Lifewatch

- Large scale european research infrastructure
- Virtual laboratory for study of biodiversity
- E-science, web services, data services, ICT Infrastructure, HPC, GRID, BIG data, workflow
- Increase data generation, real time monitoring data, biosensors
- Construction : 5 years, operation > 20 years

ESFRI European Strategy Forum on Research Infrastructures

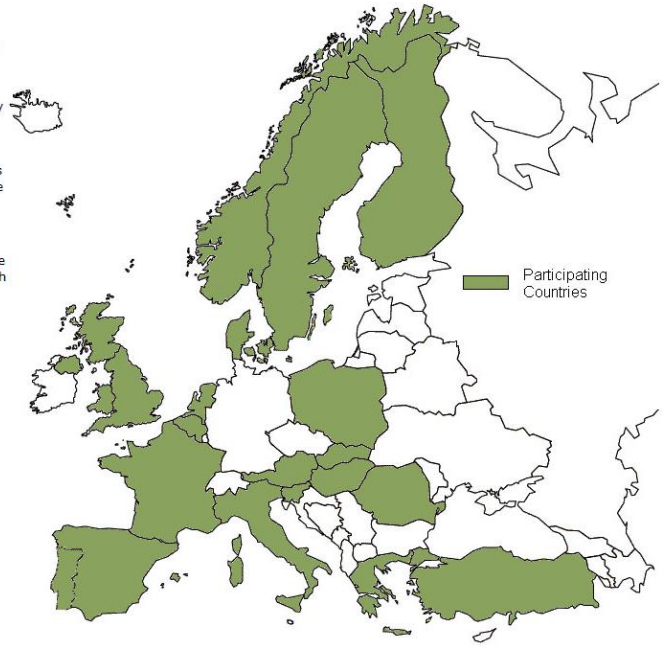
Lifewatch.eu

Participating countries

By March 2008, nineteen countries have already designated a representative in the Policy & Science Board of the Life Watch Preparatory Phase project. Further representative participants may be added during this project. The representatives act as liaison between the project consortium as a whole, which is making the preparations for the future infrastructure, and the policy makers at the national level.

Find more information about the LifeWatch developments in each country:

- AUSTRIA
- BELGIUM
- DENMARK
- FINLAND
- FRANCE
- GREECE
- HUNGARY
- ITALY
- NETHERLANDS
- NORWAY
- POLAND
- PORTUGAL
- ROMANIA
- SLOVAK REPUBLIC
- SLOVENIA
- SPAIN
- SWEDEN
- TURKEY
- UNITED KINGDOM



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.

LIFEWATCH PHASES

LIFEWATCH

Lifewatch.be

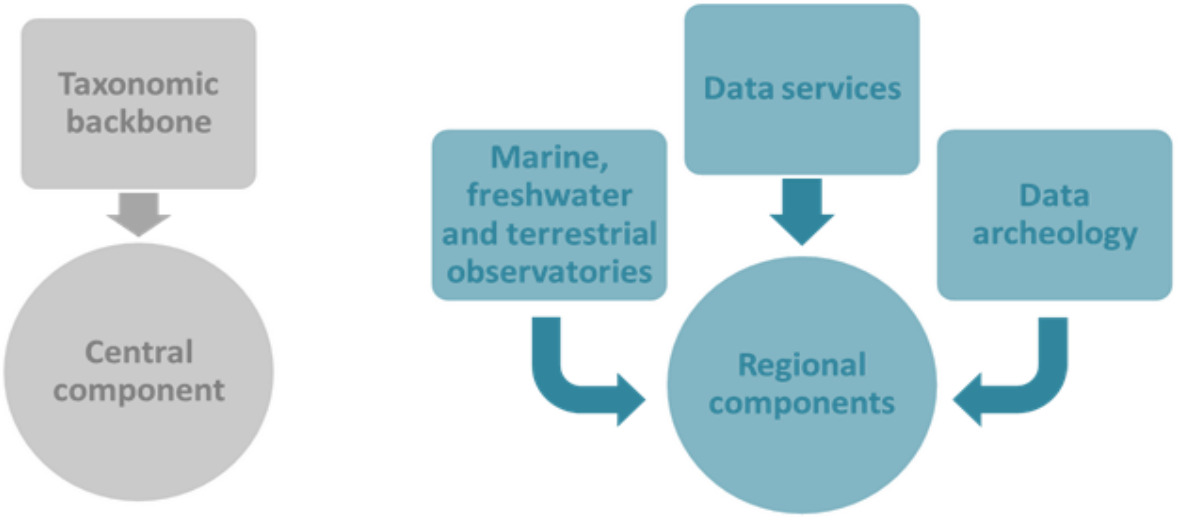
FLEMISH CONTRIBUTIONS

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.be
Antarctic observations

AntaBIF

Funded by the Belgian Science Policy Office, the AntaBIF project develops an **innovative Antarctic biodiversity information system, giving access to a distributed network of contributing databases**, according to the principles of the Global Biodiversity Information Facility (GBIF). AntaBIF builds a new data discovery tool using two complementary networks and will expand these by using an advanced technical architecture, capable of linking with many potential data resources.

ANTABIF integrates the Scientific Committee on Antarctic Research - Marine Biodiversity Information Network (SCAR-MarBIN), with the biodiversity databases managed by the Australian Antarctic Division, bringing together data from marine and terrestrial realms.

ANTABIF is the data management tool and repository for the biodiversity-related research conducted at the Princess Elisabeth Antarctica - Polar Research Station. The project uses the best available technology to integrate, share and disseminate all available information on Antarctic Biodiversity.

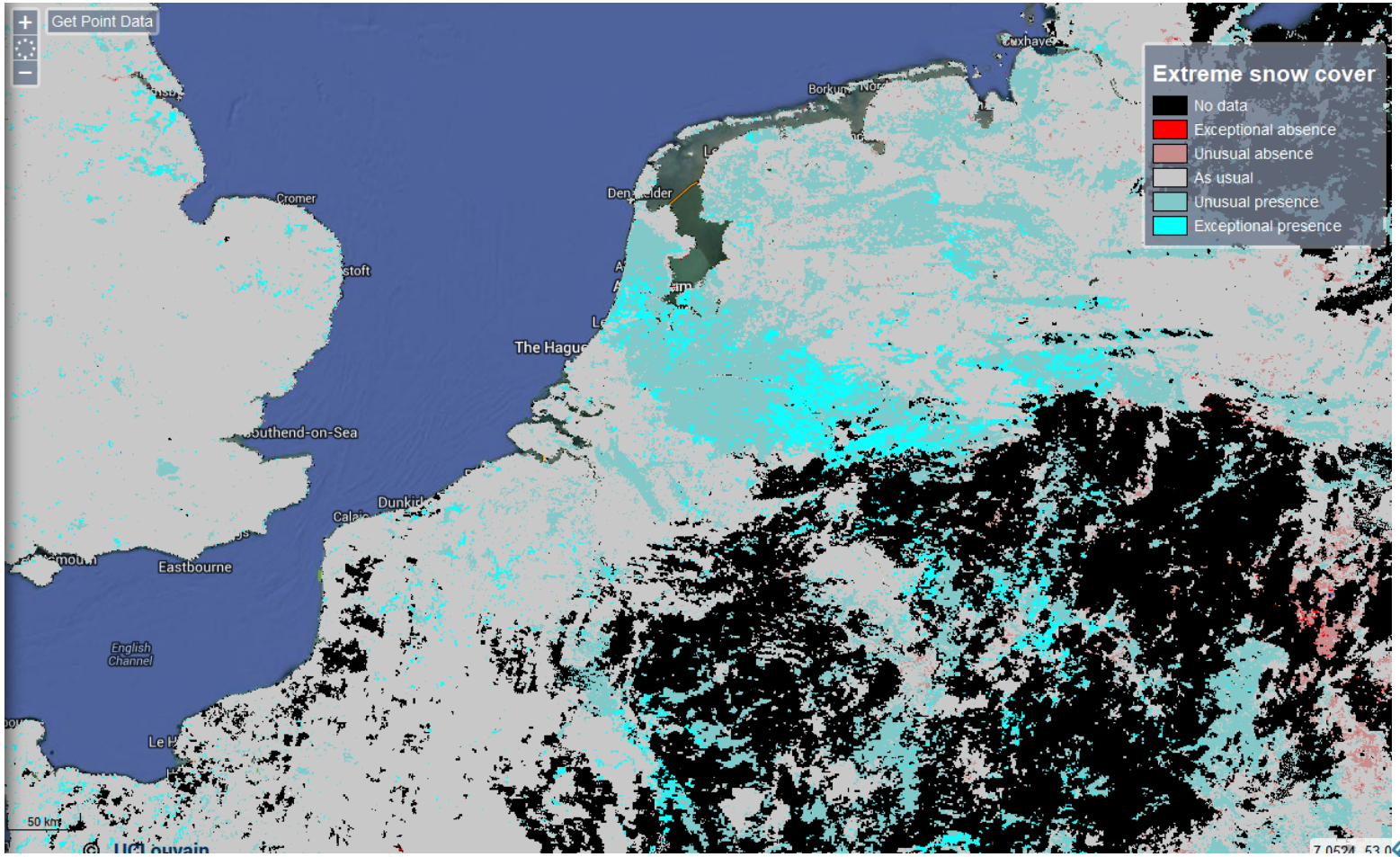
Its implementation by the Belgian Biodiversity Platform ascertains that ANTABIF can take advantage of the relevant experience of the Belgian GBIF node.

