



**Ifremer**

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# THE DEEP SEA SPY SYSTEM

Building a marine  
images annotation  
database from  
participative  
science



**Session 1**  
*Data services and tools in ocean science*

**Barcelona, Spain**  
**5-7 November 2018**



## OVERVIEW

Introduction

The annotation system – *Deep Sea Spy*

The data management

The query system – *DSS Request*

Perspectives





## Seafloor observatories

### EMSO-Azores 2010-...

Mid-Atlantic Ridge  
*Tour Eiffel, Lucky Strike*  
*Strike (1700 m)*

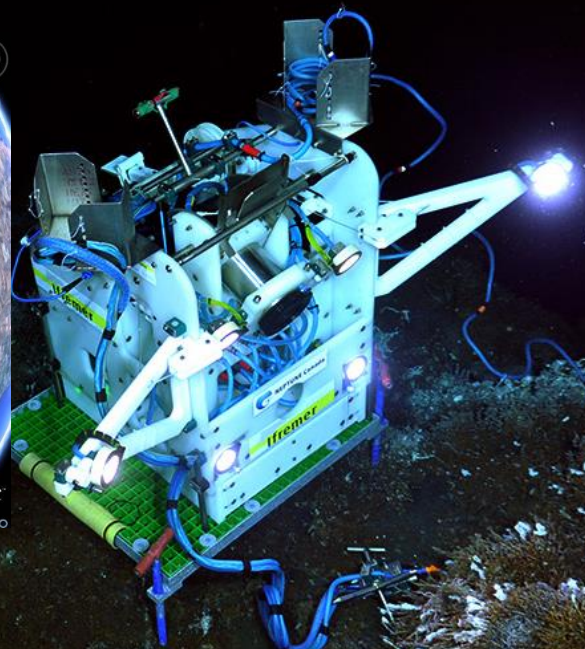


### Ocean Networks Canada 2011-...

Juan de Fuca Ridge  
*Grotto, Main*  
*Endeavour (2200 m)*



Imagery  
2 min/6 hrs/365 days



**TEMPO ecological module**



Imagery  
20 min/4 hrs/365 days



## Annotate visible inhabitants

TEMPO-MINI 2013-07-15 06:00:21

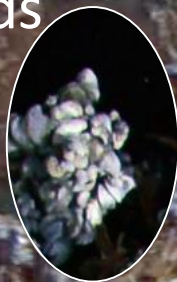
Pycnogonids



Whelk



Gastropods



Tubeworms



Scale worms



Fish





## Annotate visible inhabitants

EMS0 Azores 2015-07-29 02:57:07



## Imagery archive

780 video hours/year...

> 5000 video hours (> 10 Tb)

