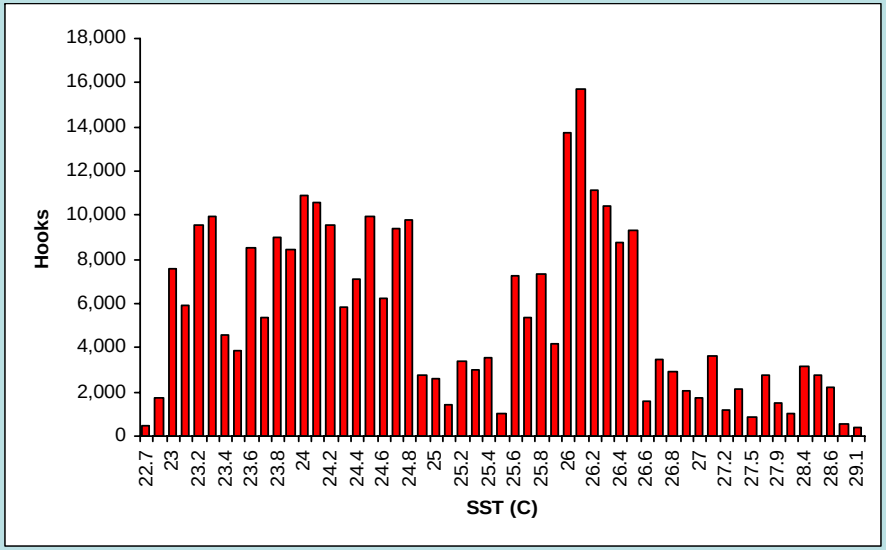
Average number of hooks per longline: **738** (range 408-1008)

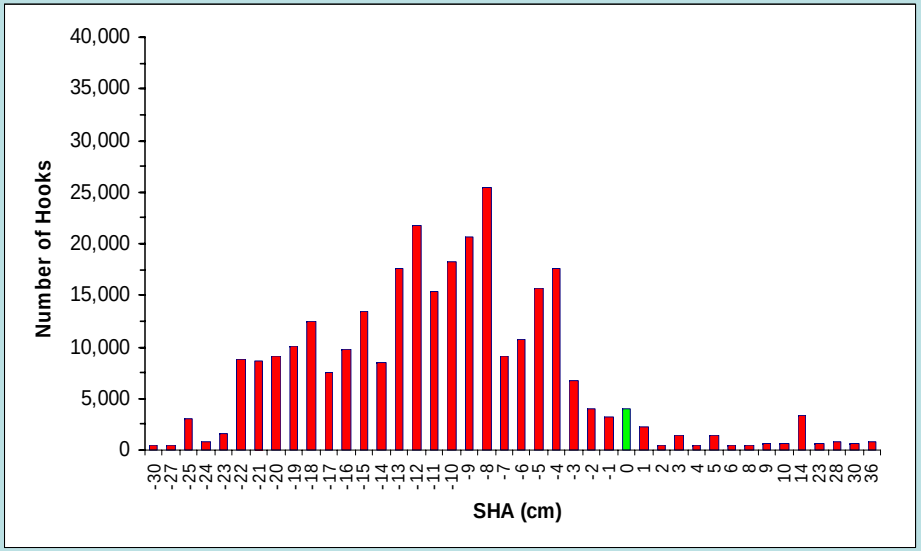
TOTAL NUMBER OF	**bluefin tuna**	CAUGHT	**:**	**150**
	yellowfin tuna		**:**	**2,106**
	swordfish		**:**	**1,775**

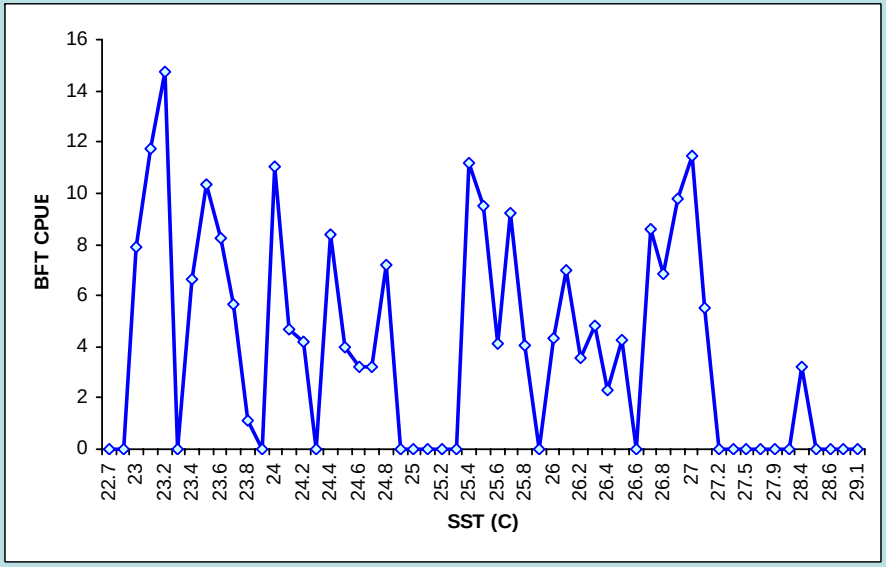
Location of pelagic longline sets (green dots), boundary of the US EEZ (yellow line) and areas closed to fishing (light blue squares)

