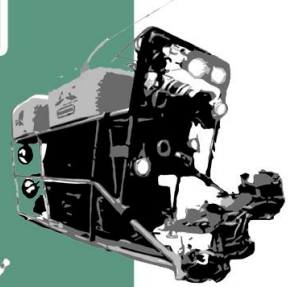
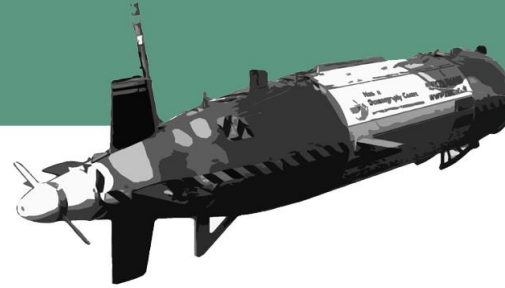
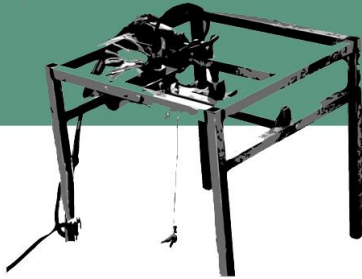
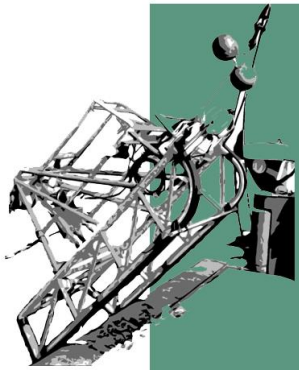