ANTABIF is steered by an International Steering Committee composed of selected experts in the field of Polar biodiversity.

For more information on AntaBIF, please contact Anton Van de Putte.

belspo SCAR Biodiversity.be museum BIODIVERSITY.AQ

Lifewatch.be
Habitat data from remote sensing



Lifewatch.be
Data archeology

DATA ARCHAEOLOGY

a) Dataset inventory

Relevant datasets will be identified based on:
1) Literature (present)
2) Interviews with data collectors (future)
3) Expert opinion on data needs (future)

A selection of reports and theses from the Belgian Marine Bibliography (BMB) already exists. This selection identified 1369 possible datasets. The BMB focuses on research activities performed by Belgian scientists or in the Belgian Part of the North Sea.

b) Prioritization

Prioritization is needed for relevance and scope, data type, time period, geographic area, functional group, risk of loss, ease of digitization, data availability and the expert's insight.

c) Data capture

Data in old publications will be digitized. Data owners will be contacted to retrieve data files. If the data cannot be delivered by the data owner, data will be digitized from the publication. All data will be stored in a standard data format.

d) Metadata generation

All datasets will be described using the Integrated Marine Information System (IMIS). All metadata will be disclosed through the LifeWatch.be website.

e) Data integration and archiving

All data will be integrated in the LifeWatch data systems. The data formats will be stored in the Marine Data Archive (MDA) to ensure availability for future research.

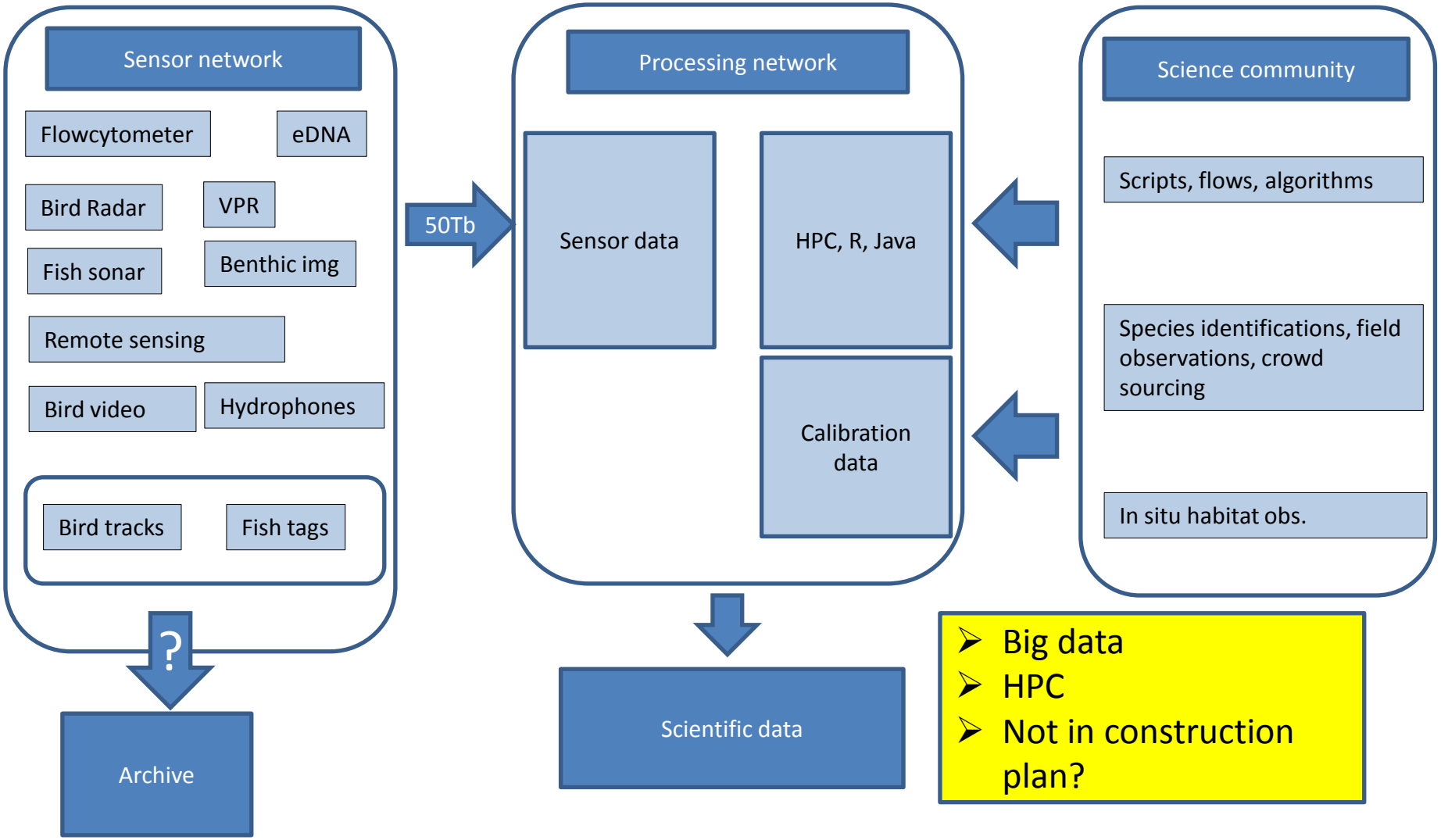
f) Data accessibility

All captured data will be made available through the LifeWatch infrastructure.

VLIZ

HERCULES STICHTING

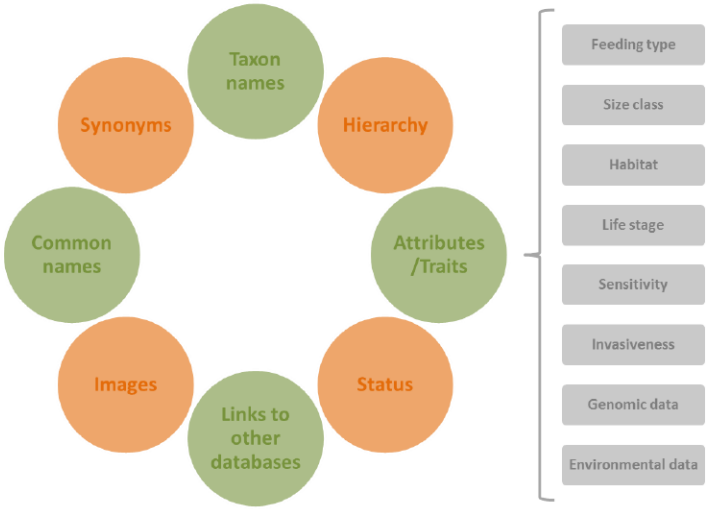
Lifewatch.be
Collaborative platform for sensor data processing



Lifewatch.be
Taxonomic backbone

CONTENT

The data required within a taxonomic backbone can vary depending on the needs and demands of the biodiversity and ecosystem research community. However, based on previous experience and discussions a set of key taxonomic and species/taxon related information could be defined :



Integrating existing databases and building access services

The first level aims at setting up a central taxonomic backbone by integrating the existing databases as contributing components and build access services bringing the data to the LifeWatch infrastructure.