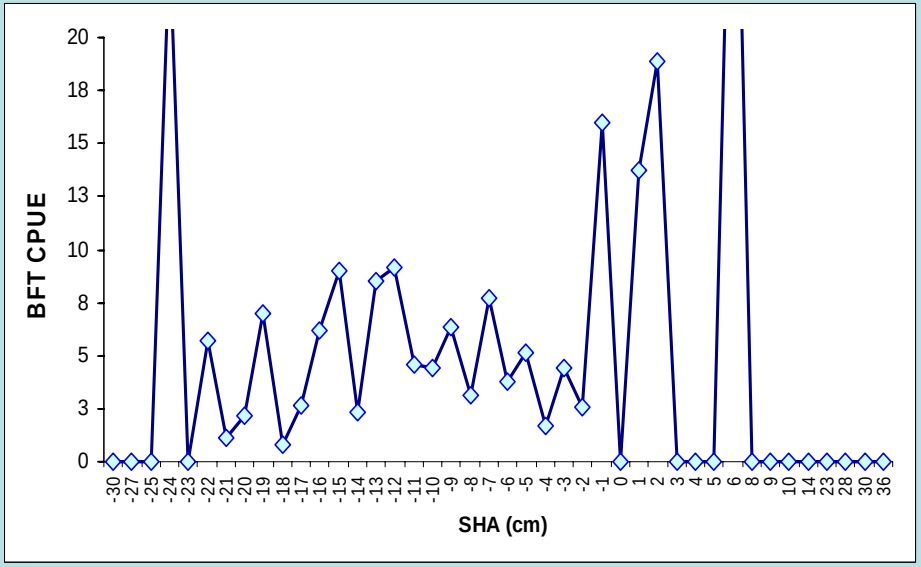


April 15th – June 15th, 2007

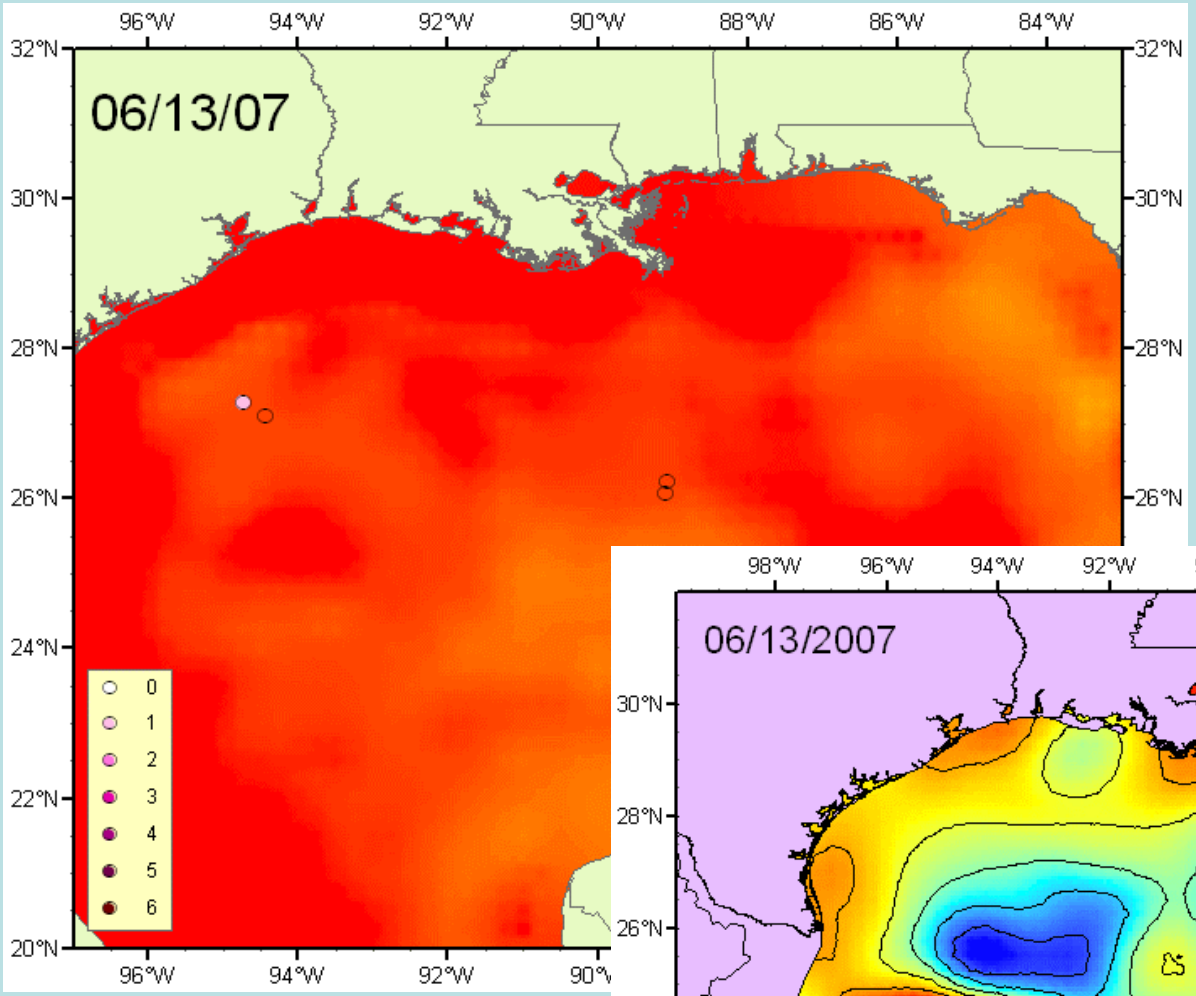




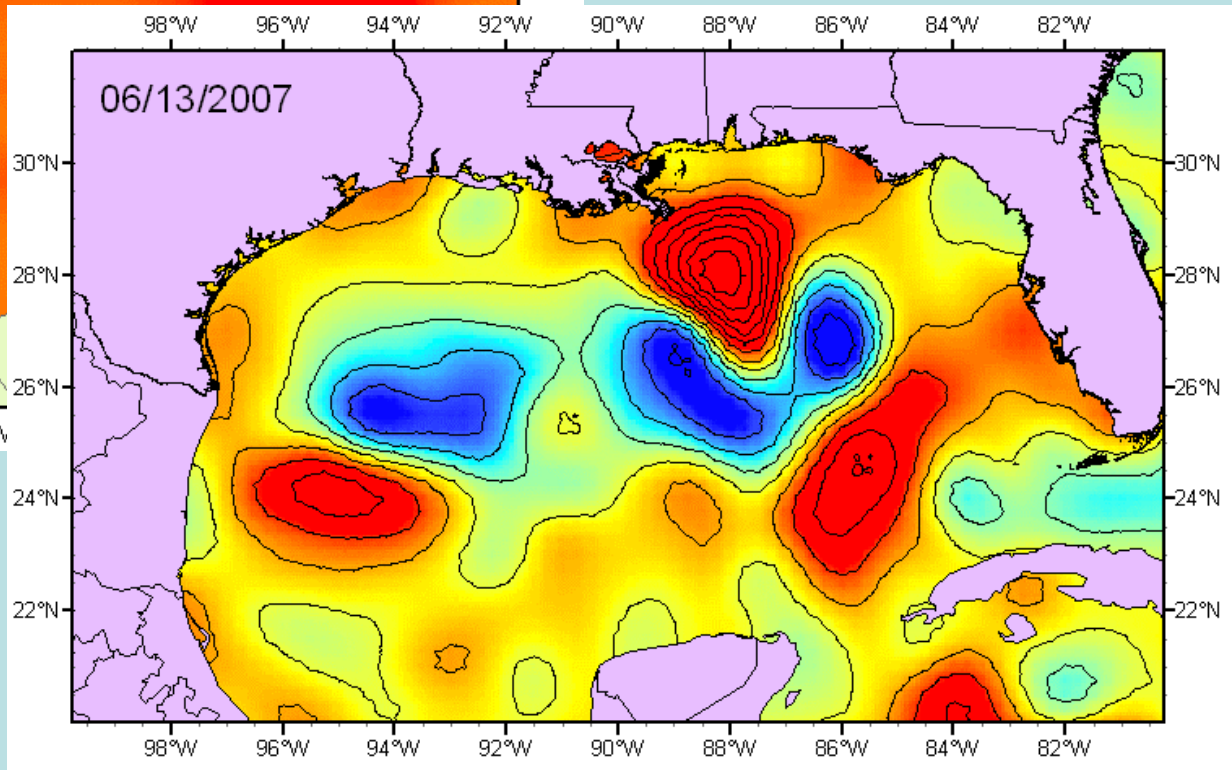




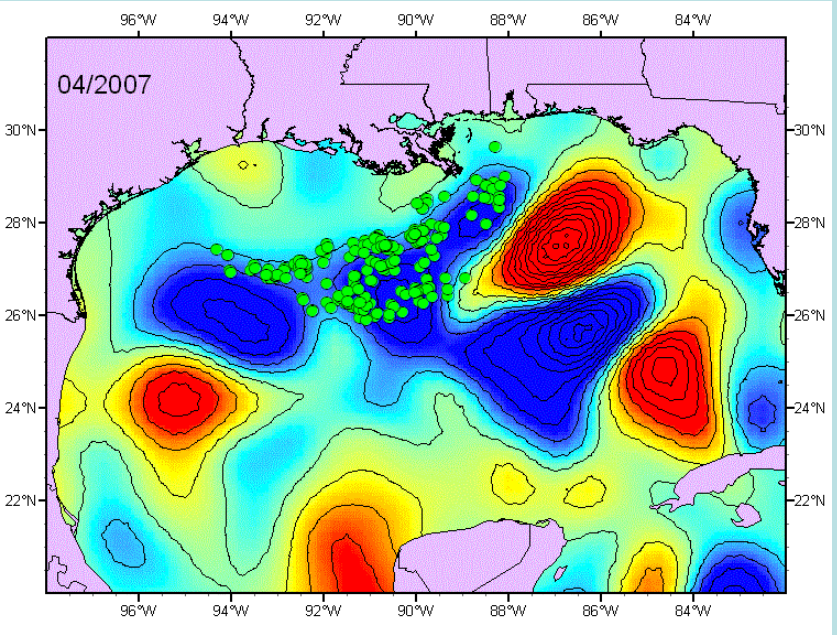
SST

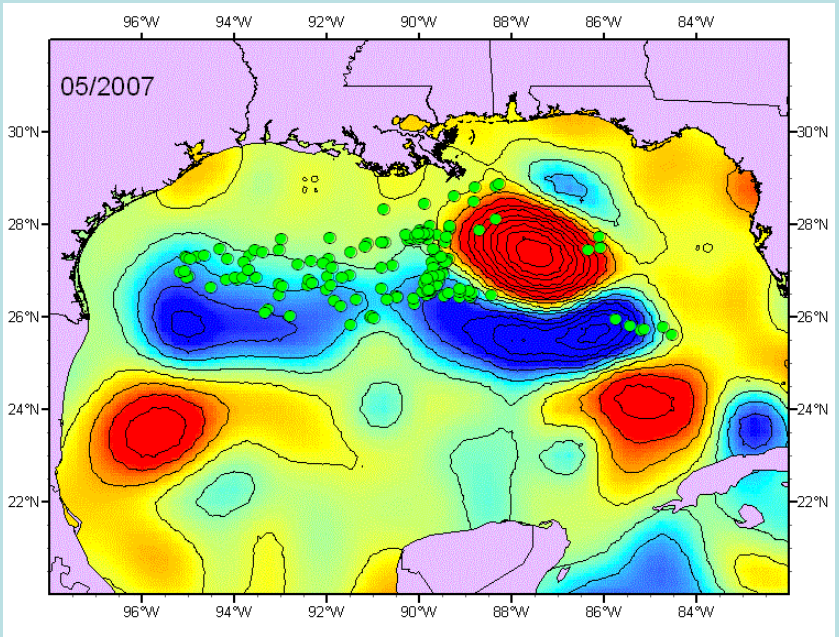

06/13/07
96°W
94°W
92°W
90°W
88°W
86°W
84°W
32°N
30°N
28°N
26°N
24°N
22°N
20°N
0
1
2
3
4
5
6

