

BIIGLE 2.0

OLIVIER SOUBIGOU
DFO / NSE / NE

CATHERINE BORREMANS
REM / BEEP / LEP

What is BIIGLE ?



Free online software for annotation of still images and videos

Developped by the Center for Biotechnology (CeBiTec) & Bielefeld University (Germany)



Links and more information:

<https://biigle.de/>

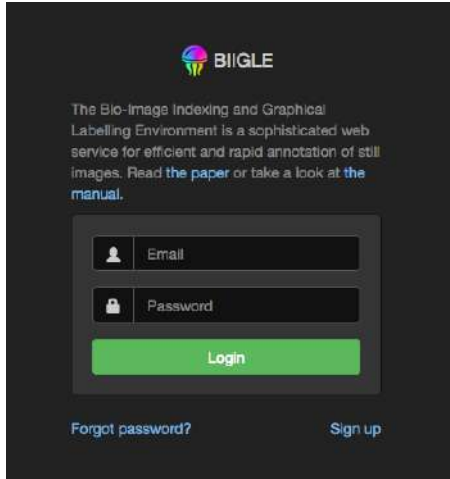
*Langenkämper D, Zurowietz M, Schoening T and Nattkemper TW (2017) BIIGLE 2.0 - Browsing and Annotating Large Marine Image Collections. Front. Mar. Sci. 4:83.
doi: 10.3389/fmars.2017.00083*

[BIIGLE Manual](#)

BIIGLE

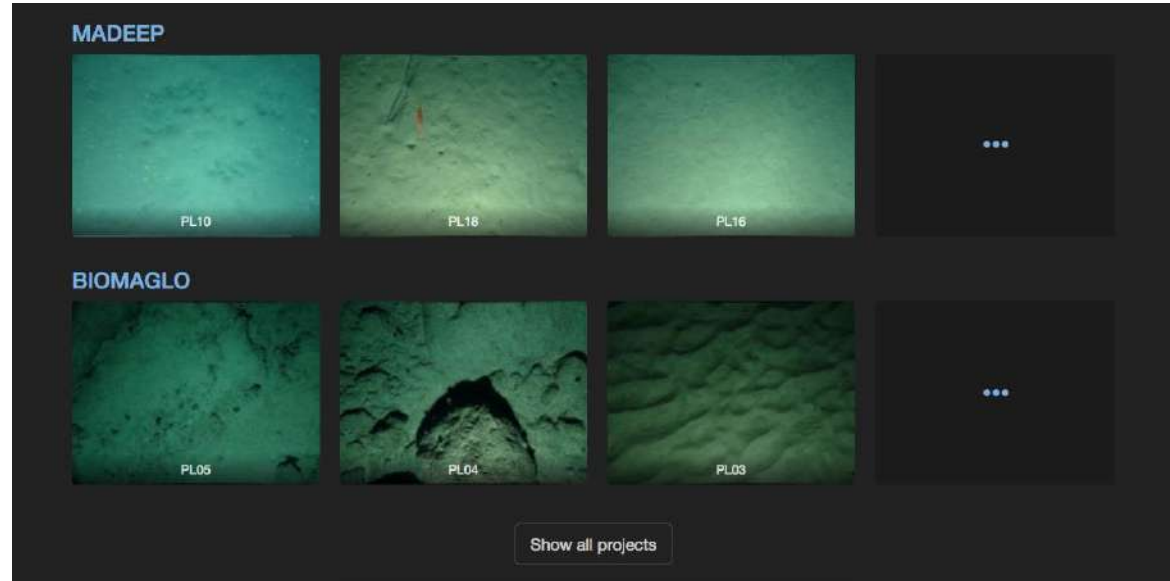
- Biigle & Ifremer history
- Web oriented platform, collaborative
- Centralized data storage
- Open source

