

Mapping efforts in Florida Keys National Marine Sanctuary

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Biogeography Branch - Habitat Mapping Team

With

NOAA Ship *Nancy Foster*

UNCW Underwater Vehicles Program

Ocean Exploration Trust – *E/V Nautilus*

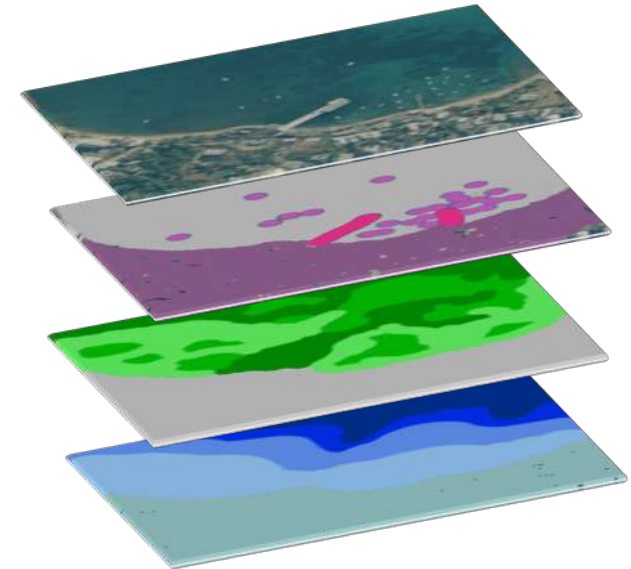
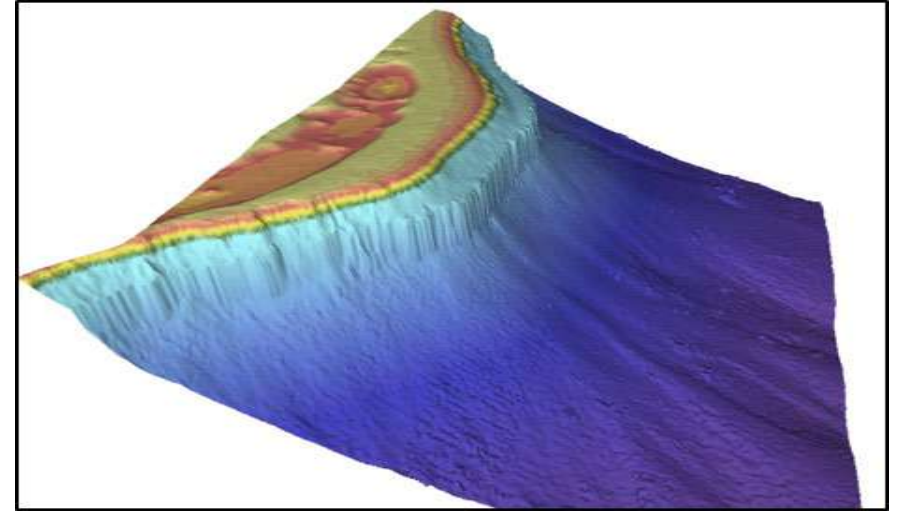
Maps depicting the geomorphology and arrangement of seafloor habitats are the foundation for decision-making

NCCOS Habitat Mapping Team Goal:

To provide cutting edge spatial data on geology and ecology of seafloor habitats for place-based management

Our objectives:

1. *Conduct multi-purpose mapping missions*
2. *Extract data-streams from ship-based missions and remote sensing tools to characterize ecology and ocean*
3. *Characterize seabed habitats and sensitive areas*
4. **Map once. Use Many Times!**



NCCOS Mission Supports FKNMS!

- Nearly 2 decades of collaboration in ecosystem management research
- Contributing mapping and data synthesis supporting conservation and management reviews
- Collaborating on NOAA ship-based science missions
- Contributing to coral restoration goals with new science
- Collaborating with FKNMS, NMFS and state of Florida on National Coral Reef Monitoring Program





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Ten Thousand Islands

Miami

Improving mapping data access!

- Mapping surveys conducted since 2001
- High-resolution Multibeam and LiDAR bathymetry
- ~65% of the 3,800 sq miles have been mapped

Florida Bay

Florida Keys



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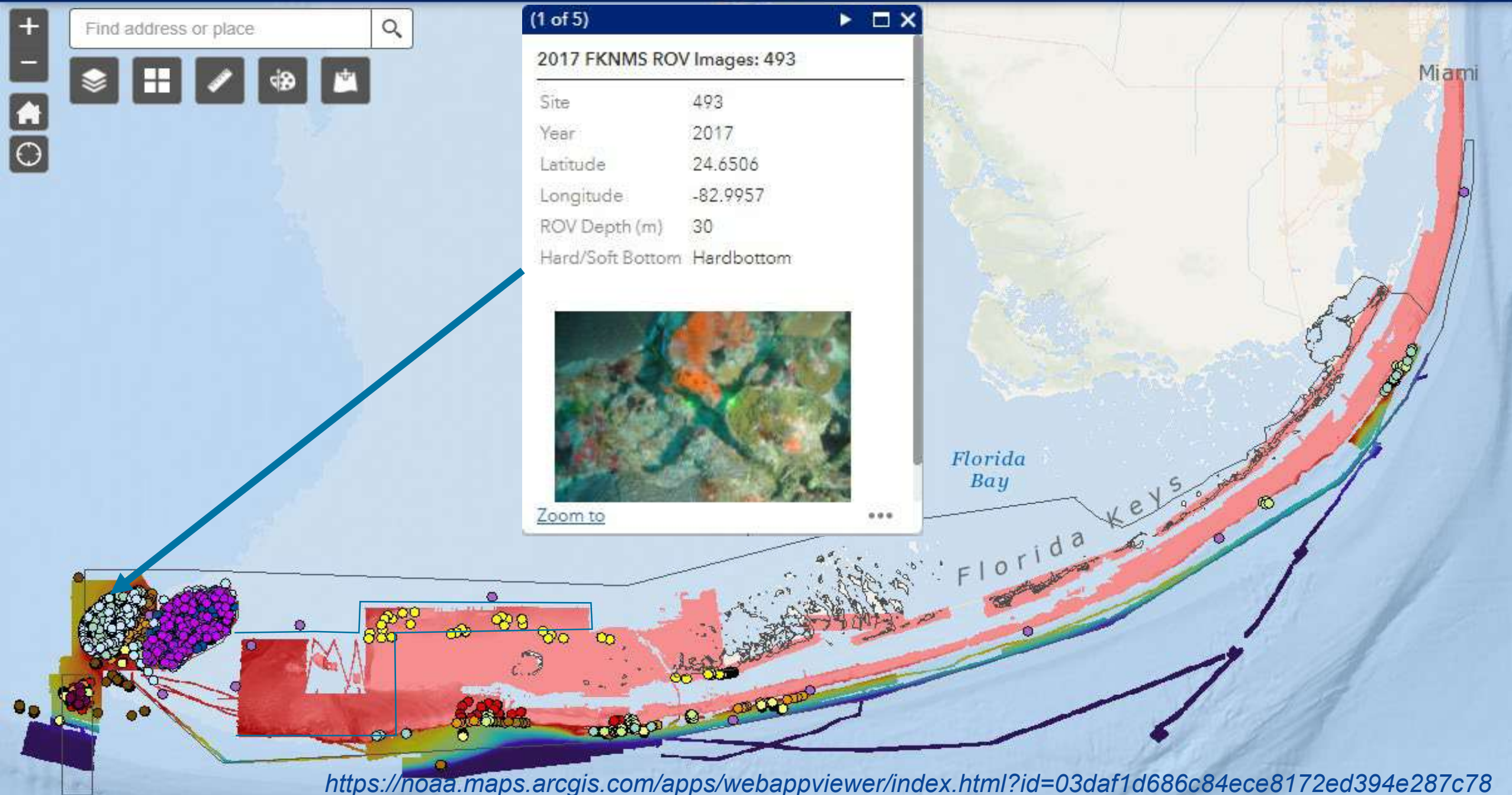
(1 of 5)

2017 FKNMS ROV Images: 493

Site	493
Year	2017
Latitude	24.6506
Longitude	-82.9957
ROV Depth (m)	30
Hard/Soft Bottom	Hardbottom



[Zoom to](#)



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Layer List

- ☒ Unified Reef Map Level 1
- ☒ -
- ☒ Unified Reef Map Level 1
- ☐ Individual or Aggregated Patch Reef
- ☐ Aggregate Reef
- ☐ Pavement
- ☐ Reef Rubble
- ☐ Scattered Coral/Rock
- ☐ Ridge
- ☐ Seagrass (Continuous)
- ☐ Seagrass (Discontinuous)
- ☐ Unconsolidated Sediment
- ☐ Artificial
- ☐ Dredged/Excavated



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Layer List

- ☒ Tortugas Bank and Rileys Hump Benthic Habitats ...
 - Aggregate Reef
 - Individual or Aggregated Patch Reef
 - Pavement
 - Scattered Coral/Rock in Unconsolidated Sediment
 - Unconsolidated Sediment
- ☒ Unified Florida Reef Tract Map (FWC, Version 2.0, 2017) ...
 - ☐ Source Map Footprints ...
 - ☐ Reef Zones ...
 - ☒ BNP Detailed Reef Map Level 1 ...
 - ☒ Unified Reef Map Level 1 ...





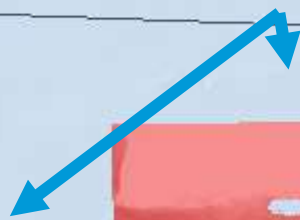
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Ten Thousand Islands

