

Semantic Vision in LifeWatch ERIC

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Background



LIFEWATCH ERIC has promoted and stimulated the debate on the use of semantic in the biodiversity data management.

Information from biodiversity and ecosystems is very heterogeneous

Needs to be better managed in order to

- **improve the actual scientific knowledge**
- **address the urgent societal challenges concerning environmental issues.**

Background

SEMANTIC RESOURCES improve the
Findability, Interpretation, Integration or Interoperability of data based.

METADATA - Metadata is data that describes other data. Meta is a prefix that in most information technology usages means "an underlying definition or description." Metadata (hereafter MD) summarizes basic information about data, which can make finding and working with particular instances of data easier.



Background



A **CONTROLLED VOCABULARY** is an organised arrangement of words (concepts) used to index content and/or to retrieve content through browsing or searching. It typically includes preferred and alternative terms and has a defined scope or describes a specific domain. Controlled vocabularies provide a definition, a coding scheme and globally unique and persistent identifier for each term. The level of detail of controlled vocabularies ranges from short unidimensional lists to complex vocabularies with hierarchical relationships (**Thesauri**).

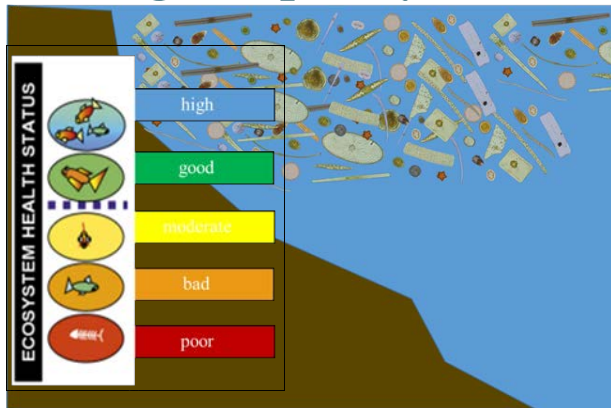
ONTOLOGIES are representations of the knowledge within a domain of interest, defined via the terminology (concepts) used within the domain and the properties and relationships among domain objects (Baader et al., 2003). In this way, ontologies represent one enabling mechanism for providing more comprehensive data discovery, integration (Jones et al., 2006) and analysis.

Phytoplankton Study Case

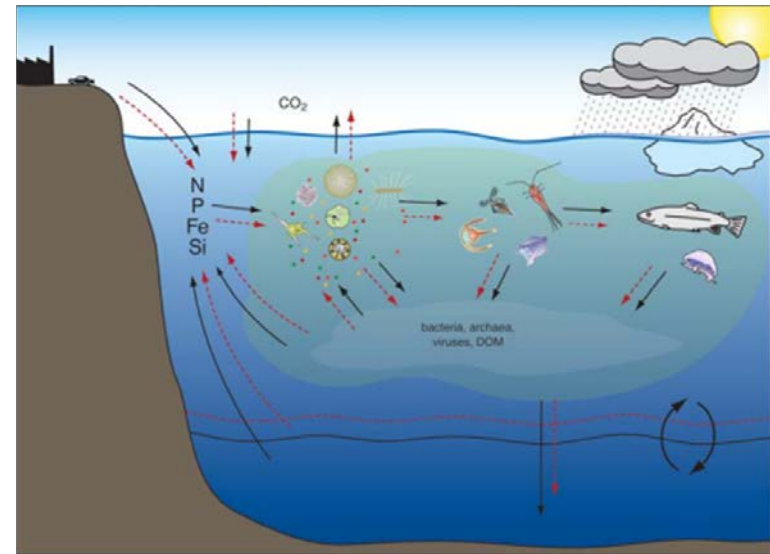
Critical to maintaining biodiversity
and supporting aquatic life



Useful indicators,
“Biological quality element”

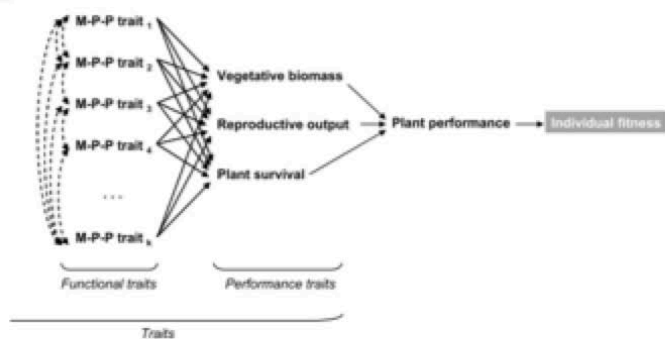


Highly efficient primary producers



Water Framework Directive, WFD 2000/60/EC
Marine Strategy Framework Directive, MSFD 2008/56/EC

Phytoplankton Study Case



at the individual level that influence individual performances via its effects on growth, reproduction and survival in relation to the environment and to other species

(Diaz & Cabido, 2001; Violle et al., 2007; Mouillot et al., 2013).

Morphological

SIZE



SHAPE



Physiological

NUTRIENT REQUIREMENT



Behavioural

MOTILITY



Phenological

PHENOTYPE



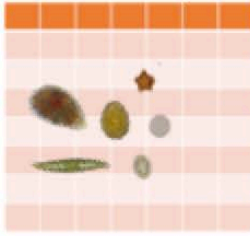
Phytoplankton Study Case

Taxonomy

Laboratory 1



Laboratory 2

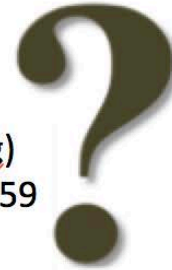


Scientific name

Ceratium furca (Ehrenberg)
Claparède & Lachmann 1859

or

Tripes furca (Ehrenberg) F.Gómez



Not harmonized

Not standardized

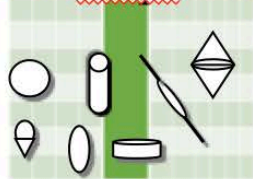
Heterogeneous

Distributed

Traits

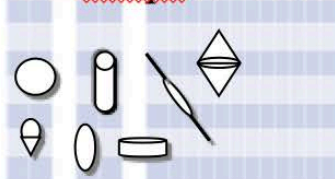
Laboratory 1

Shape



Laboratory 2

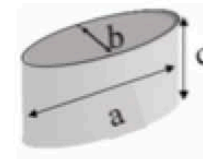
Shape



Shape

Oval cylinder
or
ellipsoid
or
prism on elliptic base

Linear dimensions



Phytoplankton Thesaurus



A thesaurus for phytoplankton trait-based approaches: Development and applicability