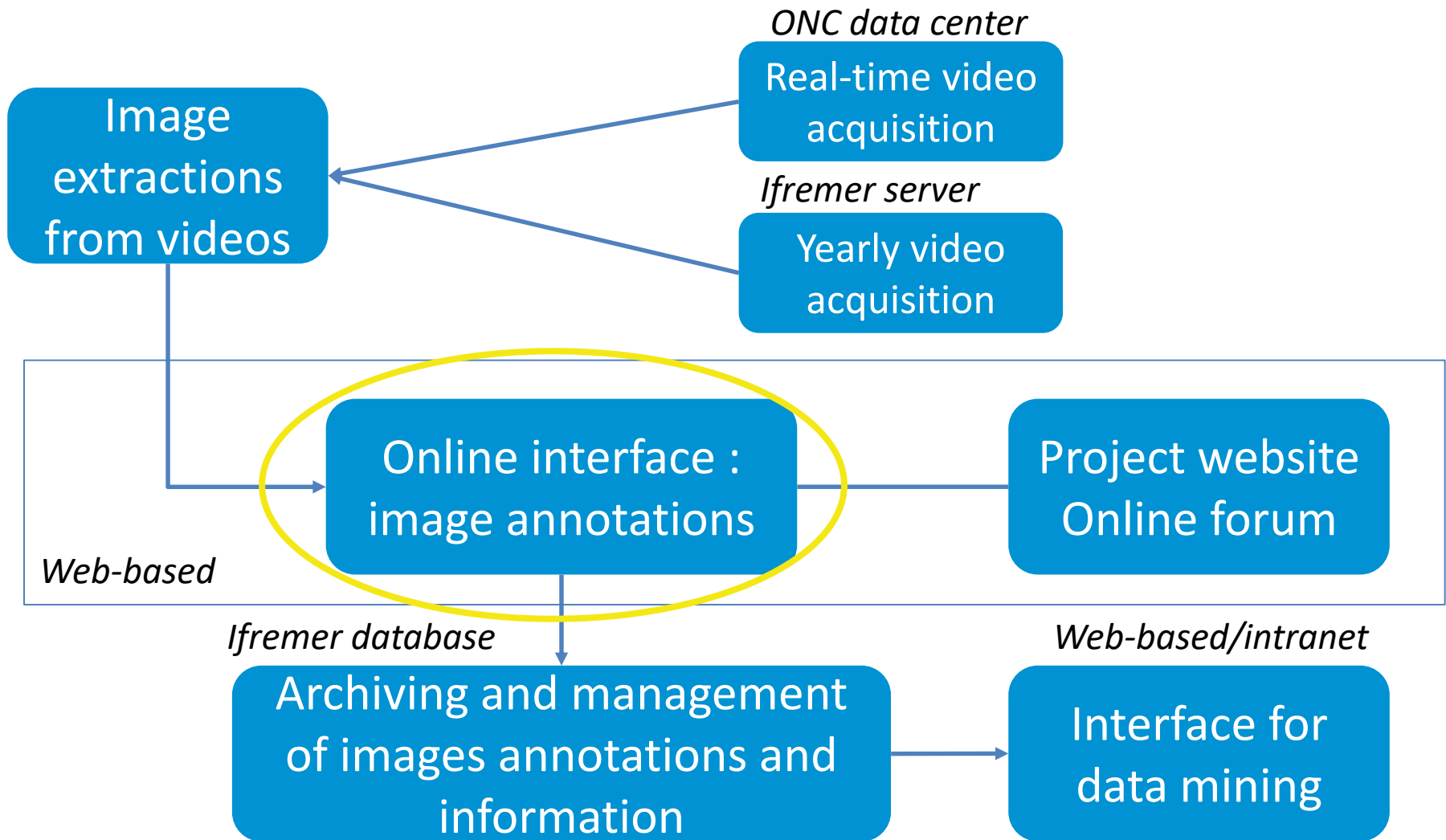
**20 work hours** to annotate **1 video hour**

...more than 11 years to annotate the  
present whole dataset  
(which increases every year) !

**To proceed such a video archive  
scientists need the help of citizen**



## Development of a citizen science project



## A web-based application to annotate species

- A web-based software for manual image processing that will help gather useful information for scientists
- A fun and engaging interface to raise awareness among the general public to deep-sea ecosystems

- **Available online (internet)**
- **Built as a game**
- **Tutorial**
- **Levels (and virtual rewards)**
- **Data stored in pixels**





