The Nordic Microalgae Information System

and other possible contributions to the construction of a marine virtual lab

LifeWatch marine thematic technical workshop

3-5 May, 2014

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The National Oceanographic Data Centre at SMHI

Database SHARK holds most of the Swedish marine monitoring data

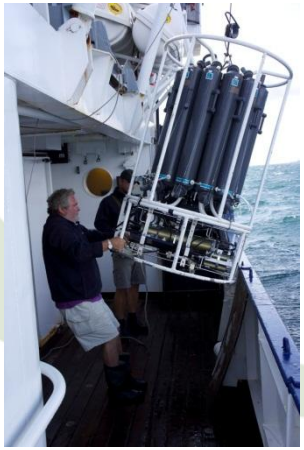
- Biology
  - Bacteria
  - Phytoplankton and chl. *a*
  - Zooplankton
  - Benthic fauna
  - Macro flora
  - Sea mammals
  - Etc.
- Physics and chemistry
  - Salinity
  - Temperature
  - Secchi depth
  - Oxygen
  - Inorganic nutrients
  - Total P and N
  - Particulate C and N
  - CDOM
  - Etc.

Physics and chemistry

Water sampling

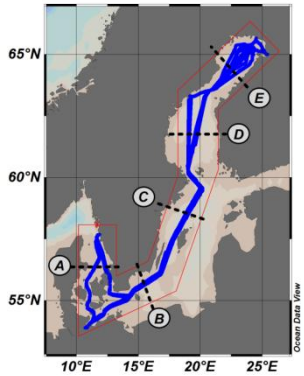
85 904 sampling occassions
660 249 water samples

- Salinity
- Temperature
- Nutrients
- Oxygen
- Chlorophyll
- Etc.



”Automated” systems

- Light ship data
- CTD-data
- Oceanographic buoys
- FerryBox-system, e.g. CO_2 and pH
- Water level gauges



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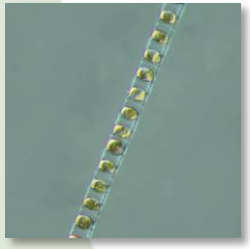
Biodiversity data from surveys, national and regional monitoring



	Number of sampling events
Pelagic bacteria	1429
Grey seals	6271
Harbour seals	6163
Macrophytes	5213
Sedimentation rates	1113
Benthic fauna	8340
Phytoplankton	1329
Zooplankton	Info missing

From www.smhi.se/sharkweb 2 December 2013

Part of a large network

Nationella och regionala dataleverantörer

NATUR VÅRDS VERKET och Havs Vatten myndigheten

ICES CIEM

ArtDatabanken
Swedish Species Information Centre

VISS - VattenInformationsSystem Sverige

VATTENMYNDIGHETERNA

Swedish Oceanographic Data Centre
SHARK

OSPAR COMMISSION

European Environment Agency

LIFEWATCH

JERICO

MyOcean

User

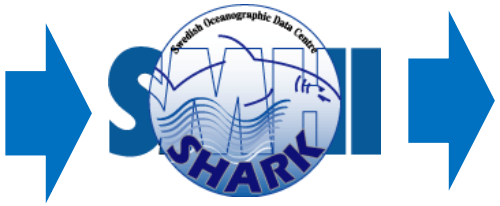
SeaDataNet

EMODnet
European Marine Observation and Data Network

ecds
Environment Climate Data Sweden

Flows of data

National marine monitoring
Regional marine monitoring
Surveys
SMHI:s automated systems
Oceanographic buoys
FerryBox System
mätsystem
Historic data
m.m.



UNESCO-IOC
ICES
EEA
Lifewatch
EMODNET
MyOcean II
SeaDataNet
SwAM
NV
Länsstyrelser
Havsmiljöinstitutet
m.m.

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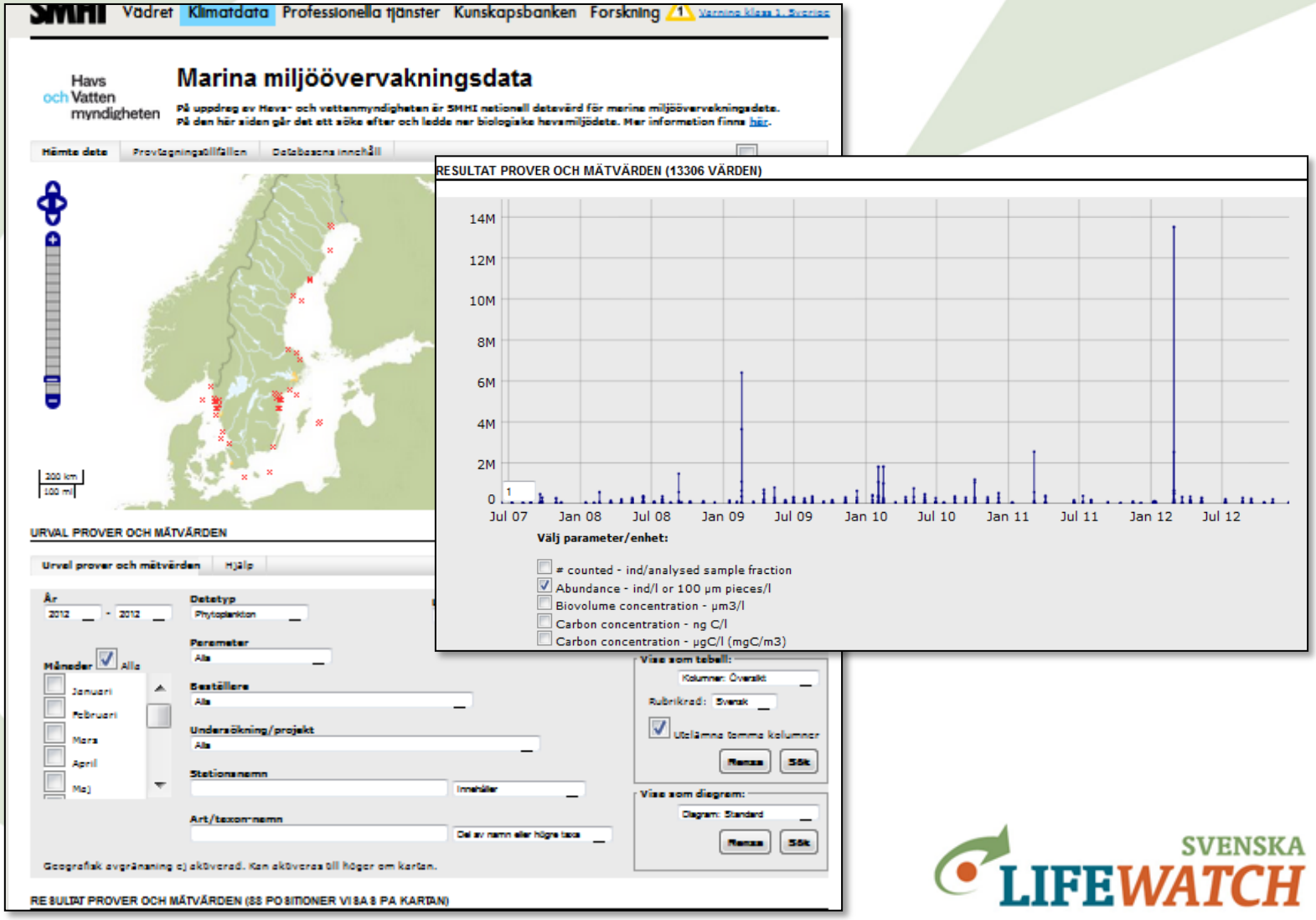
Swedish Oceanographic Data Centre