Ilaria Rosati^{a,b,c,d}, Caterina Bergami^{a,b,c,d}, Elena Stanca^a, Leonilde Roselli^a, Paolo Tagliolato^{a,b,c,d}, Alessandro Oggioni^{a,c}, Nicola Fiore^{a,c}, Alessandra Pugnetti^{a,c}, Adriana Zingone^{a,b}, Angela Boggero^{a,c}, Alberto Basset^{a,c}

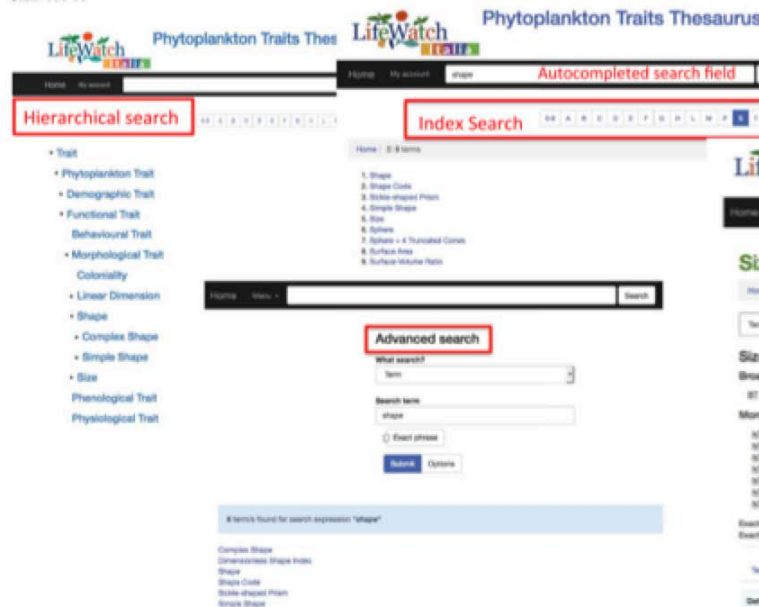


Fig. 4. Different user friendly search engines provided in PhytoTraits: hierarchical search; auto-completed field search; alphabetic letters search; and finally ad possible to search for term or non, note type, created date, and level.

- defines procedures and develop tools for data harmonization, aggregation and analysis

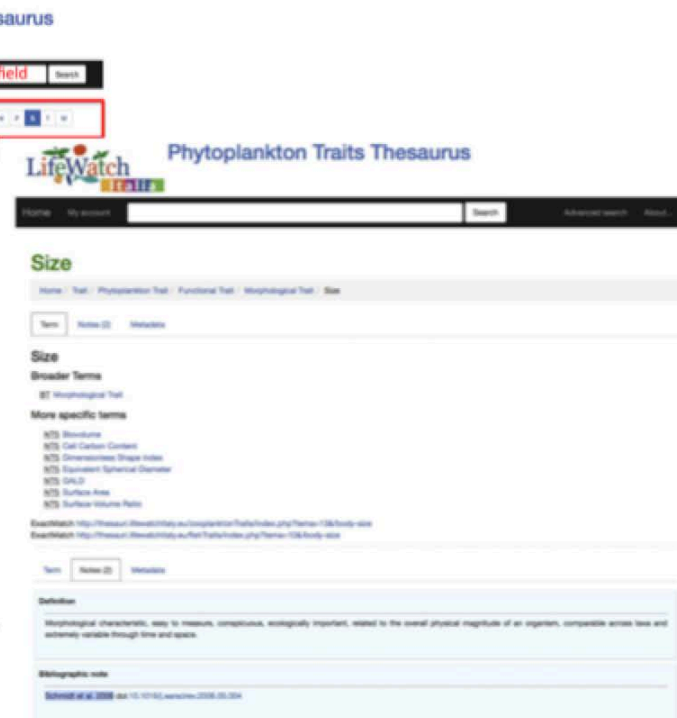
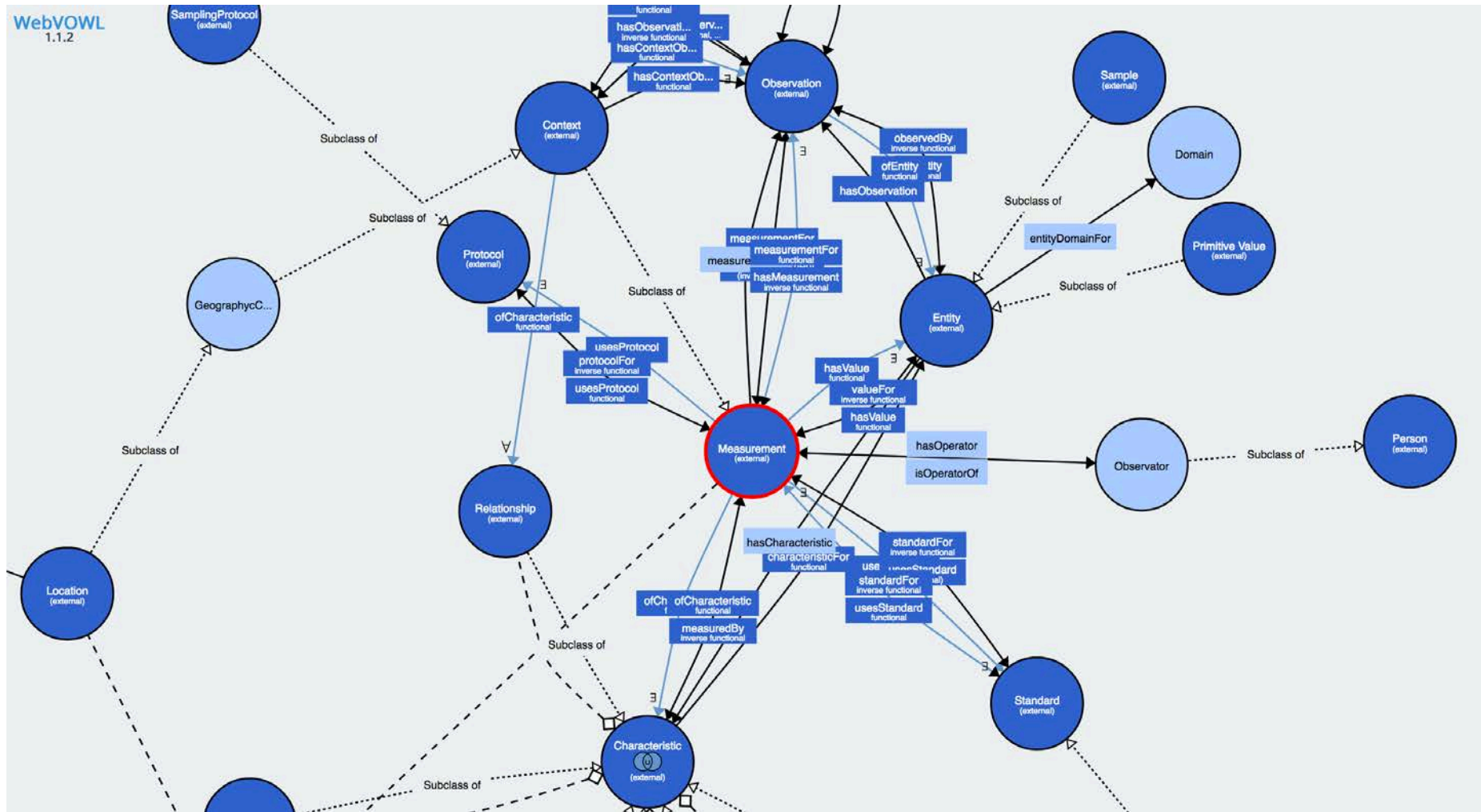