# THE BIG PICTURE II

Benthic Imagery Workshop 2021

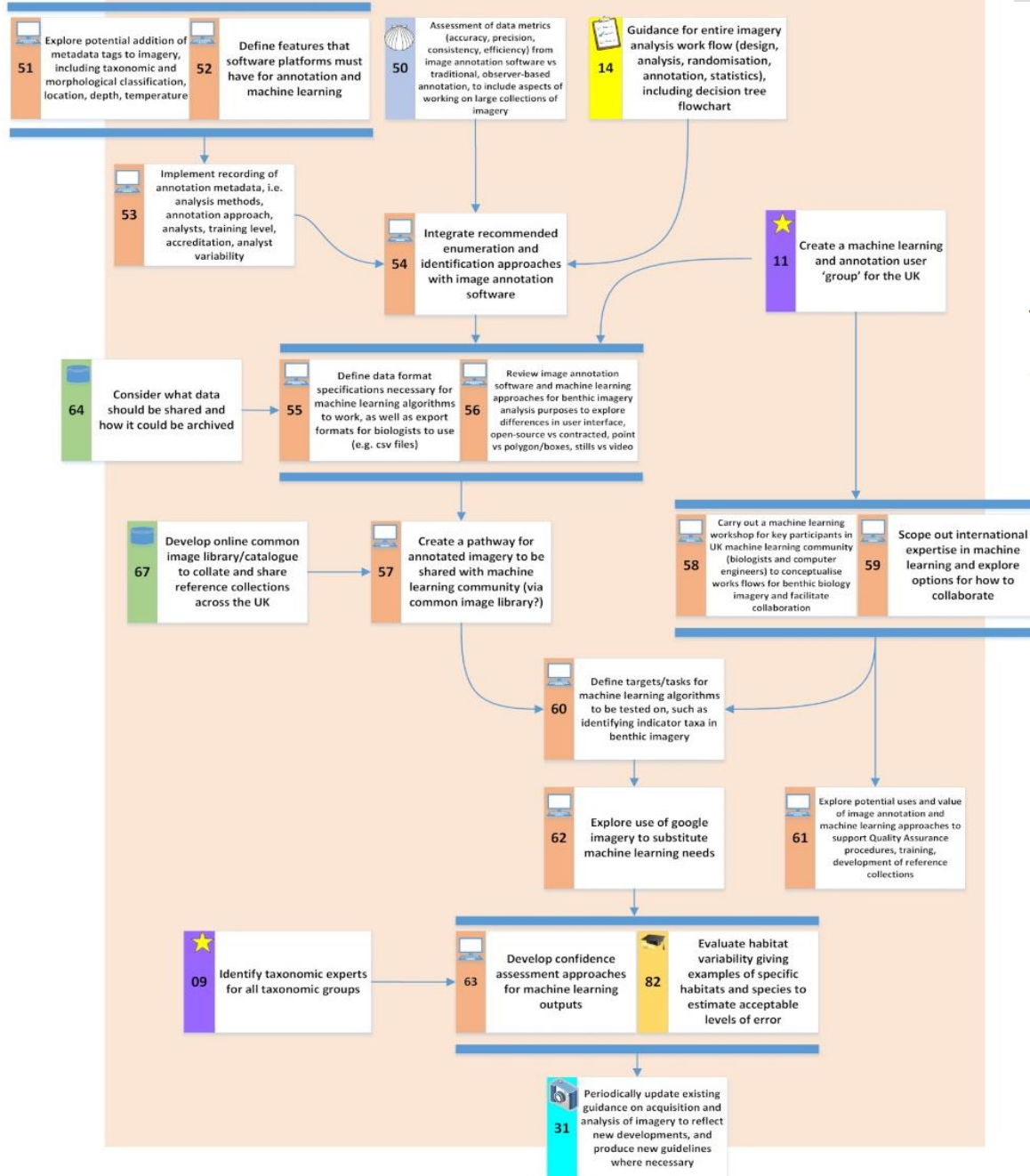


## IMAGE ANNOTATION SOFTWARE

Mark Burton & James King

Natural Resources Wales

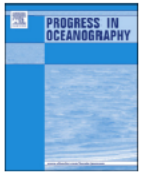
## Image annotation software and machine learning



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Progress in Oceanography

