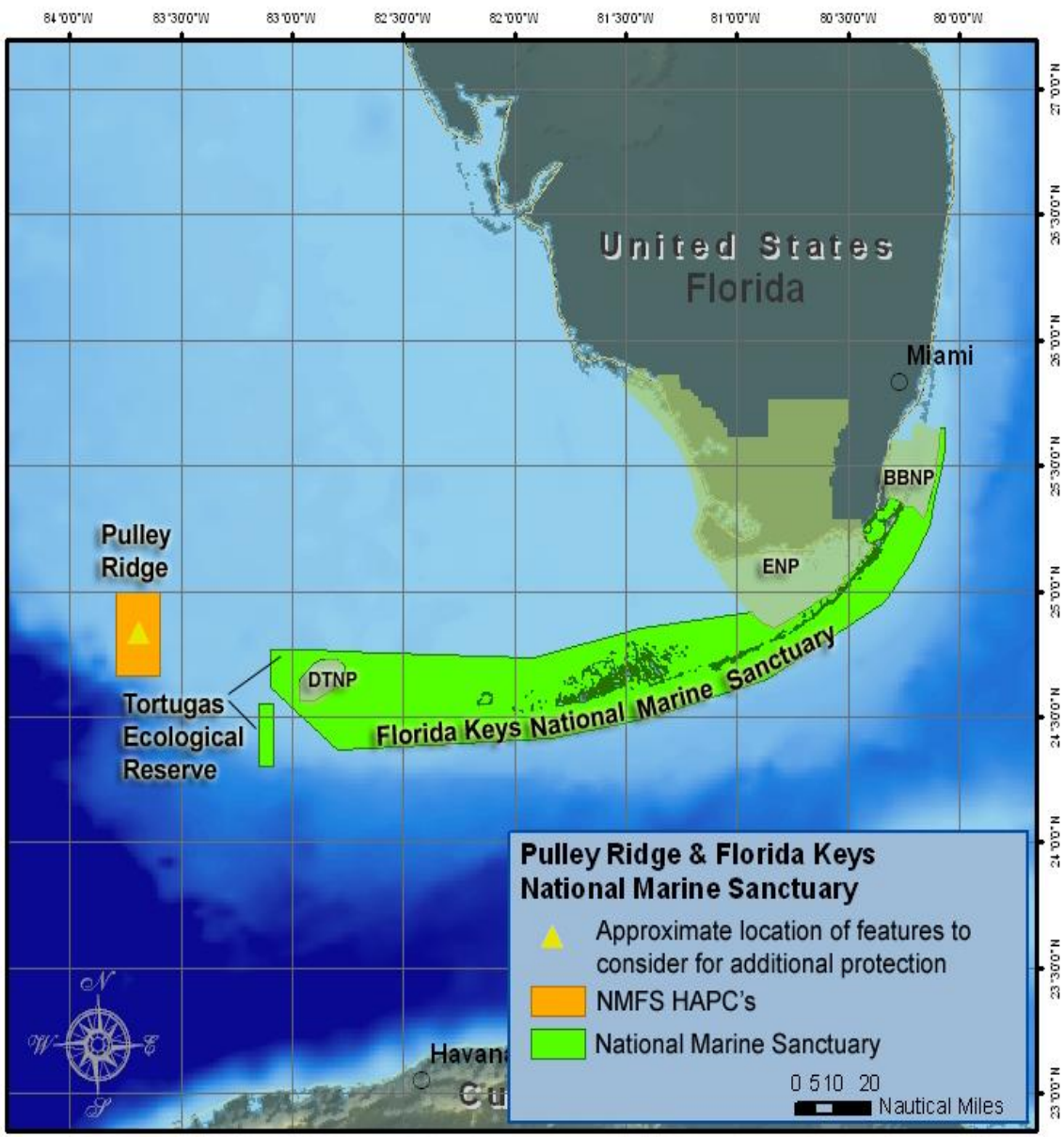
Coral Ecosystem Connectivity
Pulley Ridge to the Florida Keys

Lead PI: Dr. Robert Cowen, OSU

South Atlantic Fishery Management Council Meeting – June 2014

About Pulley Ridge



- ~300 km in length, focused on southern 30 km
- 60-75 m in depth
- Deepest zooxanthellate corals off U.S. continent
- 60+ fish species, mixture of shallow and deepwater species, incl. red grouper and scamp
- Designated a HAPC in 2005 under GoMFMC coral FMP– prohibits use of bottom gear and anchoring

Connectivity of Pulley Ridge to Florida Keys

What is Connectivity?

Exchange of materials, organisms, and genes between areas.

3 types of connectivity:

1) Genetic
2) Ecological
3) Oceanographic

Why is it important?

The success of management measures (MPAs, MPA networks, and zoning) hinges on the establishment of ecologically relevant boundaries that take into account propagule (spores, eggs, and larvae) connectivity, and the movements of juveniles and adults.

