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SPATIAL AND TEMPORAL PATTERNS OF GEORGES BANK YELLOWTAIL FLOUNDER FROM THE SMAST BYCATCH AVOIDANCE PROGRAM

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ABSTRACT

Spatial and temporal overlap of scallops and yellowtail flounder on Georges Bank has resulted in bycatch of yellowtail flounder in the US sea scallop fishery. Bycatch of yellowtail flounder has forced early closure of the scallop fishery on Georges Bank, resulting in substantial economic losses. To address this constraint and achieve optimal yield of scallops, we collaborated with the scallop fishing industry to implement a bycatch avoidance program. We designed a system to collect information on incidental catch that expands the use of existing Vessel Monitoring System technology and relies upon the active fishing fleet to provide data. Vessels supplied real-time communications about incidental bycatch rates during fishing activities. In turn, we compiled the information for the fleet and sent it back to active fishing vessels. While providing spatially and temporally-specific data on catch rates of non-target species, the fishing fleet gained valuable information about distribution of yellowtail flounder in order to avoid bycatch "hotspots". Fisheries dependent data collected by the program can be used to qualitatively track the distribution and relative magnitude of Georges Bank yellowtail flounder bycatch in the scallop fishery during summer months in Closed Area II. Information from the Bycatch Avoidance Program indicates an increase in yellowtail flounder bycatch in the scallop fishery in Closed Area II in late July through September compared to other months of the year. The observed increase in yellowtail flounder bycatch suggests a possible seasonal migration of yellowtail flounder to Closed Area II of Georges Bank.

Introduction

Since 2010, SMAST has employed a cooperative, iterative approach to reducing bycatch of yellowtail flounder (*Limanda ferruginea*) in the U.S. Atlantic sea scallop (*Placopecten magellanicus*) fishery. Our objective is to assist the scallop fleet in maximizing scallop yield by avoiding bycatch of yellowtail flounder. The program was designed to alert the scallop fishing fleet about high bycatch locations, and allow individual industry participants to change fishing behavior in response to bycatch advisories (O'Keefe and DeCelles, 2013).

Bycatch reports from participating scallop fishing vessels provide information that allows us to quantitatively track the spatial and temporal overlap between scallops and yellowtail flounder. This information can be used in near real-time by fishing vessels to avoid regions with high levels of yellowtail flounder. As a by-product, data reported by the scallop fleet offers insight into the seasonal movements of yellowtail flounder over scallop fishing grounds on Georges Bank.

The Bycatch Avoidance System was not designed as a programmatic survey for yellowtail flounder, and the fisheries dependent information provided to the program reflects the behavior of individual scallop fishing vessel while targeting scallops on Georges Bank. For these reasons, spatial and temporal observations of yellowtail flounder are not considered representative of the entire Georges Bank yellowtail population. The information provided in this report characterize patterns and trends observed during fishing years 2011 – 2013 by the scallop fishery operating in Closed Area II of Georges Bank. Fishing behavior was likely influenced by several factors, including timing of management action implementation, environmental conditions and weather, scallop price and marketability, individual decision-making, and the bycatch advisory itself.

Methods/Results

O'Keefe and DeCelles (2013) provide a detailed description of the methods employed in the Bycatch Avoidance Program. The following Methods section briefly describes the Bycatch Avoidance Program, and the information that was used to compile this report.

We collaborated with scallop fishing industry members to design a two-phase system to reduce yellowtail flounder bycatch. Phase 1 utilizes existing survey information about the locations of scallops and yellowtail on scallop fishing grounds to provide the fishing fleet with a preliminary estimation of high and low bycatch regions prior to the start of the fishery. Phase 2 employs a near real-time communication system via vessel monitoring systems (VMS) ship-to-shore emails and bycatch advisories to alert the fleet of yellowtail bycatch hotspots.

Participating vessels send daily emails to SMAST indicating fishing location within reporting grids on Georges Bank, number of dredge tows completed within each grid cell, and the amount of yellowtail flounder bycatch and scallop harvest within each grid cell. SMAST analysts compile the information from each vessel daily, classify the bycatch amount in each grid cell relative to established thresholds, and disseminate bycatch hotspot advisories to participating scallop vessels.

We quantitatively tracked the distribution and relative magnitude of yellowtail flounder bycatch in Closed Area II of Georges Bank during the scallop access area fisheries in 2011 through 2013. By examining the locations of bycatch hotspots, as classified from the Bycatch Avoidance Program, we detected a seasonal pattern in Closed Area II with increasing yellowtail flounder bycatch in mid to late July through September. This pattern was observed in 2011 through 2013 with some caveats about the collected data due to timing of the opening and closure of Closed Area II by management action. It should also be noted that the reporting thresholds in Closed Area II (i.e., bycatch amounts that we chose to represent a high, medium, or low cell) varied over the three year period, depending upon the relative allocation of scallops and yellowtail flounder to the fleet.

In fishing year 2011, the opening of the access area fishery in Closed Area II was delayed until 1 August 2011 (NEFMC 2011). We observed an increase in yellowtail flounder bycatch levels in the western and central regions of Closed Area II within three weeks of the opening. Figure 1 shows a sample of the daily bycatch advisory maps generated from vessel reports to the 2011 Bycatch Avoidance Program. Yellowtail bycatch amounts began to increase on 19 August (Figure 1C) and peaked on 29 September (Figure 1F), at which point the bycatch advisory may have influenced fishing behavior to direct scallop fishing effort to regions with lower bycatch levels. Hotspot designations were maintained until new data suggested lower bycatch amounts. Therefore, hotspots that were not subsequently fished remained classified as high bycatch areas.

In fishing year 2012, Closed Area II opened as scheduled on 15 June. Yellowtail flounder bycatch was low in the area during June and early July (Figure 2A-B). Bycatch began to increase in the western and central regions by the third week of July, and remained at high levels throughout September (Figures 2B-F). Bycatch amounts began to decline in early October and several areas that had previously been identified as hotspots had lower bycatch by mid-October (Figure 2G).

In Fishing year 2013, Framework 24 to the Scallop Fishery Management Plan changed the opening date for Closed Area II from 15 June to the start of the fishing year, and implemented a three month yellowtail flounder bycatch closure in Closed Area II from 15 August through 15 November (NEFMC 2013). Due to a management implementation delay, Closed Area II opened on 20 May, and reporting to the Bycatch Avoidance Program began on 7 June. Bycatch amounts were low in June throughout the majority of the Closed Area II scallop grounds (Figure 3A-B). Bycatch began to increase in the western and central regions of Closed Area II beginning in late June and continued to increase until the area was closed on 15 August (Figure 3C-G).

Summary

Fishery dependent data collected through the SMAST Bycatch Avoidance Program can be used to qualitatively track the spatial distribution and relative magnitude of yellowtail flounder bycatch in the scallop fishery. We used this information to identify spatial and temporal patterns of bycatch of Georges Bank yellowtail flounder in Closed Area II during scallop fishing years 2011 – 2013. A seasonal increase in bycatch amounts in the western and central region of Closed Area II was observed in all years, beginning in mid to late-July through September. The observed increase in bycatch in the western and central region of Closed Area II during summer months may indicate a seasonal migration pattern for Georges Bank yellowtail flounder.

