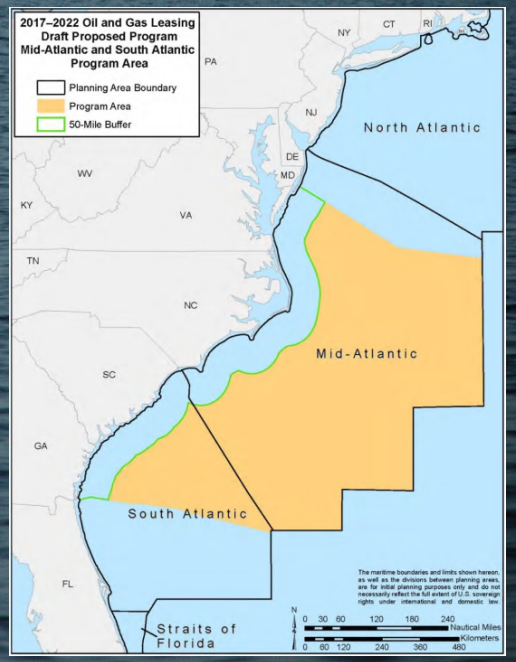
SOUTHEASTERN US MARINE ECOSYSTEMS AND HYDROCARBON EXPLORATION

Steve W. Ross

(UNCW)



SEUS Marine Ecosystems

- Large estuaries and numerous rivers
- Long coastlines, inshore and offshore
- Extensive commercial and recreational resources
- Strong linkages between inshore and offshore biota
- Waters deeper than 200 m poorly explored

- Extremely high marine and estuarine biodiversity

  (> 1000 spp. of fishes < 200 m, more than anywhere else in US except FL)

  - ❖Moderate climate
  - ❖Temperate latitudes (warm and cool temperate with subtropical input
  - ❖Habitat diversity high (shallow and deep)
  - ❖Gulf Stream (nutrient dynamics, transport, temperature moderation)