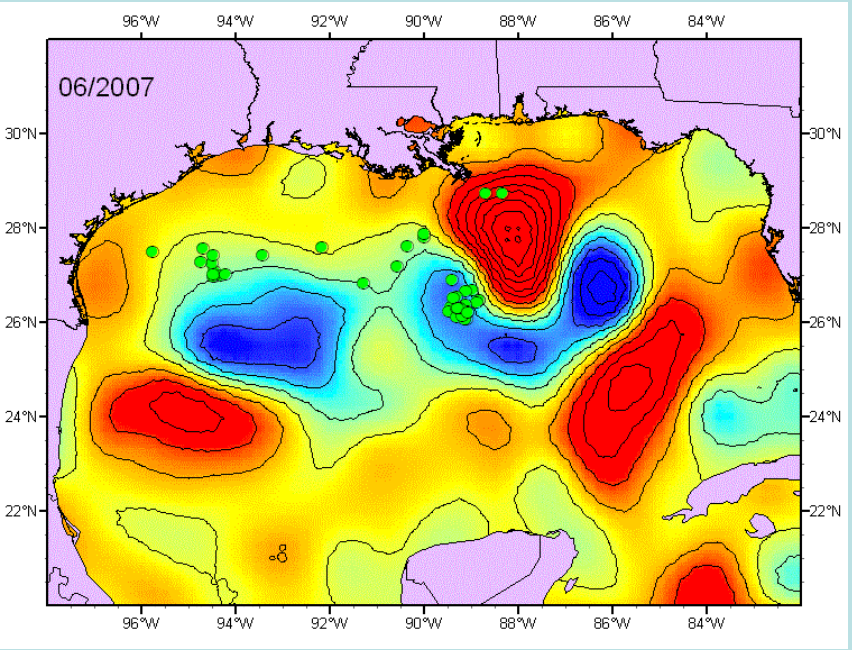
SHA


06/13/2007
98°W
96°W
94°W
92°W
90°W
88°W
86°W
84°W
82°W
30°N
28°N
26°N
24°N
22°N

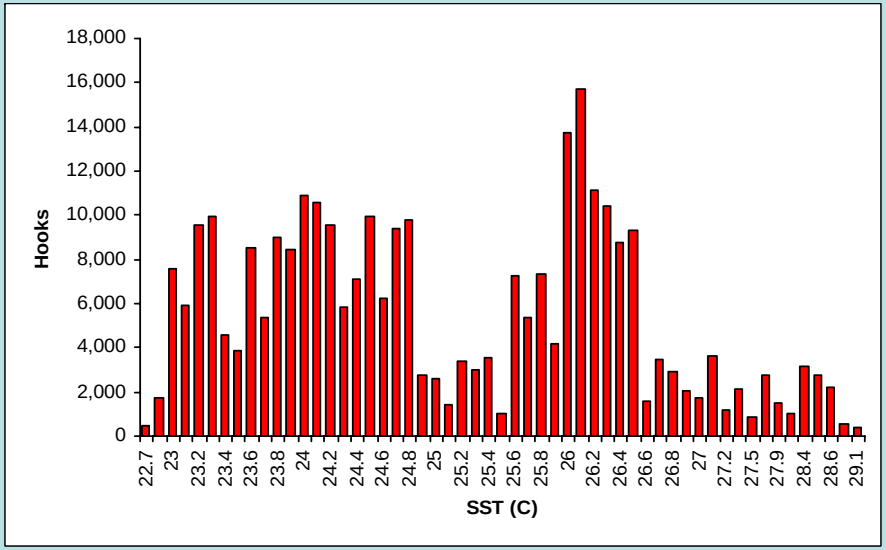
SHA in the GOM during April 15th, May 15th, and June 15th, 2007. The green dots indicate position of longline sets during those months. Warmer colors show anticlyconic rings, while cooler colors show the opposite.

