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Discover the Ocean. Understand the Planet.

SeaTube: Overview and Demonstration

—

Adrian Round | Workshop On Sea Operations – EMSO ERIC

A UNIVERSITY OF VICTORIA INITIATIVE

Presentation Overview

Main Topics

- Video Annotations – Why? and Overview
- SeaTube Features
- Use of SeaTube in your Organization

SeaTube

Video Annotations – An Overview

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Video Annotations – Why?

Why are they required?

- Oceanographic institutes worldwide conduct many varied expeditions to study the ocean
- Deep ocean environments represent the least known areas of planet earth, and video observations are required to characterize the subsea flora, fauna and biota
- An integral and critical component of these exploration cruises is the ability to reliably and accurately annotate ROV dives in conjunction with video, audio and other sensor data recordings
- These video observations require experts in relevant fields of study to identify items of interest (biological, geological, physical, etc.)
- Annotation quality (or lack thereof) will directly impact the amount and quality of the science that can be conducted

Video Annotations Overview

Problem Statements

- Video data are information rich, expensive to collect, massive in size and difficult to search/ browse/ analyze
- Video annotations are laborious to create yet are critical for scientific analysis and O&M activities
- Annotations need experts but with limited space onboard vessels, it is difficult to sail with all the required expertise onboard
- Many dives are exploring unknown oceans where there is no prior expectation as to what will be encountered
- Ability to analyze captured annotations is limited without use of structured vocabularies
- Availability and distribution of captured video and annotation data can be challenging and involve sometimes lengthy delays

Key Features Demanded by Scientists

NOAA OER conducted a study to determine the key features that their scientific community needed to address these problems. The key features were:

- Ability to capture ***real time annotations*** as observations are being made during the ROV dive
- Ability to ***view annotations with associated video and sensor data*** (ROV position, depth, temperature, salinity, etc.) in an ***easily accessible environment*** during and after the dive
- ***Enhanced collaboration*** via the ability to ***engage and utilize remote scientific resources onshore*** (potentially with a ***world-wide distribution***) both during and post-cruise
- Ability to ***filter, search and export the annotations*** (along with snapshot imagery), with the full ability to edit the contents
- ***Cloud-based*** to support ***real time access during dives***, and ***full archival access post-cruise***

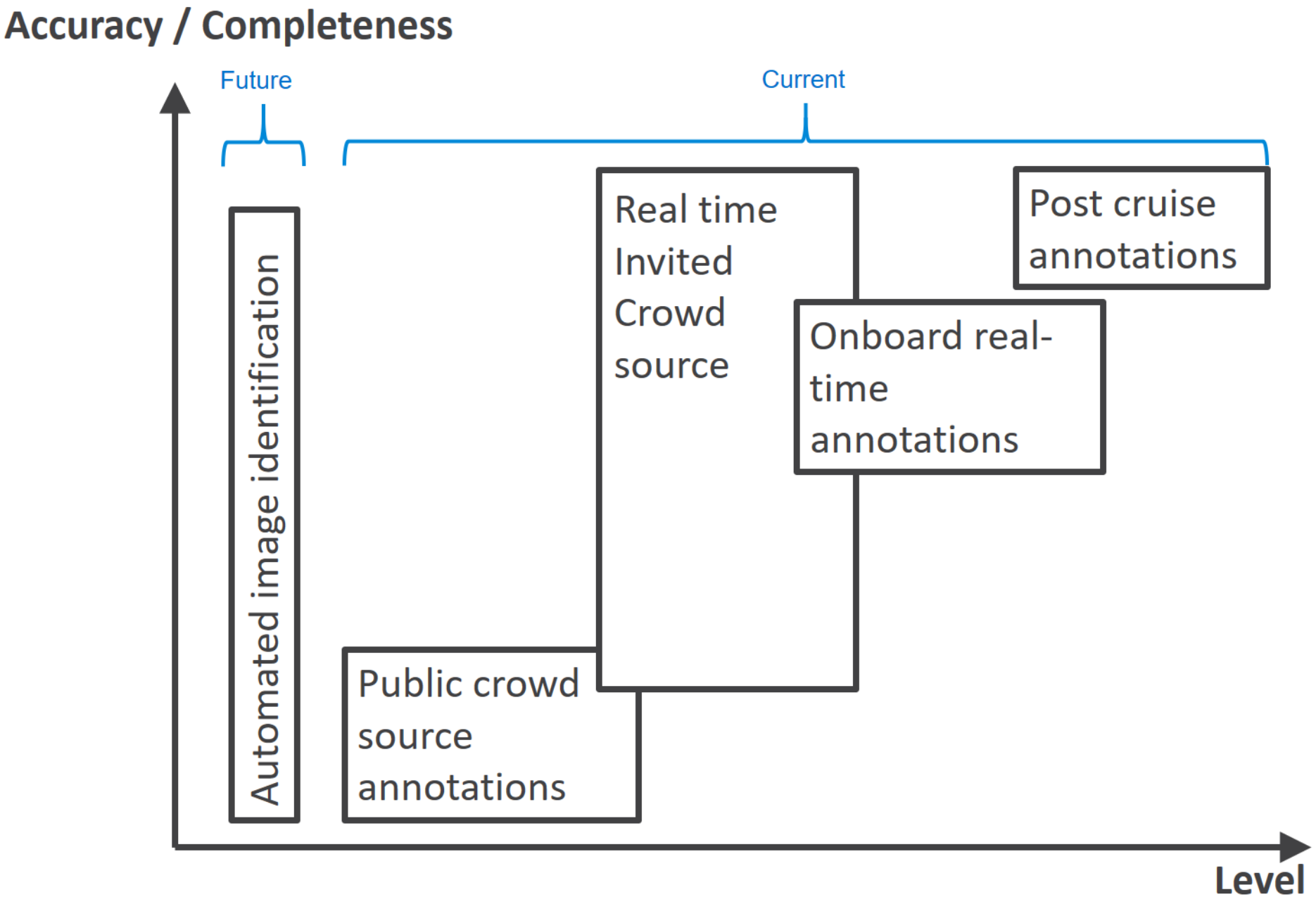
SeaTube – Main Features

SeaTube addresses these challenges by providing:

- ***Web-based, telepresence*** platform that enables ***real time streaming of video and sensor data***
- Support for both ***vessel-based and remote users (distributed worldwide)***, with ***real time synchronization of data*** between all users (“invited” crowdsourced video annotations)
- Integration with ***defined taxonomies*** (i.e. WoRMS, CMECS, etc.) and ability to create ***customized, structured vocabularies***. In addition, provides support for ***free-form comments***.
- ***Integration with OBIS*** for real time detection and alerting of observations not previously recorded in the area of interest
- ***Synchronized data display*** of dive map (ROV and annotation location) and other sensor data (i.e. temperature, depth, salinity, etc.)
- User interface structured for ***ease of use*** and ***quick entry*** of annotations, critical for real time dive annotation creation
- Full ability to ***filter, search and export*** annotations for further processing outside of SeaTube
- Ability to create ***playlists*** of key observations, useful for ***science collaboration***, ***public outreach via social media***
- ***User interface fully customizable***, allowing display of only the panels of interest and in location/size they want
- Ability to further ***engage public “Citizen Scientists”*** through use of game-ified tool (Digital Fishers) for additional crowdsourced annotations
- ***Mobile*** support

“Invited” Crowdsourced Annotations – What Is It?