Value of NC Fisheries

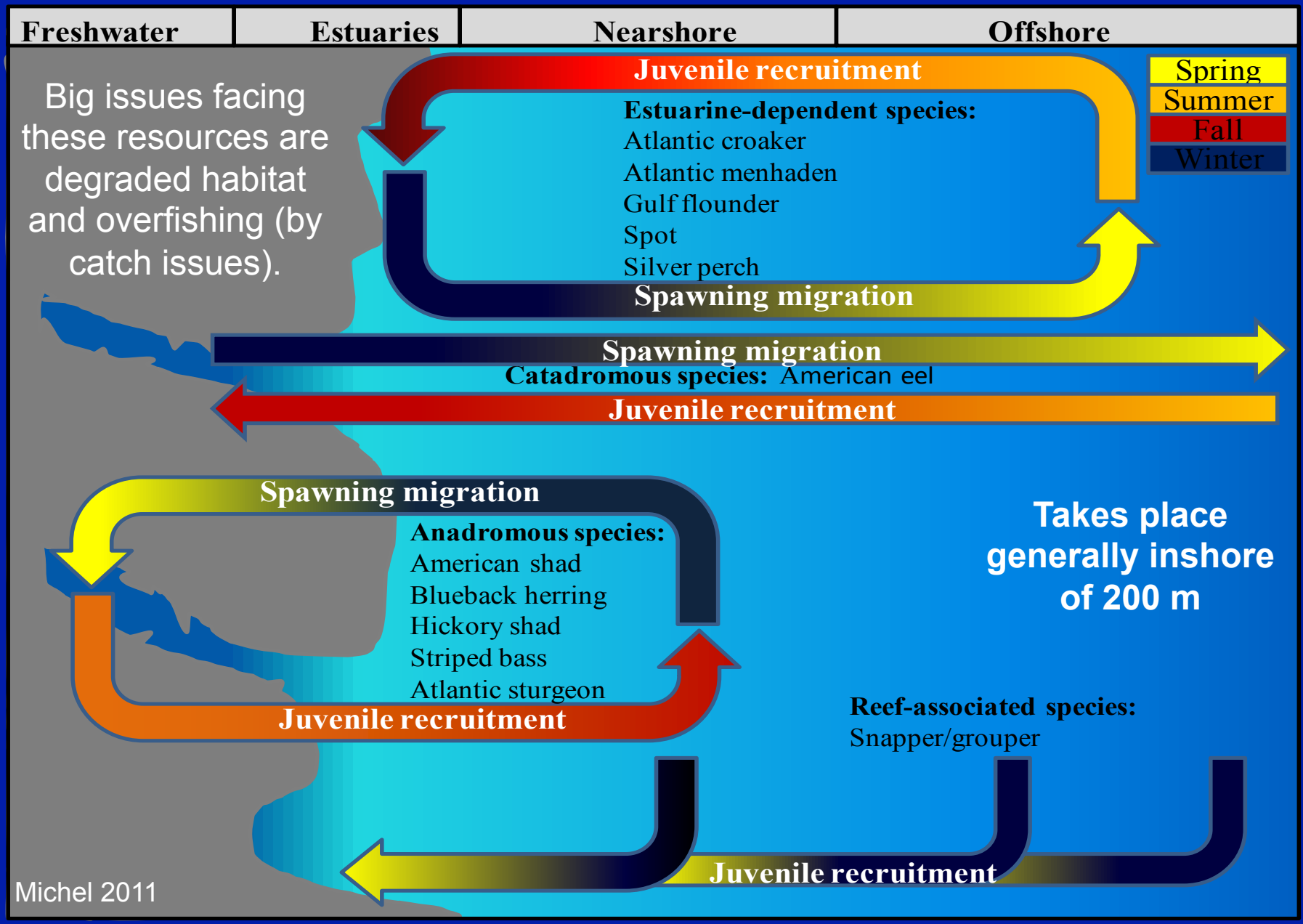
Commercial

- NC & FL have highest landings revenue in SE region; NC has highest landings
- Generated $796 m in sales in NC (2011)
- 8,850 jobs
- Shrimp & blue crab = most value (estuarine dependent species)

Recreational

- $2 b in sales impact in 2011
- 18,000 fishing related jobs
- Average 2.8 million anglers per year in the SE region
- Numerous species involved

At present most fisheries occur much shallower than 200 m. Deep water bottom fisheries are poorly developed in this region.



Great connectivity between river/estuarine and offshore systems
But less connectivity with deeper (> 200 m) waters

