The variability of preferred spawning grounds for bluefin tuna (*Thunnus thynnus*) in the Gulf of Mexico during 1993-2011

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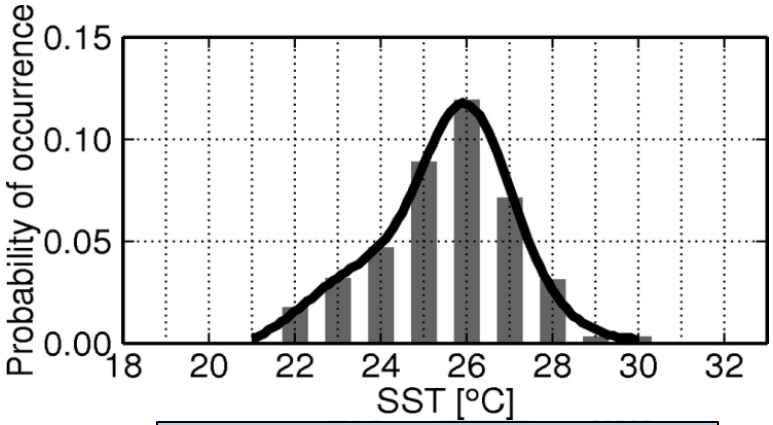
Background

- Bluefin tuna (*Thunnus thynnus*, BFT) spawning in the western North Atlantic has been observed mostly within the Gulf of Mexico during the spring

- Muhling et al. (2010, 2011)
  - BFT larvae are found in the northern GOM mostly during on late-April to late May
  - Most likely colleted in the SST range 24-28°C



Reproduced from Muhling et al. (2011)

- Lindo et al. (2012)
  - Identified a relationship between the type of mesoscale feature and the abundance of certain larvae
  - BFT larvae are more abundant in Anticyclonic boundaries (AB)

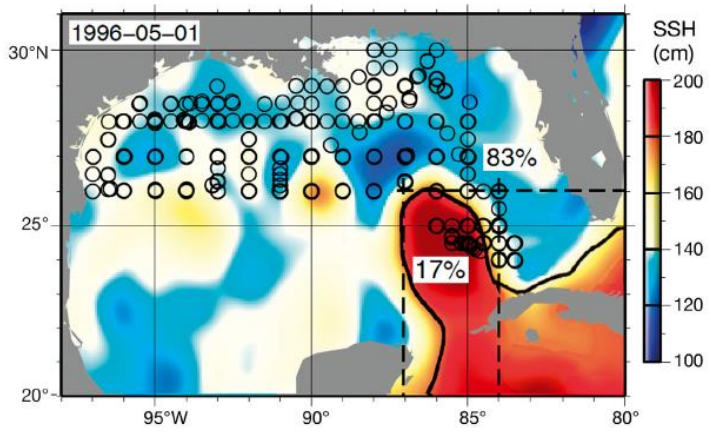
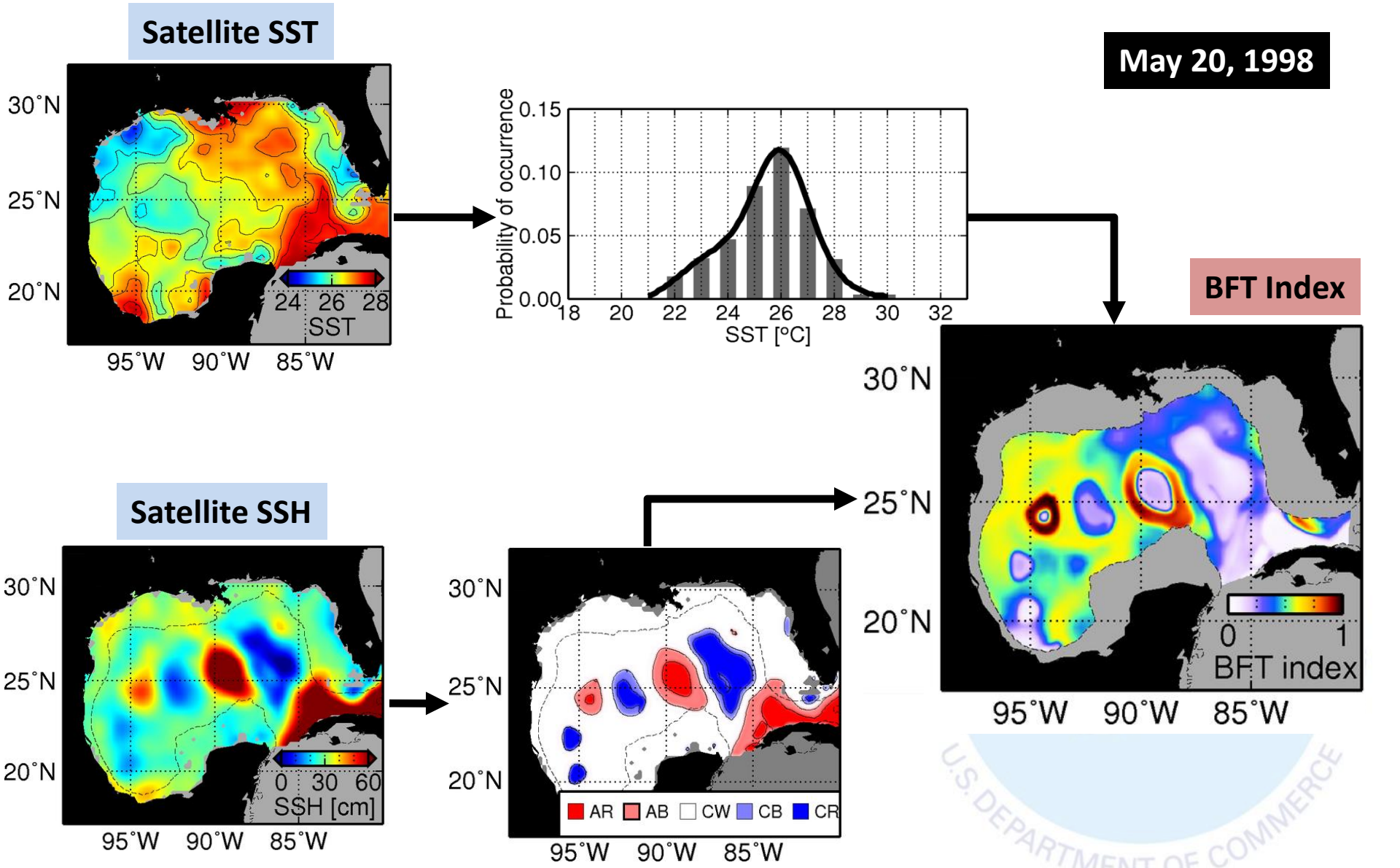