- A distributed annotation model: Interested and vetted scientists participate in real time ROV dives
- Telepresence brings the ship’s control room to labs and offices.
- Real time annotations online through a web-browser



Onboard real time annotations suffer from limited availability of expertise

Invited crowd source annotations through telepresence enables access to broad range of scientists

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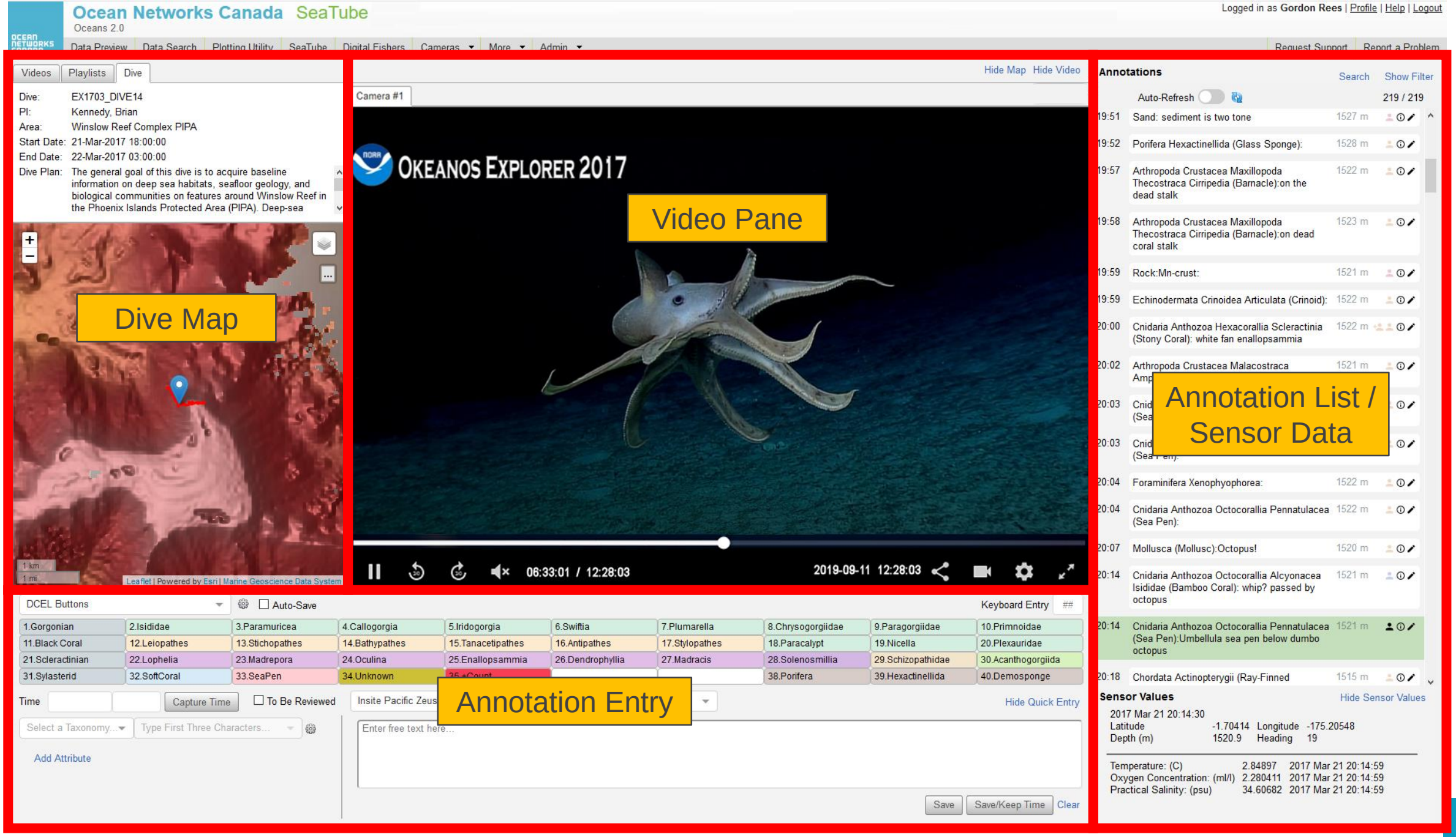
SeaTube

