NOAA Office of Ocean Exploration and Research Update

Alan Leonardi, Director
Fourteenth Meeting, Ocean Exploration Advisory Board
Washington, DC, December 3-4, 2019
By leading national efforts to explore our ocean, NOAA Office of Ocean Exploration and Research is filling gaps in our understanding of U.S. deep waters and seafloor, providing the critical data and awareness needed to sustain and accelerate the economy, health, and security of our nation.
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    • EXPRESS
    • Atlantic Seafloor Partnership for Integrated Research and Exploration
    • Competitive Grants 2019
    • National Oceanographic Partnership Program
    • Extended Continental Shelf
    • New Ocean Exploration Cooperative Institute
• 2020 Outlook
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Final Budget Execution for FY19 by Strategic Category

- **Data & Information Management**: $1,541,452
- **Science & Technology**: $7,215,315
- **Outreach & Education**: $6,624,743
- **Admin & HQ**: $7,460,650
- **Expeditions & Exploration**: $19,860,703

**TOTAL**: ~$42.7 million
2019
A Year in Review
Modes of Exploration

- NOAA Ship *Okeanos Explorer*
- Ocean Exploration Trust funding in support of E/V *Nautilus*
- Alliances: Schmidt Ocean Institute
- Partnerships: DEEP SEARCH, EXPRESS
- Competitive grants
- Extended Continental Shelf Project (ECS)
- National Oceanographic Partnership Program (NOPP)
- Ocean Exploration Cooperative Institute (OECI)
Okeanos Explorer 2019 Highlights

Windows to the Deep: Deep-sea Habitats of the Southeastern U.S.
• First exploration of the central Blake Plateau
• Extensive, previously unknown deep-sea coral and sponge habitat
• 25% of onboard mission and crew were women
  • Women held all onboard leadership positions

2019 Technology Demonstration
• Test new and emerging technologies; evaluate potential integration into NOAA operations
• Encourage collaboration with other institutions, including private partners
Okeanos Explorer 2019 Highlights

Deep Connections: Atlantic Canyons and Seamounts of the U.S. and Canada

- Six dives in three marine managed areas
- Transboundary U.S.-Canada expedition to improve understanding of biogeography and connectivity across Atlantic margin
- Endangered Atlantic halibut documented in deep-sea canyon off northeast coast – possibly critical habitat for species
2019 Southeastern U.S. Deep-sea Exploration

- Explored connectivity within and beyond Stetson-Miami Terrace Habitat Area of Particular Concern, including sites of interest to:
  - South Atlantic Fisheries Management Council
  - NOAA’s Deep Sea Coral Research and Technology Program (DSCRTP)
- Investigation into long-term impacts of deep-sea mining. Partners:
  - U.S. Geological Survey (USGS)
  - Bureau of Ocean Energy Management (BOEM)
- Mapped and explored possible easternmost extent of “Million Mounds”
  - One of the largest areas of deep-sea coral reef habitat discovered in U.S. waters
A long-lost shipwreck was found by accident as NOAA tested equipment

Scientists discovered 85 miles of deep-sea coral reef hidden off the US East Coast — here's what it looks like

Shipwreck found by accident on bottom of the Gulf of Mexico

ThayerMahan and Kraken Team Up on NOAA Op

NOAA is Livestreaming a Deep Sea Expedition and It's Pretty Amazing

‘No Way!’ Stunned Scientists Watch As Wreckfish Eats A Whole Shark

Shark swallowed whole during rare deep-sea feeding frenzy off South Carolina coast, video shows
### 2019 Expeditions

<table>
<thead>
<tr>
<th></th>
<th><strong>NOAA Ship <em>Okeanos Explorer</em></strong></th>
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<th><strong>E/V <em>Nautilus</em></strong></th>
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</thead>
<tbody>
<tr>
<td><strong>22 cruises</strong></td>
<td>9 cruises</td>
<td><strong>13 cruises</strong></td>
<td>135,342 km² mapped</td>
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<tr>
<td></td>
<td>175,480 km² mapped</td>
<td></td>
<td>27,659 linear km mapped</td>
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<tr>
<td></td>
<td>37,684 linear km mapped</td>
<td></td>
<td></td>
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<tr>
<td><strong>113 ROV dives</strong></td>
<td>48 ROV dives</td>
<td><strong>65 ROV dives</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,484 hours of ROV time</td>
<td></td>
<td>1,044 hours of ROV time</td>
</tr>
<tr>
<td></td>
<td>1,236 hours on bottom</td>
<td></td>
<td>975 hours on bottom</td>
</tr>
<tr>
<td></td>
<td>1,895 hours of video</td>
<td></td>
<td>1,044 hours of video</td>
</tr>
<tr>
<td></td>
<td>384 samples collected</td>
<td></td>
<td>639 samples collected</td>
</tr>
<tr>
<td></td>
<td>276 subsamples collected</td>
<td></td>
<td>618 subsamples collected</td>
</tr>
<tr>
<td></td>
<td>4,998 m depth reached</td>
<td></td>
<td>3,384 m depth reached</td>
</tr>
<tr>
<td></td>
<td>200+ participating scientists</td>
<td></td>
<td>150+ participating scientists</td>
</tr>
<tr>
<td></td>
<td>hundreds of participating scientists</td>
<td></td>
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</tbody>
</table>
590+ OER stories were shared by international, national, and local media and websites.