Example of use of BIIGLE for taxa identification on still images



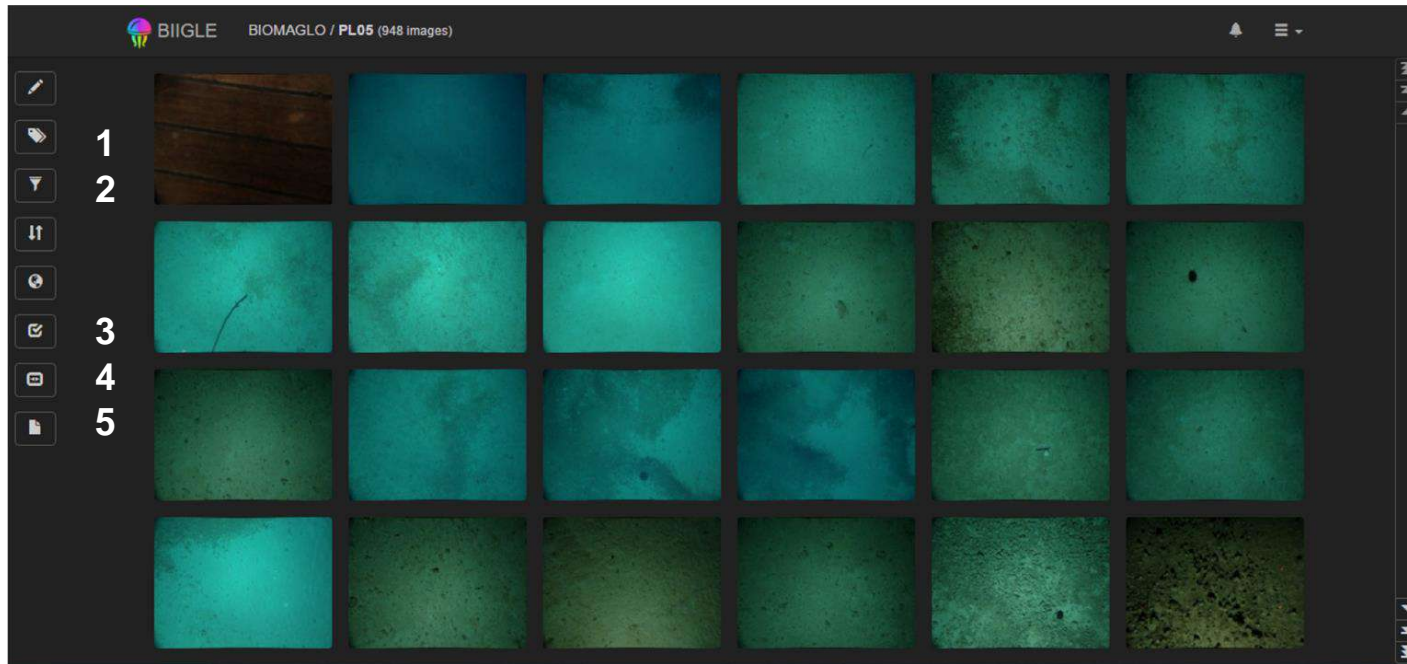
1) Sign in

2) Select the project of interest



Example of use of BIIGLE for taxa identification on still images

Project navigation: 3) After selection of a **project** and a **volume**, different functions available



1) Give an overall label to the photo

2) Filter the photo by annotation or by users annotations

3) Use the Largo function

4) Compute the distance between laser points

5) Ask for a report (.csv) on all the photos

Example of use of BIIGLE for taxa identification on still images

Annotation interface: 4) When you select an image, you can annotate using the **label tree + selection of a polygon**



Label tree

- Newly created by user or WoRMS import
- Shareable between projects
- Import/export

Annotation tools: selection of a polygon

Example of use of BIIGLE for taxa identification on still images

Annotation interface: Collaborative approach: external experts can be involved in the annotation process



Example of use of BIIGLE for taxa identification on still images

Edit a label tree: Labels can be edited, versioned and shared in collaboration with other users. You cannot delete a label that is in use / You can assign the new label to a parent label.

The screenshot displays the MADEEP web application interface. At the top left, the logo 'MADEEP' is visible, followed by the text 'Copy of the Biomaglo sub label tree'. A 'Leave' button is in the top right corner. Below this is an 'Annotation catalog' section. The main area is titled 'Labels' and has two tabs: 'Manual' and 'WoRMS'. A tooltip 'Edit labels' is positioned over the 'WoRMS' tab. Below the tabs, there is a form to add a new label, with instructions: 'To add a new label, choose a color, an optional parent label and a name.' The form includes a color selection box (currently green), a 'Label parent' dropdown, and a 'Label name' input field with a '+' button. Below the form is a list of taxonomic labels, each with a colored circle and an edit icon:

- Annelida (Feces?)
- Bioturbation
- Brachiopoda
- Chordata
- Cnidaria
- Crustacea
- Ctenophora
- Echinodermata
- Mollusc
- No Identification possible

On the right side, a 'Projects using this label tree' section shows 'MADEEP'. A user menu is open on the right, showing the user is signed in as 'Melissa Hanafi-Portier'. The menu options are: Dashboard, Projects, Label trees (highlighted with a tooltip), Manual, Settings, and Logout.