User Interface Overview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Dive
Dive: EX1703_DIVE14
PI: Kennedy, Brian
Area: Winslow Reef Complex PIPA
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End Date: 22-Mar-2017 03:00:00
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Hide Map
Hide Video
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Video Pane
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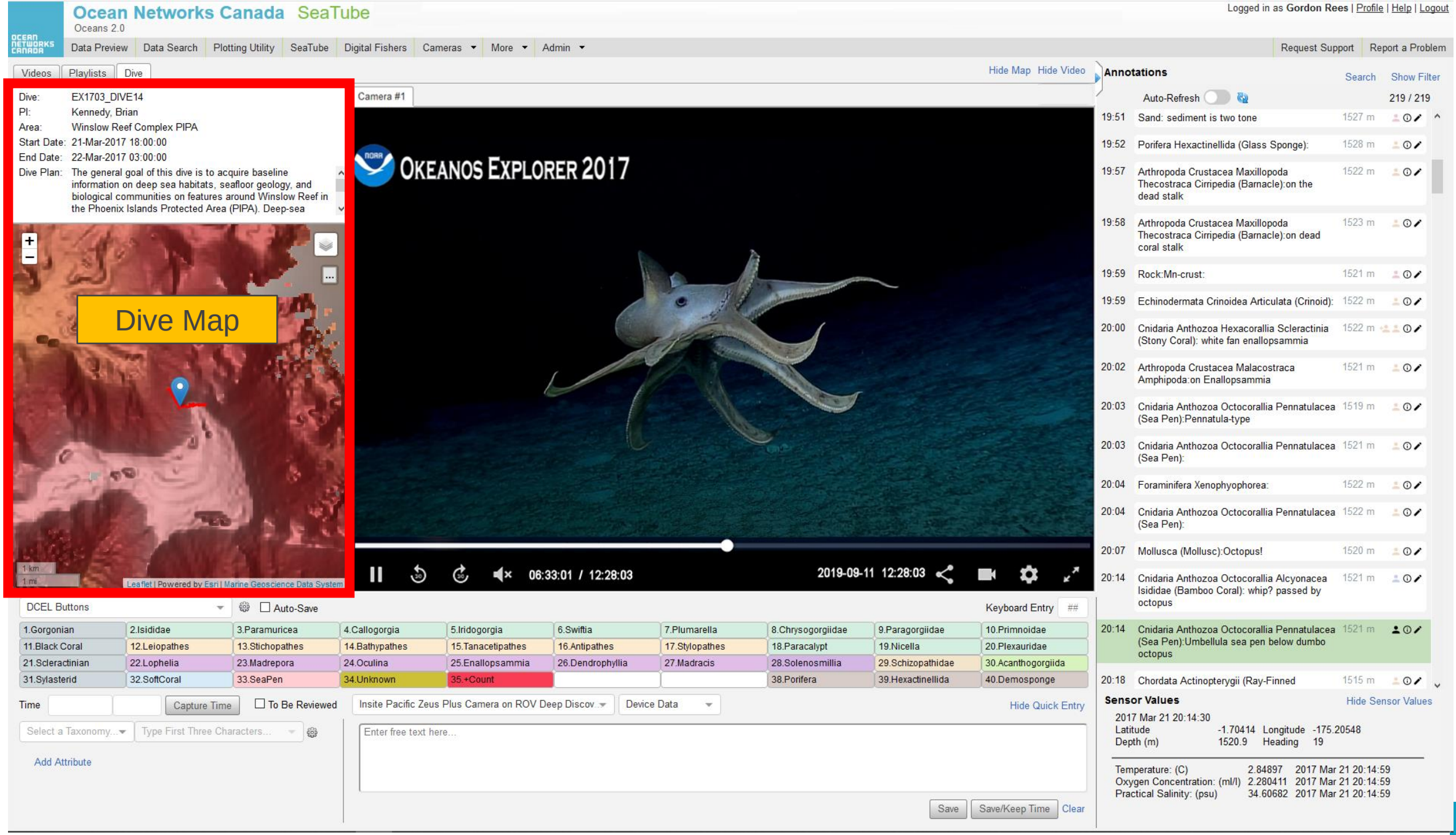
