

# **Underwater Video – *Community Perspectives on Needs, Challenges and Opportunities***

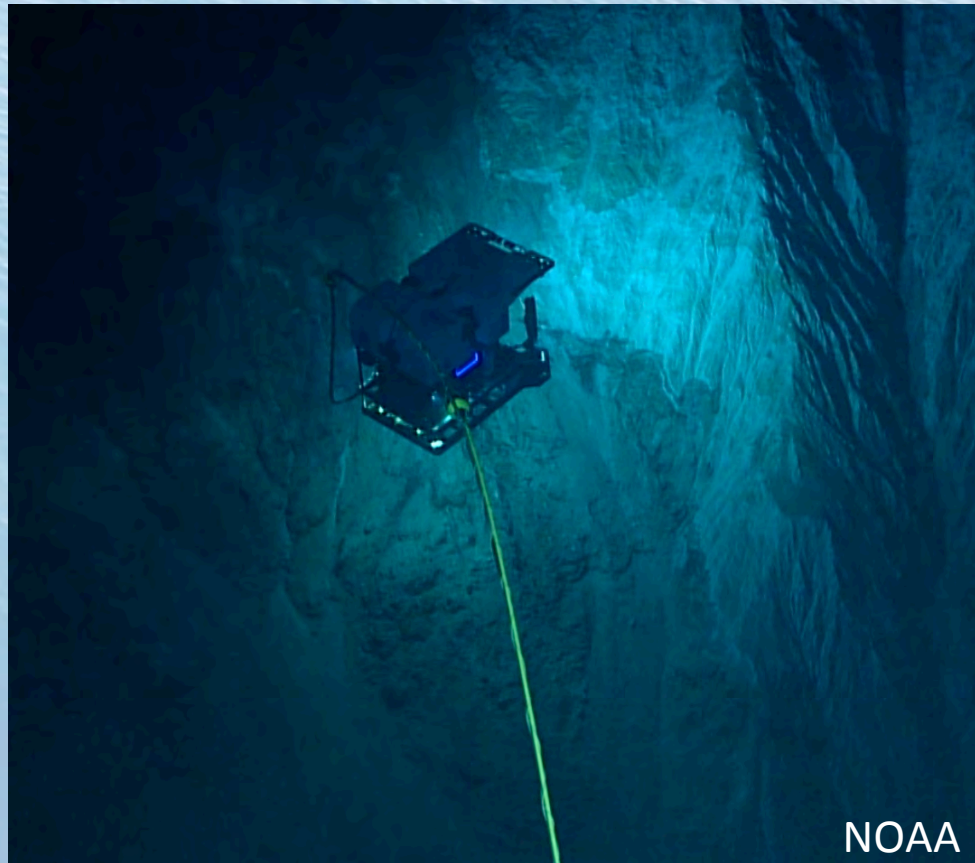
Vicki Ferrini (LDEO)

Dwight Coleman (URI)

Adam Soule (WHOI)

# Motivation

- **Underwater video imagery** has become *a critical data stream*
  - Guide sampling and exploration activities during dive operations
  - Acquired by many groups on many platforms: ROV, HOV, AUV
  - Fundamental observations for post-dive and post-cruise research



# Motivation

- **Video archives** have the potential to:
  - provide broad *significant scientific benefits* long after data acquisition
  - *engage the public* in exciting ocean science research

JASON II Dive J2-129 TUI05MV (Laubasin\_2005)