Fig. 4. A combination of numerous of different information provided for the concept "Size".

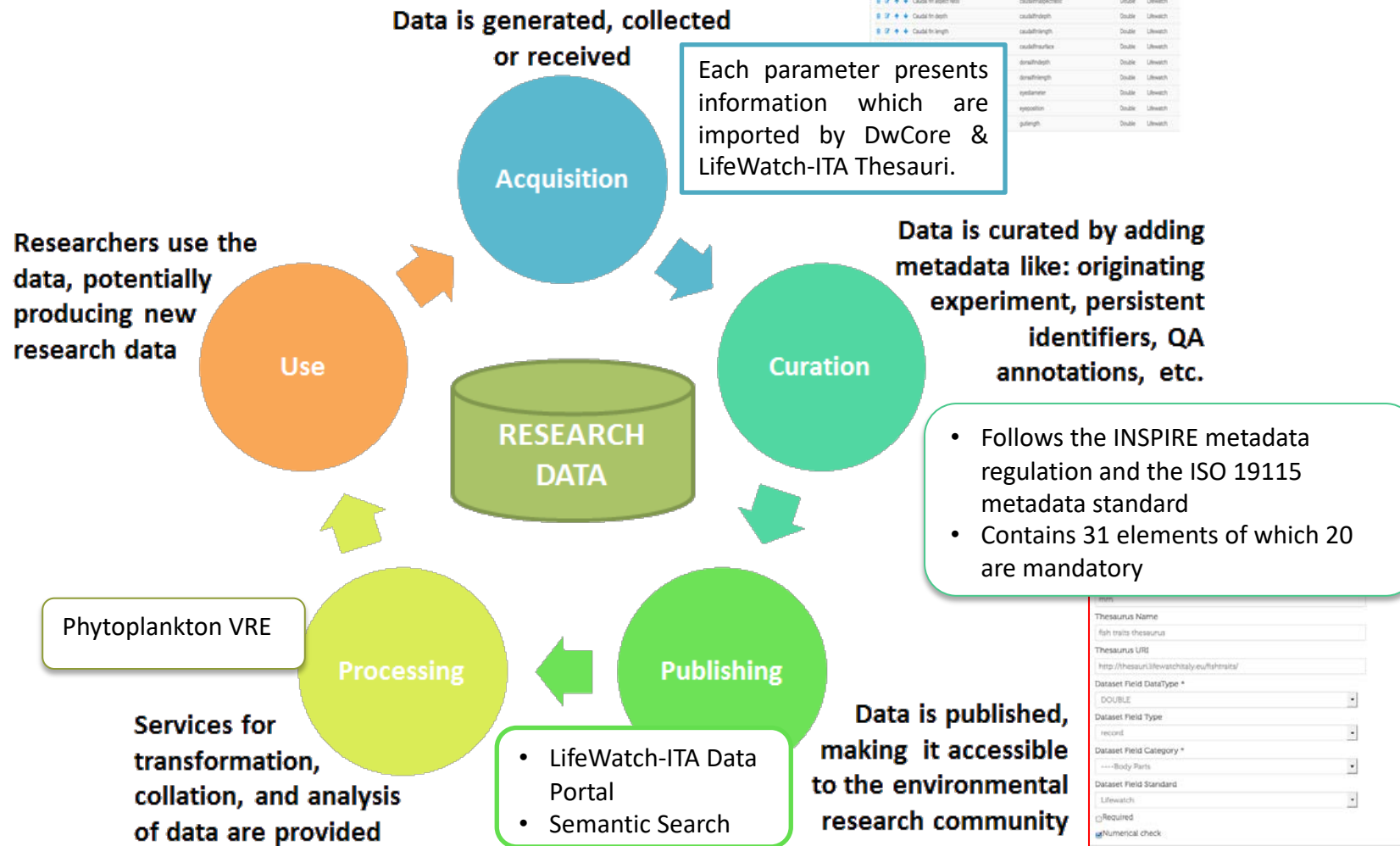
PhytoTraits is freely available on the web at the URL <http://thesauri.lifewatchitaly.eu/PhytoTraits/index.php> and it could be utilised for different purposes.