How we use BIIGLE for taxa identification?

- 1) First step: primary identification at low taxonomic level (by a deep-sea ecologist)

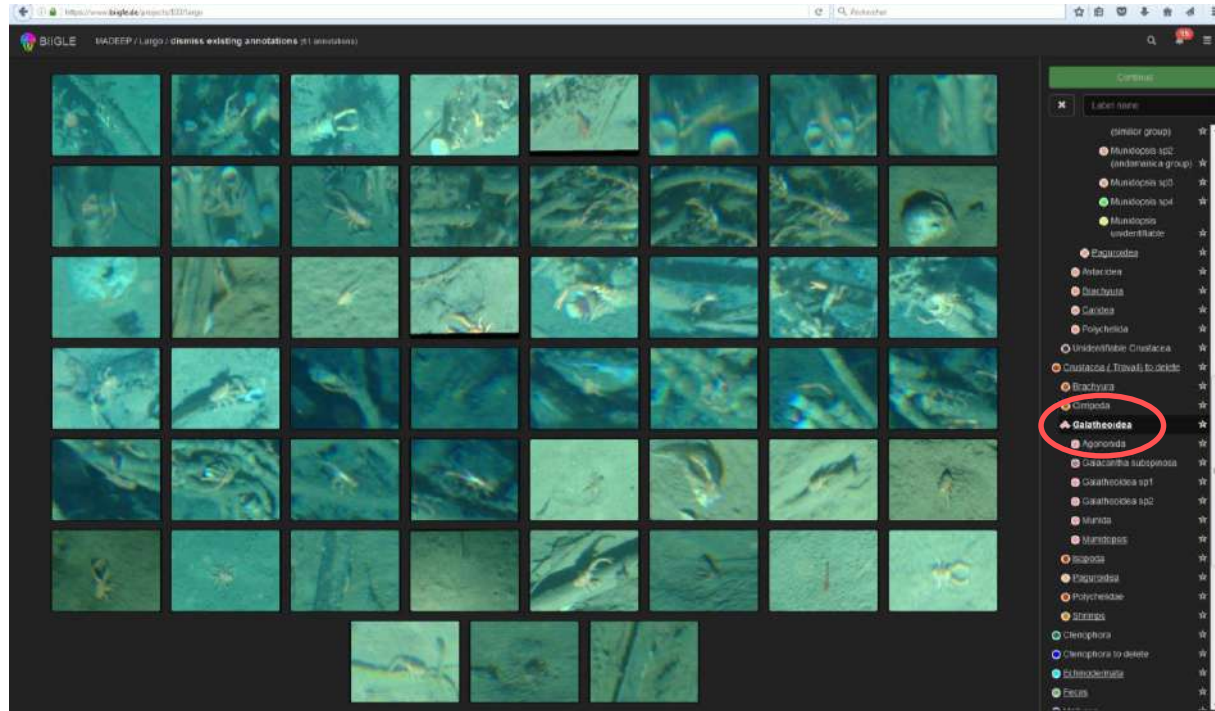


Phylum, class, order
(super-family) levels

How we use BIIGLE for taxa identification?