Supporting database management

The second level aims at completing and updating the taxonomic and species related data in the different component databases. **Currently** the following actions have been undertaken: digitization of publications (e.g. marine viruses, insects, Kinoryncha), completing taxonomic gaps (Mollusca, Ostracoda) by working with editor grants, updating global and regional lists. **Currently** the focus is on updating WoRMS, FADA and SCAR-MarBIN.

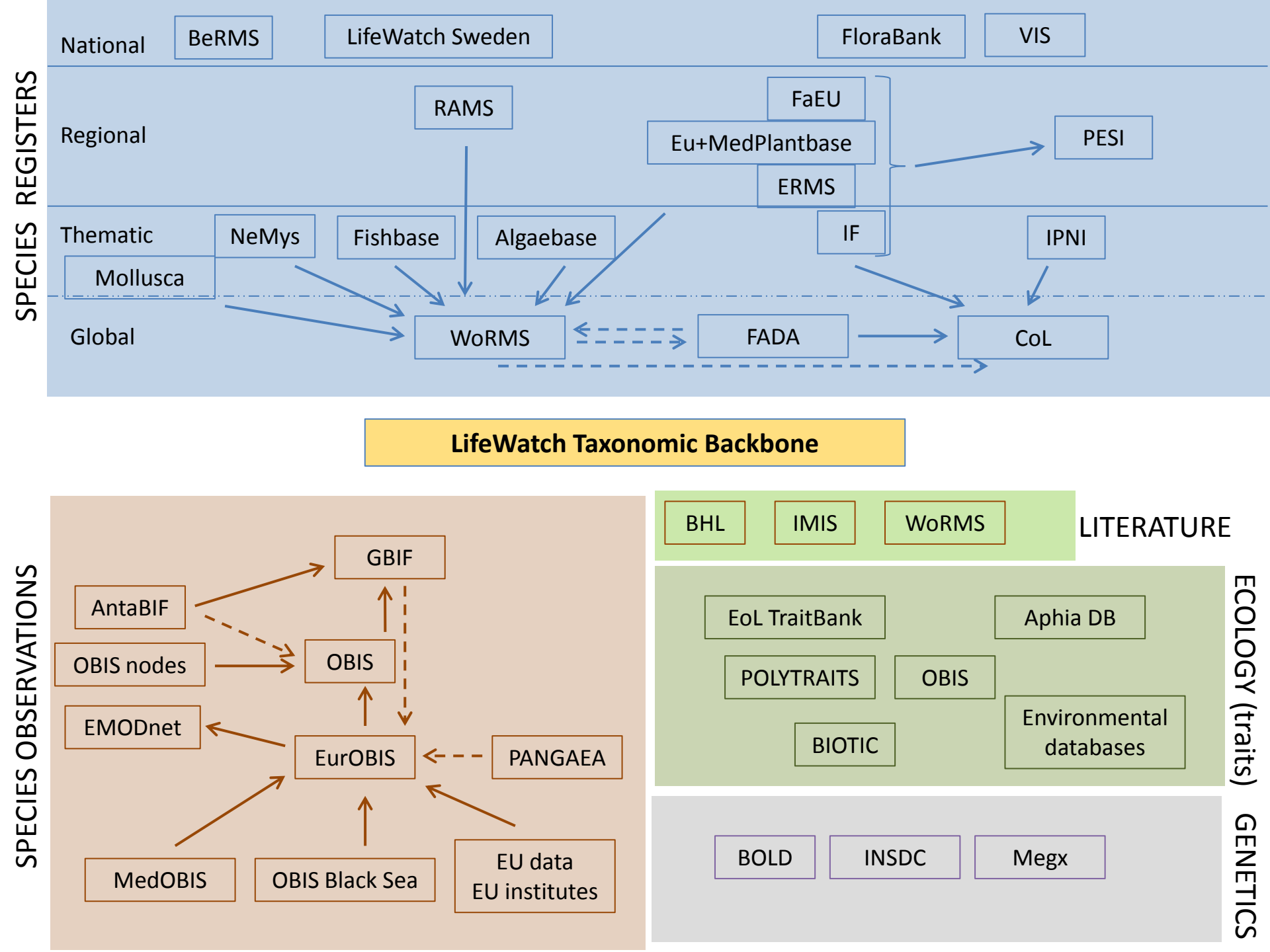
WoRMS World Register of Marine Species | .be FADA | SCAR-MarBIN

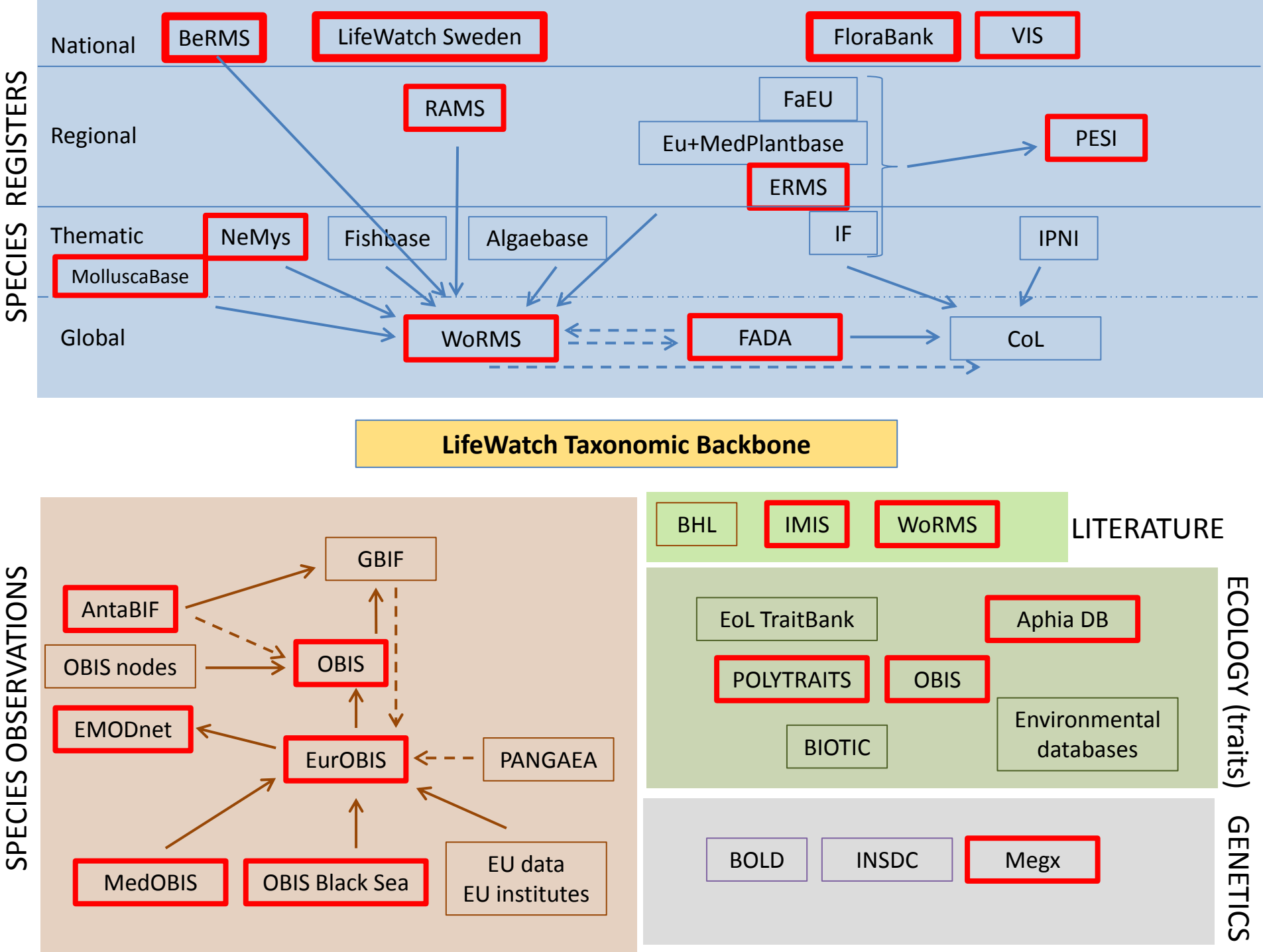
Supporting taxonomic societies

The third level aims to organize and mobilize the taxonomic experts that provide the data by supporting the taxonomy societies in which they participate. LifeWatch will provide logistic and financial support for workshops and meetings with and between the societies.