Literature Cited

New England Fishery Management Council (NEFMC). 2011. Final Framework 22 to the Atlantic Sea Scallop FMP, Including an Environmental Assessment (EA), an Initial Regulatory Flexibility Analysis and Stock Assessment and Fishery Evaluation (SAFE) Report. 28 February 2011, Newburyport, MA.

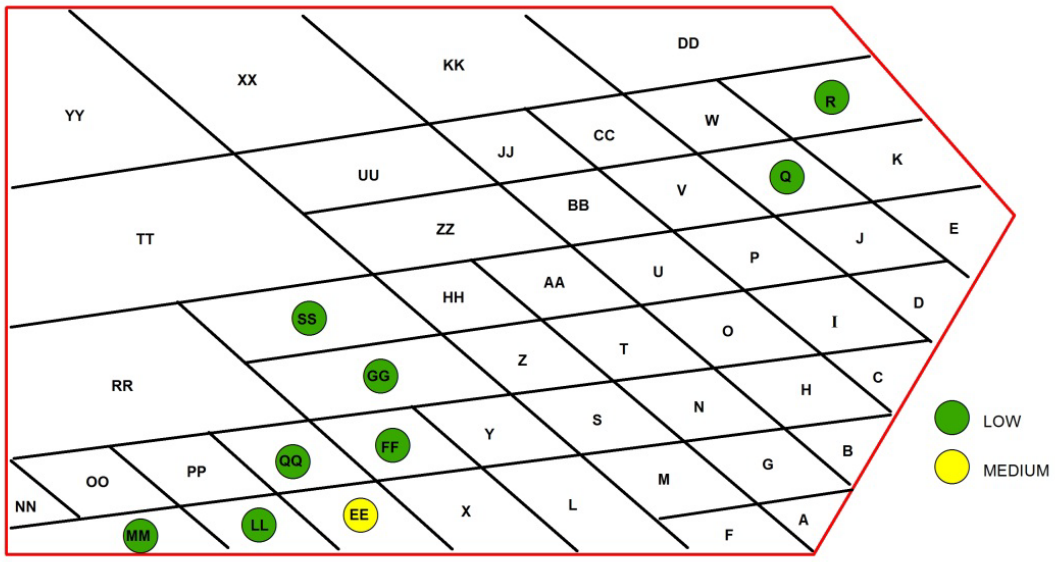
New England Fishery Management Council (NEFMC). 2013. Framework 24 to the Scallop FMP and Framework 49 to the Multispecies FMP, Including a Draft Environmental Assessment (EA), an Initial Regulatory Flexibility Analysis and Stock Assessment and Fishery Evaluation (SAFE) Report. 15 February 2013, Newburyport, MA.

O'Keefe, C.E. and G.R. DeCelles. 2013. Forming a partnership to reduce bycatch. Fisheries 38(10): 434-444.

