

# 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

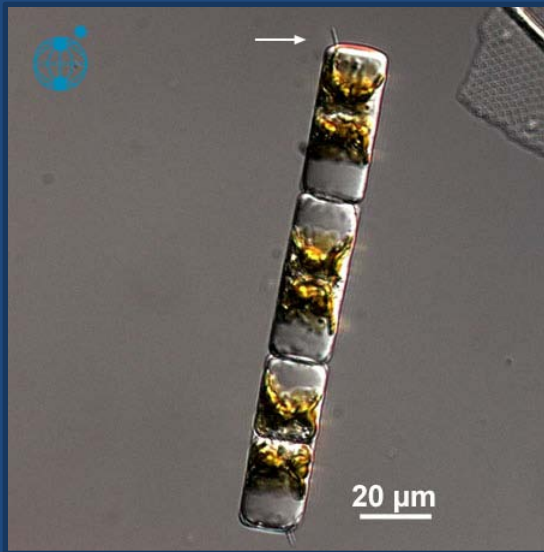


### Helgoland Roads

- Identify long-term changes in plankton communities

# Helgoland Roads phytoplankton data

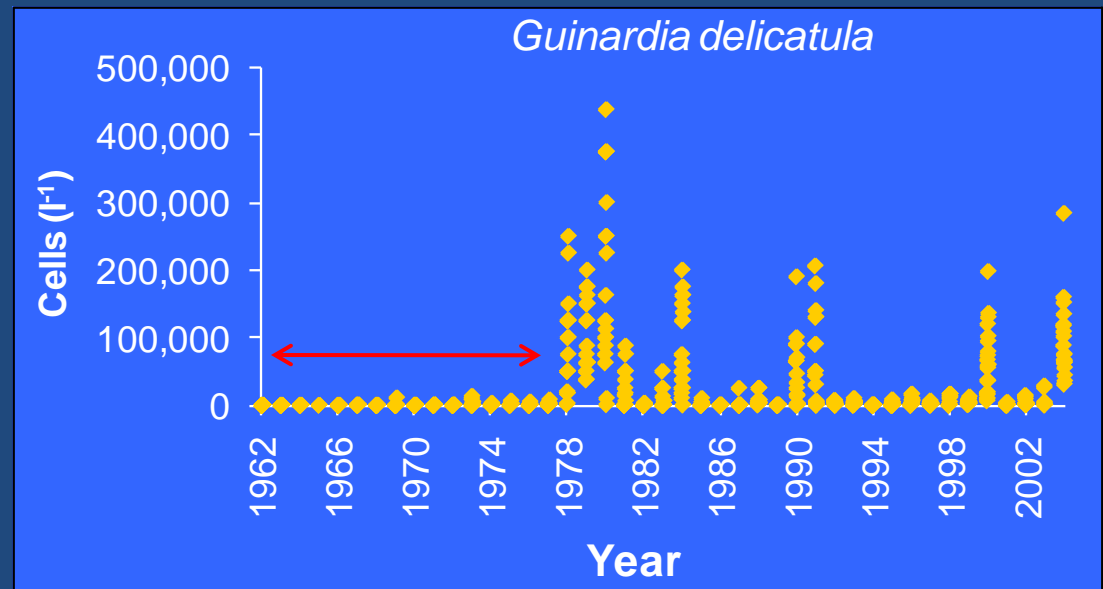
- Checklist of 297 taxa (three groups with respect to ease of identification)



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

## 1. Easily identifiable species:

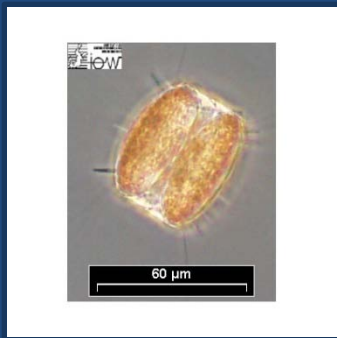
■ *Guinardia delicatula*: diagnostic features visible in Lugol fixed samples