VLIZ

HERCULES STICHTING


SPECIES REGISTERS
National
BeRMS
LifeWatch Sweden
FloraBank
VIS
Regional
RAMS
FaEU
Eu+MedPlantbase
ERMS
PESI
Thematic
NeMys
Fishbase
Algaebase
IF
IPNI
Mollusca
Global
WoRMS
FADA
CoL
LifeWatch Taxonomic Backbone
SPECIES OBSERVATIONS
GBIF
AntaBIF
OBIS nodes
OBIS
EMODnet
EurOBIS
PANGAEA
MedOBIS
OBIS Black Sea
EU data
EU institutes
BHL
IMIS
WoRMS
LITERATURE
EoL TraitBank
Aphia DB
POLYTRAITS
OBIS
Environmental databases
BIOTIC
ECOLOGY (traits)
BOLD
INSDC
Megx
GENETICS


SPECIES REGISTERS
National
Regional
Thematic
Global
BeRMS
LifeWatch Sweden
FloraBank
VIS
RAMS
FaEU
Eu+MedPlantbase
ERMS
PESI
NeMys
MolluscaBase
Fishbase
Algaebase
IF
IPNI
WoRMS
FADA
CoL
LifeWatch Taxonomic Backbone
SPECIES OBSERVATIONS
GBIF
AntaBIF
OBIS nodes
OBIS
EMODnet
EurOBIS
PANGAEA
MedOBIS
OBIS Black Sea
EU data
EU institutes
BHL
IMIS
WoRMS
LITERATURE
EoL TraitBank
Aphia DB
POLYTRAITS
OBIS
Environmental databases
BIOTIC
ECOLOGY (traits)
BOLD
INSDC
Megx
GENETICS

LifeWatch taxonomic backbone available web services

- Taxon services
  - Get ID's and taxon authorities (PESI & WoRMS)
  - Get distributions for a specific taxon ID (PESI & WoRMS)
  - Get scientific name for common name (PESI & WoRMS)

  - Taxon match: match scientific name with several species registers:
    - WoRMS
    - Catalogue of Life (CoL)
    - Integrated Tax. Information System (ITIS)
    - Pan-European Species Directories (PESI)
    - International Plant Names Index (IPNI)
    - Index Fungorum (IF)
    - Global Names Index (GNI)
    - PaleoDB
    - African Register of Marine Species (AfReMaS)

- Geographical services

  Based on latitude-longitude:
  - Get ICES Ecoregions
  - Get IHO sea areas
  - Get Large Marine Ecosystems of the World
  - …

LifeWatch taxonomic backbone - concept

Example questions to be answered by the taxonomic backbone:

- – *Which (macro)benthic species live in the North Sea at depths between 50-100m?*
  - Input:
    - ✓ Trait(s): benthos (macro)
    - ✓ Biogeography: North Sea; defined depth-range
  - Output:
    - ✓ Taxonomy (based on WoRMS): species list

✓ – *Where does species X appear?*

+/- – *Which invasive pelagic species are known to occur in the Black Sea?*

- – *Which species from the Habitat/Bird Directive are on the IUCN Red List?*

✓ – *How does my marine species list relate to the African Register of Marine Species?*

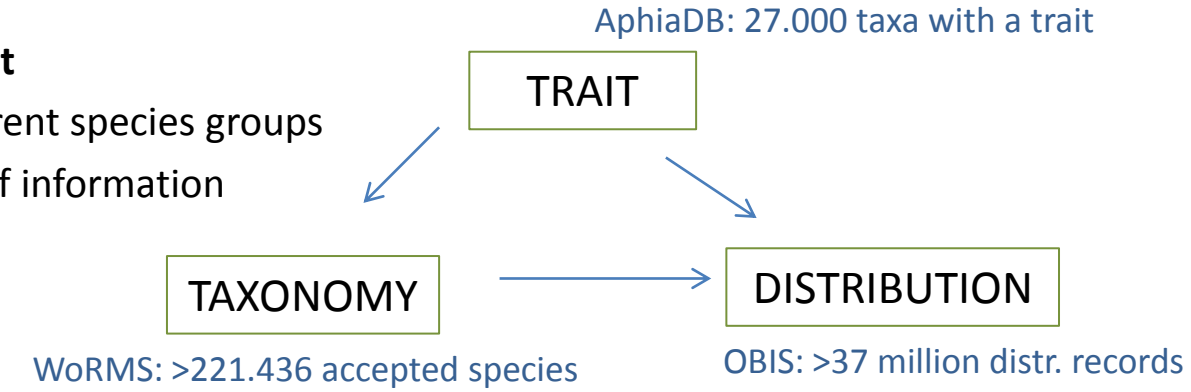
– *…*

=> *LifeWatch data services available (or in development) to answer these questions*

LifeWatch taxonomic backbone traits and observations

World databases of marine species have now been established but are limited to taxonomic (e.g. WoRMS) and distribution (e.g. OBIS) data. The benefits of these databases could be multiplied by associating species with richer ecological and biological information.

- **EDMONET marine trait project**
  - Document traits for different species groups
  - Literature => tracebility of information



2 types of traits:

1. Expert based
2. Derived from observations

For both, standardized (accepted) trait vocabularies should be used
=> data integration & comparison possible

Traits – some examples:

- Feeding type
- Size class
- Habitat
- Sensitivity
- Invasiveness
- …

LifeWatch taxonomic backbone – interface

Offer users an easy-to-use and interactive interface, including web services

1. ***Simple search:***
   - ✓ Search taxon name
   - ✓ Get overview of systems holding this name and related info

LIFEWATCH
Regional portal

Taxonomic backbone

Simple search - result

Species Y Linnaeus, 1758

Available in: WoRMS World Register of Marine Species | .be FADA | SCAR-MarBIN

Taxonomy

WoRMS: Animalia – Mollusca – Bivalvia - …
FADA: Animalie – Mollusca – Bivalvia - …
RAMS: Animalia – Mollusca – Bivalvia - …

Occurrence - distribution

Show map, based on literature-derived occurrences (WoRMS / FADA / RAMS) and actual distributions from e.g. EurOBIS

Traits

List systems where trait-info is available (environment, status, ecology …)
Link to TraitBank from EoL?

Vernaculars

WoRMS: 20 vernaculars
FADA: not found
RAMS: 20 vernaculars

Literature

WoRMS : 7 sources (link), including:
- original description (link)
- redescription (link)
- identification guide: 2 (links)

FADA: not found

RAMS: 3 sources (link), including:
- original description (link)
- redescription (link)

BHL: X results (link)

IMIS / OCR: Y results (link)

Images

WoRMS: 10 images
FADA: not found
RAMS: 6 images

2. *Advanced search:*

Example: which invasive pelagic species are known to occur in the Black Sea? Where are they found?