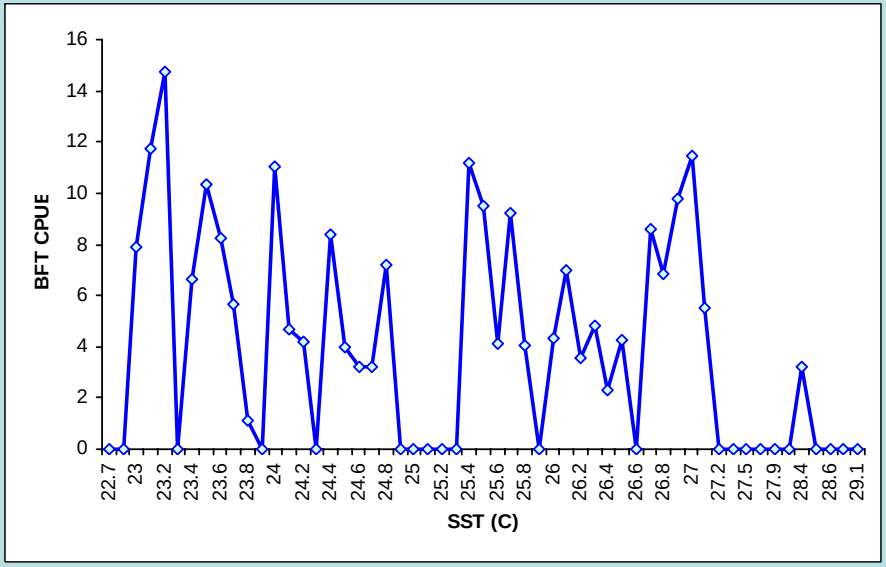




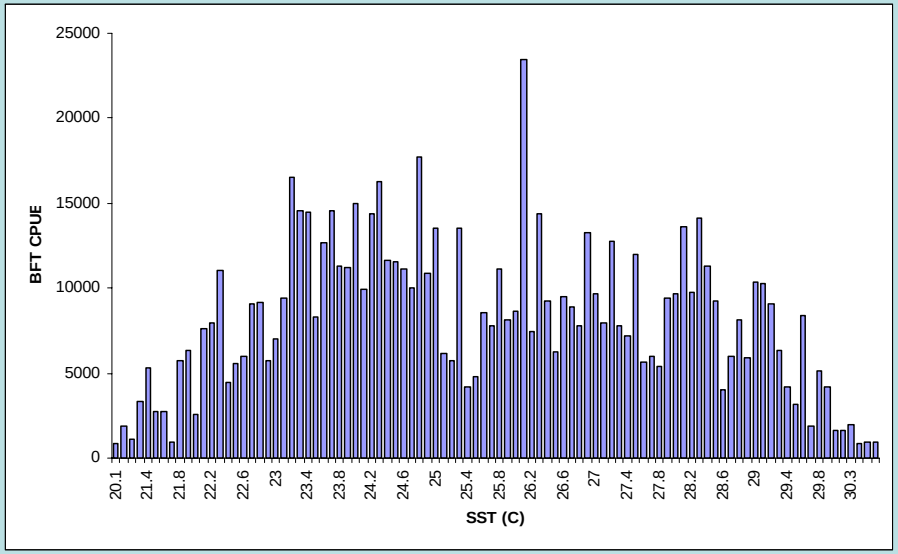


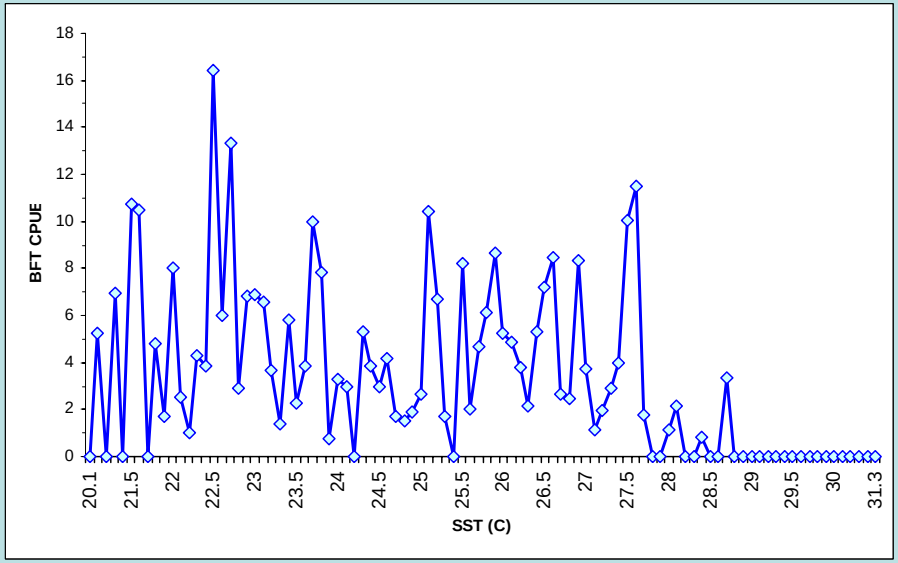
2007





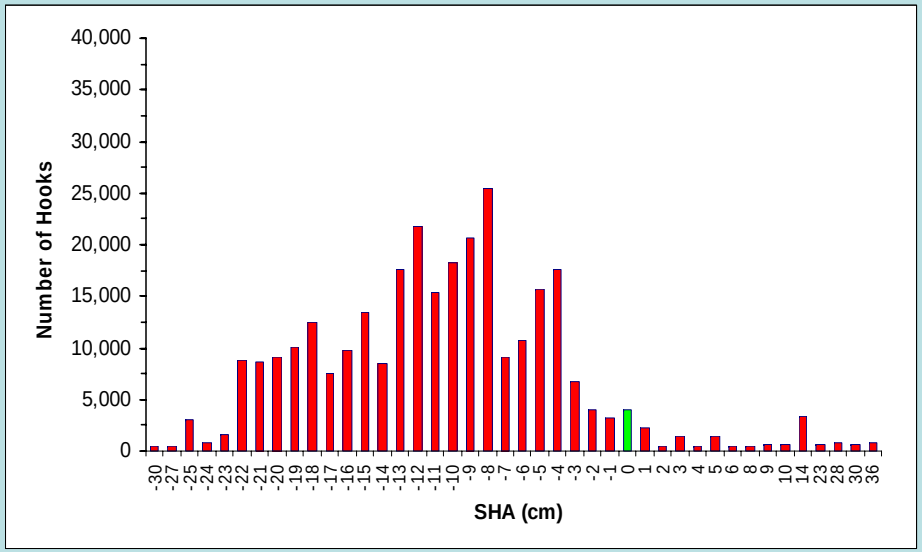
1993-2006

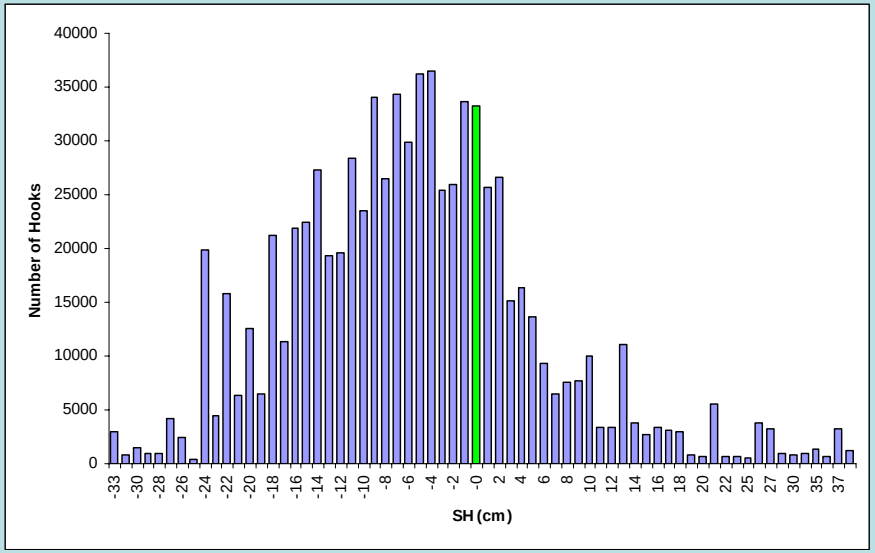


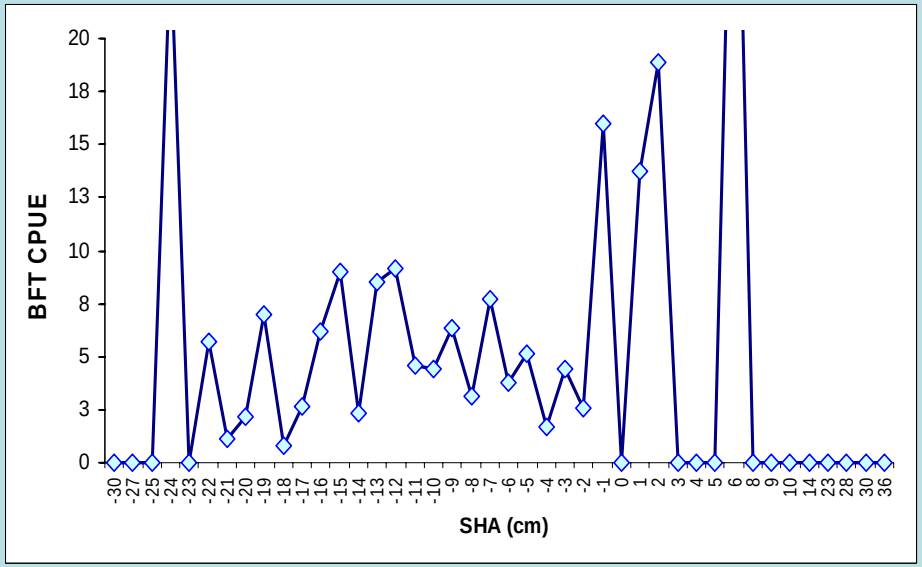


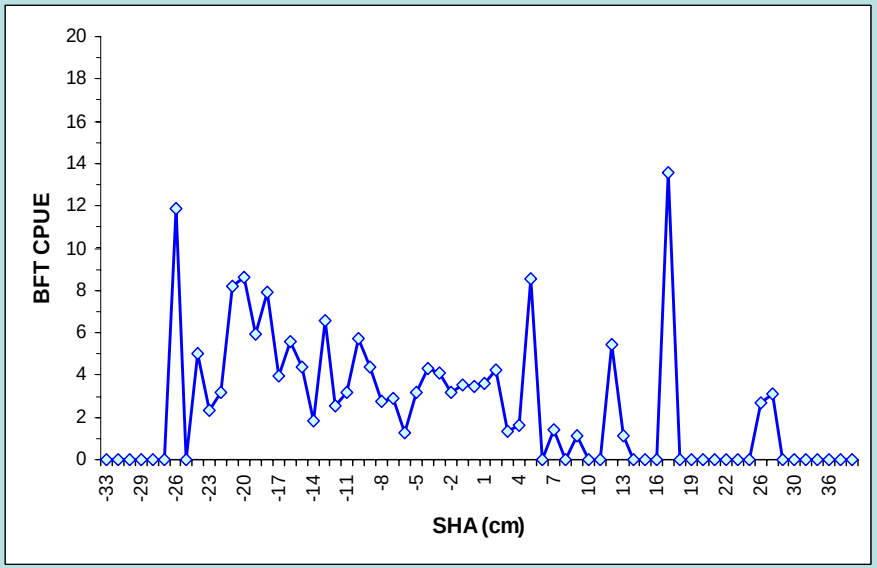
2007

1993-2006









Using SH, SH gradient and EKE particular locations in the GOM were identified as being:

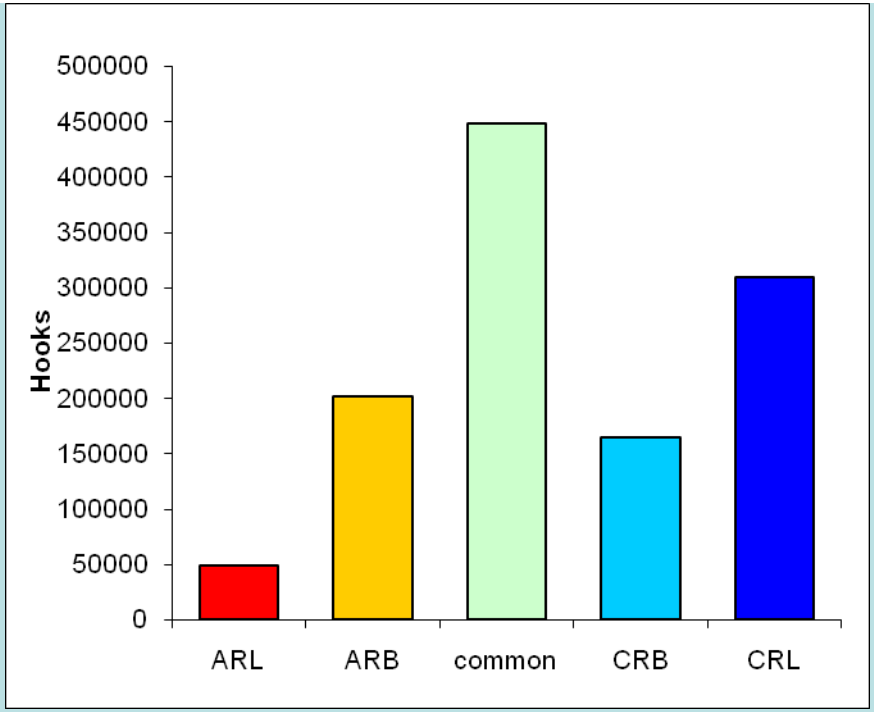
-Inside an anti-cyclonic ring (ALR)

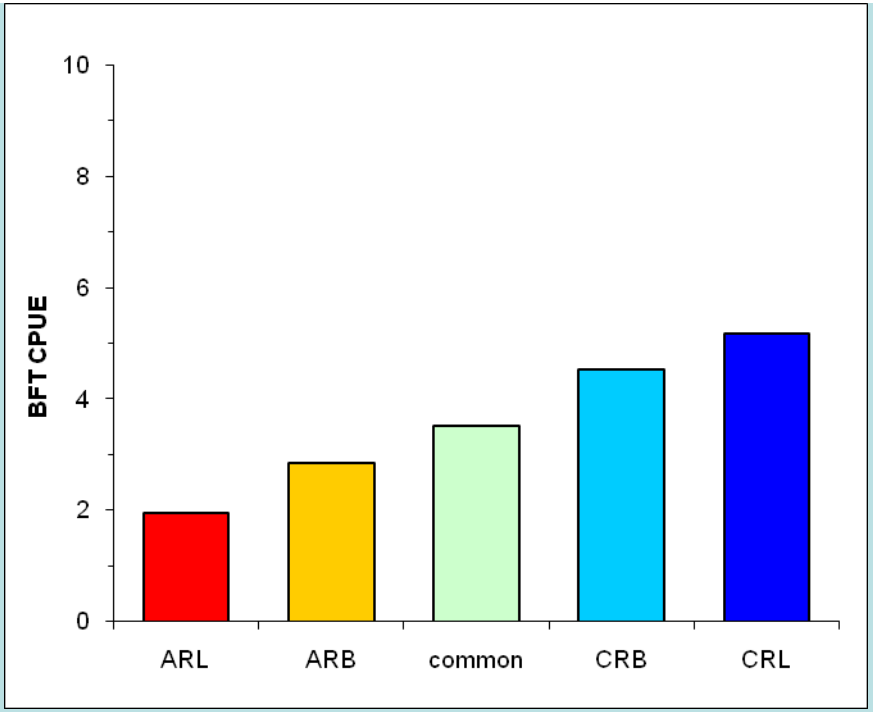
-Within the frontal region of an anti-cyclonic ring (ALB)