Abundance of *G. delicatula* in May since 1962

# Helgoland Roads phytoplankton data ctd.

## ■ 2. Partially identified groups: *Thalassiosira*



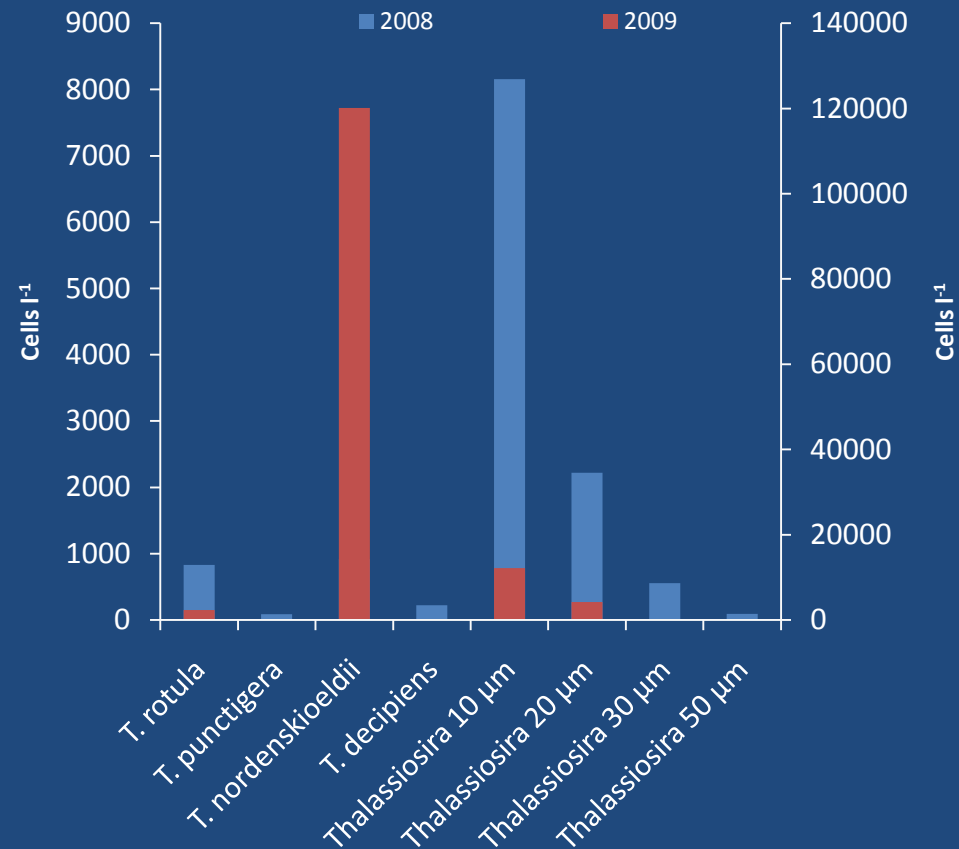
*T. punctigera* (Lugol)



*T. punctigera* (Live)

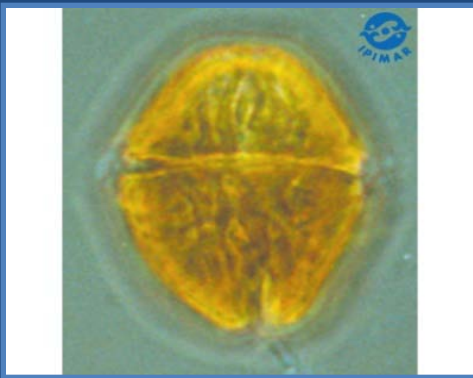
■ For some species diagnostic features visible in **Lugol fixed** samples