www.smhi.se/sharkweb



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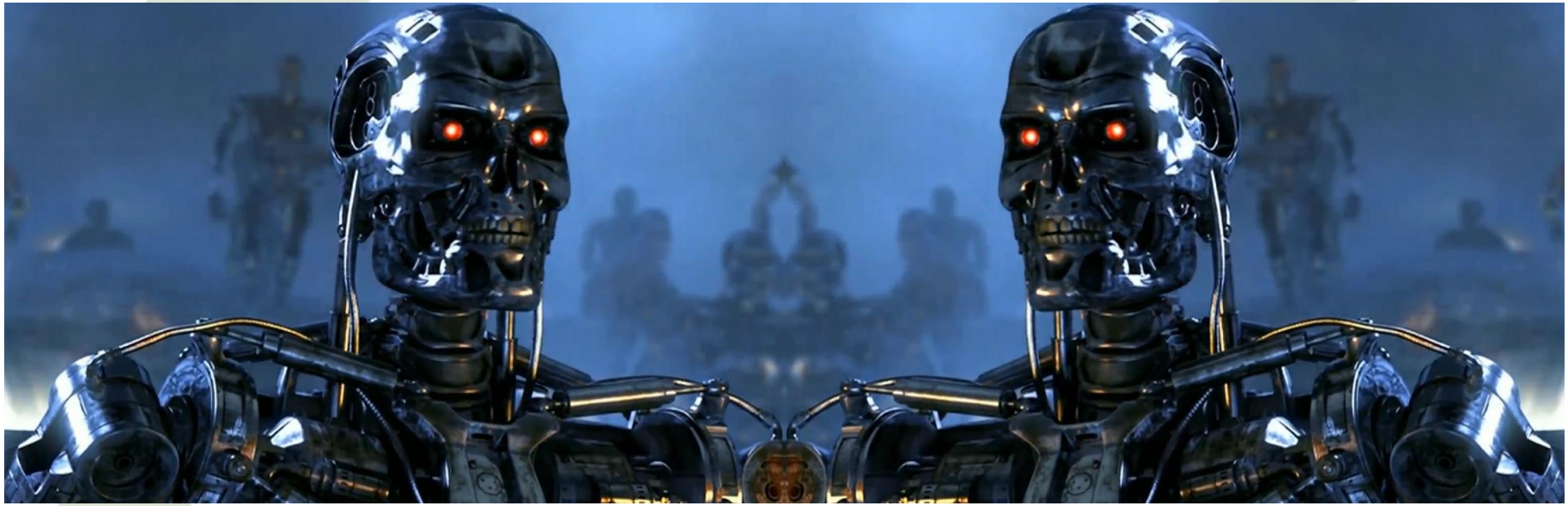
Machine – Machine communication



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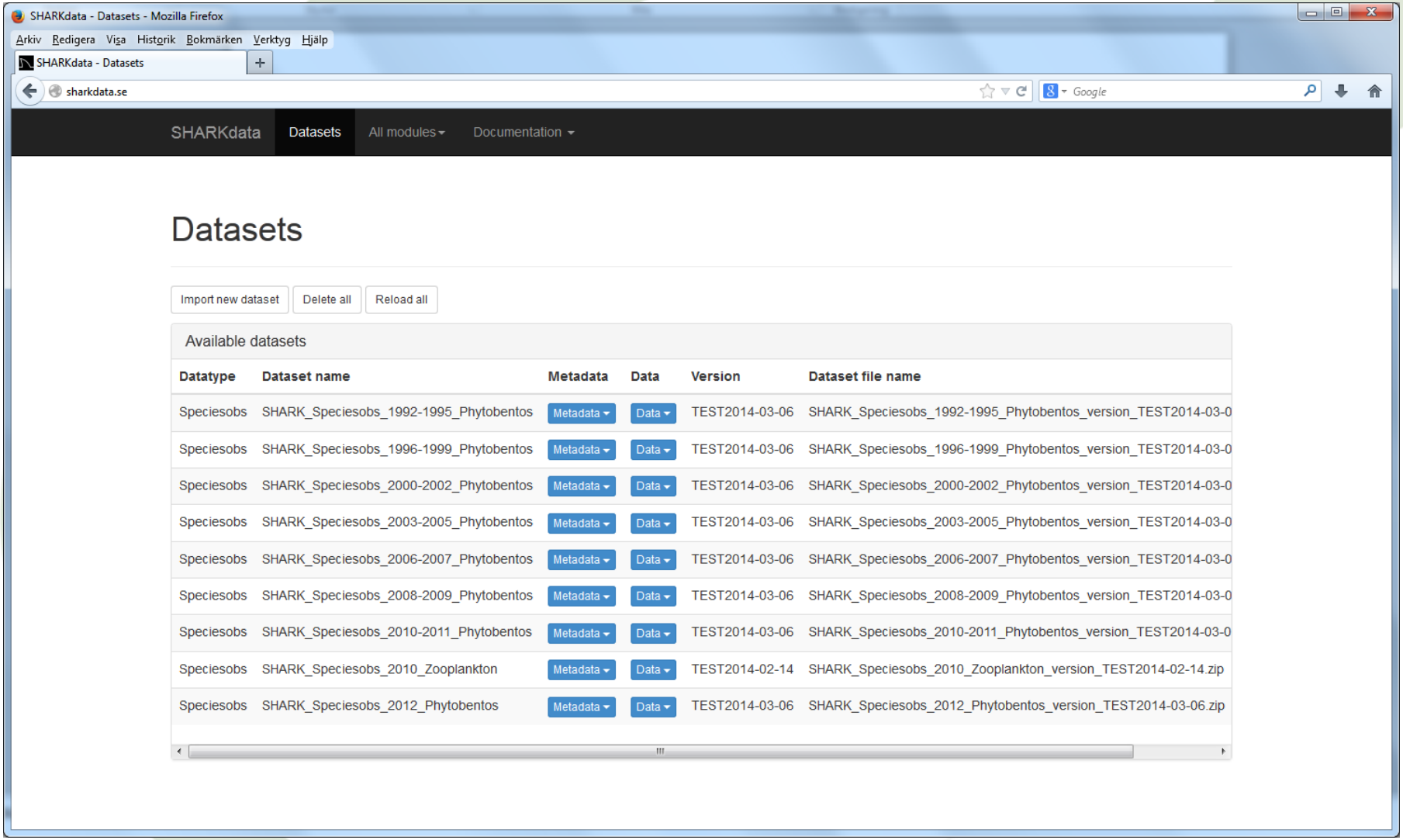

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SHARKdata | Datasets | All modules | Documentation

Species observations

Update | Reload | Clean up

Species observations filter

Year from: 2007

Year to: 2009

Scientific name: Homarus gammarus

As reported on various rank.

Class: All

Including taxa of lower rank.

Order: All

Including taxa of lower rank.