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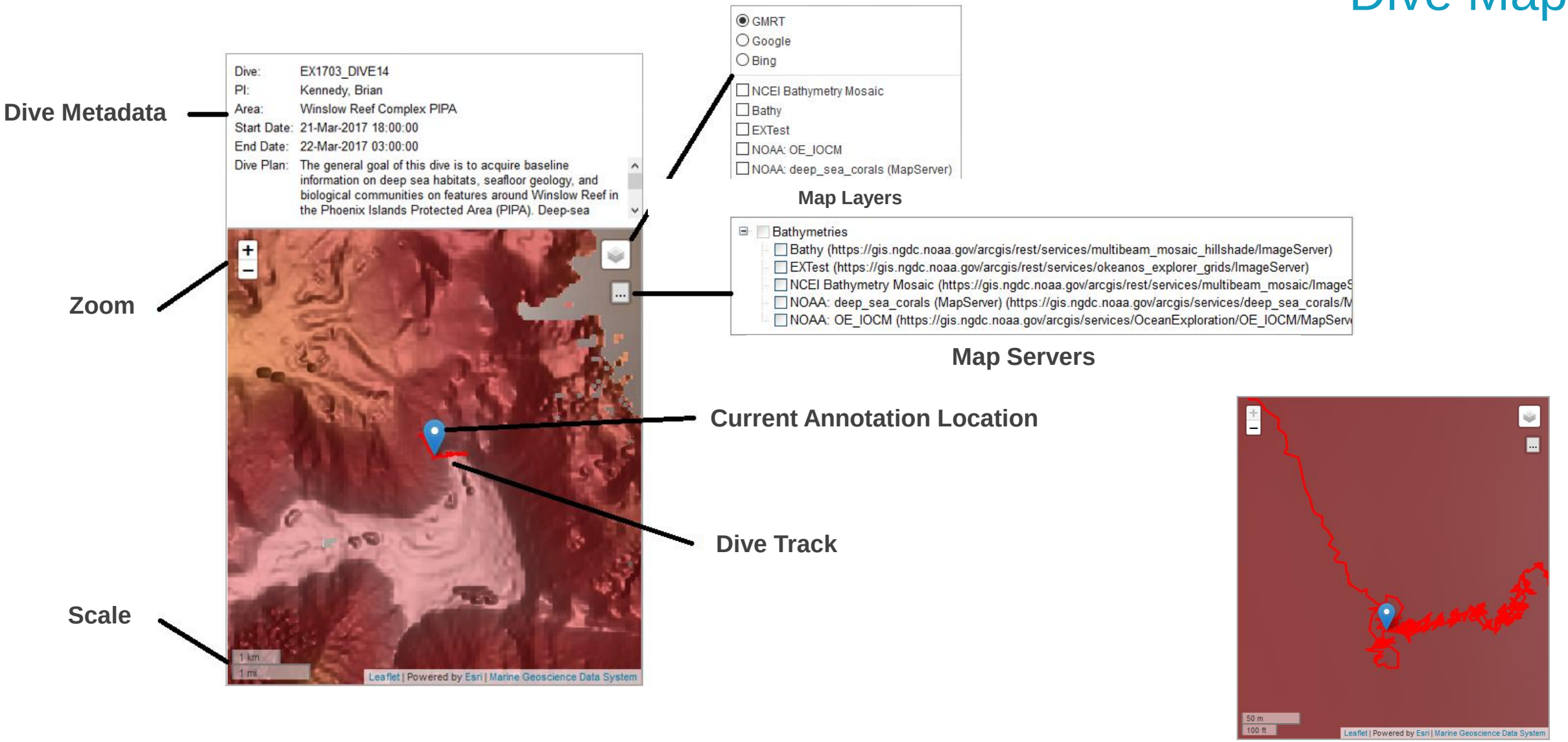
Dive Map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NCEI Bathymetry Mosaic
Bathy
EXTest
NOAA: OE_IOCM
NOAA: deep_sea_corals (MapServer)
Map Layers
Bathymetries
Bathy (https://gis.ngdc.noaa.gov/arcgis/rest/services/multibeam_mosaic_hillshade/ImageServer)
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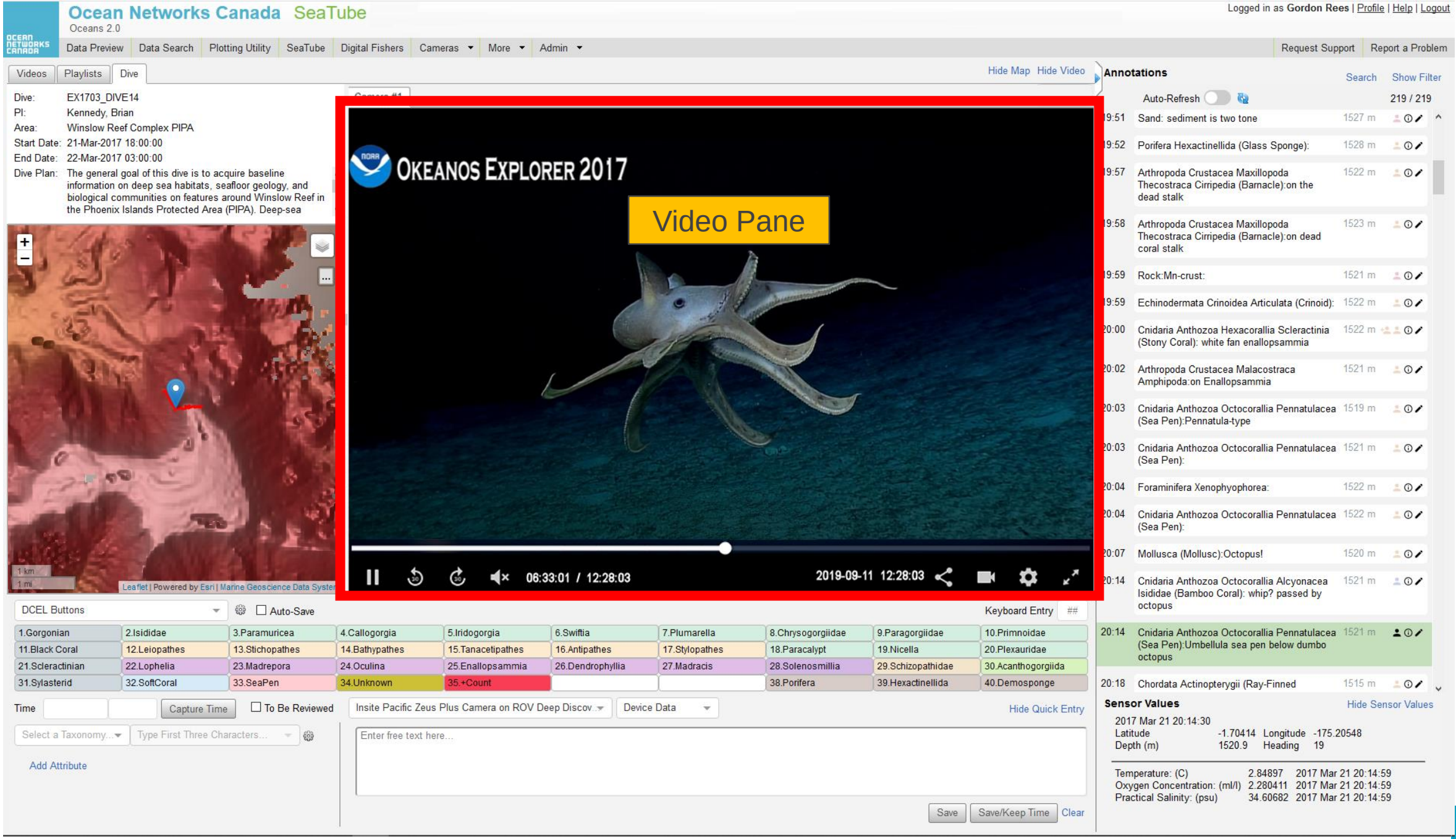
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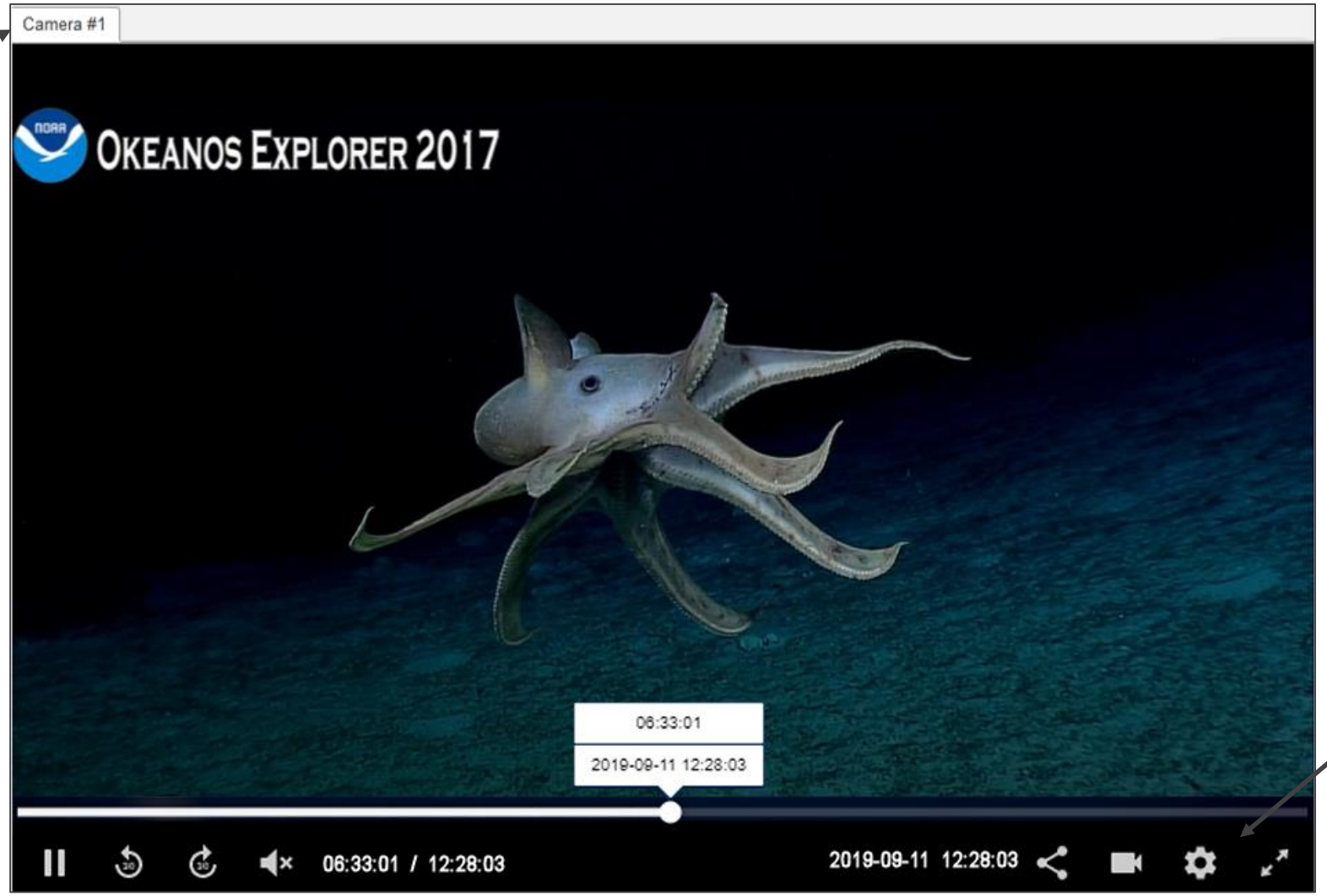