■ Others grouped into size classes



# Helgoland Roads phytoplankton data ctd.

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



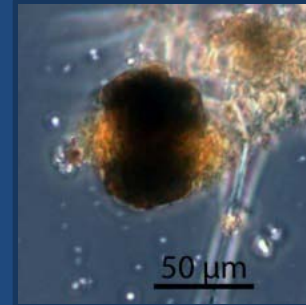
- No identifiable diagnostic features
- Count of size classes
- Size class composition varies throughout the year

Image material can aid data integration

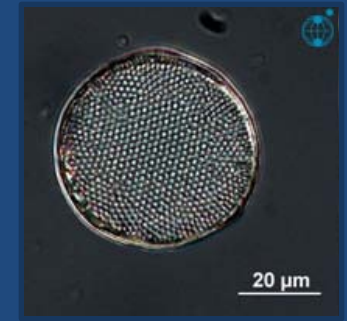
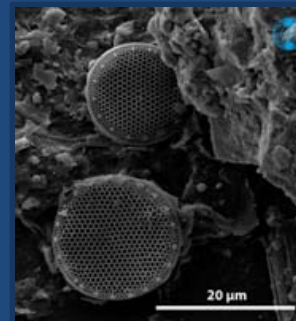


# PLANKTON\*NET: Types of images

Lugol fixed images as counted  
for Helgoland Roads series  
(same magnification etc.)



Intensive taxonomic monitoring:  
SEMs, images of live organisms

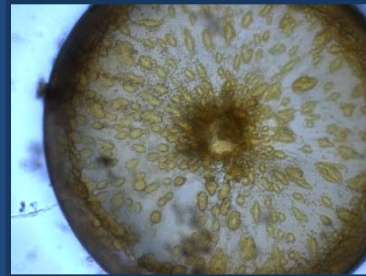


Other supporting images



# PLANKTON\*NET: Types of images

Lugol fixed images as counted for Helgoland Roads series

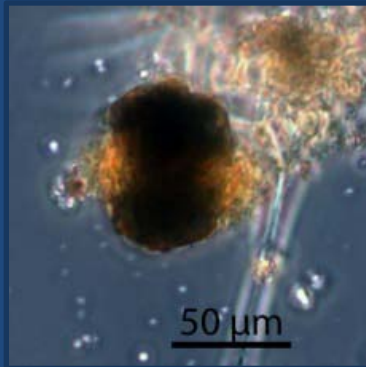


*C. wailesii*

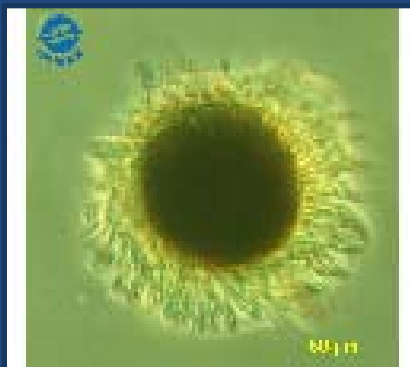
## Purpose

■ Continuity within time series

■ Comparability between time series



*M. rubra* HR



*M. rubra* Portugal



*M. rubra* Baltic

Problem: Taxonomic, diagnostic features often not visible

The only purpose is the documentation of count data

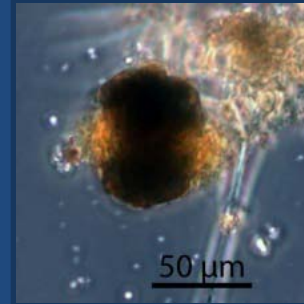
Images archived for size class components as well as identified species



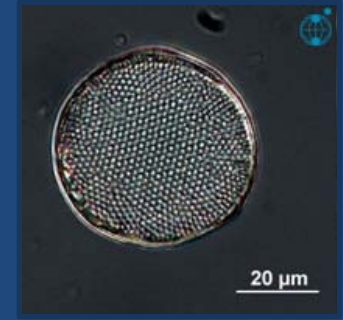
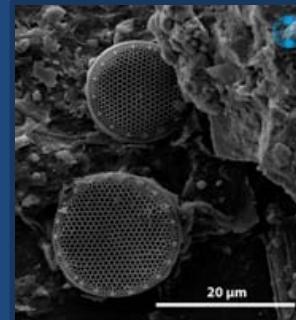
**Challenge:** how to standardize this  
image information?

