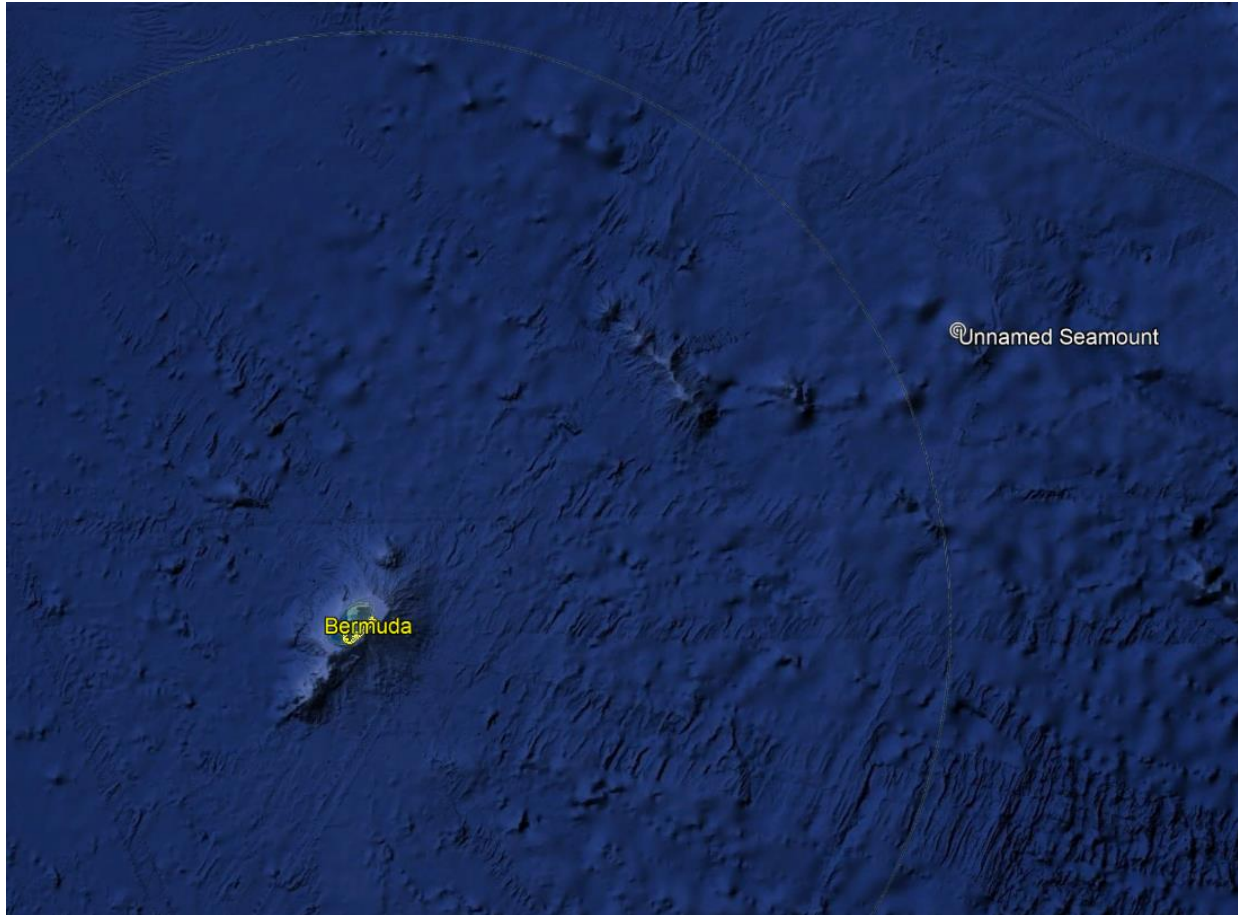


ROV Dive Summary, EX-21-04, Dive 01, July 03, 2021

General Location Map



Dive Information

Site Name	"North Bermuda Tritop"
General Area Descriptor	Twin peaked seamount northeast ~ 270 miles NE of Bermuda (outside Bermuda EEZ)
Science Team Leads	Rhian Waller, Jason Chaytor
Expedition Coordinator	Kasey Cantwell, Kimberly Galvez (Expedition Coordinator in Training)
ROV Dive Supervisor	Chris Ritter
Mapping Lead	Shannon Hoy