Figures

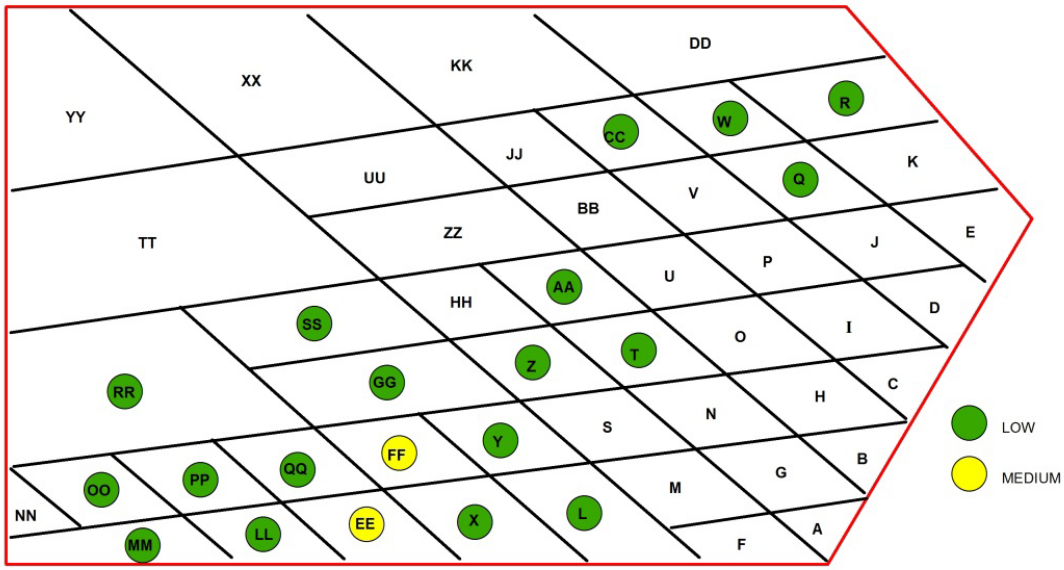
A

Closed Area II Yellowtail Bycatch
8/2/11



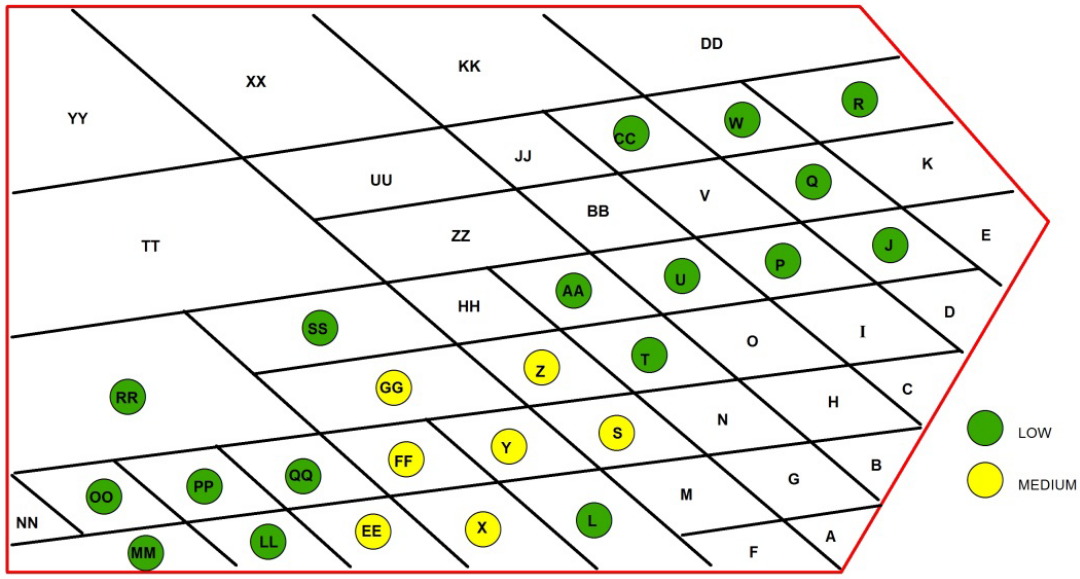
B

Closed Area II Yellowtail Bycatch
8/12/11



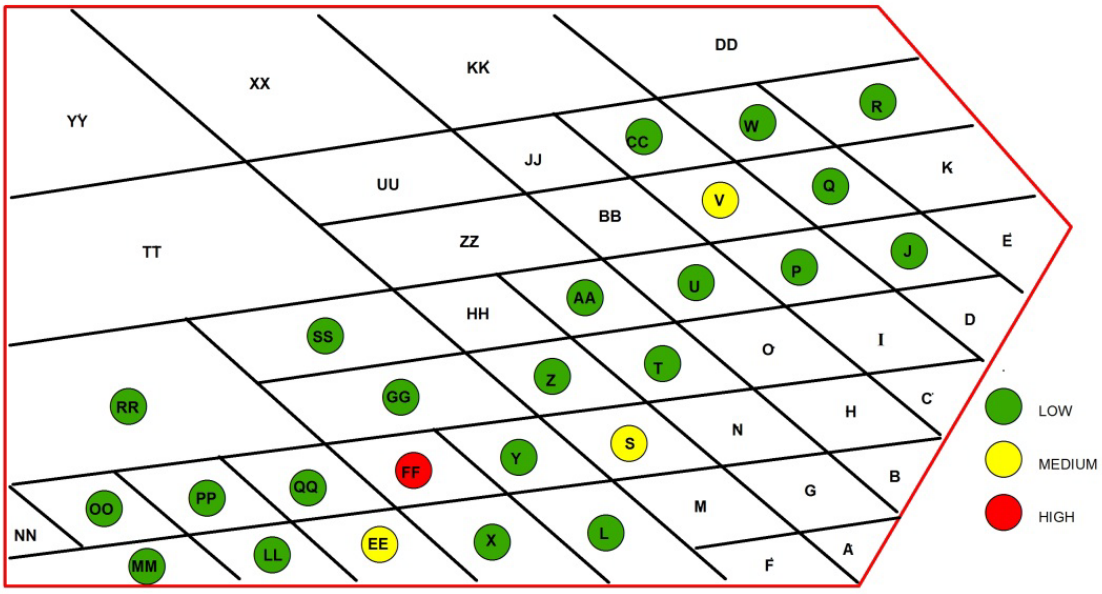
C

Closed Area II Yellowtail Bycatch
8/19/11



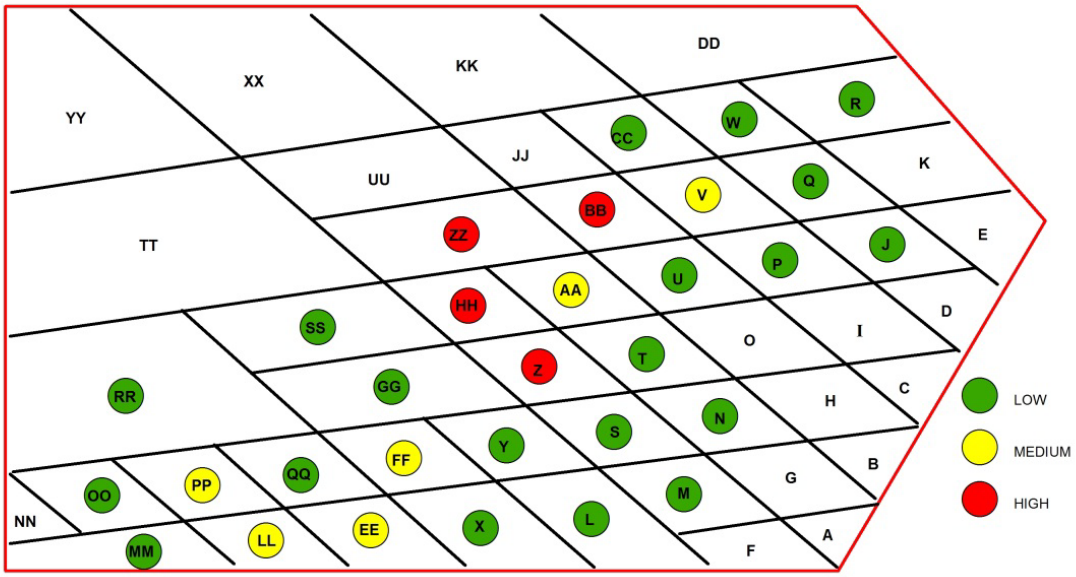
D

Closed Area II Yellowtail Bycatch
9/2/11



E

Closed Area II Yellowtail Bycatch
9/14/11



F

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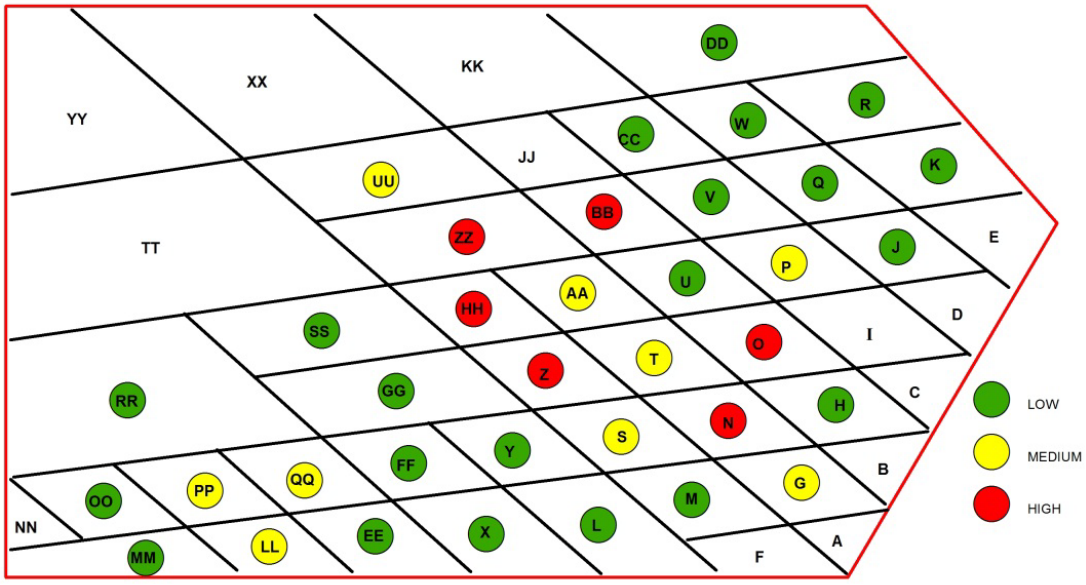
9/29/11



