

# Mapping and Geomorphic Characterization of the Vast Cold-Water Coral Mounds of the Blake Plateau

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## Mapping of the Blake Plateau

The full extent of the largest cold-water coral (CWC) mound province thus far discovered has been recently revealed through multibeam sonar surveys completed during a multi-year exploration campaign on the Blake Plateau offshore of the southeastern U.S. coordinated by NOAA Ocean Exploration and partners. The extensive CWC mounds in the study region are primarily formed by *Desmophyllum pertusum* (previously named *Lophelia pertusa*).

- Study area is 133,581 km<sup>2</sup> (1.7x land area of Scotland).
- CWC mounds in this region form distinct bumps or pinnacles (composed of slope, ridge, and peak features) readily observable in multibeam bathymetry data.
- Mounds were mapped in depth ranges spanning 350-900 m.
- Multibeam data from 31 different cruises were cleaned and synthesized into a 35 m resolution bathymetric grid (Figure 1).

## Geomorphic Characterization of the Blake Plateau

A standardized geomorphic classification of seafloor features was completed in order to delineate and quantify CWC mounds. The Bathymetry- and Reflectivity-based Estimator for Seafloor Segmentation (BRESS) method developed by Masetti et al. (2018) was used to classify the entire area into five geomorphic landform classes (peaks, valleys, ridges, slopes, and flats).

- 8 sub-regions exhibiting diverse mound morphologies, vertical relief, and densities were compared using BRESS and ArcGIS Pro software (Figure 1., white polygons A-H, and Figure 2.).
- The characteristic dome shape of the structure-forming CWC mounds enabled the "peak" landform class to be used to identify and count the number of individual apparent CWC mounds.
- **83,908** mound features were classified, with the vast majority likely to be CWC mounds (Examples shown in Figure 3.)
- The total area of each landform type is shown in Figure 4., providing a quantitative synopsis of the region complementing the dramatic spatial distribution of these habitats as shown in Figure 5.