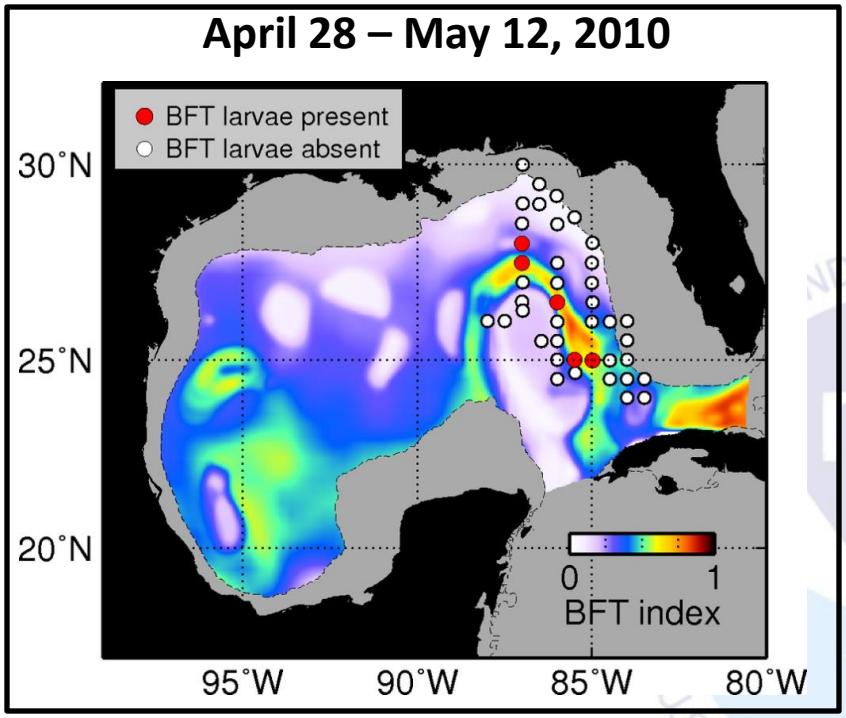
Figure 4 from Lindo et al. (2011)

