

# Nordic Microalgae - an information system for aquatic microalgae

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Fig. 4. Images of phytoplankton from www.nordicmicroalgae.org. Photographers: Ann-Turi Skjevick and Bengt Karlson.



## Abstract

Phytoplankton and other microalgae are diverse and changes in systematics and taxonomy are not uncommon. Correct identification of organisms is essential when monitoring phytoplankton. The most common tool is light microscopy although molecular techniques as well as fluorescence and electron microscopy are also used. The aim of the Nordic Microalgae information system is to present up to date information on microalgae and related heterotrophic groups at the web site www.nordicmicroalgae.org. The site is available to the public since mid-2011. A version adapted for small screen devices, e.g. smart phones, is available since April 2013 at http://m.nordicmicroalgae.org. The system is based upon the concept of taxon sheets which contain information on a certain taxon, e.g. name, taxonomic position, harmfulness, size, biovolume information, images and links to other resources. Images and videos of organisms are contributed by users. Downloadable check lists of species and higher taxa are regularly quality controlled and updated. A database with quantitative data from phytoplankton monitoring is part of the system. It is available at www.smhi.se as part of the Swedish National Oceanographic Data Centre. Modern database and web technology facilitates interactive production of distribution maps and graphs of time series of data. The system is part of the Swedish Lifewatch project which contributes to EU Lifewatch.

## The problem to solve

Phytoplankton, benthic microalgae and aquatic protozoa are important parts of aquatic ecosystems. This is recognized e.g. in the EU Water Framework Directive and in the EU Marine Strategy Framework Directive and also in conventions such as OSPAR and HELCOM. Monitoring of harmful algae is essential for safe harvesting of wild and farmed shellfish since algal toxins may accumulate in e.g. mussels. Harmful algae also affect fish farms and sometimes wild fish and other marine organisms. Invasive microalgae also pose a problem. Thus monitoring of phytoplankton biodiversity, biomass and events such as harmful algal blooms is important to society. Today several different monitoring programs exist; international, national, regional etc. Some focus on harmful algae only while others monitor the whole plankton community. Unfortunately consistent organism identification and use of names is not always the case. Also ways to calculate biomass differ and data is not always readily accessible. This makes intercomparisons between different datasets difficult and costly.

## Three part system

At present microscopy is the state of the art for identifying and quantifying phytoplankton although e.g. imaging flow cytometry and molecular methods show promise for the future. To guarantee the quality and intercomparability of results from monitoring of microalgae an information system for aquatic microalgae has been created. It consists of three main parts:

1. The web site www.nordicmicroalgae.org with information on properties of organisms. The users contribute much of the content. Information on taxonomy and systematics comes from www.algaebase.org and the species centres in the Nordic countries. Information on biovolume and carbon content comes from the HELCOM phytoplankton expert group. Information on harmfulness comes from the IOC-UNESCO Taxonomic Reference List of Harmful Micro Algae.
2. A database for marine monitoring data. The Swedish Oceanographic Data Centre holds most marine biological and oceanographic data in Sweden. All data is freely available. As part of the Lifewatch project data is further quality controlled and will be made available via web feature services.
3. Plankton Toolbox is a free software tool for working with plankton data. Functionality include quality control, plotting, statistics etc. One convenient feature is ways to aggregate data from e.g. species level to algal class level. The software is currently being tested by selected users.