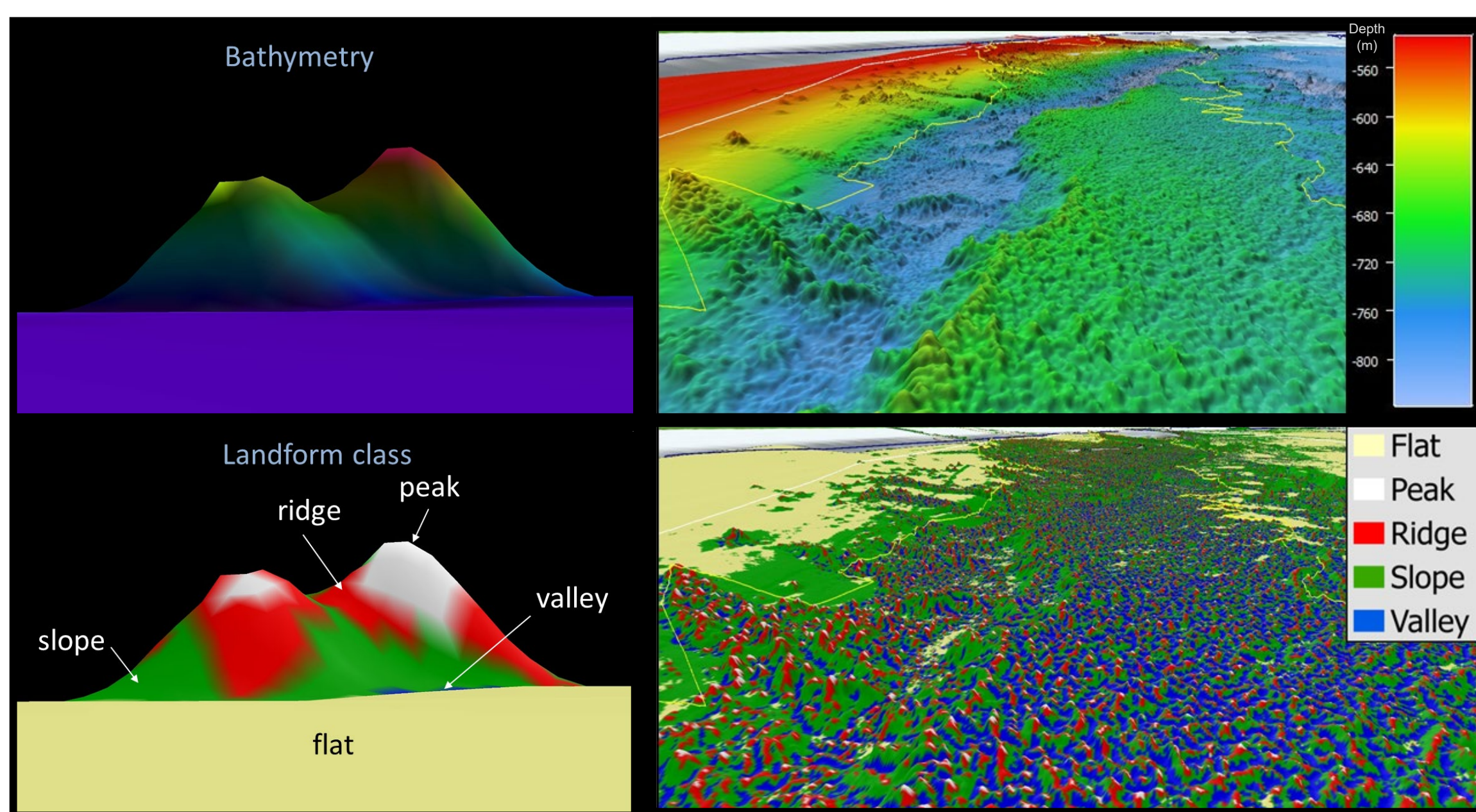


Figure 3. 3D examples of how bathymetric data were classified into landform features at an individual mound level (left), and across the region (right). Example is from the "Million Mounds" sub-region (polygon H in Figure 1.) and visualized in QPS Fledermaus software.

## Substrate Data From Submersible Dives

Video data recorded from 23 submersible dives were used to assess the substrate character within classified landforms: 15 dives were completed using NOAA's dual-body *Deep Discoverer/Seirios* ROVs, 4 dives completed by HOV *Alvin*, and 4 dives by the dual-body *Jason/Medea* ROVs.

- 6,081 substrate observations of the seafloor were classified using the Coastal and Marine Ecological Classification Standard (NOAA, 2015). See Figure 6. for example imagery.
- Coral rubble was found to be the dominant substrate component within the peak (66%), ridge (72%), and slope (62%) landforms, thereby validating the interpretation of these bathymetric features as CWC mounds (Figure 7.)