LIFEWATCH-ITA CORE ONTOLOGY

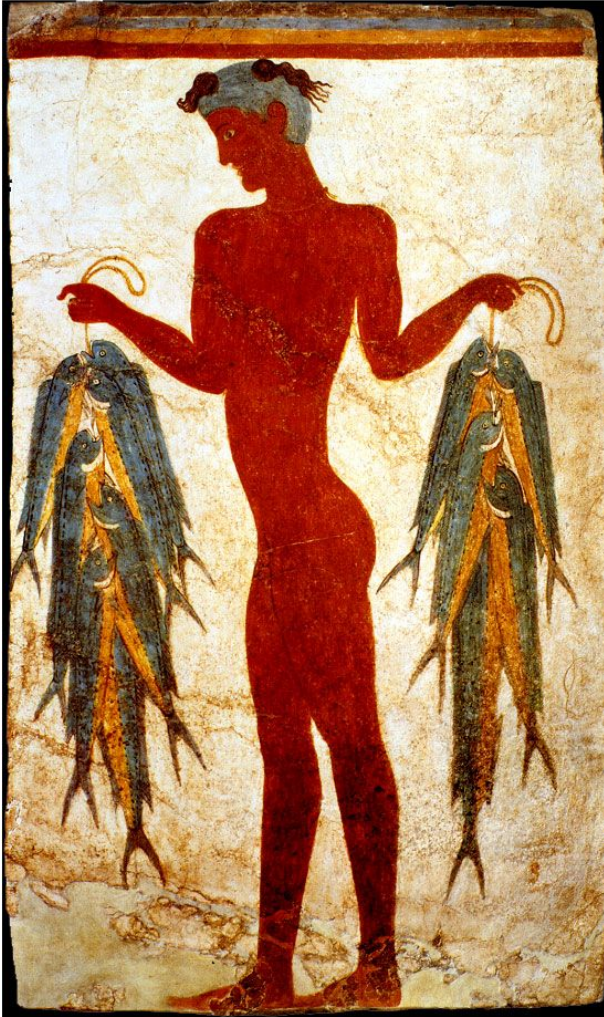




Phytoplankton Data Life Cycle



Complex Query



Which hotels are nearby restaurants that serve the fish that the boy is holding?

What is the painting?

Which is the species of the fish?

Is it edible? Is it endangered?

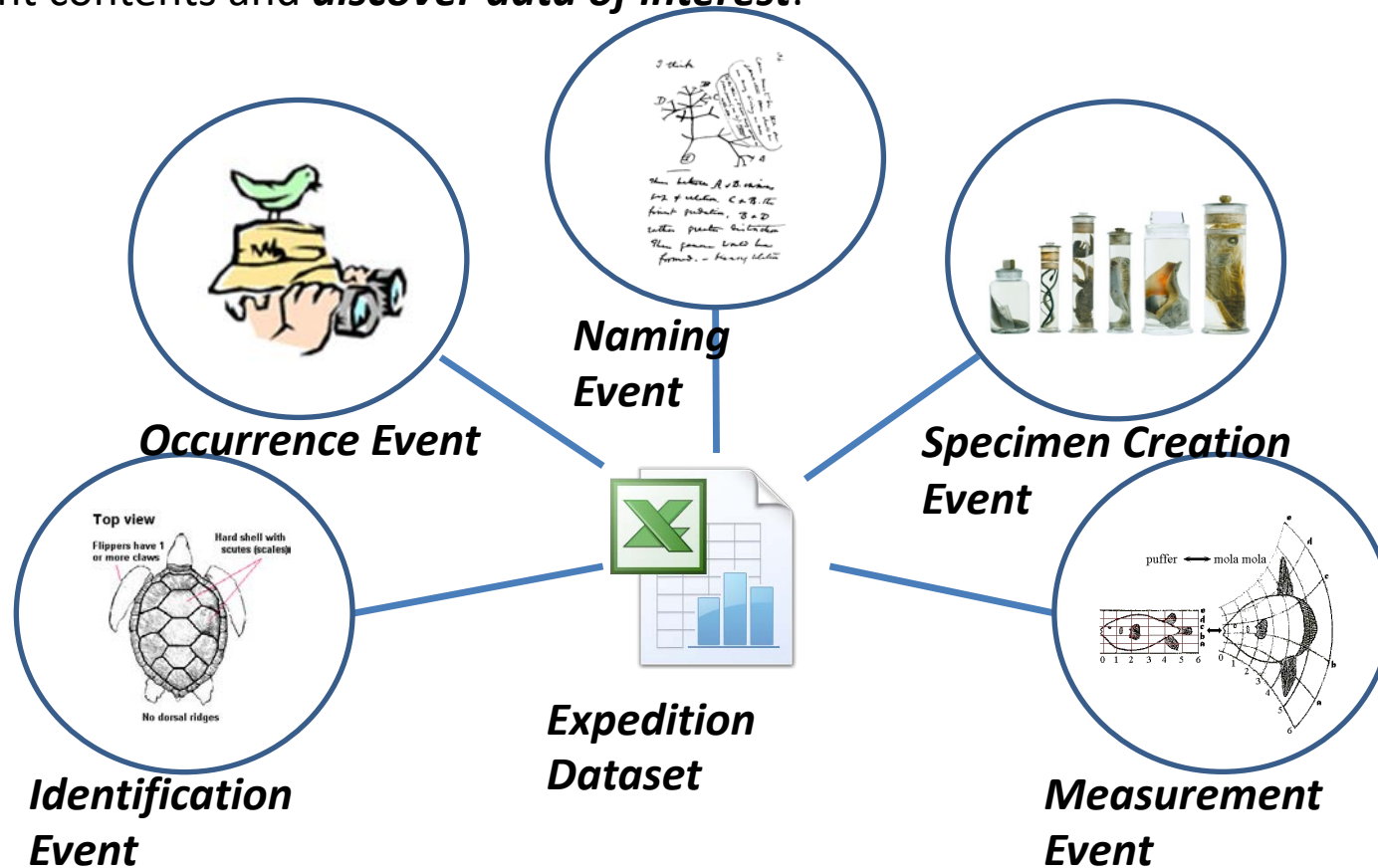
Which are the recipes of this fish?