14:09:07.831/2134

lon: -176.147231  
lat: -20.762856  
elev: -2282 m

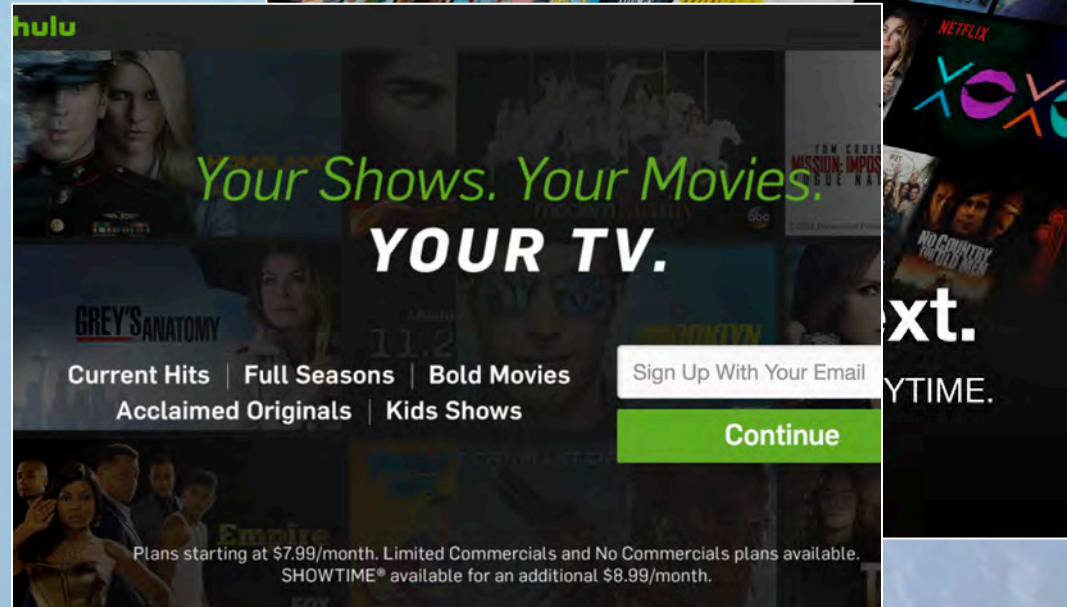
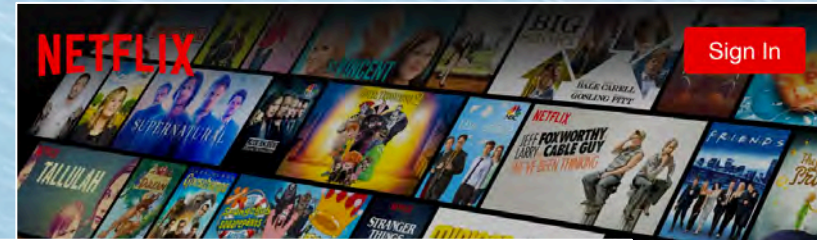
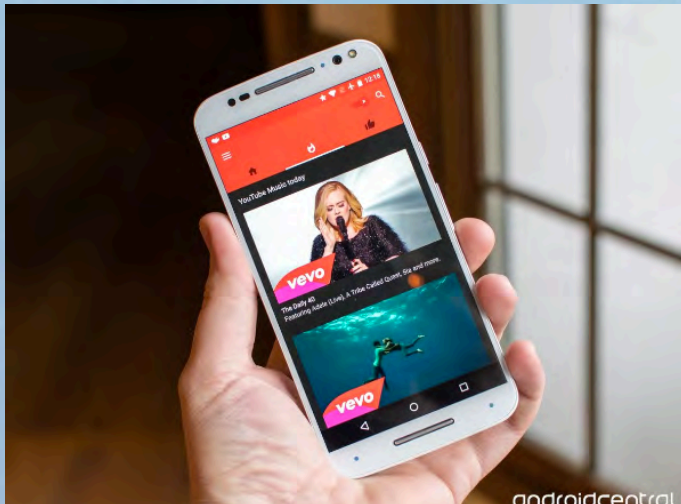
Location: Lau Basin Seafloor Depth: 2136.393m

Time (UTC)	2005/04/14 09:07:06	Navigation	
Event Text		Position	176.19287305000003°W 20.76606441°S (RVN.JAS2.LBL.v1)
Event Type		Original Position	7684.696°E 7450.112°N (JAS2)
DAQ Type	ASNAP	Local XY	7680.96m (X), 7447.3m (Y)
		Original Local XY	7684.696m (X), 7450.112m (Y)
		Roll	2.21°
		Pitch	-6.06°
		Heading	331.15°
		Vehicle Depth	2134.28m
		Altitude	2.113m
		Local Origin	
		Original Nav Source	JAS2



# Motivation

- The oceanographic community has yet to fully *capitalize on modern technologies* for managing, streaming, discovering, tagging video for:
  - Scientific research
  - Citizen science
  - Public engagement



# Overarching Goal

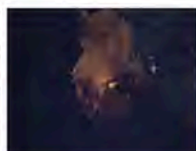
Move the community toward the common goal of broad public access to distributed video content for scientific research and public outreach.



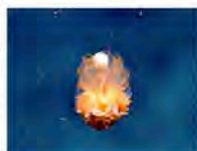
**Dive 19: Octopus**  
During the last dive of the expedition on the eastern slope of Esmeralda Bank Crater, this small octopus was seen in a field of stalked crinoids. (Video)



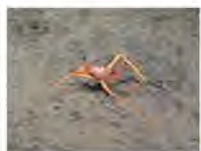
**Dive 19: Sea Star Walking**  
A sea star uses its tube feet to move across the seafloor. (Video)



**Dive 18: Octopus**  
This octopus was spotted tucked under an overhang during exploration of the outer slope of the Esmeralda Seamount. (Video)



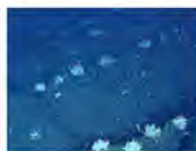
**Dive 17: Siphonophore**  
A rare encounter with a swimming dandelion siphonophore on Dive 17 at Farallon de Medinilla. (Video)