Species: All

Including taxa of lower rank.

View data | View example URLs | Clear

Species observations

occurrenceID	DataType	scientificName	scientificNameAuthorship	decimalLatitude	decimalLongitude	eventDate	year	mont
022bce078f11ddbba26f323e965eb57d	Phytobenthos	Homarus gammarus	-	57.37391	11.85557	2007-08-11	2007	8
0686506a3b813086b89307011f05b3a9	Phytobenthos	Homarus gammarus	-	57.43337	11.89516	2008-07-22	2008	7
35b619e73d3c7e95022f3d9baa6540cd	Phytobenthos	Homarus gammarus	-	57.43337	11.89516	2009-08-03	2009	8

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SHARKdata | Datasets | All modules | Documentation

Order: All

Including taxa of lower rank.

Species: All

Including taxa of lower rank.

View data | View example URLs | Clear

Example URLs

/speciesobs/table.txt/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus&page=1&per_page=10
/speciesobs/table.json/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus&page=1&per_page=10
/speciesobs/table.json/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus&page=1&per_page=10&view_deleted=true
---
/speciesobs/table.txt/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
/speciesobs/table.json/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
/speciesobs/positions.kml/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
/speciesobs/year_info.kml/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
/speciesobs/map/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
http://maps.google.se/?q=http://sharkdata.se/speciesobs/positions.kml/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
http://maps.google.se/?q=http://sharkdata.se/speciesobs/year_info.kml/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
---
For development (from http://test.sharkdata.se):
http://maps.google.se/?q=http://test.sharkdata.se/speciesobs/positions.kml/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus
http://maps.google.se/?q=http://test.sharkdata.se/speciesobs/year_info.kml/?year_from=2007&year_to=2009&scientific_name=Homarus gammarus

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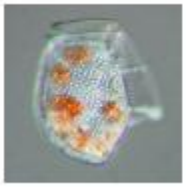
Information system for microalgae

SMHI






www.nordicmicroalgae.org

- Cooperation with Nordic countries and all countries surrounding the Baltic Sea
- Connected to Dyntaxa and www.algaebase.org
- Useers contribute content
- Phytoplankton
- Benthic microalgae
- Mikrozooplankton
- Taxonomic information
- Imgaes
- Video
- Biovolume
- Carbon content
- Harmfulness

www.smhi.se/sharkweb

- Database with quantitative data
- PostgrSQL
- Data is freely available
- Web feature services sharkdata.net

Plankton Toolbox

- Analysis tool
- Open source software for Windows, Mac och Linux
- Aggregerate data
- Statistics
- Plotting
- Etc.

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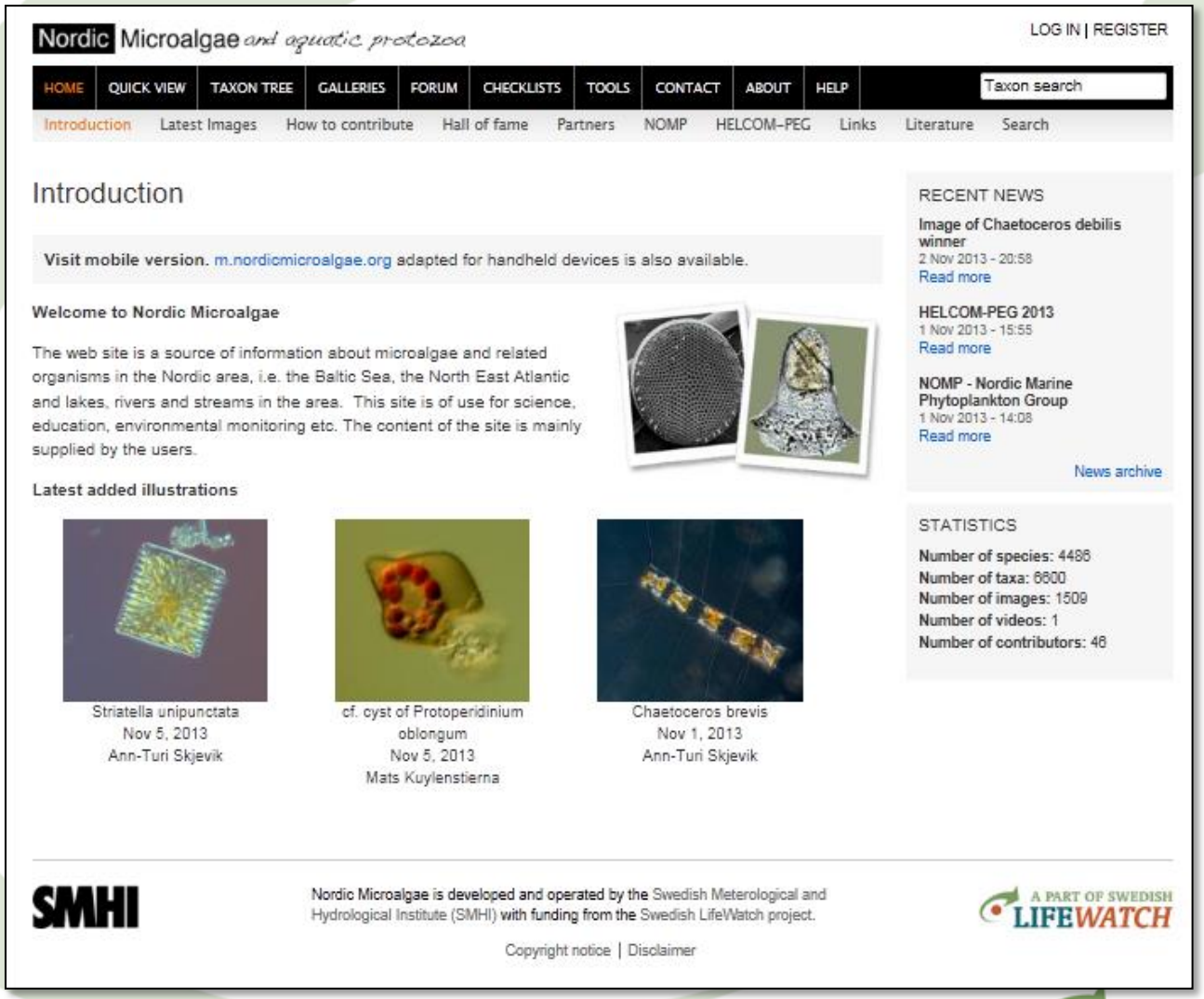
Nordic Microalgae