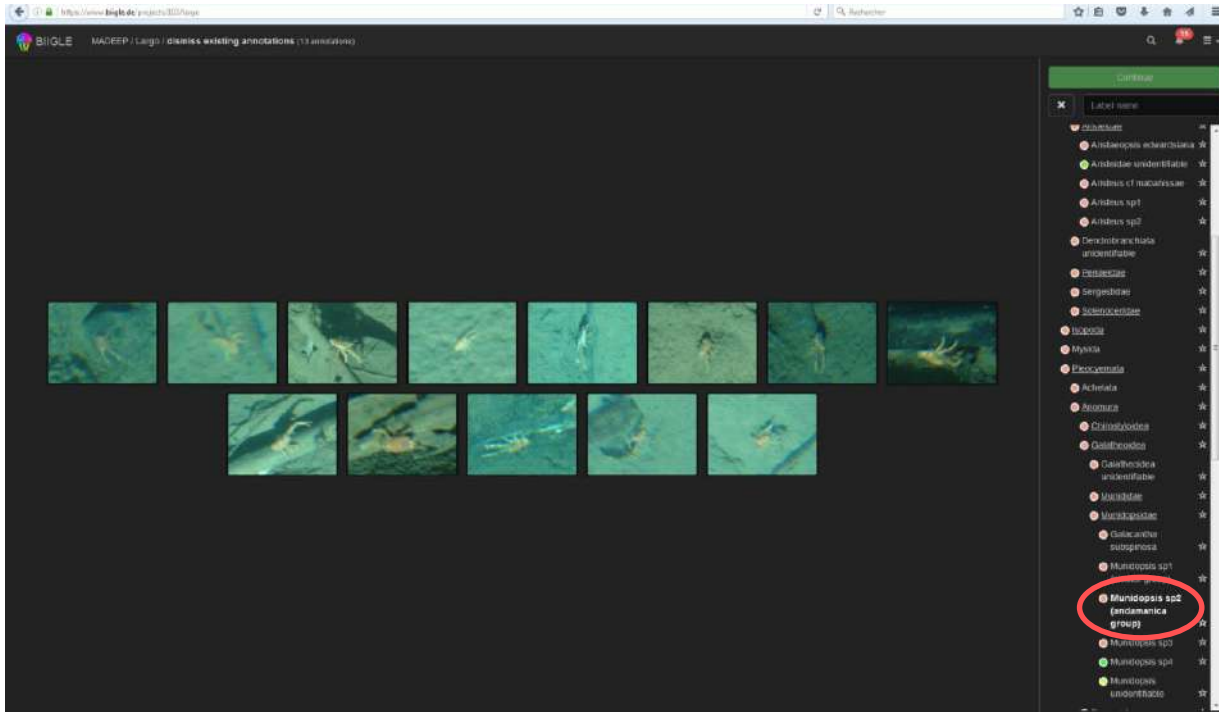
2) Improvement of taxonomic identification by experts

For example: a selection with Largo tool on Galathoidea



How we use BIIGLE for taxa identification?

2) Improvement of taxonomic identification by experts



Family, genus (species)
levels
Morphospecies



Tutorial (C. Borremans)

Video annotation

The screenshot displays the BIIGLE software interface for video annotation. The main window shows a video frame of a seabed with several red and white circular markers. The interface includes a top bar with the BIIGLE logo, file path, and search icon. A timeline at the bottom shows the video's duration from 00:07:05.28 to 00:05:17.17. Below the timeline are four annotation tracks: 'Unknown' (green bars), '1.2 Not Annotated' (green bars), '1.1 Annotated' (green bars), 'Corals' (purple bars), and 'Sponges' (orange bars). A red vertical line indicates the current video position at approximately 00:07:08.00. The URL 'https://biigle.de' is visible in the bottom left corner.

BIIGLE PAC2019-015_Central Coast ROV_May 2019 / Videos-1 / DCSIII2/PAC2019-015_DCSIII2_20190512_173501.mp4

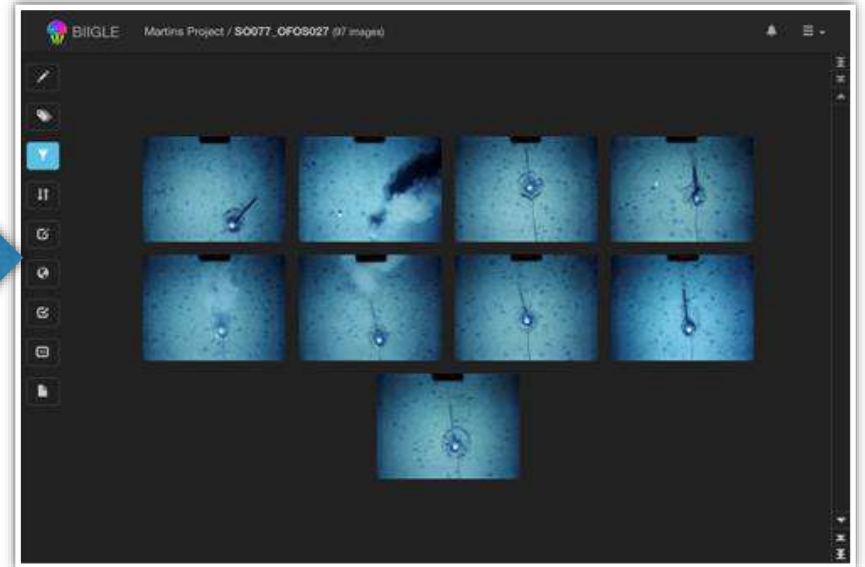
00:07:05.28 00:08:00.00 00:09:42.86 00:11:25.72 00:13:08.58 00:14:51.44 00:16:34.30 00:18:17.16 00:20:00.02 00:21:42.88 00:23:25.74 00:25:08.60 00:26:51.46 00:28:34.31 00:30:17.17

