Taxonomic Backbone for LifeWatch

Services and databases for species taxonomy, distribution and traits

Klaas Deneudt, Stefanie Dekeyzer , Bart Vanhoorne , Filip Waumans, Simon Claus, Leen Vandepitte, Francisco Hernandez

VLIZ

Vlaams Instituut voor de Zee vzw
Flanders Marine Institute

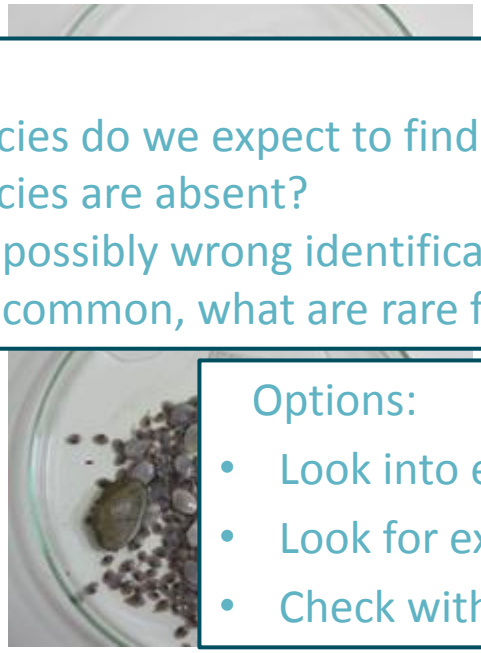
Biodiversity research

Van veen grab at x,y,t
Observation:
- X,Y
- t
- Depth: 20m
- Sediment : sand

Species

Amphiodia atra (Stimpson, 1852)
Hemipholis elongata (Say, 1825)
Chione sp.
Corbula caribea (Orbigny, 1842)
Corbula sp.
Cyclinella tenuis (Rècluz, 1852)
Lioberus castaneus (Say, 1822)
Nucula semiornata (Orbigny, 1846)
Periploma compressa (Orbigny, 1846)
Temnoconcha brasiliana (Dall, 1921)
Thysanocardia catharinae (Grube, 1868)
Branchiostoma platae (Hubbs, 1922)

Analysis:
- What species do we expect to find?
- What species are absent?
- What are possibly wrong identifications?
- What are common, what are rare findings?



Options:
- Look into existing literature
- Look for existing data
- Check with experts

What is LifeWatch?

VIRTUAL LABORATORY

LifeWatch is a distributed **virtual laboratory** and will be used for biodiversity research, for climatological and environmental impact studies, to support the development of ecosystem services and to provide information for policy makers in Europe. This large European research infrastructure will consist of several biodiversity observatories, databases, web services and modeling tools. It will be integrating the existing systems, upgrading them were possible and developing new systems where needed.

PARTICIPATING COUNTRIES

Preparatory phase

Construction phase

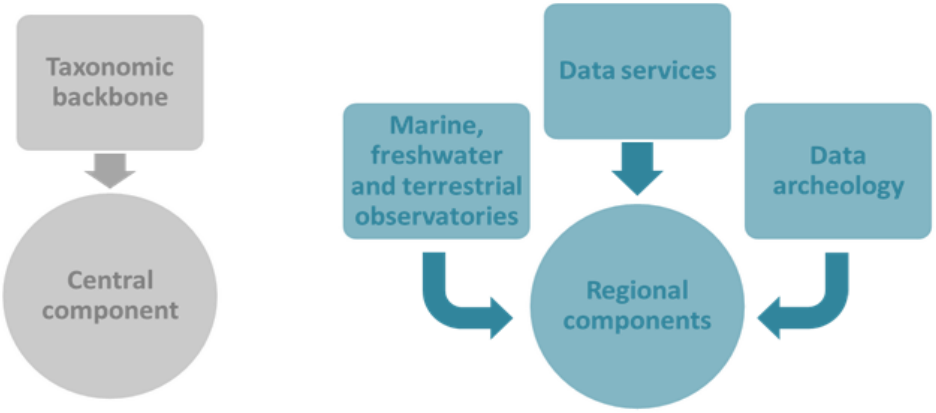
FLEMISH CONTRIBUTIONS

The Flemish contributions to LifeWatch are coordinated by the Flanders Marine Institute (VLIZ) and the Research Institute for Nature and Forest (INBO). The Flemish LifeWatch consortium is funded by the Hercules Foundation.

Vlaams Instituut voor de Zee
Flanders Marine Institute

inbo

HERCULES STICHTING

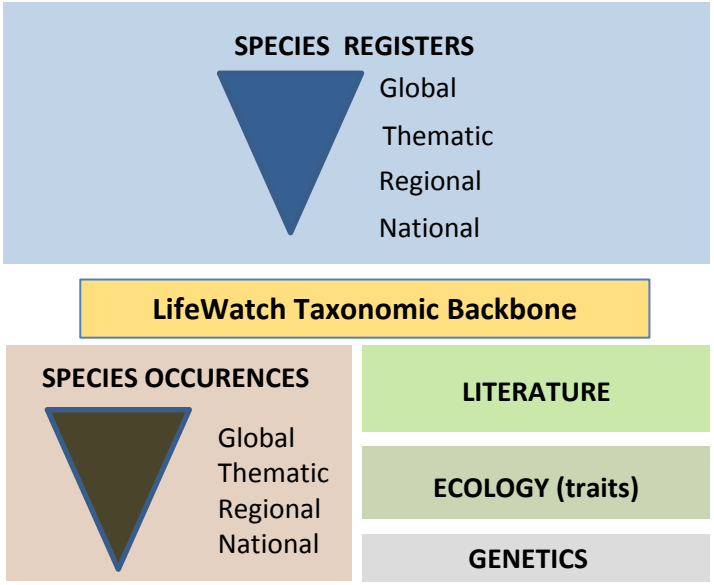


LIFEWATCH PHASES

What is the LifeWatch Taxonomic Backbone?