Which restaurants serve such dishes?

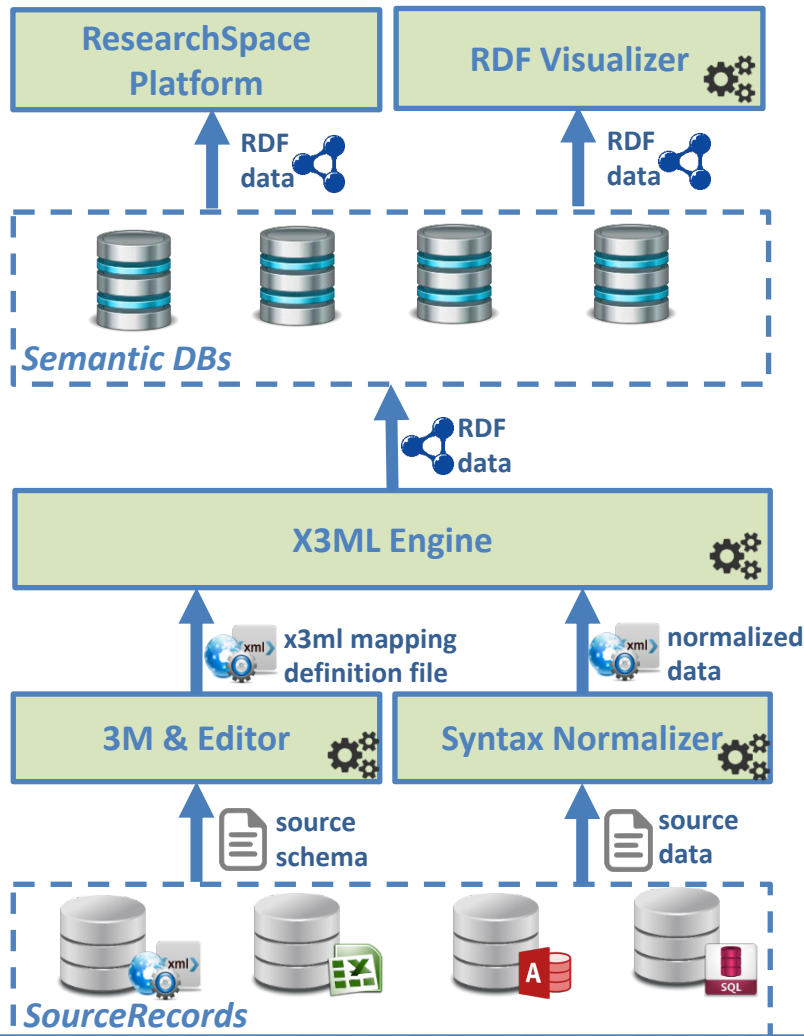
Which hotel is nearby this restaurant?

Idea

Exploit the events' information that is explicitly or implicitly contained in the datasets, **model the different concepts and entities** of the biodiversity domain and **take advantage of the semantic graph's** capabilities to navigate efficiently through the different contents and **discover data of interest**.