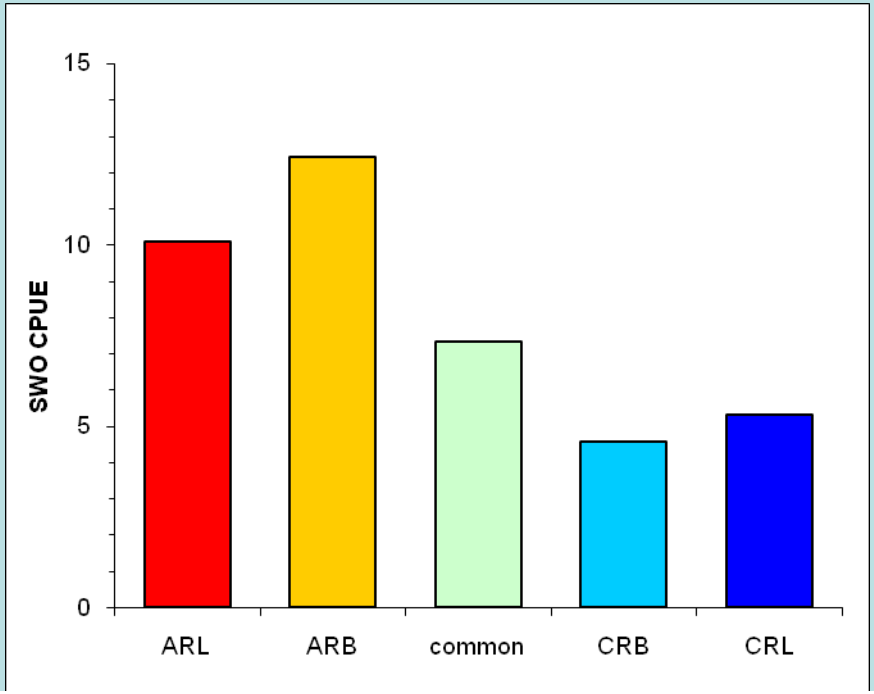
-In ‘common’ waters

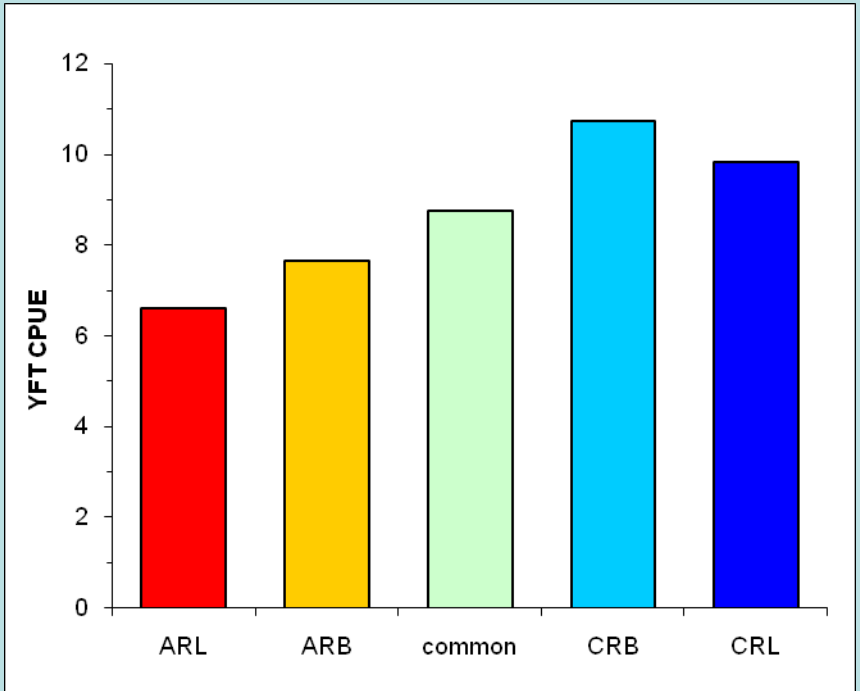
- Inside an cyclonic ring (CLR)

-Within the frontal region of an anti-cyclonic ring (CLB)


Hooks
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
ARL
ARB
common
CRB
CRL

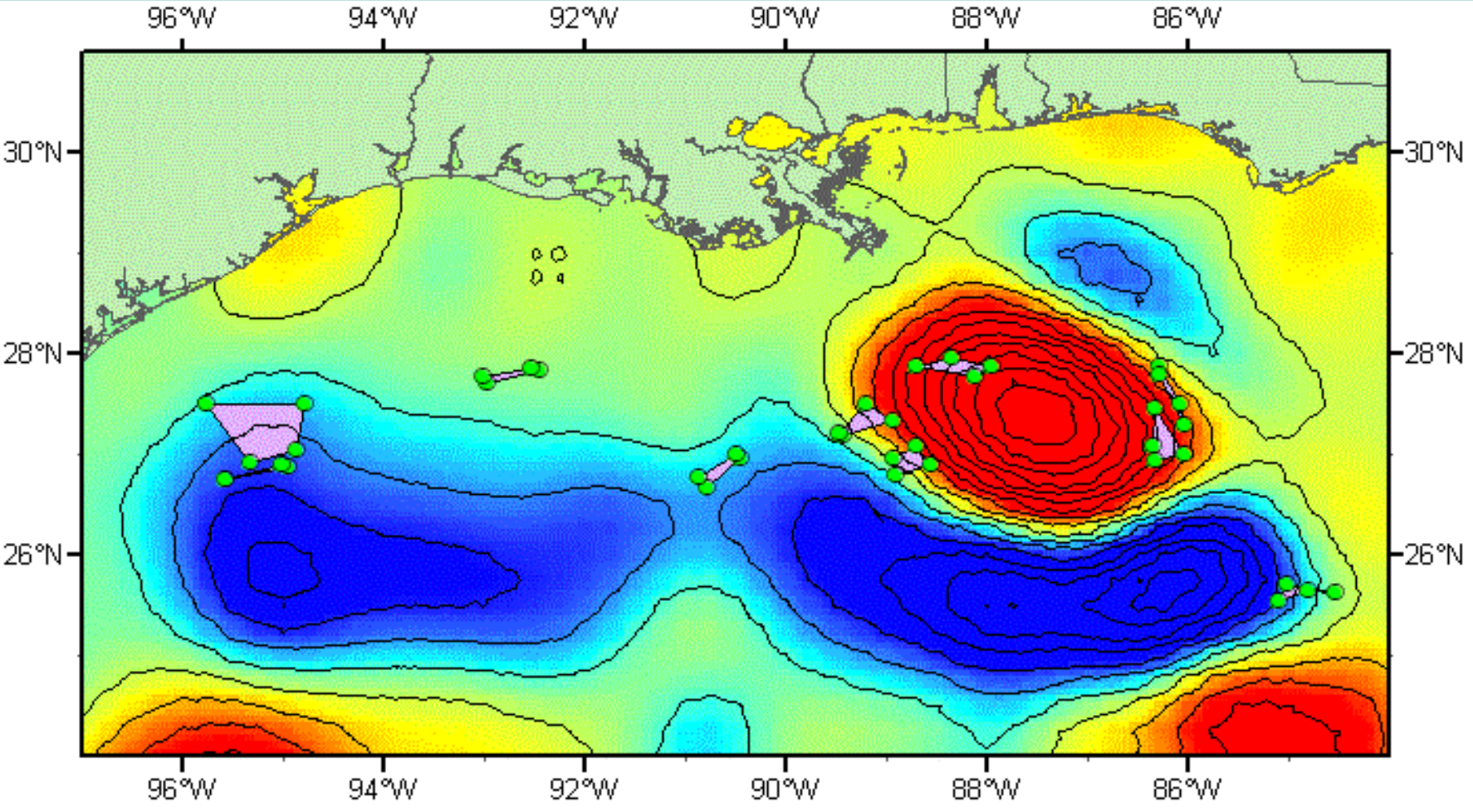

BFT CPUE
10
8
6
4
2
0
ARL
ARB
common
CRB
CRL


SWO CPUE
15
10
5
0
ARL
ARB
common
CRB
CRL


YFT CPUE
12
10
8
6
4
2
0
ARL
ARB
common
CRB
CRL

Using the reported latitude-longitude coordinates of the beginning and end of the set and haulback operations (green dots) it was possible to identify if the area swept by the longline during the soaking period was completely inside a ring, in the frontal areas, partially inside a ring and partially in the frontal areas, etc.

Only 38% of all sets in 2007 had all four points within the same ‘waters’.