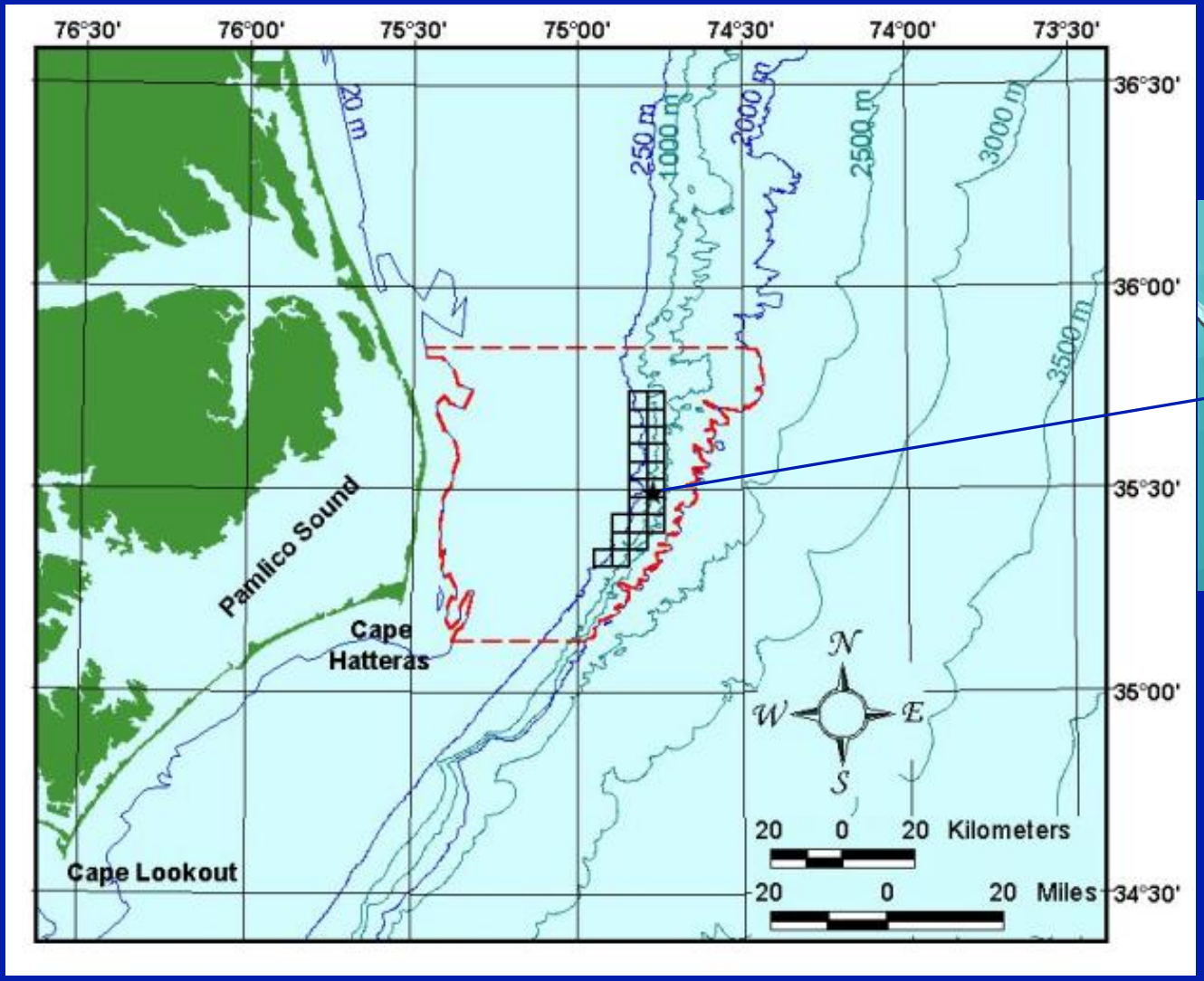
Status of Fishery Information

- Pretty good biological and habitat data on most commercial and recreational fish species in estuarine and coastal waters
- Pretty good biological data on most economically important pelagic fishes in offshore waters
- Limited data on larval biology and transport and offshore spawning (all species)
- Lack of data on many aspects of most non-economic species (important for management on an ecosystem basis)
- Severe lack of biological data > 200 m (benthic & mesopelagic)
- Lack of data on offshore habitats (distribution and importance)
- Limited information on the interplay of physical oceanography and biology (larval transport, genetic continuity, dispersal barriers or conduits)

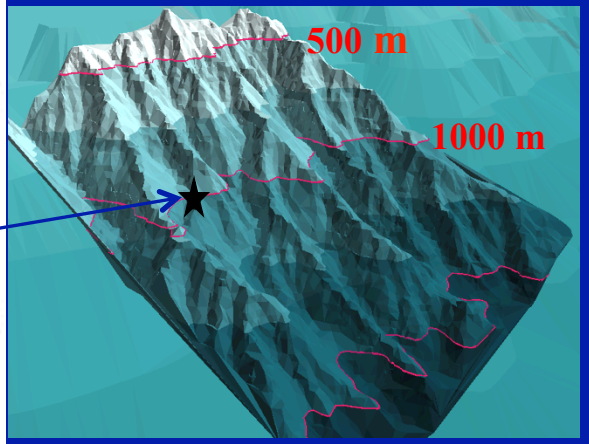
Fishery Related Progress ?

- Huge increase in multidisciplinary knowledge in selected areas (The Point, deep coral banks, Gulf Stream)
- Better models of estuarine and ocean dynamics
- Better inventories of fish species assemblages
- More data on fish movements (tagging technology)
- Management improvements (MPAs, population data, protected seasons)

Progress leads us to refine research and ask better questions.



