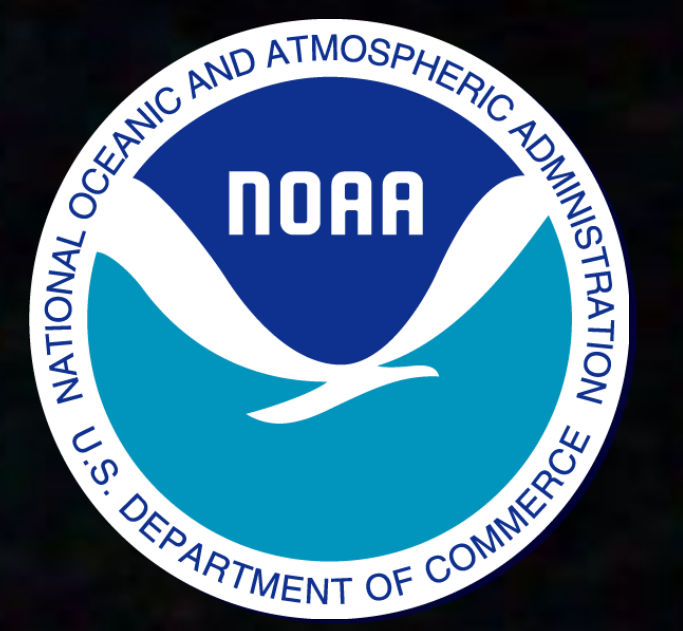


# Deep-Sea Corals of the Southeast U.S.: Insights from NOAA's National Database of Deep-Sea Corals and Sponges



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