www.nordicmicroalgae.org



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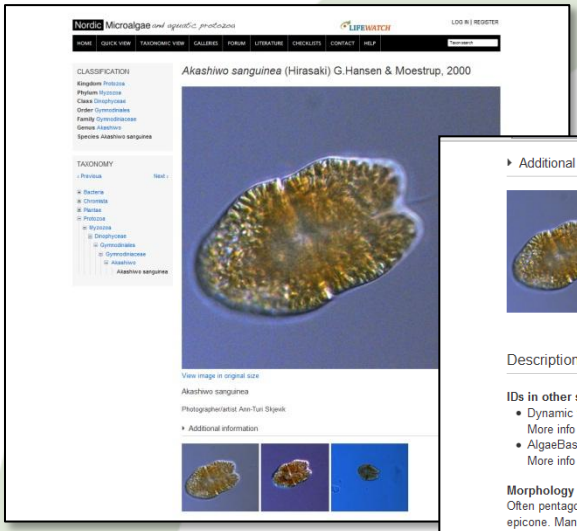
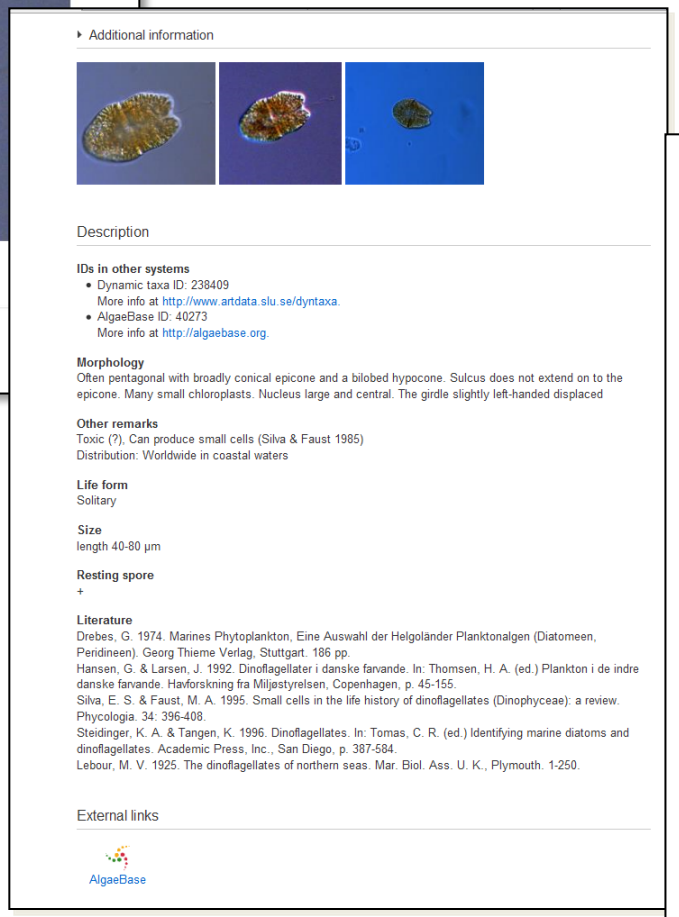
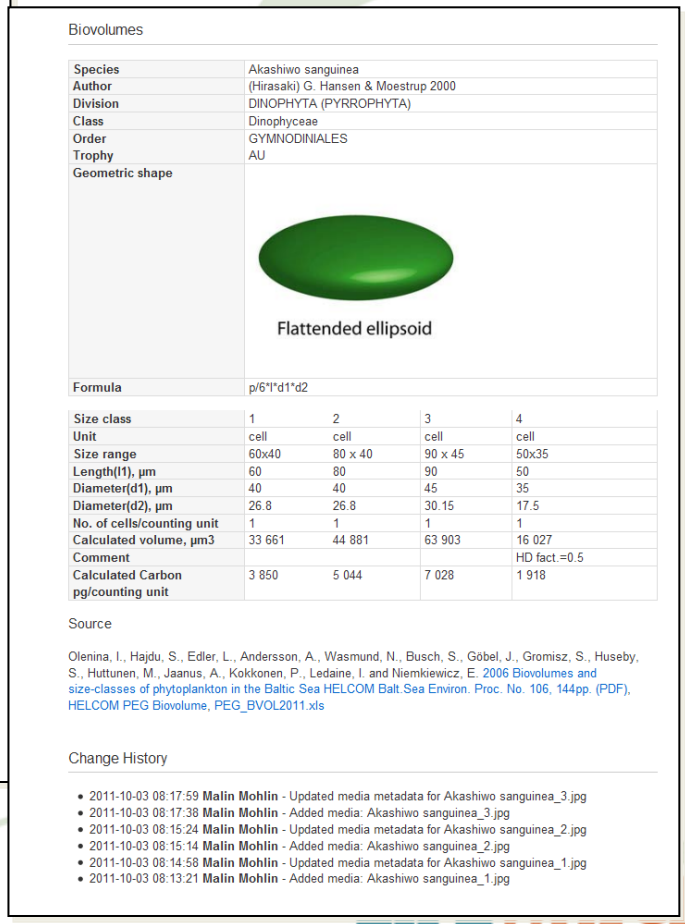
Taxon sheets







Check lists

Checklists | Nordic Microalgae - Mozilla Firefox

Arkiv Redigera Visa Historik Bokmärken Verktyg Hjälp

http://nordicmicroalgae.org/checklists

Mest besökta | Kom igång | Senaste nytt | Fel vid sidhämtning | PlanktonDB | Spend

Checklists | Nordic Microalgae

Nordic Microalgae *and aquatic protozoa* LIFEWATCH LOG IN | REGISTER

HOME | QUICK VIEW | TAXONOMIC VIEW | GALLERIES | FORUM | LITERATURE | CHECKLISTS | CONTACT | HELP | Taxon search

Checklists

Nordic Microalgae checklists (at present in a test version)

Lists of species and subordinate taxa and some addtional information is availabe in the standard version.
The extended version also includes the taxonomic hierarchy and HELCOM-PEG names etc.
Please note that the content of Nordic Microalge is based on DynTaxa at the Swedish Species Information Centre.

Adobe Acrobat format

nordicmicroalgae_checklist_2011_Oct_10.pdf

Excel file format

nordicmicroalgae_checklist_2011_Oct_10.xls

nordicmicroalgae_extended_checklist_2011_Oct_10.xls

Text file (tab delimited)

nordicmicroalgae_checklist_2011_Oct_10.txt

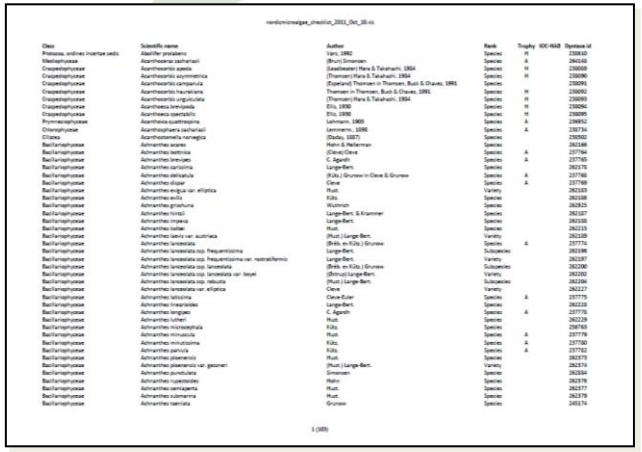
nordicmicroalgae_extended_checklist_2011_Oct_10.txt

Biovolumes and Size-Classes of Phytoplankton in the Baltic Sea
Olenina, I., Hajdu, S., Edler, L., Andersson, A., Wasmund, N., Busch, S., Göbel, J., Gromisz, S., Huseby, S., Huttunen, M., Jaanus, A., Kokkonen, P., Ledaine, I. and Niemkiewicz, E. 2006 Biovolumes and size-classes of phytoplankton in the Baltic Sea HELCOM Balt.Sea Environ. Proc. No. 106, 144pp. http://www.helcom.fi/stc/files/Publications/Proceedings/bsep106.pdf

