Regular online archival of images as metadata for plankton time series

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Aims:

- Introduce Helgoland Roads (HR) data series

- Types of images archived to support HR (images as metadata)

- Means of image data archival: Introduction PLANKTON*NET (http://planktonnet.awi.de)

Introduction

Helgoland Roads Long-term data series

■started in 1962, samples taken work-daily:

- ■Phytoplankton counts (Lugol fixed samples),
- ■Inorganic nutrients
- ■Temperature, salinity, Secchi depth
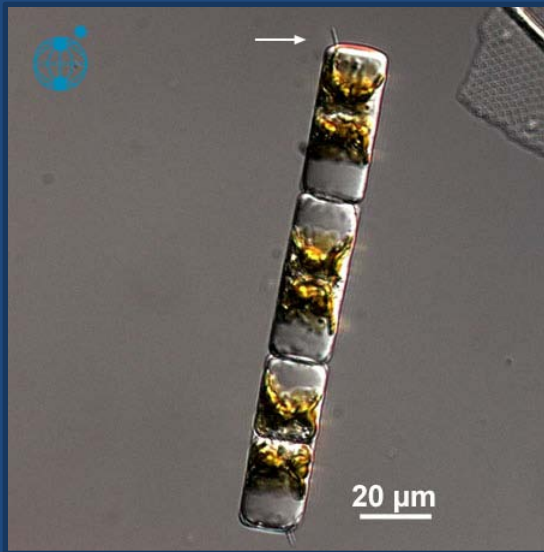
■ Images archived in PLANKTON*NET and linked to Pangaea

Helgoland Roads
➢ **Identify long-term changes in plankton communities**
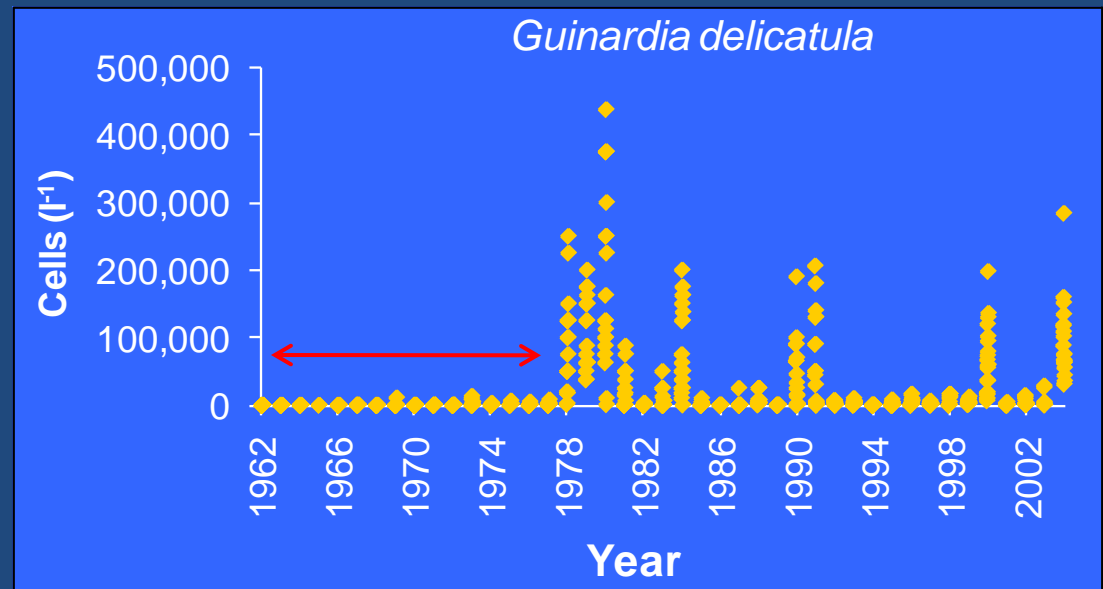
Helgoland Roads phytoplankton data

- **Checklist of 297 taxa (three groups with respect to ease of identification)**