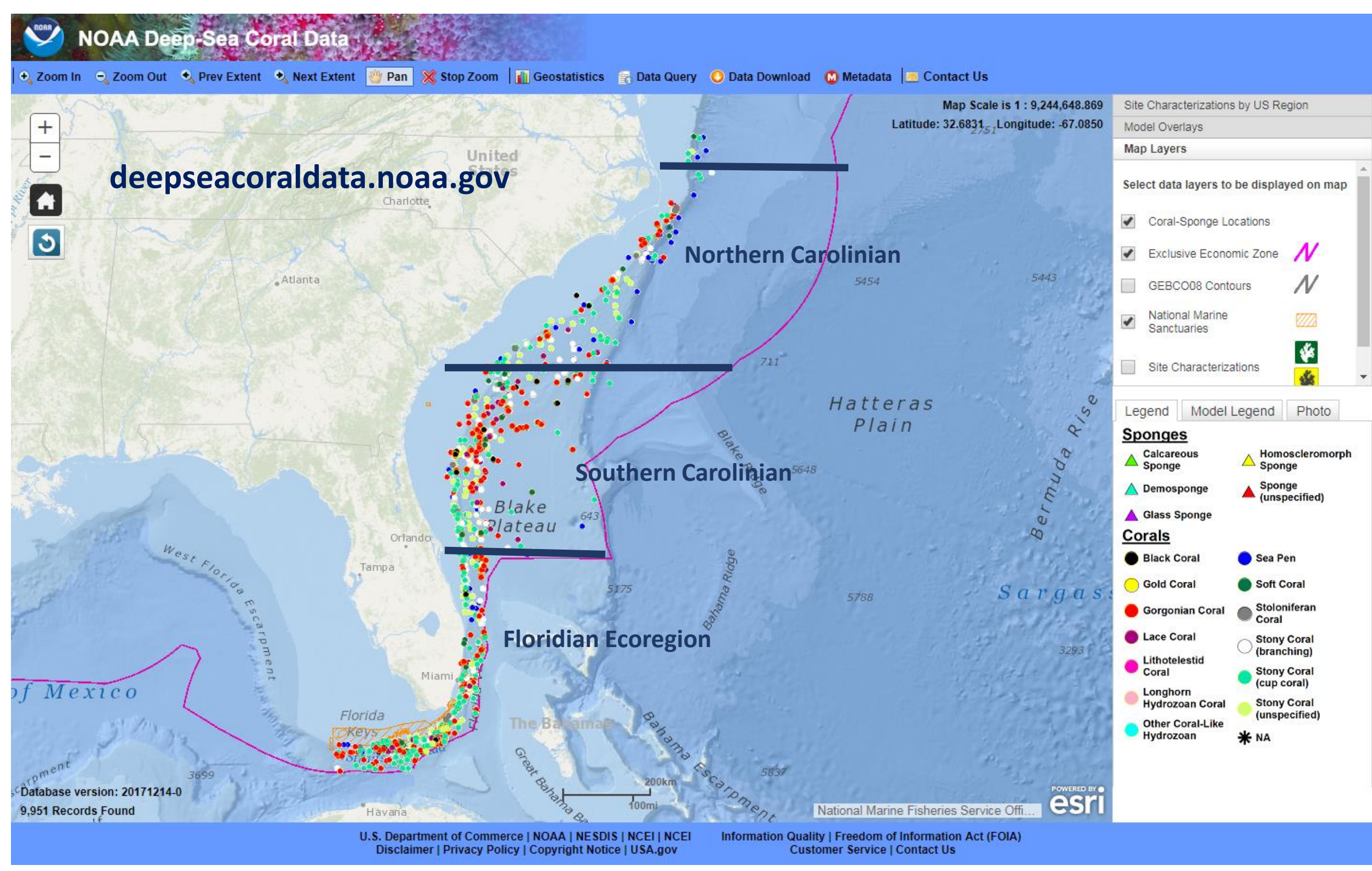
**Objective:** Initial exploration of patterns of distribution of deepwater corals in the Southeast U.S. that can inform research, modeling and management