Manteo Prospect
Hatteras Middle Slope
("The Point")



- Dynamic oceanography
- Rugged terrain
- High carbon deposition
- High infaunal biomass
- Unusual communities
- High productivity and biological activity

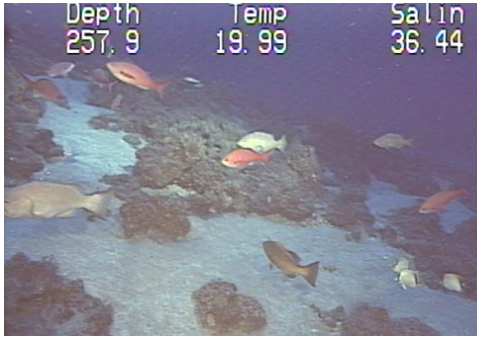
Since the late 1980s, there has been substantial progress in understanding offshore ecology.
Even so, the farther offshore or deeper we go, the less we know, and in some cases there are almost complete knowledge gaps.

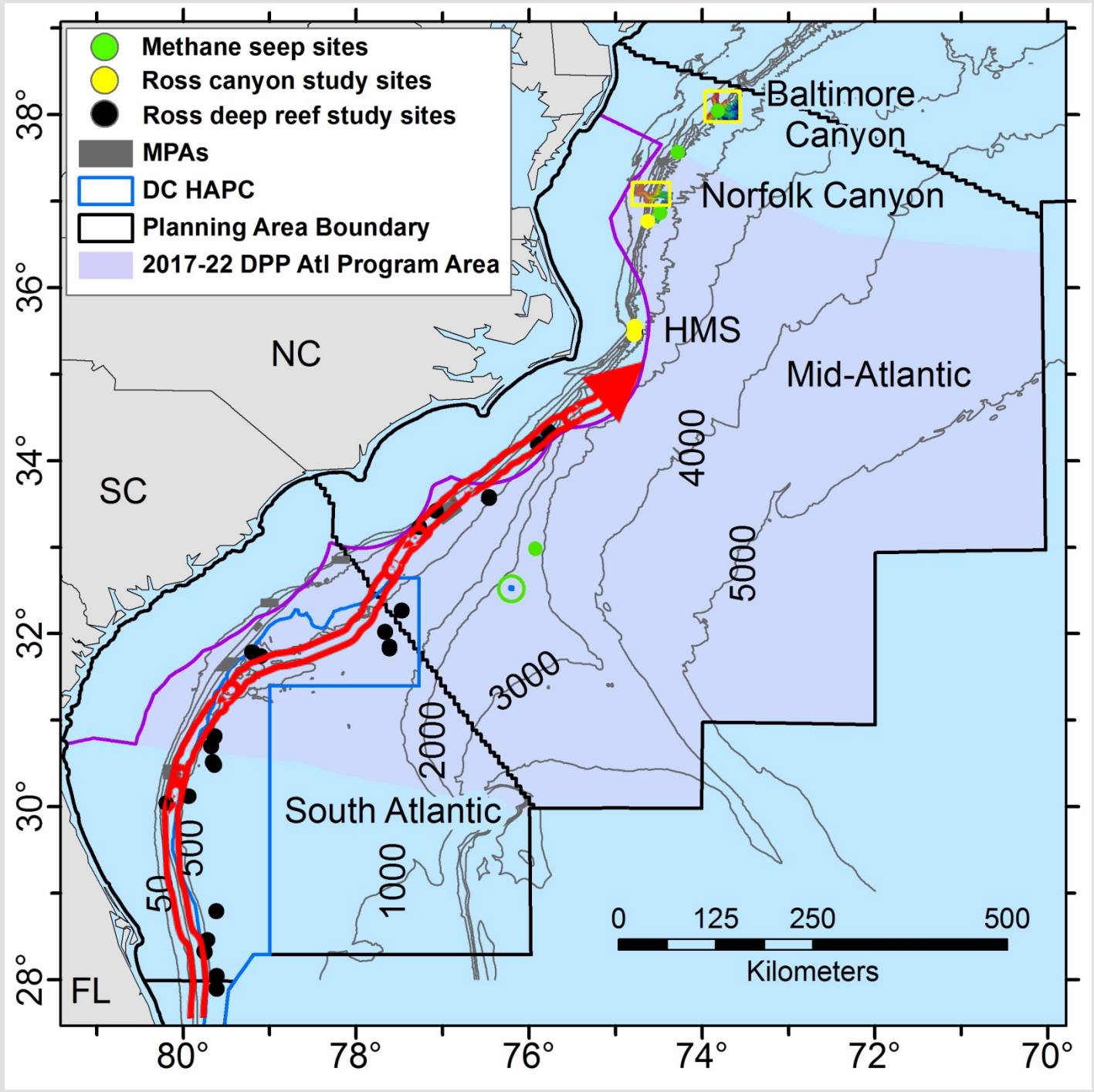
South Atlantic Bight Hardbottom Benthic Habitat