BFT larvae index



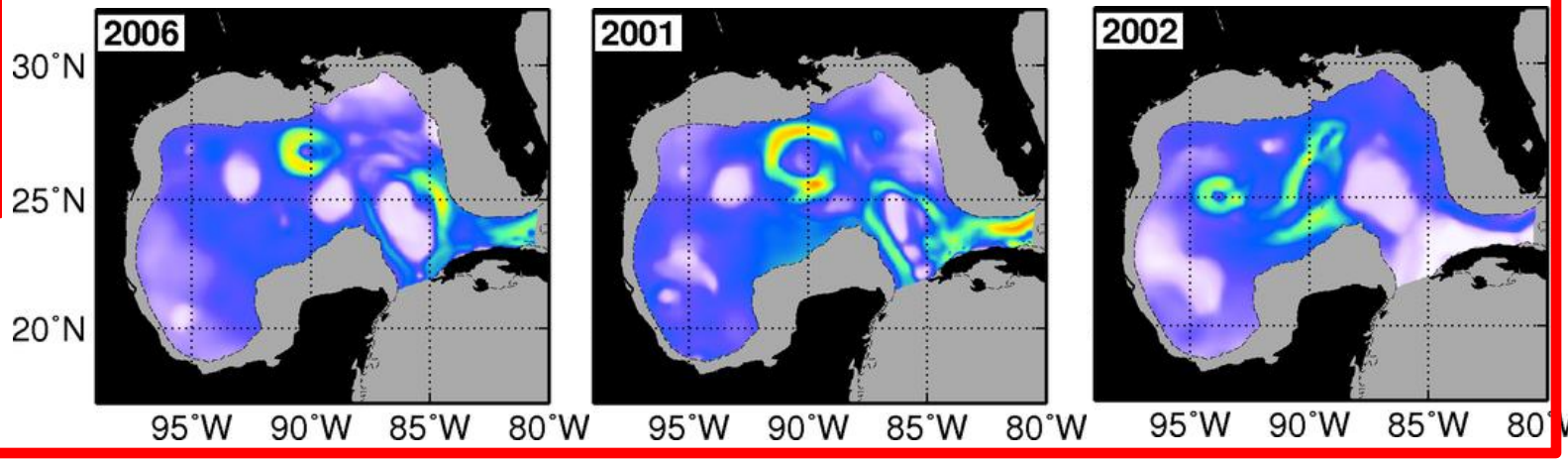
BFT Index – comparison with SEAMAP surveys

- SEAMAP survey 2010
  - from the 41 stations sampled between April 28 and May 12, only 5 stations captured BFT larvae