Search criterium 1:

-Trait = pelagic

(pick-lists of traits, organized per trait group or category)

AND

Search criterium 2:

- Trait = invasive

AND

Search criterium 3:

-Geographic area = Black Sea

=> or give area by bounding box

=> or pick-lists of IHO / EEZ / country

AND

Search criterium 4:

- Limit to species belonging to … (specify taxon group)

Select your results output:

- Species list (with classification)

- List of available distribution records

- Map available distribution records

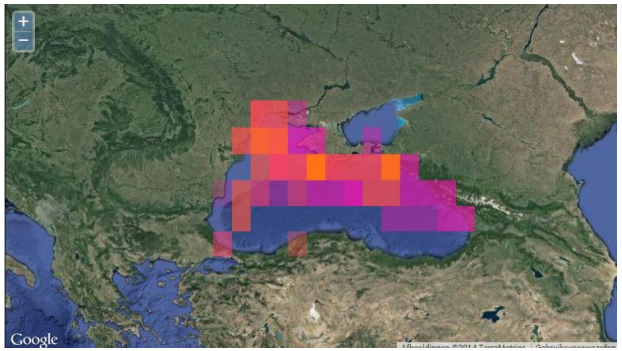
Advanced search – result:

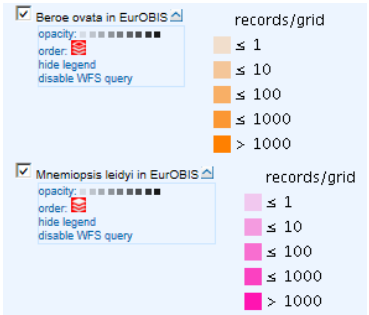
Search results for “pelagic – invasive – Black Sea”

Species list *[view] [download]*
- Mnemiopsis leidyi
- Beroe ovata
- …

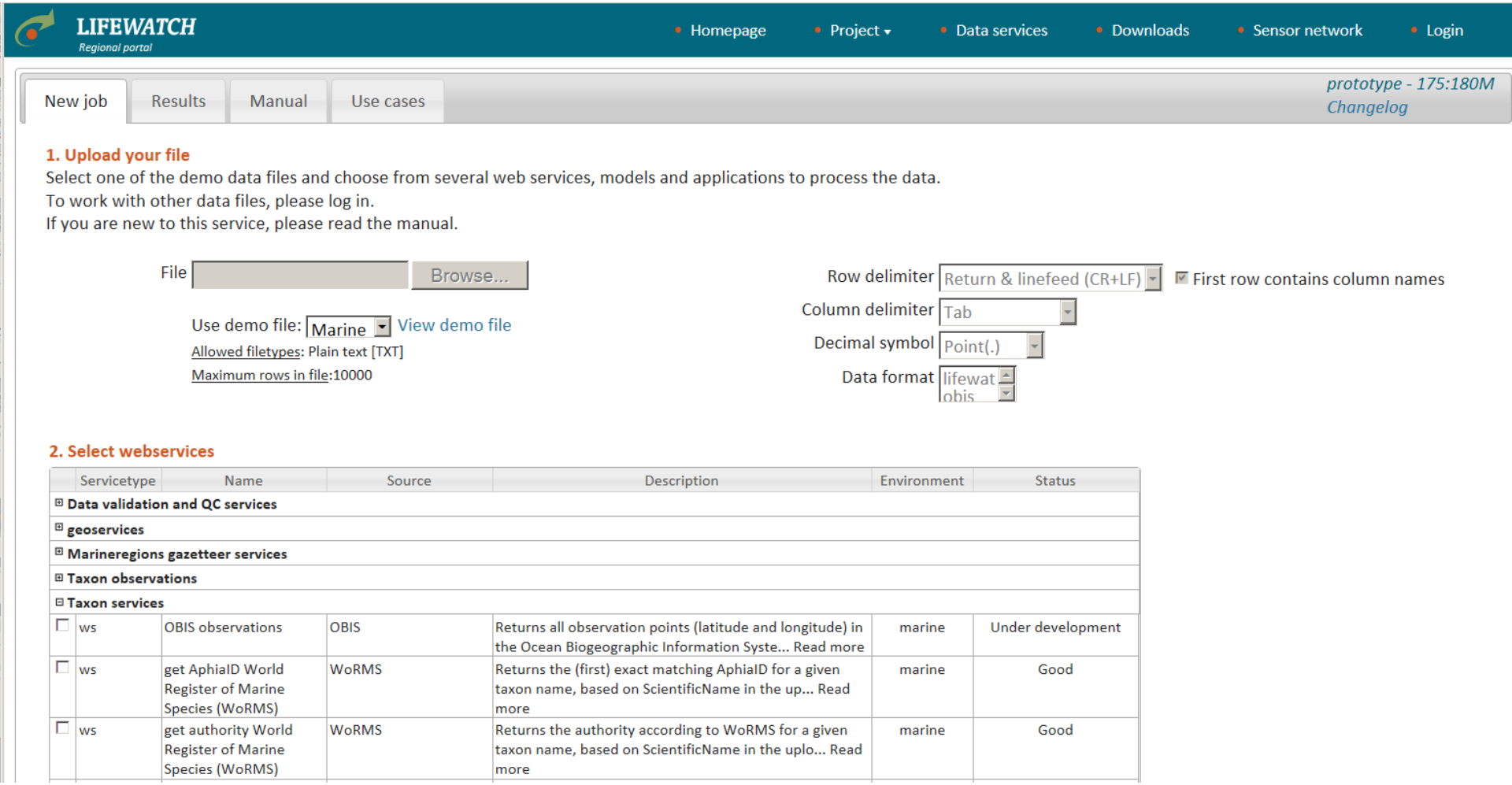
Distribution records *[view] [download]*

Distribution map(s)





3. Available web services
http://www.lifewatch.be/data-services



Marine trait data

.....

World databases of species have now been established but are limited to taxonomic (e.g. World Register of Marine Species,) and distribution (e.g. Ocean Biogeographic Information System) data.

The benefits of these databases could be multiplied by associating species with richer ecological and biological information.

Opinion TRENDS in Ecology and Evolution Vol.21 No.4 April 2006

Rebuilding community ecology from functional traits

Brian J. McGill[1], Brian J. Enquist[2], Evan Weiher[3] and Mark Westoby[4]

[1]Department of Biology, McGill University, Montreal, QC, Canada, H3A 1B1
[2]Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA
[3]Department of Biology, University of Wisconsin – Eau Claire, Eau Claire, WI 54702, USA
[4]Department of Biological Sciences, Macquarie University, NSW 2109, Australia

Ecology Letters, (2007) 10: 1170–1181 doi: 10.1111/j.1461-0248.2007.01117.x

LETTER

The role of functional traits and trade-offs in structuring phytoplankton communities: scaling from cellular to ecosystem level

Trait-Based Community Ecology of Phytoplankton

Elena Litchman[1] and Christopher A. Klausmeier[2]

Kellogg Biological Station, [1]Department of Zoology, and [2]Department of Plant Biology, Michigan State University, Hickory Corners, Michigan 49060; email: litchman@msu.edu, klausme1@msu.edu

REVIEW

Microbial Biogeography: From Taxonomy to Traits

Jessica L. Green,[1]* Brendan J. M. Bohannan,[1] Rachel J. Whitaker[2]

The biogeographic variation of life has predominantly been studied using taxonomy, but this focus is changing. There is a resurging interest in understanding patterns in the distribution not only of taxa but also of the traits those taxa possess. Patterns of trait variation shed light on fundamental questions in biology, including why organisms live where they do and how they will respond to environmental change. Technological advances such as environmental genomics place microbial ecology in a unique position to move trait-based biogeography forward. We anticipate that as trait-based biogeography continues to evolve, micro- and macroorganisms will be studied in concert, establishing a science that is informed by and relevant to all domains of life.

And so it was indeed: she was now only ten inches high, and her face brightened up at the thought that she was now the right size for going though the little door into that lovely garden.
Lewis Carroll (1865)

ronmental conditions. This concept was prompted by Martinus Willem Beijerinck and concisely summarized by Lourens Gerhard Marinus Baas Becking in the widely referenced quote, "everything is everywhere, but the environment selects"

Traditional community ecology

Environmental stressors

Temperature
pH
grain size
current speed
POC flux
sediment TOC

?