journal homepage: [www.elsevier.com/locate/pocean](http://www.elsevier.com/locate/pocean)



## Review

## Current and future trends in marine image annotation software



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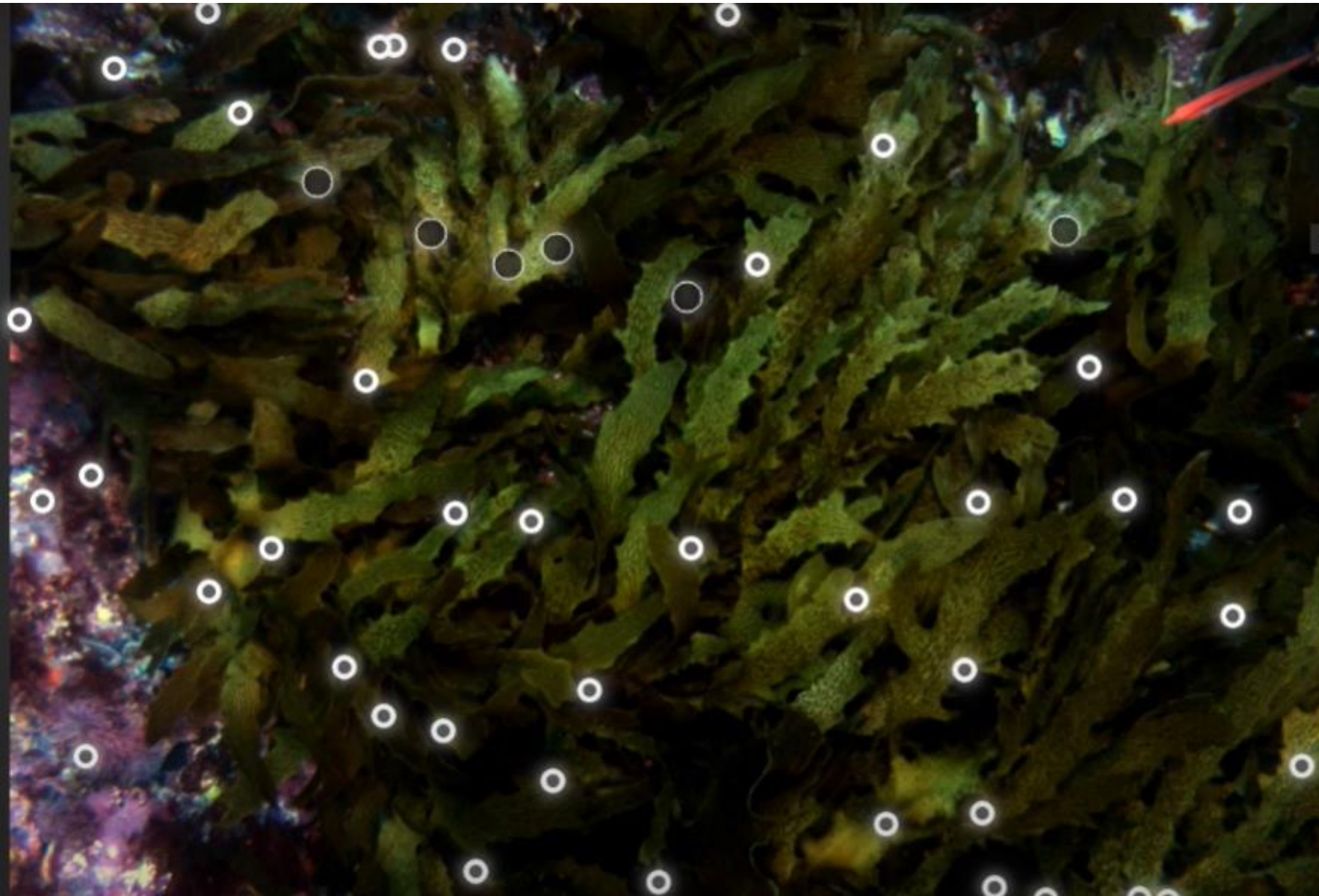
# Marine Image Annotation Softwares