Anderson et al. (in review 2015)

Shelf (< 200 m) Hardbottom

- Important resources = snapper, grouper, porgy complex & other reef fishes
- Invertebrate fauna very rich but poorly studied
- Reefs support diverse subtropical communities (spawning sites)
- Designated as EFH
- Overfishing & habitat degradation are issues
- Do the 6 shelf edge MPAs (371 sq. nmi) offer sufficient protection?





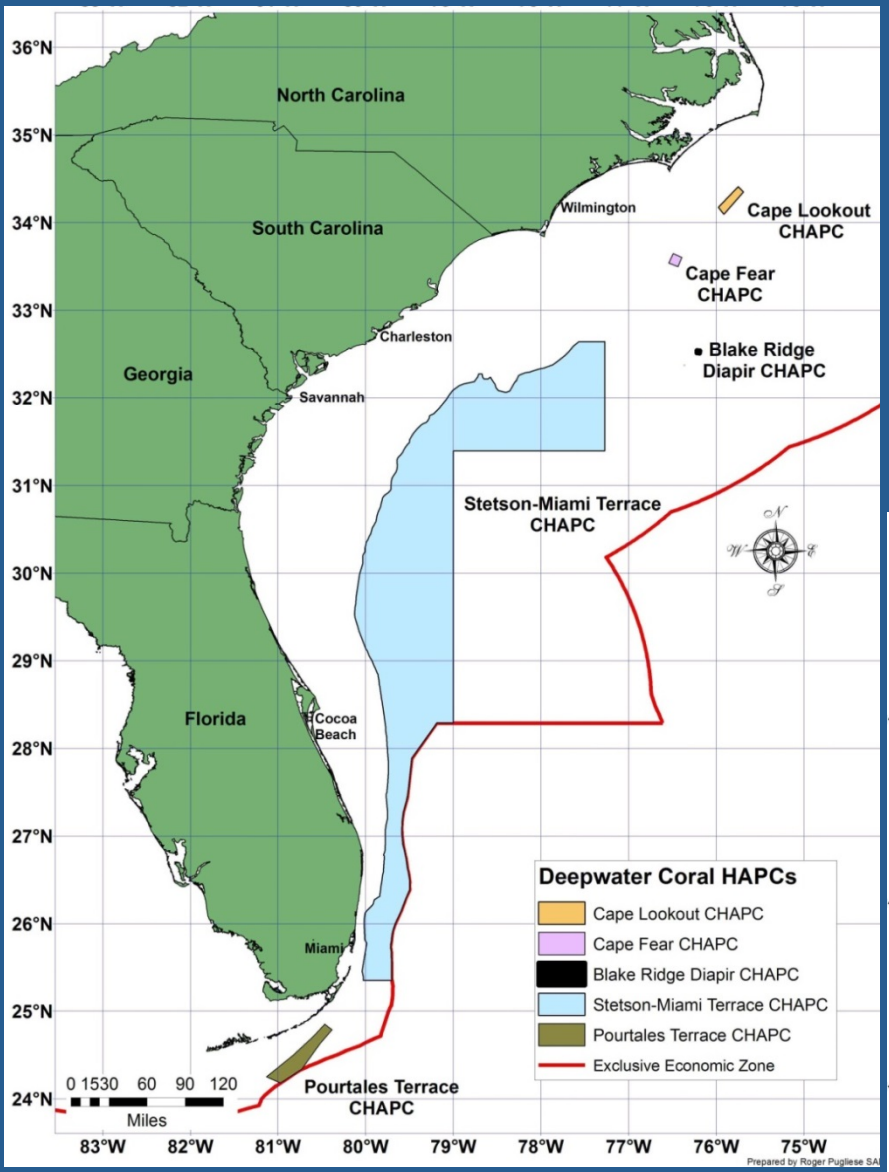
Muds and canyons north of Cape Hatteras

Hard grounds and carbonate sands south of Cape Hatteras

A virtual data desert beyond 1000 m, esp. for benthic ecology & biology

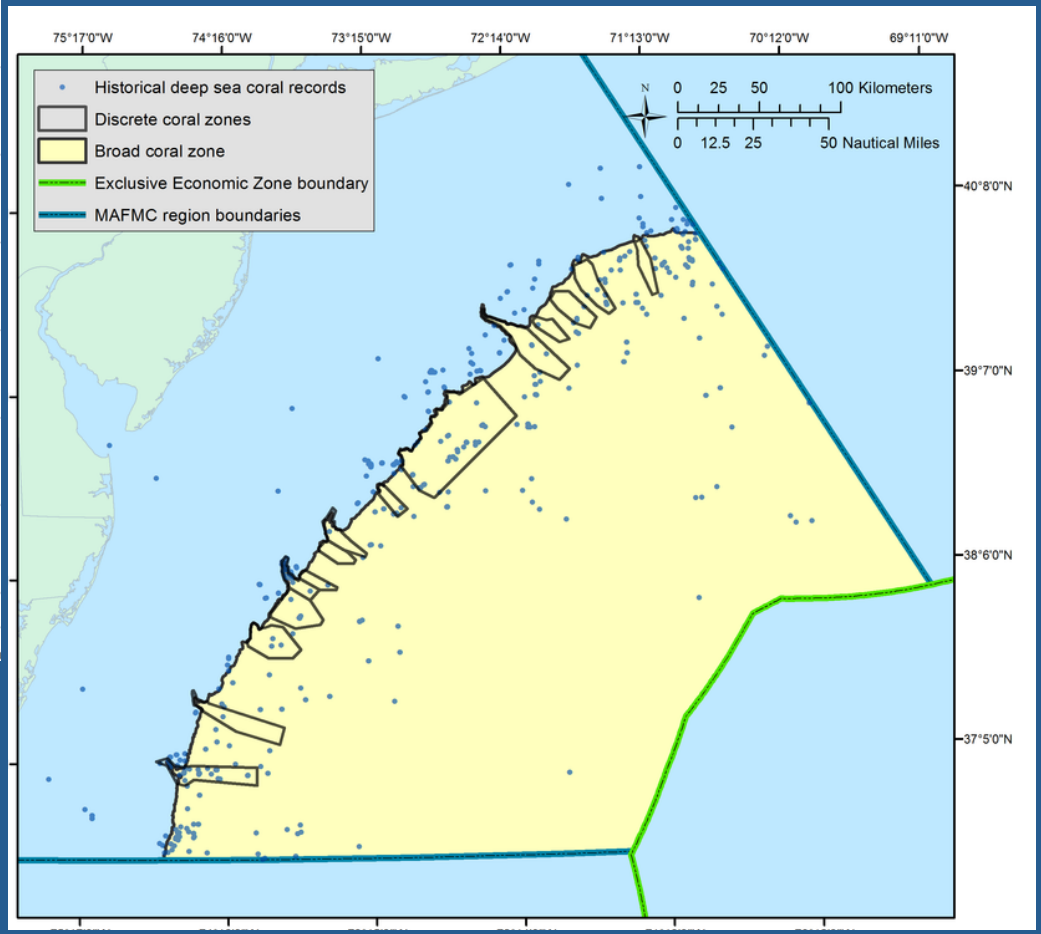
Depths in meters

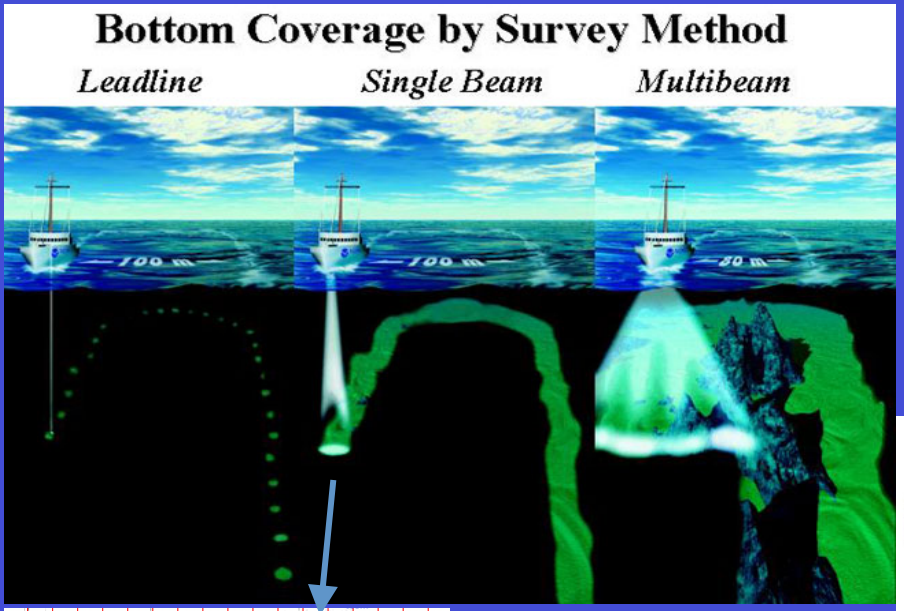
These studies, plus contributions from others, led to the creation of the largest benthic protected areas in US continental waters.