The latest update of the HELCOM-PEG list of biovolumes of phytoplankton in the Baltic Sea and the Kattegat-Skagerrak is available at ICES at: http://www.ices.dk/env/repfor/index.asp

Copyright notice | Disclaimer

Klar



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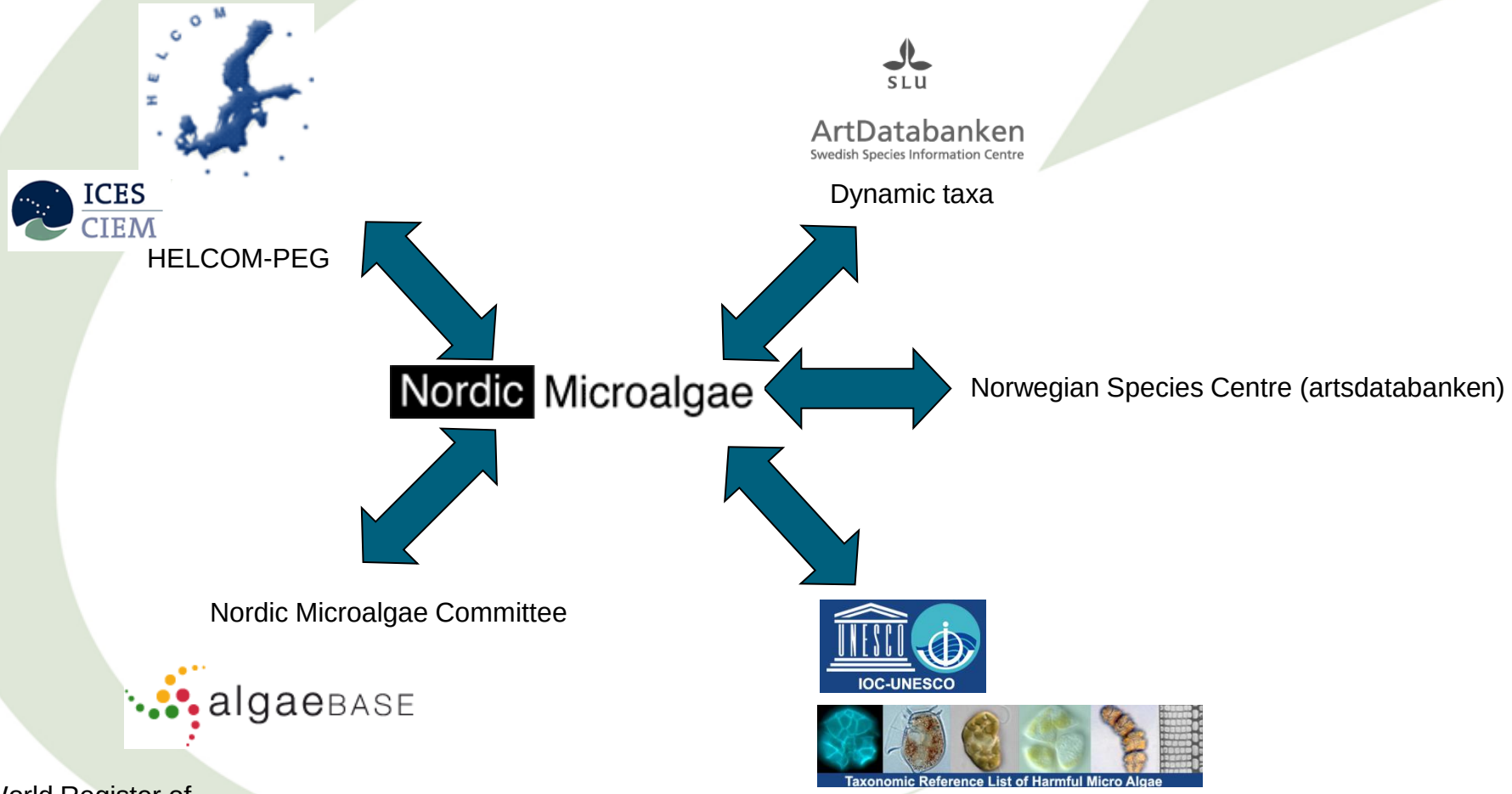
Data flow plankton species information



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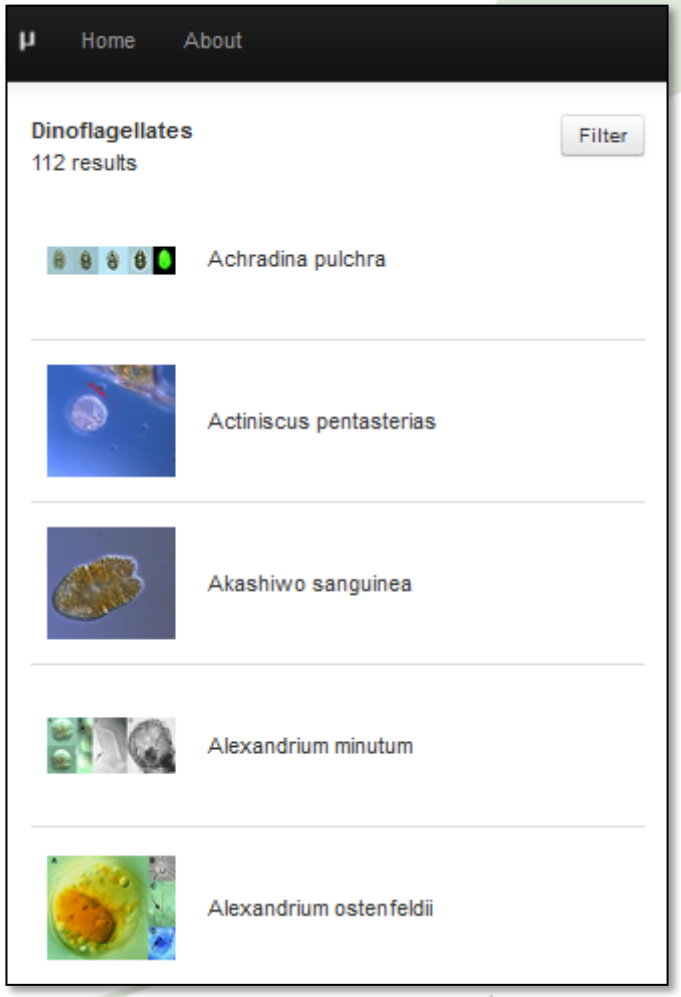
m.nordicmicroalgae.org