- ADELIE
- BIIGLE
- CATAMI
- ClassAct Mapper
- COVER
- CORALNET
- CPCe
- DIAS
- Ecotaxa
- EventMeasure
- FISH\_ROCK
- Frame-Grabber
- ImageJ
- IRLS
- Morphocluster
- NICAMS
- OFOP
- photoQuad
- Seascape
- SeaScribe/Seatube
- Squidle+
- TransectMeasure
- VARS
- VIDEOMON
- Video Navigator
- VirtualVan
- Zoolmage

Specifications/ acronym	ADELFE	BIIGLE	CATAMI	ClassAct	COVER	CPCe	DIAS	EventMeasure	FISH_ROCK	Frame- Grabber	ImageJ	IRLS	NICAMS	OFOP	photoQuad	Seascape	SeaScribe	Squidle	TransectMeasure	VARS	VIDEOMON	Video Navigator	VirtualVan
<b>Descriptors of image annotation interface</b>	Buttons Lists (tree) Rulers	Lists	Lists	Buttons Lists	Buttons Lists and Rulers	Buttons	Buttons Lists	Buttons	Buttons Lists	Text Entries	–	Buttons Lists	Buttons Lists Database search	Buttons Lists	Buttons Lists Rulers	Lists	Buttons Lists	Buttons Lists	Buttons	Buttons Lists	Buttons Touch- screen	Buttons Lists	Buttons Lists
<b>Real-time Video</b>	Y/Y	–	–	–	–	–	–	–	–	Y/Y	–	Y/Y	Still image	Y/Y	–	–	Y/Y (G)	–	–	Y/Y	–	–	Y/Y
input/capture still image	–	–	–	Y (N)	–	–	–	–	–	Y	–	Y (U)	Y (P)	Y (P)	–	–	Y (O)	–	–	–	Y(X)	–	Y
Receive other data inputs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Display data	Y	–	–	Depth Navigation	–	–	–	–	–	Depth Nav Sci Inst	–	All ROV Data	–	All Ship & Sub + customizable	–	–	Sub, + other metadata	–	–	Y	Y	–	Depth Nav Sci Inst
<b>Posterior annotation</b>	Y	Depth, Nav, Temp, etc.	Nav.	–	Depth	–	Nav.	–	Date Time Depth Nav. Alti Area	Nav. Attitude other	–	All ROV Data, logger name	–	Ship & Sub – Nav.	–	–	–	Depth, nav, meta data, terrain, mosaics	–	Y	–	Y	Depth Nav Sci Inst
Display data	Y/Y	Y (B)/Y	–/–	Y (J)/Y	–/–	–/Y	Y/Y	Y/Y	–/Y	Y/–	–/–	Y/Y	Y/Y	–/Y (D)	–/Y	–/Y	–/Y	–	Y/Y	Y/Y	–	Y	Y/–
Browse annotation file/edit	–	Y	Y	–	–	–	Y	–	–	–	–	Y	Y	Y	–	–	Y	Y	–	–	–	Y	–
Multiple annotation	Y	–	–	–	Y	–	–	Y	–	Y	–	Y	–	Y (Y)	–	–	– (G)	–	Y	Y	–	–	Y
<b>Extra tools</b>	Y	–	–	–	Y	–	–	Y	–	Y	–	Y	–	Y (Y)	–	–	– (G)	–	Y	Y	–	–	Y
Capture still image from video	Y	Y	Y	–	Y	Y	Y	Y	Y	Y	–	Y	Y	–	–	–	–	Y	Y	Y	–	–	Y
Browse pictures	–	Y	Y	–	Fixed and random point count	Random point count	Length or area, point count	Y	Length or area meas.	–	Y	–	Y	–	Y (M)	Image Segmentation	–	Y	Y	Y	–	–	–
Other tools for image analysis	Y	Y	–	–	–	–	–	Y	–	–	–	–	–	–	–	–	– (B)	Y	Y	– (B)	–	–	Y
Annotation data analysis	Y	–	–	–	–	–	–	–	–	–	–	–	–	Y	–	–	Y	–	–	–	–	–	Y
Process navigation data	Y	–	–	–	–	–	–	–	–	Y	–	Y	–	Y	–	–	Y	Y	–	Y via database	–	–	Y
Integrate annotation file	–/–	–(H)/Y (I)	–/Y	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–	–	–	–	–/–
<b>Automated annotation</b>	–/–	–(H)/Y (I)	–/Y	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–/–	–	–	–	–	–/–
Event detection/ object identification	Y (T)	MySQL server	–	MDB (E)	–	–	PostgreSQL	–	Matlab	GeoBroswer/ EIC	–	MySQL	PostGIS or Spatialite	–	–	–	Y (R)	–	–	Y (S)	–	–	GeoBroswer/ EIC
<b>Database</b>	Y (T)	MySQL server	–	MDB (E)	–	–	PostgreSQL	–	Matlab	GeoBroswer/ EIC	–	MySQL	PostGIS or Spatialite	–	–	–	Y (R)	–	–	Y (S)	–	–	GeoBroswer/ EIC
Functions and format	–	Y (B)	–	via MDB	–	–	Y	–	Matlab	Y	–	Y	db search tools or image-by- image review	–	–	–	Yes (via database application)	Yes	–	Y	–	–	Y
Browse database	–	Y (B)	–	via MDB	–	–	Y	–	Matlab	Y	–	Y	db search tools or image-by- image review	–	–	–	Yes (via database application)	Yes	–	Y	–	–	Y



# SQUIDLE+



Filter/Search

- Biota
  - Bacterial mats
  - Bioturbation
  - Ascidians
  - Brachiopods
  - Bryozoa
  - Crustacea
  - Echinoderms
    - Echinoderms: Feather stars
      - Echinoderms: Feather stars: Stalked crinoids
      - Echinoderms: Feather stars: Unstalked crinoids
    - Echinoderms: Ophiuroids
      - Echinoderms: Ophiuroids: Basket stars
      - Echinoderms: Ophiuroids: Brittle / snake stars
    - Echinoderms: Sea cucumbers
    - Echinoderms: Sea cucumbers: Benthic
    - Echinoderms: Sea cucumbers: Pelagic / swimming
    - Echinoderms: Sea stars
    - Echinoderms: Sea urchins
      - Echinoderms: Sea urchins: Irregular urchins
      - Echinoderms: Sea urchins: Regular urchins
  - Fishes
    - Fishes: Bony fishes
    - Fishes: Eels
    - Fishes: Elasmobranchs
      - Fishes: Elasmobranchs: Chimaeras
      - Fishes: Elasmobranchs: Rays & skates
    - Fishes: Placoderm fishes