20 μm

G. delicatula: is appearing earlier in the year since the late 70s

1. Easily identifiable species:
- *Guinardia delicatula*: diagnostic features visible in Lugol fixed samples

Abundance of *G. delicatula* in May since 1962

Helgoland Roads phytoplankton data ctd.
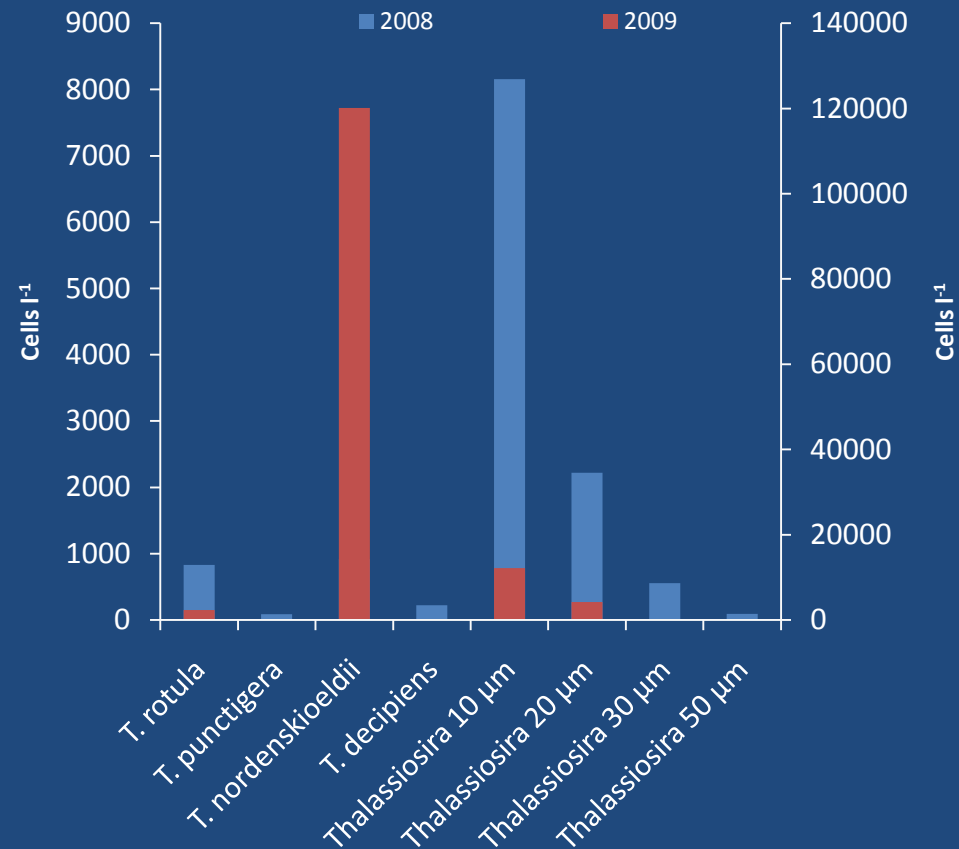
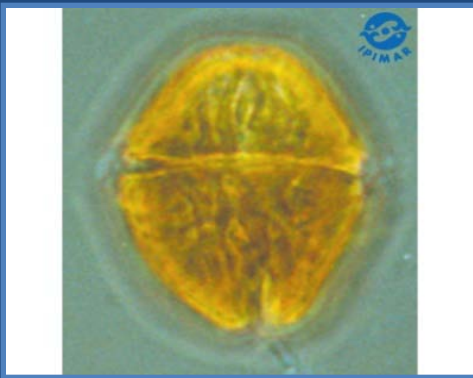- **2. Partially identified groups: *Thalassiosira***
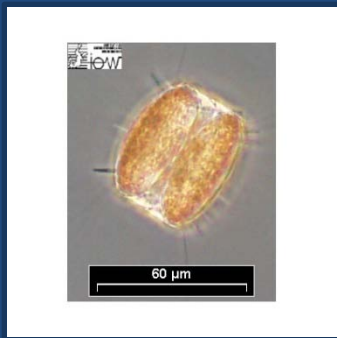
T. punctigera (Lugol)

T. punctigera (Live)

- For some species diagnostic features visible in **Lugol fixed** samples
- Others grouped into size classes

Helgoland Roads phytoplankton data ctd.

- ## 3. Mostly unidentified groups in Lugol fixed samples

- No identifiable diagnostic features
- Count of size classes
- Size class composition varies throughout the year

Image material can aid data integration

PLANKTON*NET: Types of images

Lugol fixed images as counted
for Helgoland Roads series
(same magnification etc.)
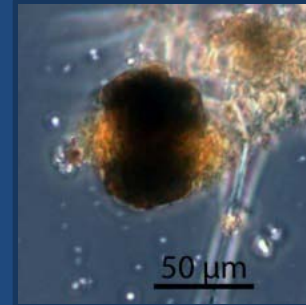
Intensive taxonomic monitoring:
SEMs, images of live organisms
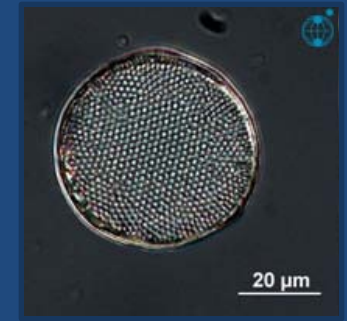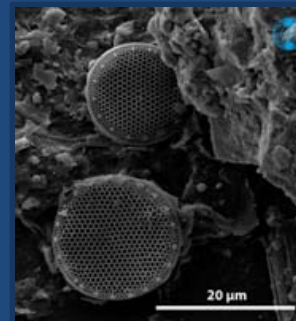
Other supporting images