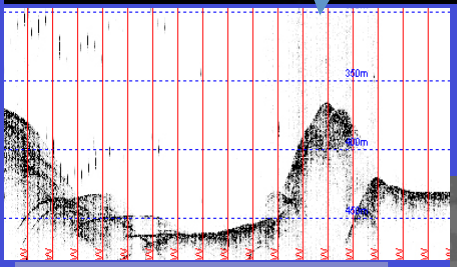


South Atlantic Fishery Management Council created 4 deep coral HAPCs (23,000 sq. miles) to protect most deep coral habitat off the SEUS.

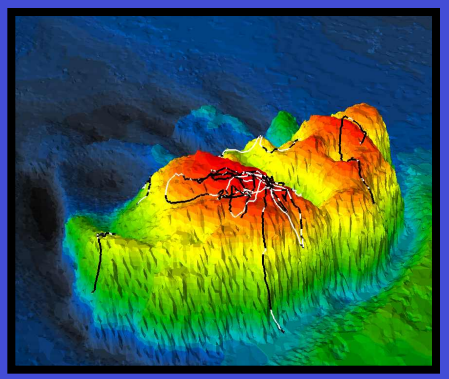
Mid-Atlantic Fishery Management Council's Deep-Sea Corals Amendment will protect over 38,000 sq. miles of bottom, focused on canyons and corals.