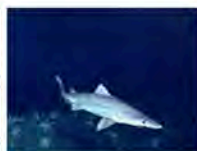
**Dive 13: Hermit Crab**  
This hermit crab appears to be missing a pair of legs, but in fact, they are instead modified to hold this anemone in place. (Video)



**Dive 13: Jellyfish**  
This unidentified jellyfish is seen floating through the water column, before quickly retracting its tentacles and swimming away. (Video)



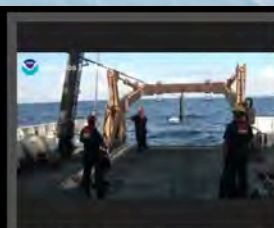
**Dive 12: Basket Star City**  
An aggregation of basket stars like this is a rare sighting. (Video)



**Dive 12: Sand Tiger Shark**  
A sand tiger shark was seen swimming amongst this rare aggregation of basket stars. (Video)



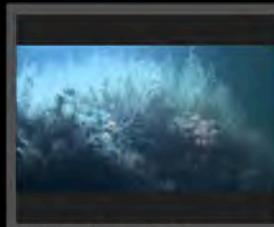
**Alvin Port Recorder**  
327 annotations



**EX1504L4 VID 20150922T181348Z STREAM 1 600 EX1504L4 DIVE09**  
746 annotations



**LIS Dive 02 - Video 3**  
0 annotations



**LIS Dive 07 - Video 6**  
0 annotations



**Scott Reef - coral spawning ROV Dive 1**  
3 annotations



**Scott Reef - coral spawning ROV Dive 1.5**  
3 annotations

# Understanding the Landscape

- Coordinate within the community of stakeholders to identify *current practices* and *needs*
  - Science Users, Data Professionals, Vehicle Operators, Education & Outreach Professionals
  - Community Survey (> 130 participants)
- What solutions exist outside our community?
  - Film & television industry
  - Commercial software



# TV/Video/Film Industry Input

- Gathered input from professionals
  - AMC Networks\*, Disney\*, NBC News, WWE\*, Freelance video professionals\*
- Tools practices are dictated by specific needs, workflows, and business models
  - Media Storage and Management
  - Tagging & Annotation
  - *Proxy video + full resolution*

The screenshot shows a software interface titled "Tape Info". It features a "Tape List" section with a scrollable list of tape identifiers: Raw1017LiveA\_R1, Raw1017LiveA\_R2, Raw1017LiveB\_R1, and Raw1017LiveB\_R2. Below this are dropdown menus for "Graphics Language" and "Commentary Language". To the right, there are several input fields and controls: "Fetch Existing Tape" (a button), "Remove Tape From D..." (a button), "Filename ID" (text field with "Raw1017LiveA\_R1"), "Send to Logger" (checkbox), "Rejoin" (button), "Avid" (checkbox), "Off Site Barcode" (text field), "Details" (text field), "Source" (dropdown menu with "LIVE AUDIO A"), "Reel" (text field with "1" and "of 2"), "Format" (dropdown menu with "HD CAM SR"), "Tape Location" (dropdown menu), and "General Comment" (text field with "Dub Located In").

\*workshop panelists

# June 2016 Workshop

- > 40 participants (+ ~30 remote)
- Consensus on best practices – full data life cycle
  - Acquisition, Formats, Naming Conventions, Media
  - Metadata, Annotation, Tagging
  - Storage, Archiving and Access
- Develop a roadmap
  - Short-term (low-cost) solutions
  - Longer-term (higher-cost) solutions
  - Sharing ideas, tools, workflows, vocabularies, etc.





# Recording - Recommendations

- Consensus on file naming convention
- Video files should be temporally continuous
- Frequent time-stamped frame-grabs encouraged
- Real-time narration encouraged
- If resources permit, create 3 versions of video files:
  - Offline
  - Near-line
  - Online (proxy)



# Metadata - Recommendations

- Critical situational metadata defined
  - Recommend providing in accompanying file
  - Encourage including on CC channel
- If possible, discontinue:
  - Video overlays
  - Audio time code
- Continue to seek mechanisms and standards for embedding metadata *in* video files



# Access – Recommendations

- Video should be *open access*
- Need to develop standards and APIs for making distributed content discoverable & interoperable
- Need to develop a *community-wide solution* for long-term archiving of and access to video
- At-risk legacy video needs to be digitized!

# Conclusions

- Lots of excitement about underwater video!
- Several challenges and opportunities remain
  - Online access
  - Long-term storage
  - At-risk media
  - Annotation approaches
- Ongoing coordination and collaboration will be important in moving community toward common goals

# The beginning...



Final Workshop Report Released Oct 2016

<https://github.com/underwatervideo/UnderwaterVideoWorkingGroup>