Support for multiple streams

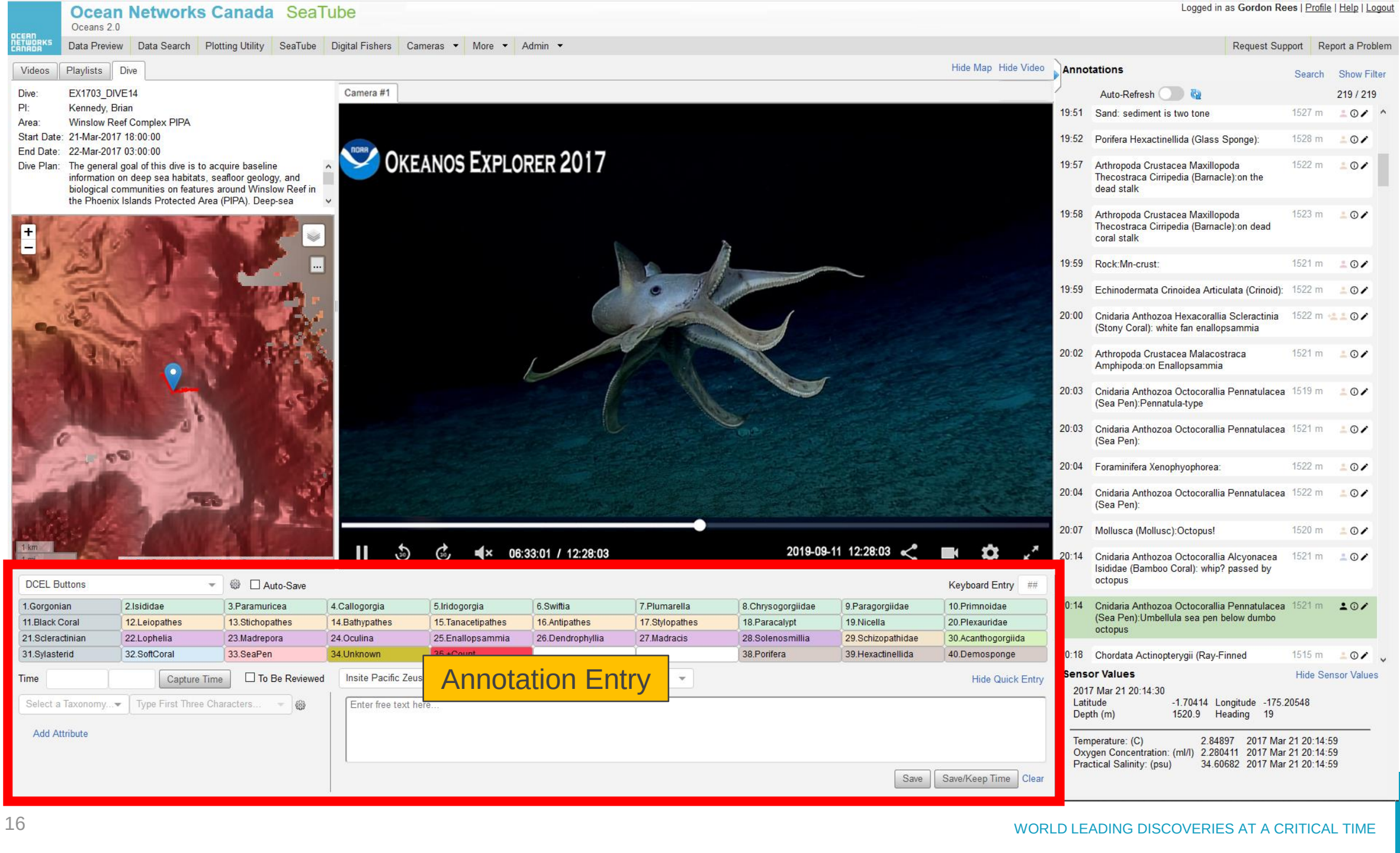
Speed, Resolution & Snapshots

Rewind/Fast Forward

Elapsed Time & UTC time

Social Media

Playlist Recording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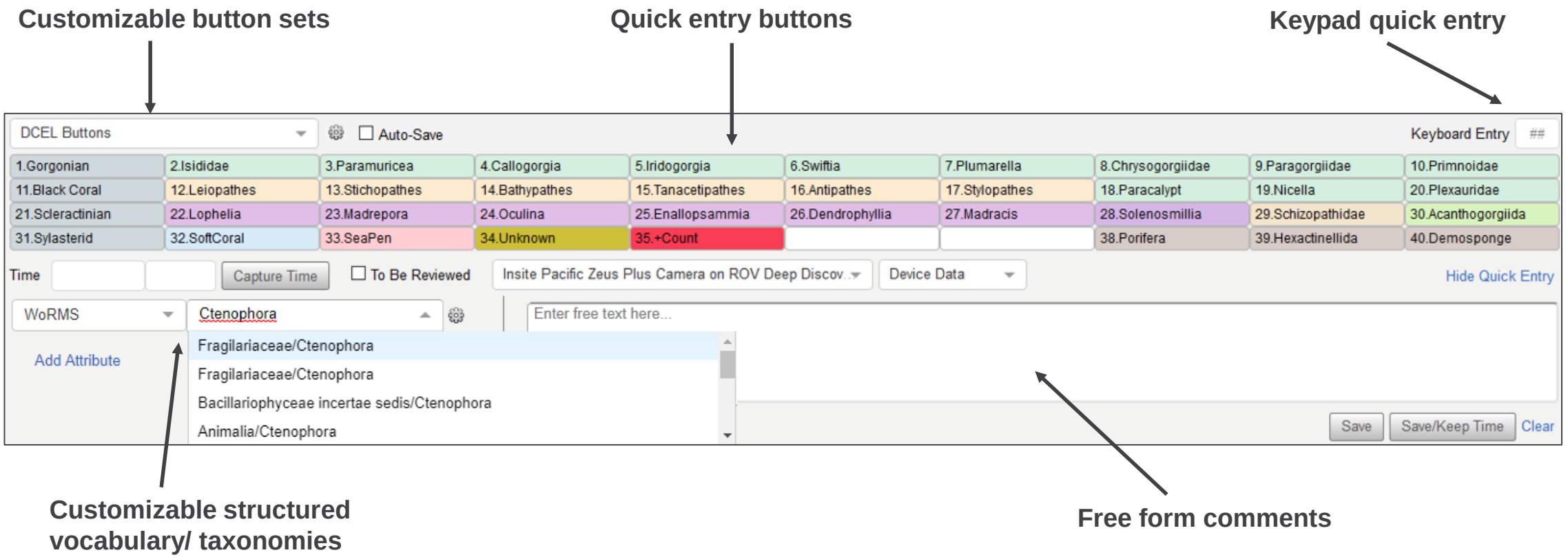