Taxonomic Backbone

- Central contribution to LifeWatch
- Facilitates the standardisation of species information
- (Virtually) brings together different component databases & data systems
- 5 major branches



Biodiversity research

Van veen grab at x,y,t
Observation data :

- X,Y
- Date
- Depth: 20m
- Sediment : sand

Analysis:

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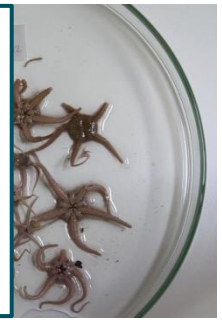

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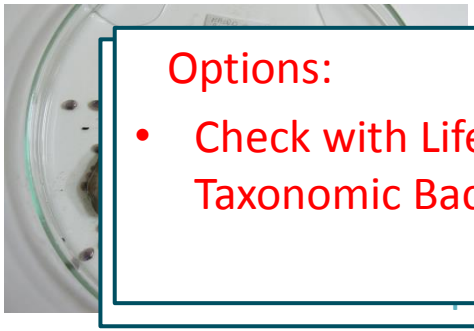
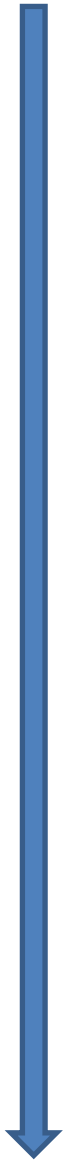


Options:

- Check with LifeWatch Taxonomic Backbone

Source	Analysis	Result
Observation	identify species take position	P{} observed species x,y
Marine regions	region of x,y	Westhinder bank North sea
OBIS occurence data WoRMS distribution data LW ENM data	species in North sea	S{}
TB – Habitat Traits	S{Species in benthos}	Sb{} benthic species
TB – Size Traits	Sb{X < size < Y}	Sm{} macrobenthic species
Observation	take depth describe substrate	20m soft sediment
TB – Environment Traits	Sm{Species at 20m, soft sediment}	E{} expected species
	E{} – P{} P{} – E{}	A{} absent species E{} possible errors U{} unique observations



Taxonomic Backbone

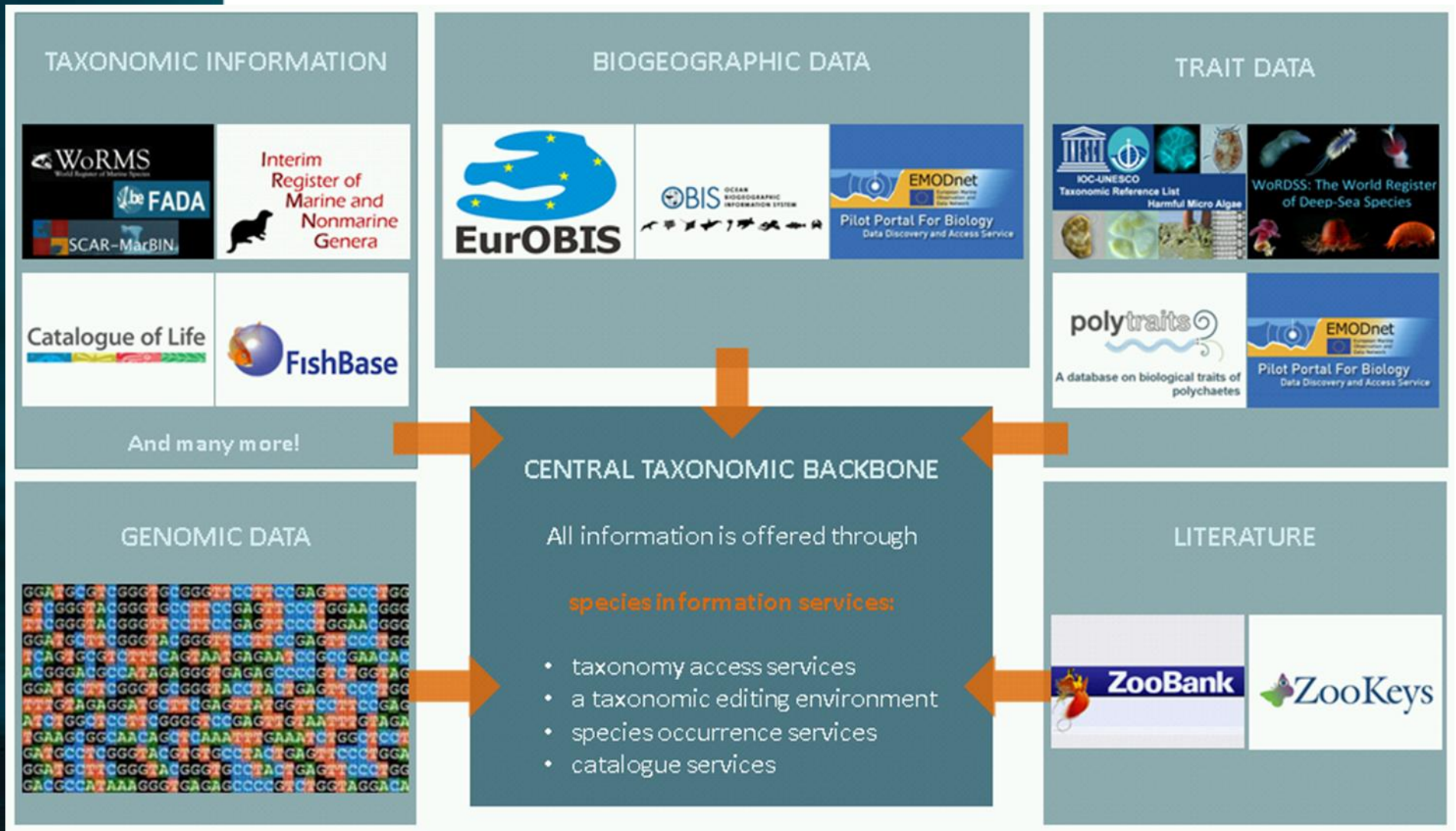
Example questions:

- I'm planning to take a Van Veen benthic grab at a particular location in the North Sea. What species can I expect to capture?
- Which invasive planktonic species are known to occur in the Black Sea?
- Where does species 'X' appear?
- Which species from the Habitat/Bird Directive are on the IUCN Red List?