TEMPO-MINI 2014-07-24 06:00:21



fetescience  
Disconnect



## JUAN DE FUCA RIDGE SPECIES TO LOOK FOR

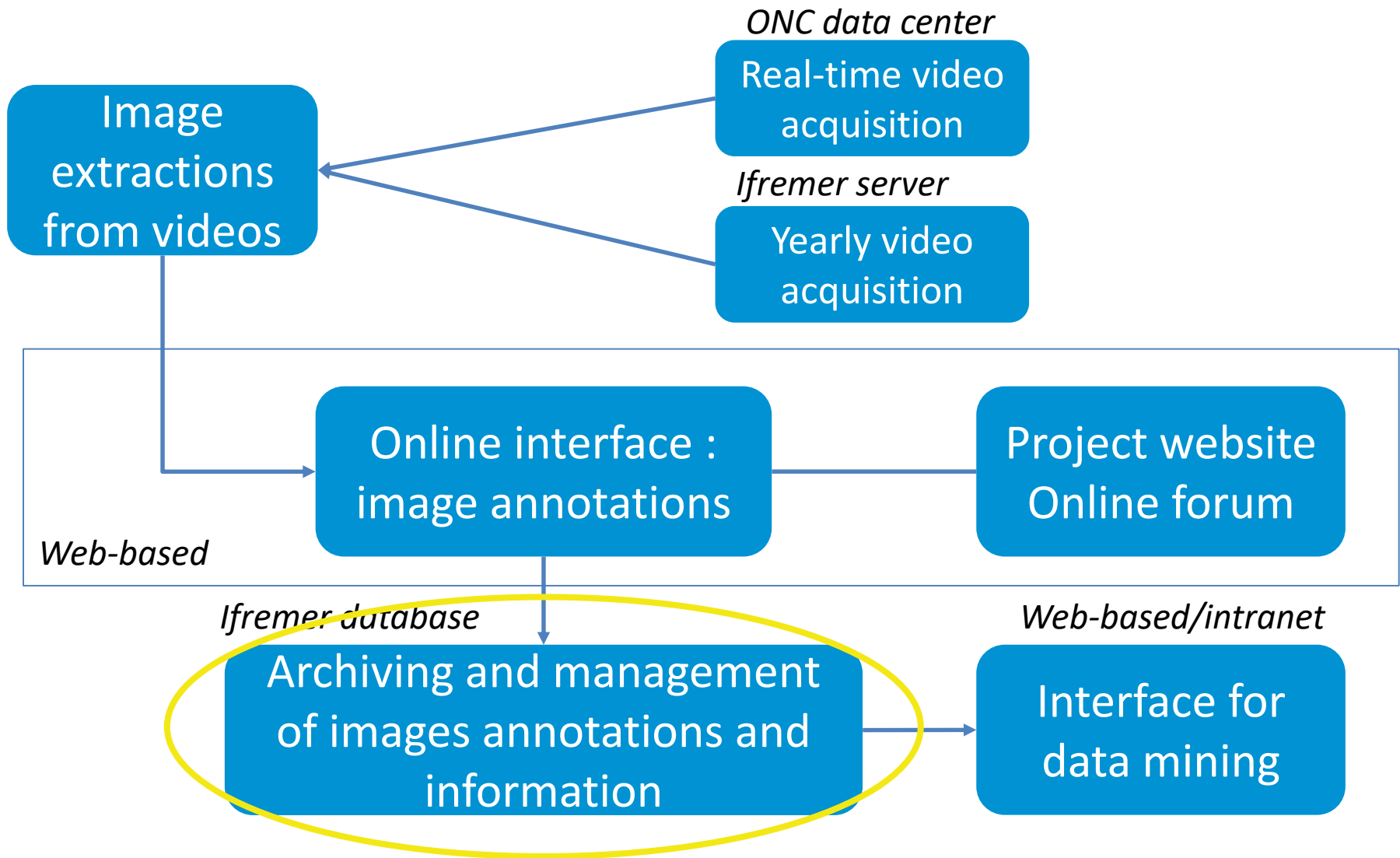
- Buccinid snail (7)
- Polynoid worms
- Pycnogonid (3)
- Spider crab
- Zoarcid fish