show/hide child nodes

# VARs

User: lonny VCR: /dev/tty.RS422 Deck Control Video: D0623-01HD

Timecode	Description	PC/S	Observer	Camera Direction
00:39:46:07	Gastropoda	[icon]	lonny	stationary
00:39:59:19	Gastropoda	identity-reference   s.	lonny	stationary
00:40:01:16	Zoarcidae	[icon]	lonny	stationary
00:40:08:19	Gastropoda	identity-reference   s.	lonny	stationary
00:40:24:00	Polynoidae	[icon]	lonny	stationary
00:40:25:05	Polynoidae	[icon]	lonny	stationary
00:40:31:01	Polynoidae	[icon]	lonny	stationary
00:40:41:04	Funiculina-Halipterus ...	[icon]	lonny	stationary
00:40:53:28	shell	part-of   Pteropoda L.	lonny	stationary
00:41:03:04	Panmychia	surface-color   self	lonny	stationary
00:41:21:02	Panmychia	surface-color   self	lonny	stationary
00:41:54:02	Bothrocara brunneum	identity-reference   s.	lonny	stationary
00:41:57:23	Bothrocara brunneum	image-quality   self   perspective   self   d... relative-size   self   L.	lonny	stationary
00:42:08:17	Bothrocara brunneum	identity-reference   s.	lonny	stationary
00:42:11:16	Bothrocara brunneum	identity-reference   s.	lonny	cruise
00:42:15:01	Asterias	[icon]	lonny	stationary
00:42:16:02	Bothrocara brunneum	identity-reference   s.	lonny	stationary
00:42:20:24	Laracea	[icon]	lonny	stationary
00:43:08:29	Liponema brevicaume	[icon]	lonny	stationary
00:43:15:15	Liponema brevicaume	comment   self   sam... comment   self   sea ... sample-reference   s. sampled by   Suction... surface-color   self   comment   self   sam... sample-reference   s. sampled by   Suction...	lonny	stationary
00:53:59:00	Gastropoda	[icon]	lonny	stationary
00:55:58:02	Mysida	[icon]	lonny	stationary
00:56:11:16	Polynoidae	[icon]	lonny	stationary
00:56:22:29	Calathoidae	[icon]	lonny	stationary
01:00:45:25	Ophiura	population-quantity   red	lonny	stationary
01:00:45:25	Ophiura	population-quantity	lonny	stationary
01:01:23:09	Ophiura	population-quantity	lonny	stationary
01:01:29:24	Ophiura	population-quantity	lonny	stationary
01:01:43:23	Ophiura	population-quantity	lonny	stationary
01:02:19:25	Ophiura	comment   self   white population-quantity	lonny	stationary
01:02:22:22	bacterial mat	[icon]	lonny	stationary

Bothrocara brunneum  
Bothrocara brunneum | identity-reference | self | 2

00:00:00:00

100

Asterosidea Halipterus californica Distichoptilum Hexagrammidae Leptogorgia chilensis Mediaster Metridium farcinem Mitrocoma cellularia Nanomia bijuga Parastichopus californicus Pennatulacea Pleuronectiformes Pleurobranchaea californica Porifera Rathbunaster californicus Sebastes

MB shallow MB Deep Arctic

Annotation Mode: OUTLINE Camera Direction: cruise





# CORALNET

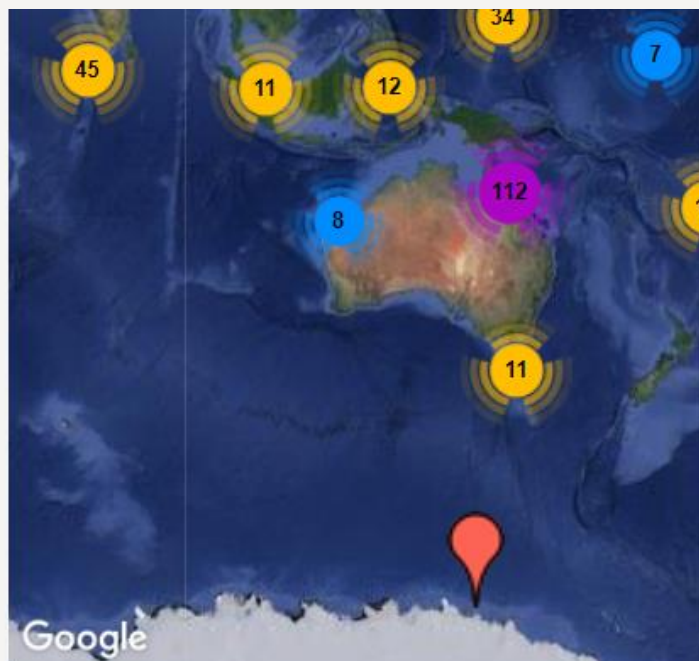
## A WEB SOLUTION FOR CORAL REEF ANALYSIS

Upload coral reef images, organize and annotate images, and view annotation statistics.