VLIZ

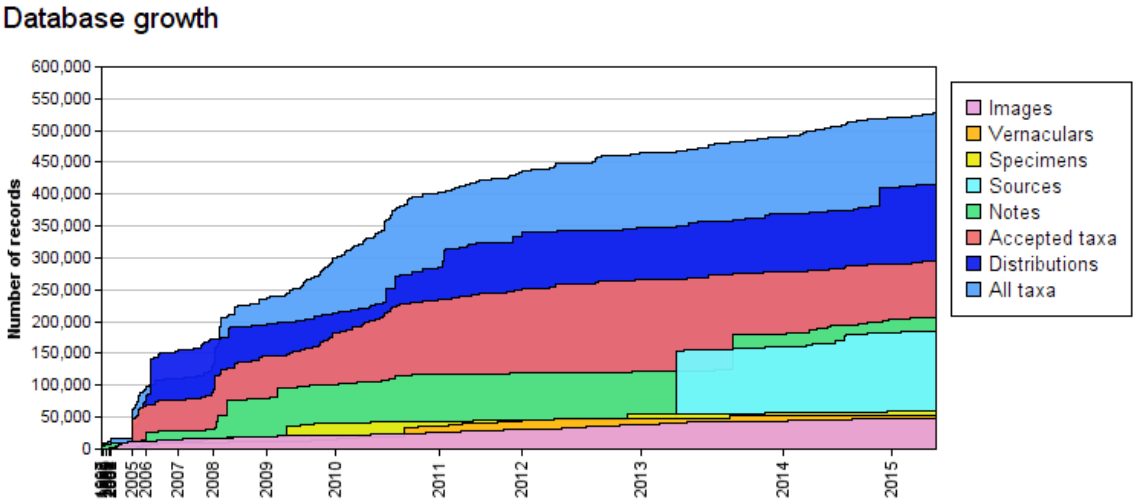
How do we gather the required information?

1) Integrate existing databases



2) Complete & update species data

- Support by
  Data Management Team
- Technical developments



3) Organize & mobilize (taxonomic) experts

Taxonomic backbone: Species names

World Register of Marine Species (WoRMS)

WoRMS
World Register of Marine Species

Freshwater Animal Diversity Assessment (FADA)

FADA

Interim Register of Marine and Nonmarine Genera (IRMNG)

Register of Marine and Nonmarine Genera

Pan-European Species directories Infrastructure (PESI)

EU-NOMEN

Paleobiology Database (PaleoBioDB)

The Paleobiology Database

Integrated Taxonomic Information System (ITIS)

ITIS

WoRMS Currently holds:
229,408 accepted species , of which
96% checked [more stats]

Catalogue of Life (CoL)

Catalogue of Life

FishBase

FishBase

AlgaeBase

algaeBASE

Global Names Index (GNI)

Global Names Index

International Plant Names Index (IPNI)