## HOW TO ANNOTATE the Buccinid snail



Buccinum  
thermophilum

## Development of a citizen science project





## Deep Sea Spy database

Mission

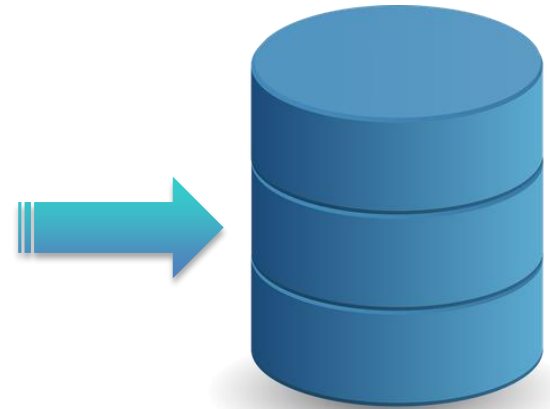
Observatory

Image

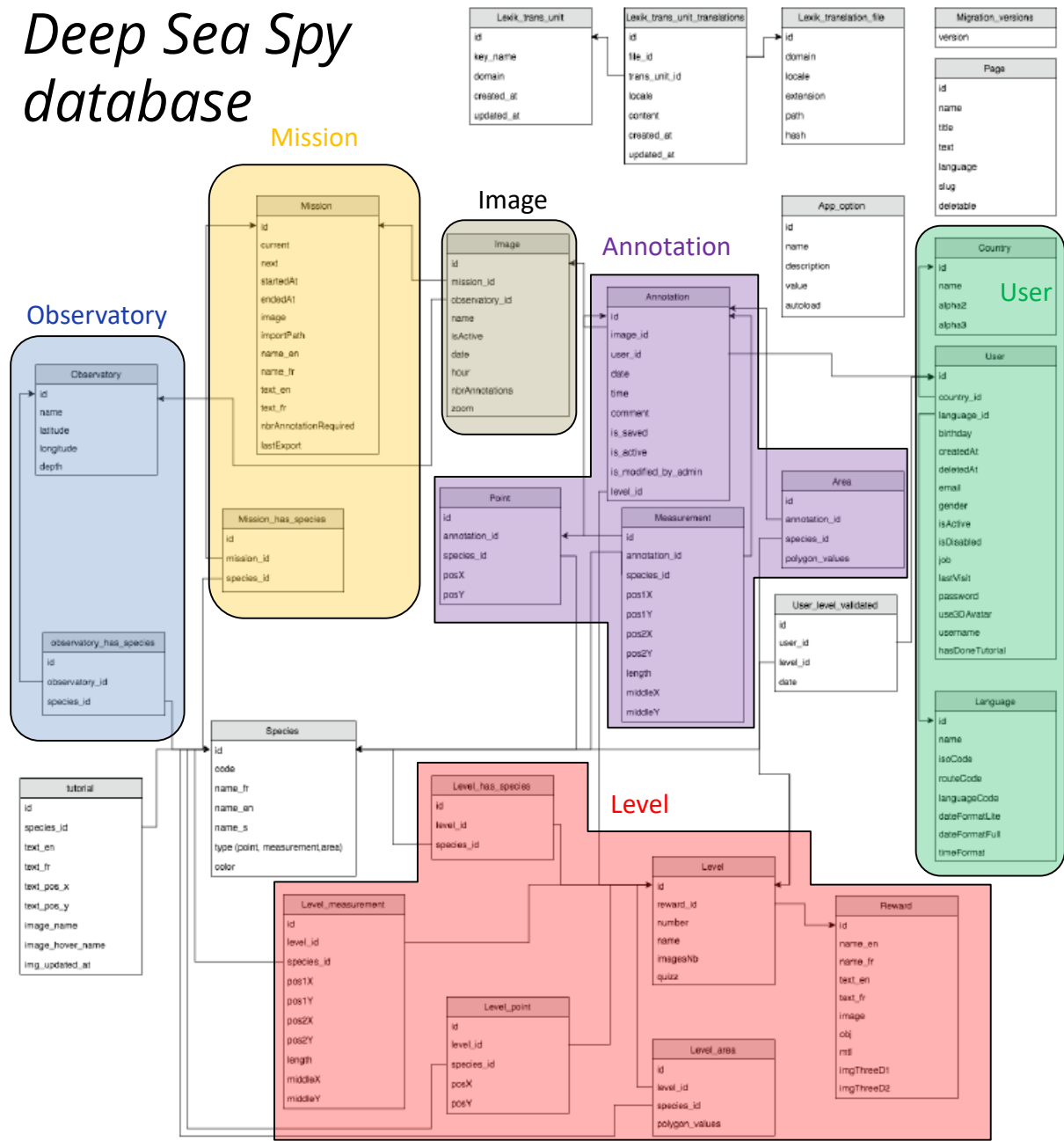
Annotation

Level

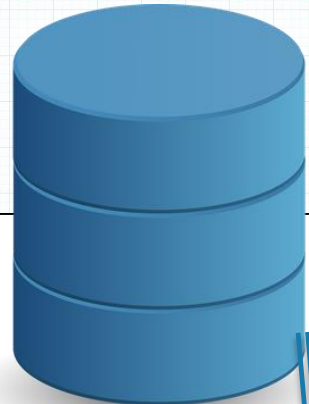
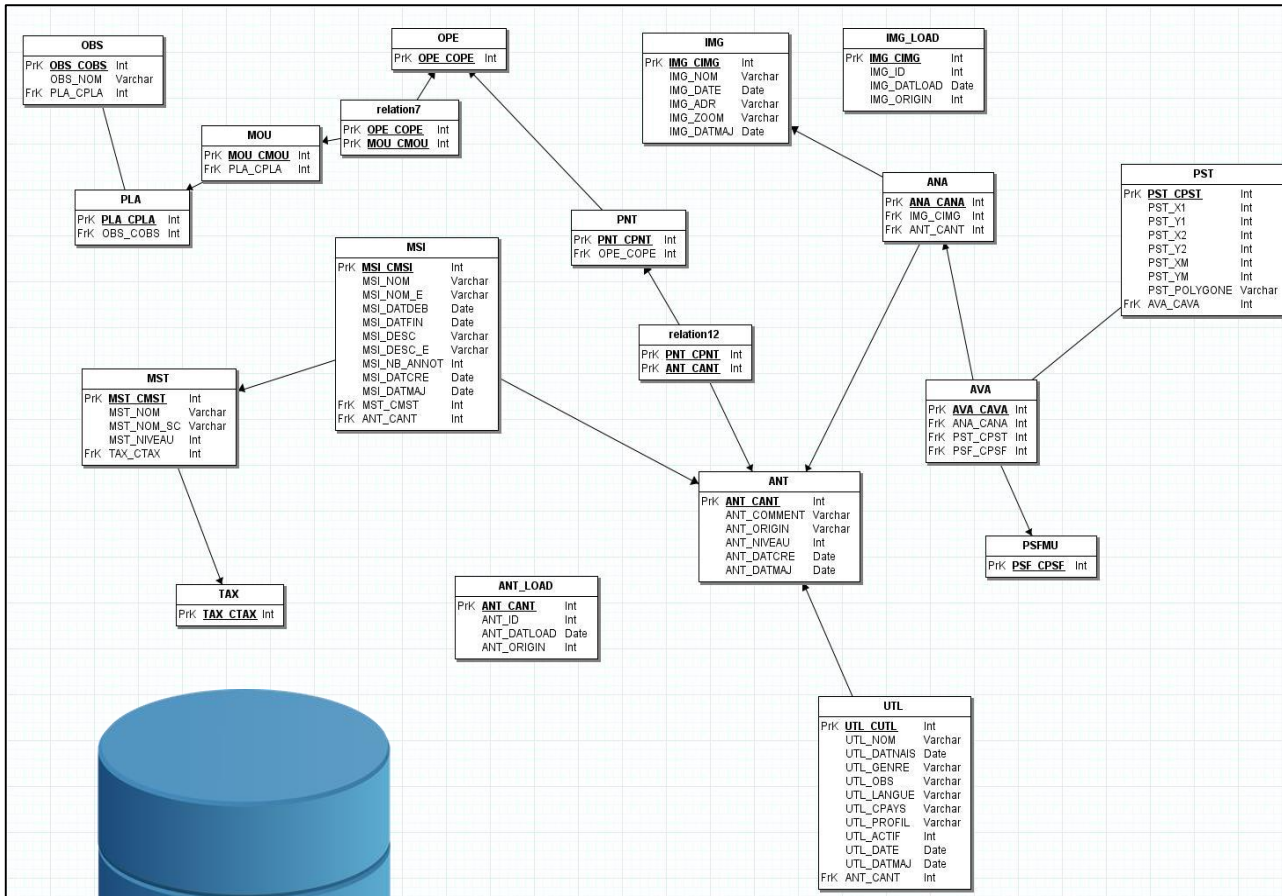
## Citizen Science & Imagery Data