**In Brief:**

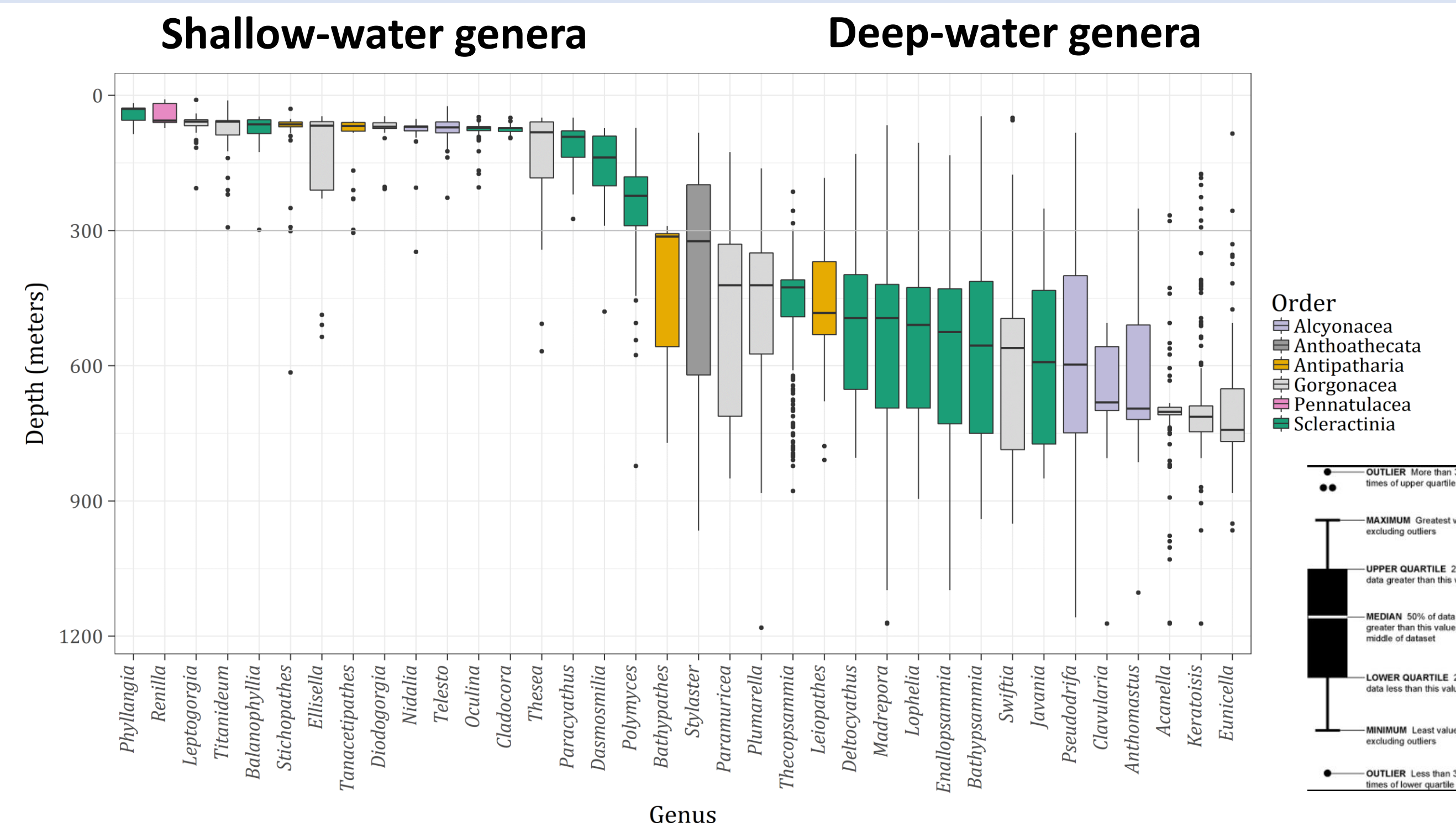
- NOAA's Deep-Sea Coral & Sponge Database provides a unique resource for scientists and managers that is standardized, quality-controlled, and regularly updated
- A preliminary analysis of deep-sea coral records from the Southeast U.S. reveals both distinct assemblages by depth, as well as evidence of biogeographic differences among sub-regions
- Disparities in sampling effort and methodologies is a major confounding factor, however, extensive metadata and current, more standardized survey techniques allow refined analyses
- These records are being used in the region for:
  - Informing spatial planning and management
  - Habitat suitability modeling of deep-sea corals
  - Identifying research gaps and planning for major regional research efforts