# 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:

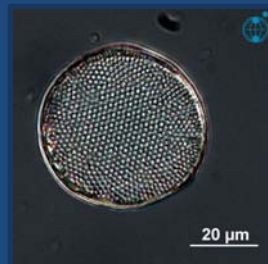
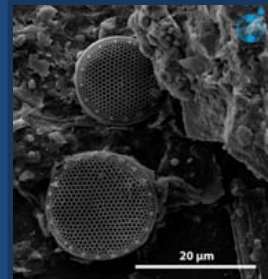
- SEMs

- images of live organisms

- Permanent slides

## Purpose

- Aim: Images in which ,traditional‘ diagnostic features are visible
- Authoritative taxon information
- Higher taxonomic resolution of HR

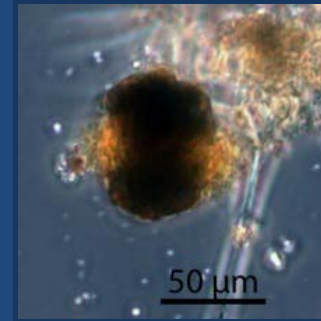


## Images

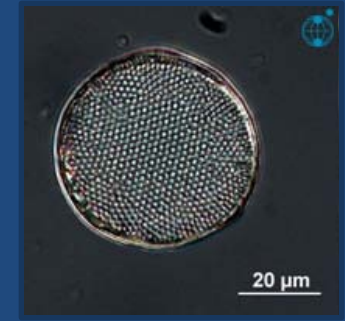
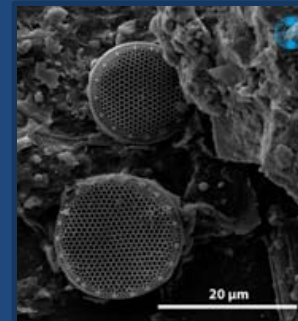
are taken from additional net samples (not the Lugol fixed sample)  
Aim is to produce full species list for the sample