## www.nordicmicroalgae.org

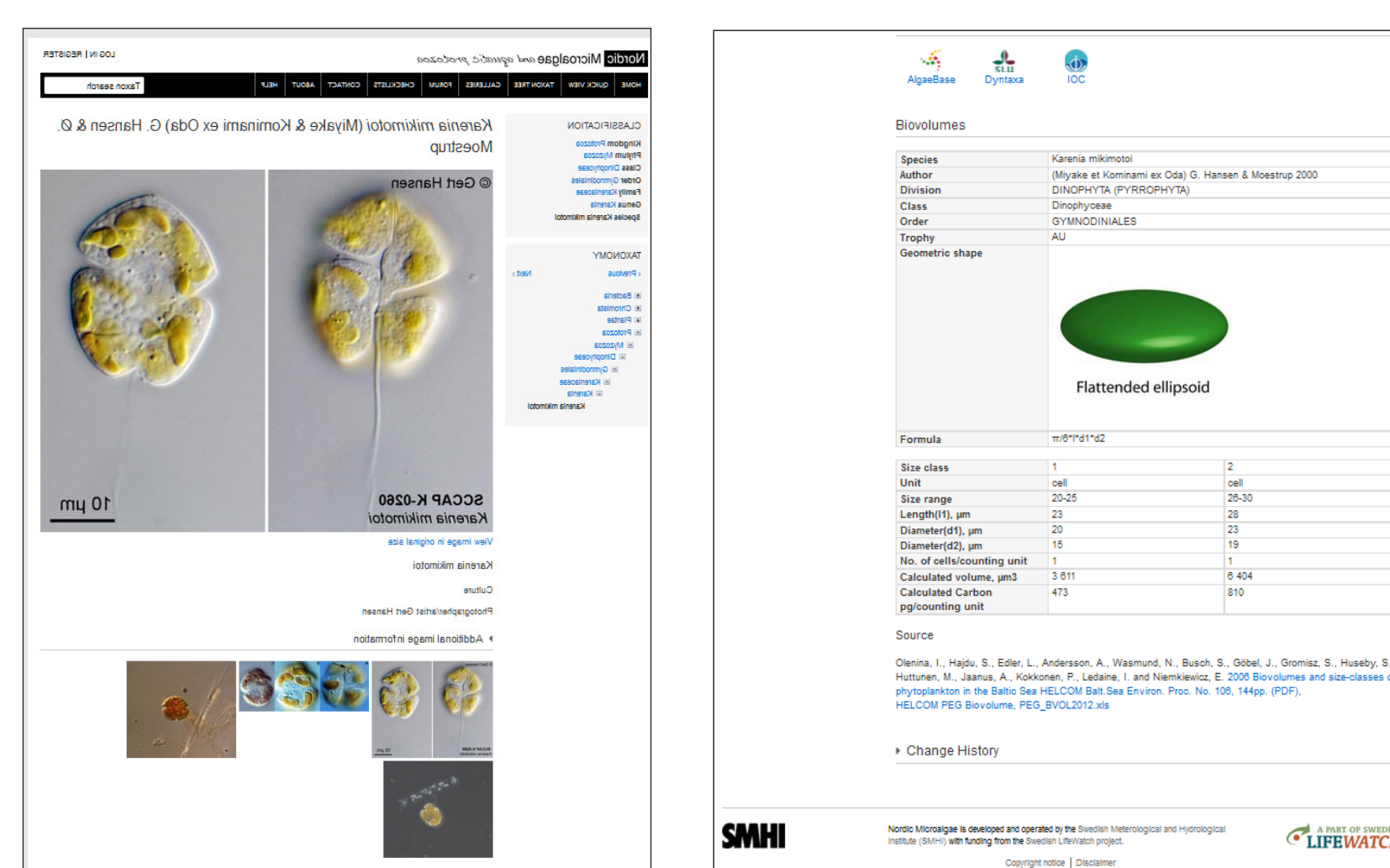
