#### E/V Nautilus Season Overview & Scientist Ashore Introduction

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#### Outline

Brief Background:
Ocean Exploration Trust
Technologies
2021 Expeditions Season
Opportunities for participation

### Mission & Sponsorship



"Mapping, exploring, and characterizing the ocean and coastal shoreline advances scientific understanding, safeguards the Nation's economic prosperity, and promotes the health and security of our people. This knowledge is essential to advancing America's understanding of the marine environment and addressing sustainable **Unmapped Seafloor in U.S. Waters** ocean resource management **MEC Strategy** 

40°W

### OECIVEHICLES & SYSTEMS



### Technology Overview







### OPERATIONS & CAPABILITIES: MAPPING





#### KNUDSEN 3260 SUBBOTTOM (3.5/15 KHz)

#### KONGSBERG EM302 (30 KHZ)

650



#### **ROVs Hercules** & Argus (4000-m, 6000-m)





#### **ROVs Little Hercules** & Atalanta (6000-m)





#### BIOLOGICAL

#### GEOLOGICAL

WATER & GAS

8

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1777

ARCHAEOLOGICAL

### E/V Nautilus: Work spaces



- Chemical storage & fume hood
- Indoor & outdoor sinks with fresh/sea water
- Milli-Q DI water







### Who's Who on Nautilus

#### 31 Science & operations:

- Expedition Leader (1): organizes the cruise, oversees the cruise activities, and is the nexus of communication between the ship's crew and science and ops teams, and shore
- **Lead Scientist(s) (1-2):** scientist who fosters collaborations with the scientific community to ensure broad and inclusive objectives are met. Writes cruise and dive plans. *Typically* sails on *Nautilus*
- Watch Leaders (3): on-watch decision-makers who guide the dives and monitor & respond to the Science Chat. On ship or shore.
- Watchstanding Science & Operations team: ROV pilots (6), navigator/mappers (3+), data loggers (3), video engineers (3), science communication participants (3), additional scientists
- Non-watchstanding support: data engineer (1), deck chief (1), communications lead (1)



#### 17 Ship's crew

### **Telepresence Model**

What?

- High bandwidth satellite connection between ship and shore
- Low-latency video
- Data ashore
- Science Chat, VOIP, and phone lines

Why?

- Broader participation
- Engagement with public



#### Education & Outreach

#### Education

- Internships
- Science Communication Fellowship
- Live ship-to-shore interactions
- K-12 curriculum (now translated to Spanish) & online resources
- Outreach
  - NautilusLive website & social media
  - Live event series







## Questions?

Next topic: 2021 field season

### 2021 Ocean Exploration Trust Expeditions

#### Season at a glance:

- Nautilus ops July-December (197 ops days)
- 11 Nautilus expeditions
- 1 mobile expedition

OCEAN NETWORKS CANADA

CASCADIA MARGIN

Deferred from 2020 due to covid-19

WEST COAST EEZ MAPPING

OEAN EXPLORATION COOPERATIVE INSTITUTE

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### Thunder Bay National Marine Sanctuary

June 2021

- Lead scientists: Stephanie Gandulla & Jeff Gray Funding: National Marine Sanctuary Foundation/ONMS Goals: lakebed mapping & historical shipwreck monitoring & documentation







### Santa Barbara Basin ROV & Mapping

#### July 2021

- Lead scientists: Dr. Joan Bernhardt, WHOI & Dr. Peter Girguis, Harvard
- Funding: NOAA OECI, WHOI/NASA, Harvard
- Goals: sample sediment-water interface in OMZ, deploy ABISS lander, & map gaps in US EEZ



### Methane Seeps along the Cascadia Margin

#### July-August 2021

- Lead scientists: Dr. Tamara Baumberger (PMEL/OSU)
- Funding: NOAA OECI
- Goals: explore the geochemistry of methane seeps & characterize across latitudinal & depth gradients



### Ocean Networks Canada

#### August 2021

- P.I.: Ian Kulin (ONC)
- Funding: ONC/UVic
- Goals: cabled ocean observatory maintenance and exploration







#### NOAA Ocean Exploration Cooperative Institute Tech Demo

#### September 2021

- PI's: Robert Ballard (OET), Larry Mayer (UNH), Dana Yoerger (WHOI), Andy Bowen (WHOI)
- Funding: NOAA OECI
- Goals: Test new deep-sea robotics & develop con-ops for future exploration missions





### Mapping to Hawaii

#### October 2021

- Funding: NOAA OECI
- Goal: map the seafloor, including focused US EEZ gap-filling surveys