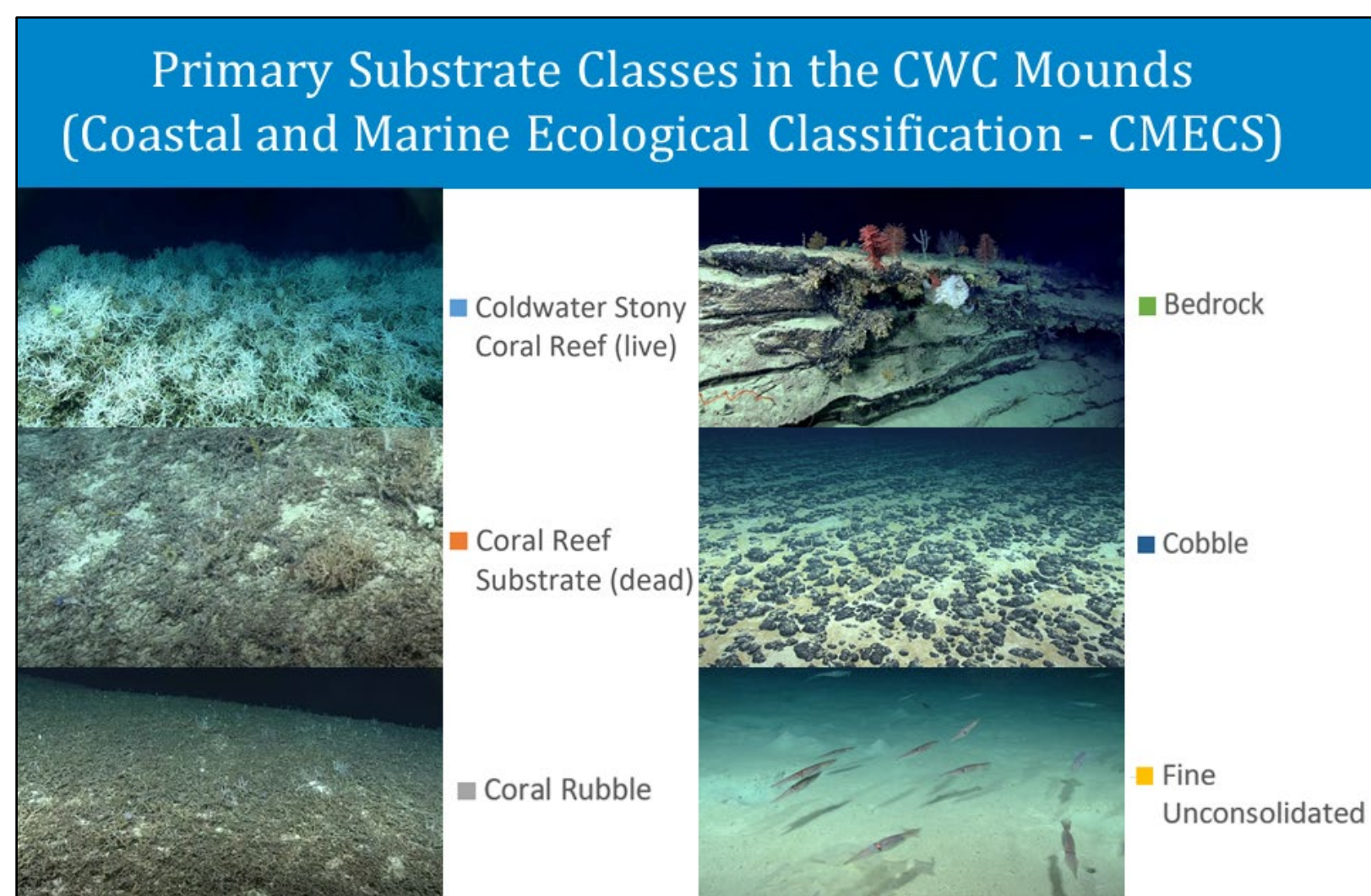


Figure 6. Primary substrate classes classified from video imagery.