Unknown
1.2 Not Annotated
1.1 Annotated
Corals
Sponges

https://biigle.de

Other BIIGLE features

- Laser point detection
- Images metadata
- Different formats of reports (exports)



Geospatial browsing, filtering/gating and visualization

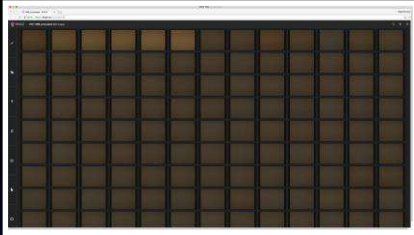
Deep Learning: Example of the assessment of benthic communities in the PAP zone with MAIA



- assessment of benthic communities in the PAP zone
- 12k images
- 30k annotations
- 19 classes



Unsupervised Detection with autoencoder Network

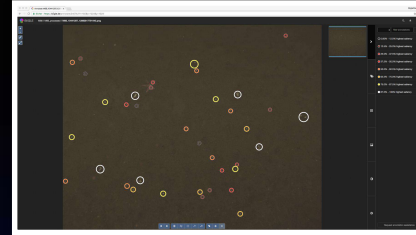


3293 images
M66, North Sea
(Data provided by NOC)

Autoencoder



AE
3 fully connected layers
latent(hidden) layer
of 252 nodes
=10% of input size
<10h training time
on NVIDIA Titan X
~ 10^5 image patches



174k detections
ranked by saliency
1 sec / image

Annotate M86_104412973291 x
Sicher | <https://biigle.de/annotate/3407427m=1506&x=1224&y=1024>

Biigle M86 / M86_processed / M86_10441297_12962617781445.png

filter annotations


- 0.00% - 12.5% highest saliency
- 12.5% - 25.0% highest saliency
- 25.0% - 37.5% highest saliency
- 37.5% - 50.0% highest saliency
- 50.0% - 62.5% highest saliency
- 62.5% - 75.0% highest saliency
- 75.0% - 87.5% highest saliency
- 87.5% - 100% highest saliency

Request annotation assistance

M66_processed - BIIGLE

Sicher | <https://bigle.de/volumes/485/largo>

BIIGLE M66 / M66_processed / Largo / dismiss existing annotations (21747 annotations)



Continue

Label name

Global

- Laser Point

Autoencoder Detection

- 0.00% - 12.5% highest saliency
- 12.5% - 25.0% highest saliency
- 25.0% - 37.5% highest saliency
- 37.5% - 50.0% highest saliency
- 50.0% - 62.5% highest saliency
- 62.5% - 75.0% highest saliency
- 75.0% - 87.5% highest saliency
- 87.5% - 100% Highest saliency

Interesting Object

- Interesting Object

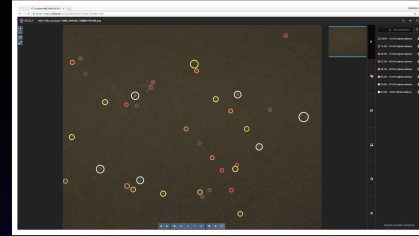
Sleipner Labels

- animal
- garbage
- shell

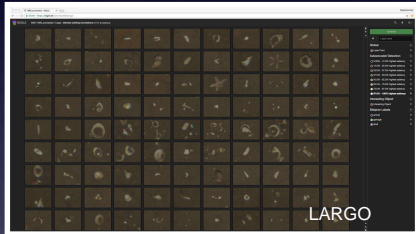
Unsupervised Detection with autoencoder Network



Autoencoder



Human observer assistance



AE output (sorted),
classified into five saliency ranks
100-87.5% most salient
87.5-75% most salient

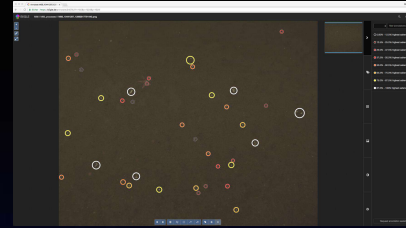
...