### Mapping the Papahānaumokuākea Marine National Monument

October-November 2021

- Funding: NOAA OECI & ONMS NOPP
- Goal: map the seafloor in advance of ROV expeditions, US EEZ gap-filling surveys





### Lili'uokalani Ridge Seamounts

#### Postponed to 2022

- Lead Scientists: Chris Kelley (UH-emeritus), Randy Kosaki (PMNN Beth Orcutt (Bigelow Labs)
- Funding: ONMS & ONMS NOPP
- Goals: characterize & determine origin of seamount chain



### Southern Wentworth & Don Quixote Seamounts

November-December 2021

- Lead Scientists: Chris Kelley (UH-emeritus), Randy Kosaki (PMNM), Beth Orcutt (Bigelow Labs), Tom Hourigan (NOAA)
- Funding: ONMS & ONMS NOPP
- Goals: characterize & determine origin of seamount chain

Shoal	A LAR A BARRA	14 ····		Prokofyei
Northampton Seamounts	Raita Bank	2121	Mendelssohn Seamount	
Don Quixote Seamount Haaheo Seamount	4953	5374		
5337 Tamana Seamount	The states	5157	3092	1
Paul Seampunt	5065		The second and the	- a state and the same
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2279	the states		Chautauqua Seamount	a waiia
	the state of the s	age and a second second	4882	and the second
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2100

### Chautauqua Seamount Chain

#### December 2021

- Lead Scientists: Adam Soule (URI-GSO)
- Funding: NOAA OECI
- Goals: map & characterize seamount chain, collect voucher specimens of biology &

geology





## Questions?

Next topic: Scientist Ashore Program

### Scientist Ashore Program

#### Connecting scientists to expedition from shore

- Planning: provide input to expedition plans
  - Mapping or ROV dive suggestions
  - Sample requests
  - Technology additions
- During expedition:
  - Science Chat
- Post-expedition:
  - Open access samples & data
- 2020 telepresence
  - 50-70% reduction of sci/ops teams on ship
  - >28 dive leads on shore



### Examples of technology additions

- Visual
  - Still camera (OSU Sexton, WHOI Mesocam)
    Video (Deepi)
    NGS Deep Sea drop cams
- Self-logging oceanographic instruments
   MAPR (miniature autonomous plume recorders)
   Passive acoustics

  - Waverider buoyArgo biogeochemical float
- Mapping
  - Lidar
  - Norbit
- Sampling devices
  - Gastights
  - Temperature/O2 probe In situ water filtration

  - Mass spectrometer Switchable magnet

  - Soft gripper
  - Gecko gripper





### **Open Sample and Data Access**

#### R2R Repository: ID & Locate datasets

	R2R	SEARCH CRUISES DATA TYPES & PRODUCTS QA DASHBOARD	COMMUNITY * ABOUT R2R *
Nautilus			Home / Search / Nautilus
Operator: Ocea	n Exploration Trust		
Nautilus Select Cruise ID			
Filter List		« < 1 2 3 4 5 > »	~
CRUISE ID	SUMMARY	START DATE START PORT END DA	TE END PORT
NA125	Project: Southern California EEZ Mapping Chief: OET Data Manager	2020-11-10 Los Angeles 2020-1	2-05 Los Angeles
NA124	Project: Southern California Biomes	2020-10-27 Los Angeles 2020-1	1-06 Los Angeles

2016-2020 data https://www.rvdata.us/search/vessel/Nautilus

Direct Data requests to OET for complete cruise archives

#### **Specimens: Find & request**



**Biological voucher & DNA:** Harvard's Museum of Comparative Zoology **Geological (rocks & short sediment cores):** University of Rhode Island's Graduate School of Oceanography Marine Geological Samples Lab

### Scientist Ashore Sample Accommodation

- Expanded wet lab sample processing capacity
  - Environmental DNA (eDNA)
  - Seawater sampling (POM, carbonate chemistry)
  - Microplastics
  - Sediments







# Recently published discoveries using imagery and collections



 Zoosymposia 19: 121–134 (2020)

 https://www.mapress.com/j/zs

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https://doi.org/10.11646/zoosymposia.19.1.14 http://zoobank.org/um:lsid:zoobank.org:pub:8216E96C-8A20-4677-899C-E072EE63D91E

A new genus and species of spionid polychaete (Annelida, Spionidae) from a deepwater cold seep site in the Eastern Mediterranean Sea off Turkey