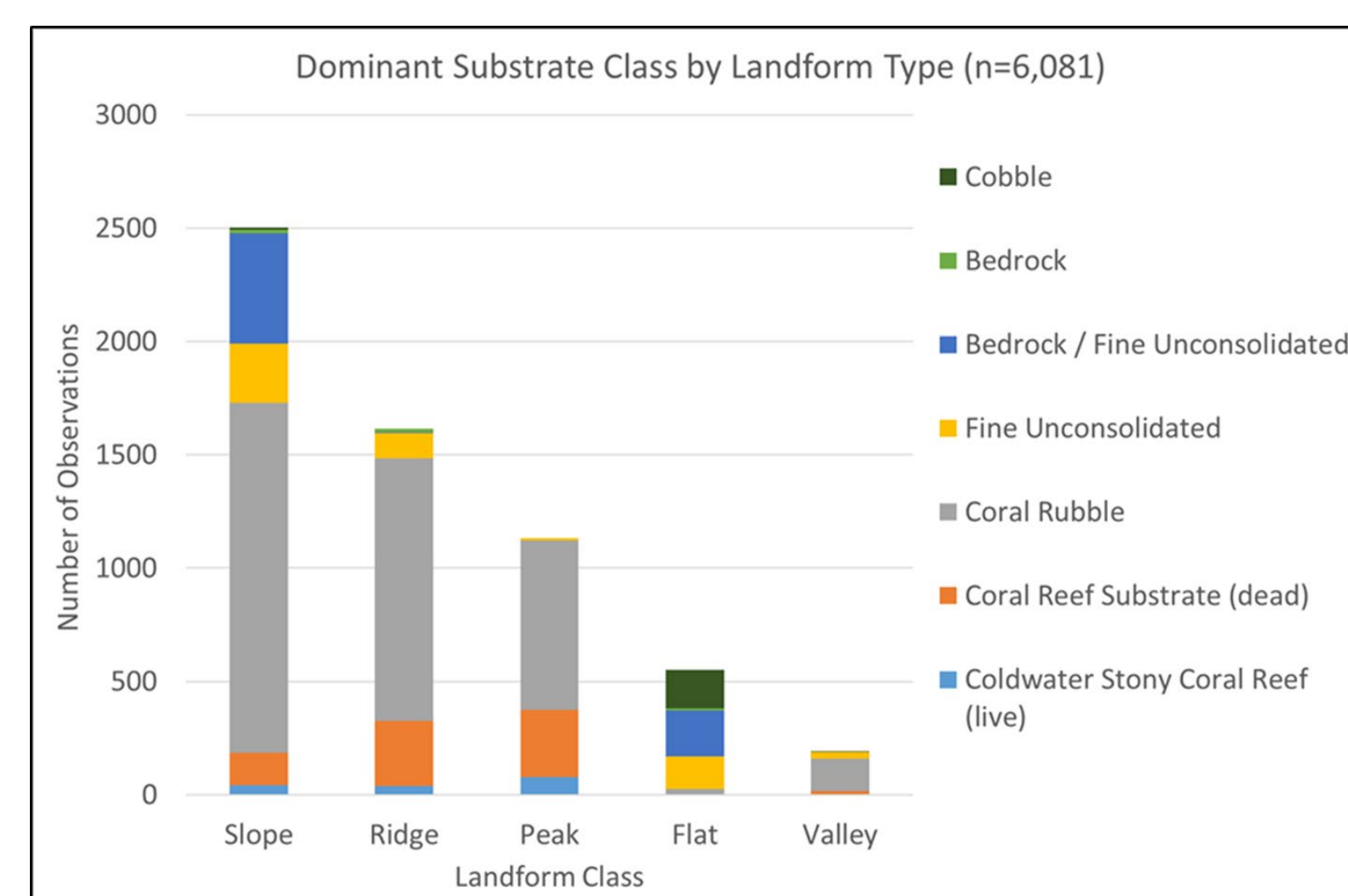


Figure 7. Cumulative plot of dominant substrate classes by landform type.

## Conclusions

- A total of **83,908** individual peak features were delineated, providing the first estimate of the overall number of potential CWC mounds mapped in the region to date.
- Mound vertical relief ranged from 3-178 meters above the adjacent seafloor, with densities reaching 4.79 mounds/km<sup>2</sup>.
- Ground-truth from 23 submersible dive videos validated the interpretation of mound features as CWC mounds even on features with as little as 10 meters of average vertical relief.
- Substantial areas of recently mapped CWC mounds are located outside of the current Stetson/Miami Terrace Deep Water Coral Habitat Area of Particular Concern boundary.
- The Blake Plateau supports a globally exceptional CWC mound province of unprecedented scale and morphological complexity.