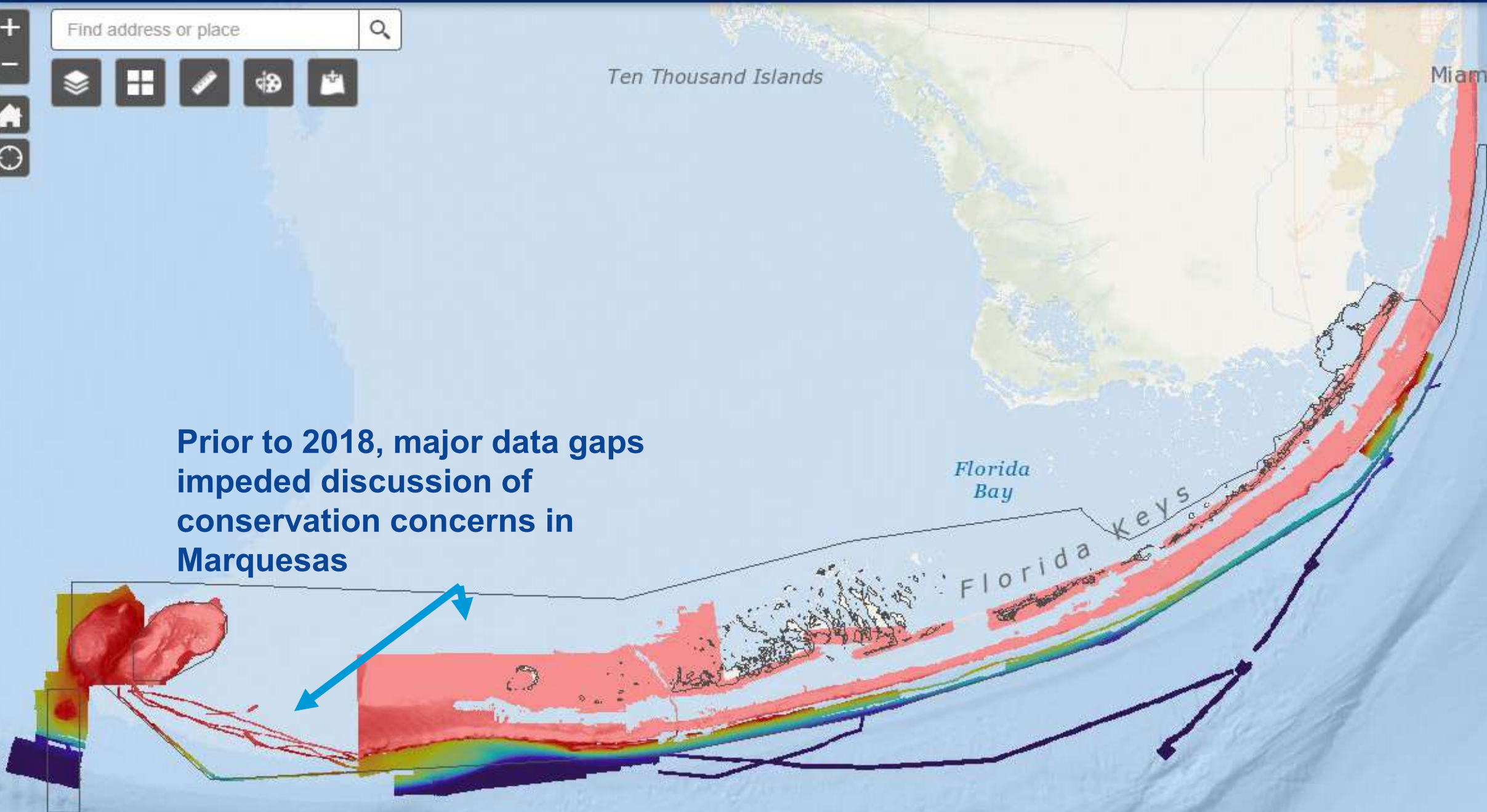
Miami

Prior to 2018, major data gaps impeded discussion of conservation concerns in Marquesas



Florida Bay

Florida Keys





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Ten Thousand Islands

Miami

Nearly 375 square miles of NEW DATA!



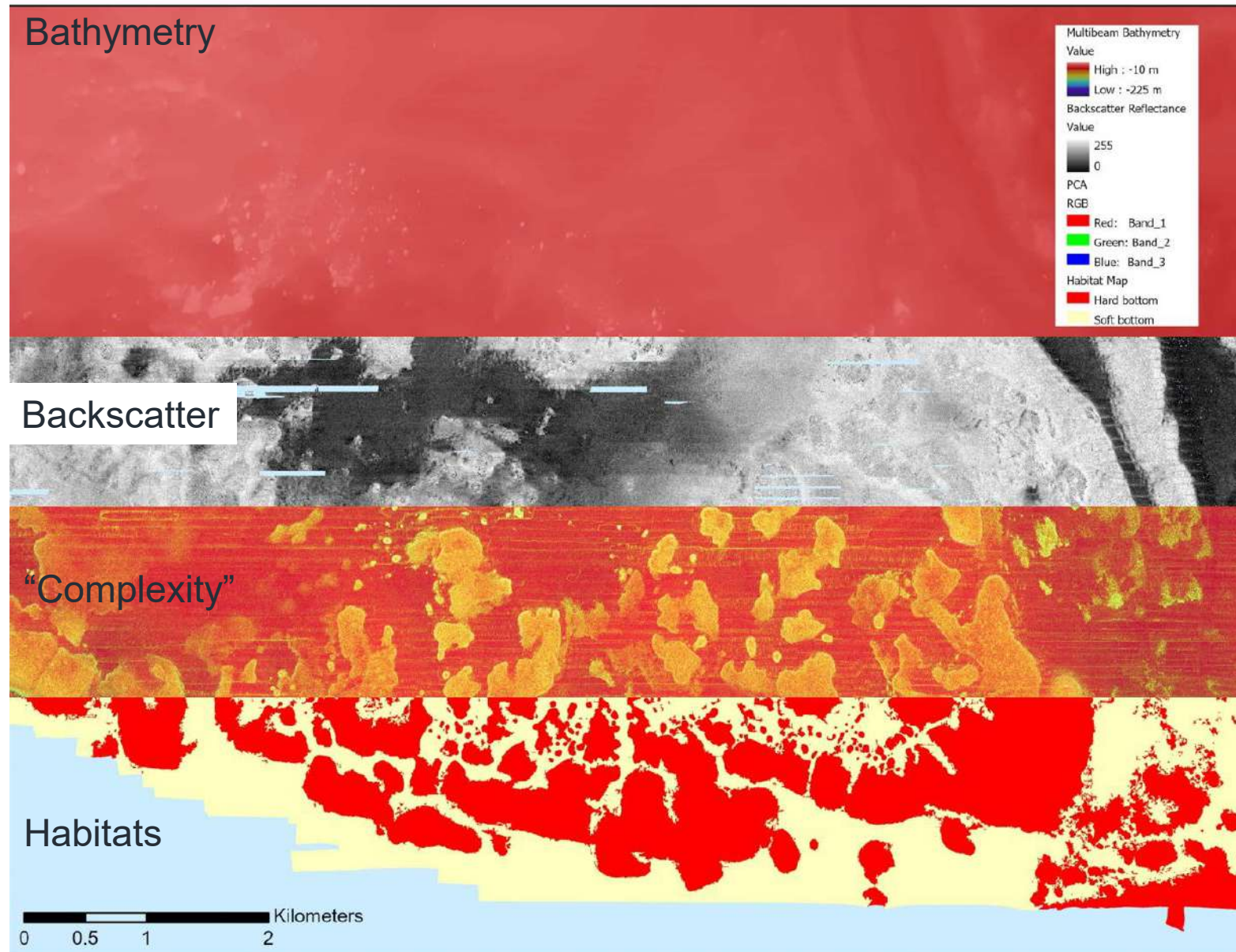
Florida Bay

Florida Keys

Marquesas

Without “groundtruthing”, the new highest resolution bathymetry show complex seabed features that indicate patch reefs and other hard substrates.

Simple “Hard / Soft” characteristics can be derived from bathymetry and backscatter

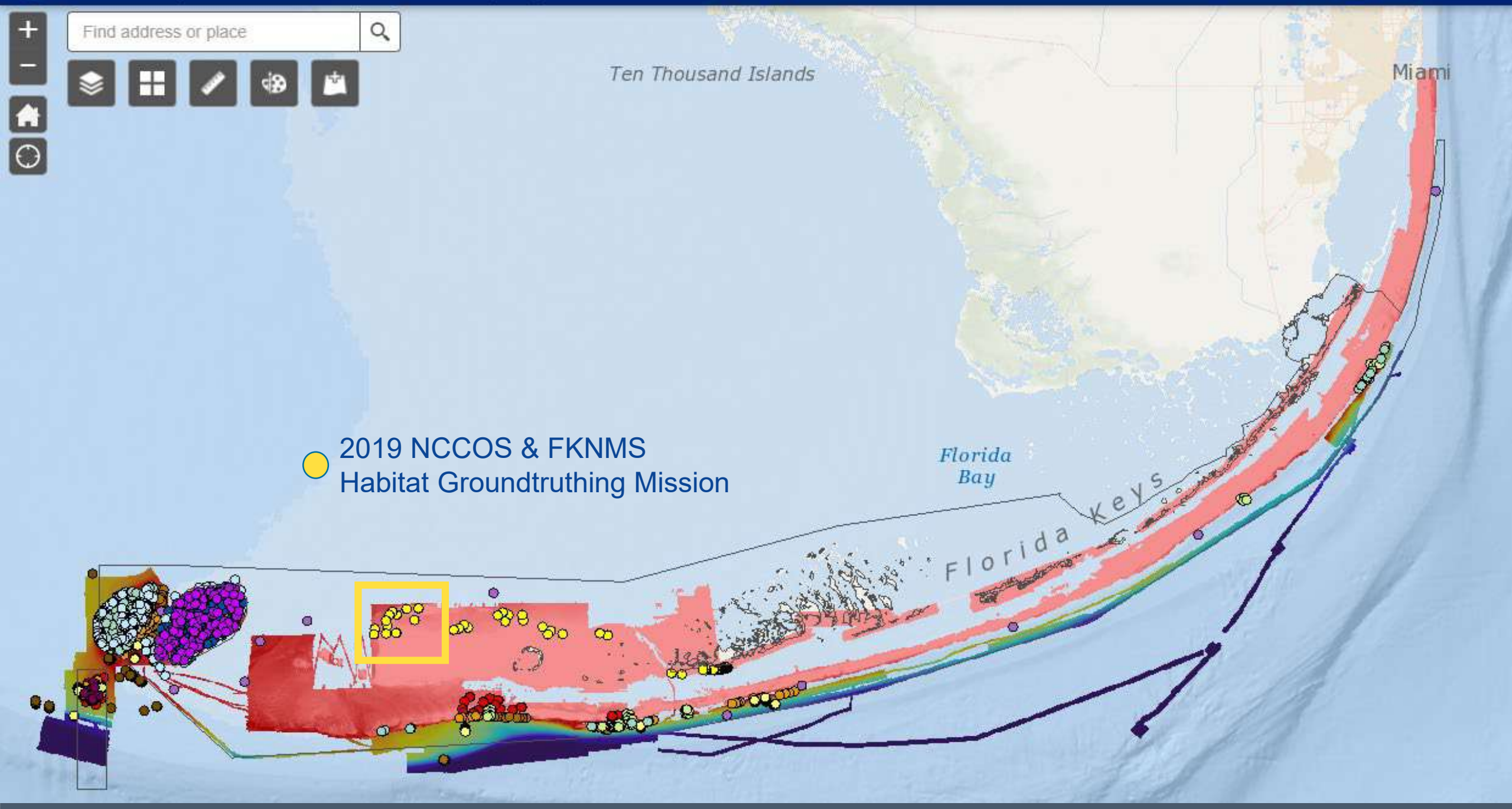




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 2019 NCCOS & FKNMS
Habitat Groundtruthing Mission