Tools Exploited

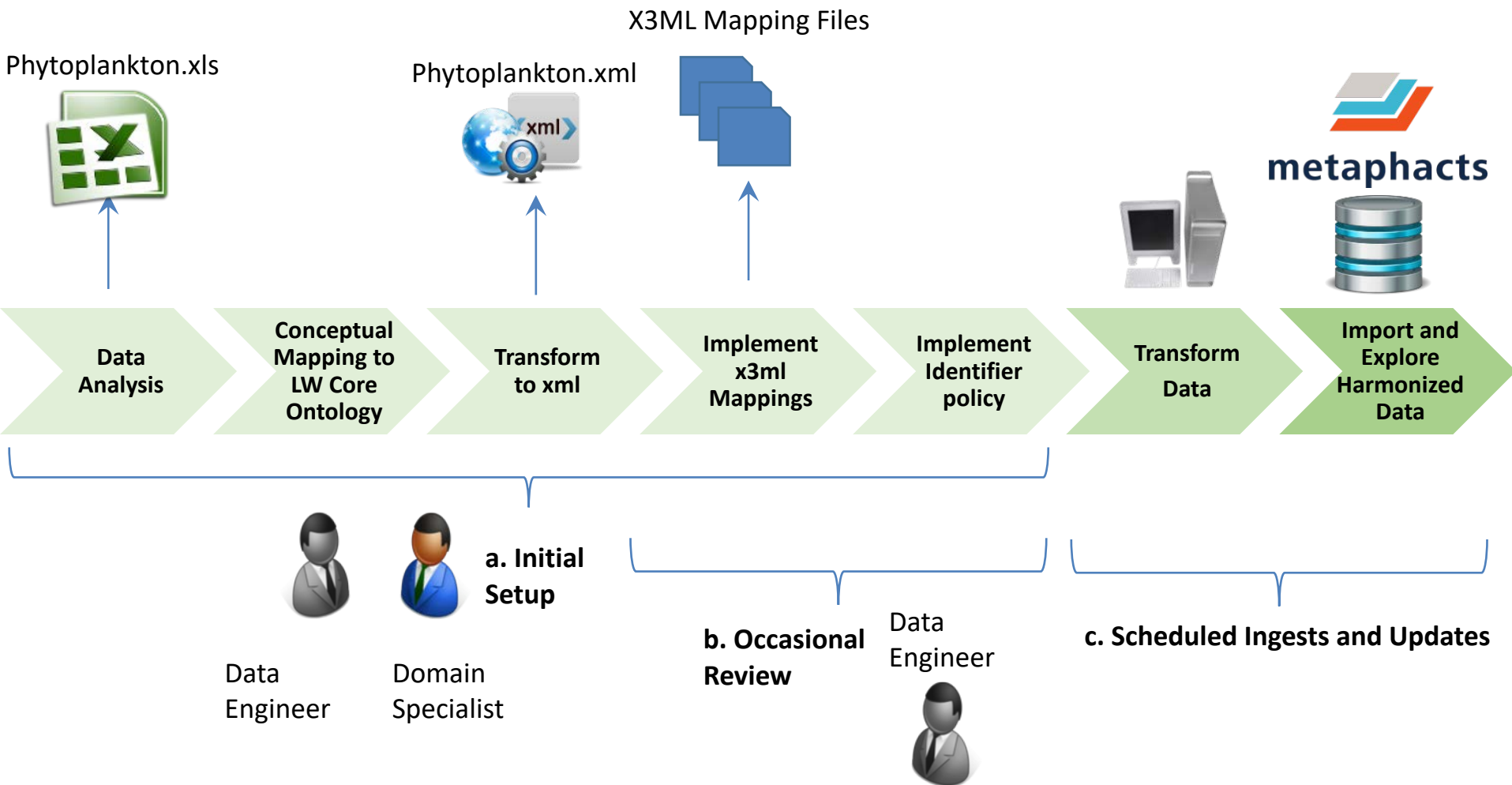


3M Editor is an web application suite that assists domain experts to create and edit mapping definitions based on **X3ML**.

x3ml engine realizes the transformation of structured source data records to the target schema format

ResearchSpace Platform supports end-user friendly navigation, exploration and visualization of Knowledge Graphs, rich semantic search with visual query construction and faceting, customizable semantic clipboard and Authoring and editing for end users

Executed Workflow



Original Data Snapshot

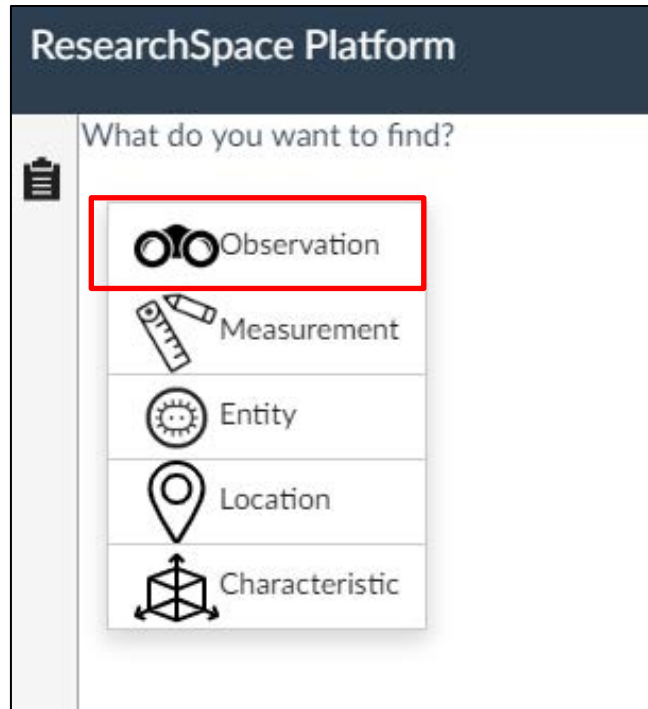
A	B	C	D	E	F	G	H	I	J	K
catalognumber	organismquantity	organismquantitytype	eventid	parenteventid	year	month	day	country	countrycode	locality
61437	1	individual	b	2	2011	5	6	greece	gr	korission
59195	1	individual	a	1	2011	5	6	greece	gr	korission
54028	1	individual	a	1	2011	5	6	greece	gr	korission
53964	1	individual	a	1	2011	5	6	greece	gr	korission
54203	1	individual	a	1	2011	5	6	greece	gr	korission
59945	1	individual	b	1	2011	5	6	greece	gr	korission
63396	1	individual	c	3	2011	5	6	greece	gr	korission
56384	1	individual	b	2	2011	5	6	greece	gr	korission
60213	1	individual	c	1	2011	5	6	greece	gr	korission
60217	1	individual	c	1	2011	5	6	greece	gr	korission
63504	1	individual	c	3	2011	5	6	greece	gr	korission
59868	1	individual	b	1	2011	5	6	greece	gr	korission
57627	1	individual	a	3	2011	5	6	greece	gr	korission
54425	1	individual	b	1	2011	5	6	greece	gr	korission
59838	1	individual	b	1	2011	5	6	greece	gr	korission
63328	1	individual	c	3	2011	5	6	greece	gr	korission
57472	1	individual	a	3	2011	5	6	greece	gr	korission
58723	1	individual	c	3	2011	5	6	greece	gr	korission
53956	1	individual	a	1	2011	5	6	greece	gr	korission
61490	1	individual	b	2	2011	5	6	greece	gr	korission
59214	1	individual	a	1	2011	5	6	greece	gr	korission
59821	1	individual	b	1	2011	5	6	greece	gr	korission
61884	1	individual	c	2	2011	5	6	greece	gr	korission
61685	1	individual	c	2	2011	5	6	greece	gr	korission
60667	1	individual	a	2	2011	5	6	greece	gr	korission
59788	1	individual	b	1	2011	5	6	greece	gr	korission
60118	1	individual	c	1	2011	5	6	greece	gr	korission
62063	1	individual	a	3	2011	5	6	greece	gr	korission
62440	1	individual	c	2	2011	5	6	greece	gr	korission