4 label categories
(interesting, animal, garbage, shell)
All labels are put into one
category (for now) for FCN training

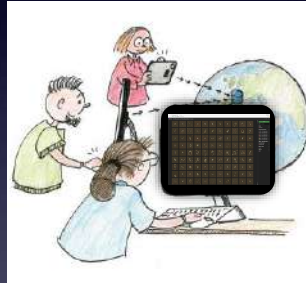
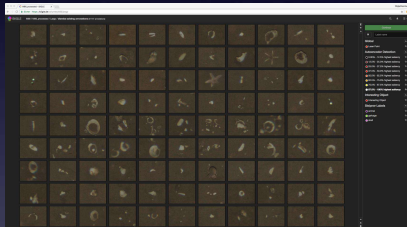
Unsupervised Detection with autoencoder Network



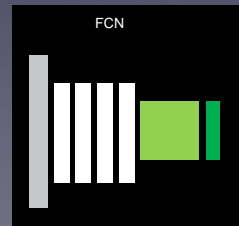
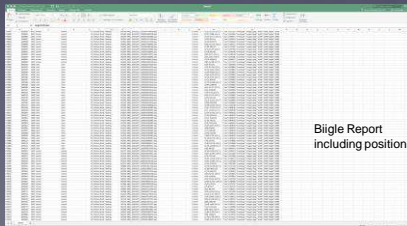
Autoencoder



Human observer assistance



Fully convolutional network (FCN) [1] learning (5-40h on NVIDIA Titan X) and application



1 sec / image

semantic segmentation (segmentation + label for every pixel) red=> animal, blue => shell

[1] Long, J et al. "Fully convolutional networks for semantic segmentation." *CVPR*. 2015.

Example of MAIA output

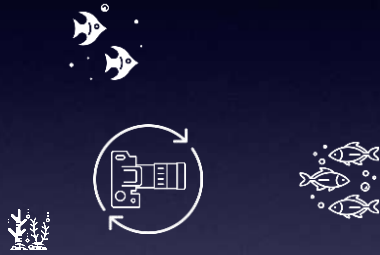


TIAMAT

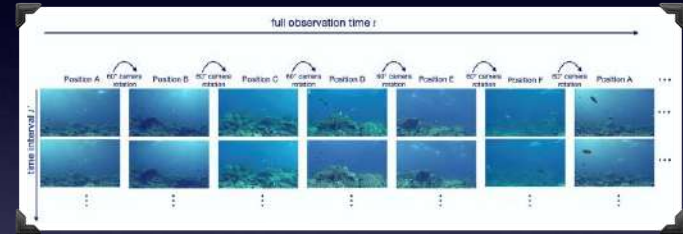
- ANR / DFG project
- University of Bielefeld: machine learning
- Ifremer: spatial integration, visualization and analysis
- Datasets: observatories, exploration

Deep Learning: Classification of tropical fish in rotating stationary observatories

1. A stationary video camera turns 60° every 30s



2. The resulting time series can be used to monitor a bigger area



3. AI is used to detect „interesting“ objects without any human input using...



...Dino

Caron et al. „Emerging Properties in Self-Supervised Vision Transformers“, ICCV 2021



...Movement

4. A machine learning Algorithm is trained on the manual annotations to detect fish



5. The AI automatically detects fish



BIIGLE in Ifremer (since January 2021)

<https://biigle.ifremer.fr/>

- Ask for an account
- Access to the data
 - ! mp4 format for videos
- Projects, volumes, label tree,... to be defined by the user

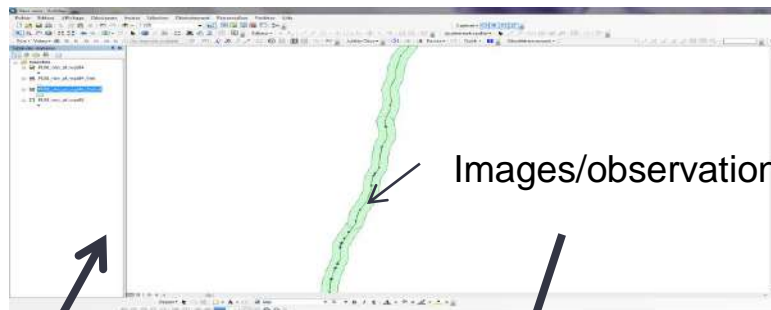
Contacts: Olivier Soubigou, Mickael Dequidt, Catherine Borremans