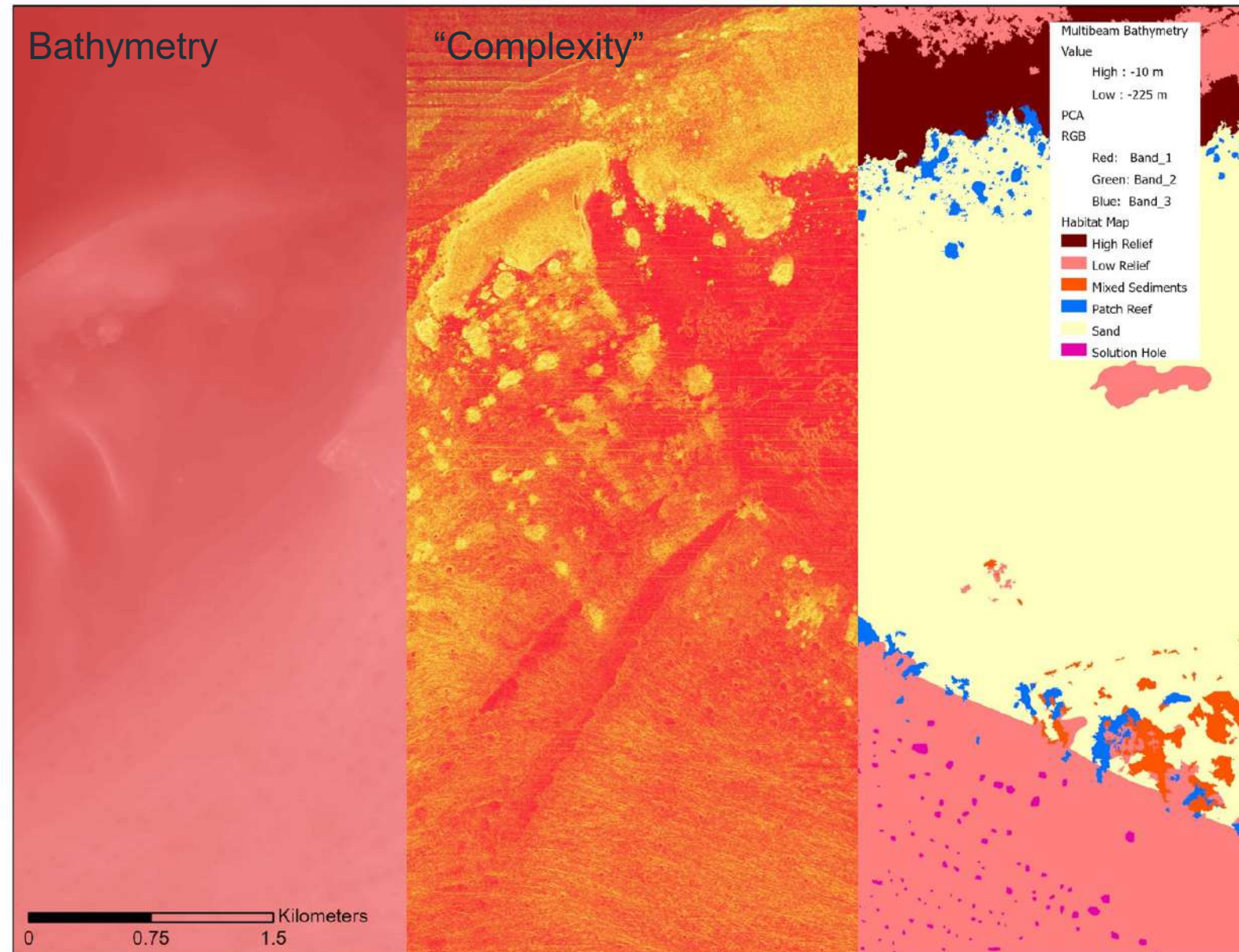


Marquesas

With “groundtruthing” the new high-resolution bathymetry can be classified to more habitat types

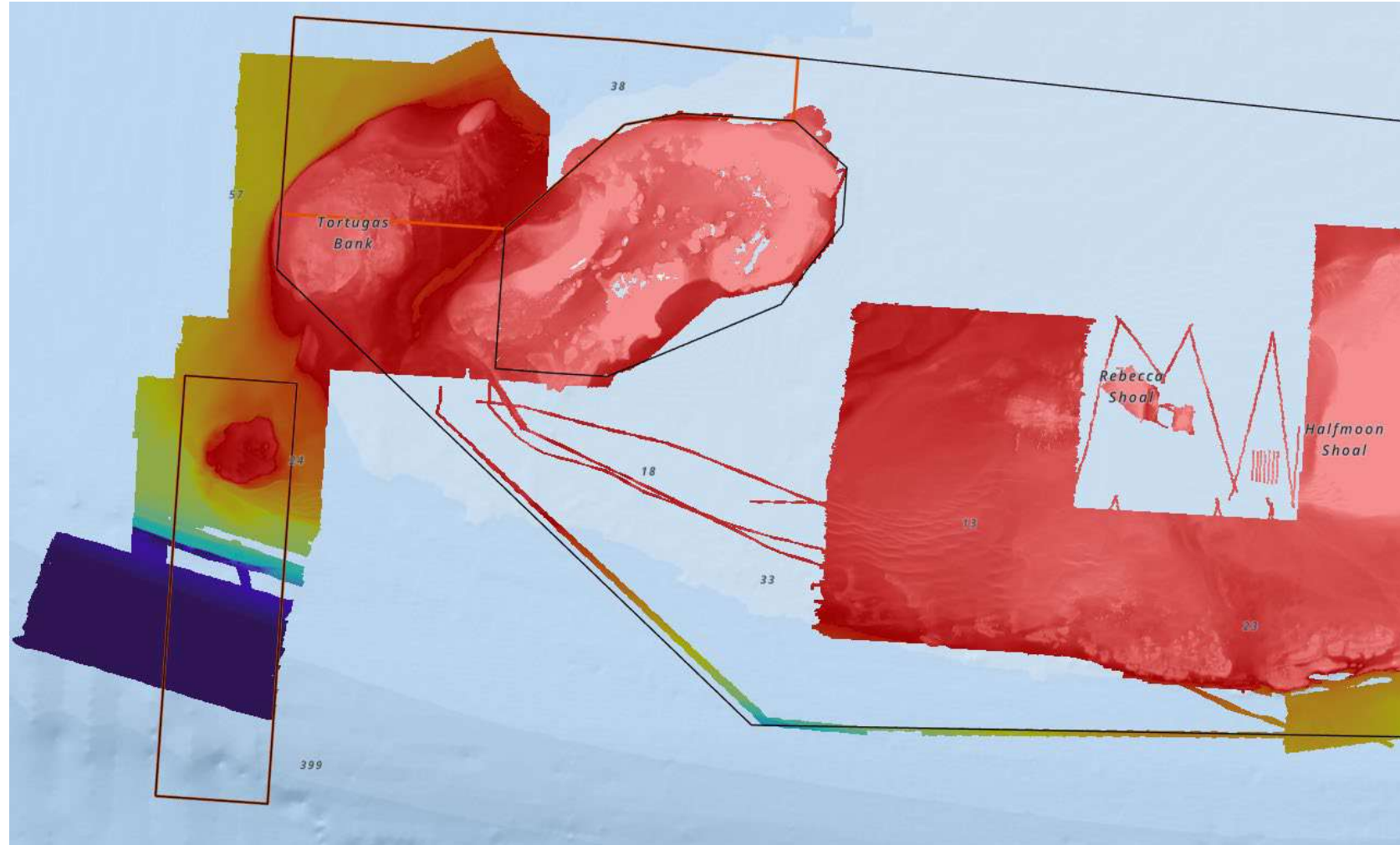
Differentiate:

- High-relief aggregate reefs
- Low relief pavement
- Patch reefs
- Sand
- Solution holes



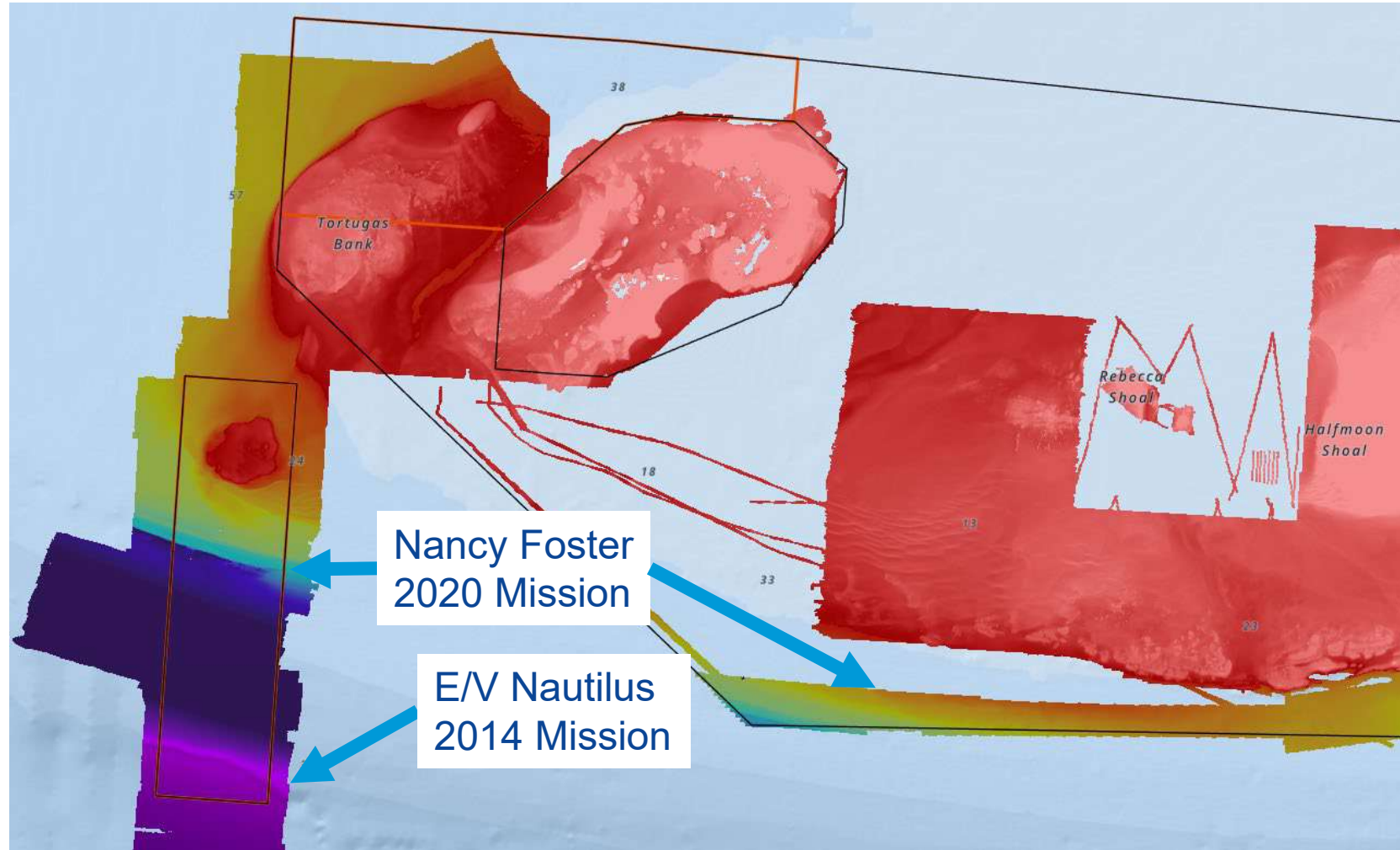
Tortugas South Ecological Reserve State of bathymetry - 2019

- Primarily NOAA research and survey vessels
- NPS and NOAA LIDAR
- Remaining gaps around Dry Tortugas and Banks, especially in Tortugas South Ecological Reserve