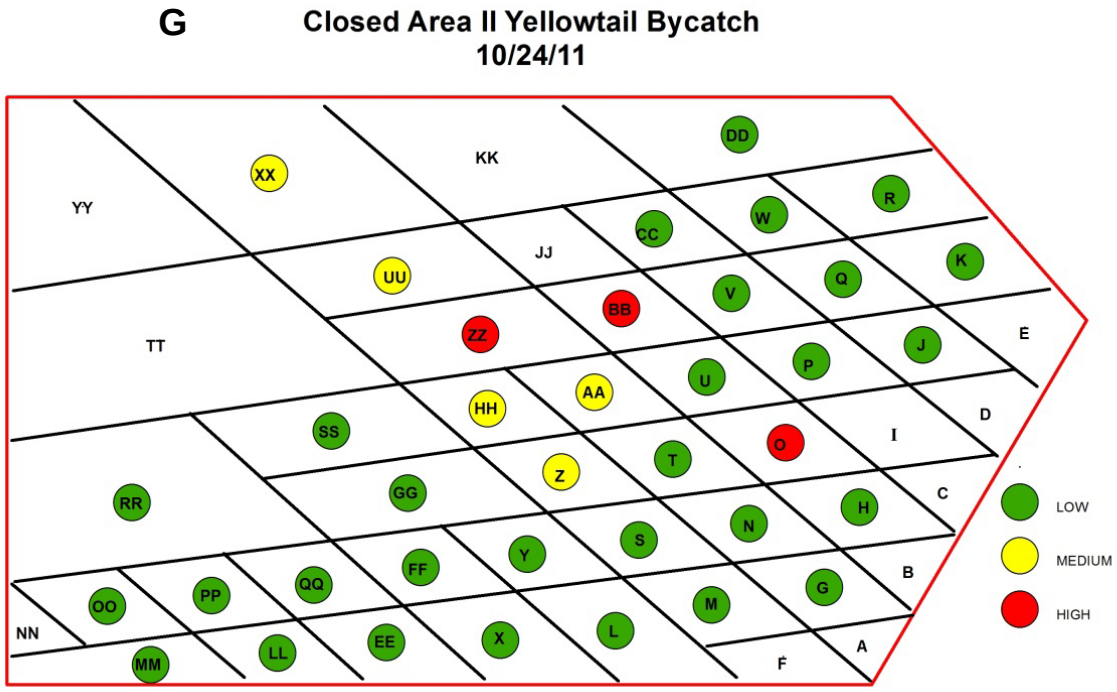
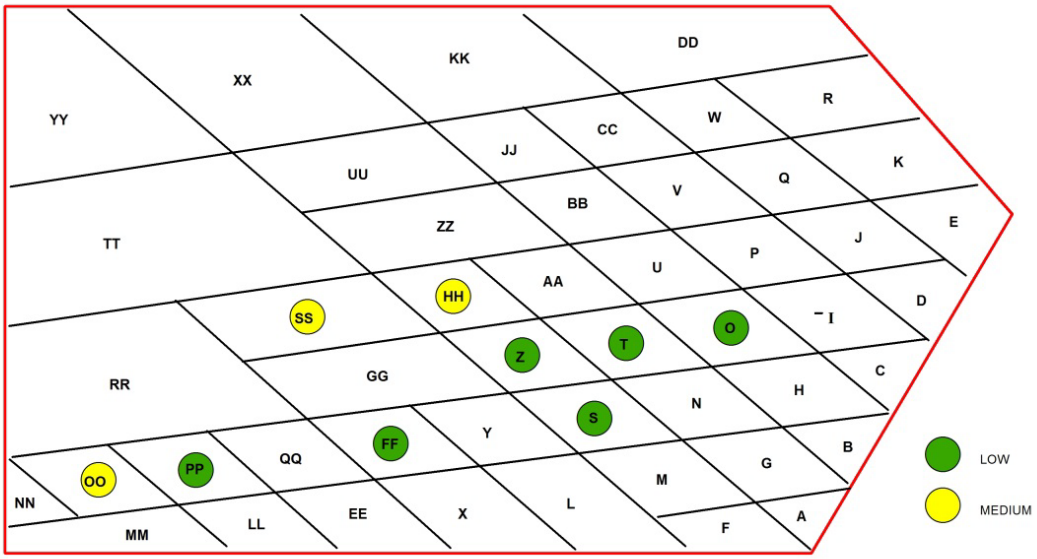
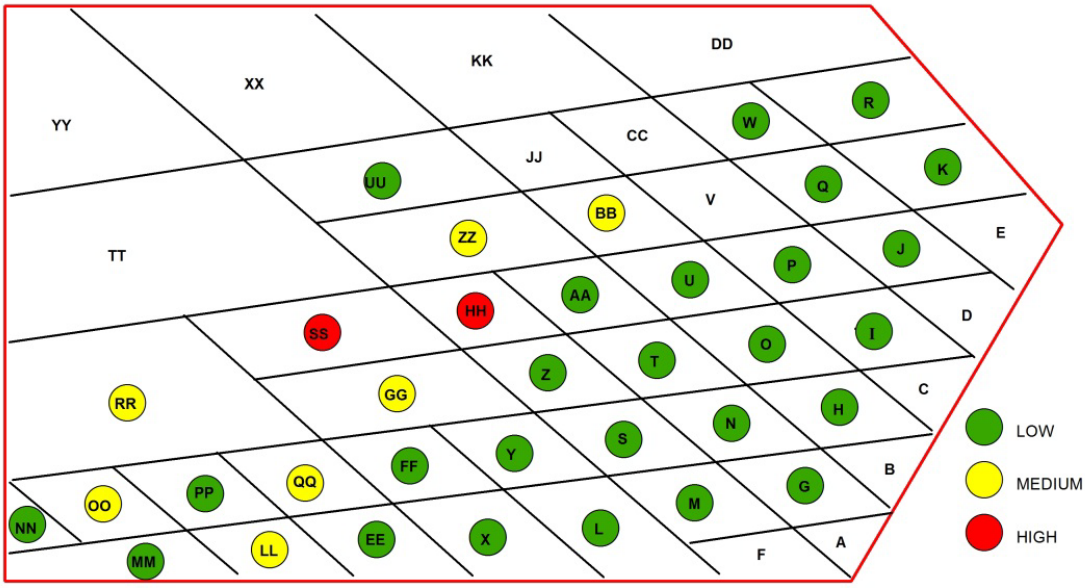


Figure 1. Closed Area II Bycatch Avoidance System yellowtail flounder bycatch advisories from 2 August through 24 October 2011.