Geo-referencing /quantifying data using Adelie software

BIIGLE export file

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	label_Id	label_Final	Phylum	Subphylum	Class	Subclass	Order	Suborder	Infraorder	Superfamily	Family	Genus	Species	lastname	filename			
3444	8573	Galacantha	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Anomura	Galatheoidea	Munidipodae	Galacantha	Galacantha	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222234-000.jpg			
3445	9026	Galathea	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Anomura	Galatheoidea				Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222008-000.jpg			
3446	9026	Galathea	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Anomura	Galatheoidea				Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222512-000.jpg			
3447	9155	Glyptocarrang	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Crangoloidea	Glyptocarrang	Glyptocarrang	Glyptocarrang	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-220232-000.jpg			
3448	9027	Halioporidae	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Penseoidea	Solenoceridae	Halioporidae		Hanafi-Porti	MADEE-PL06-SCAM1-20140411-220112-000.jpg			
3449	9027	Halioporidae	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Penseoidea	Solenoceridae	Halioporidae		Hanafi-Porti	MADEE-PL06-SCAM1-20140411-220126-000.jpg			
3450	9027	Halioporidae	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Penseoidea	Solenoceridae	Halioporidae		Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223112-000.jpg			
3451	9193	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223108-000.jpg			
3452	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-220104-000.jpg			
3453	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222144-000.jpg			
3454	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222146-000.jpg			
3455	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222636-000.jpg			
3456	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222704-000.jpg			
3457	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222206-000.jpg			
3458	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222206-000.jpg			
3459	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-222326-000.jpg			
3460	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223132-000.jpg			
3461	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223132-000.jpg			
3462	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223172-000.jpg			
3463	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-220738-000.jpg			
3464	9197	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223106-000.jpg			
3465	9198	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223104-000.jpg			
3466	9199	Heterocarpa	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Pleocyemata	Caridea	Pandaloidae	Pandalidae	Heterocarpa	Heterocarpa	Hanafi-Porti	MADEE-PL06-SCAM1-20140411-223132-000.jpg			

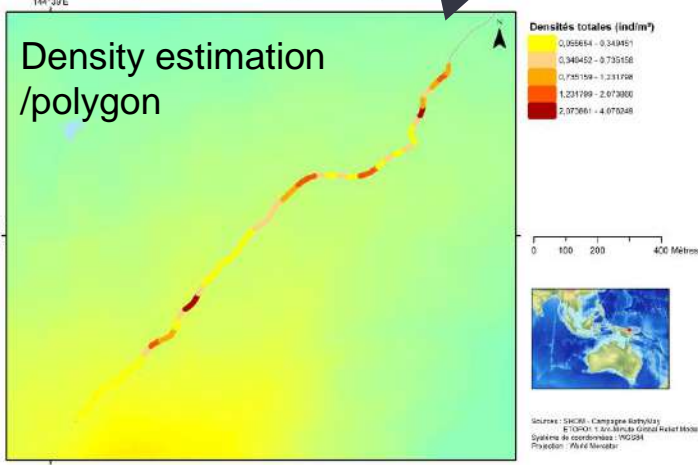
Sampling units (polygons)



Analyse de la plongée SCAMPI 06 - Campagne Madeep

ADELIE input file

Obs	Time	Depth	Temp	Sal	Lat	Lon	Species	Count	Order	Family	Genus	Species	Order	Family	Genus	Species	Order	Family	Genus	Species
1	01:00:00	10	20.0	35.0	-13.0	100.0	Galacantha	1												
2	01:01:00	10	20.0	35.0	-13.0	100.0	Galacantha	1												
3	01:02:00	10	20.0	35.0	-13.0	100.0	Galacantha	1												
4	01:03:00	10	20.0	35.0	-13.0	100.0	Galacantha	1												
5	01:04:00	10	20.0	35.0	-13.0	100.0	Galacantha	1												



Density estimation /polygon



Data import

Source: SHOM - Campagne Galathea
E.TOPON: 1. Av. Sully - Centre National Institut
Système de coordonnées: WGS84
Projection: PAM-Mercator