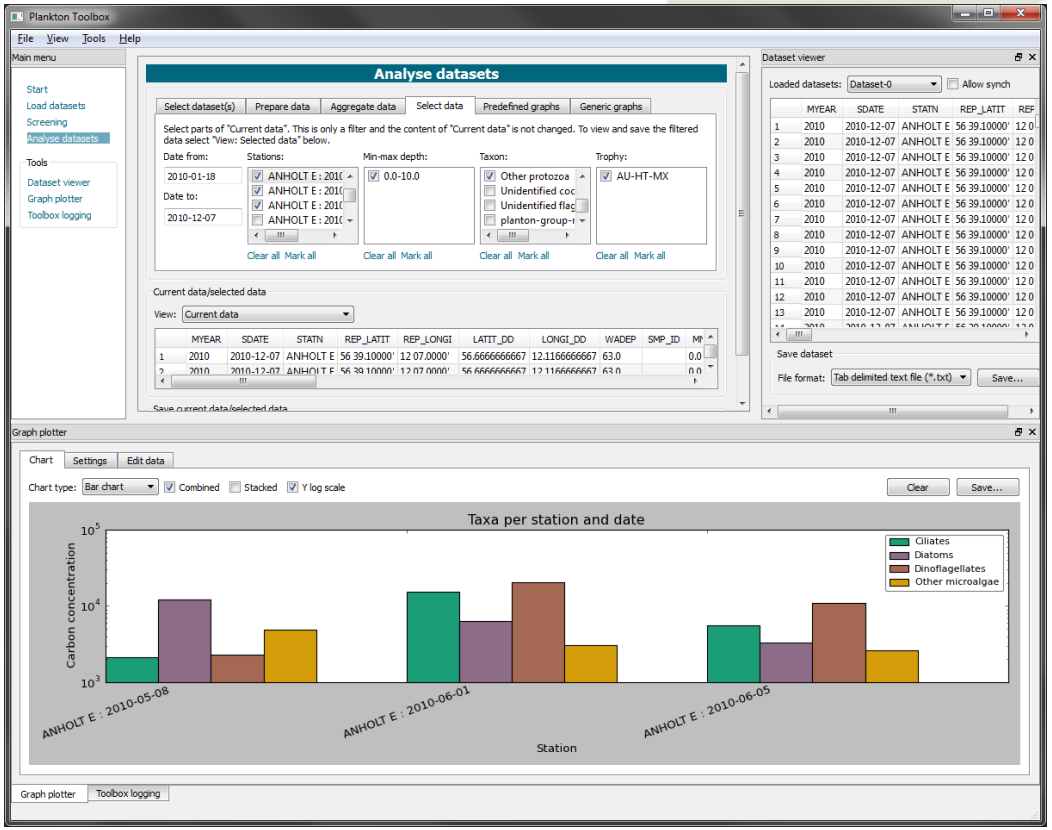
- Adapted for smartphones and tablets
- Tested on iPhone, iPad, Android
- Not an app – you need internet access
- Same content as www.nordicmicroalgae.org



Analysis tool - Plankton Toolbox

www.nordicmicroalgae.org/tools

- Tool for working with phyto- and zooplankton data
- Stand alone software developed in Python (open source)
- Available for Windows, Mac, Linux
- Version 1.0.0 released 19 May 2014
- Reads multiple data formats
- Screen data
- Filter data
- Aggregate data
- Plot data
- Statistical analysis
- Exports in txt and xlsx



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About quantitative phytoplankton data

Information from one sample

- Biodiversity
  - Species
  - Genera
  - Unidentified organisms
- Cell shape and size
  - Size group
  - Geometric shape
  - Cell volume
  - Carbon content
- Trophic type
  - Autotrophic
  - Mixotrophic
  - Heterotrophic
  - Not specified
- Abundance (cell numbers)
- Biomass
  - Biovolume
  - Carbon

Meta data

Experiment

- Control
- Treatment
- Replicate

Field data

- Location
  - Latitude
  - Longitude
  - Depth or depth range
- Date and time
- Sampling method
  - Tube
  - Water bottle
  - Etc.

Analysis method

- Utermöhl – inverted microscope
- Other counting chambers
- Filtering – fluorescence microscopy etc.

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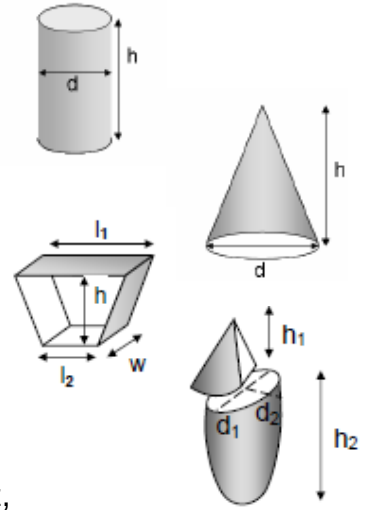
Phytoplankton analysis method Utermöhl with calculation of biovolume



Olenina, I., Hajdu, S., Edler, L., Andersson, A., Wasmund, N., Busch, S., Göbel, J., Gromisz, S., Huseby, S., Huttunen, M., Jaanus, A., Kokkonen, P., Ledaine, I. and Niemkiewicz, E. 2006 Biovolumes and size-classes of phytoplankton in the Baltic Sea HELCOM Balt.Sea Environ. Proc. No. 106, 144pp. (PDF)

Recent list available at:

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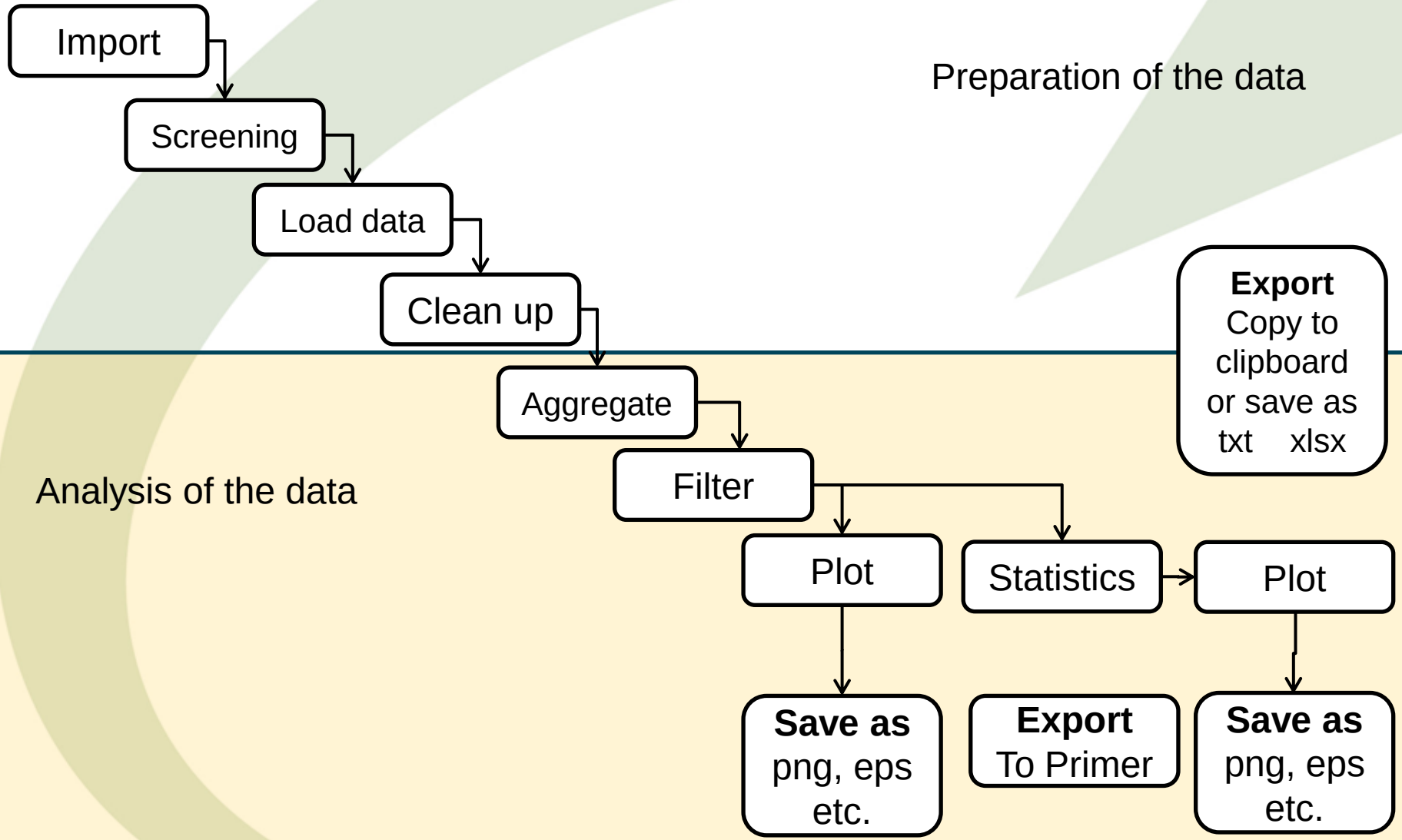
Stepwise analysis of data using Plankton Toolbox