# 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



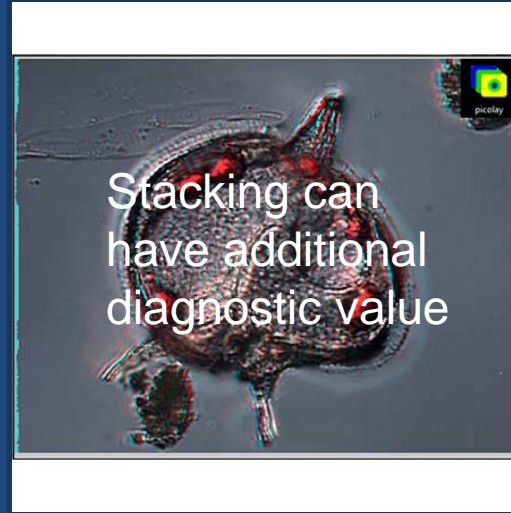
Other supporting images



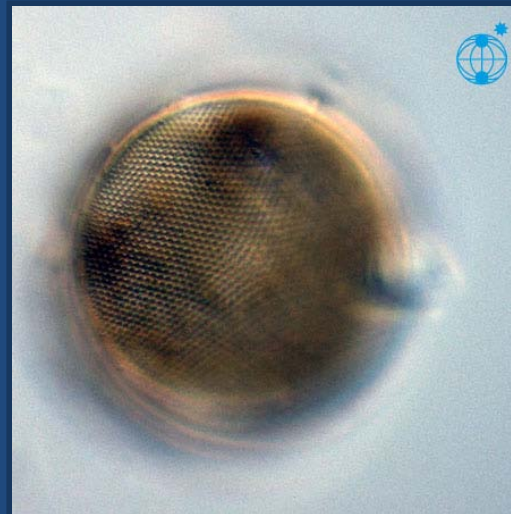
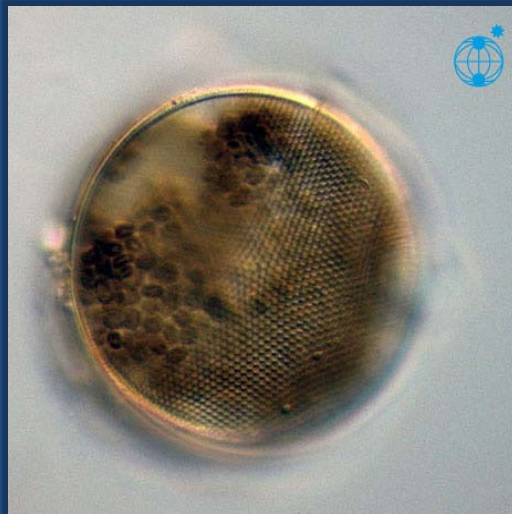
# Supporting image material

Stacked images

2D stack



3D stack



# PLANKTON\*NET

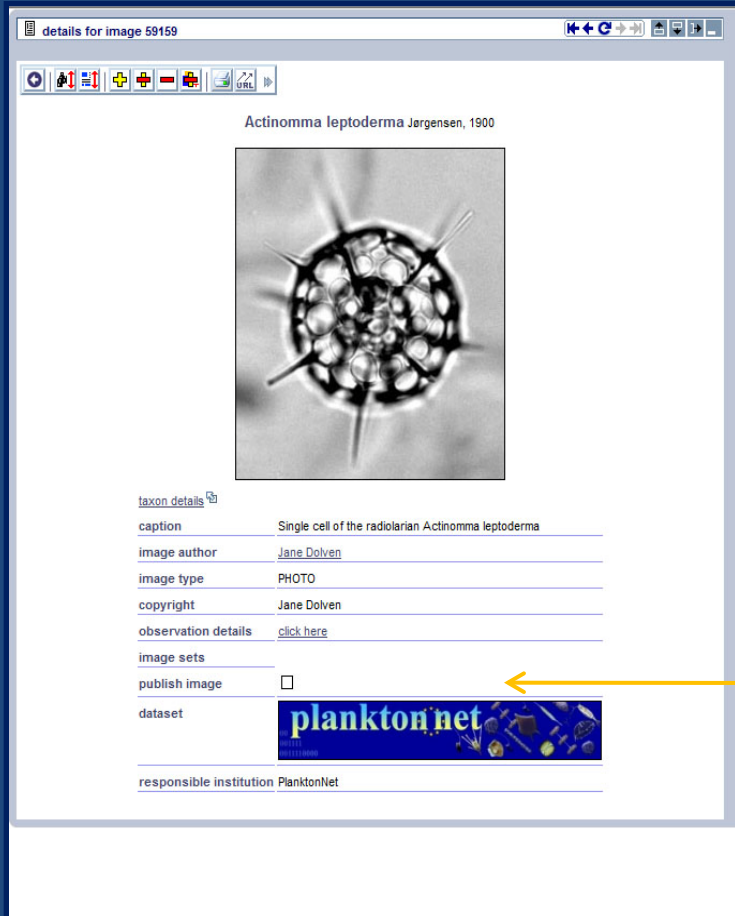
## ■ Introduction

- 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

The screenshot displays the plankton.net website interface. At the top, the site logo "plankton.net" is visible, accompanied by a decorative header with binary code and various plankton illustrations. The main content area is titled "details for image 59900" and features a large central image of a circular, golden-brown diatom specimen, identified as *Thalassiosira eccentrica* (Ehrenberg) P.T. Cleve, 1903-1904. A "picolay" logo is present in the top right corner of the image area. Below the image, a "taxon details" section provides metadata: caption ("Composite image of the centric diatom Thalassiosira eccentrica, stacked from 17 individual images"), image author ("alexandra"), image type ("PHOTO"), observation details (with a "click here" link), image sets ("Helgoland plankton - stacked images"), and dataset ("plankton.net"). The responsible institution is listed as PlanktonNet.