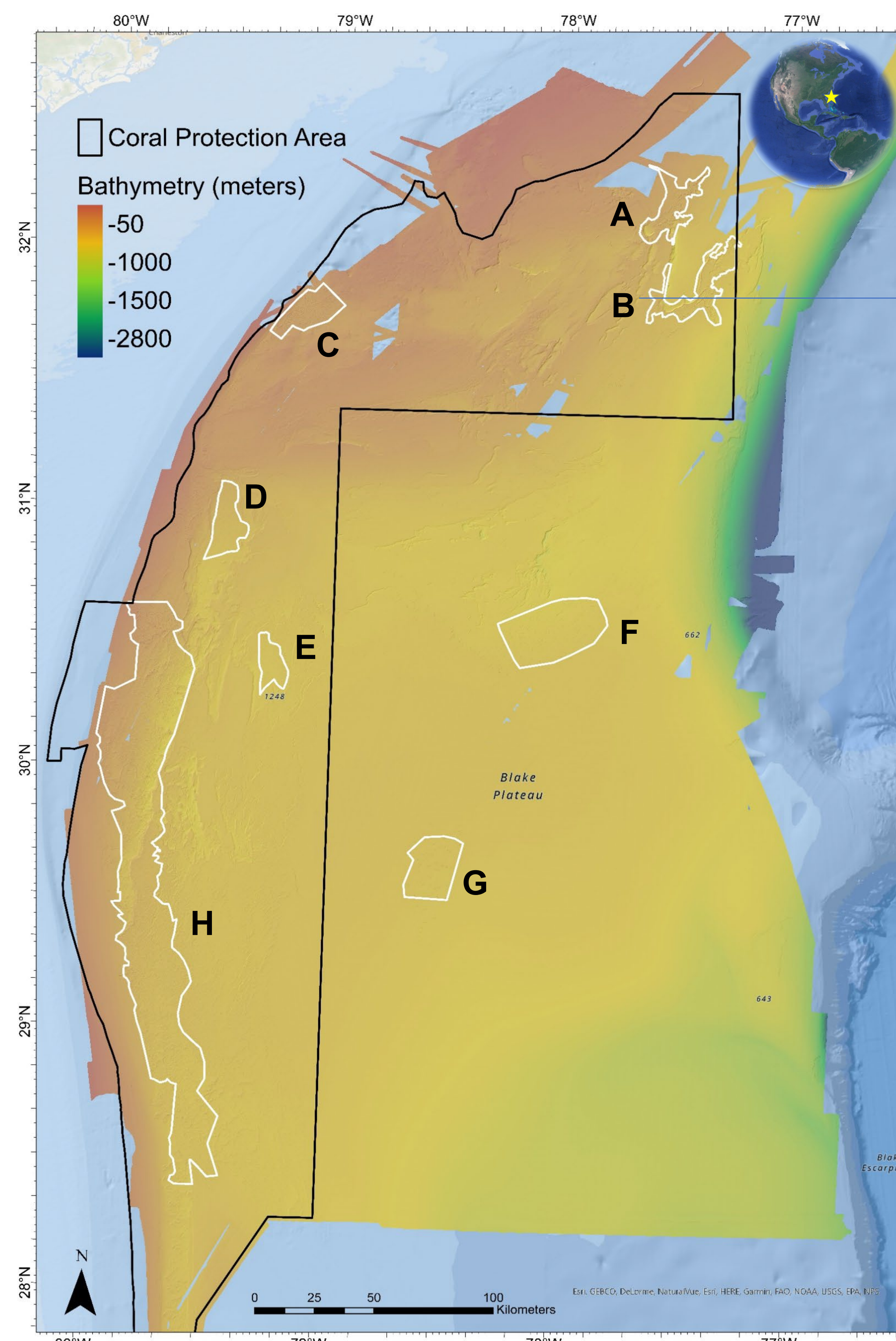


Figure 1. Bathymetry map of Blake Plateau synthesized from 31 cruises. Black polygon is the Stetson/Miami Deep Water Coral Habitat Area of Particular Concern designated by the South Atlantic Fishery Management Council to protect corals from bottom-contact gear. White polygons A-H are sub-regions selected to compare mound characteristics across the plateau.