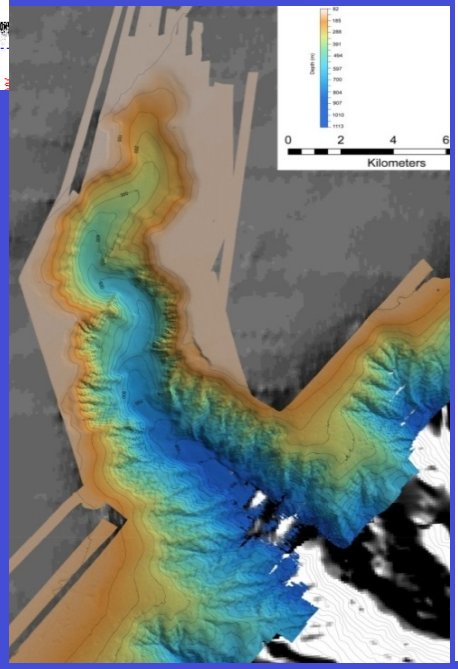






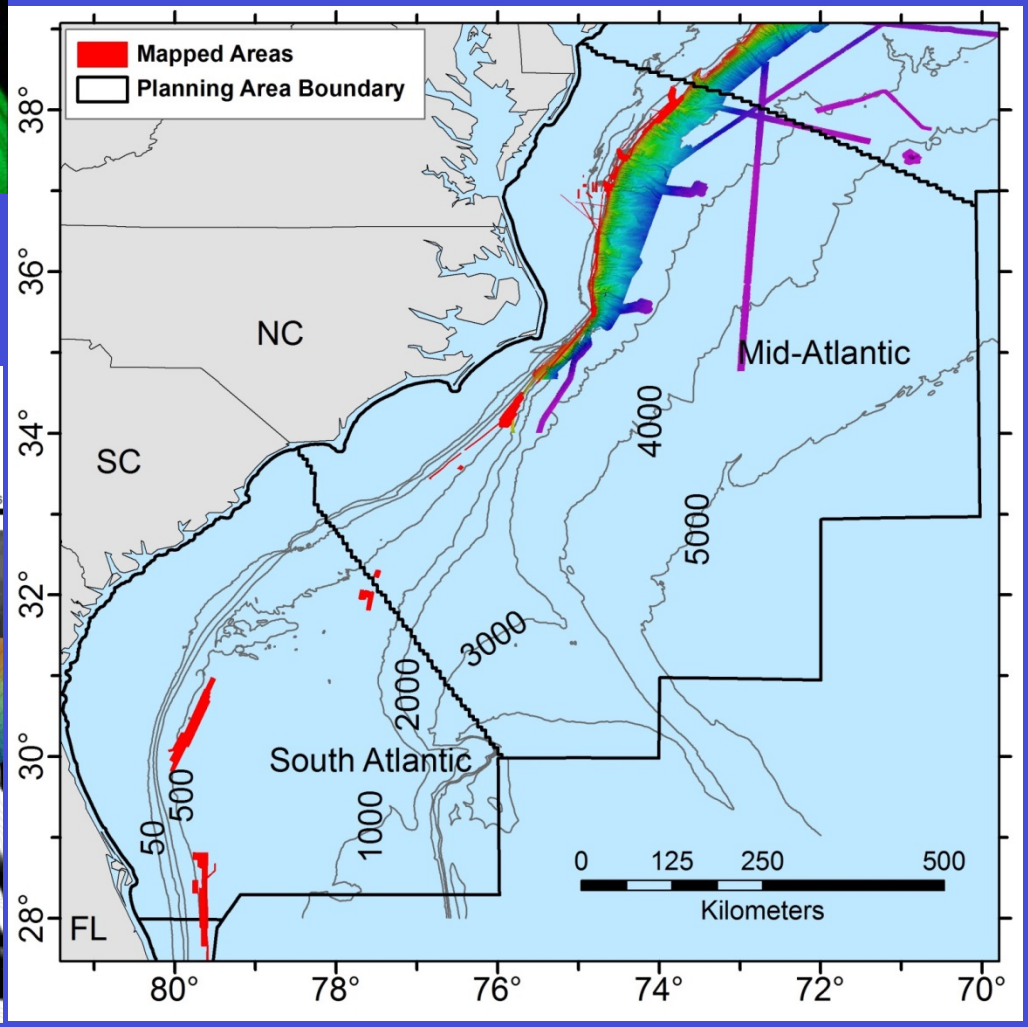
Cape Fear Bank





Areas recently (2006 -) mapped with high detail, high precision multibeam sonar

Mapped boxes are only **4.4%** of the two planning areas.



RESEARCH TO CONSIDER

- Severe lack of biological data > 200 m (benthic & mesopelagic)
- Strong need for better habitat descriptions
  - Multibeam mapping of interest/target areas
- Trophodynamic or energetics studies (most bang per $$)
  - Complete unfinished studies, add others
- Interaction of physical oceanography and biology
  - larval transport, genetic continuity, dispersal barriers or conduits
- Population structure & connectivity studies
- Marine larvae dynamics
  - distributions, seasonality, movements
- Locate ocean spawning areas for important species