Set categories were defined by considering how many of the points of the set were within each oceanographic feature

ALR100: all 4 points (100%) were within an anticyclonic ring

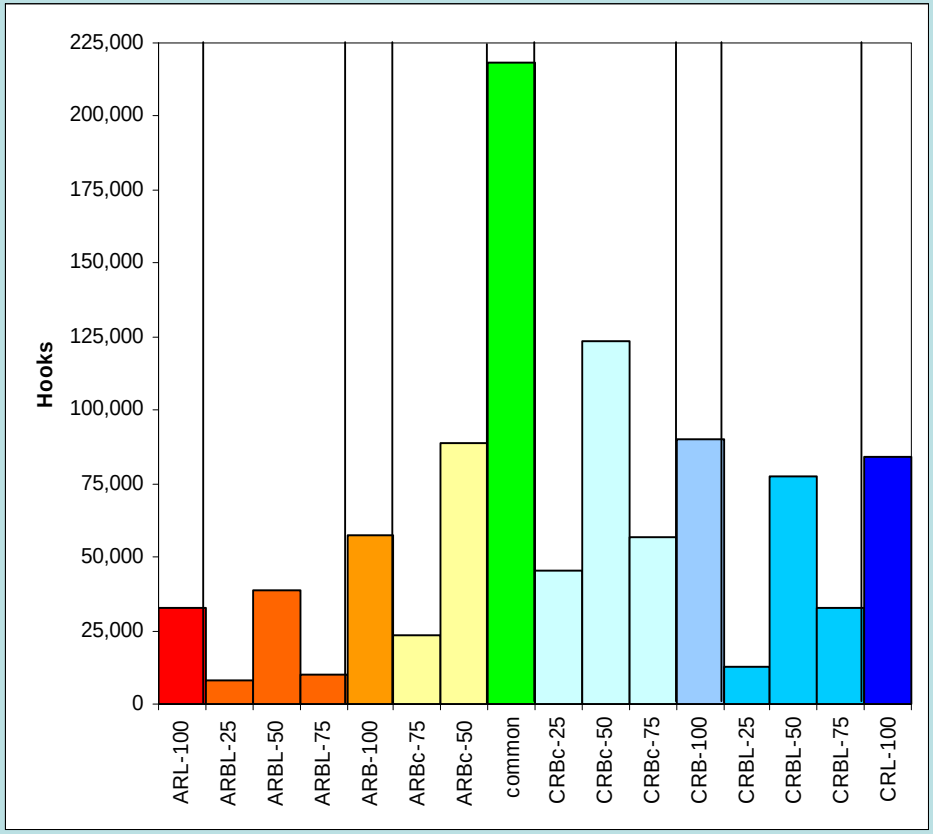
ALB25, ALB50, ALB75: some points within the anticyclonic ring and some points within an anticyclonic ring frontal area.

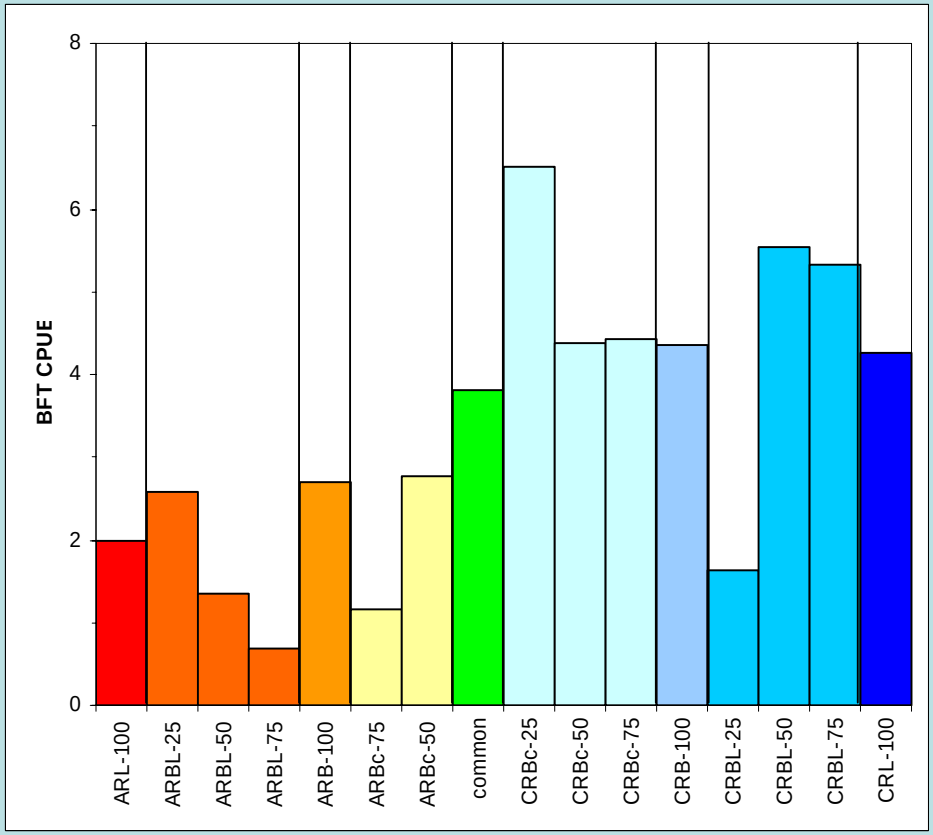
ALB100: all 4 points (100%) were within an anticyclonic frontal area

ALC25, ALC50, ALC75: Some points within an anticyclonic ring frontal area and some points on the ‘common’ waters.

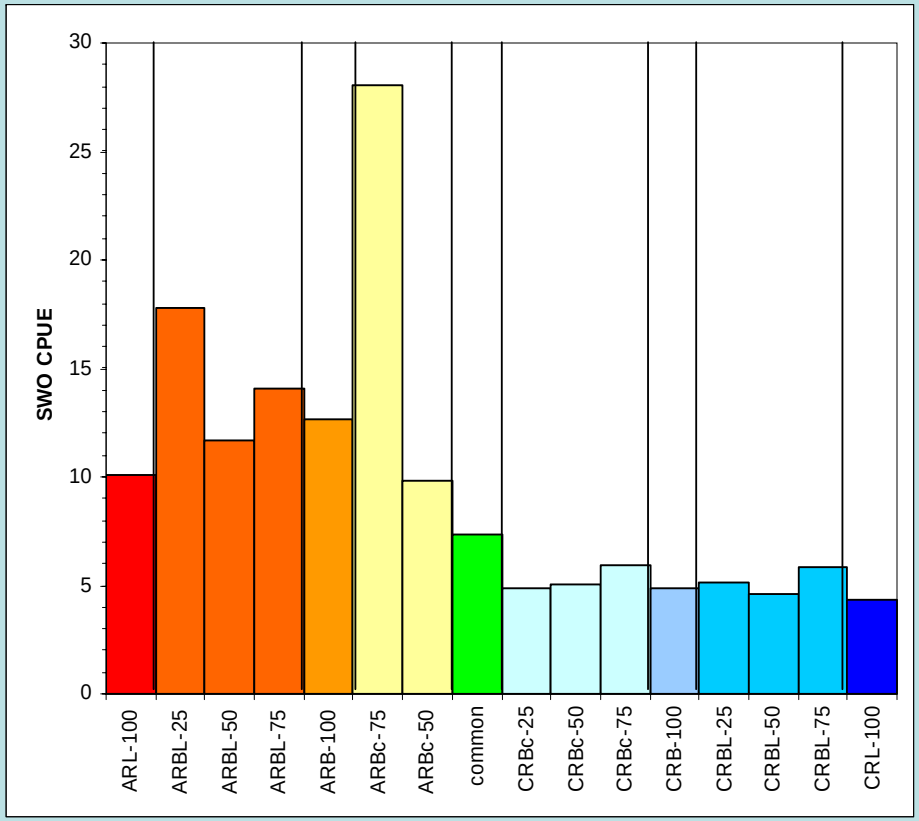
Same rationale was applied to define sets associated to cyclonic rings.

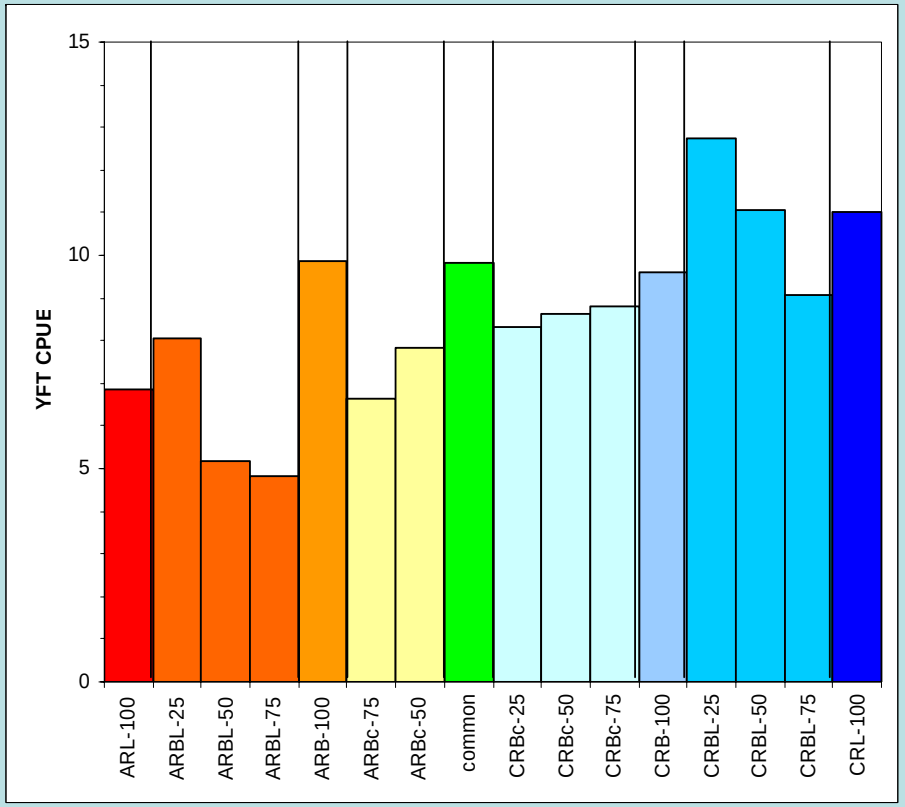
Effort (number of hooks) and average BFT CPUE in each set category for The period 1993-2007 (months 3-7).