Ifremer central database



## Citizen Science & Imagery Data



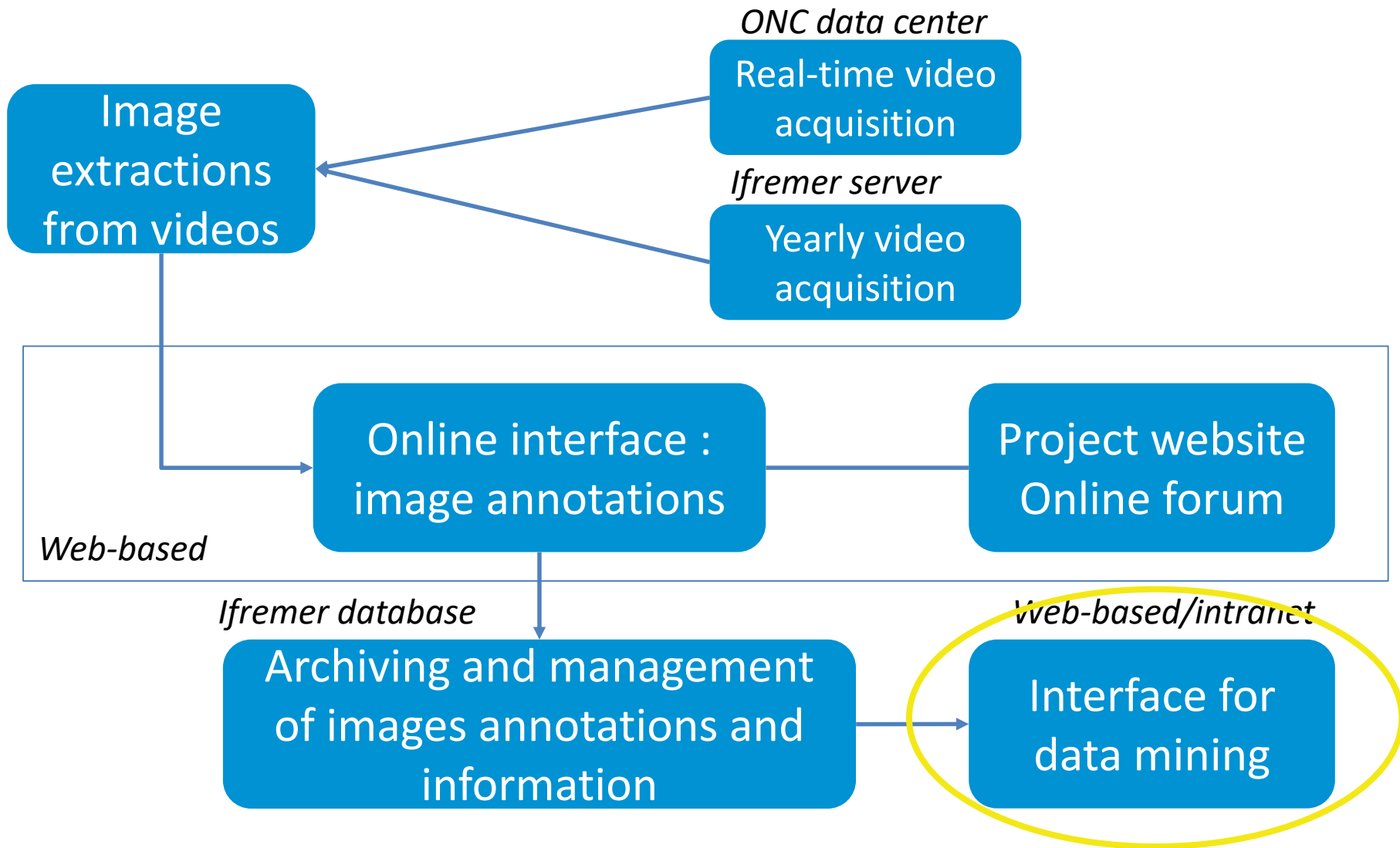
**Standardisation** →

- **Taxonomy**  
Ifremer/WorMS
- **Parameters**  
SeaDataNet P01  
vocabulary library  
LGPIXEL1  
Length (in digital image) of biological entity specified elsewhere

Ifremer central database



## Development of a citizen science project



## A web-based application to search DSS data

Selection :

- Mission
- Observatory
- Time
- Species

\* : champ obligatoires

Choisir la/les mission(s) :  
Les missions \* Toutes les missions

Choisir le/les observatoire(s) :  
Liste des Observatoires \* Tous les observatoires

Choisir la/les espèce(s) :  
Le/Les Taxons disponible \* Crabe bythograeidé  
Escargot buccinidé  
Poisson zoarcidé  
Crabe araignée  
Poisson Cataetyx  
Poisson chimère  
Autre poisson  
Ver polynoïdé

Couverture temporelle :  
Toute la couverture temporelle de la mission   
Debut \* DD/MM/YYYY Fin \* DD/MM/YYYY  
Si fixe :

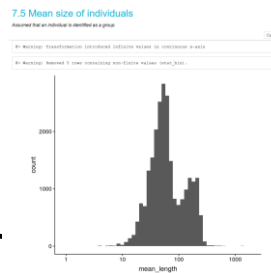
Plage horaire : \*  
 Tout  Fixe  Définir une plage horaire

Ne pas échantillonner   
Fréquence d'échantillonnage\*  
 Définir un temps (H; M; S)  Semaines  Mois  
Fenêtre de temps d'échantillonnage  
Durée : \* HH:MM:SS  
Application de la fenêtre\*  
 Avant  Symétrique  Après

Recherche Mettre à zéro


CSV file export

R import & further statistical analyses



(habitats mapping, ecological studies...)



- Thanks to the resulting Deep Sea Spy database, help improving the algorithms necessary to produce accurate automated species detection in imagery using a machine learning approach
- Share the system with other Ifremer imagery data types (coastal environment, fisheries...)
- Take advantage of  elasticsearch features to enhance searching and exploring the Deep Sea Spy dataset (through DSS Request)
- Aim at later uptake of imagery data by an international data infrastructure ?

Thank you to all the colleagues  
who contributed to this project...

... and thank you all for your attention!



[WWW.DEEPSEASPY.COM](http://WWW.DEEPSEASPY.COM)