The International Plant Names Index

Hexacorallians of the World

Hexacorallians of the World

The Reptile Database

ReptileDB

Recent and Fossil Bryozoa

Recent and Fossil Bryozoa

Taxonomic related projects

AquaRES: Aquatic species Register Exchange and Services

AquaRES

Phylum Ctenophora: List of all valid species names

Turbellarian Taxonomic Database

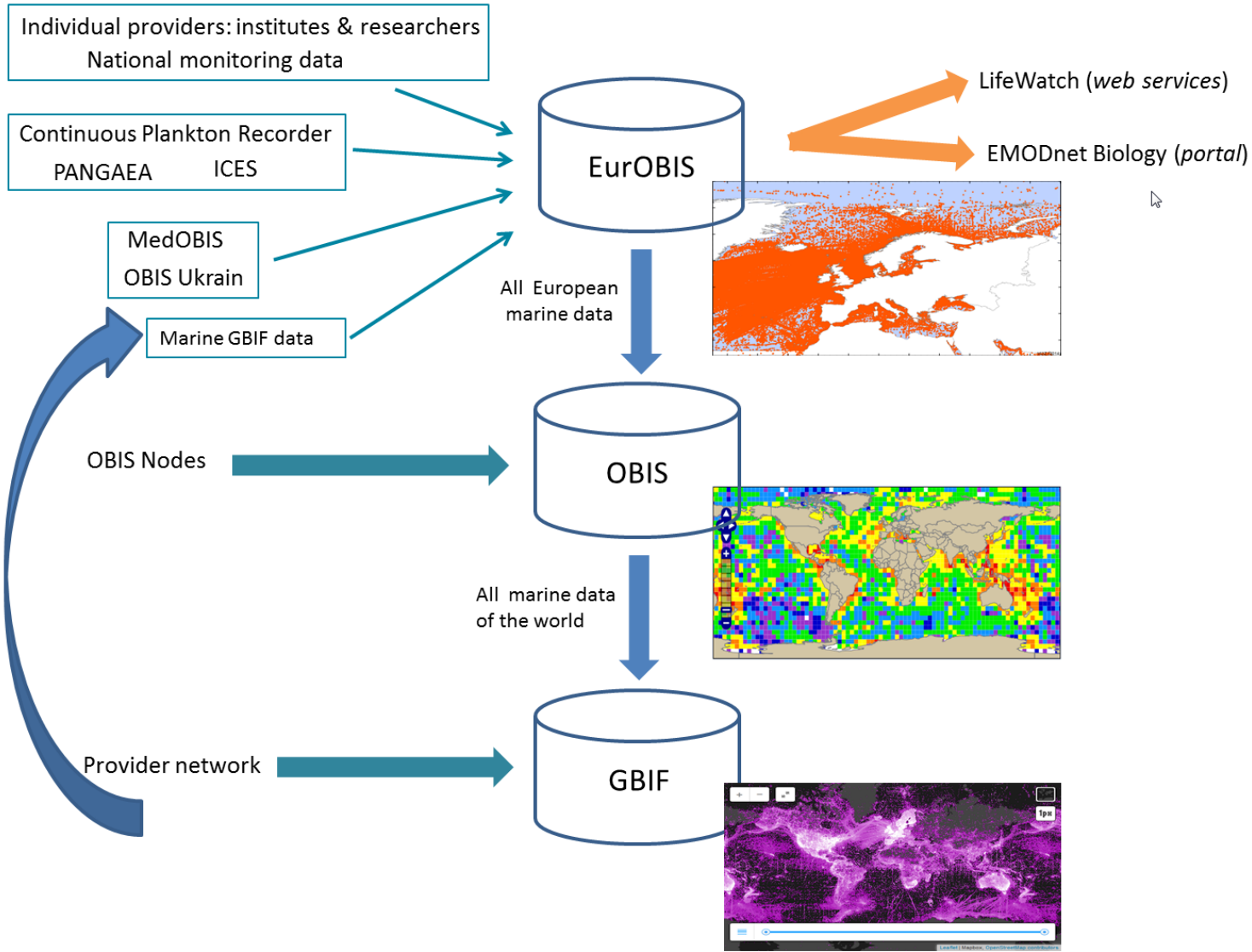
Turbellarian Taxonomic Database

Index Fungorum (IF)

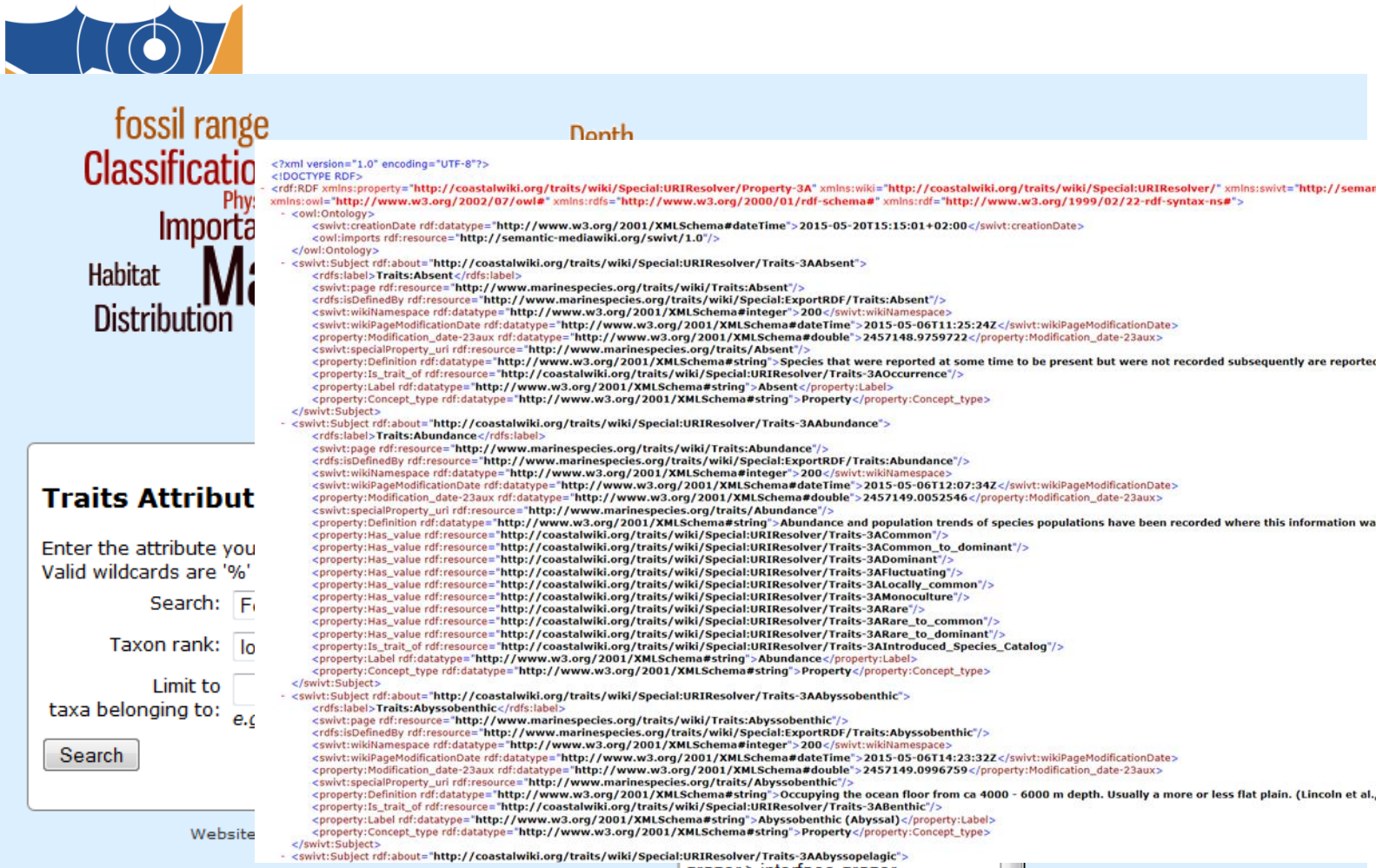
Index Fungorum

VLIZ

Taxonomic backbone: species distribution



Taxonomic backbone: species traits

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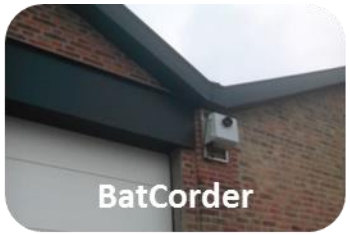
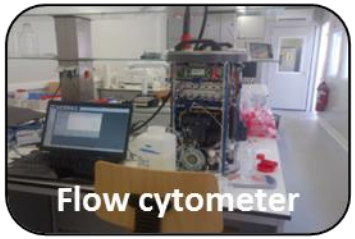
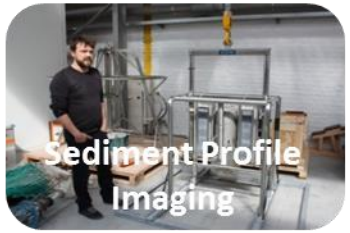
Gathering new observation data -> LW observatory







...