**The Database & Map Portal:**

- Over 620,000 deep-sea coral and sponge records from museums, research institutions, scientific literature, trawl surveys, and field observations by NOAA and partners using submersibles, ROVs, etc.
- Updated quarterly with extensive associated data and metadata about the records and surveys
- Quality controlled and standardized content
  - Current taxonomy (WoRMS)
  - Valid values/vocabulary (Darwin Core)
  - No duplicate records
- Accessible through online map portal allowing searches, downloads and Web Mapping Services (WMS)

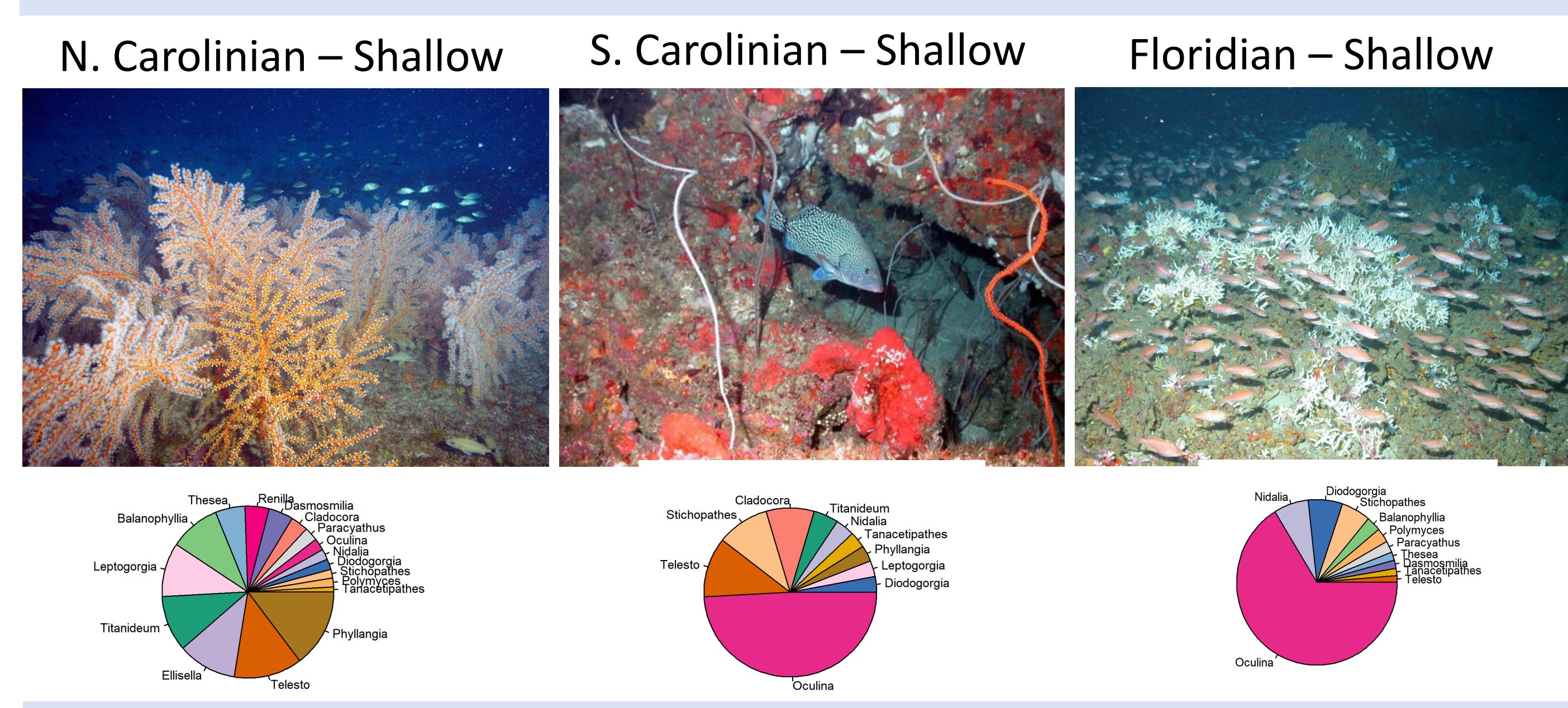


**Depth Distribution of Coral Genera:** All azooxanthellate genera with over 25 records are included. Plots show median depth, quartiles around median (box), range and outliers. The plots highlight a distinct **shallow-water coral assemblage** occurring shallower than 300 m (most from 50-150 m) and a **deep-water coral assemblage** > 300 m deep. Most surveys in the region have been conducted in depths less than 1000 m