1,095+ Nautilus-related news reports were featured in international, national, and local media and websites. Expedition footage licensed for use in over a dozen documentary productions with distribution across National Geographic, BBC, Discovery, and Science Channel networks, and museum exhibitions around the world.
## 2019 Engagement and Outreach

<table>
<thead>
<tr>
<th>Category</th>
<th>FY19 Ocean Exploration and Research</th>
<th>FY19 Ocean Exploration Trust</th>
<th>% change from FY18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website Visits</td>
<td>~4,300,000</td>
<td>~1,300,000</td>
<td>↓ 24.3% decrease</td>
</tr>
<tr>
<td>Live Video Views</td>
<td>~535,000</td>
<td>~1,500,000</td>
<td>↓ 26% decrease</td>
</tr>
<tr>
<td>Facebook Followers</td>
<td>144,867</td>
<td>104,200</td>
<td>↑ 8.5% increase</td>
</tr>
<tr>
<td>Twitter Followers</td>
<td>~188,300</td>
<td>~34,900</td>
<td>↑ 7.2% increase</td>
</tr>
<tr>
<td>Instagram Followers</td>
<td>~72,200</td>
<td>~96,400</td>
<td>↑ 106.9% increase</td>
</tr>
<tr>
<td>YouTube Views</td>
<td>~4,454,000</td>
<td>~10,000,000</td>
<td>↑ 8.2% increase</td>
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<tr>
<td>YouTube Subscribers</td>
<td>~85,700</td>
<td>~244,000</td>
<td>↑ 44.3% increase</td>
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<tr>
<td>YouTube Minutes Watched</td>
<td>~14,000,000</td>
<td>~6,700,000</td>
<td>↓ 47.5% decrease</td>
</tr>
<tr>
<td>Educators Trained</td>
<td>672</td>
<td>753</td>
<td>↑ 39.3% increase</td>
</tr>
<tr>
<td>Reached Students</td>
<td>81,312</td>
<td>13,070</td>
<td>↓ 26.1% decrease</td>
</tr>
<tr>
<td>Educator Workshops</td>
<td>30</td>
<td>3</td>
<td>↓ 17.5% decrease</td>
</tr>
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$12M, 4.5-year NOPP-funded BOEM-USGS-NOAA project
Goal: Document sensitive canyon, seep, and coral habitats off U.S. Atlantic Coast to inform management decisions should offshore resource development occur
Fieldwork completed 2019; analysis continues through 2021
  22-day cruise in April 2019 on NOAA Ship Ronald H. Brown
    11 ROV dives
    Over 1,600 biological and geological samples
    Range extension of vestimentiferan tube worms
  9-day cruise in October 2019 on NOAA Ship Nancy Foster
    8 midwater trawls and 17 CTD casts at three sites
    Recovered benthic lander from Richardson Hills
Atlantic Seafloor Partnership for Integrated Research and Exploration: Outcomes to Date

- Mapped over 245,000 square kilometers in support of NOAA goal of mapping U.S. EEZ by 2030
- Prioritized areas of interest to key partners and resource managers, including:
  - Southeast Deep Coral Initiative
  - South Atlantic Fishery Management Council
  - Northeast Canyons and Seamounts Marine National Monument
- Began Canadian and European collaborations for 2019-2020 expeditions
- Contracted Fugro to map ~27,000 square kilometers on Blake Plateau
EXPRESS

- Ongoing West Coast campaign between BOEM, USGS, NOAA, nongovernmental organizations
- Aligned with NOAA’s West Coast Deep-sea Coral Initiative
- Investigations inform:
  - Commercial fisheries
  - Understanding of deep-sea corals and sponges
  - Sanctuary management
  - Potential critical minerals and offshore wind energy siting
  - Cascadia Margin mapping and marine geohazards
  - Testing and development of new technologies
ROV dives and 20 AUV dives in 15 West Coast locations

- 200,000 AUV images
- 110 corals, sponges, and water samples for eDNA analysis
- 20 CTD casts with monocore to sample mud core
- First test of OER-sponsored Global Foundation for Ocean Exploration fly-away telepresence
  - First on a NOAA Fisheries survey vessel
  - Three live interactions (Exploratorium, schools)
- Port event with the Exploratorium
- Data will be analyzed to provide coast-wide distribution of deep-sea corals, sponges, fishes, and their associates
Competitive Grants 2019 Highlights

Blue Holes
• Found two endangered sawfish; unexpected increase in O² at 60 meters
• To be featured in an episode of PBS’ “Changing Seas”

Journey into Midnight
• Using the Medusa stealth camera system, recorded first sighting of giant squid in U.S. waters

Microbial Stowaways
• Discovered two 19th century shipwrecks that will shed light on both history and microbial biodiversity
• Other projects helped advance eDNA testing, soft robotics and deep-sea sampling, long-endurance ocean robots, photothermal interferometry
2019 Autonomous Mapping Awards