About the Project

- Goal: Provide info to regional resource managers on the potential connectivity of Pulley Ridge & Florida Keys, and provide a sense of current community distribution and organization.

- Funders: NOAA – NCCOS, OAR HQ & OER

- Two NOAA Cooperative Institutes (CIMAS & CIOERT)

- Project Period: 2011-2016
- NOAA investment: >$6.0M incldg shiptime

Scamp grouper at 320 feet, Dry Tortugas.

Unique Project

2 Reasons:

- 35 Principal Investigators across multiple disciplines (11 universities & 3 Federal & state agencies)
- Stakeholders Advisory Board -> Managers are part of the project with representatives from:

- BOEM
- Gulf of Mexico FMC
- South Atlantic FMC
- Florida Keys NMS
- Southeast Region NMS
- NMFS/Southeast Region
- NMFS/SEFSC
- Florida FWRI
- Ocean Exploration and Research
- Gulf Coast Restoration TF
- National Park Service
- Nature Conservancy

Expected Results & Uses

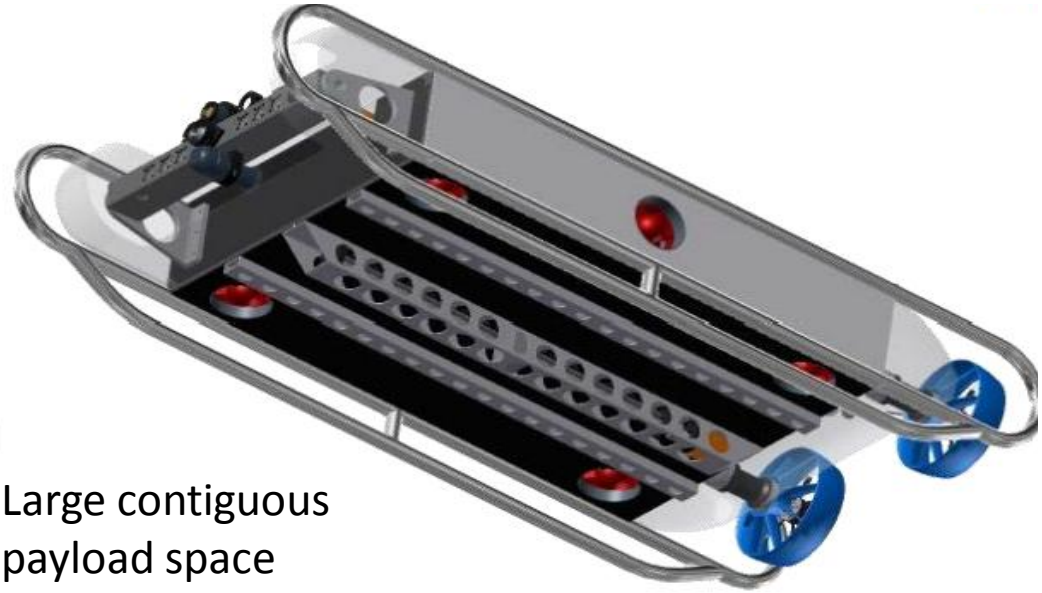
- Expected Results:
  - Maps of larval dispersal pathways under different oceanographic scenarios
  - Population connectivity information for focal species
  - Community structure, abundance, and distribution of sessile species
  - Socioeconomic effects of new management alternatives
- Expected Uses:
  - Info will feed into Florida Keys NMS Management Plan Review & FMCs processes

Accomplishments/2014 Plans

- Completed 2 field seasons
  - 2012 (Pulley Ridge only)
    - ROV surveys of benthos & fishes
    - Diver genetic collections
    - Characterize planktonic larval fish & invertebrates
  - 2013 (Pulley Ridge & Dry Tortugas)
    - ROV surveys of benthos & fishes
    - Diver genetic collections
    - Genetic samples of larger fish species using fish traps
    - Characterize planktonic larval fish & invertebrates

- 2014 - 3rd field season
  - Major technology developments

Bluefin U-4000 Hybrid AUV/ROV



Large contiguous payload space

Dimensions : **~ 2.0 m (W) x 4 m (L) x 1 m (H)**
Weight : **950 kg (2,100 lb) max**
Depth Rating : **4,000 m**
Speed : **2 kts (cruise) to 6 kts (sprint)**
Power: **(6) Bluefin 1.5 kWh batteries**
Tether: **up to 6,000 m (with option for 12,000 m)**
Thrusters: **8 brushless DC**
Typical Payload: **Imaging sonar, HD video camera**