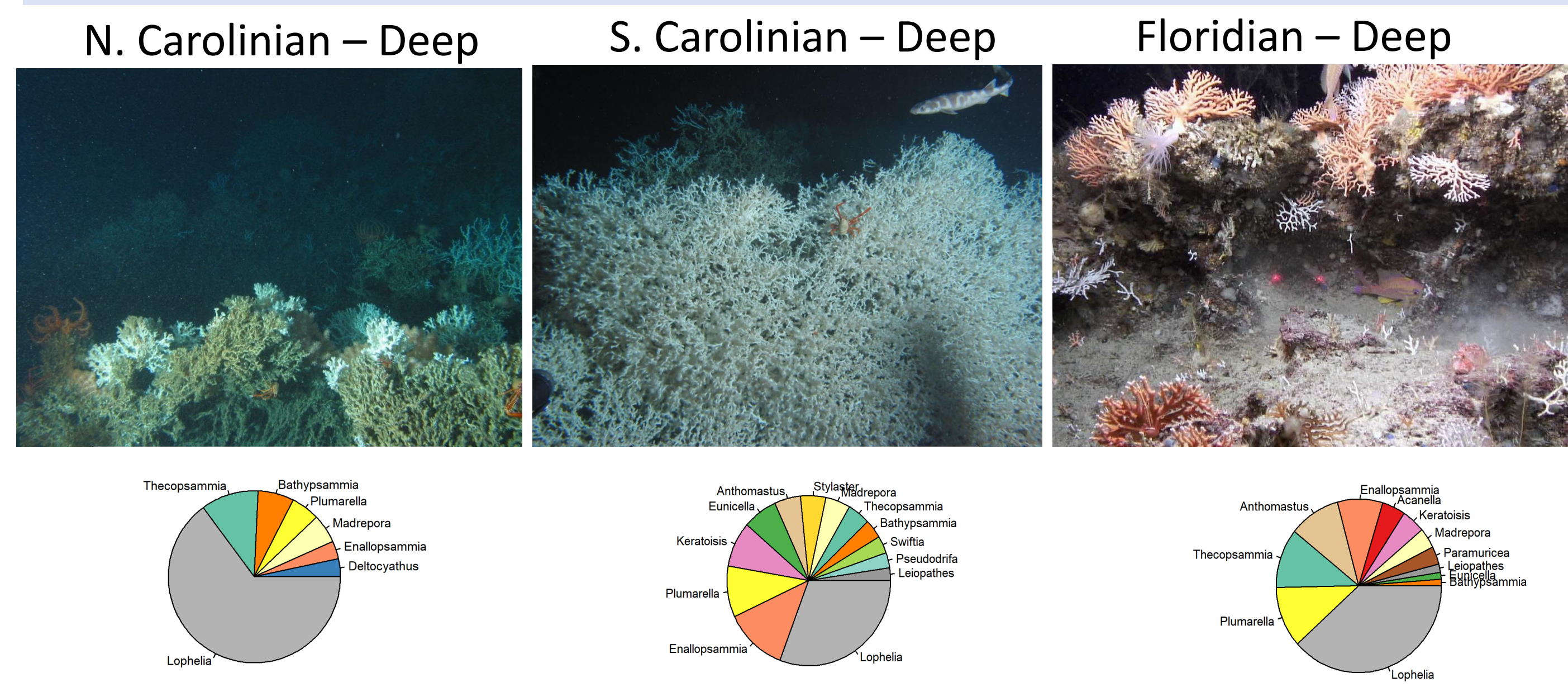


**Geographic Distribution of Coral Genera:** The Carolinian and Floridian ecoregions (Spalding et al., 2007; Marine Ecoregions Of the World) were used to generally delineate expected biogeographic patterns. The Carolinian region was divided into north and south portions around the area of the Charleston Bump, a feature which deflects the Gulf Stream offshore.

**Shelf edge coral assemblages** in the North Carolinian sub-region are dominated by gorgonians. Further South, however, the reef-forming *Oculina varicosa* plays an increasingly dominant role.