How can you use the taxonomic backbone?

Using Taxonomic Backbone

Web services = systems that allow communication between several computers over the web

⇒ allows integration of services and tools into own scripts or applications

Example:http://geo.vliz.be/geoserver/MarineRegions/wms?service=WMS&version=1.1.0&request=GetMap&layers=MarineRegions:eez&styles=&bbox=-180.000015258789,-85.3755950927734,180.000015258789,87.0239486694336&width=689&height=330&srs=EPSG:4326&format=application/openlayers

http://geo.vliz.be/geoserver/MarineRegions/wms?service=WMS
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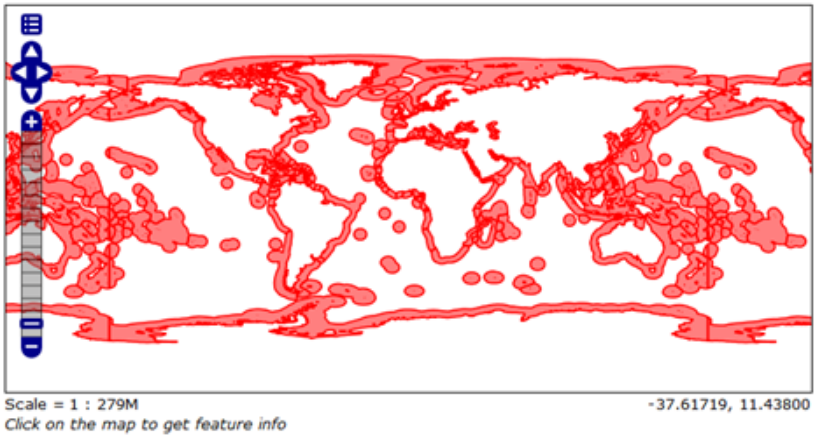
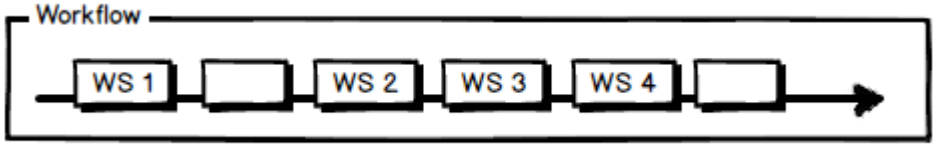


Using Taxonomic Backbone

Workflows = the concatenated use of the data services

=> output first data service is input next data service



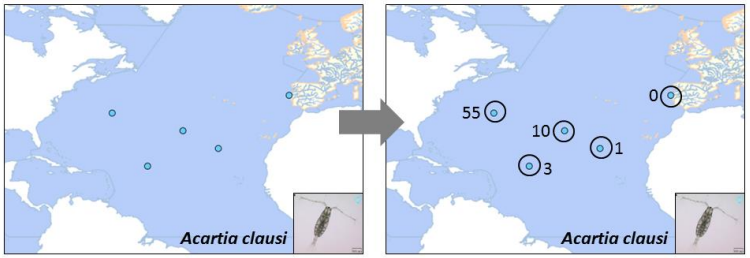
Using Taxonomic Backbone

4 example workflows:

LIFEWATCH Regional portal

USE CASE 1:

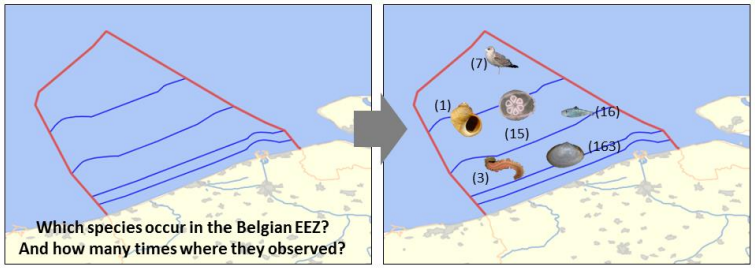
Marine species observations in a 1000m radius around your own observation points



LIFEWATCH Regional portal

USE CASE 2:

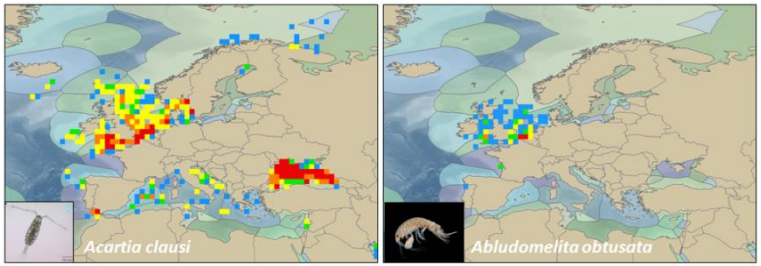
Marine species list and number of observations per geographical area



LIFEWATCH Regional portal

USE CASE 3:

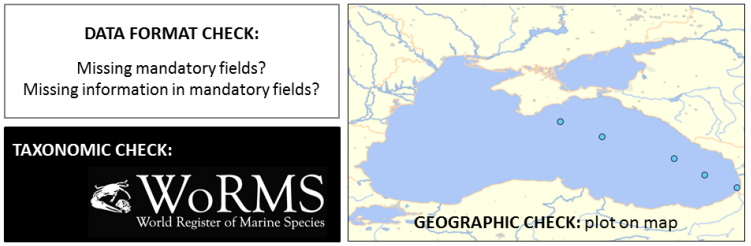
List of geographical areas per marine species



LIFEWATCH Regional portal

USE CASE 4:

Quality control of biodiversity datasets



VLIZ

Using Taxonomic Backbone

USE-CASE 2: Extract a list of species for a specific region, including the number of observations for that region

INPUT = place name(s)