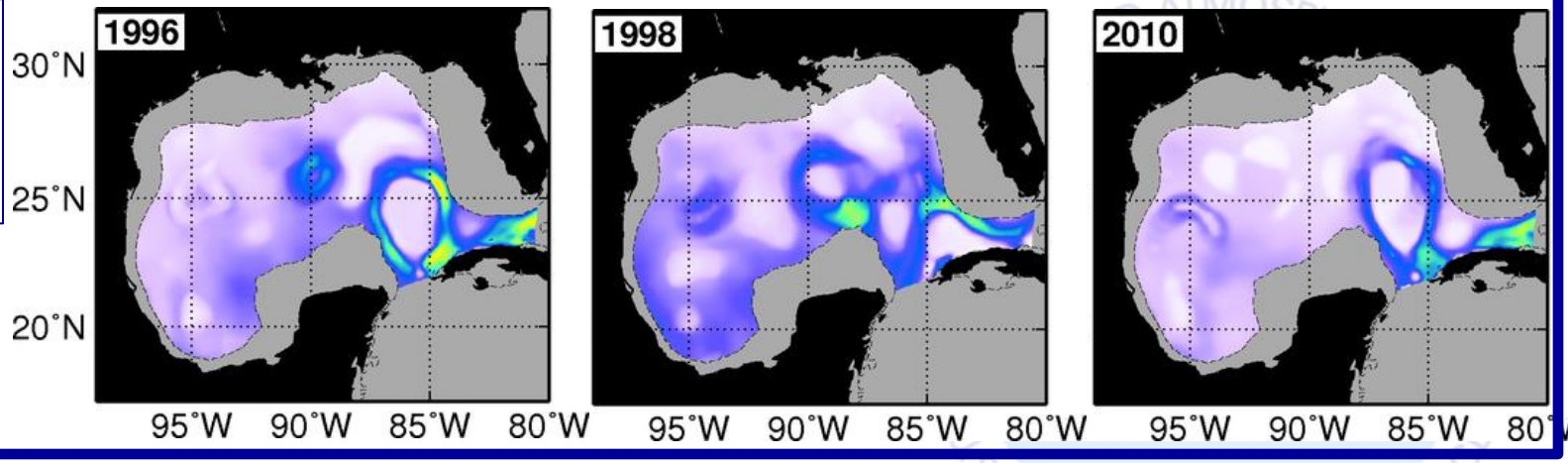


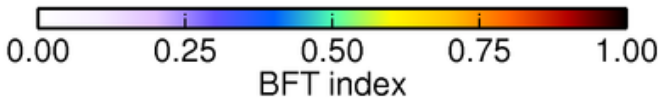
BFT Index GOM – spring-time extremes

Years with good Environmental conditions for spawning

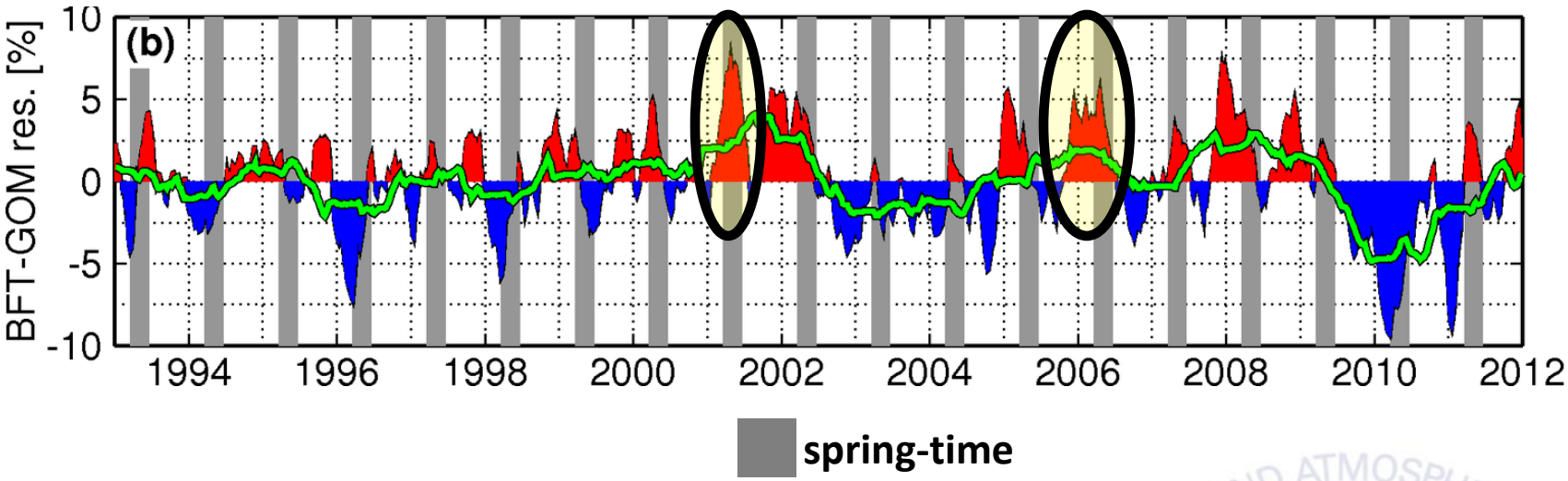


Years with Bad environmental conditions for spawning





Integrated BFT Index GOM 1993-2011



- How the spring-time spawning conditions associate with environmental conditions in other seasons?

e.g. 2001 vs. 2006

- Are spring-time spawning conditions linked with longer-period variability?

The one-year low-passed time-series (green-line) suggests the existence of year-to-year variability

Summary

- In this collaborative work, integrated knowledge from previous studies were applied to compute one single index for monitoring environmental conditions for BFT spawning during 1993-2011

- Although not shown, we found that the temporal variability of preferred spawning conditions for BFT in the GOM is mostly linked with the SST, while the spatial variability is mostly liked with the mesoscale field

  - Best years: 2001, 2002, and 2006 (high spring-time SST)

  - Worst years: 1996, 1998, and 2010 (low spring-time SST)

Future Work

- The BFT Index will be used to:
  - Quantify year-to-year periodicities in the preferred environmental conditions
  - Study the intra-seasonal variability by computing the best period in the spring for BFT spawning within the GOM for each year
  - Analyze trends in the preferred environmental conditions and in the optimal period during spring-time for spawning during 1993-2011
  - Manuscript