Some info needed

Microscopy

- Names of organisms
- Taxonomic hierachy
- Trophic types
- Cell volumes
- Carbon content

Molecular data

- Operational Taxonomic Units
- Taxonomic hierachy
- Trophic types
- Ratio rDNA/Cell size
- Ratio cell size/carbon content

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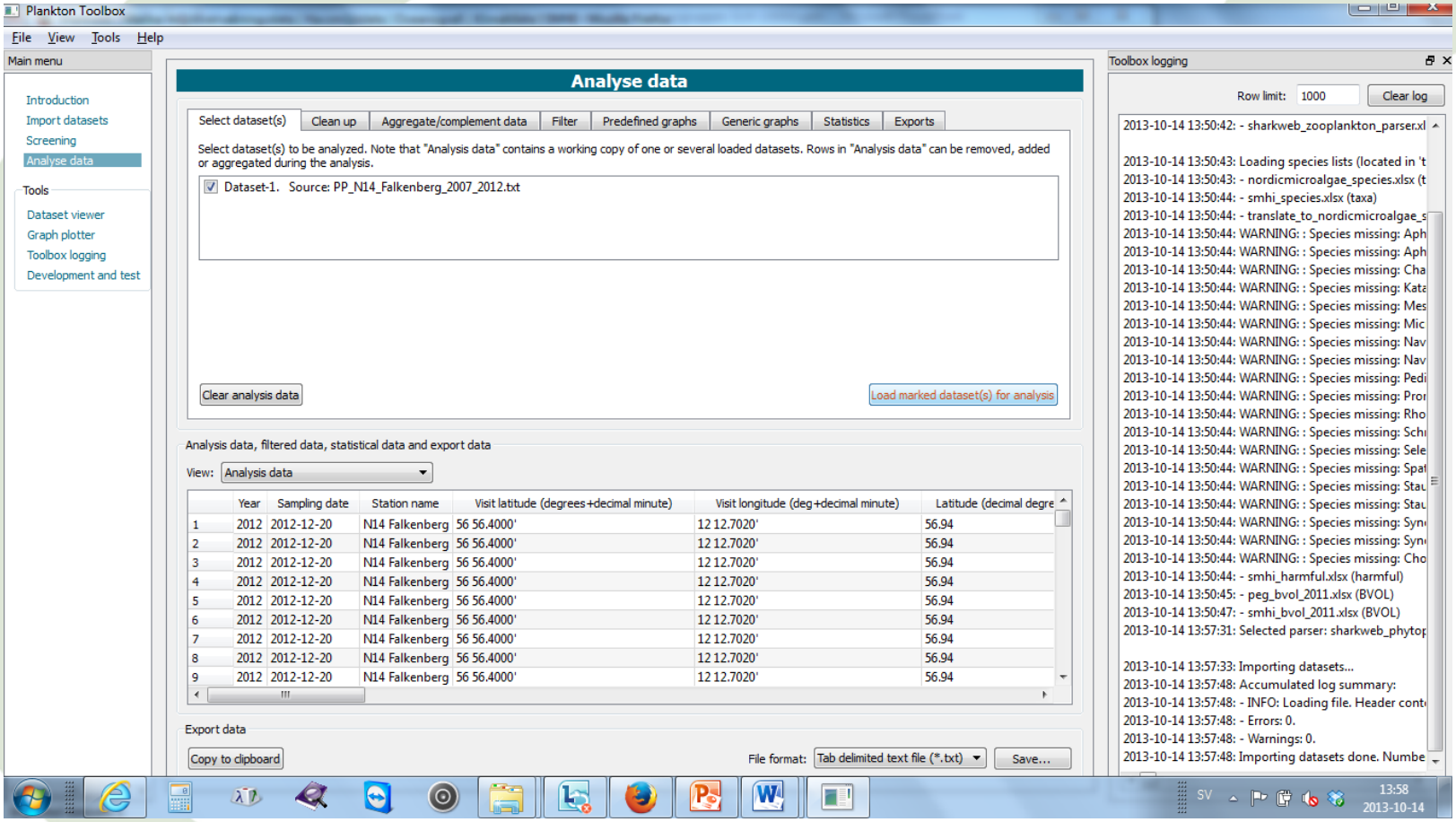
Plankton Toolbox