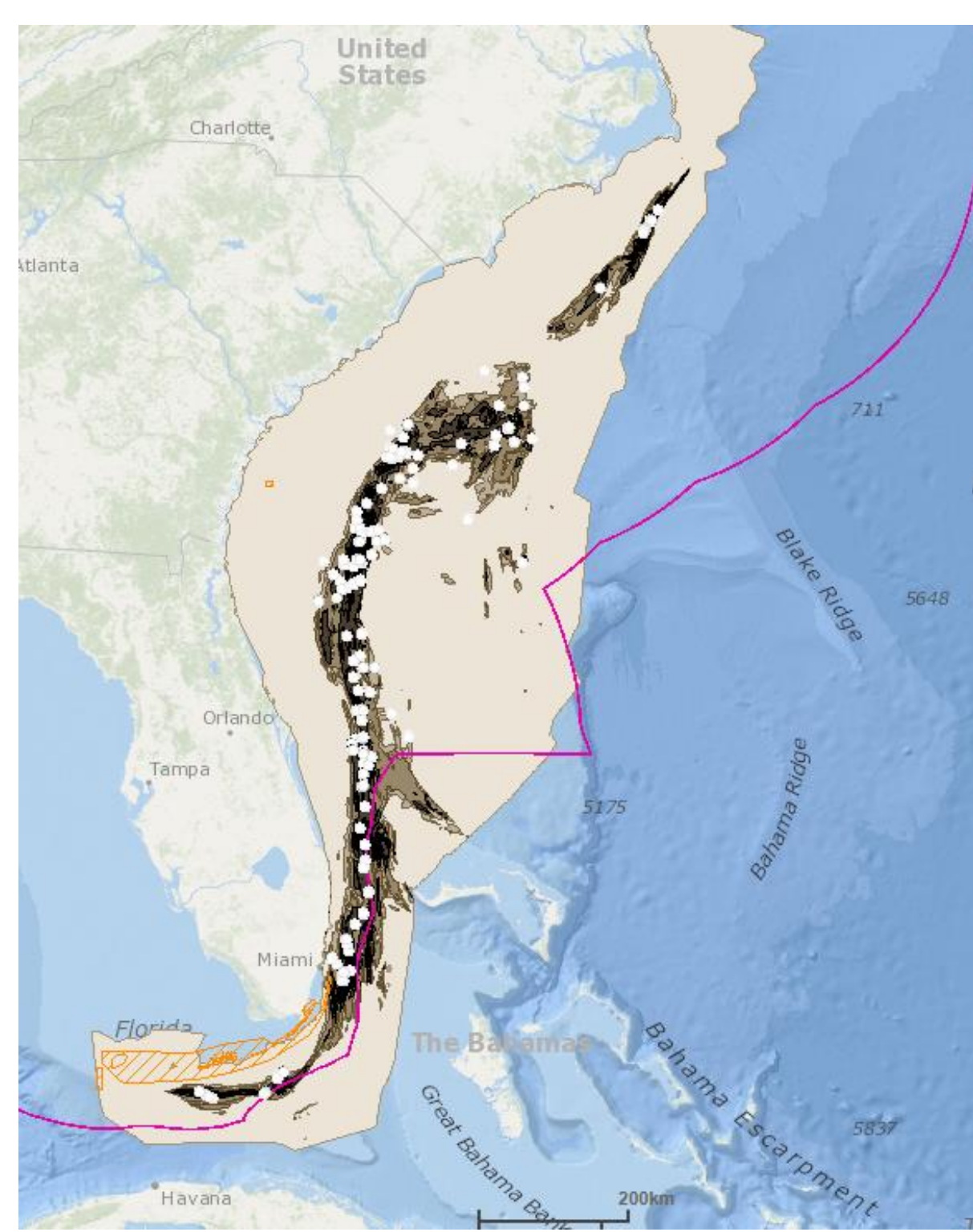


At depths between 400-800 m, **deep coral assemblages** in all three regions are dominated by the reef-forming coral *Lophelia pertusa*. In the South Carolinian and Floridian sub-regions, a second reef-forming species, *Enallopsammia profunda*, along with black and stylasterid corals are increasingly prominent.