A **Closed Area II Yellowtail Bycatch**
6/17/12



B **Closed Area II Yellowtail Bycatch**
7/1/12



C **Closed Area II Yellowtail Bycatch**
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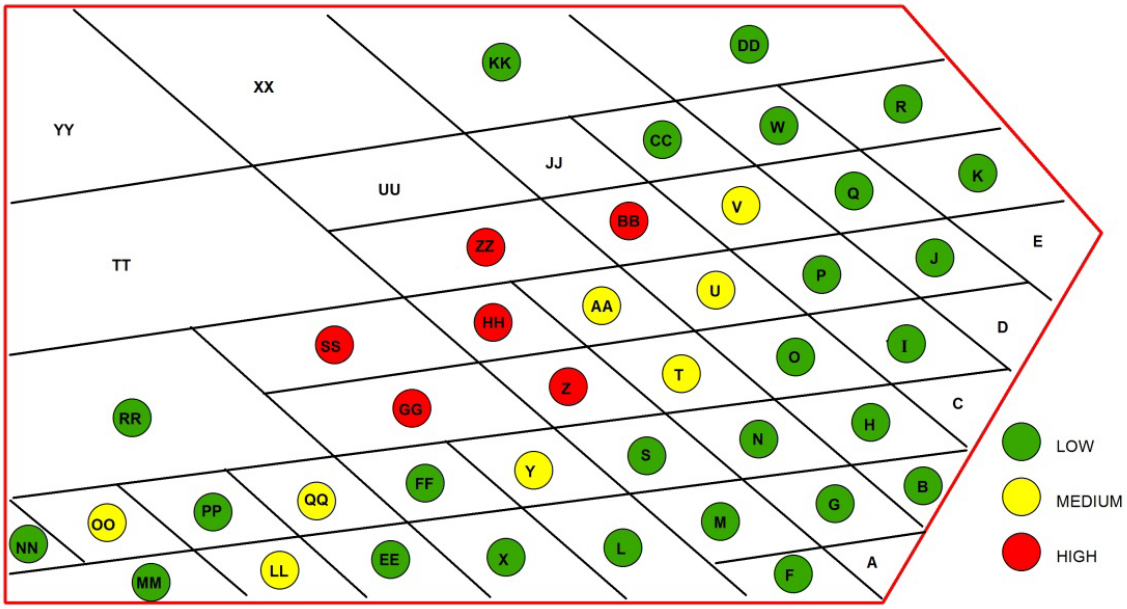
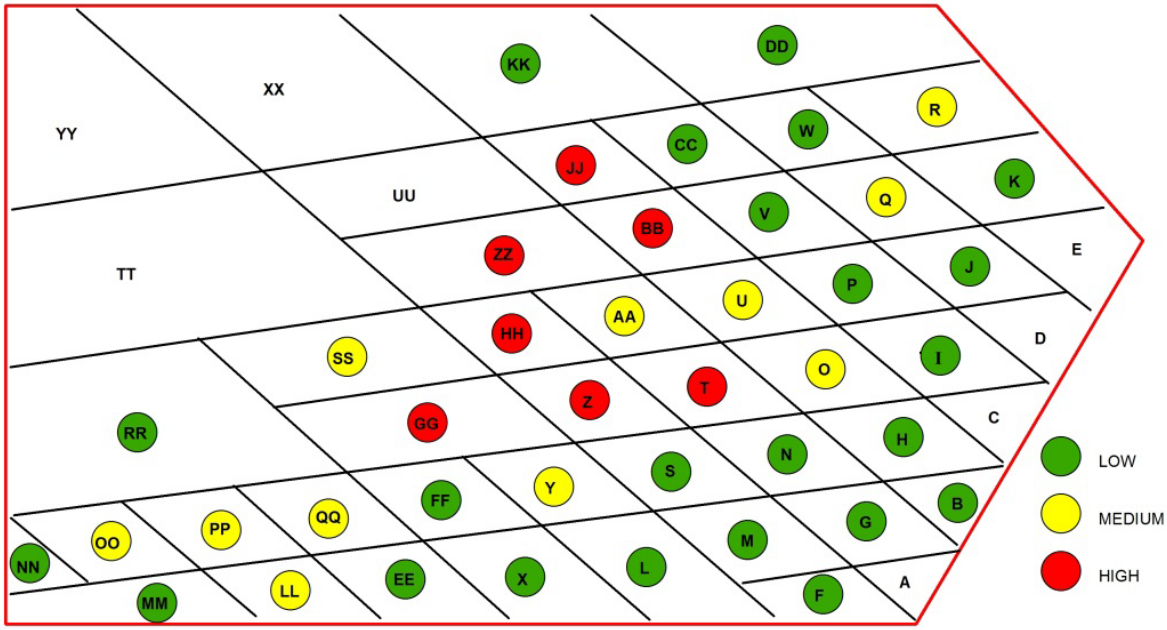
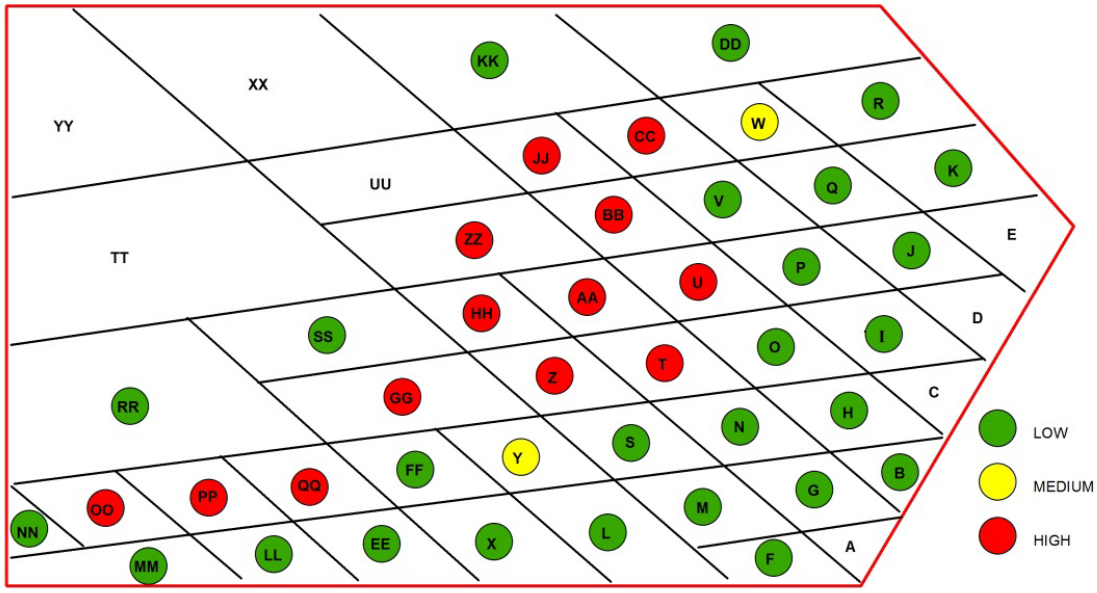