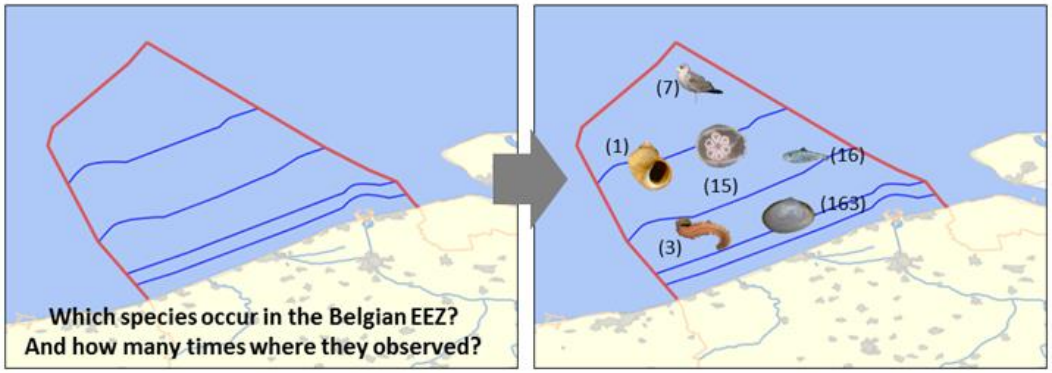
Service 1: "Translation" of place name to coordinates/bounding box

Service 2: Coordinates fed to OBIS

⇒ extract of species list for those coordinates/bounding box

⇒ Calculation of number of observations per species for those coordinates

OUTPUT = list of species with number of available observations in OBIS



http://www.lifewatch.be/data-services

LIFEWATCH Regional portal

Homepage • Project • Data services • Downloads • Sensor network • Login

New job | Results | Manual | Use cases | Changelog

1. Upload your file

Select one of the demo data files and choose from several web services, models and
To work with other data files, please log in.
If you are new to this service, please read the manual.

File

Choose File No file chosen

Use demo file: Marine ▾ View demo file

Allowed filetypes: Marine | Plain text [CSV] | excel [XLS] | excel [XLSX]

Maximum rows in: Terrestrial

2. Select webservices

Name	Source	Description
⊞ Data validation and QC services		
⊞ MarineRegions gazetteer services		
⊞ Taxon observations		
⊞ Taxon services		
⊞ Tidal services		
⊞ Geographical services - Administrative boundaries		
⊞ Geographical services - Bathymetry		
⊞ Geographical services - Biogeographical classification		
⊞ Geographical services - Environmental data		
⊞ Geographical services - Features		
⊞ Geographical services - Protected areas		
⊞ Geographical services - Total biological valuation		