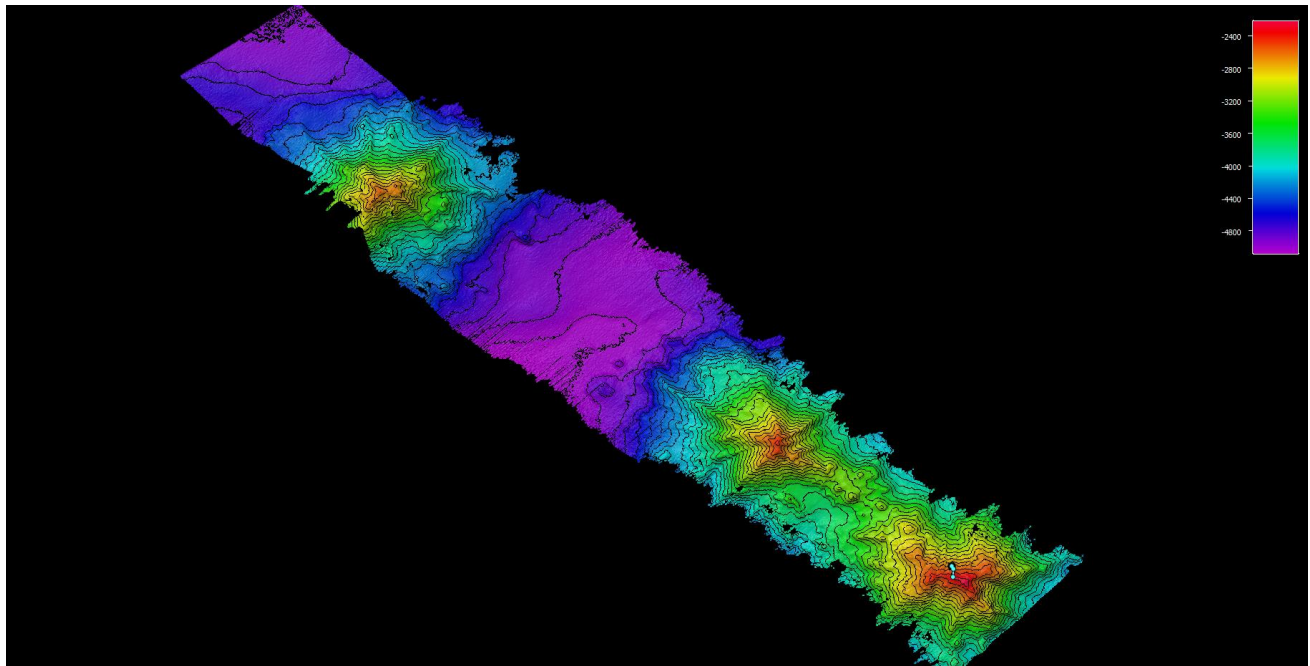
Dive Description	<p>On arrival at the bottom, the dive began on a broad, lower slope terrace of partially exposed FeMn oxide-coated rock (likely basalt) at a depth of approximately 2590 m. The sediment appeared to be primarily composed of biogenic components including several species of pteropods and small coral “twigs”. Low-relief sediment ripples were seen along the initial traverse although they quickly disappeared on approach to debris apron at the base of steeper rock slope. Sample EX2104-D01-01G was collected from the rock rubble from this debris apron.</p> <p>The steepest seafloor gradient traversed during the dive was characterized by extensive FeMn-coated outcrop, with little sediment accumulation. Although primary rock textures were hidden during most, if not all, of the dive, FeMn-crusts on the exposed hard substrate displayed a wide variety of secondary textures (smooth, pitted and botryoidal). The rugged and dissected nature of these outcrops captured and preserved more complete coral skeletons, which were entirely absent in the sediment and rock debris encountered earlier.</p> <p>Towards the end of the dive, the ROV transited across a lower-relief sedimented slope mantled by dense patches of partially FeMn-coated coral rubble. In places, the coral rubble appeared to be shaped into downslope-normal bands, perhaps indicating some along- or down-slope directed flow/current. Prior to coming off bottom, boulders and larger outcrops were observed scattered across the sedimented slope.</p> <p>Biological observations during the dive showed a spread out but diverse deepwater coral and sponge fauna, including some species new to this region. Bathypathes sp. were the only black corals seen during the dive, though there were several putative species of Keratoisis and Lepidisis bamboo corals observed. Corallium and anthomastus were also frequently seen on rocky outcrops and two species of sea pens were observed in sedimented areas. Sponges were also well represented, with one potential species range extension (large plate-like species), Rossellid, Farreid and several unknown species also observed. Associated fauna on either corals or sponges was sparse, but we did observe ring anemones on Corallium, branching forams on sponges and several brittlestars, barnacles and squat lobsters. Only three fish were observed during the whole dive. <i>Desmophyllum dianthus</i> fossil corals attached to rocky outcrops and also in piles on sediment, alongside other fossil deposits of octocoral skeletons, though no live scleractinians were observed.</p>
Notable Observations	Potentially new species and new species ranges of deep sea sponges Thick FeMn-oxide crusts (perhaps up to 10 cm in thickness)
Community and habitat observations	Corals and Sponges - Present Chemosynthetic Community - Absent High biodiversity Community - (Present in small patches) Active Seep or Vent - Absent Extinct Seep or Vent - Absent Hydrates - Absent
CMECS Feature Type(s)	Rock, Sediment (Fine & coarse unconsolidated)
SeaTube Link (science annotation system)	https://data.oceannetworks.ca/SeaTubeV3?resourceTypeId=600&resourceId=5070