XML view

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<root>
  <entry>
    <catalognumber>61437</catalognumber>
    <organismquantity>1</organismquantity>
    <organismquantitytype>individual</organismquantitytype>
    <eventid>b</eventid>
    <parenteventid>2</parenteventid>
    <year>2011</year>
    <month>5</month>
    <day>6</day>
    <country>greece</country>
    <countrycode>gr</countrycode>
    <locality>korission</locality>
    <decimallatitude>39.43919444</decimallatitude>
    <decimallongitude>19.91111111</decimallongitude>
    <phylum>Cryptophyta</phylum>
    <class>Cryptophyceae</class>
    <family>Geminigeraceae</family>
    <order>Pyrenomonadales</order>
    <genus>Plagioselmis</genus>
    <providedscientificname>Plagioselmis prolunga</providedscientificname>
    <scientificname>Plagioselmis prolunga</scientificname>
    <measurementremarks>frontal</measurementremarks>
    <internalandexternalstructures/>
    <shape>cone+half sphere</shape>
    <biovolume>55.86</biovolume>
    <cellcarboncontent>8.27</cellcarboncontent>
```

Queries Examples

Q1: Show me all the **observations** of **Plagioselmis prolonga** instances

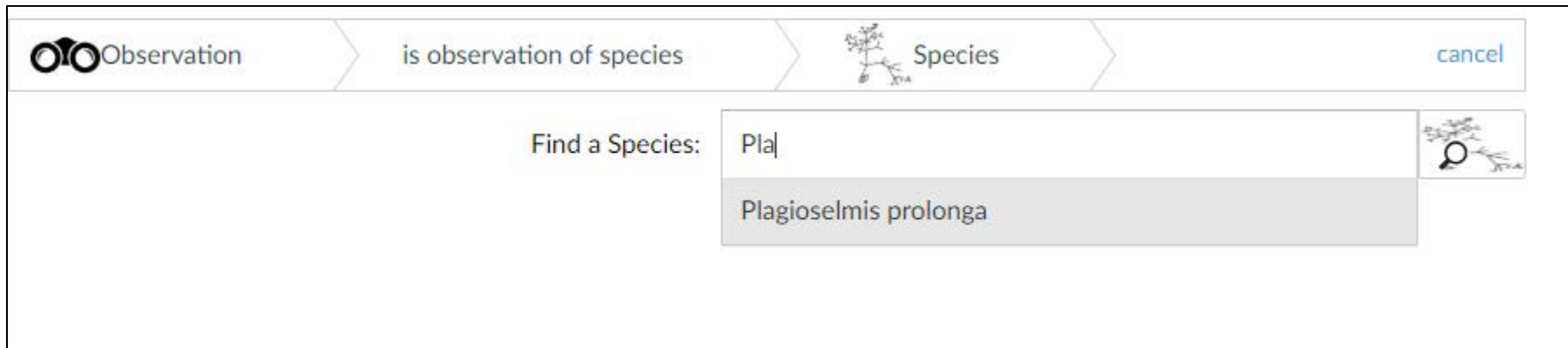


Queries Examples

Q1: Show me all the **observations** of **Plagioselmis prolonga** instances



Observation > ... related to > Species (dropdown menu open with options: Species, Entity) > cancel

Observation > is observation of species > Species > cancel

Find a Species: Pla
Plagioselmis prolonga

Queries Examples

Find: Observations IS OBSERVATION OF SPECIES *Plagioselmis prolonga*

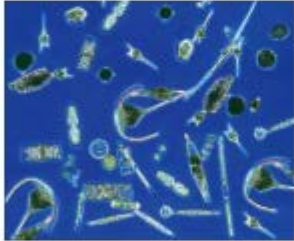
Observation is observation of species Species *Plagioselmis prolonga*

found 3 matches

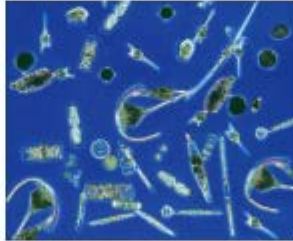
Grid Table Carousel

Only entities with image representation are shown in the Grid!

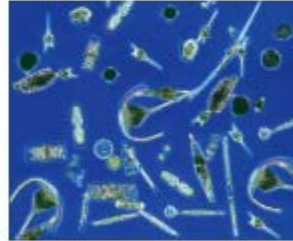
Filter Results



Observation of Cryptoph...



Observation of Plagiosel...



Observation of Cryptoph...

Download CSV Download JSON

Queries Examples

	Summary		
Field			
is Observation Of	53956 instance of Plagioselmis prolunga 53964 instance of Plagioselmis prolunga 54028 instance of Cryptophyceae 54203 instance of Plagioselmis prolunga 54425 instance of Plagioselmis prolunga 54965 instance of Plagioselmis prolunga 55084 instance of Plagioselmis prolunga 59195 instance of Plagioselmis prolunga 59214 instance of Leucocryptos marina 59788 instance of Plagioselmis prolunga 59821 instance of Plagioselmis prolunga 59838 instance of Plagioselmis prolunga 59868 instance of Plagioselmis prolunga 59945 instance of Plagioselmis prolunga 59993 instance of Plagioselmis prolunga 60118 instance of Plagioselmis prolunga 60162 instance of Plagioselmis prolunga 60213 instance of Plagioselmis prolunga 60217 instance of Plagioselmis prolunga 60476 instance of Plagioselmis prolunga 60499 instance of Plagioselmis prolunga	0	
Year	2011	0	0
Month	5	0	0
Day	6	0	0
Location	korission	0	0
Country	greece	0	0
Latitude	39.43930556	0	0
Longitude	19.91119444	0	0

Home

	Summary	Authoring
Field		
Species	Plagioselmis prolunga	00
Genus	Plagioselmis	00
Phylum	Cryptophyta	00
Class	Cryptophyceae	00
Order	Pyrenomonadales	00

Queries Examples

▼ Find: **Observations** IS OBSERVATION OF 53956 instance of *Plagioselmis prolonga*

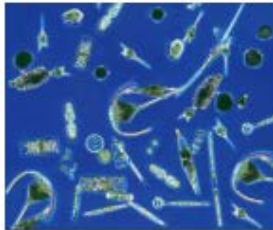


found 1 matches

Grid [Table](#) [Carousel](#)

Only entities with image representation are shown in the Grid!

Filter Results



Observation of Cryptoph...

Download CSV

Download JSON

Queries Examples

Find: Measurements WAS OBSERVATION OF Observation of Cryptophyceae no 1



Measurement