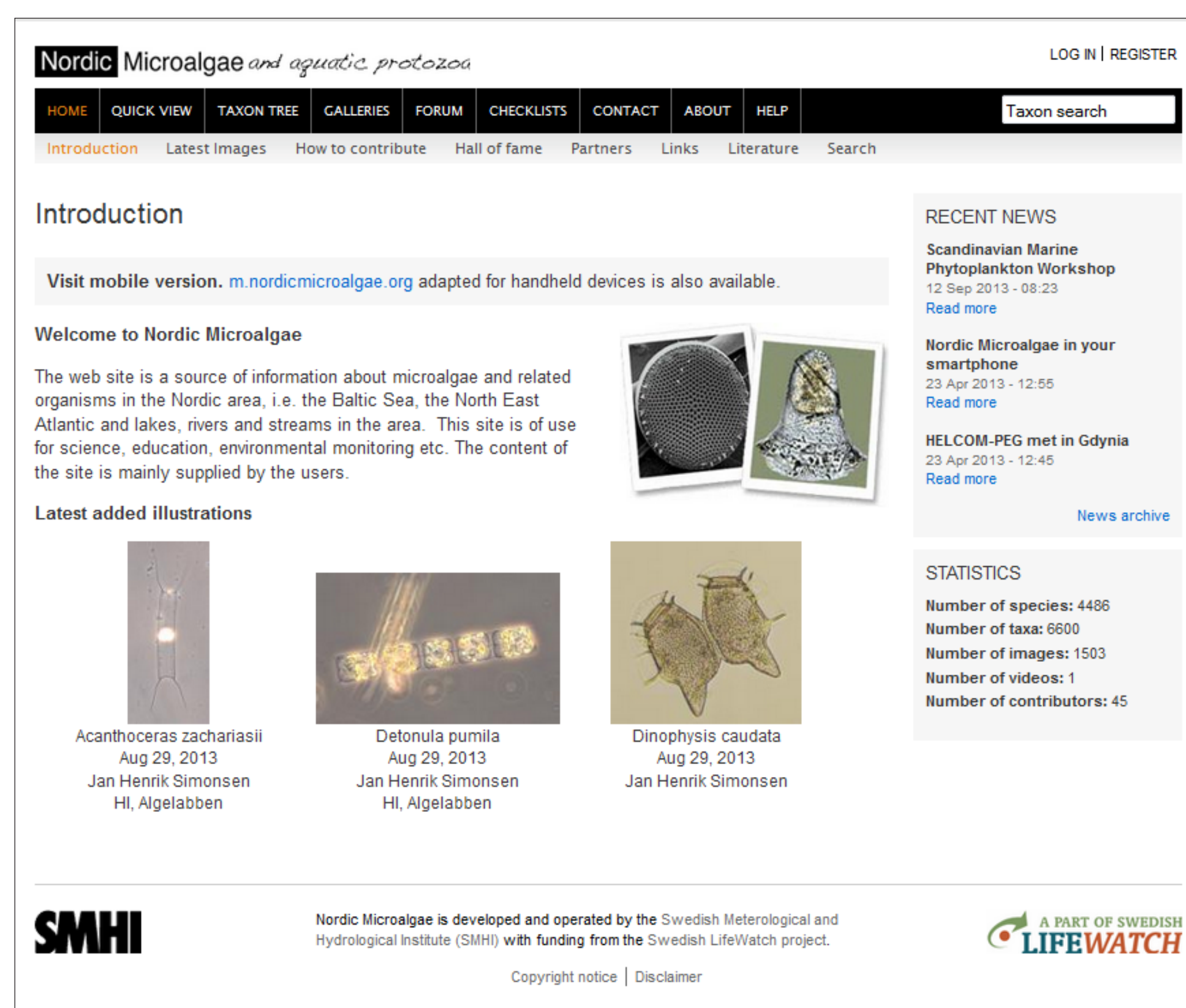