PLANKTON*NET: Types of images

Lugol fixed images as counted
for Helgoland Roads series
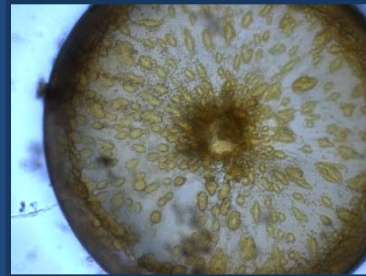
Purpose

■Continuity within time series

C. wailesii

■Comparability between time series
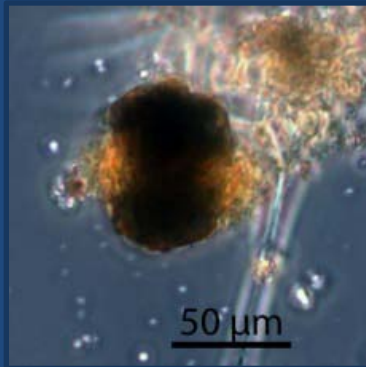
M. rubra HR
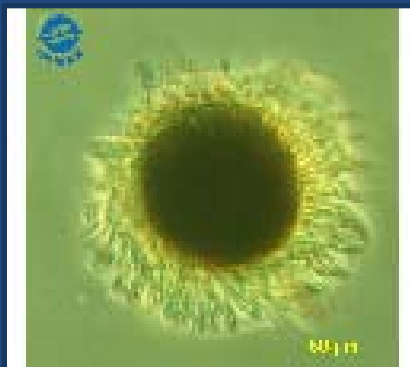
M. rubra Portugal

M. rubra Baltic

Problem: Taxonomic, diagnostic features often not visible
The only purpose ist the documentation of count data
Images archived for size class components as well as identified species

Challenge: how to standardize this image information?

PLANKTON*NET: Types of images

Lugol fixed images as counted
for Helgoland Roads series
(same magnification etc.)
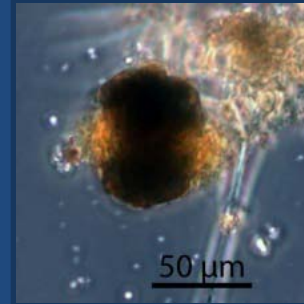
Intensive taxonomic monitoring:
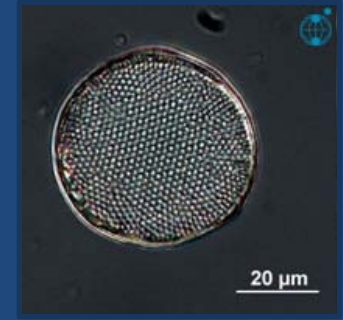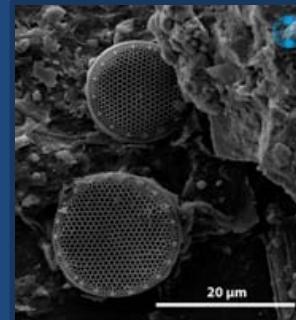
Other supporting images

PLANKTON*NET: Types of images ctd.

Intensive taxonomic monitoring:
■SEMs

■images of live organisms

■Permanent slides

Purpose

■Aim: Images in which ‚traditional'
diagnostic features are visible
■Authoritative taxon information
■Higher taxonomic resolution of HR
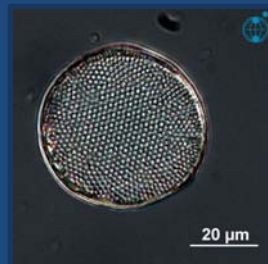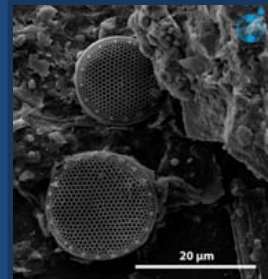
Images
are taken from additional net samples (not the Lugol fixed sample)
Aim is to produce full species list for the sample