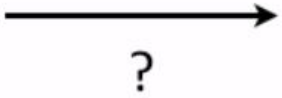
Species abundances

BIO3-EBS-1C	EPI	Ampharetidae	Amage	Amage sculpta	1
BIO3-EBS-1C	EPI	Ampharetidae	indet	Ampharetidae indet (juvs.?)	13
BIO3-EBS-1C	SUPRA	Ampharetidae	Sosanopsis	Sosanopsis kerguelensis	1
BIO3-EBS-1C	SUPRA	Ampharetidae	Anobothrus	Anobothrus sp. A	1
BIO4-EBS-2A	EPI	Ampharetidae	Anobothrus	Anobothrus sp. A	1
BIO4-EBS-2B	EPI	Ampharetidae	Anobothrus	Anobothrus sp. A	8
BIO4-EBS-3A	EPI	Ampharetidae	Glyphanostonum	Glyphanostonum sp. A	1
BIO4-EBS-3A	EPI	Ampharetidae	Anobothrus	Anobothrus sp. A	3
BIO4-EBS-3A	SUPRA	Ampharetidae	Amage	Amage sculpta	1
BIO4-EBS-3A	SUPRA	Ampharetidae	Anobothrus	Anobothrus sp. A	1
BIO4-EBS-3B	EPI	Ampharetidae	Anobothrus	Anobothrus sp. A	9
BIO4-EBS-3B	EPI	Ampharetidae	Sosanopsis	Sosanopsis kerguelensis	1
BIO4-EBS-3C	EPI	Ampharetidae	Amage	Amage sculpta	4
BIO4-EBS-3C	EPI	Ampharetidae	Amphicteis	Amphicteis sp. A	1
BIO4-EBS-3C	EPI	Ampharetidae	Anobothrus	Anobothrus sp. A	22
BIO4-EBS-3C	EPI	Ampharetidae	Glyphanostonum	Glyphanostonum sp. A	21
BIO4-EBS-3C	SUPRA	Ampharetidae	Asabellides	Asabellides sp. A (? BV)	1
BIO4-EBS-3C	SUPRA	Ampharetidae	Anobothrus	Anobothrus sp. A	2
BIO4-EBS-3D	EPI	Ampharetidae	Eusamytha	Eusamytha sp. A	1
BIO4-EBS-3F	EPI	Ampharetidae	Melinae (Moyanus?)	Melinae (Moyanus?) sp. A	3
BIO4-EBS-3F	EPI	Ampharetidae	Anobothrus	Anobothrus sp. A	24
BIO4-EBS-3F	EPI	Ampharetidae	indet	Ampharetidae indet (juvs.?)	12
BIO4-EBS-3F	EPI	Ampharetidae	Glyphanostonum	Glyphanostonum sp. A	3
BIO4-EBS-3F	EPI	Ampharetidae	Sosanopsis	Sosanopsis kerguelensis	1
BIO4-EBS-3F	EPI	Ampharetidae	to id	to id	3
BIO4-EBS-3F	SUPRA	Ampharetidae	Anobothrus	Anobothrus sp. A	1
BIO4-EBS-3F	SUPRA	Ampharetidae	Sosanopsis	Sosanopsis kerguelensis	2
BIO4-EBS-3F	SUPRA	Ampharetidae	Eusamytha	Eusamytha sp. A	3
BIO5-EBS-2B	SUPRA	Ampharetidae	to id	to id	1
BIO5-EBS-3B	EPI	Ampharetidae	Glyphanostonum	Glyphanostonum sp. A	1
BIO5-EBS-3B	SUPRA	Ampharetidae	Anobothrus	Anobothrus sp. A	1
BIO5-EBS-3B	SUPRA	Ampharetidae	Sosanopsis	Sosanopsis kerguelensis	1
BIO5-EBS-3D	EPI	Ampharetidae	Anobothrus	Anobothrus sp. A	3
BIO5-EBS-3D	SUPRA	Ampharetidae	Glyphanostonum	Glyphanostonum sp. A	1
BIO6-EBS-2A	EPI	Ampharetidae	Samytha?	Samytha sp. A	3
BIO6-EBS-2A	SUPRA	Ampharetidae	Samytha?	Samytha sp. A	2
BIO6-EBS-2A	SUPRA	Ampharetidae	Amphicteis	Amphicteis sp. A	1
BIO6-EBS-3E	SUPRA	Ampharetidae	Glyphanostonum	Glyphanostonum sp. A	1
BIO3-EBS-1C	EPI	Amphinomidae	Paramaphinome	Paramaphinome australis	1
BIO4-EBS-3C	SUPRA	Amphinomidae	Paramaphinome	Paramaphinome australis	1
BIO4-EBS-3B	EPI	Polynoidae	Antarctinoe	Antarctinoe ferox	1
BIO4-EBS-3C	EPI	Aphroditidae	Aphrodita	Aphrodita sp.	1
BIO4-EBS-3F	SUPRA	Aphroditidae	Aphrodita	Aphrodita sp.	1
BIO4-EBS-3E	EPI	Capitellidae	Notomastus	Notomastus latericeus	5
BIO6-EBS-2B	SUPRA	Capitellidae	Notomastus	Notomastus latericeus	1
BIO6-EBS-2B	SUPRA	Capitellidae	Capitella	Capitella sp.	1
BIO4-EBS-3A	EPI	Capitellidae	Notomastus	Notomastus latericeus	1
BIO4-EBS-3C	EPI	Capitellidae	Notomastus	Notomastus latericeus	4
BIO6-EBS-2A	EPI	Capitellidae	Notomastus	Notomastus latericeus	1
BIO6-EBS-2A	SUPRA	Capitellidae	Notomastus	Notomastus latericeus	2
BIO5-EBS-3E	EPI	Capitellidae	Capitella	Capitella sp.	1
BIO5-EBS-3E	EPI	Capitellidae	Notomastus	Notomastus latericeus	1
BIO3-EBS-1C	EPI	Chaetopteridae	Chaetopterus	Chaetopterus variopedatus	2
BIO4-EBS-2B	EPI	Chaetopteridae	Chaetopterus	Chaetopterus variopedatus	2
BIO4-EBS-3C	EPI	Chaetopteridae	Chaetopteridae	Chaetopteridae sp.	1
BIO4-EBS-3E	SUPRA	Chaetopteridae	Phyllochaetopterus	Phyllochaetopterus socialis	1
BIO5-EBS-3E	SUPRA	Chaetopteridae	Phyllochaetopterus	Phyllochaetopterus socialis	1
BIO4-EBS-3F	SUPRA	Capitellidae	Notomastus	Notomastus latericeus	1
BIO3-EBS-1A	EPI	Cirratulidae	Chaetozone	Chaetozone setosa	2
BIO3-EBS-1A	EPI	Cirratulidae	indet	Cirratulidae indet	3
BIO4-EBS-3E	EPI	Cirratulidae	indet	Cirratulidae indet	2
BIO4-EBS-3E	EPI	Cirratulidae	Chaetozone	Chaetozone setosa	9
BIO4-EBS-3E	EPI	Cirratulidae	Chaetozone	Chaetozone sp. B	7
BIO4-EBS-3E	EPI	Cirratulidae	Aphelochaeta	Aphelochaeta sp. A	9
BIO4-EBS-3E	SUPRA	Cirratulidae	Aphelochaeta	Aphelochaeta sp. B	1
BIO5-EBS-1B	EPI	Cirratulidae	Chaetozone	Chaetozone pinguis	1
BIO5-EBS-1B	EPI	Cirratulidae	Chaetozone	Chaetozone setosa	2