demofile_lifewatch_marine (6) - Notepad

File Edit Format View Help

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Abra prismatica 51.12183        2.603333        2009/03/03T10:48:00Z
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Ammodytes tobianus      51.41667        3.4     2009/03/03T10:48:00Z
Ammodytidae     51.4142 3.321256        2009/03/03T10:48:00Z
ampelisca       51.50783        2.891167        2009/03/03T10:48:00Z
Ampelisca brevicornis   51.52633        2.913833        2009/03/03T10:48:00Z
Ampharete       51.43333        2.808333        2009/03/03T10:48:00Z
Amphilochus manudens    51.5    2.976333        2009/03/03T10:48:00Z
Amphilochus neapolitanus        51.5    2.999667        2009/03/03T10:48:00Z
Amphinema dinema                        2009/03/03T10:48:00Z
Amphipholis squamata    51.52367        2.097   2009/03/03T10:48:00Z
Amphipoda       51.38467        2.7775  2009/03/03T10:48:00Z
Amphiura        51.27667        2.613333        2009/03/03T10:48:00Z
Amphiura brachiata      51.4405 2.900833        2009/03/03T10:48:00Z
Amphiura chiajei        51.24873        2.730233        2009/03/03T10:48:00Z
Amphiura filiformis     51.24873        2.730233        2009/03/03T10:48:00Z
Amphiuridae     51.2465 2.726167        2009/03/03T10:48:00Z
Ampithoe        51.2505 2.734667        2009/03/03T10:48:00Z
Anapagurus hyndmanii    51.2465 2.726167        2009/03/03T10:48:00Z
Anarhichas lupus        51.2505 2.734667        2009/03/03T10:48:00Z
Anchialina agilis                       2009/03/03T10:48:00Z
Anguilla anguilla       51.30833        2.85    2009/03/03T10:48:00Z
Angulus tenuis  51.30833        2.85    2009/03/03T10:48:00Z
Anomia  51.53333        2.765   2009/03/03T10:48:00Z
Anomura 51.51667        3.316667        2009/03/03T10:48:00Z
Anoplodactylidae        51.60133        2.83    2009/03/03T10:48:00Z
Anoplodactylus petiolatus       51.61833        2.955   2009/03/03T10:48:00Z
```

3. Verify order, change order if necessary and run

Selected services

http://www.lifewatch.be/data-services

LIFEWATCH
Regional portal

Homepage | Project | Data services | Downloads | Sensor network | Login

New job | Results | Manual | Use cases | *Changelog*

1. Upload your file

Select one of the demo data files and choose from several web services, models and applications to process the data.
To work with other data files, please log in.
If you are new to this service, please read the manual.

File
Choose File | No file chosen

Use demo file: Marine | View demo file
Allowed filetypes: Marine | Terrestrial | Plain text [CSV] | excel [XLS] | excel [XLSX]
Maximum rows in

Heading: First row contains column names
Column delimiter: Tab
Decimal symbol: Point(.)
Data format: lifew… | obis

2. Select webservices

Name	Source	Description	Environment	Status
⊞ Data validation and QC services				
⊞ MarineRegions gazetteer services				
⊞ Taxon observations				
⊞ Taxon services				
⊞ Tidal services				
⊞ Geographical services - Administrative boundaries				
⊞ Geographical services - Bathymetry				
⊞ Geographical services - Biogeographical classification				
⊞ Geographical services - Environmental data				
⊞ Geographical services - Features				
⊞ Geographical services - Protected areas				
⊞ Geographical services - Total biological valuation				

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⊞ Taxon observations				
⊞ Taxon services				
⊞ Tidal services				
⊞ Geographical services - Administrative boundaries				
⊞ Geographical services - Bathymetry				
⊞ Geographical services - Biogeographical classification				
⊞ Geographical services - Environmental data				
⊞ Geographical services - Features				
⊞ Geographical services - Protected areas				
⊞ Geographical services - Total biological valuation				

3. Verify order, change order if necessary and run

Selected services

http://www.lifewatch.be/data-services

LIFEWATCH Regional portal

Homepage • Project • Data services • Downloads • Sensor network • Logged in as: Stefanie Dekeyzer [Log out]

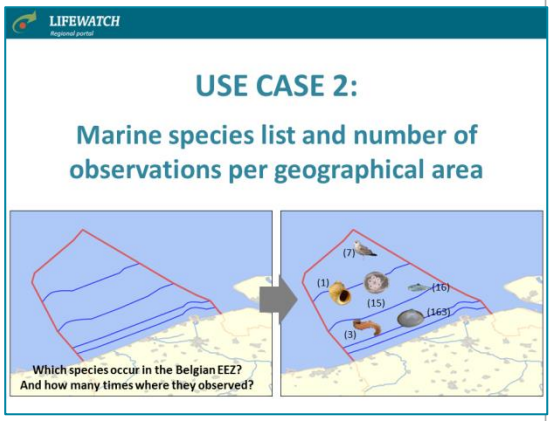
2. Select webservices

	Name	Source	Description	Environment	Status
⊞	**Data validation and QC services**				
⊞	**MarineRegions gazetteer services**				
☐	Get lat-long by accepted name	MarineRegions	Returns the latitude, longitude,accepted name and the Marine Regions ID (MRGID) of a given gazetteer... Read more	Marine & terrestrial	Good
☐	Get lat-long by mrgid	MarineRegions	Returns the latitude and longitude of the centroid and the preferred gazetteer name of a Marine Regi... Read more	Marine & terrestrial	Good
☑	Get lat-long by name	MarineRegions	Returns the latitude, longitude, matched name and the Marine Regions ID (MRGID) of a given gazetteer... Read more	Marine & terrestrial	Good
☐	Get gazetteer name by Lat-long	MarineRegions	Returns the Marine Regions place name and the Marine Regions ID (MRGID) of the bounding box (radius ... Read more	Marine & terrestrial	Good
⊞	**Taxon observations**				
☐	Number of observations in a 1000m radius around a point	OBIS	Gives the number of observations of a taxon in a radius of 1000 meter around a point.	marine	Good
☑	Taxon list of a certain region	OBIS	Gives a taxon list based on observations from the obis database for a certain region (mrgid as input... Read more	marine	Good
☐	Number of observations of a marine taxon	OBIS	Returns all observation points (latitude and longitude) in the Ocean Biogeographic Information Syste... Read more	marine	Good
⊞	**Taxon services**				
⊞	**Tidal services**				
⊞	**Geographical services - Administrative boundaries**				
⊞	**Geographical services - Bathymetry**				
⊞	**Geographical services - Biogeographical classification**				
⊞	**Geographical services - Environmental data**				
⊞	**Geographical services - Features**				
⊞	**Geographical services - Protected areas**				
⊞	**Geographical services - Total biological valuation**				

3. Verify order, change order if necessary and run

Selected services

- Get lat-long by name ×
- Taxon list of a certain region ×



1. Get lat-long by name
2. Taxon list of a certain region

http://www.lifewatch.be/data-services

LIFEWATCH Regional portal • Homepage • Project • Data services • Downloads • Sensor network • Logged in as: Stefanie Dekeyzer [Log out]

New job | Results | Manual | Use cases — Changelog

Your job is in progress.
If there are validation errors, they will appear on top.