D **Closed Area II Yellowtail Bycatch**
8/10/12



E **Closed Area II Yellowtail Bycatch**
8/28/12



F **Closed Area II Yellowtail Bycatch**
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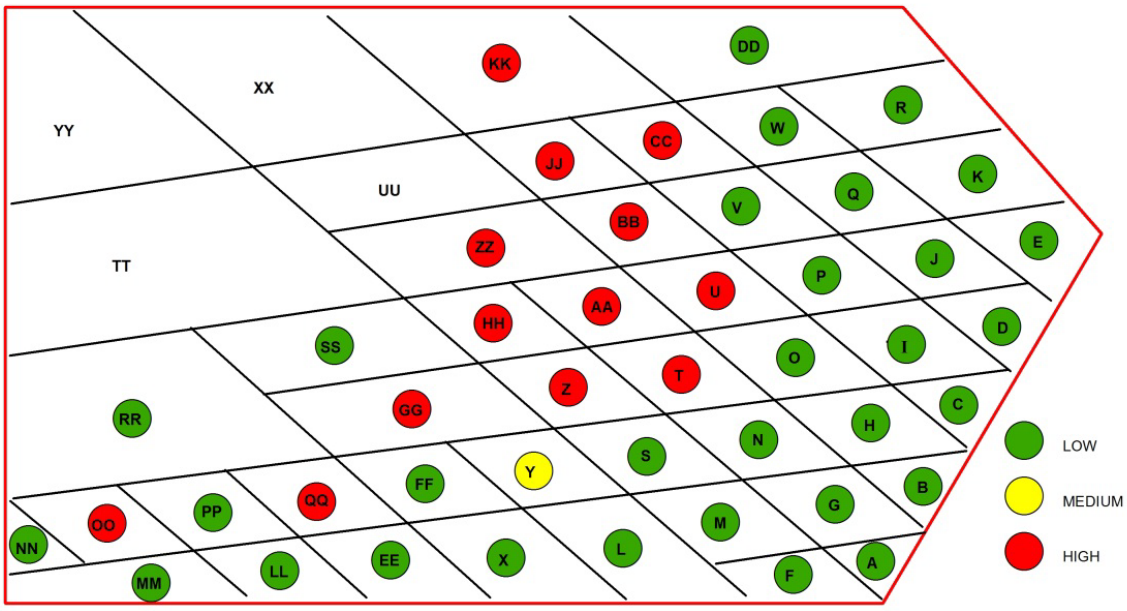


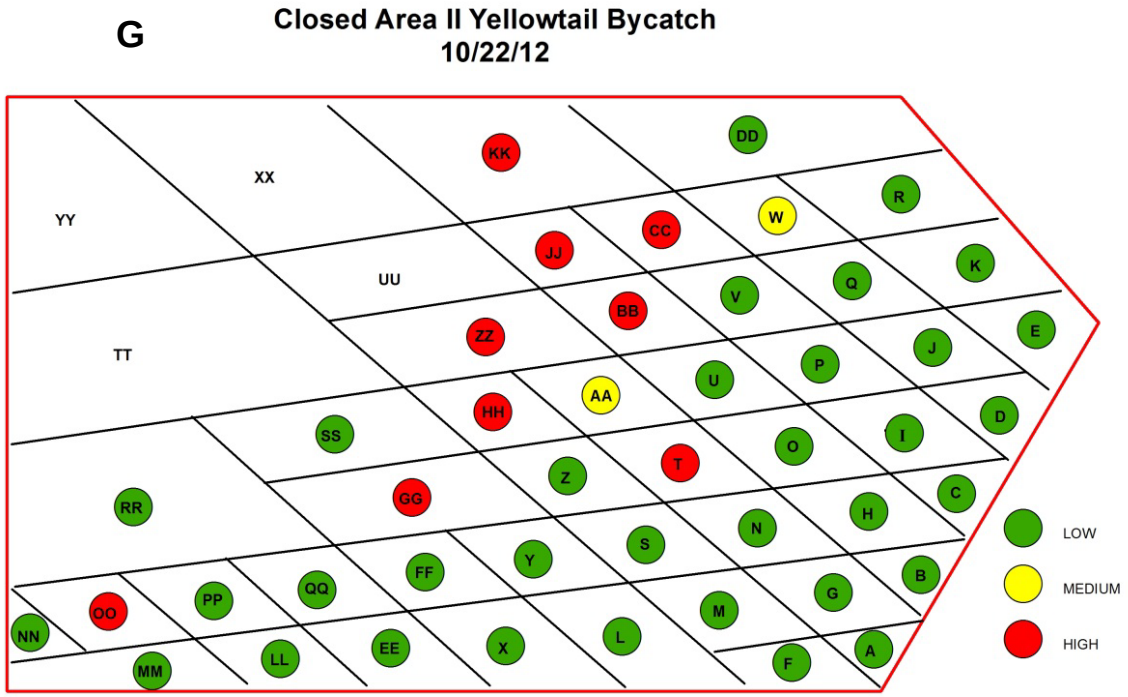
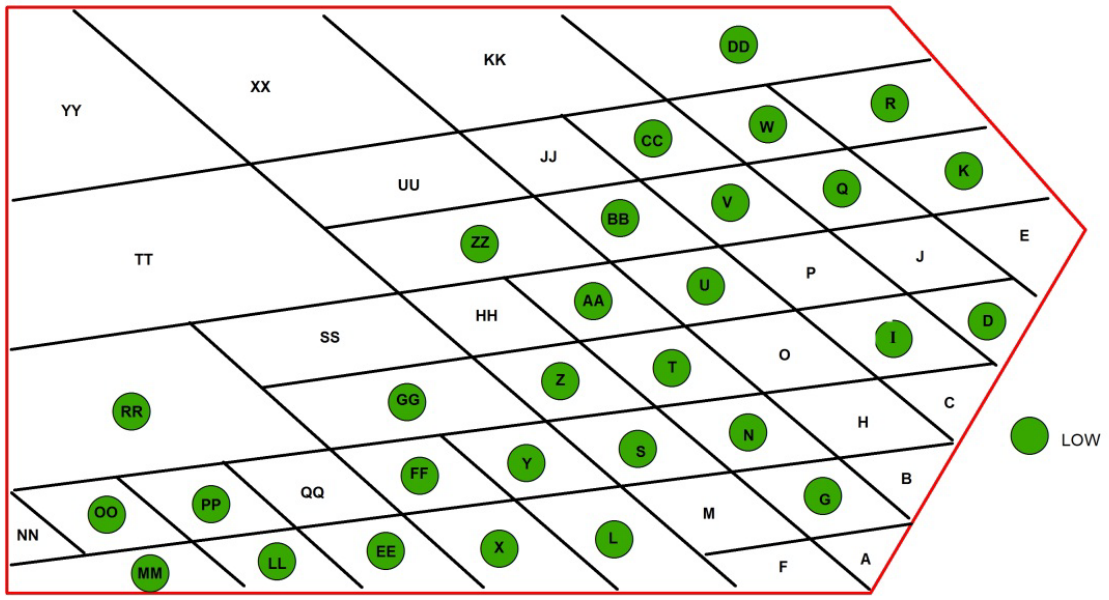
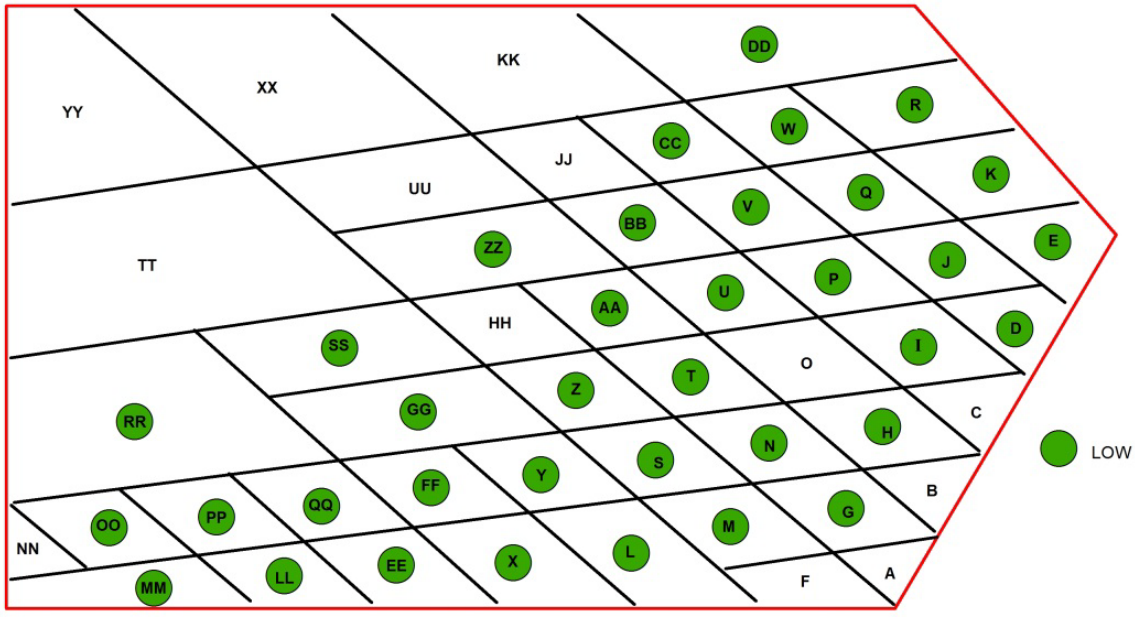