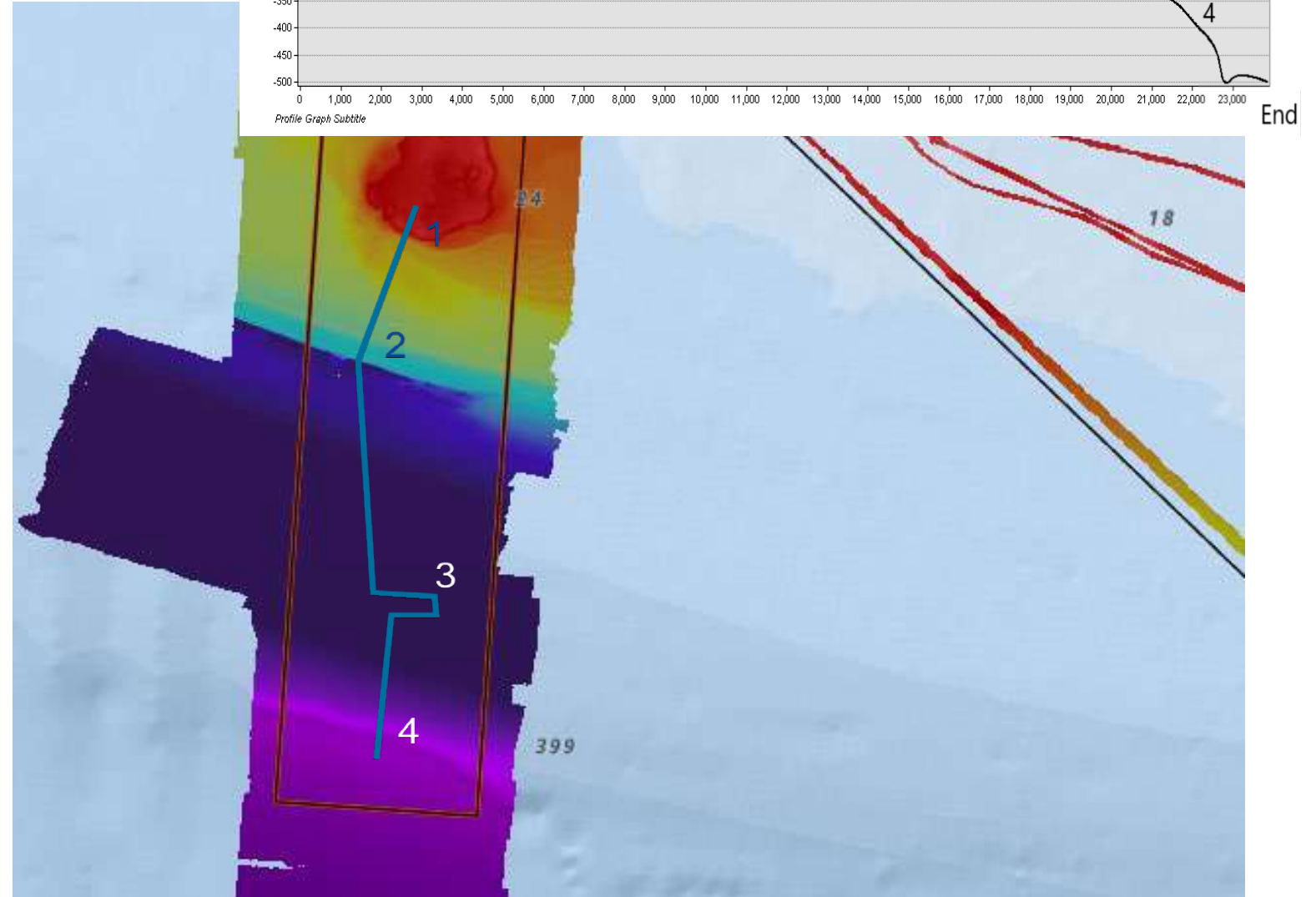
Tortugas South Ecological Reserve State of bathymetry – 2020!

- “Discovered” E/V *Nautilus* (Ocean Exploration Trust) **2014** mission data
- NOAA Ship Nancy Foster mission in September 2020:
 - Filled gaps near Miller’s Ledge
 - Added to FKNMS boundary coverage south of Marquesas



Tortugas South Ecological Reserve

- Prominent coral cap-
Rileys Hump
- Bathymetric features and “terraces”
 1. Rileys Hump
“Cubera Elbow”
 2. Miller’s Ledge
& ridges
 3. “Mounds”
 4. “Deep escarpment”



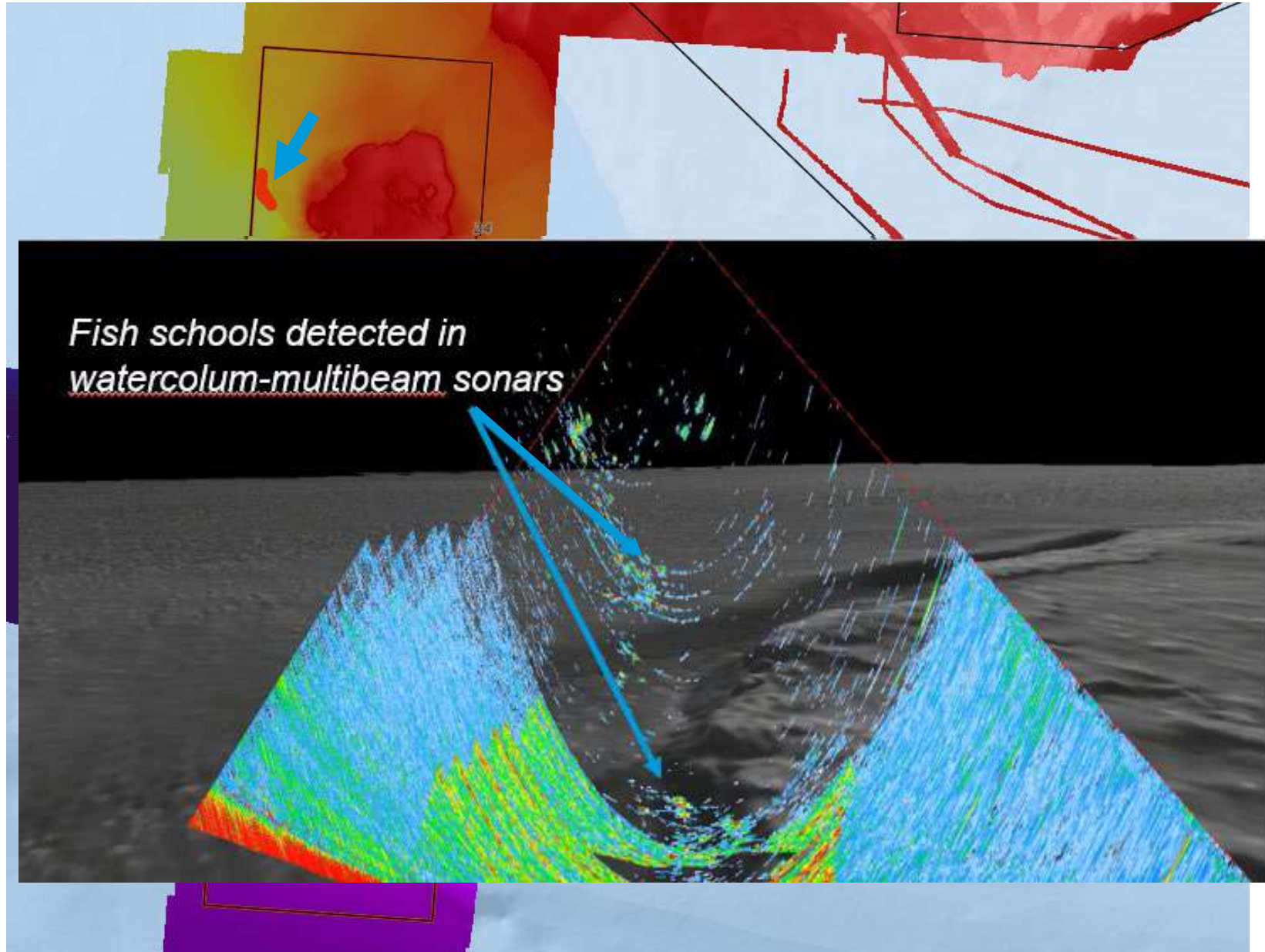
NOAA Ship Nancy Foster

Mission: NF-20-08

1. Riley's Hump - "Cubera Elbow"

FL FWC, NMFS and NCCOS repeated mapping and echosounder surveys, divers, and ROVs since 2010 have observed multi-species aggregations along the entire feature

- Massive schools of jacks
- Aggregations of snappers
- Schools extend nearly length and width of a football field