Fig. 1. Screen shots from www.nordicmicroalgae.org

## Swedish Oceanographic Data Centre

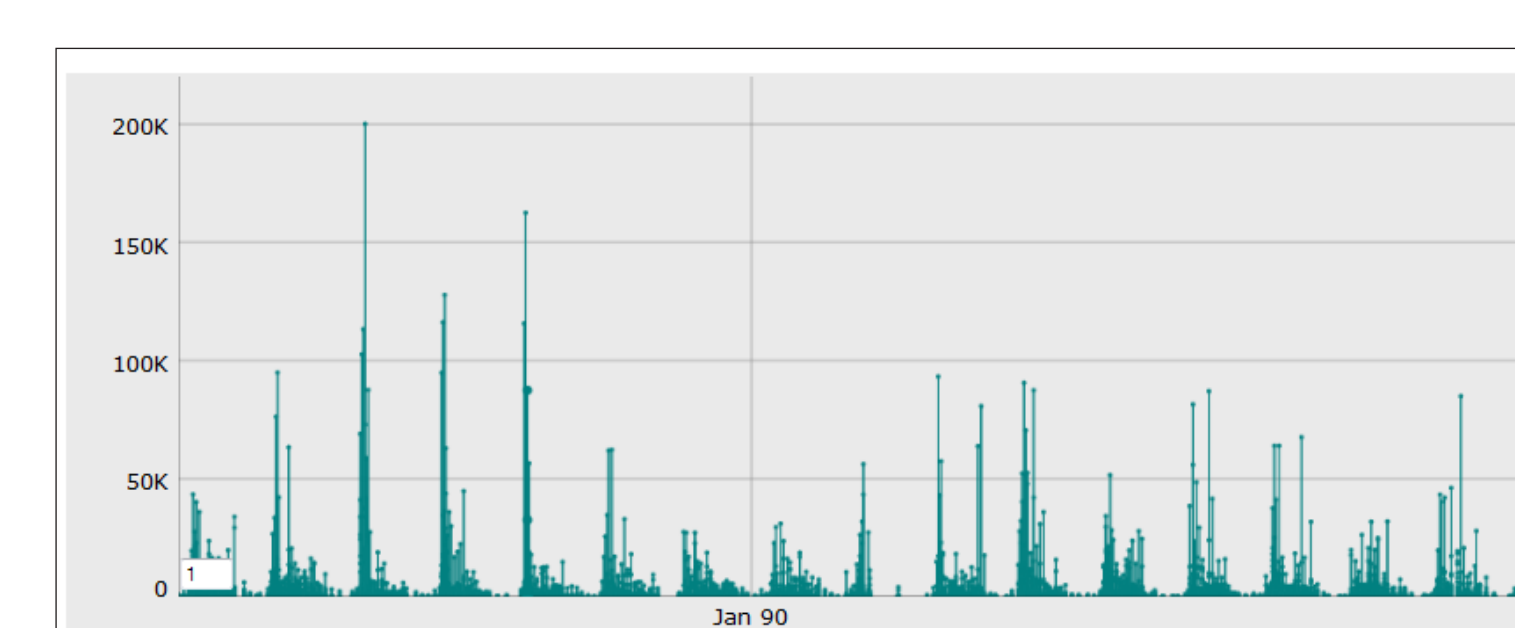
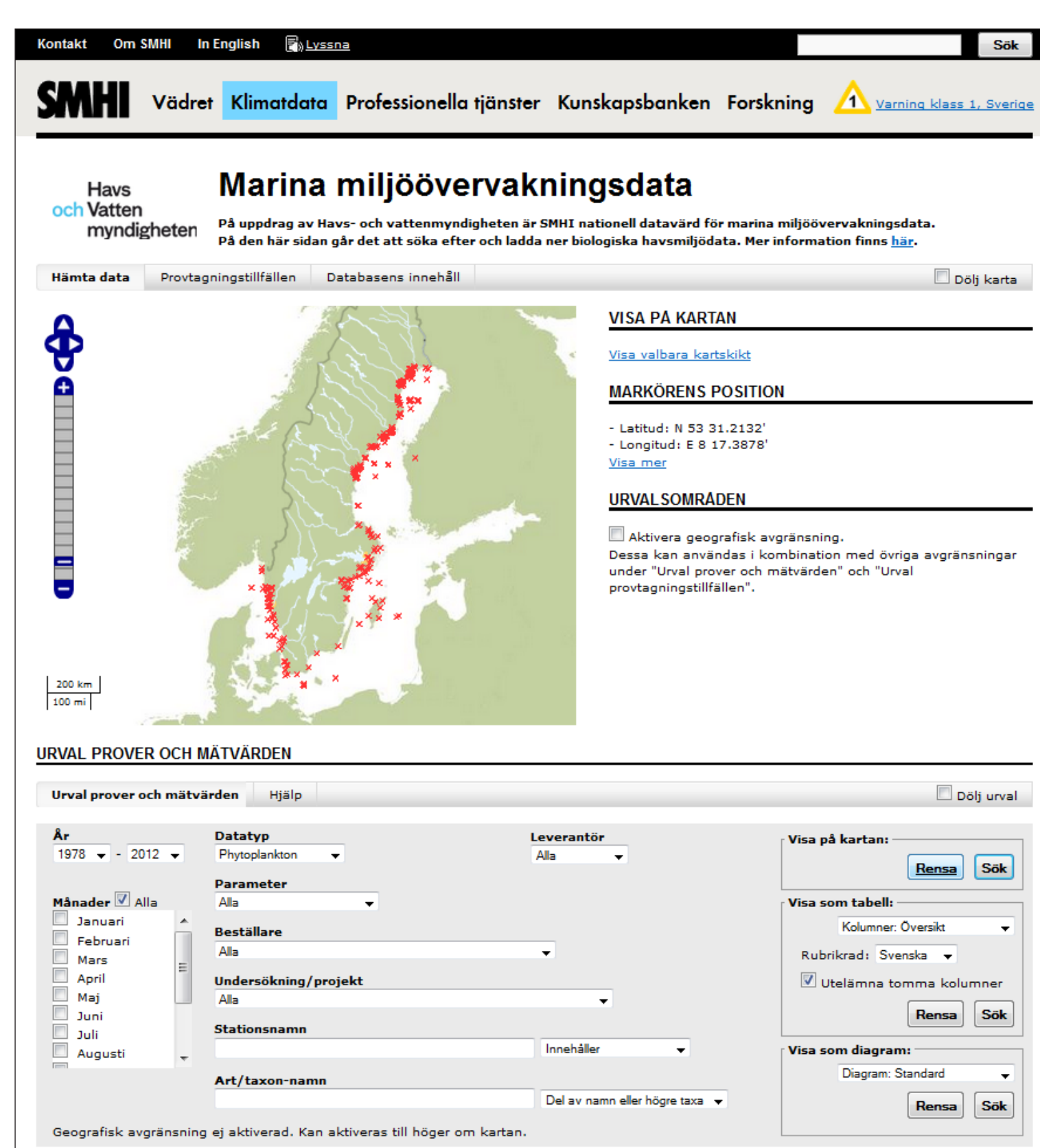