[Sign In](#)

[Register](#)

[About](#)



### SITEWIDE STATISTICS

Number of sources: 1,785

Number of images: 1,641,522

Number of point annotations: 61,231,121


### SITE NEWS

CoralNet is officially out of Beta

A new deep learning engine for CoralNet

Annotation tool bug fixes follow-up: checking potentially affected images

# SeaScribe/ SeaTube



**Ocean Networks Canada**  
Oceans 2.0

SeaTube Pro

March 1st, 8 am PST - Scheduled outage for maintenance, expect data gap

[Help](#) | [Login](#)

[Data Preview](#) | [Data Search](#) | [Plotting Utility](#) | [SeaTube](#) | [More](#) ▾

[Request Support](#) | [Report a Problem](#)


[Videos](#) | [Playlists](#)

Resolution: **Low** ▾ Time: 19-Nov-2019 17:13:30 Latitude: 23.98371 Longitude: -83.39003 Depth: 932.6 Heading: 204.2 [Search All Videos](#)

[Cruises](#)


- NEPTUNE Maintenance 2020-C
- NEPTUNE 2020-09 Nautilus (S
- NEPTUNE Maintenance 2020-C
- NEPTUNE/VENUS Maintenan
- NOAA OER Testing Shake Dow
- TestTest - 2020-Mar-07 00:01
- NOAA OER Season 2020 Begin
- NOAA OER Southeast USA Dec
- EX1907\_DIVE12 - 2019-Nov**
- E1907\_DIVE11 - 2019-Nov-
- EX1907\_DIVE10 - 2019-Nov
- EX1907\_DIVE09 - 2019-Nov
- EX1907\_DIVE08 - 2019-Nov
- EX1907\_DIVE07 - 2019-Nov
- EX1907\_DIVE06 - 2019-Nov
- EX1907\_DIVE05 - 2019-Nov
- EX1907\_DIVE04 - 2019-Nov
- EX1907\_Dive03 - 2019-Nov
- EX1907\_DIVE02 - 2019-Nov
- EX1907\_DIVE01 - 2019-Nov
- NEPTUNE/VENUS Maintenan

[Insite Pacific Zeus Plus Camera on ROV Deep Discoverer](#)



03:31 / 04:57

[Map](#) | [Profile](#) | [Detail](#)








Sorry, we have no imagery here.

Imagery ©2021 Landsat / Copernicus, Maxar Technologies Terms of Use

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[Dive Log Entries](#) | [My Annotations](#)