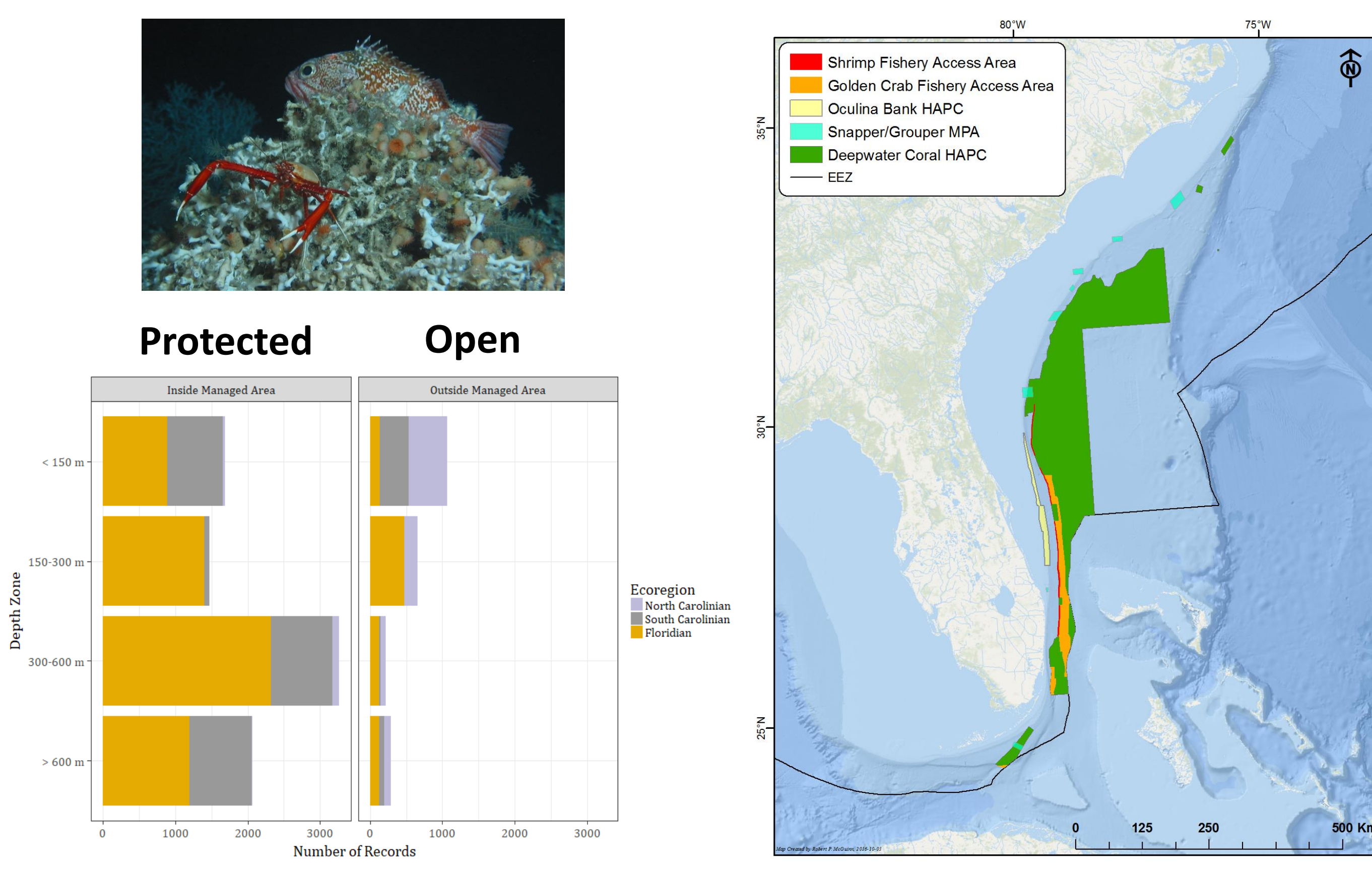
**Habitat Suitability Modeling:**

Predictive habitat modeling is increasingly playing a central role, both in helping target areas for further study as well as informing management efforts. Models also provide insights into the environmental conditions that determine deep-sea coral distribution. Kinlan et al. (2013) developed initial habitat suitability models for a number of Southeast U.S. deep-sea coral taxa using database records. Model layers are available from the Deep-Sea Coral Data Portal. NOAA and the Bureau of Ocean Energy Management are collaborating on the next generation of improved models.



Maximum Entropy (MaxEnt) predictive habitat model for *Lophelia pertusa* in the U.S. Southeast Region (Kinlan et al. 2013). Dark colors indicate greater likelihood of suitable habitat, determined by a cross-validation method that determined likelihood thresholds using the ratio of false positive to false negative classification results when the model was tested on data left out of the fitting process. White dots are records of *L. pertusa* in the database.

**Informing Management:** Fishing impacts are the most serious threat to deep-sea coral ecosystems in most U.S. regions. The South Atlantic Fishery Management Council has been a leader in protecting deep-sea coral habitats, beginning with the *Oculina* Banks Habitat Area of Particular Concern (HAPC), established in 1984 as the world's first deepwater coral protected area. Together with subsequent actions, over 60,000 km<sup>2</sup> are now protected from bottom-contact fishing in shelf edge Snapper-Grouper MPAs and Deepwater Coral HAPCs.