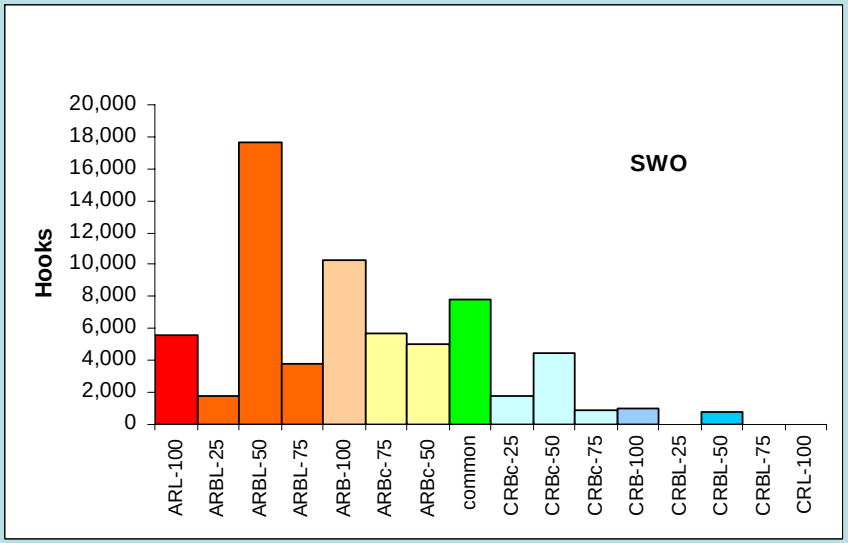


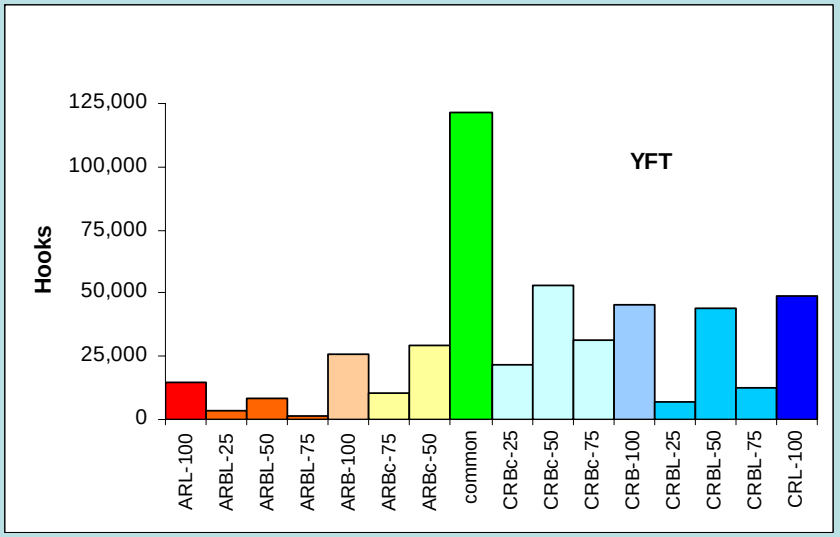
Average SWO and YFT CPUE by set category for the period 1993-2007 (months 3-7).