Fig. 2. Screen shots from http://www.smhi.se/klimatdata/oceanografi/Havsmiljodata/marina-miljoovervakningsdata showing some features of the web site for the Swedish Oceanographic Data Centre. The map indicate locations where phytoplankton has been sampled. The graph shows a time series of phytoplankton biomass data in carbon units.

## Plankton Toolbox

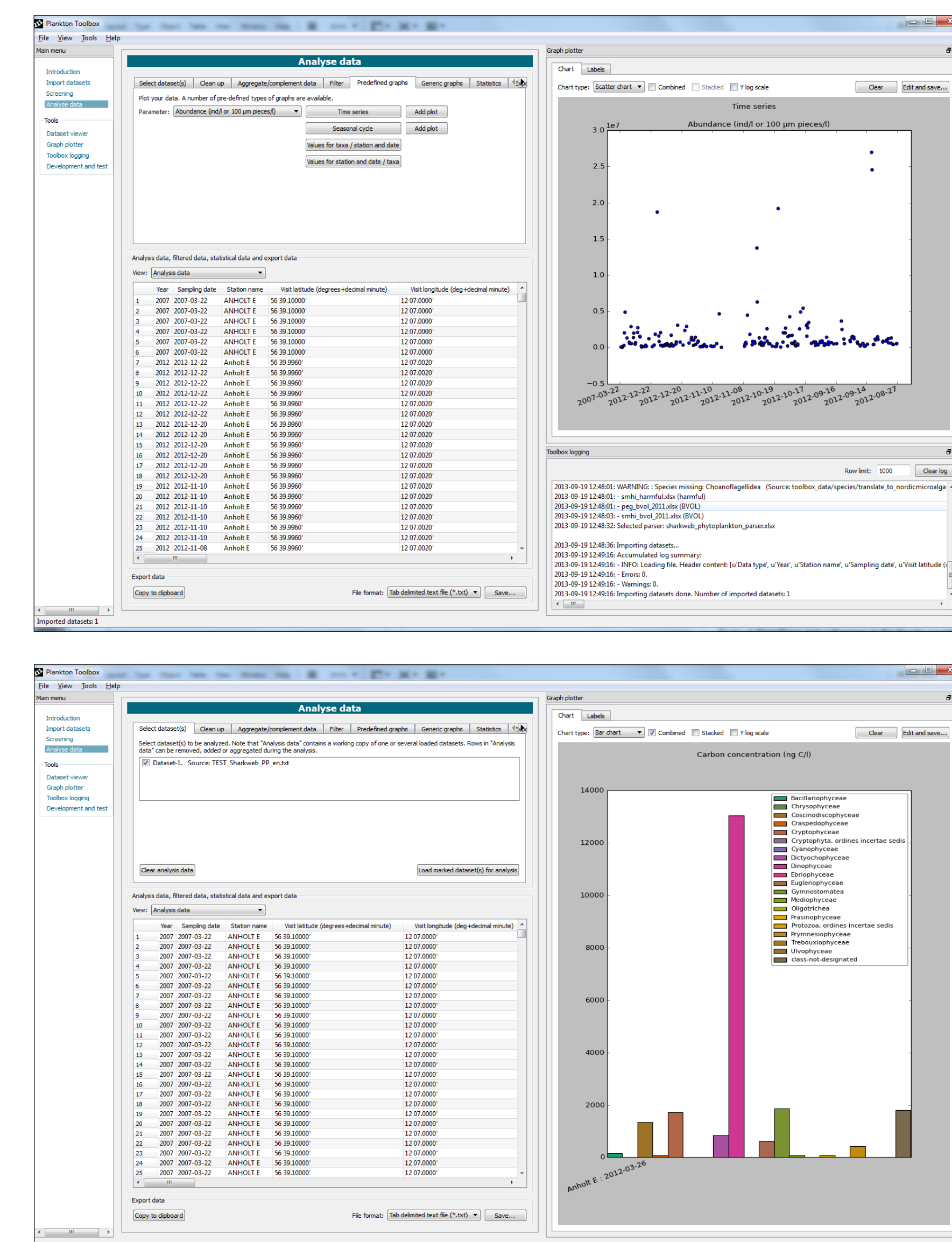


Fig. 3. Screenshots from the software tool Plankton Toolbox.

## Collaboration, free data and free software

The concept for the information system for aquatic microalgae is based on collaboration between specialists working on microalgae and on marine data. The microalgae committees in the Nordic countries contribute to the content of checklists, quality control of images etc. Swedish data is freely available already but the aim is to make databases connected through web feature services through Lifewatch. The software tool Plankton Toolbox is built using open source software (Python) and is available for Windows, Mac and Linux. Currently (Sep. 2013) it is only available to selected users for testing. A first public release is planned shortly.

## Acknowledgements

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