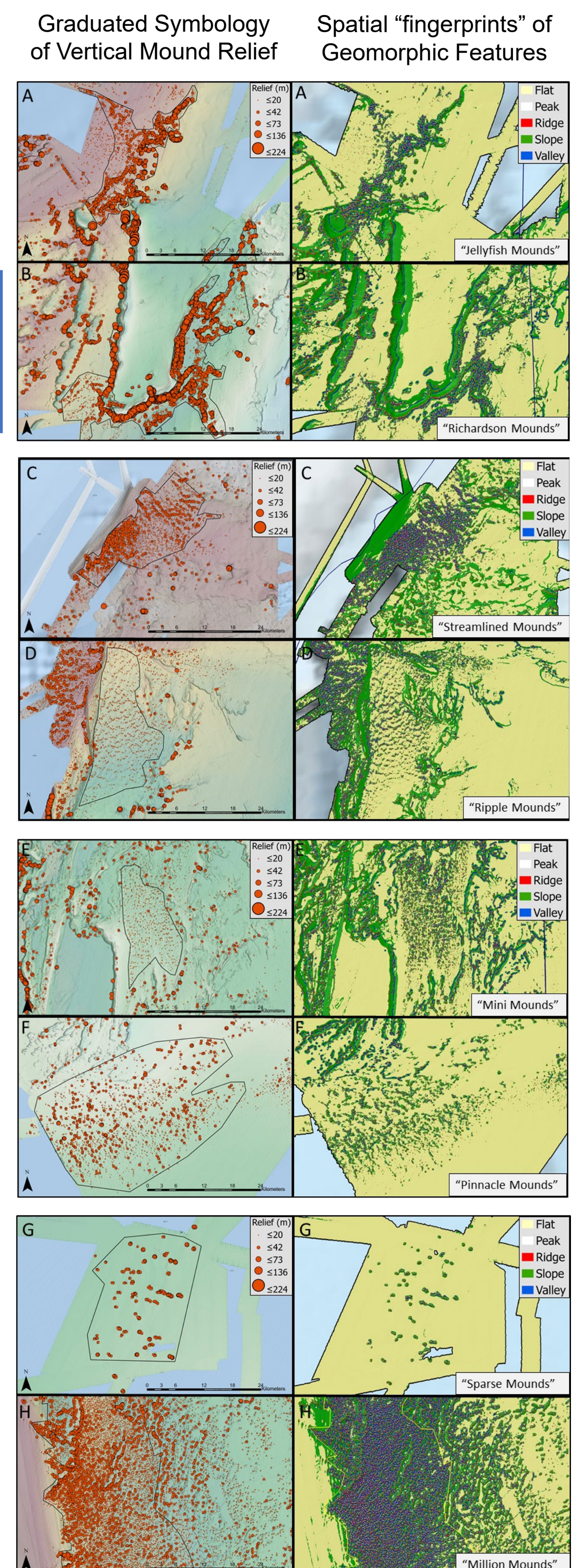


Figure 2. Maps of sub-regions A-H evaluated for their diverse mound characteristics. Left column: density and vertical relief of mounds from the surrounding terrain (each mound is a red dot). Right column: spatial patterns of landforms in each sub-region. Note the diversity of mound patterns formed across the varied geography of the plateau.

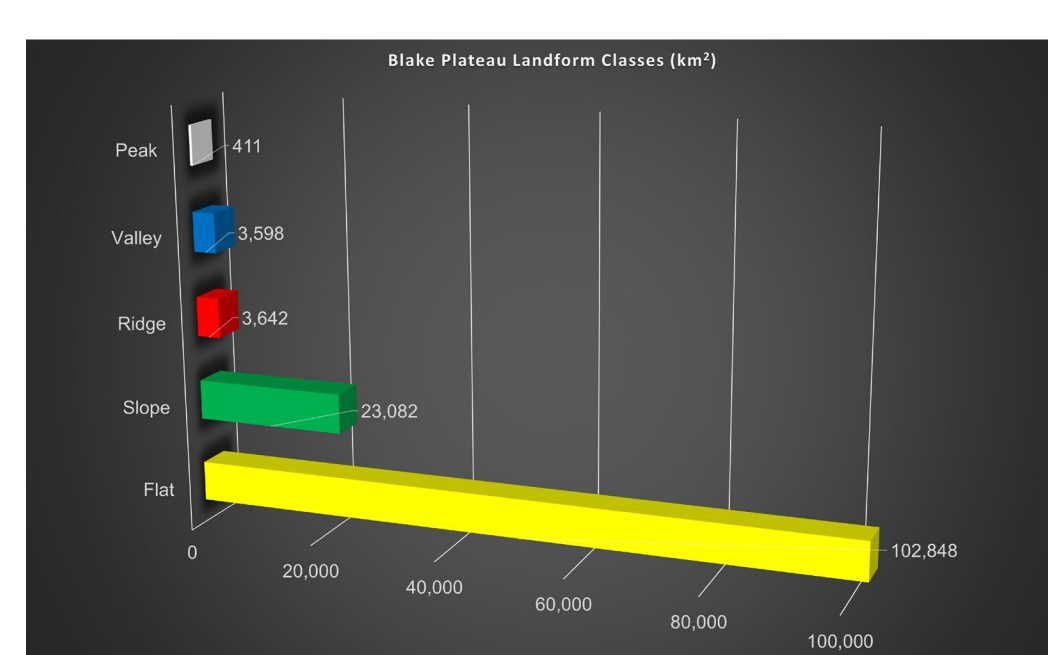


Figure 4. Total area of each landform type.