NOAA Ship Nancy Foster Mission: NF-20-08

1. Riley's Hump - "Cubera Elbow"

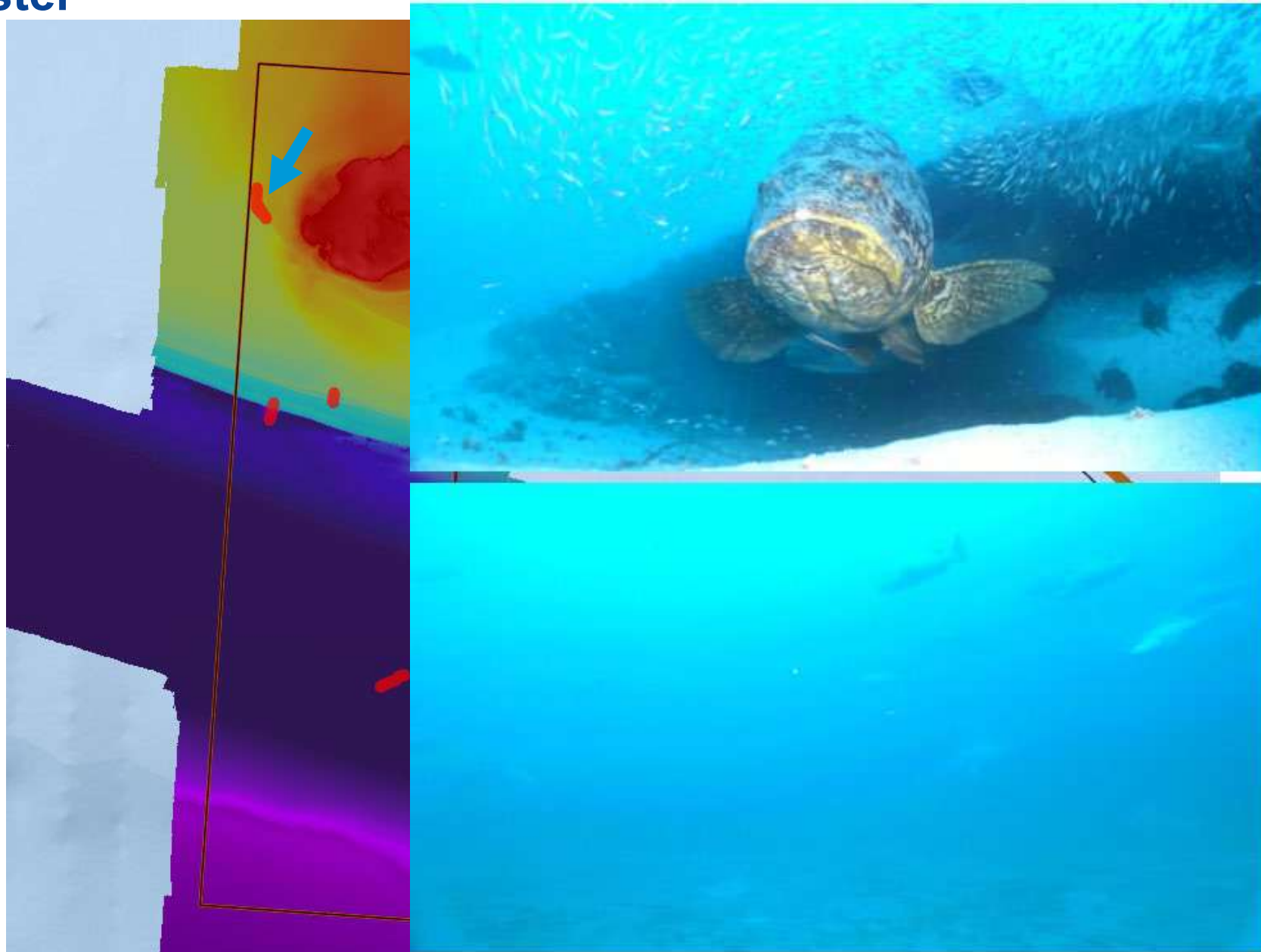
NCCOS ROV Dive 810

52-75m escarpment

Several pairs of Goliath grouper

Dozens of scamp and yellowmouth
grouper

Several dozen cubera snapper



NOAA Ship Nancy Foster Mission: NF-20-08

2. Mid-terrace ridge

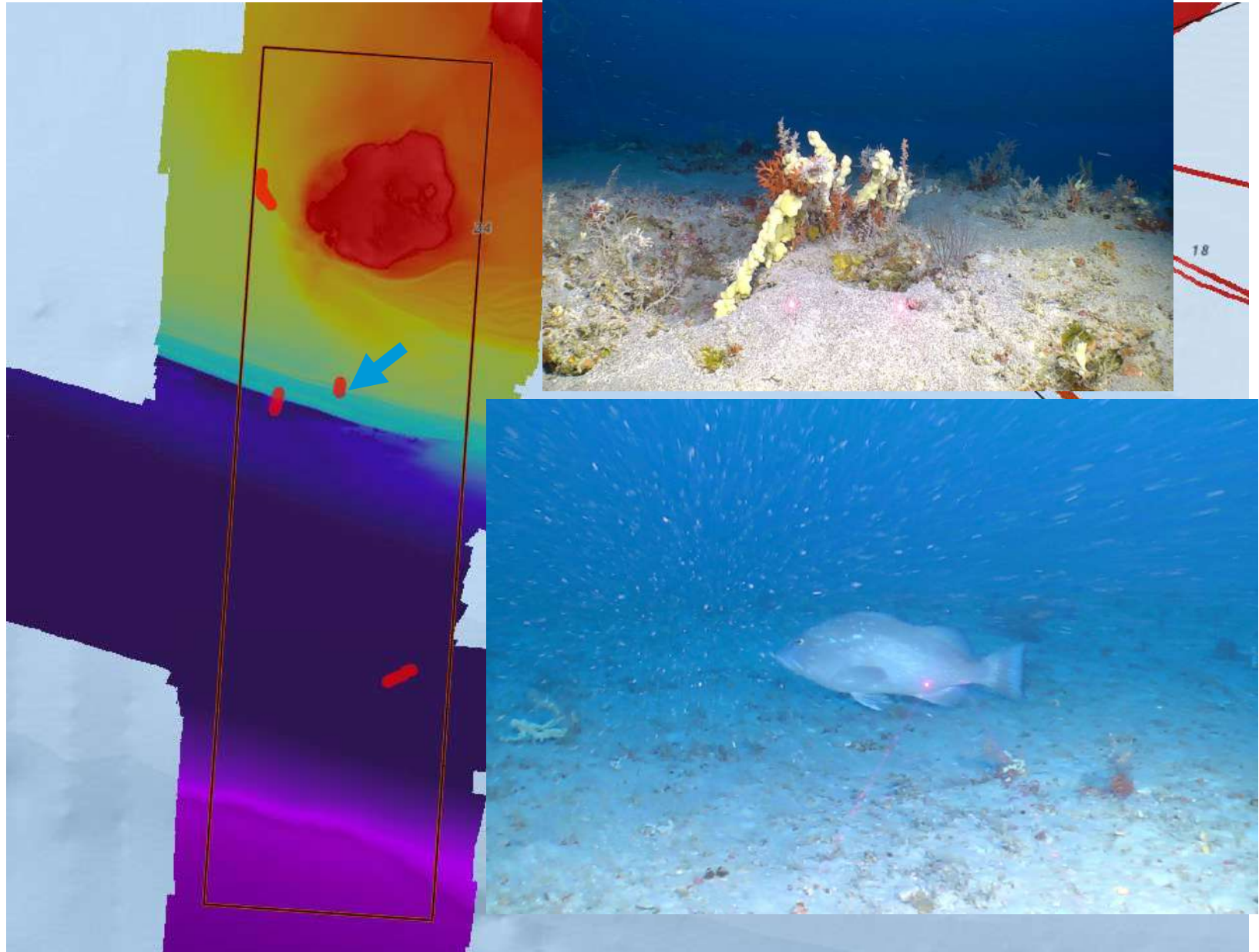
NCCOS ROV Dive 809

75-80m depth, subtle relief

Attached sponges, soft corals

Squirrelfish, snappers

Red grouper



NOAA Ship Nancy Foster Mission: NF-20-08

2. Miller's Ledge

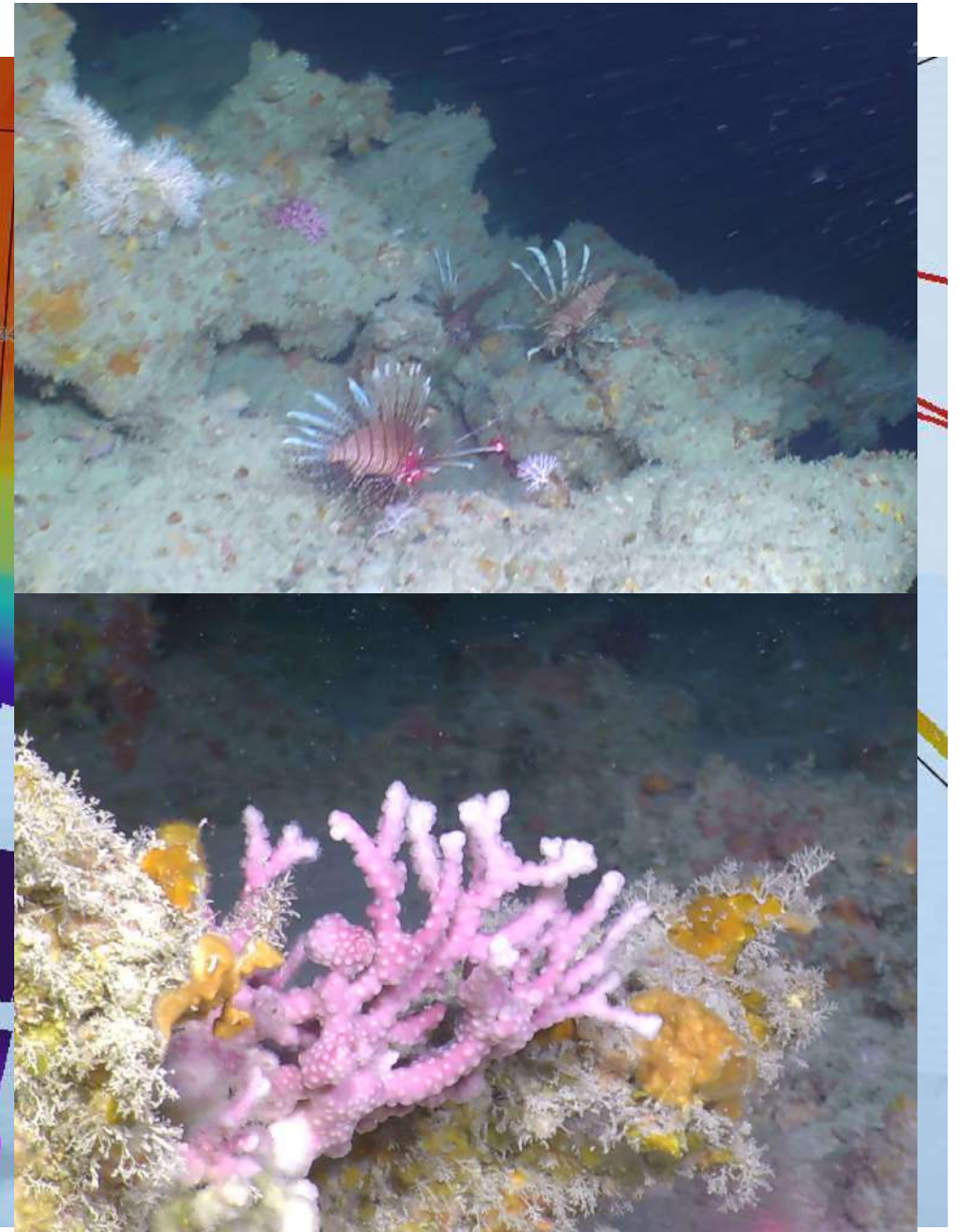
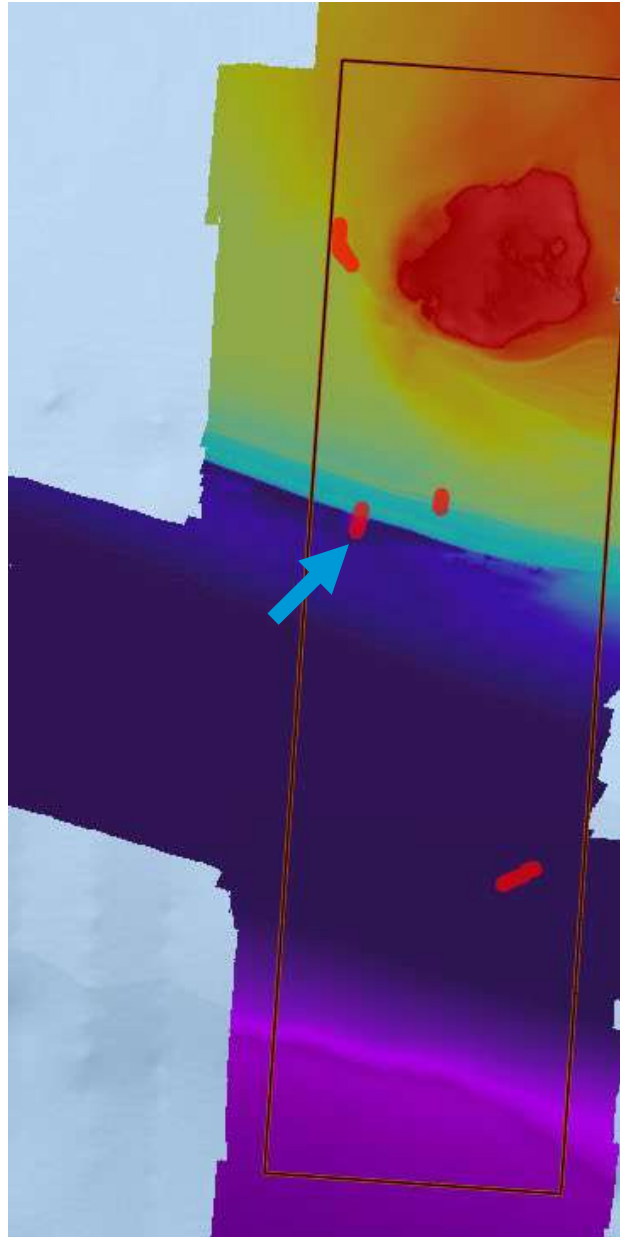
NCCOS ROV Dive 808