PLANKTON*NET: Types of images

Lugol fixed images as counted
for Helgoland Roads series
(same magnification etc.)
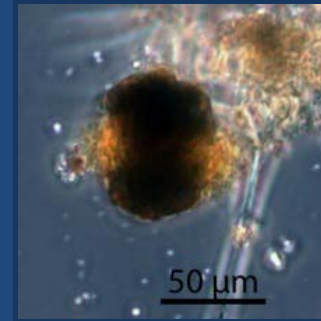
Intensive taxonomic monitoring:
SEMs, images of live organisms
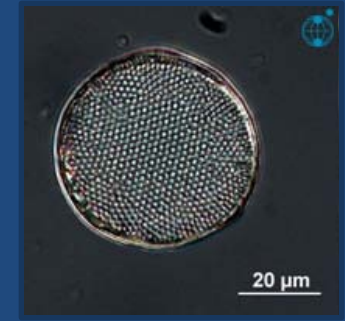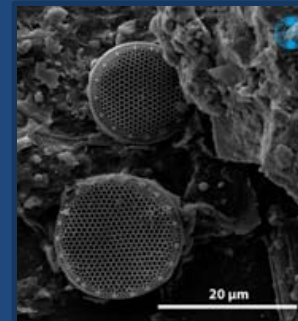
Other supporting images

Supporting image material

Stacked images

2D stack

3D stack

Stacking can have additional diagnostic value
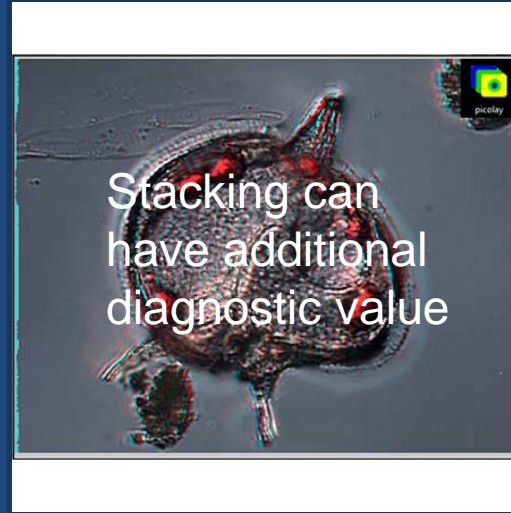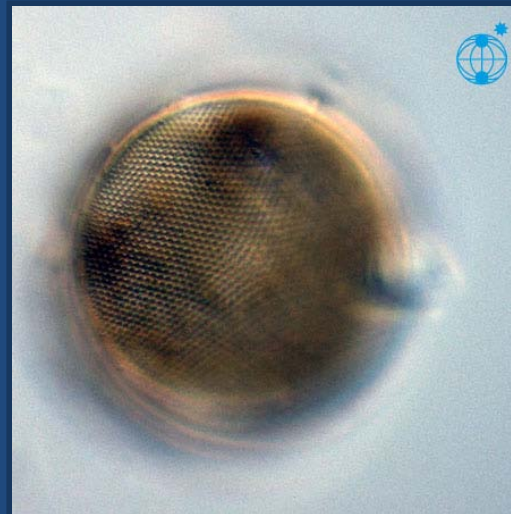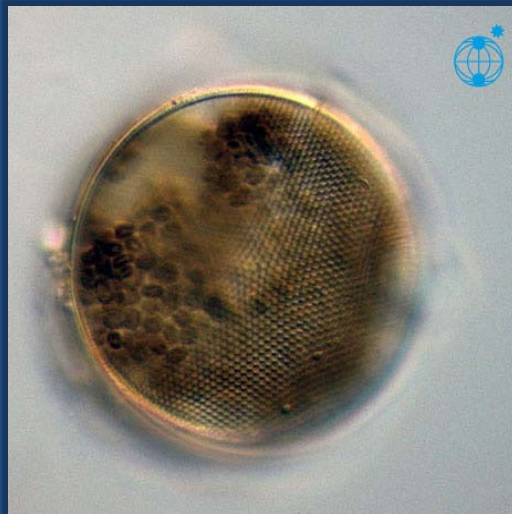
PLANKTON*NET

- Introduction
  - Online database containing 8000 **publicly available** images by different data providers
  - Data entered as observations, with a standardized metadata protocol (Darwin core)
  - Several images can be attached to one observation
  - Images available in low and high resolution

- Aims
  - Provide **authoritative taxonomic** information on plankton
  - Build **biogeographical inventories** of plankton species
  - Archival of images as **metadata** for numerical data series