Trait-based community ecology

Environmental stressors

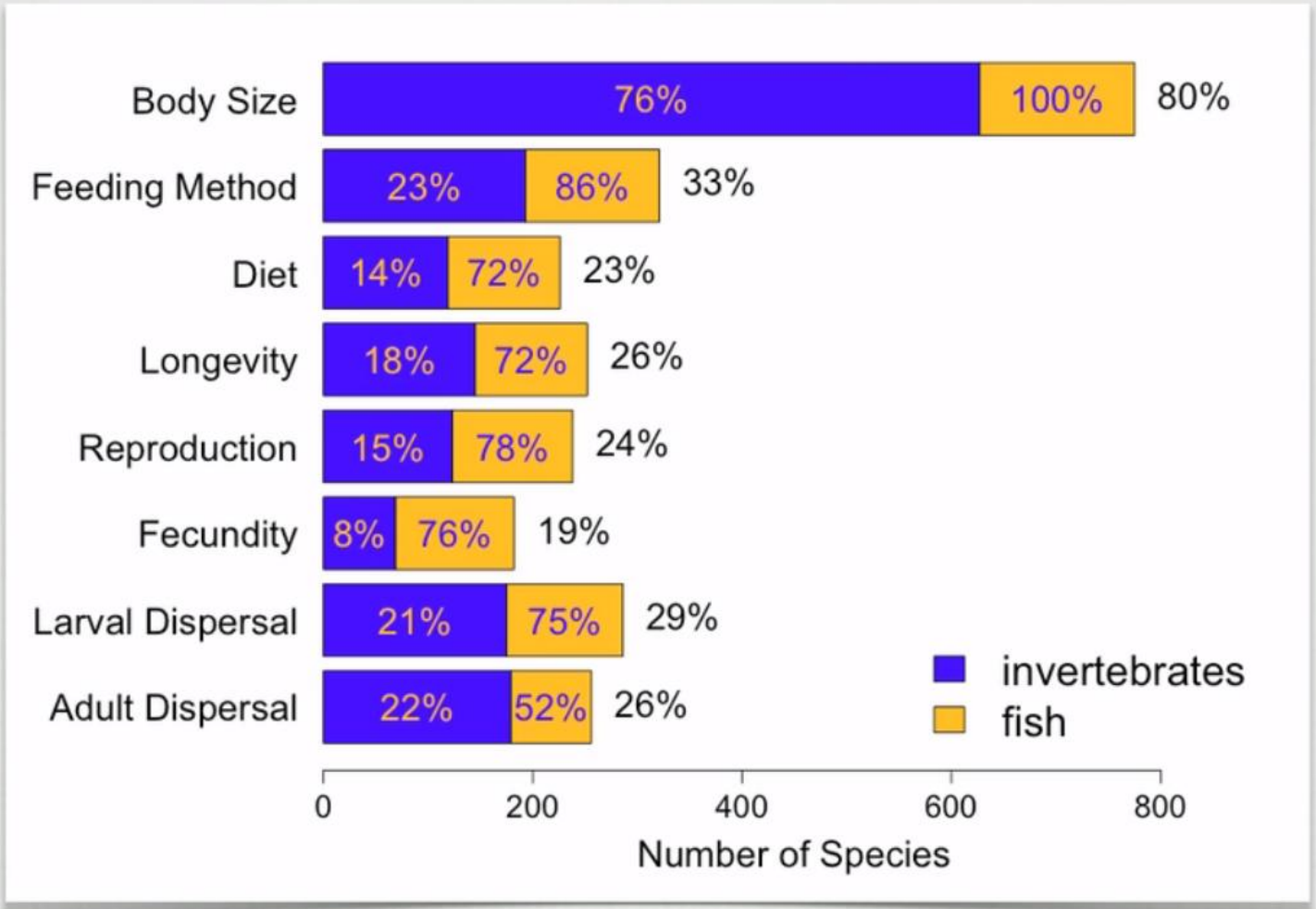
Temperature
pH
grain size
current speed
POC flux
sediment TOC



?

Trait abundances

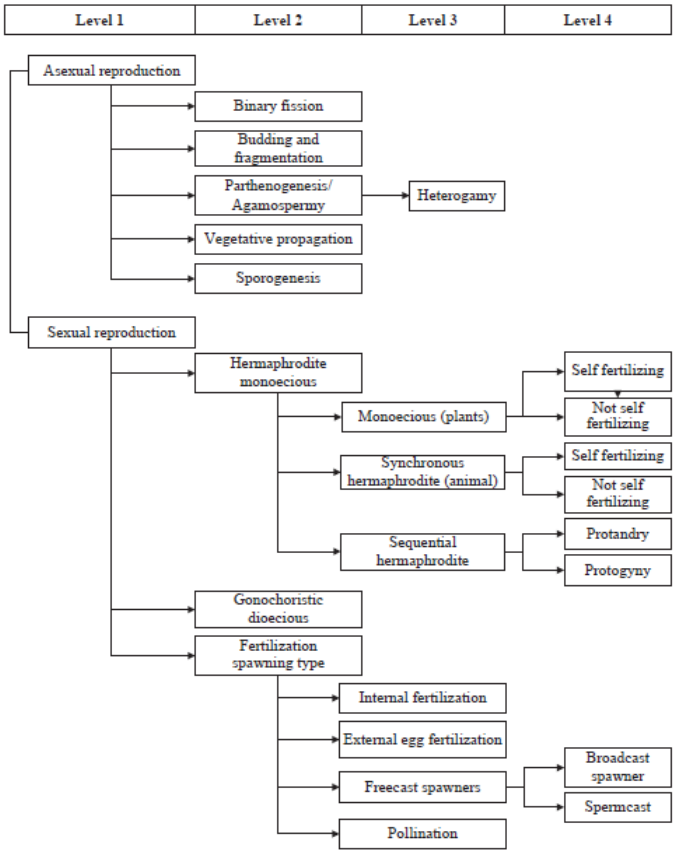
##	R-BEN	R-PEL	BS-MAC	HE1-NO	HE1-YES	HE2-EPI	HE2-INF	HE3-MAJ	HE3-MIL
## AC1	17.5	0.0	17.5	15.5	2.0	2.0	0.0	0.0	2.0
## B1	25.0	0.0	25.0	23.0	2.0	1.0	1.0	1.0	1.0
## B2	21.0	0.0	21.0	21.0	0.0	0.0	0.0	0.0	0.0
## B3	17.0	0.0	17.0	17.0	0.0	0.0	0.0	0.0	0.0
## BH	267.0	1.0	268.0	260.0	8.0	7.0	1.0	0.0	8.0
## C1	151.5	0.0	151.5	139.5	12.0	10.5	1.5	0.0	12.0
## C12	50.0	0.0	50.0	47.5	2.5	2.5	0.0	0.0	2.5
## C14	76.3	0.7	77.0	75.3	1.7	1.7	0.0	0.0	1.7
## C4	105.0	0.0	105.0	91.0	14.0	9.5	4.5	1.5	12.5
## C7	141.0	0.0	141.0	134.3	6.7	5.0	1.3	0.3	6.0
## GKF	41.0	0.0	41.0	39.0	2.0	2.0	0.0	0.0	2.0
## HiPro	243.0	0.0	243.0	227.0	16.0	15.0	1.0	1.0	15.0
## MT1	394.2	0.0	394.2	392.0	2.2	1.8	0.3	0.0	2.2
## MT2	383.0	0.0	383.0	356.0	27.0	22.5	4.5	0.0	27.0
## MT3	227.8	0.5	228.2	213.0	15.2	14.0	1.2	0.2	15.0
## MT4	137.5	0.0	137.5	120.0	17.5	16.0	1.5	0.0	17.5
## MT5	50.7	0.0	50.7	49.0	1.7	1.7	0.0	0.0	1.7
## MT6	22.2	0.0	22.2	18.0	4.2	3.5	0.0	0.0	3.5
## NB2	94.0	0.0	94.0	70.0	24.0	14.0	10.0	0.0	24.0



LITTLE INFORMATION FOR MOST TRAITS

Activities

1. Set up trait classification (with global marine biology community (WoRMS,…))



Example reproduction traits hierarchy for reproduction from Reusser & Lee (2011)