130 – 80m escarpment

Rock outcrops

Attached soft corals and sponges

Numerous mesophotic reef fish,
lionfish, grouper



E/V Nautilus 2014 Mission: NA-042

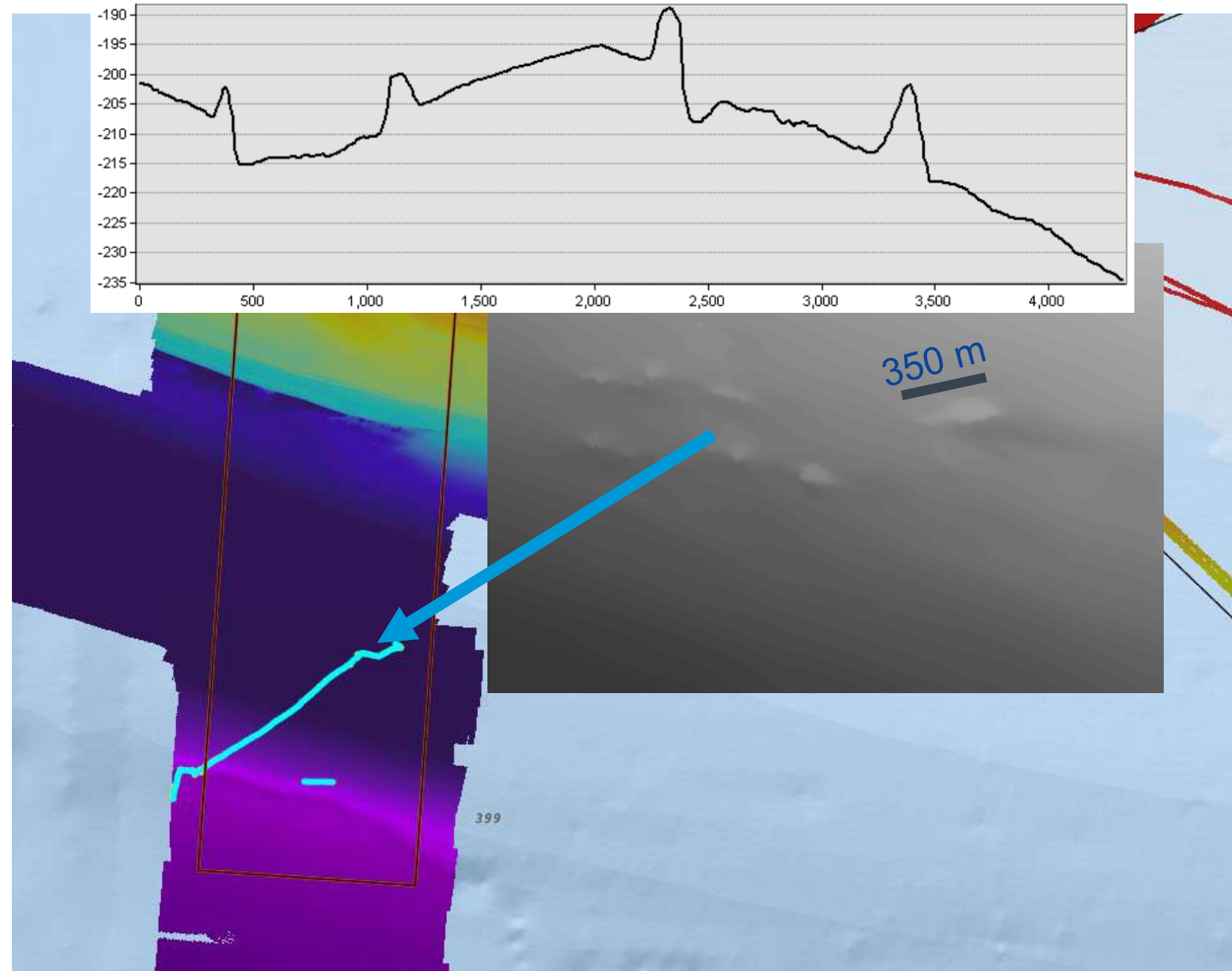
3. Mounds at 200m:

Dive NA042-H1328

10-15m relief

“Semi-hard bottom habitat with small soft coral. A couple Snowy Grouper spotted. Crab and many burrows in the mounds. White fan shaped coral, two ophiorids on top of small mound. In (vehicle) Argus came some kind of reef shark.”

“Approaching the large mound. A lot of small mounds and burrows in sediment. Another shoal of squid a couple of snowy groupers, pencil urchins and big-eye fish. A little rocky over the mound with soft coral. A basket star on the mound. Large fish under the crust.”



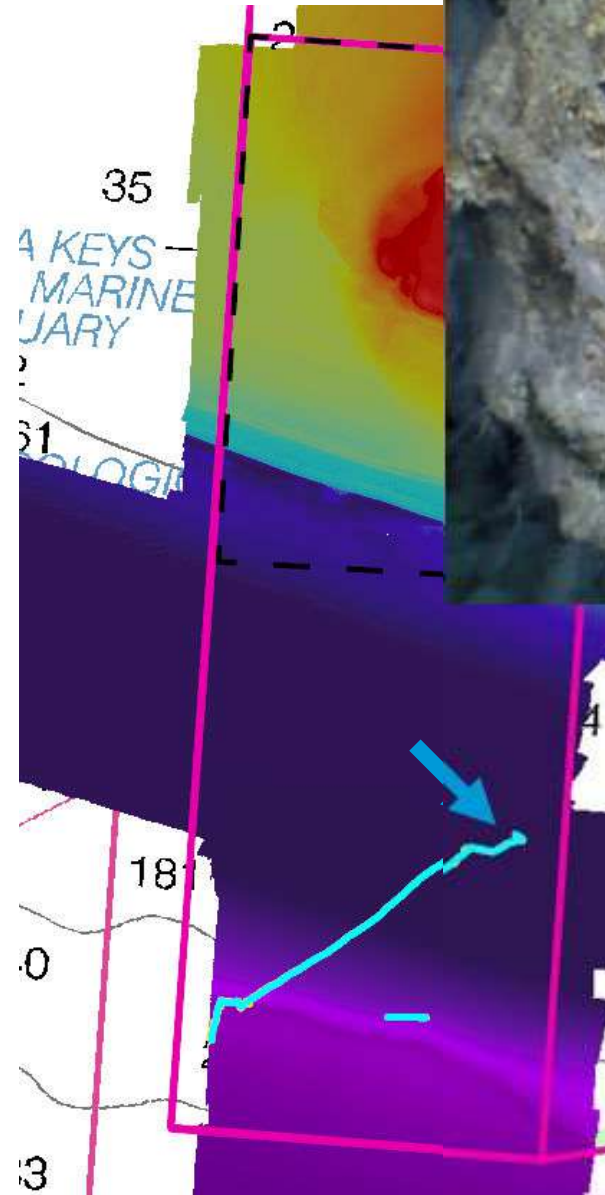
NOAA Ship Nancy Foster Mission: NF-20-08

3. Mounds at 200m:

NCCOS ROV Dive 807

10m relief

Numerous deep grouper and other deep reef species in high relief mounds with

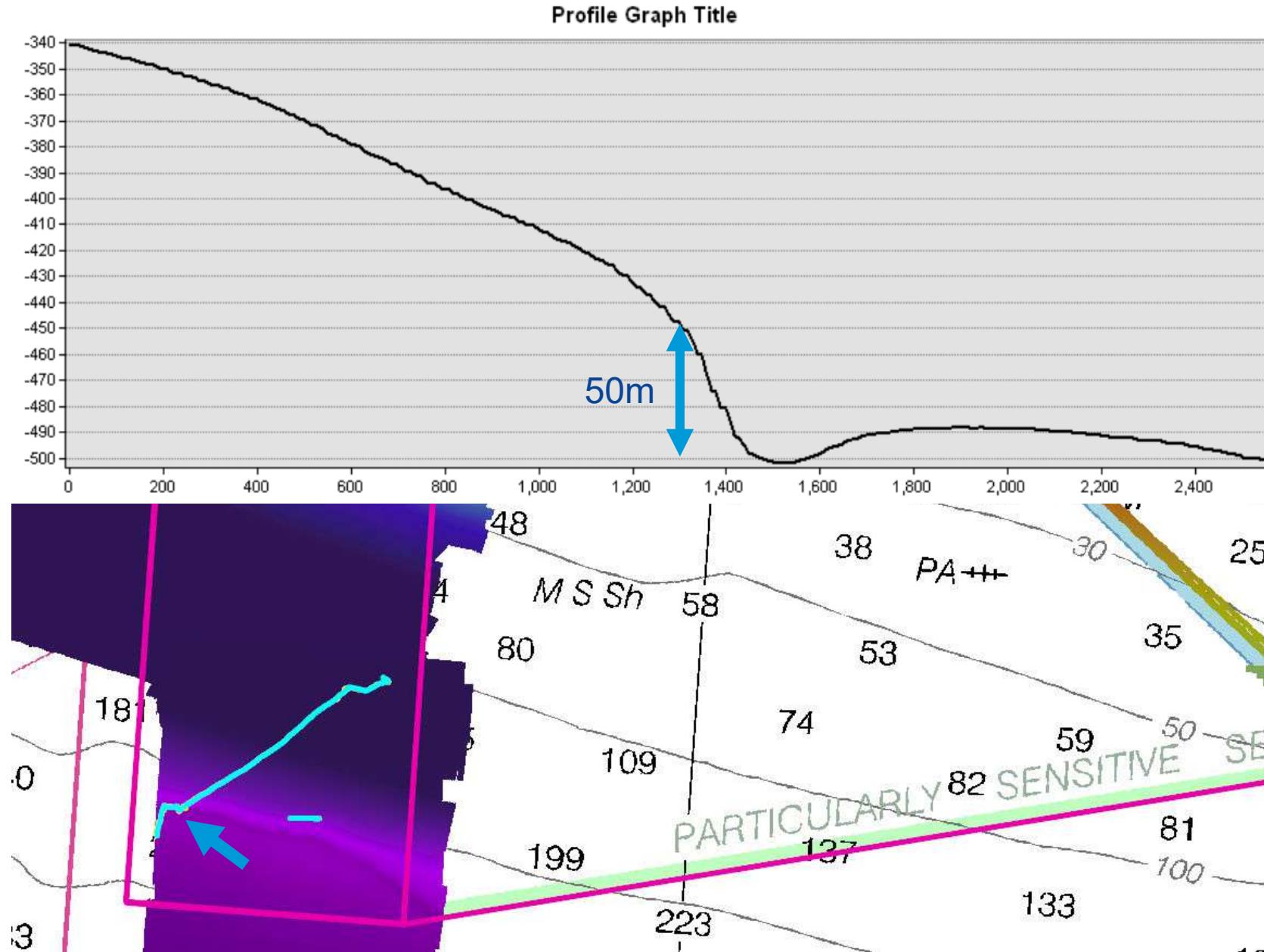


E/V Nautilus 2014 Mission: NA-042

4. "Deep escarpment"