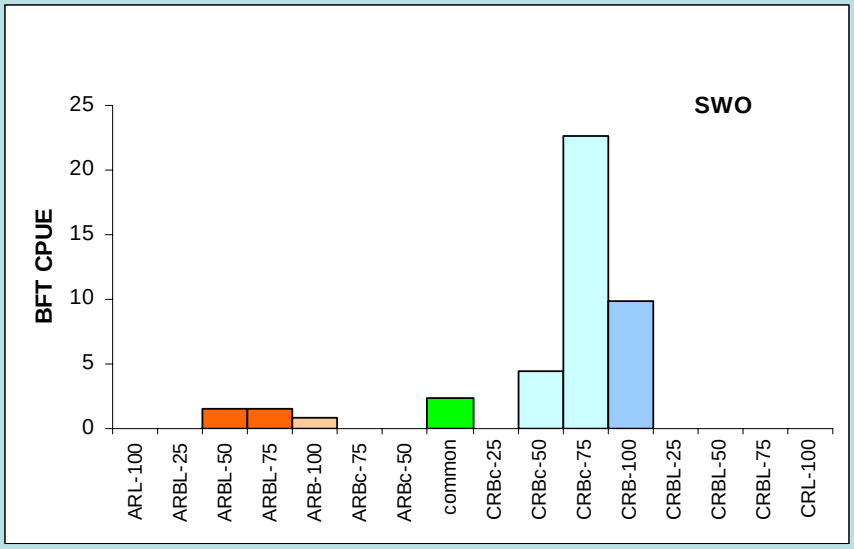


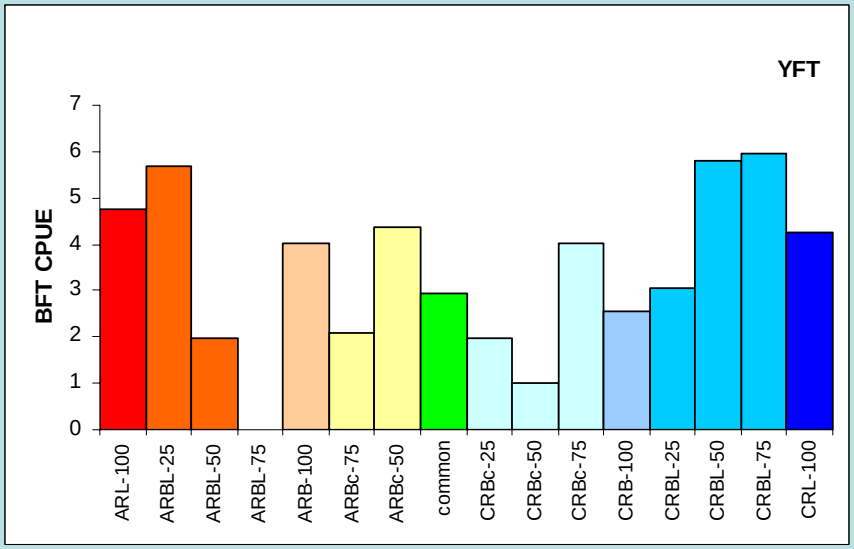


Effort (number of hooks) and average BFT CPUE by set category and target species

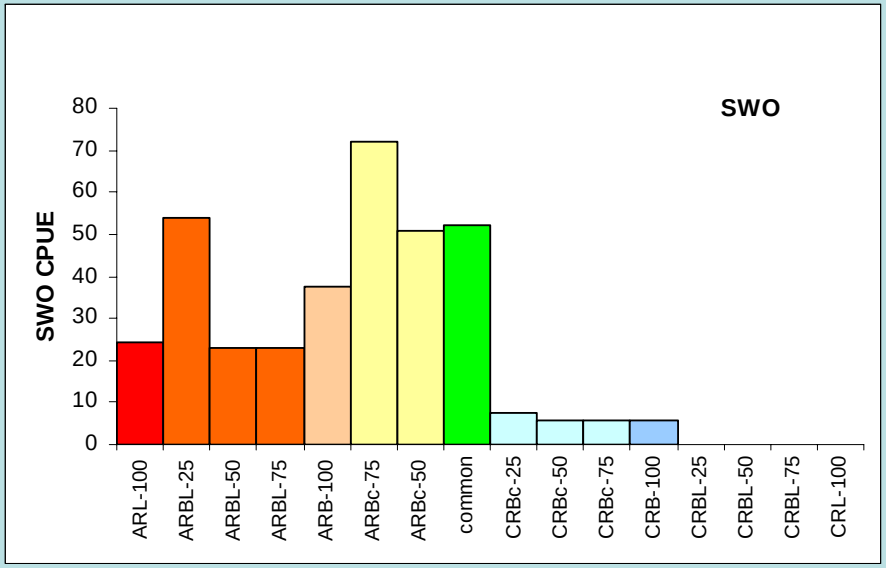


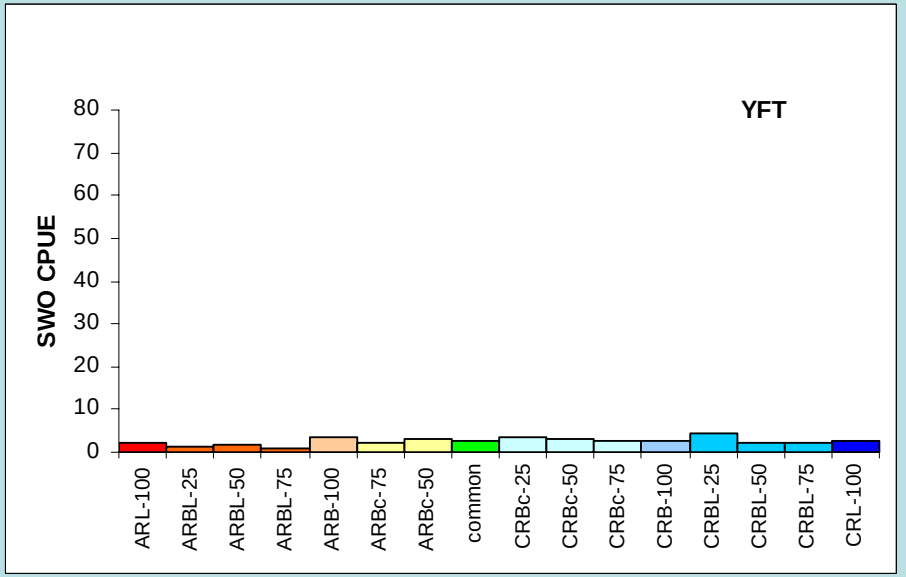


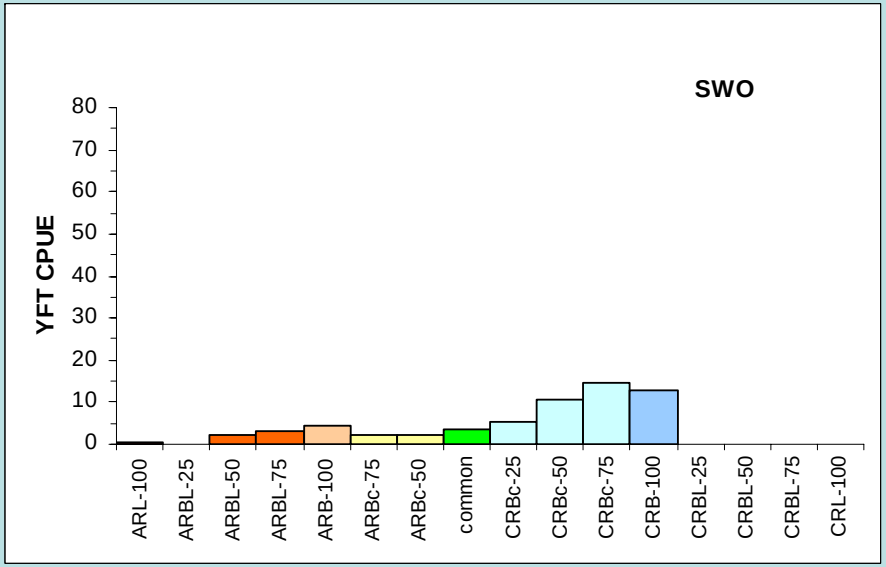


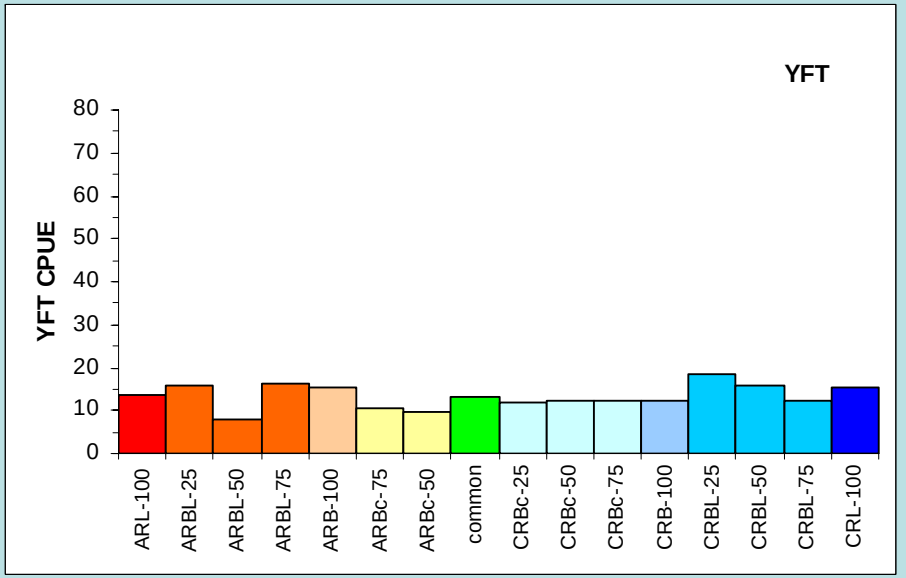


Average SWO and YFT CPUE by set category and target species

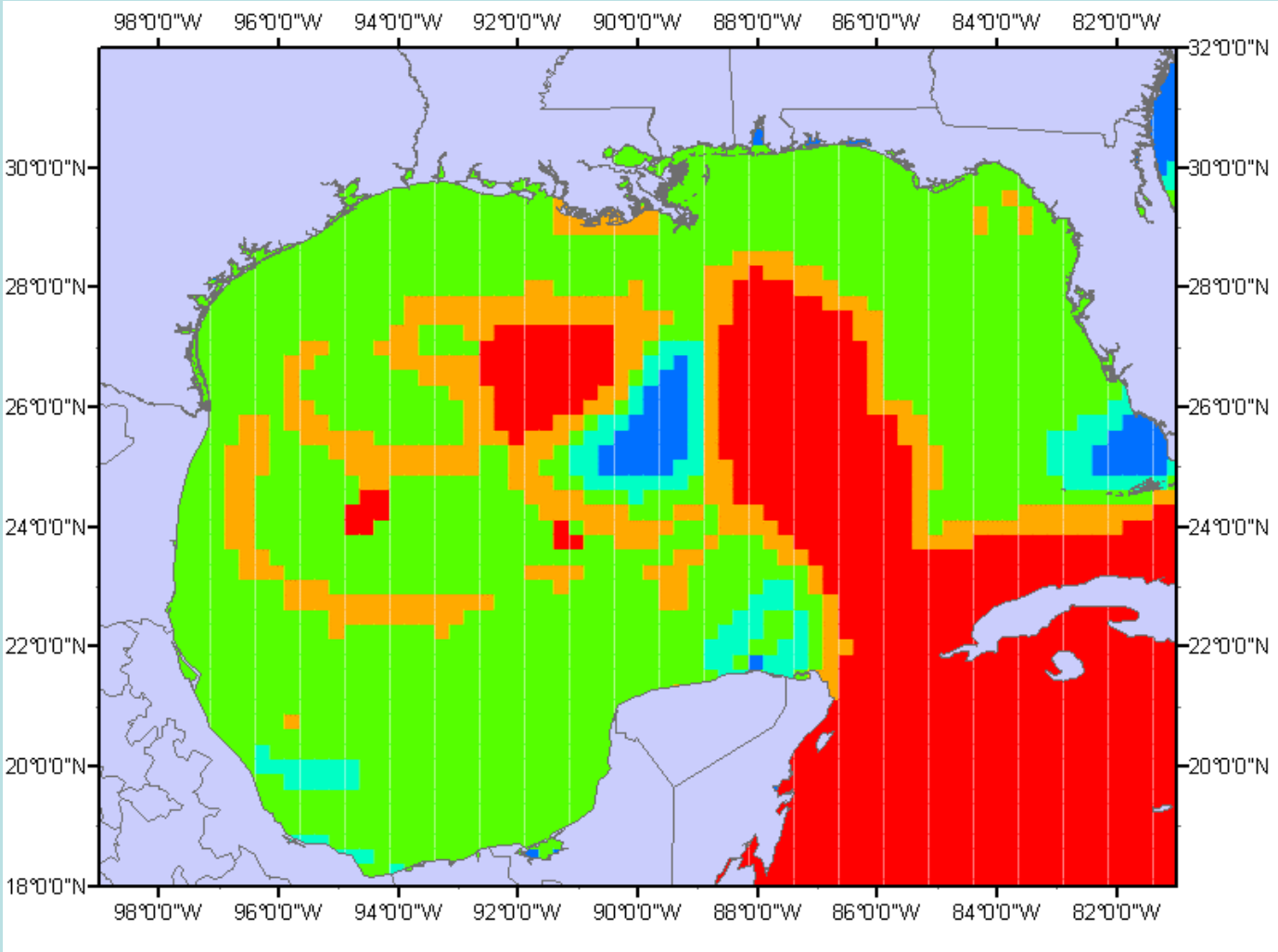








Identification of frontal areas, common waters and areas of cyclonic and anti-cyclonic circulation in the GOM



CONCLUSIONS

SST is not a good predictor of CPUE during the warmest month in the Gulf of Mexico.

Highest values of BFT CPUE were associated to the frontal areas of the cyclonic rings.

BFT CPUE was lowest in areas associated to anticyclonic rings.

In general, the responses of the CPUE of BFT, YFT and SWO to satellite observations were qualitatively different among each other.

Presently, estimation procedures used to standardize CPUE for the US pelagic longline fleet do not include environmental observations.