	Pilot project 1	Pilot project 2	Pilot project 3
Who	A. Iglikowska/G. Boxshall	A. McQuatters-Gollop *et al.*	J. Hosegood/T. Webb
Taxonomic scope	**Planktonic Copepoda**	**Planktonic taxa**	**Benthic taxa**
Geografic scope	Global	Global	UK and North Sea
Number of taxa	± 2500 species	± 400 taxa	625+330 species
Start date	01/06/2013	01/06/2013	01/06/2013
End date	30/11/2013	30/09/2013	30/09/2013
Defined attributes	(1) Organism type (2) Time in plankton (3) Body size (4) Feeding type (5) Spawning method (6) Larval feeding strategy (7) Number of life stages (8) Habitat (9) Depth range	(1) Organism type (2) Time in plankton (3) Body size (4) Shape (form) (5) Feeding method (6) Spawning method (7) Life stage (name, #) (8) Sociability (9) Toxicity (10) Habitat (11) Climate province (12) Sea areas	(1) Body size (2) Feeding method (3) Diet (4) Developmental mechanism (5) Reproductive frequency (6) Reproductive period (7) Reproductive timing (8) Age at maturity (9) Fecundity (10) Egg size (11) Larval feeding strategy (12) Larval duration (13) Life span (14) Sociability (15) Habitat (16) Movement method (17) Migration

	Pilot project 4	Pilot project 5	Pilot project 6
Who	A. Taylor/M. Tasker	O. De Clerck *et al.*	S. Pagad *et al.*
Taxonomic scope	**Seabirds and coastal birds**	**Macro-algae**	**Invasive species**
Geografic scope	Europe	Europe	Global
Number of taxa	79 + 49 species		/
Start date	01/07/2013	01/10/2013	01/06/2013
End date	30/09/2013		31/08/2013
Defined attributes	(1) Body size (2) Diving depth (3) Egg size (4) Fecundity (5) Feeding method (6) Longevity - Adult life span (7) Longevity - Age at maturity (8) Oil sensitivity rate (9) Predominant food (10) Seasonal occurrence in European waters (11) Sociability (12) Susceptibility to lowered forage fish availability (13) Susceptibility to wind turbines	(1) Morphofunctional class. (2) Life cycle (3) Flowering (4) Zonation (5) Substrate (6) Habitat (7) Drifting (8) Spawning method (9) Endemicity (10) Ecophysiological data	(1) Occurrence (2) Provenance (3) Invasiveness (4) Native country (5) Native sea area (6) Source country (7) Source sea area (8) Introduced country (9) Introduced sea area (10) Introduced date (11) Abundance (12) Population trend (13) Management (14) Impact (15) Vector – Dispersal

2. Collecting and standardizing data

	A	B	C	D	E	F	G	H
1	AphiaID	Authority	Authority	egg laying mode	Reference (Sources Chad Walter) or expert opinion	Notes	nal Ref (not in \	Larval feeding strategy
2								
3	345918	Acartia (Acanthacartia) bacorehuiensis	Zamora-Sanchez & Gomez-Aguirre, 1985	broadcast spawner	Expert opinion based on congeners			planktotrophic
4	345919	Acartia (Acanthacartia) bifilosa	(Giesbrecht, 1881)	broadcast spawner	121420			planktotrophic
5	345920	Acartia (Acanthacartia) bilobata	Abraham, 1970	broadcast spawner	Expert opinion based on congeners			planktotrophic
6	345921	Acartia (Acanthacartia) californiensis	Trinast, 1976	broadcast spawner	118295			planktotrophic
7	345922	Acartia (Acanthacartia) chilkaensis	Sewell, 1919	broadcast spawner	Expert opinion based on congeners			planktotrophic
8	345932	Acartia (Acanthacartia) dweepi	Haridas & Madhupratap, 1978	broadcast spawner	Expert opinion based on congeners			planktotrophic
9	345933	Acartia (Acanthacartia) fossae	Gurney, 1927	broadcast spawner	Expert opinion based on congeners			planktotrophic
10	416441	Acartia (Acanthacartia) giesbrechti	Dahl, 1894	broadcast spawner	Expert opinion based on congeners			planktotrophic
11	345934	Acartia (Acanthacartia) italica	Steuer, 1910	broadcast spawner	76793			planktotrophic
12	345935	Acartia (Acanthacartia) levequei	Grice, 1964	broadcast spawner	Expert opinion based on congeners			planktotrophic
13	416442	Acartia (Acanthacartia) pietschmani	Pesta, 1912	broadcast spawner	Expert opinion based on congeners			planktotrophic
14	345937	Acartia (Acanthacartia) plumosa	Scott T., 1894	broadcast spawner	Expert opinion based on congeners			planktotrophic
15	345940	Acartia (Acanthacartia) sinjiensis	Mori, 1940	broadcast spawner	118279			planktotrophic
16	416443	Acartia (Acanthacartia) spinata	Esterly, 1911	broadcast spawner	Expert opinion based on congeners			planktotrophic
17	345942	Acartia (Acanthacartia) steueri	Smirnov, 1936	broadcast spawner	118269			planktotrophic
18	345943	Acartia (Acanthacartia) tonsa	Dana, 1849	broadcast spawner	118295			planktotrophic
19	345946	Acartia (Acanthacartia) tropica	Ueda & Hiromi, 1987	broadcast spawner	Expert opinion based on congeners			planktotrophic
128	346143	Batheuchaeta enormis	Grice & Hulsemann, 1968	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
129	346144	Batheuchaeta gurjanovae	(Brodsky, 1955)	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
130	346145	Batheuchaeta heptneri	Markhaseva, 1981	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
131	104277	Batheuchaeta lamellata	Brodsky, 1950	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
132	341258	Batheuchaeta peculiaris	Markhaseva, 1983	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
133	341259	Batheuchaeta pubescens	Markhaseva, 1986	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
134	346146	Batheuchaeta tuberculata	Markhaseva, 1986	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
135	342428	Bradyetes curvicornis	Markhaseva & Schulz, 2007	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
136	221282	Bradyetes florens	Grice & Hulsemann, 1967	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
137	104279	Bradyetes inermis	Farran, 1905	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
138	104280	Bradyetes matthei	Johannessen, 1976	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
139	346170	Bradyetes pacificus	Ohtsuka, Boxshall & Shimomura, 2005	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
140	342429	Bradyetes weddellanus	Markhaseva & Schulz, 2006	broadcast spawner	Expert opinion based on no published record ever of egg sacs in this genus			lecithotrophic
141	346171	Bradyidius angustus	(Tanaka, 1957)	broadcast spawner	Expert opinion based on B. armatus			lecithotrophic
142	146735	Bradyidius armatus	(Vanhöffen, 1897)	broadcast spawner	102299	gs attached in groups to substrate		lecithotrophic
143	346172	Bradyidius arnoldi	Fleminger, 1957	broadcast spawner	Expert opinion based on B. armatus			lecithotrophic
144	357476	Bradyidius brevispinus	Bradford, 1969	broadcast spawner	Expert opinion based on B. armatus			lecithotrophic

3. Link it to taxonomic and biogeographic databases & write workflows that could help marine community and functional ecologist answering fundamental questions

Marine trait database

WoRMS World Register of Marine Species

OBIS OCEAN BIOGEOGRAPHIC INFORMATION SYSTEM

Marineregions.org

towards a standard for georeferenced marine names

Final goal: testing fundamental macro-ecological research hypothesis

- Is the functional diversity higher in the deep sea?
- Effect of temperature changes on functional diversity
- Are organisms bigger towards the poles?
- …..

challenge

- Van veen grab at x,y,t
- Observation data :
  - Set of present species P{}
  - X,Y
  - Depth : 20m
  - Sediment : sand
- Analysis
  - What species do we expect to find?
  - What species are absent?
  - What are possibly wrong identifications?
  - What are common, what are rare findings?

Validation of observations workflow

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

Big data challenge

- Validationworkflow(cruise samples)
  - 1 d sampling, 2 w processing, 200 observations
- Validationworkflow(project samples)
  - 12 d sampling, 24w, 2400 obs.
- Validationworkflow(dataset)
  - 5000 obs.
- Validationworkflow(sensordata)
  - 1000 obs/d , realtime processing