- $3 million advancing autonomous mapping in the deep ocean
  - OER leveraged $1.5 million of OAR NOPP funds
  - Three awards, three different platform types
U.S. Extended Continental Shelf Project

Okeanos Explorer

OET
DEEP SEARCH
EXPRESS
Comp. grants
ECS
NOPP
OECI
Extended Continental Shelf in 2019/2020

- Continue management and archiving of ECS data and derived products with U.S. ECS project partners
- Draft regionally specific documents for submission to Commission on the Limits of the Continental Shelf
- No additional at-sea data collection planned
- Contributions to general ocean exploration include:
  - New data management indexing and visualization tools
  - Investigation into the use of ECS multibeam data to classify habitat
  - Data availability for baseline characterization
University of Rhode Island is hosting NOAA’s Ocean Exploration Cooperative Institute
OECI will facilitate a long-term collaborative environment between NOAA and the awardees
A priority is to transition toward development of smaller, less expensive mobile ROVs and AUVs for ocean exploration and mapping
These next-generation instruments can be launched from a wide variety of oceanographic vessels
Looking Forward

2020
- 195 days at sea (~52% within U.S. EEZ /~47% international waters)
- Intrusive ship repairs, mission demobilization and subsequent reintegration, trials, and shakedown (still developing)
- EM 304 Trials (December-April) - upgrade sonar system
- Caribbean Exploration Mapping
  - Meso-American and Caribbean Sea Hydrographic Commission and NOAA Office of Coast Survey priorities to complete U.S. EEZ mapping
  - Possible technology demonstrations with Woods Hole Oceanographic Institution (AUV Orpheus) and University of Puerto Rico (hadal lander) (May)
- Caribbean mapping
- Voyage to the Mid-Atlantic Ridge (June-August)
- U.S.-Canada Mapping (September)
Voyage to the Ridge 2020

- Three cruises, 70 days at sea
- Science objectives represent priorities from U.S., European, and Canadian federal agencies, international collaborators, nongovernmental organizations, and the broader science community
- Exploration will include hydrothermal vents, fracture zones, deep-sea coral and sponge habitats, rift zones, and areas inside International Seabed Authority lease blocks
- Region is of interest inform understanding of connectivity of sensitive marine habitats across the Atlantic
Opportunities in 2020 and Beyond

2020/2021 *Okeanos Explorer* priorities include:
- U.S. Caribbean
- Mid-Atlantic Ridge
- U.S. Southeast and Bahamas
- Completing ASPIRE work with *Okeanos Explorer*

Potential for *Okeanos Explorer* to transition from the Atlantic and into the Pacific in 2022
- Initial scoping with partners underway

E/V *Nautilus* and Mobile System
- West Coast work in 2020 in support of EXPRESS
- Extend and expand the Campaign to Address Pacific monument Science, Technology, and Ocean Needs (CAPSTONE)
EXPRESS/NOPP Critical Minerals Expedition 2020

- September 2020: USGS, BOEM, and NOAA partnership on R/V Roger Revelle with ROV Jason
- Goal: Acquire baseline information on critical minerals within the U.S. Exclusive Economic Zone (EEZ) and their interactions with surrounding ocean environment, including hydrothermal vent and deepwater species
- Responsive to Executive Order 13817 (Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals)
# Competitive Grants for 2020

<table>
<thead>
<tr>
<th>PI</th>
<th>Institution</th>
<th>Dates</th>
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<tbody>
<tr>
<td>Distel</td>
<td>Northeastern University</td>
<td>December 6-12, 2019; August-December 2020</td>
</tr>
<tr>
<td>Spirek</td>
<td>South Carolina Institute of Archaeology and Anthropology, University of South Carolina</td>
<td>October 21-25, 2019; November 4-8, 2019</td>
</tr>
<tr>
<td>Diercks</td>
<td>University of Southern Mississippi</td>
<td>May 16-30, 2020</td>
</tr>
<tr>
<td>Levin</td>
<td>Scripps Institution of Oceanography/University of California, San Diego</td>
<td>June 13-20, 2020</td>
</tr>
<tr>
<td>Hoyt</td>
<td>NOAA Office of National Marine Sanctuaries</td>
<td>June or July 2020</td>
</tr>
<tr>
<td>Lawrence</td>
<td>NOAA Office of National Marine Sanctuaries</td>
<td>June 15-July 1, 2020</td>
</tr>
<tr>
<td>Thurber</td>
<td>Oregon State University</td>
<td>August 8-23, 2020</td>
</tr>
<tr>
<td>Wright</td>
<td>Harbor Branch Oceanographic Institute, Florida Atlantic University</td>
<td>September 23-October 4, 2020</td>
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Questions?

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Extra Slides
Areas Mapped ($km^2$) for ECS Project, FY02-18

- Atlantic: 810,705
- Marianas: 630,228
- Gulf of Alaska: 518,156
- Kingman-Palmyra: 32,300
- Arctic: 215,371
- Necker Ridge: 187,210
- Mendocino: 117,210
- Bering Sea: 92,250
- Gulf of Mexico: 70,581
- Johnston Atoll: 32,300

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