Figure 2. Closed Area II Bycatch Avoidance System yellowtail flounder bycatch advisories from 17 June through 22 October 2012.

A **Closed Area II Yellowtail Bycatch**
6/7/13



B **Closed Area II Yellowtail Bycatch**
6/21/13



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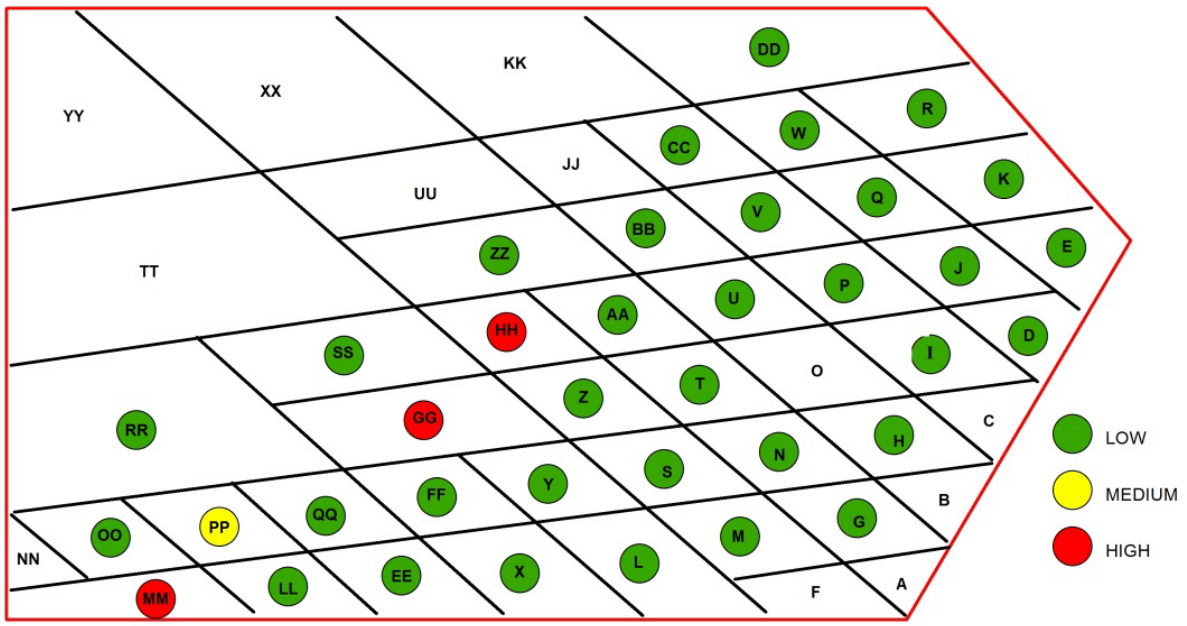
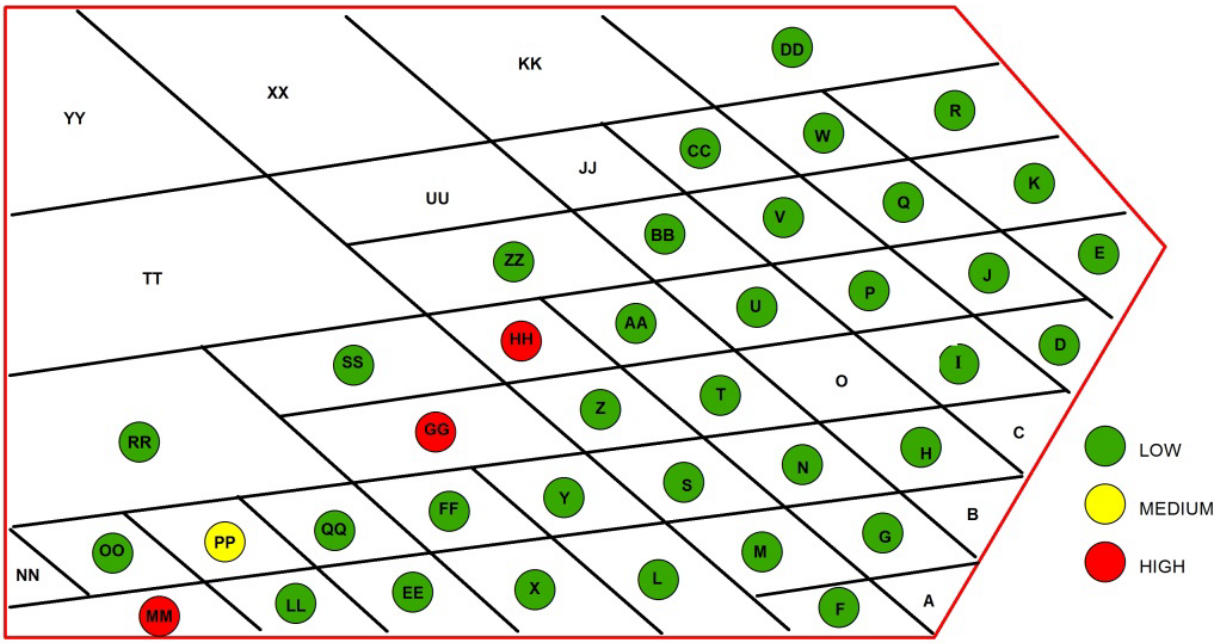
6/27/13