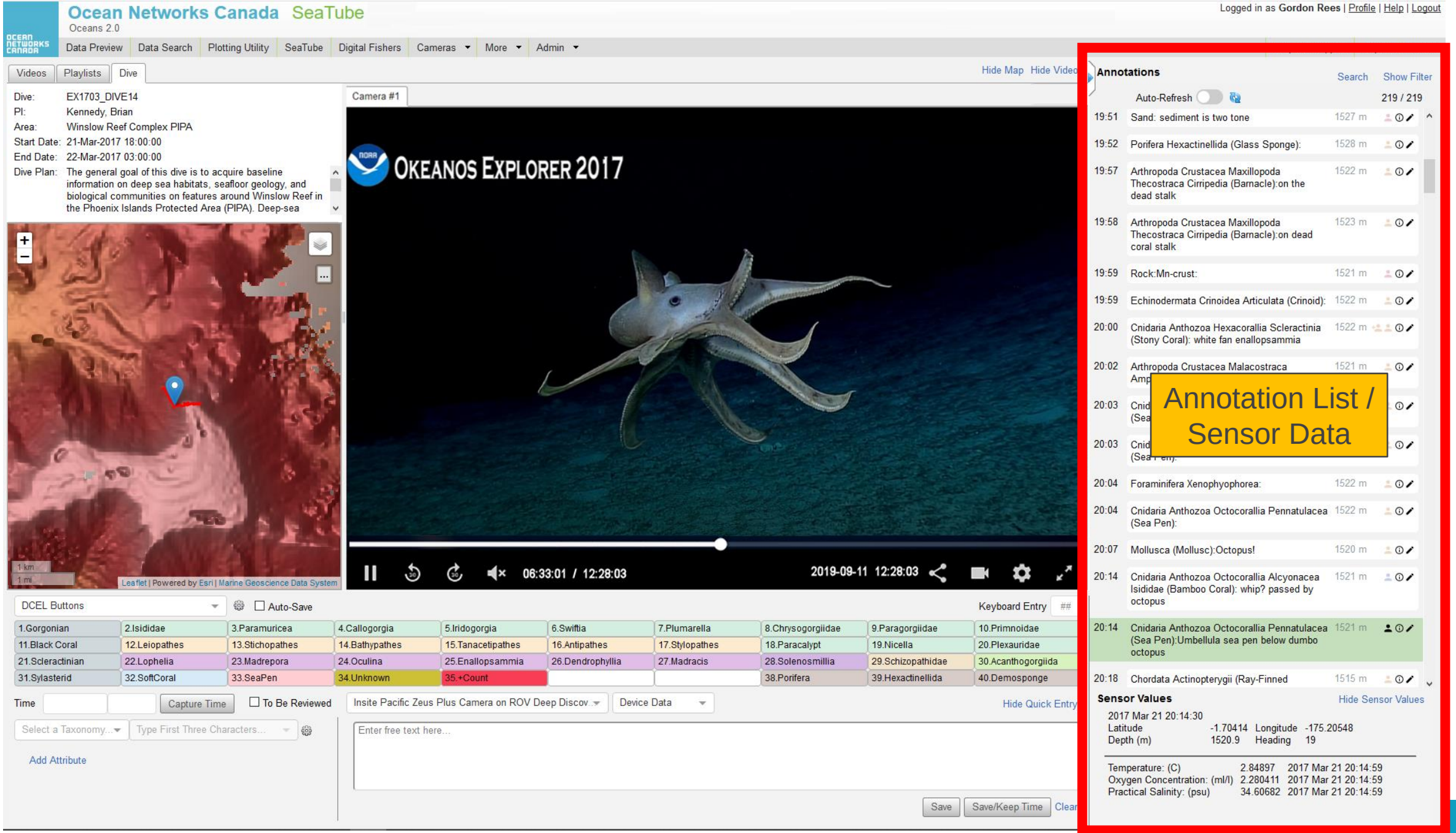
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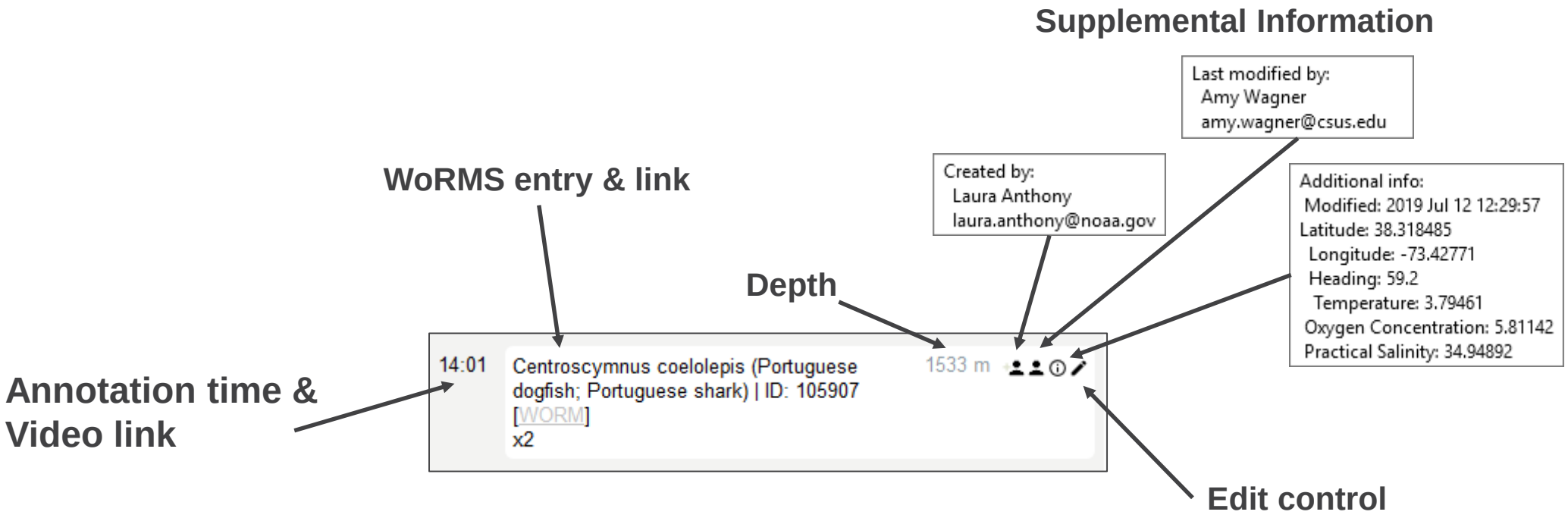
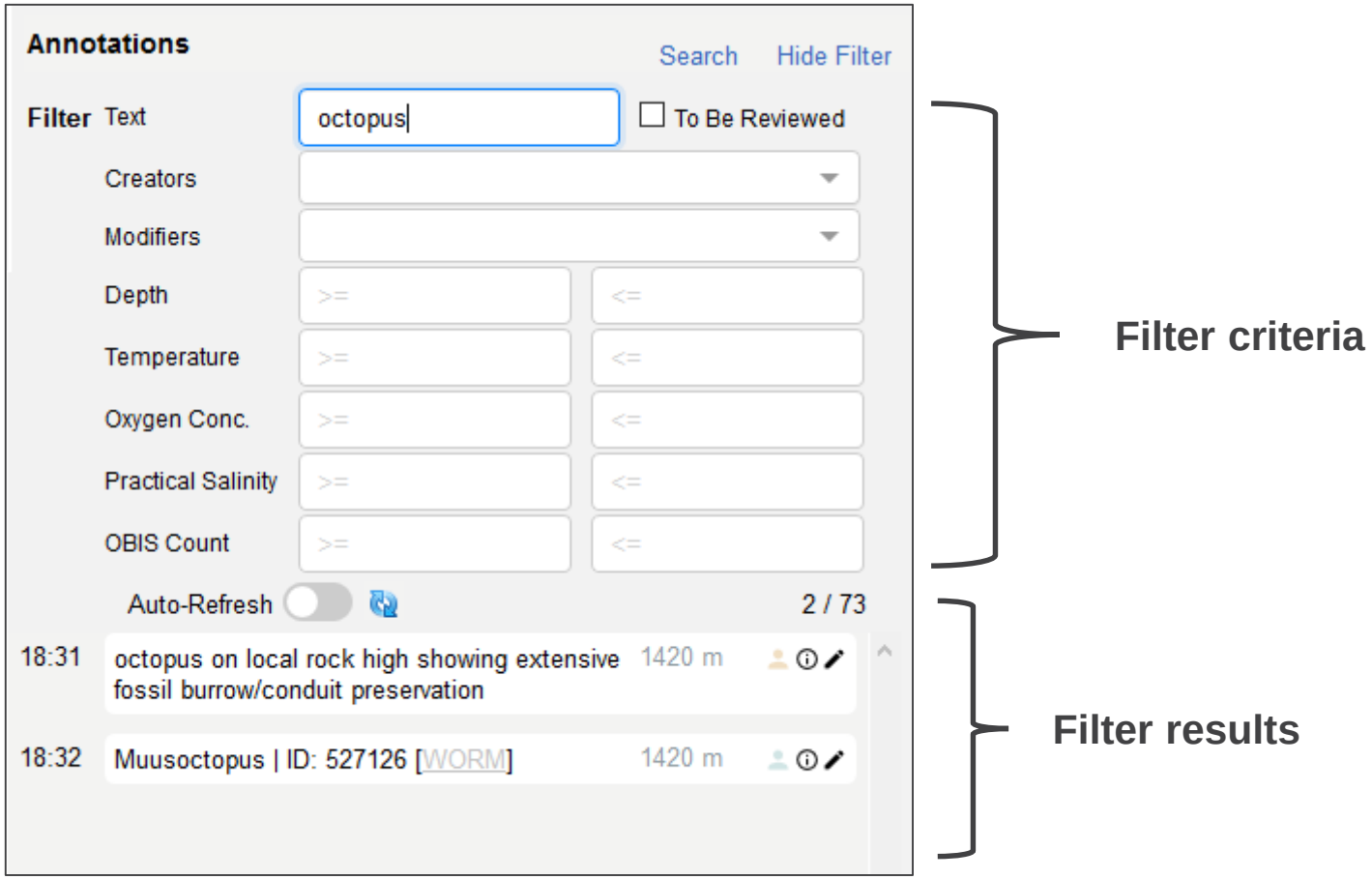
20:00 Cnidaria Anthozoa Hexacorallia Scleractinia (Stony Coral): white fan enallopsammia 1522 m
20:02 Arthropoda Crustacea Malacostraca 1521 m
20:03 1521 m
20:03 1521 m
20:04 Foraminifera Xenophyophorea: 1522 m
20:04 Cnidaria Anthozoa Octocorallia Pennatulacea (Sea Pen): 1522 m
20:07 Mollusca (Mollusc):Octopus! 1520 m
20:14 Cnidaria Anthozoa Octocorallia Alcyonacea Isididae (Bamboo Coral): whip? passed by octopus 1521 m
20:14 Cnidaria Anthozoa Octocorallia Pennatulacea (Sea Pen):Umbellula sea pen below dumbo octopus 1521 m
20:18 Chordata Actinopterygii (Ray-Finned 1515 m
Annotation List / Sensor Data
Sensor Values
Hide Sensor Values
2017 Mar 21 20:14:30
Latitude -1.70414 Longitude -175.20548
Depth (m) 1520.9 Heading 19
Temperature: (C) 2.84897 2017 Mar 21 20:14:59
Oxygen Concentration: (ml/l) 2.280411 2017 Mar 21 20:14:59
Practical Salinity: (psu) 34.60682 2017 Mar 21 20:14:59