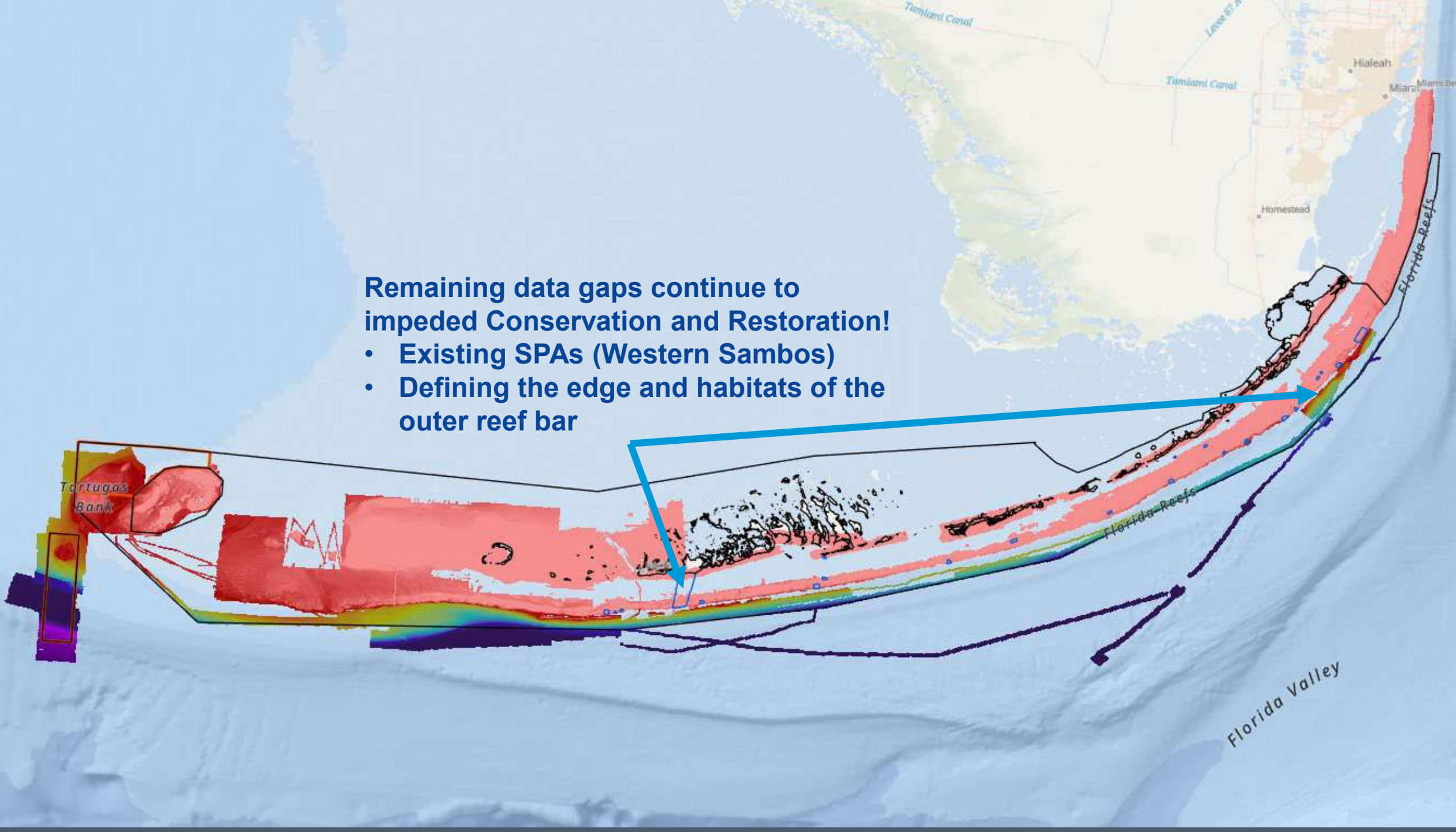
Dive NA042-H1328

"Lot sightings of fish with the black fin and leopard print. Sightings of many larval fish, a cat shark, a blue metallic fish. Lots of soft corals and stony coral (not usually found at these depths) on boulders. Some calcium tube worms on the rocks. Lots of tunicates."



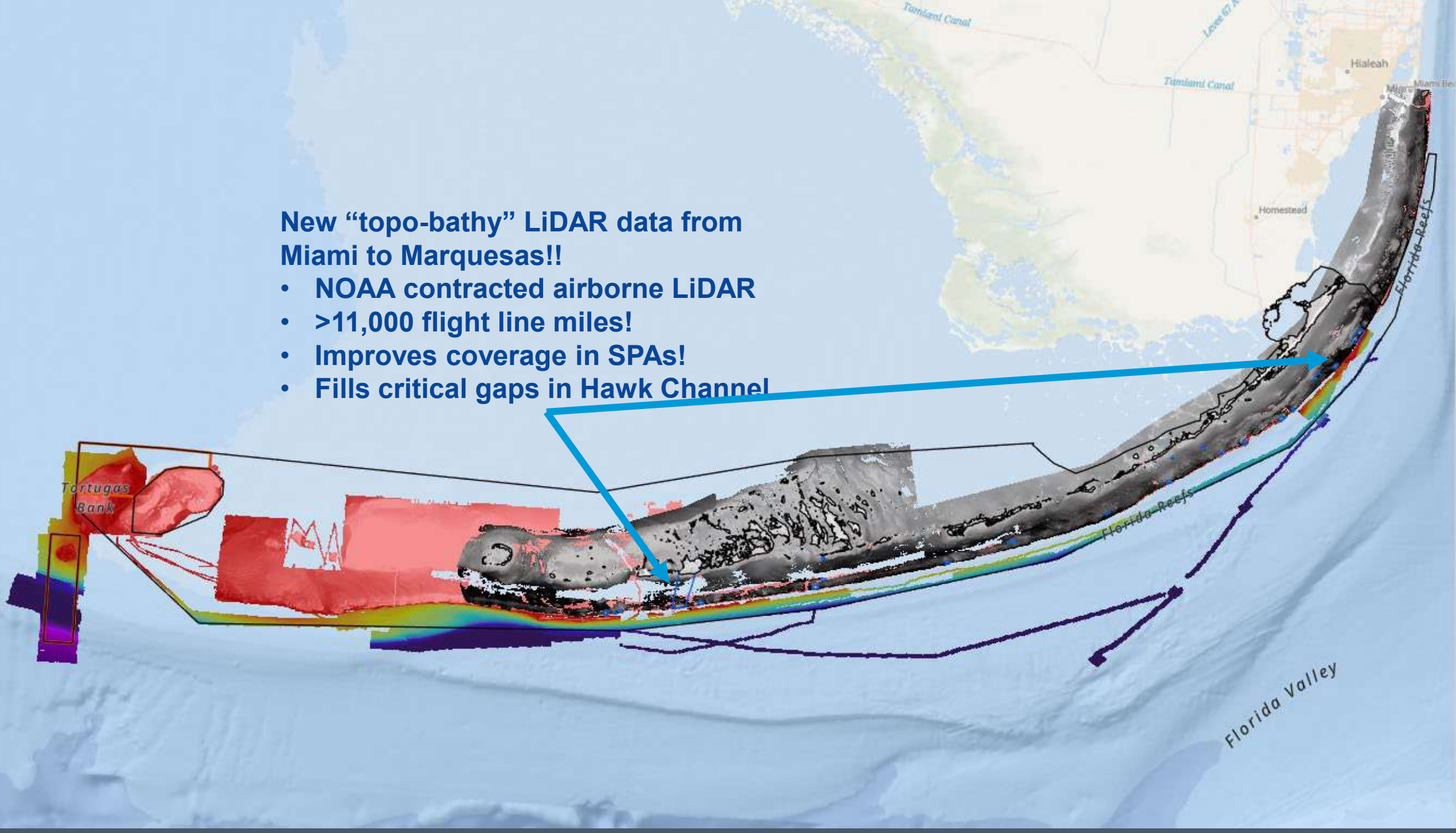
Remaining data gaps continue to
impeded Conservation and Restoration!

- Existing SPAs (Western Sambos)
- Defining the edge and habitats of the
outer reef bar