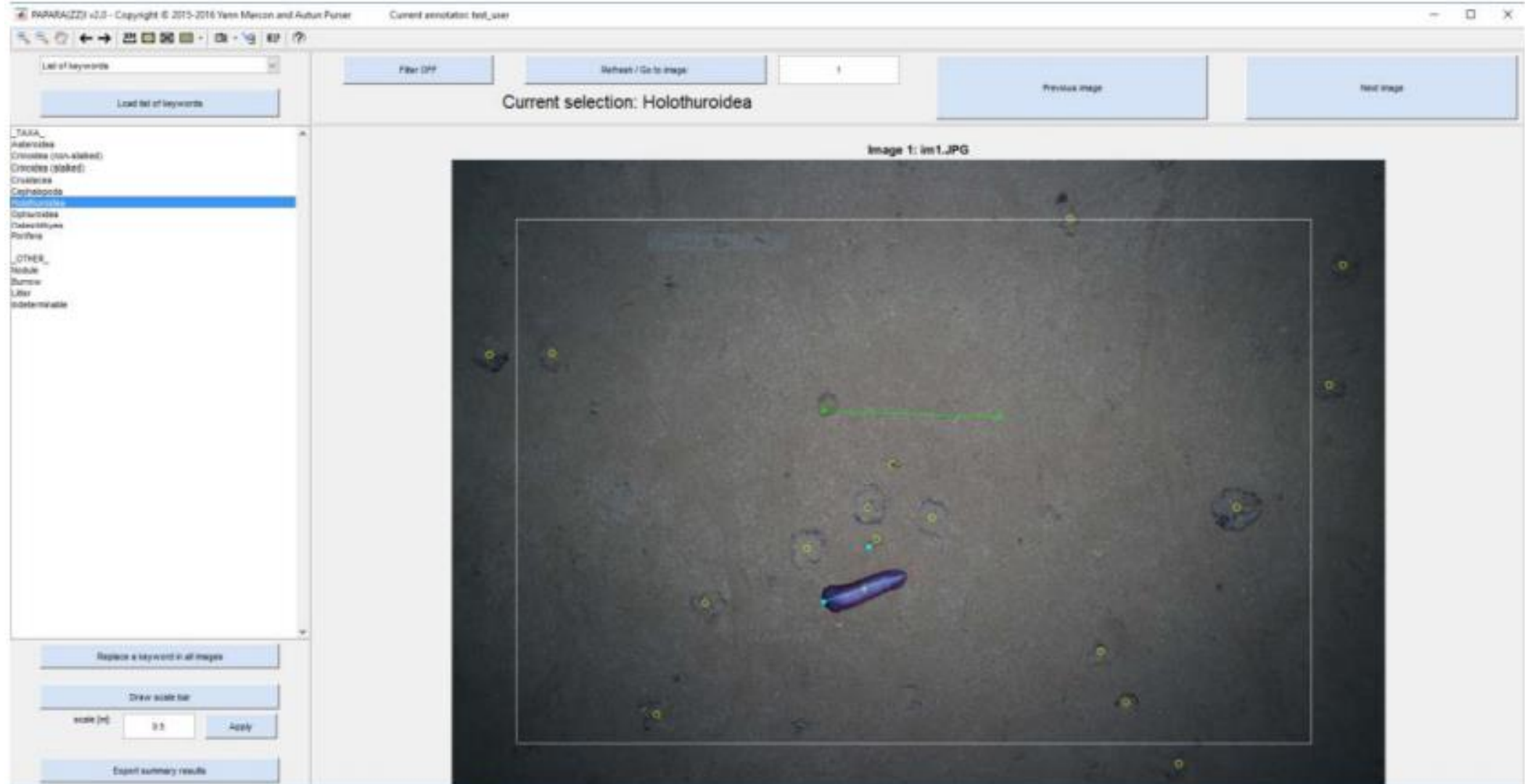
Start Date (UTC)	End Date (UTC)	Comment	Latitude	Longitude	Depth	Origin	Action
19-Nov-2019 17:03:40	19-Nov-2019 17:03:40		23.98399	-83.39003	932.3	SeaScribe	
19-Nov-2019 17:09:27	19-Nov-2019 17:09:27		23.98379	-83.39004	933.4	SeaScribe	
19-Nov-2019 17:13:27	19-Nov-2019 17:13:27	Urchin like Hexactinilledia being eaten by a Plantaster sp	23.98371	-83.39003	932.5	SeaScribe	
19-Nov-2019 17:18:36	19-Nov-2019 17:18:36	Maybe Tanacetipathes	23.98346	-83.39001	932.1	SeaScribe	
19-Nov-2019 17:23:42	19-Nov-2019 17:23:42		23.98349	-83.39	930.6	SeaScribe	

<https://data.oceannetworks.ca/SeaTube#>





[PAPARA\(ZZ\)I: An open-source software interface for annotating photographs of the deep-sea - ScienceDirect](#)