JAMES A BLAKE<sup>1</sup> & PATRICIA A. RAMEY-BALCI<sup>2</sup> <sup>1</sup>Aquatic Research & Consulting, 24 Hitty Tom Road, Duxbury, Massachusetts, 02332 USA. <sup>1</sup>Jabiake@@gmail.com, © https://orcid.org/0000-0001-8217-9769 <sup>2</sup>College of Sciences, Koç University, Rumelifeneri Yolu 34450, Sartyer, Istanbul, Turkey. <sup>1</sup>arameybalci@gmail.com, © https://orcid.org/0000-0002-5224-8863

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ORIGINAL RESEARCH ARTICLE Front. Mar. Sci., 14 November 2019 | https://doi.org/10.3389/fmars.2019.00684

#### Distributions of the Pelagic Holothurian *Pelagothuria* in the Central Pacific Ocean as Observed by Remotely-Operated Vehicle Surveys

#### 🔍 Gina M. Selig<sup>1,2</sup>, 🎑 Amanda N. Netburn³\* and 🔝 Mashkoor Malik³

Marine Science Department, University of Hawai'i at Hilo, Hilo, HI, United States National Oceanic and Atmospheric Administration Educational Partnership Program/Minority Serving Institute Scholar, Silver Spring, MD, United States National Oceanic and Atmospheric Administration Office of Ocean Exploration and Research, Silver Spring, MD, United States

**METEORITIC MATERIAL RECOVERED FROM THE 07 MARCH 2018 METEORITE FALL INTO THE OLYMPIC COAST NATIONAL MARINE SANCTUARY.** M. Fries<sup>1</sup>, J. Waddell<sup>2</sup>, OET and crew of E/V *Nautilus*<sup>3</sup>, SOI and crew of R/V *Falkor*<sup>4</sup>, B. Pugel<sup>5</sup>, R. Zeigler<sup>1</sup>, R. Harvey<sup>6</sup>, L. Welzenbach<sup>7</sup>, F. McCubbin<sup>1</sup>, and P. Abell<sup>1</sup>. <sup>1</sup>NASA JSC, <sup>2</sup>NOAA Olympic Coast NMS, <sup>3</sup>Ocean Exploration Trust, <sup>4</sup>Schmidt Ocean Institute, <sup>5</sup>NASA GSFC, <sup>6</sup>Case Western Reserve U., <sup>7</sup>Rice U. Email: marc.d.fries@nasa.gov

#### Article Open Access Published: 17 August 2020

#### Characterization of deep-sea benthic invertebrate megafauna of the Galapagos Islands

Pelayo Salinas-de-León P, Patricia Martí-Puig, Salome Buglass, Camila Arnés-Urgellés, Etienne Rastoin-Laplane, Marie Creemers, Stephen Cairns, Charles Fisher, Timothy O'Hara, Bruce Ott, Nicole A. Raineault, Henry Reiswig, Greg Rouse, Sonia Rowley, Timothy M. Shank, Jenifer Suarez, Les Watling, Mary K. Wicksten & Leigh Marsh

 Scientific Reports
 10, Article number:
 13894 (2020)
 Cite this article

 4167
 Accesses
 1
 Citations
 139
 Altmetric
 Metrics

















### Mapping Data & Products Availability

- Raw multibeam and subbottom data ALL & SEGY
- Processed multibeam data edited files, grid files, backscatter mosaic, KML, summary statistics, ArcGIS project
- Map products and images for outreach and education



### Mapping Data Public Access & Archive

- OET archive and access data request
- OER Digital Atlas
- 2016+ Rolling Deck to Repository to NCEI
- GMRT and Seabed Pacifc to 2030
   >200 km<sup>2</sup>
- 2021 cruise products to MGDS



### GIS Project for Planning and Access

- GIS project in progress
- Geodatabase tracks, ROV dives, observations, samples, multibeam, SBP
- ArcGIS Online cruise/dive planning
- Coming next geospatial query and analysis
- <u>Preliminary Expeditions Overview</u>: https://arcg.is/XqWjyo



### What's Next?

- March-June: Planning meetings & Expedition Overviews shared
- July-December: expeditions
  - Cruise plan shared prior to expedition
  - Ship reports (Sit Reps) & Dive plans emailed throughout cruise
  - Engage with shipboard scientists using Science Chat & follow along using online tools & streaming
- December-January: expedition wrap-up & reporting
  - Request data & samples

2022 season starting in 1st quarter, in Honolulu, HI

## Questions?