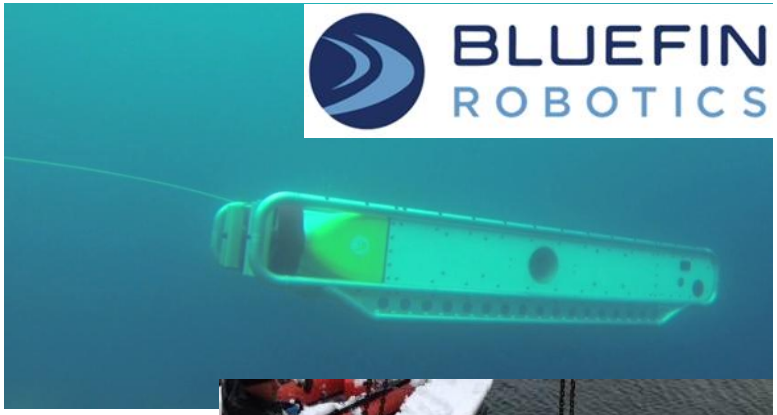
LONG RANGE
Capable of 4 km depth and ~8 hours of operation SpiderOpticsTM tether deployment technology with slant ranges up to 4 km

SUBSTANTIAL PAYLOAD
Inspection payload including MB, SSS, HD video camera , laser imaging, sensors

EASE OF USE
Reduced logistics with fiber optic tether and rapidly swappable on-board batteries
Air-shippable system and can be mobilized in an ISO van for long-term deployments

INCREASED SAFETY
No high-voltage cables running from system to ship
No heavy deck lifting gear required
Emergency mode with independent over-the-horizon satellite positioning
AUV returns to beacon if tether is damaged

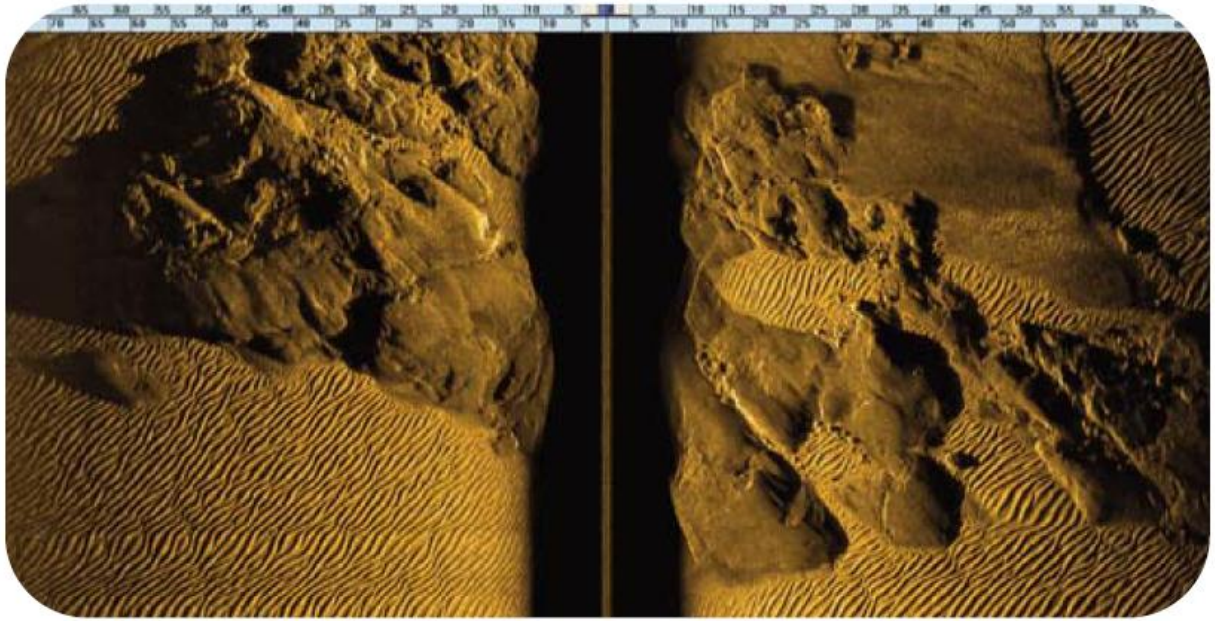
Hybrid Platform for co-located Laser Bathymetry and Multibeam survey at deep water and strong currents sites: **Bluefin U-4000**



- Hybrid AUV-ROV for automated or manual survey with real-time feedback of imagery OR can be used in fully autonomous mode
- Self-spooling 3.5 mm fiber tether – doesn't require a TMS or specialist ship for operations, can operate in up to 6 knots current
- Sufficient space and power for both multibeam and laser bathymetry payloads, other larger payloads
- CIOERT evaluation of U-4000 during 2014 Pulley Ridge cruise, initially with HD camera, Seabird CTD, pH (SeaFET), pCO2 (HydroC) sensors

Bluefin 12 with Klein-3500 for high resolution acoustic survey at Pulley Ridge and surrounding sites of interest

- 10-12 hr acoustic surveys will be conducted through the night
- 2 hrs to produce primary processed mosaics, available for science mission planning meeting in morning
- 1500 m rated
- 1.5 kWhr packs x 5



Klein-3500 hydrographic quality side scan co-registered swath bathymetry – example image showing 150 meter swath

Mohawk “PLUS” ROV for 2014