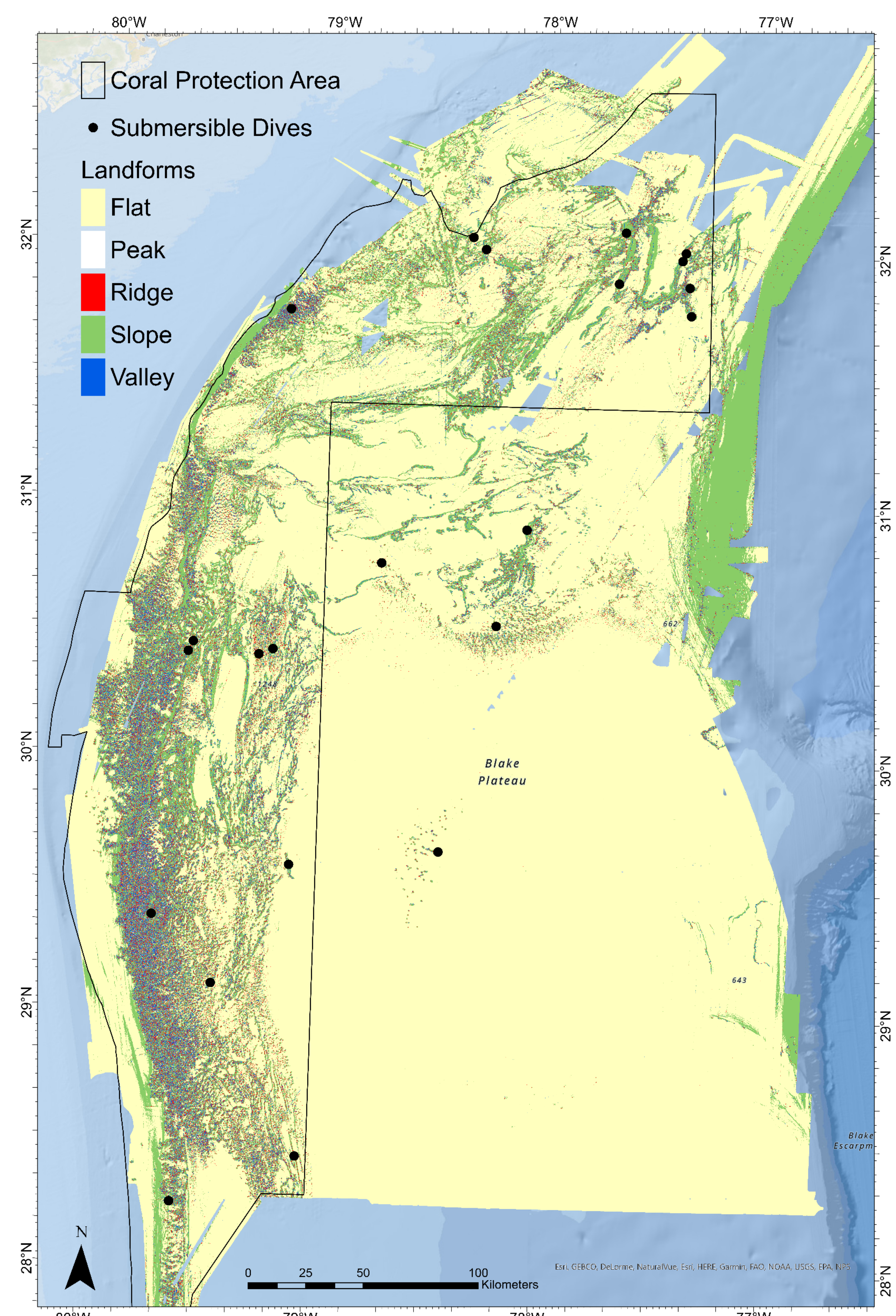


Figure 5. Classified landform map of the Blake Plateau comprised of flats, peaks, ridges, slopes, and valley features. Note how clearly the map highlights the impressive scarp features and coral mound complexes as compared with just the bathymetry map (Figure 1). The black polygon is the Stetson/Miami Deep Water Coral Habitat Area of Particular Concern designated by the South Atlantic Fishery Management Council to protect corals from bottom-contact gear. Black circles represent the location of submersible dives that collected video imagery of seafloor substrates as analyzed in this study.