Equipment Deployed

ROV	<i>Deep Discoverer</i>
-----	------------------------

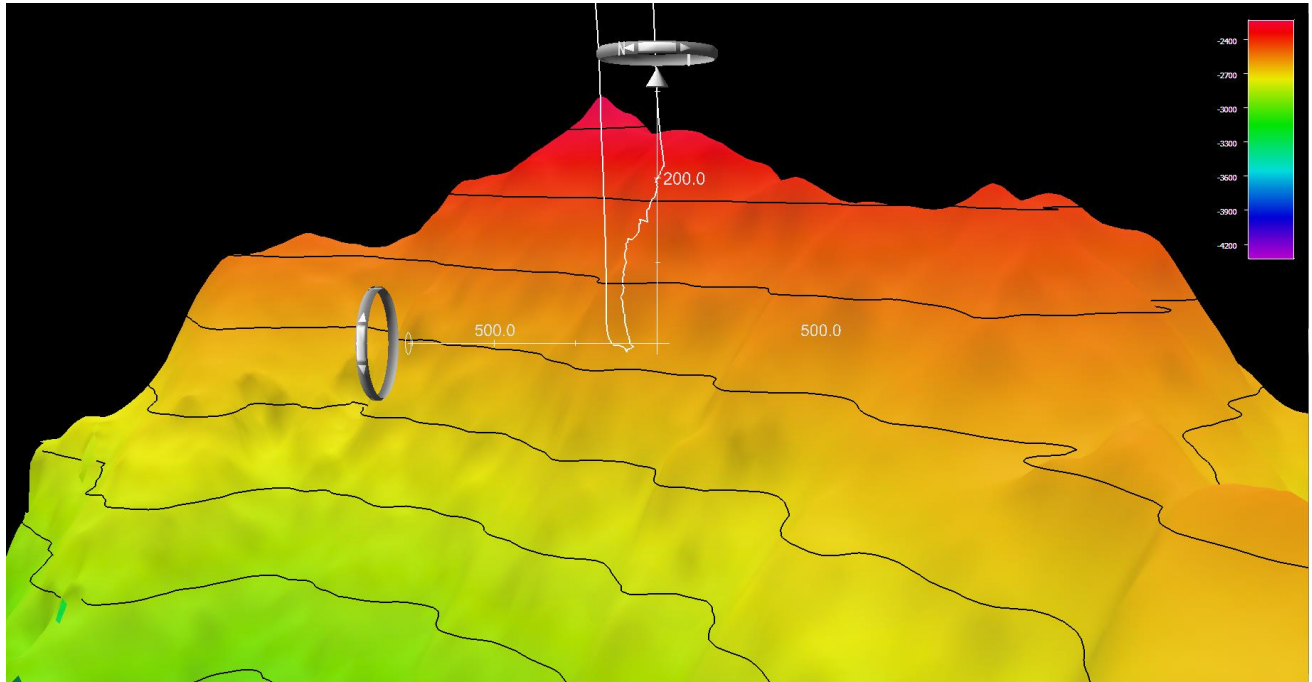
Camera Platform	<i>Seirios</i>
ROV Measurements	The following ROV measurements, data streams and equipment are used on each ROV deployment: CTD, depth, scanning sonar, USBL position, altitude, heading, attitude, high-resolution cameras, low resolution cameras, manipulator arms, suction sampler, sample drawers and thrusters. The section below notes if any of these sensors were malfunctioning or not operational
Equipment Malfunctions	D2's CTD data was noisy (later this was found to be a result of a new LED light being too close to the CTD sensor). This issue was resolved in advance of EX2104 Dive 3.