# BIIGLE II

 BIIGLE

SkomerPhotos / Photoset /  NWA19970615m4L.jpg







 Filter annotations 



 Alcyonium digitatum 4

 Corynactis area 5

 Corynactis viridis 46

 Frame area 2

 Orange crust 10

 Rock 1

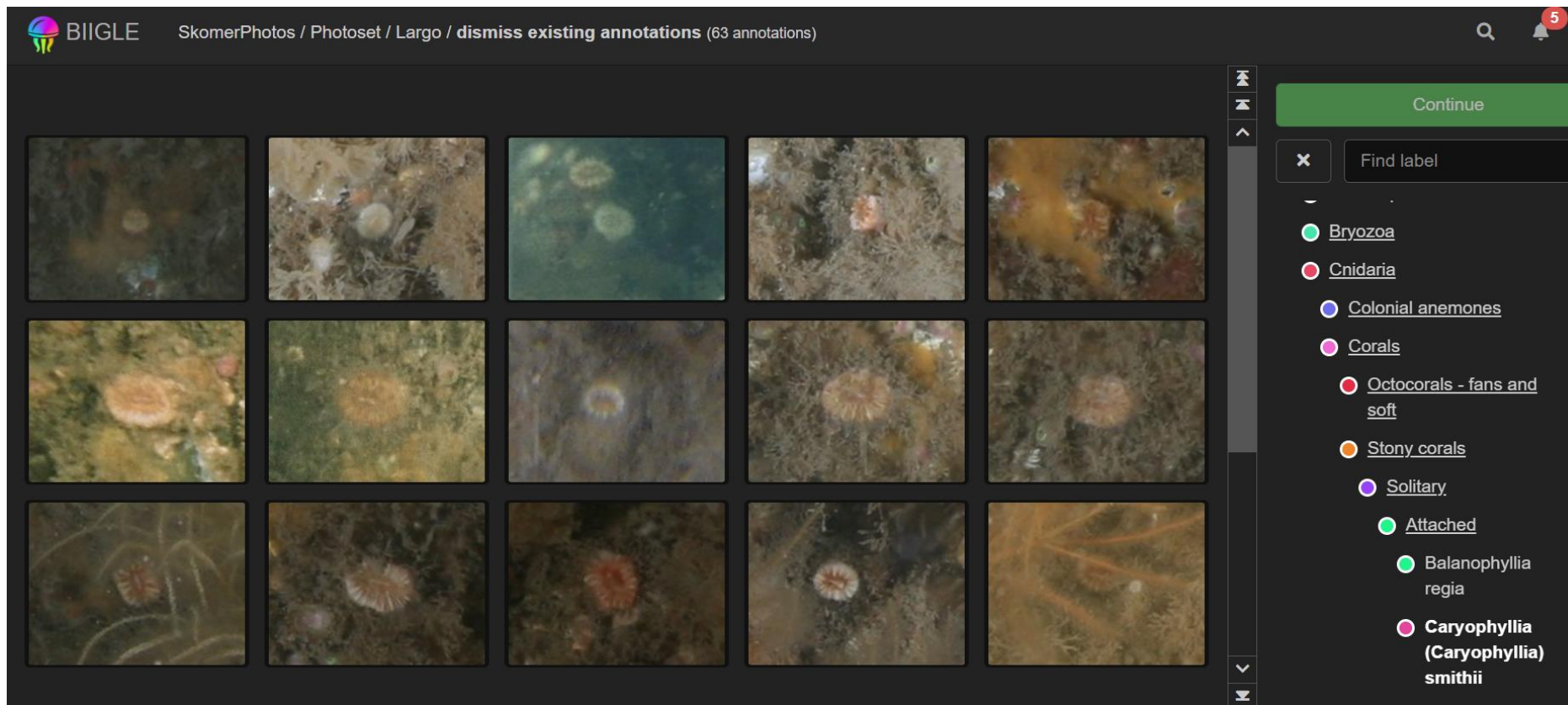
 Rock- barnacles 10

 Tall erect Hydroids 13

 Unidentifiable 3

## Useful features of an annotation system:

- Consistent labels – which can be shared (ideally linked to the EIP)
- Measure as well as count
- QA features – e.g. the LARGO tool in Biigle
- Link with Machine Learning features (and output??)





- WHAT SHOULD THE IMAGE ANNOATION GROUP DO?
- Proscribe which annotation systems should be used?
- OR keep up to date with developments and provide updates
- Provide a list of “desirable” features of an annotation tool
- Need to have very strong links with the EIP, data group and the Machine learning group.