Annotation List Item



Annotation List Filter



Sensor Data

Sensor data synched with annotation and video time

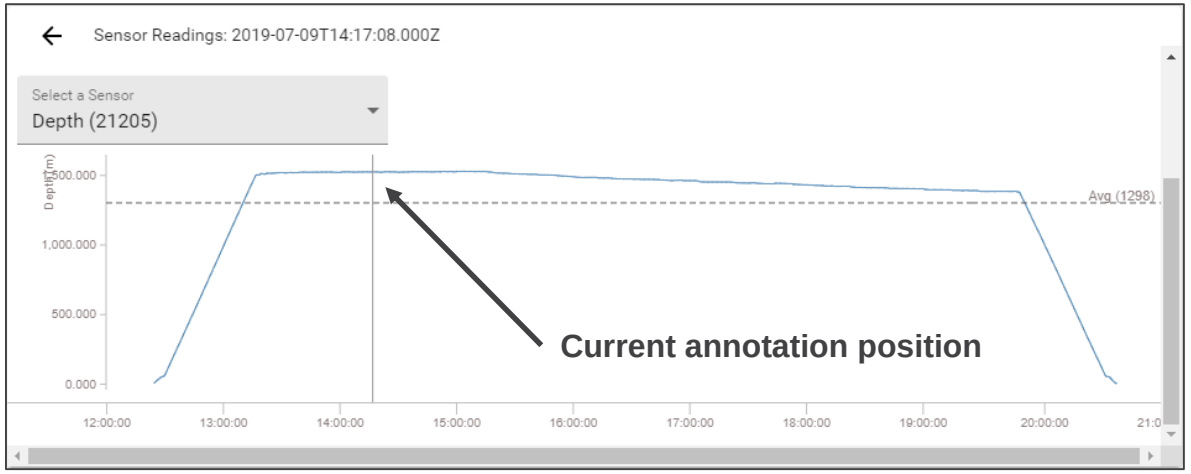
Sensor Values Hide Sensor Values

2019 Jul 09 14:01:30

Latitude	38.31822	Longitude	-73.42786
Depth (m)	1533.3	Heading	36.9

Temperature: (C)	3.79329	2019 Jul 09 14:01:59
Oxygen Concentration: (ml/l)	5.788881	2019 Jul 09 14:01:59
Practical Salinity: (psu)	34.95061	2019 Jul 09 14:01:59

Sensor Plots synched with annotation and video time



SeaTube

Annotation Tools

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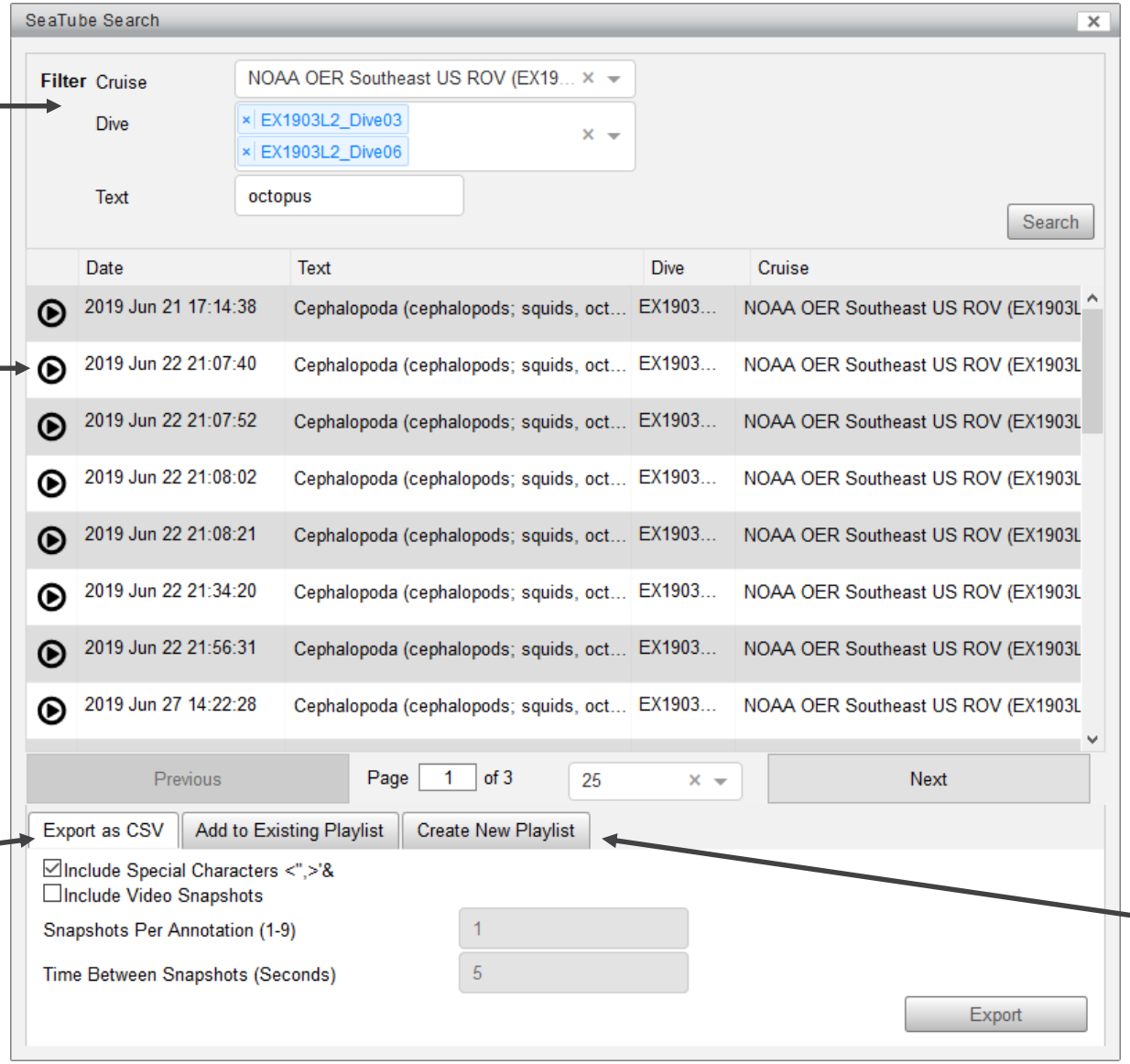
Annotation Search