SMHI



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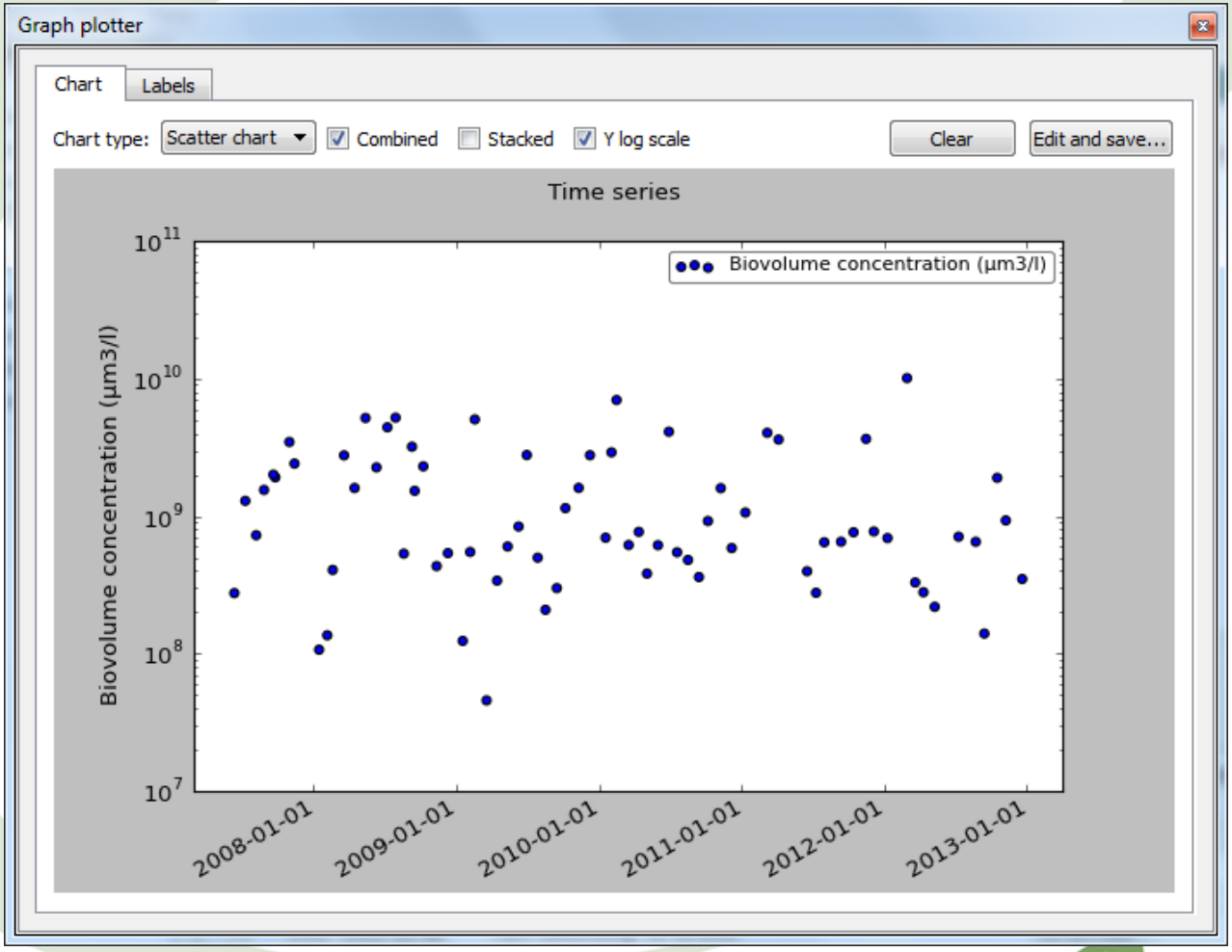
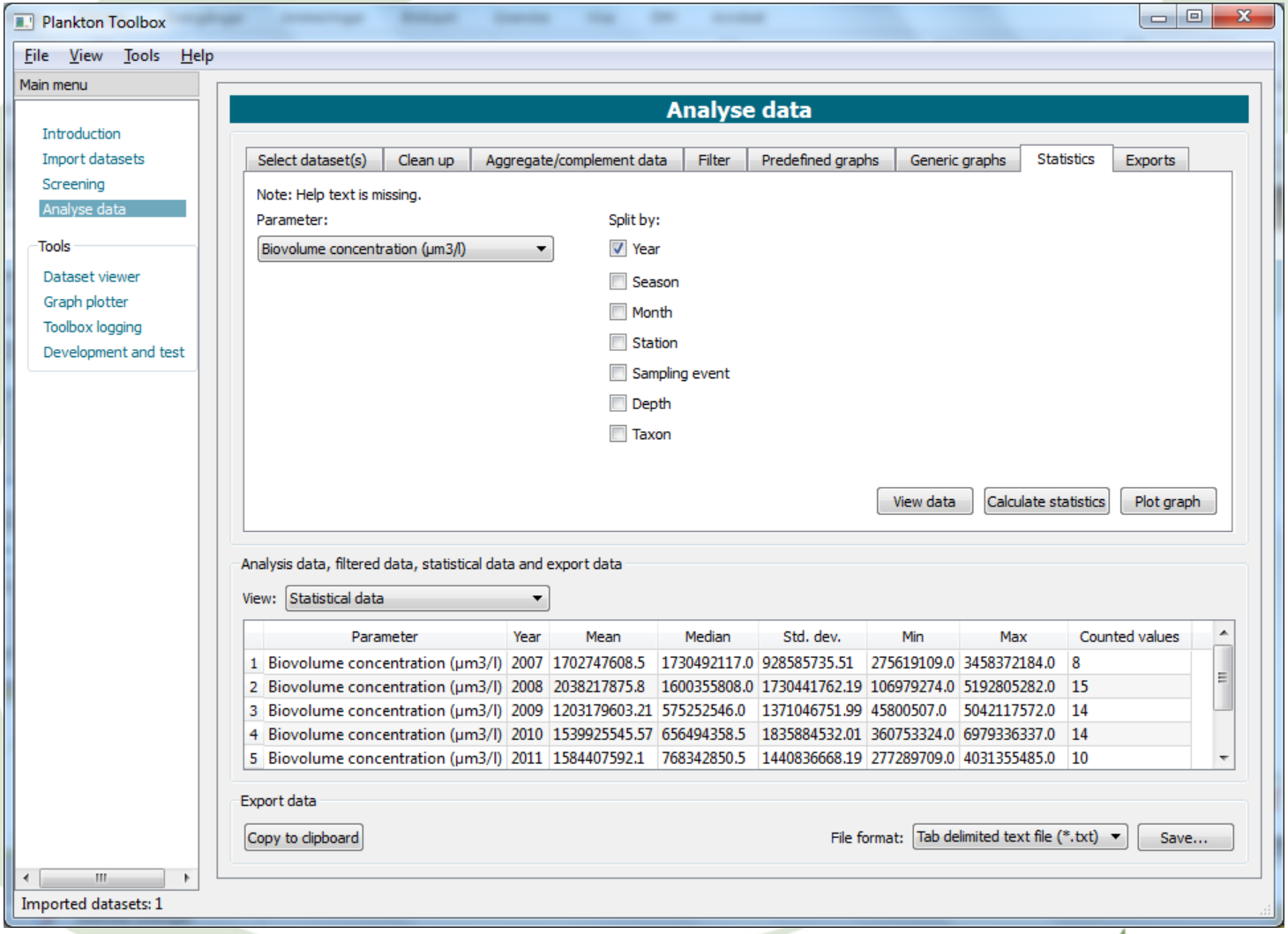
Plankton Toolbox
Plot of aggregated data



Statistics



	Parameter	Year	Mean	Median	Std. dev.	Min	Max	Counted values
1	Biovolume concentration (µm3/l)	2007	1702747608.5	1730492117.0	928585735.51	275619109.0	3458372184.0	8
2	Biovolume concentration (µm3/l)	2008	2038217875.8	1600355808.0	1730441762.19	106979274.0	5192805282.0	15
3	Biovolume concentration (µm3/l)	2009	1203179603.21	575252546.0	1371046751.99	45800507.0	5042117572.0	14
4	Biovolume concentration (µm3/l)	2010	1539925545.57	656494358.5	1835884532.01	360753324.0	6979336337.0	14
5	Biovolume concentration (µm3/l)	2011	1584407592.1	768342850.5	1440836668.19	277289709.0	4031355485.0	10

Summary

- Data from marine monitoring and surveys
  - Biology
  - Physics and chemistry
- Machine to machine communication
- Information system for microalgae
  - Quantitative information on biodiversity, distribution, abundance, biomass
  - Information on size, trophic type, harmfulness etc.
  - Analysis tool Plankton Toolbox
- Quality control needed at every step in work flows
- Communication with the original data provider is essential