Overview of Dive Site



Smoothed ROV dive track (blue) on an overview bathymetry of the seamount, 3x vertical exaggeration.

Close-up Map of Main Dive Site

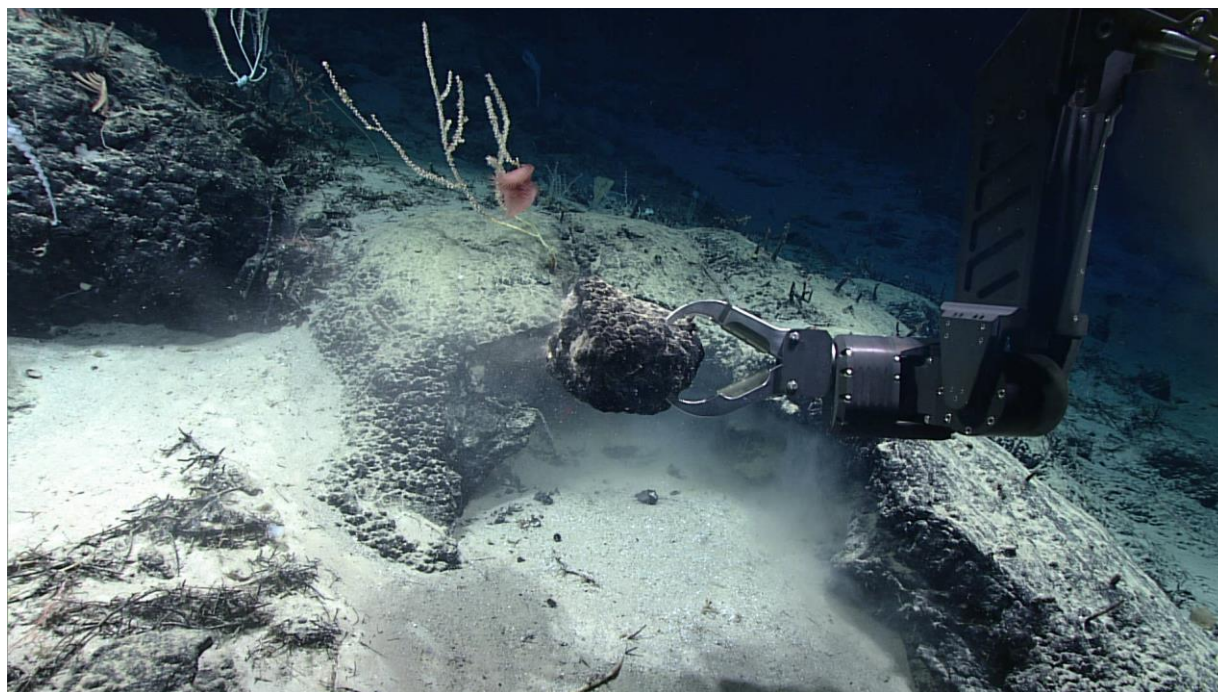


Smoothed ROV dive track (white) of "North Bermuda Tritop" Seamount - 3x vertical exaggeration, depth in meters, 100 meter contours

Representative Photos of the Dive



[A typical seafloor scene during Dive 1. A large rock outcrop with thick ferromanganese crust, with a large anthomastus coral central and Isididae, Acanella and Corallium corals also present]