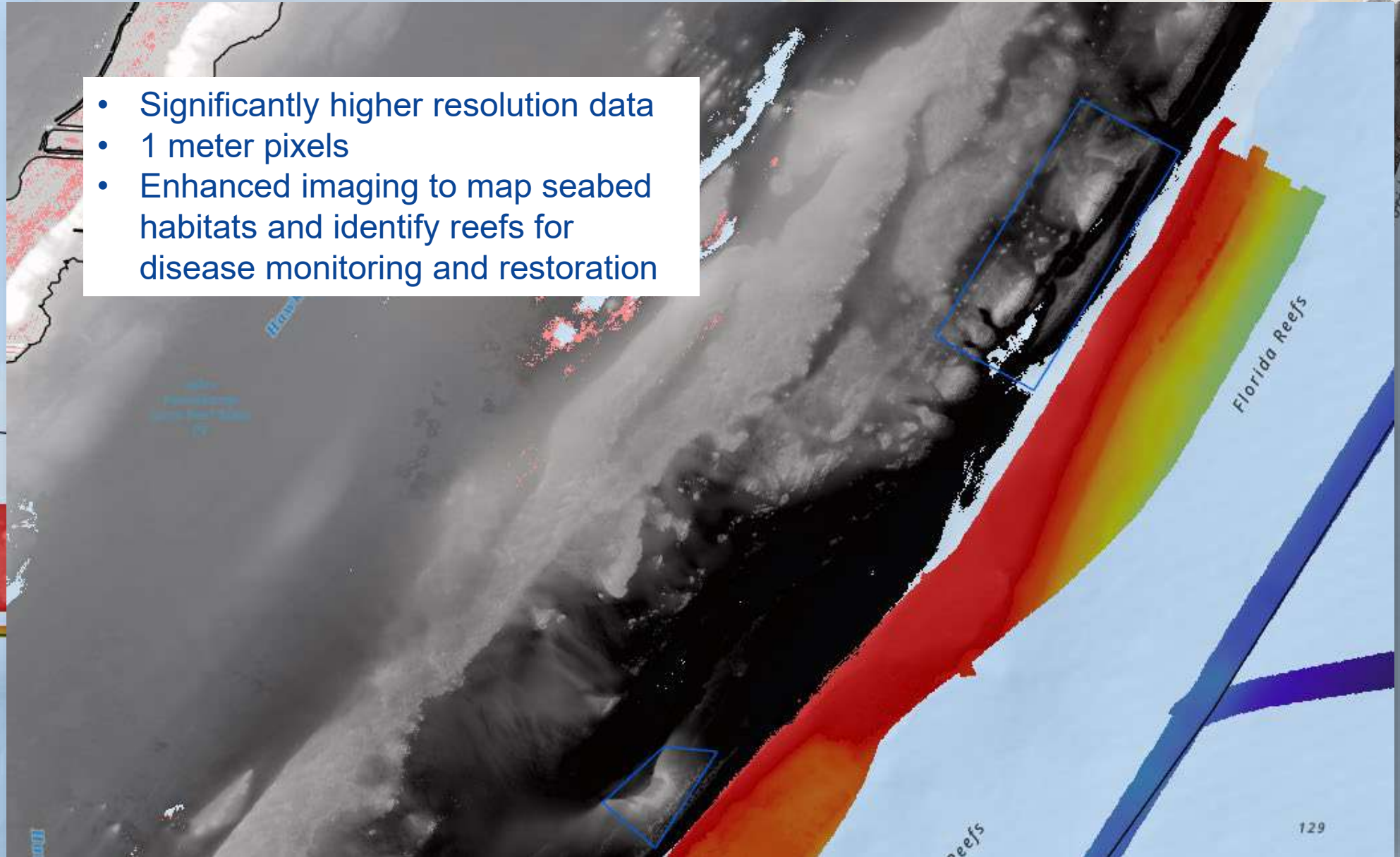


**New “topo-bathy” LiDAR data from
Miami to Marquesas!!**

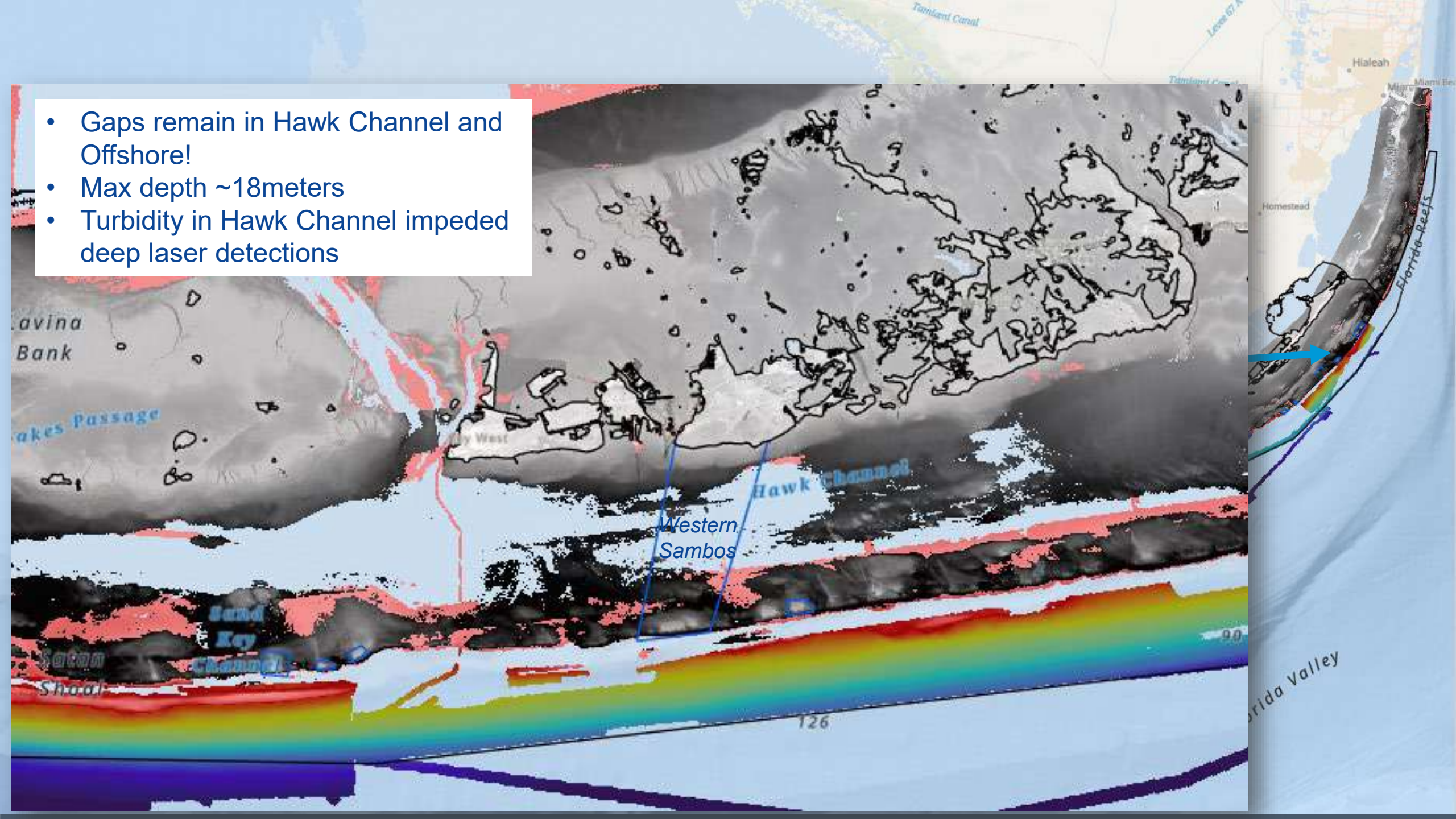
- NOAA contracted airborne LiDAR
- >11,000 flight line miles!
- Improves coverage in SPAs!
- Fills critical gaps in Hawk Channel



- Significantly higher resolution data
- 1 meter pixels
- Enhanced imaging to map seabed habitats and identify reefs for disease monitoring and restoration

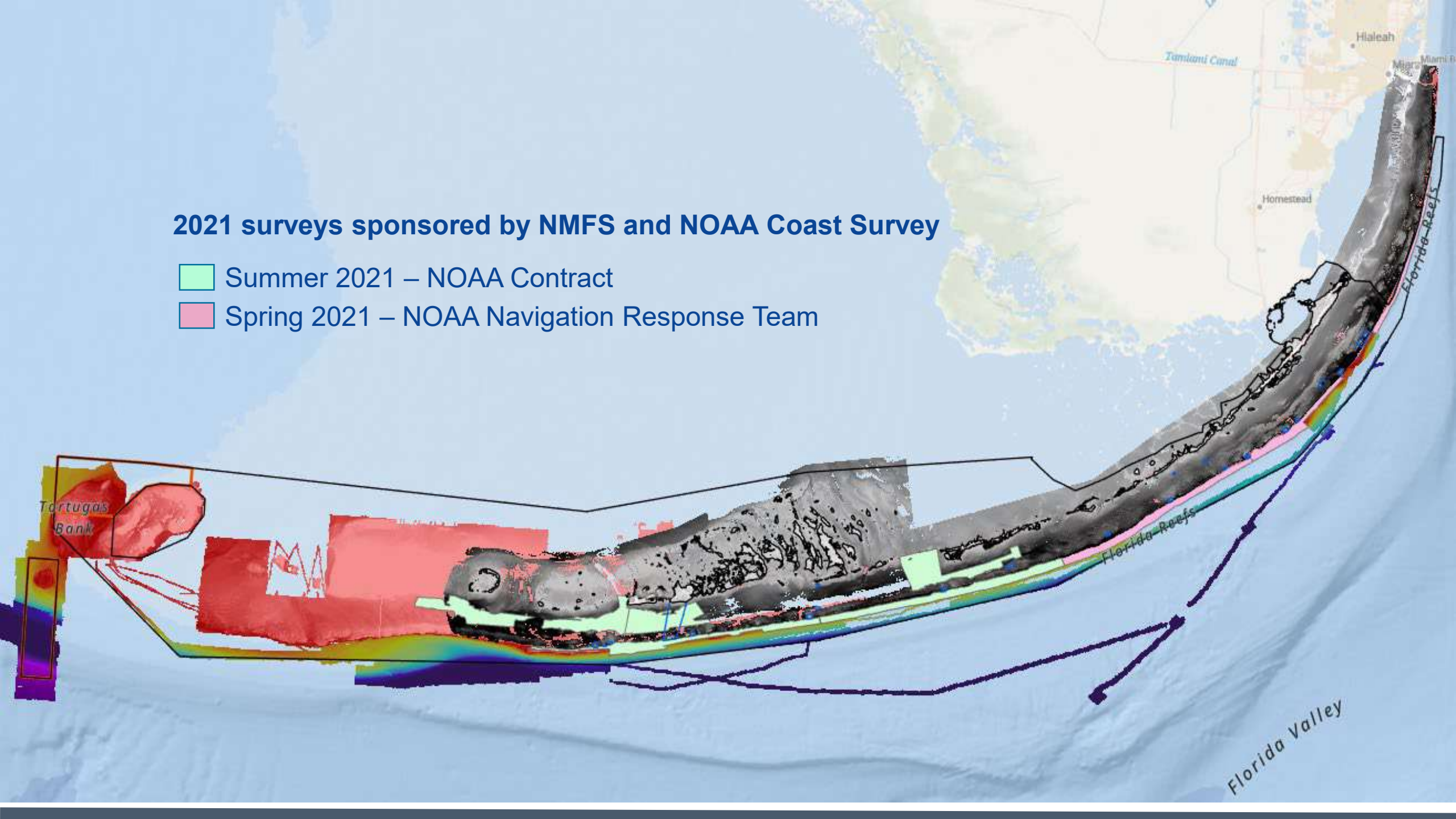


- Gaps remain in Hawk Channel and Offshore!
- Max depth ~18meters
- Turbidity in Hawk Channel impeded deep laser detections



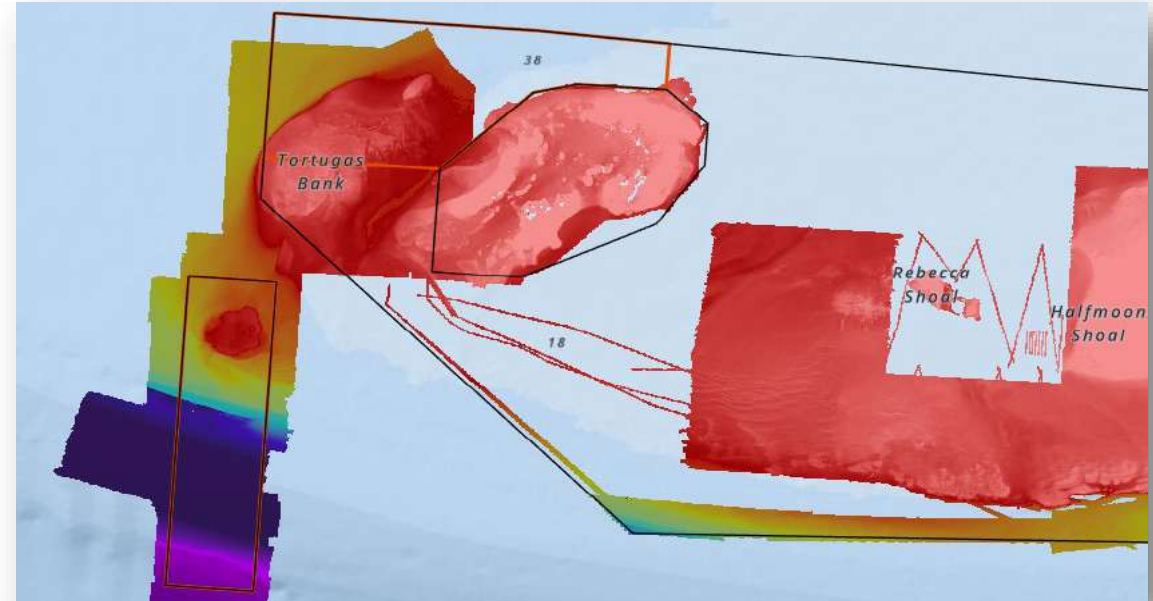
2021 surveys sponsored by NMFS and NOAA Coast Survey

- Summer 2021 – NOAA Contract
- Spring 2021 – NOAA Navigation Response Team



NOAA Ship *Nancy Foster* 2021

- Collaborative missions with NCCOS, FKNMS and Coral Reef Conservation Program
- March-April 2021
- 30+ days at sea
- **More mapping!**
- Restoration, disease and other targeted ecosystem science



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