D **Closed Area II Yellowtail Bycatch**
7/8/13



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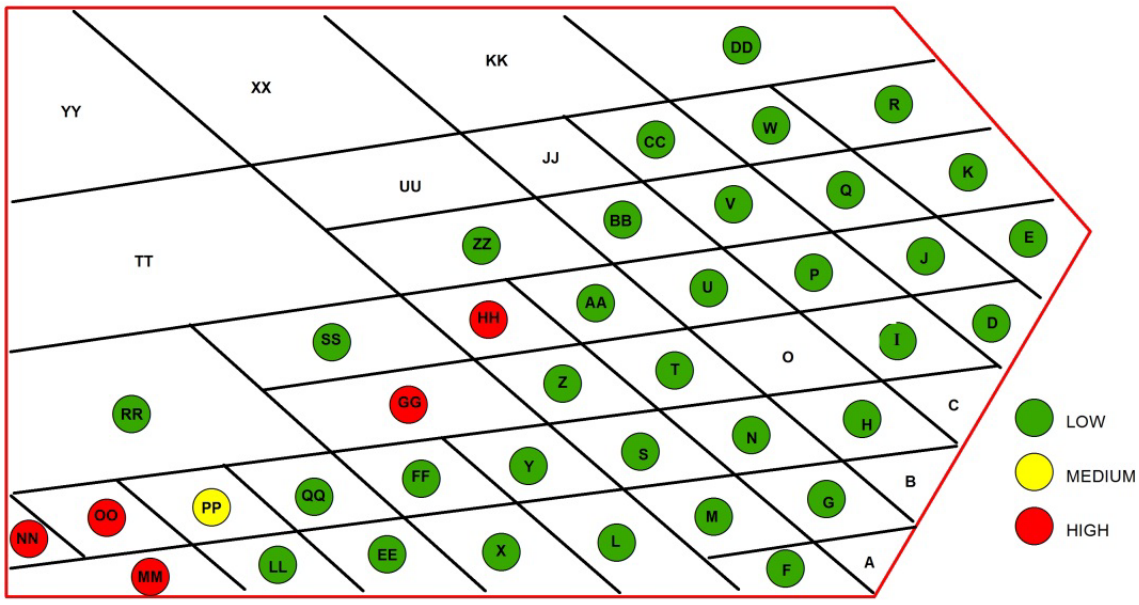

F **Closed Area II Yellowtail Bycatch**
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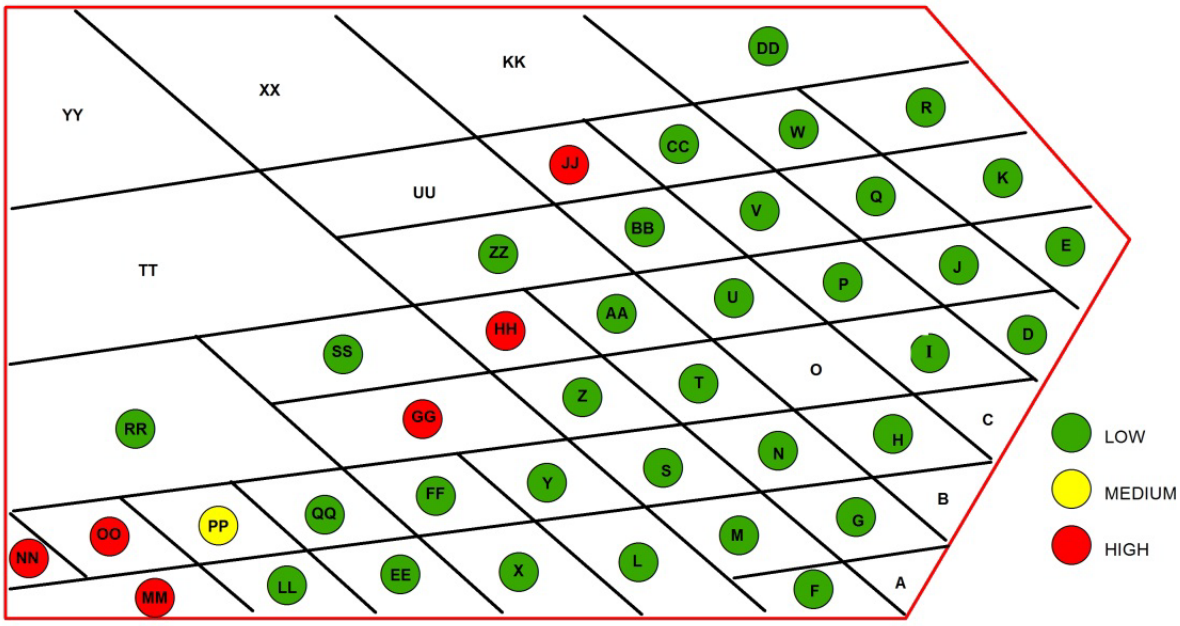

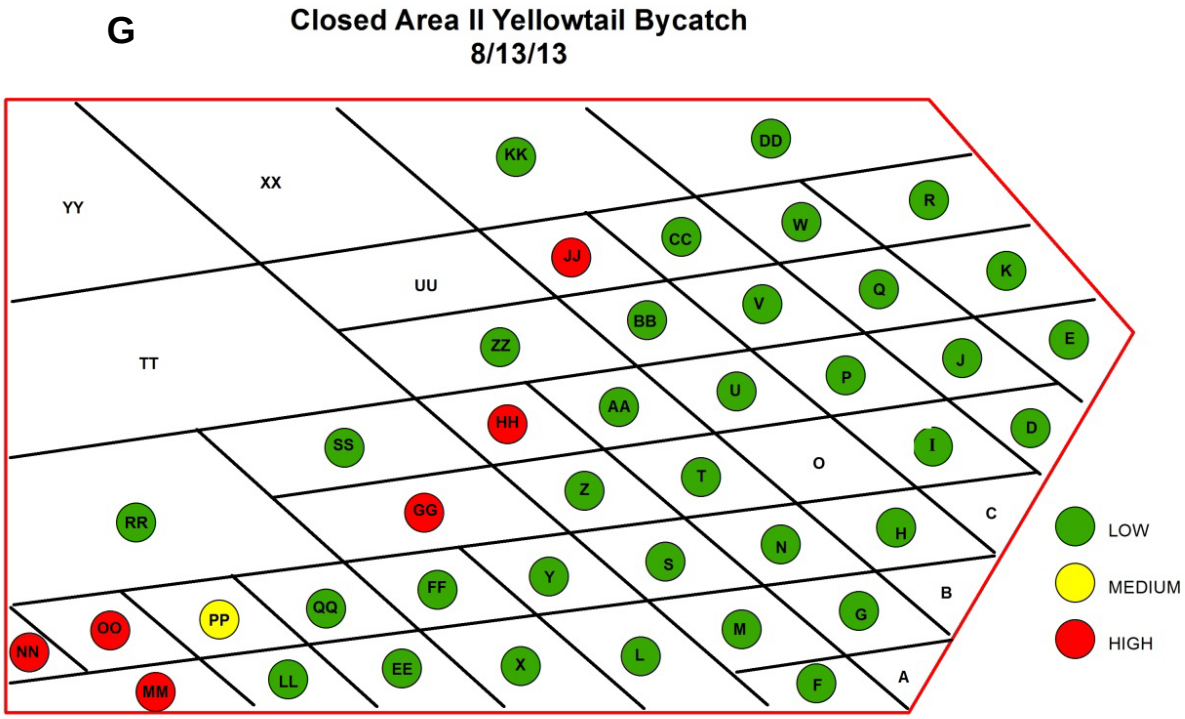

Figure 3. Closed Area II Bycatch Avoidance System yellowtail flounder bycatch advisories from 6 June through 13 August 2013.