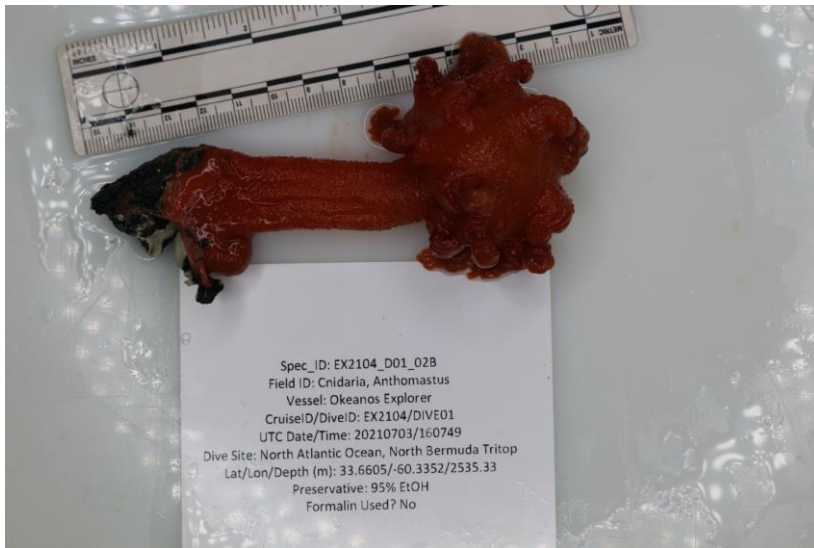


[ROV Deep Discoverer collecting rock sample EX2104_D01_06G, with a thick ferromanganese crust]

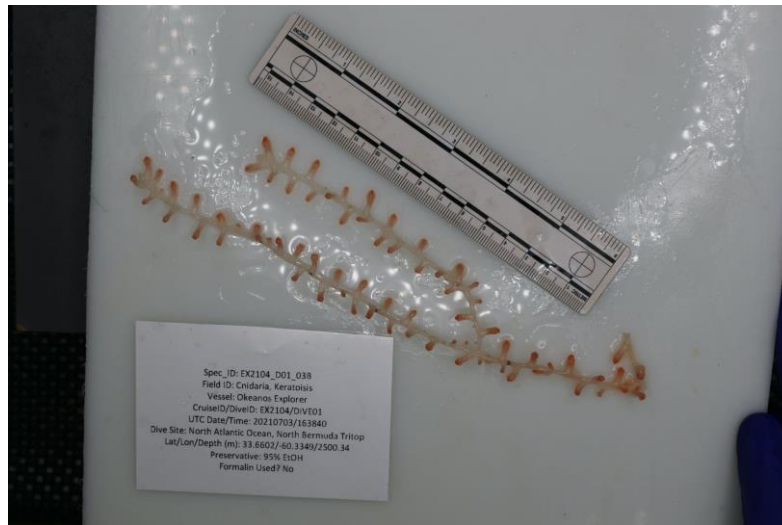
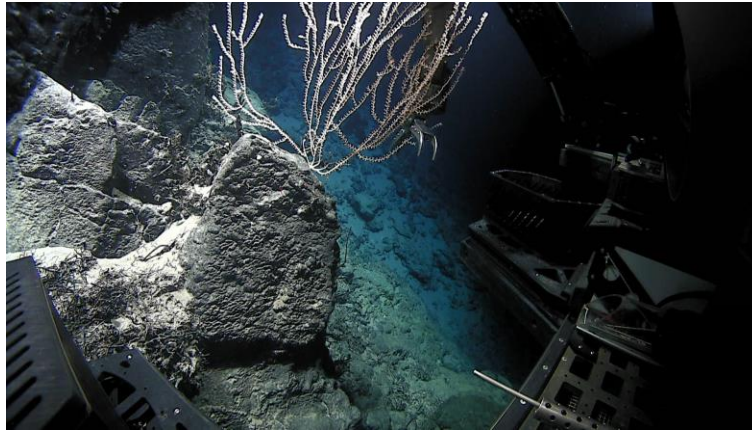
Samples Collected -