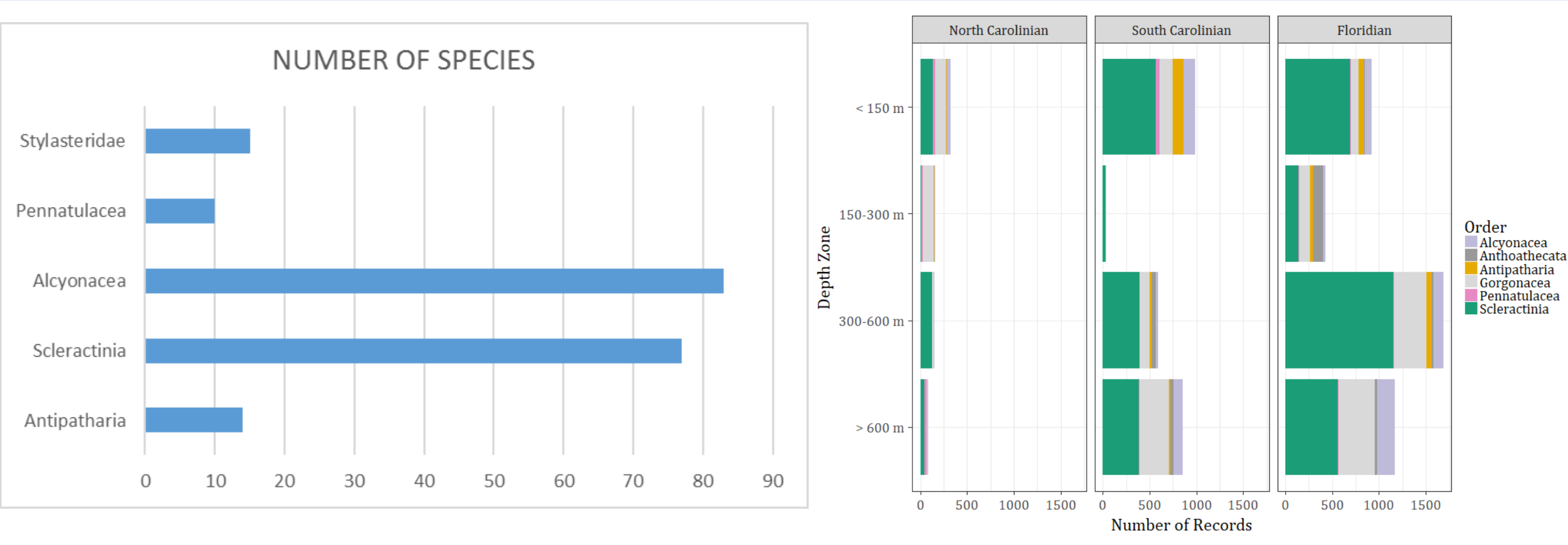


Number of coral records inside and outside South Atlantic Fishery Management Council MPAs and coral HAPCs. The majority of known locations of deepwater corals, especially those in deeper waters, are protected from fishing impacts in the region.

**References:**

- Hourigan TF, Reed JK, Pomponi SA, Ross SW, David AW, Harter S (2017) State of Deep-Sea Coral and Sponge Ecosystems of the Southeast United States. In: Hourigan TF, Etnoyer PJ, Cairns SD (eds) *The State of Deep-Sea Coral and Sponge Ecosystems of the United States*. NOAA Tech Memo NMFS-OHC-4, Silver Spring, MD, Silver Spring, MD
- Hourigan TF, Cairns SD, Reed JK, Ross SW (2017) Deep-Sea Coral Taxa in the U.S. Southeast Region: Depth and Geographical Distribution. Online resource: <https://deepseacoraldata.noaa.gov/library/2017-state-of-deep-sea-corals-report>.
- Kinlan BP, Poti M, Etnoyer PJ, Siceloff L, Jenkins C, Dorfman D, Caldow C (2013). Digital data: predictive models of deep-sea coral habitat suitability in the U.S. South Atlantic. NOAA National Centers for Coastal Ocean Science. Available at: [https://nccospublicstor.blob.core.windows.net/projects-attachments/35/DSC\\_PredictiveModeling\\_US\\_Southeast.zip](https://nccospublicstor.blob.core.windows.net/projects-attachments/35/DSC_PredictiveModeling_US_Southeast.zip)
- Spalding, M., et al., Marine Ecoregions of the World: A Bio-regionalization of Coastal and Shelf Areas. *BioScience* (2007) 57 (7): 573-583 doi:10.1641/B570707

**Southeast U.S.** The region extends from Cape Hatteras to the Florida Keys – often separated into Carolinian and Floridian biogeographic ecoregions. The region supports important fisheries and contains substantial offshore oil and gas reserves. It is home to the most extensive deep-sea coral reefs in the nation. With 199 described species of azooxanthellate deepwater corals (Hourigan et al. 2017), it is second only to the better-studied Gulf of Mexico among U.S. regions in numbers of species.



Number of described species of deepwater corals in the U.S. Southeast Region (Hourigan et al. 2017). Number of records at the genus level used in this analysis. Gorgonians are represented separately as "Gorgonacea"



NOAA Deep Sea Coral Research & Technology Program  
[deepseacoraldata.noaa.gov](https://deepseacoraldata.noaa.gov)