PLANKTON*NET functionality
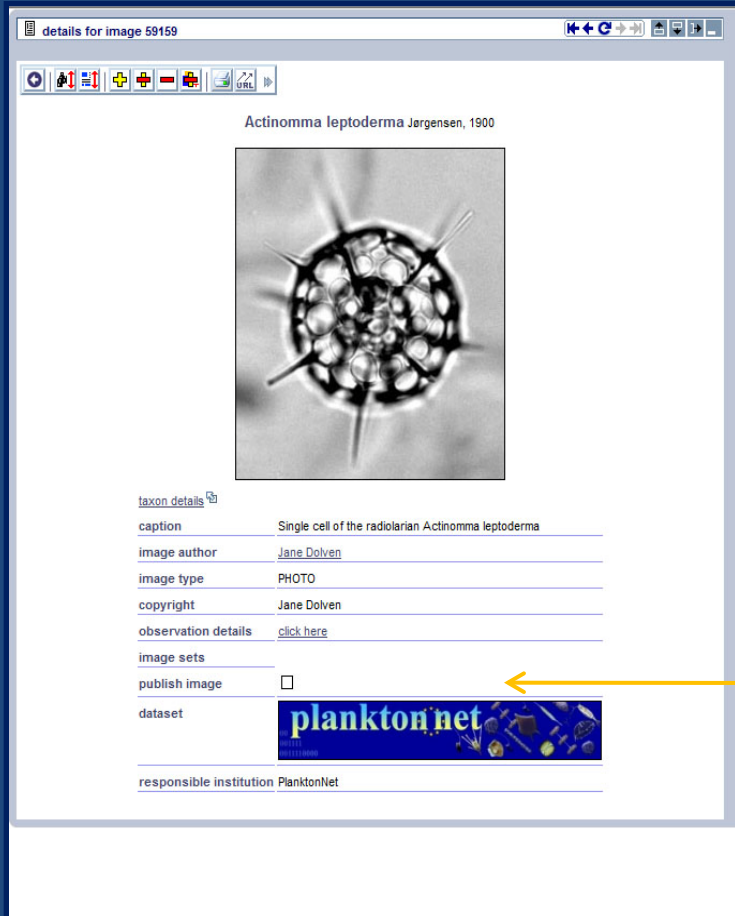
Data describing the delivered images:
- Image author
- Type of image
- Copyright information

- Images can be uploaded without publishing them
- User groups for image sub-sets

PLANKTON*NET functionality

PLANKTON*NET functionality: Taxon details

For each species the following information is available:

Link to all images for the taxon:

Links to original literature

Certified links to external resources

Links to numerical data in Pangaea

Short descriptions

Biogeographical information

PLANKTON*NET search functions

- Images

PLANKTON*NET search functions

- Observations

Links to Pangaea

http://www.pangaea.de
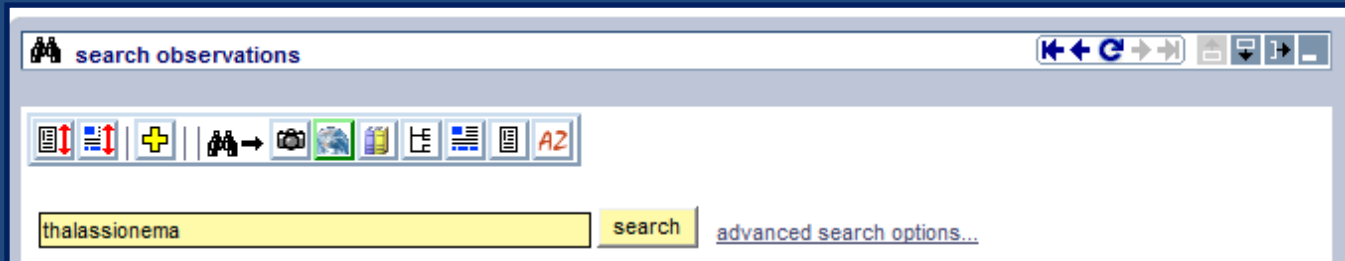
■Pangaea = one of the largest databases for environmental data in the world
■Parameter list for Helgoland linked to representative PLANKTON*NET images
■Data sets submitted to Pangaea with links to ‚Lugol images'

Summary

1. Image metadata

- Misidentifications become more apparent, when comparing data
- Images facilitate taxonomic continuity within a data series
- Can take pictures of unidentified organisms for later ID by experts
- BUT: Image standardization is till an issue
- Provide documentation of components of size classes (e. g. to document seasonal differences)
- Provide material for automatic image recognition (?)

2. PLANKTON*NET

- Provision of authoritative taxonomic information to support ecological studies
- Provide reliable biogeographic information on the plankton taxa in the database→ contributions by partners and external data providers