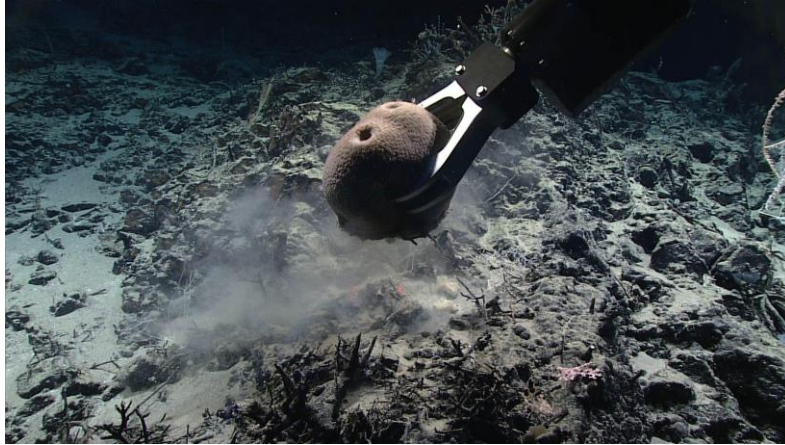
Sample ID	EX2104_D01_01G
Date (UTC)	20210703
Time (UTC)	151856
Depth (m)	2570.423
Latitude (decimal degrees)	33.660953
Longitude (decimal degrees)	-60.335727
Temp. (°C)	
Field ID(s)	FeMn crusted rock
Comments	a piece of FeMn crust broke off and will be separately stored as a subsample, .04 cm thickness of the crust



Sample ID	EX2104_D01_02B
Date (UTC)	20210703
Time (UTC)	160138
Depth (m)	2535.330
Latitude (decimal degrees)	33.6606750
Longitude (decimal degrees)	-60.33535
Temp. (°C)	3.225
Field ID(s)	Anthomastus
Comments	attached to a FeMn crusted fossilized coral stalk, majority of specimen subsampled



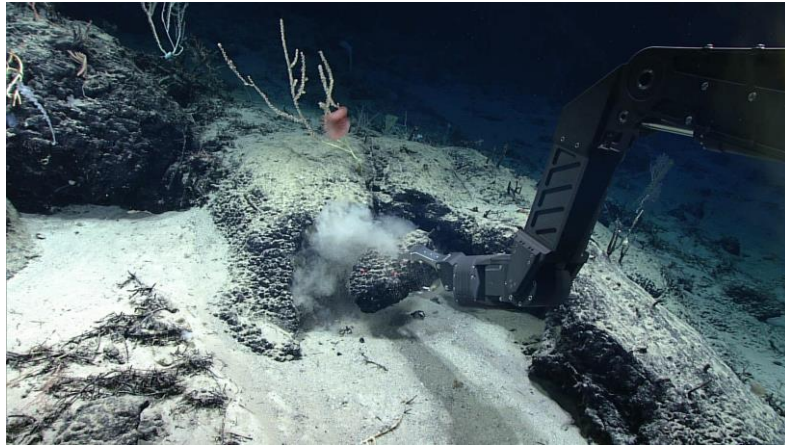
Sample ID	EX2104_D01_03B
Date (UTC)	20210703
Time (UTC)	163840
Depth (m)	2500.338
Latitude (decimal degrees)	33.660236
Longitude (decimal degrees)	-60.335033
Temp. (°C)	3.416
Field ID(s)	Keratoisis
Comments	unusual bamboo coral, branches after nodes



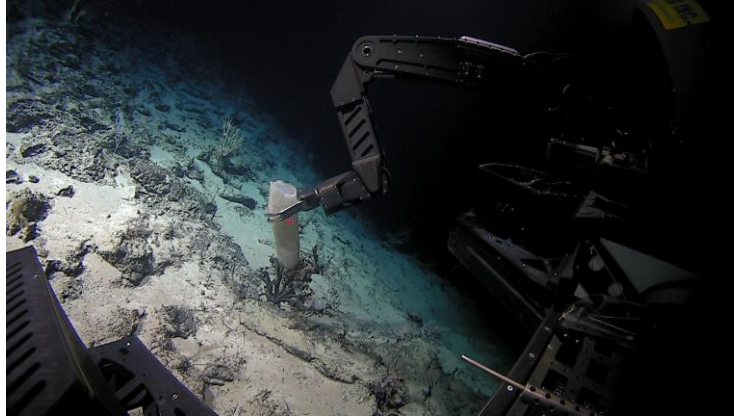
Sample ID	EX2104_D01_04B
Date (UTC)	20210703
Time (UTC)	170519
Depth (m)	2467.874
Latitude (decimal degrees)	33.659904
Longitude (decimal degrees)	-60.334831
Temp. (°C)	3.393
Field ID(s)	<i>Geodia megastrella</i>
Comments	two operculums, round, spherical, on bottom is fossilized coral with FeMn crusting with various carbonate