was observation of



Observation

Observation of Cryptophyceae no 1

found 168 matches

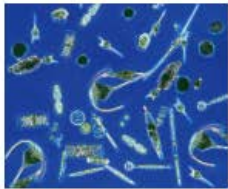
Grid

Table

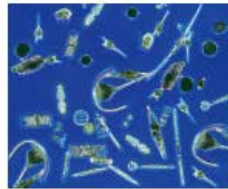
Carousel

Only entities with image representation are shown in the Grid!

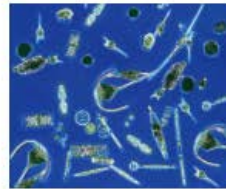
Filter Results



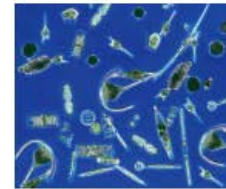
Measurement of Plagiosel...



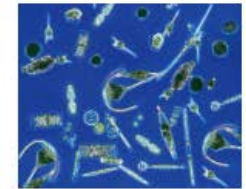
Measurement of Plagiosel...



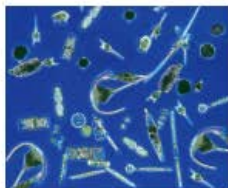
Measurement of Plagiosel...



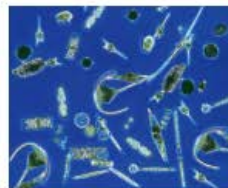
Measurement of Plagiosel...



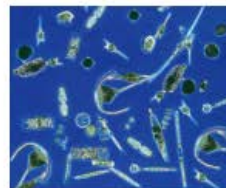
Measurement of Plagiosel...



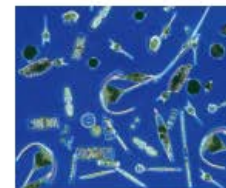
Volumeeqcylinder



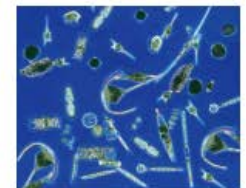
Volumeeqcylinder



Volumeeqcylinder



Volumeeqcylinder



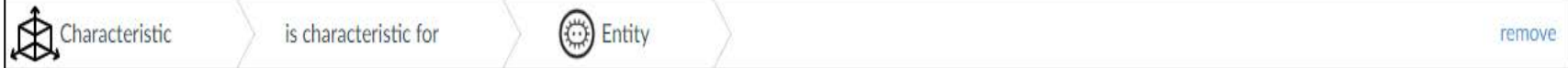
Volumeeqcylinder

Queries Examples

- Query 5: retrieve values of all characteristics observed for the species **Plagioselmis prolonga** and spatial information related to the species.

Queries Examples

Find: **Characteristics** IS CHARACTERISTIC FOR Entity where entities has species *Plagioselmis prolonga*



WHERE

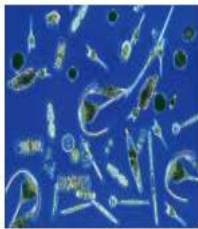


found 400 matches

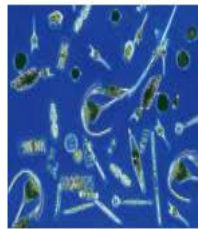
Grid Table Carousel

Only entities with image representation are shown in the Grid!

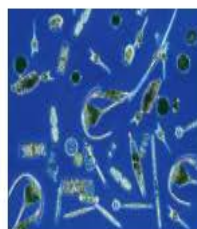
Filter Results



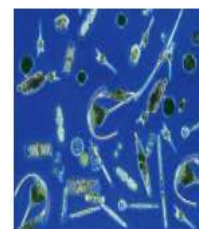
Biovolume



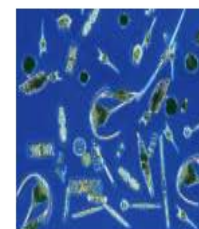
Biovolume



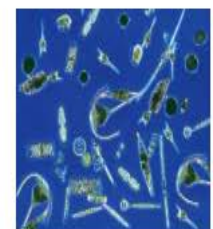
d



d



Volumeeqsphere



Volumeeqsphere

Queries Examples

Find: **Characteristics** IS CHARACTERISTIC FOR Entity where entities has species *Plagioselmis prolonga* and HAS TYPE d



Characteristic

is characteristic for



Entity

WHERE



Entity

has species



Species

Plagioselmis prolonga

AND



Characteristic

has type



Type

d

remove

Hide Filter

found 45 matches

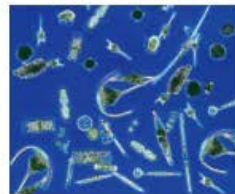
Grid

Table

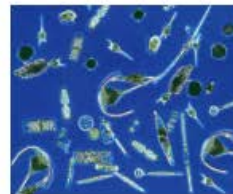
Carousel

Only entities with image representation are shown in the Grid!

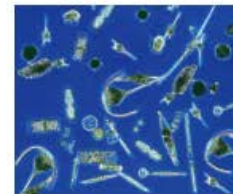
Filter Results



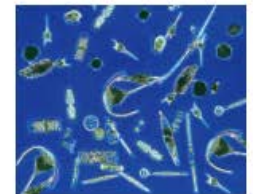
d



d



d



d

Queries Examples

Find: **Locations** IS LOCALITY OF Observation where observations is observation of species *Plagioselmis prolonga*

Location is locality of Observation

WHERE

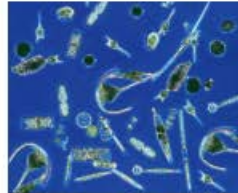
Observation is observation of species Species *Plagioselmis prolonga*

found 3 matches

Grid Table Carousel

Only entities with image representation are shown in the Grid!

Filter Results



korission

Queries Examples

Q6: Show me all the **measurements** of a **characteristic**

 Measurement

was measurement of

 Characteristic

cancel

WHERE

 Characteristic

has type

 Type

cancel

Find a Type:

Bio

Biovolume

Q7: Show me all the **characteristics** of an **individual or a species**

 Characteristic

... related to

 Entity

 Type

cancel

Queries Examples

Q6: Show me all the **measurements** of a **characteristic**

 Measurement

was measurement of

 Characteristic

cancel

WHERE

 Characteristic

has type

 Type

cancel

Find a Type:

Bio

Biovolume

Q7: Show me all the **characteristics** of an **individual or a species**

 Characteristic

... related to

 Entity

 Type

cancel

Acknowledgments



Elena STANCA, Ilaria ROSATI and all the LifeWatch Italy Team

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Nikos Minadakis

FORTH

e-mail: minadakn@ics.forth.gr

Thank you



Demo



<http://83.212.169.164:10214/resource/LWERIC>