To submit another job, click on the button 'newjob'. To view all jobs, click on the button 'results'.

new job | Results

LIFEWATCH Regional portal • Homepage • Project • Data services • Downloads • Sensor network • Logged in as: Stefanie Dekeyzer [Log out]

New job | Results | Manual | Use cases — Changelog

Below you will find a list of previously executed jobs. refresh table

jobs

date	filename	resultreport	resultfile	status	comment
2014-09-03 15:00	test_file_use_case_2.txt	open	9358_test_file_use_case_2.txt	done	
2014-06-30 09:44	lifewatch_check_kerkyra.txt	open	8292_lifewatch_check_kerkyra.txt	done	
2014-06-30 09:44	lifewatch_check_kerkyra.txt	open	8291_lifewatch_check_kerkyra.txt	done	

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Report

http://www.lifewatch.be/data-services

Job properties

Name: Dekeyzer Stefanie
Number job: 5816
Comment:
Inputfile: test_file_use_case_2.txt
Resultfile: 5816_test_file_use_case_2.tab

Requested Services (2)

- Get lat-long by name
- Get a taxon list of a certain region (mrgid)

Resultfile

Results - Get lat-long by name

Number of no exact match(es) :0
Number of fuzzy match(es) :0
Number of no match(es) :0
Number of error(s) :0
Number of exact match(es) :19

Results - Get a taxon list of a certain region (mrgid)

Wandelaar: Number of unique species found in OBIS => 0
Belgian Exclusive Economic Zone: Number of unique species found in OBIS => 6805
North Sea: Number of unique species found in OBIS => 5147
Central North Sea: Number of unique species found in OBIS => 15930
Northern North Sea: Number of unique species found in OBIS => 15930
Southern North Sea: Number of unique species found in OBIS => 17025
German part of the North Sea: Number of unique species found in OBIS => 5147
Danish part of the North Sea: Number of unique species found in OBIS => 4487
Dutch part of the North Sea: Number of unique species found in OBIS => 7258
Norwegian part of the North Sea: Number of unique species found in OBIS => 5692
French part of the North Sea: Number of unique species found in OBIS => 2757
United Kingdom part of the North Sea: Number of unique species found in OBIS => 10224
Belgian part of the North Sea: Number of unique species found in OBIS => 6805
North Sea Bottom Current: Number of unique species found in OBIS => 6805

Legend - added fields

added_row_ws	Indicates which service has added the row to the result file
aphiaid	Unique identifier within the Aphia database
Latitude_by_name	
Longitude_by_name	
matched_name	the name of the matching marineregions gazetteer name
mrgid_by_name	
required_fields_check	Are the required fields present and completed? (1=yes, 0=no)
Scientific_name	Name of taxon
taxonlist_mrgid_note	Note on taxonlist for mrgid

VLIZ

List of species for the North Sea

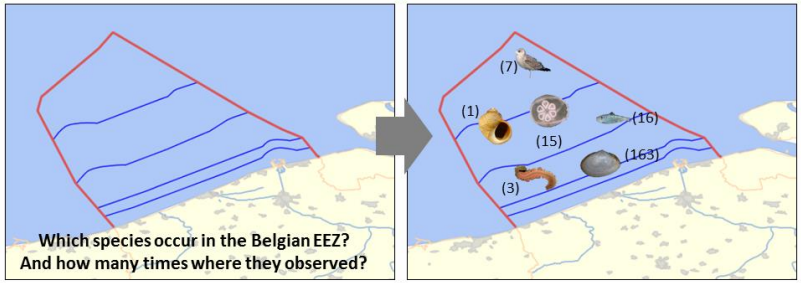
Number of observations for that species in the North Sea

	A	B	C	D	E	F	G	H	I	J	K	L
1	location	required_fields_check	latitude_by_name	longitude_by_name	matched_name	mrgid_by_name	scientific_name	aphiaid	tax	added_row_ws	num_observation	
6812	North Sea	1	5.596.853	5.596.853	North Sea	2350						
6813							Microcystis wesenbergii	146561		taxonlist_mrgid	1	
6814							Ampharetinae	152252		taxonlist_mrgid	7	
6815							Culicimorpha	150928		taxonlist_mrgid	5	
6816							Raniceps raninus	126442		taxonlist_mrgid	1	
6817							Munnidae	118263		taxonlist_mrgid	5	
6818							Protohydridae	22788		taxonlist_mrgid	1	
6819							Rhodophyta	852		taxonlist_mrgid	50	
6820							Rhizostoma	135257		taxonlist_mrgid	5	
6821							Talorchestia	101788		taxonlist_mrgid	1	
6822							Gyrodinium spirale	109876		taxonlist_mrgid	1	
6823							Pyramidellinae	224522		taxonlist_mrgid	1	
6824							Eulimidae	135		taxonlist_mrgid	3	
6825							Hirudinea	2041		taxonlist_mrgid	1	
6826							Thalassiosira nitzschioides	149227		taxonlist_mrgid	1	
6827							Proclea	129711		taxonlist_mrgid	1	
6828							Phaxas	138335		taxonlist_mrgid	18	
6829							Clytia	117030		taxonlist_mrgid	119	
6830							Cellaria salicornia	153836		taxonlist_mrgid	1	
6831							Scopelocheirus hopei	102720		taxonlist_mrgid	1	
6832							Pasiphaea sivado	107677		taxonlist_mrgid	2	
6833							Laminariaceae	143755		taxonlist_mrgid	2	
6834							Margelopsis	117151		taxonlist_mrgid	32	
6835							Halaphanolaimus longisetosus	121257		taxonlist_mrgid	1	
6836							Cydippida	1251		taxonlist_mrgid	458	
6837							Metopa	101764		taxonlist_mrgid	1	
6838							Carpelimus (Taenosoma) foveolatus	150688		taxonlist_mrgid	2	
6839							Dictyosphaerium pulchellum	178933		taxonlist_mrgid	3	
6840							Lagerheimia genevensis	178610		taxonlist_mrgid	3	
6841							Delavalia	347056		taxonlist_mrgid	11	
6842							Nassarius nitidus	140509		taxonlist_mrgid	1	
6843							Choniolaimus papillatus	120928		taxonlist_mrgid	2	
6844							Monhysteridae	2188		taxonlist_mrgid	137	
6845							Chaetonotus (Schizochaetonotus)	371021		taxonlist_mrgid	1	
6846							Microlaimus pinguis	153418		taxonlist_mrgid	3	
6847							Heterocheila	151022		taxonlist_mrgid	2	
6848							Ironidae	2199		taxonlist_mrgid	121	
6849							Alosa fallax	126415		taxonlist_mrgid	15	
6850							Jania	144012		taxonlist_mrgid	1	
6851							Lymnocardiinae	381865		taxonlist_mrgid	17	
6852							Strombidiidae	1703		taxonlist_mrgid	1	
6853							Tomopteris krampi	131556		taxonlist_mrgid	1	
6854							Antithamnionella ternifolia	163275		taxonlist_mrgid	2	
6855							Pherusa flabellata	130110		taxonlist_mrgid	1	

LIFEWATCH
Regional portal

USE CASE 2:

Marine species list and number of observations per geographical area



Using Taxonomic Backbone

WORKSHOP: Biodiversity data preparation and analysis using LifeWatch virtual labs and web services

- Some of the **skills** that are taught are...
  - Retrieving and working with web services (REST, OGC WMS/WFS, Biodiversity catalogue, GeoNetwork, etc.)
  - Biodiversity data standardization and quality control (taxon matching, geographic quality control, etc.)
  - Building analysis workflows in R, Taverna, LifeWatch e-lab, etc.
- **Organizers:** VLIZ-Flanders Marine Institute
- **Duration:** one and a half - two days
- **Venue:** Oostende
- **Date:** November 26-27 (2015)
- **Price:** free

VLIZ

Conclusions

Conclusions

- LifeWatch supports biodiversity research and ecosystem studies
- Taxonomic backbone offers online access to species information
- Research & data tools are based on web services and workflows
- Register for the workshop

VLIZ