Search across cruise/ multiple dives

Play video/show annotation

Export annotations & images



Search criteria

Search results

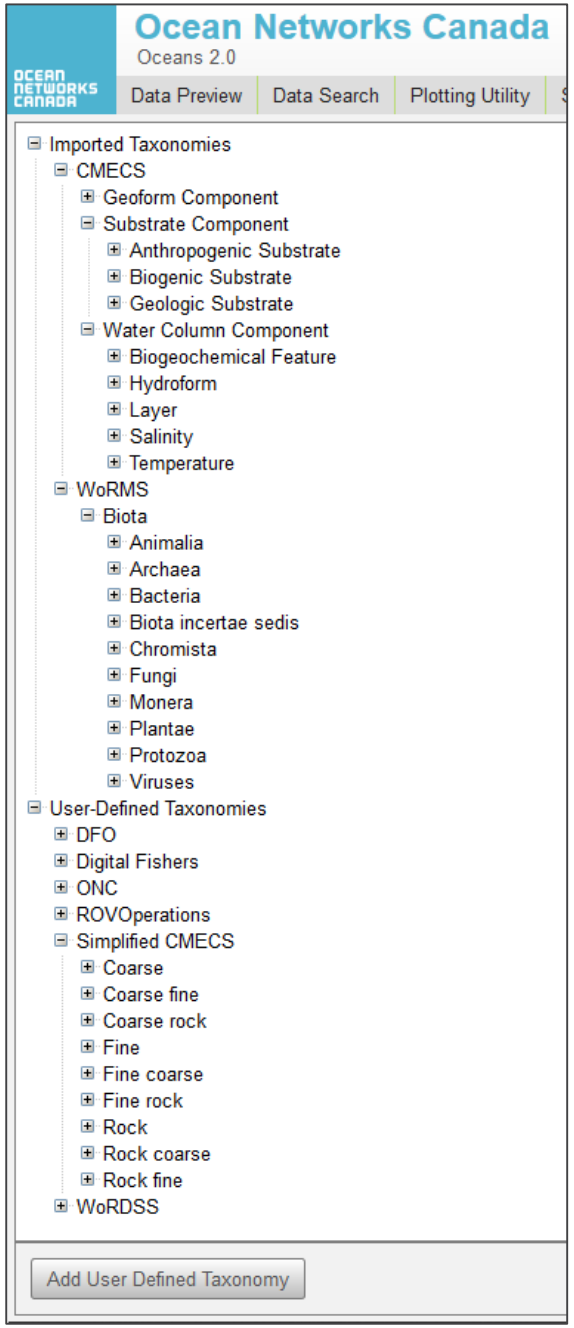
Create composite playlist segments

Customizable Taxonomies

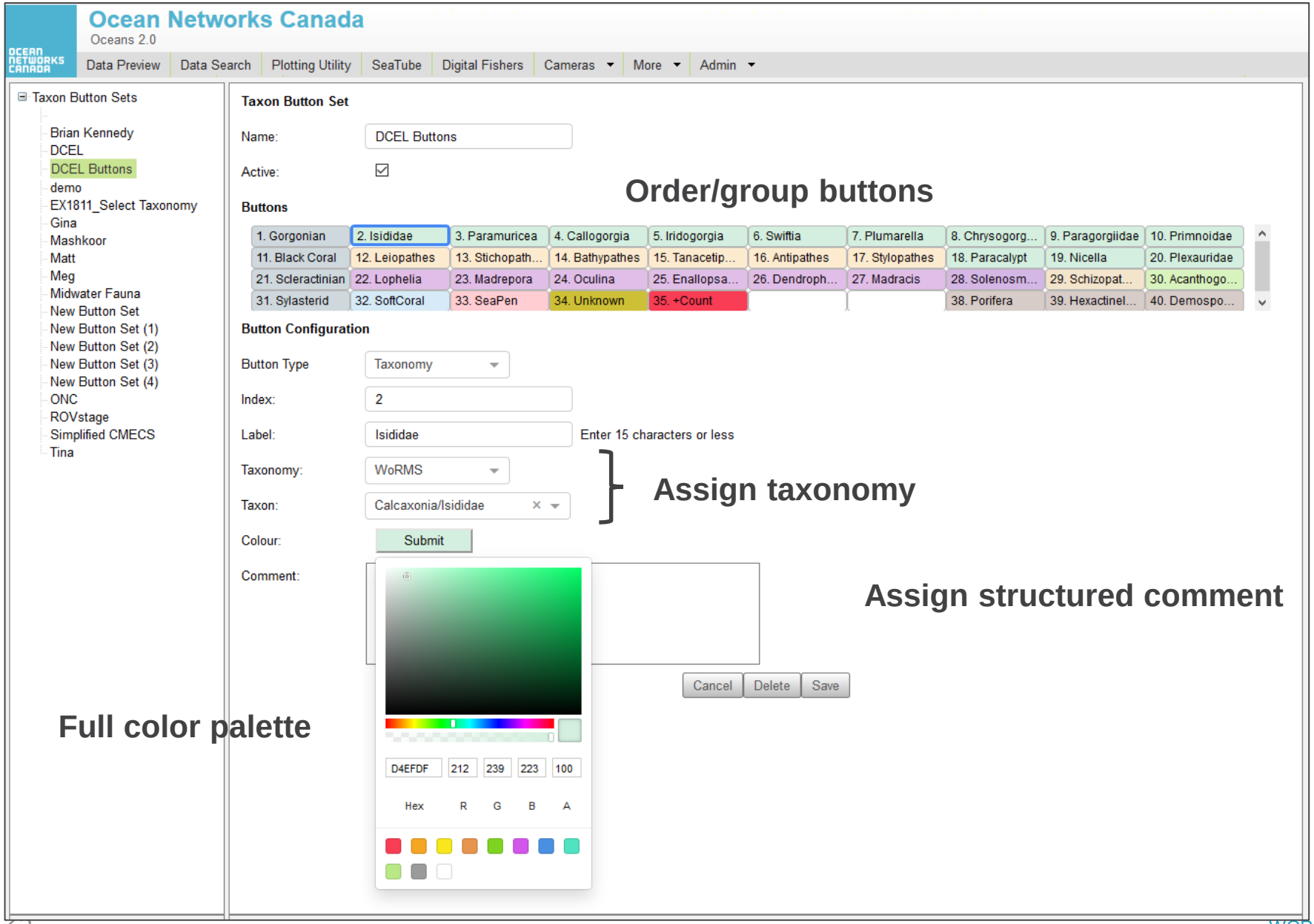
Imported/external Taxonomies

(i.e. WoRMs, CMECS, etc.)

User defined taxonomies



Customizable Quick Entry Button Sets



SeaTube

Use by Your Organization

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Usage of SeaTube

SeaTube is currently an integrated component of Oceans 2.0 – ONC's master data acquisition, archive, distribution and visualization system

Options:

1. ONC-Hosted
    - ❑ System administration by ONC staff
    - ❑ Data stored at ONC, but fully owned and managed by the user organization
2. Blended
    - ❑ ONC administered
    - ❑ Data stored at the client facility

    ***Note** - this option currently involves more complexity to setup and configure

ONC is also working on a fully stand-alone SeaTube offering, allowing for full administration and local storage at user organization location.

ONC would also like to foster discussion with other organizations regarding a collaborative, open-sourced platform for SeaTube.

ONC-Hosted Advantages

- Minimizes initial expenses and time to implement
- Allows assessment of full capabilities utilizing your own data (Try Before You Buy)
- SeaTube / Oceans 2.0 has been field proven and represents over a decade of dedicated development
- Provides robust capability out-of-the-box, and allows for custom expansion of services by client
- All administration, configuration, archiving, continuity of operations, etc. already exist and would be extended to the client
- Extra operational support available as required to support client's cruises & dives
- Avoids the financial and technical risk associated with a large, new, customized development projects undertaken by the client to replicate existing SeaTube / Oceans 2.0 functionality
- ONC has a large professional software development team dedicated to the continual maintenance and innovative evolution of SeaTube / Oceans 2.0
- An ONC-hosted solution also allows clients and their users to utilize our extensive computing resources
- Client data can be protected for only authorized access

Estimated Costs

- Installation model chosen (ONC-hosted or Blended)
- Whether the full system or select components (i.e. SeaTube) will be included
- The number, type and specific oceanographic instruments that will need to be configured and supported
- Estimated data volumes
- Whether extra hardware is required, depending on estimated data volumes and installation model chosen
- Whether existing customer hardware can be utilized for local components
- Whether extra data products are required
- Level of training, administration, data stewardship, QA/QC, etc., services that the client would like ONC to provide
- Extension of the system access to other organizations beyond the original client (i.e. if the client intends the installation to support a national program consisting of multiple member organizations)

Thank You!

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For more information:

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