Sample ID	EX2104_D01_05G
Date (UTC)	20210703
Time (UTC)	175412
Depth (m)	2436.276
Latitude (decimal degrees)	33.659000
Longitude (decimal degrees)	-60.334899
Temp. (°C)	
Field ID(s)	Rock
Comments	FeMn encrusted, approx 18 cm x 13 cm x 15 cm; some sargassum attached to it; 1.5 cm long fossilized coral stalk also encrusted with FeMn



Sample ID	EX2104_D01_06G
Date (UTC)	20210703
Time (UTC)	175608
Depth (m)	2435.498
Latitude (decimal degrees)	33.659073
Longitude (decimal degrees)	-60.334755
Temp. (°C)	
Field ID(s)	Manganese Crust
Comments	may be sediment trapped inside, crust with fine grain carbonate, carbonate core inside, FeMn crust pending examination, botryoidal texture of the crust, several fossilized coral stalks covered in a thin layer of FeMn; indications of worm tubes also covered in FeMn crust



Sample ID	EX2104_D01_07B
Date (UTC)	20210703
Time (UTC)	180313
Depth (m)	2439.276
Latitude (decimal degrees)	33.659000
Longitude (decimal degrees)	-60.335098
Temp. (°C)	3.407
Field ID(s)	Rossellidae
Comments	unknown sponge species, large vase shape

Scientists Involved (provide name, email, affiliation)

First Name	Last Name	Email	Affiliation
Charles	Messing	messagingc@nova.edu	Nova Southeastern University
Christa	Rabenold	christa.rabenold@noaa.gov	NOAA/OER
Christopher	Kelley	ckelley@hawaii.edu	University of Hawaii
Christopher	Mah	brisinga@gmail.com	Dept. Invertebrate Zoology, National Museum of Natural History
Ciara	Larence	ciara.larence@maine.edu	University of Maine
Cindy	Van Dover	clv3@duke.edu	Duke University
Dhugal	Lindsay	dhugal@jamstec.go.jp	JAMSTEC
Ellen	Kenchington	Ellen.Kenchington@dfo- mpo.gc.ca	DFO
Emily	Crum	emily.crum@noaa.gov	NOAA Ocean Exploration
George	Matsumoto	mage@mbari.org	MBARI
Harold	Carlson	harold.carlson@noaa.gov	NOAA, USC
Jason	Chaytor	jchaytor@usgs.gov	USGS
Jaymes	Awbrey	C00227433@louisiana.edu	University of Louisiana at Lafayette
Joana	Xavier	joanarxavier@gmail.com	CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Portugal
Kasey	Cantwell	kasey.cantwell@noaa.gov	NOAA Ocean Exploration
Kenneth	Sulak	jumpingsturgeon@yahoo.com	USGS
Kimberly	Galvez	kimberly.galvez@noaa.gov	OER
Les	Watling	watling@hawaii.edu	University of Hawaii at Manoa
Mashkoor	Malik	mashkoor.malik@noaa.gov	NOAA Ocean Exploration
Megan	Cromwell	megan.cromwell@noaa.gov	NOAA NCEI
Nicole	Morgan	nmorgan@fsu.edu	Florida State University
Noelle	Helder	noelle.helder@noaa.gov	NOAA Ocean Exploration
Peter	Auster	peter.auster@uconn.edu	UConn & Mystic Aquarium
Bramley	Murton	bramley.murton@noc.ac.uk	National Oceanography Centre, UK
Scott	France	france@louisiana.edu	University of Louisiana at Lafayette
Steve	Auscavitch	steven.auscavitch@temple.edu	Boston University
Susan	Gottfried	susan.gottfried@noaa.gov	NCEI
Tina	Molodtsova	tina@ocean.ru	P.P.Shirshov Institute of Oceanology RAS

Upasana	Ganguly	upasana.ganguly1@louisiana.edu	University of Louisiana at Lafayette
Pierre	Josso	piesso@bgs.ac.uk	British Geological Survey

Please direct inquiries to:

NOAA Office of Ocean Exploration & Research
1315 East-West Highway, SSMC3 RM 10210
Silver Spring, MD 20910
oceanexplorer@noaa.gov