On the left side, a navigation menu includes links for "home", "information", "sponsors", "contact us", "forum", "search", "images", "image sets", "observations", "all observations", "scientific names", "classification", "references", "documents", "glossary", "data input", "control panel", and "help". The "search" menu is highlighted with a red border. Below the navigation menu, a "logged in" section shows the user "alexandra" as an administrator with IP address 217.91.230.107. It also lists group memberships: GroupSupervisors, Global dinocyst database, North Sea, University of Oldenburg, Helgoland Plankton, and Mediterranean, Italy, Fomia Harbour, with a "5 group(s)" indicator and a "sign out" button.

On the right side, there are several informational panels: "related projects" with links to Radiolaria.org, WORMS, ALGAEBASE, AQUAPARADOX, DIADIST - Online diatom resources, Microbiological Garden, Aquatic Microbes Forum, and micro\*scope; "what is new?" featuring a news item about the 2010 International Year of Biodiversity; "last image" showing a smaller version of the diatom image; "what is this?" with a small thumbnail; and "from glossary".



# PLANKTON\*NET functionality: Taxon details

For each species the following information is available:

random images

images for this name  
add taxon description

valid name  
Thalassiosira rotula Meunier, 1910

classifications  
Catalogue of Life Col. Hierarchy Thalassiosira

citations in references  
Thalassiosira rotula Meunier, 1910 - Meunier A. 1910. p.

links to other resources  
Catalogue of Life Thalassiosira rotula  
ITS Thalassiosira rotula  
marBEF ERMIS Thalassiosira rotula  
AlgaeBase Thalassiosira rotula

environmental data  
PANGAEA Found 252 environmental datasets in WDC-MARE for Thalassiosira rotula.

taxon description  
Cells are flat, disk-shaped with slightly rounded corners. They are united into loose chains of variable length. In water mounts the connecting thread between cells appears as one single thread thickening towards the valve surface. This thread actually consists of several individual central strutted processes, which are visible in valve view on electron micrographs. The valve face also shows radial ribs. More strutted processes with a varying number of satellite pores are found all over the valve face. One labiate process is present.

description author alexandra  
entered by @20082008  
entered date 20070420  
edit taxon description

Map Satellite Hybrid

← Link to all images for the taxon:

← Links to original literature

← Certified links to external resources

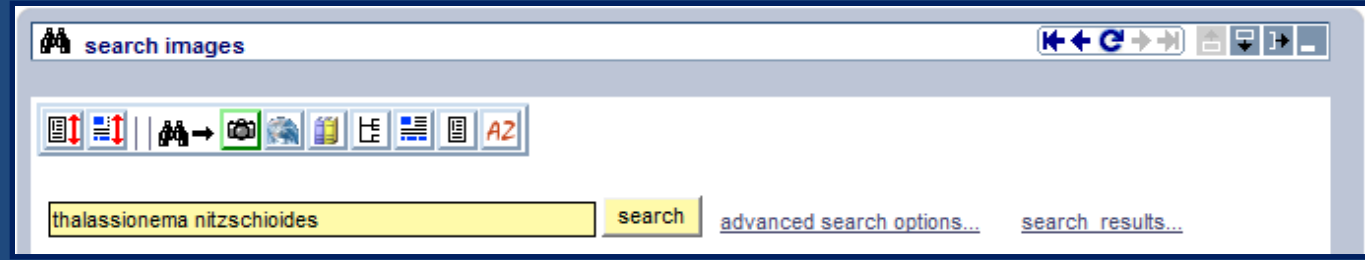
← Links to numerical data in Pangaea

← Short descriptions

← Biogeographical information

# PLANKTON\*NET search functions

- Images



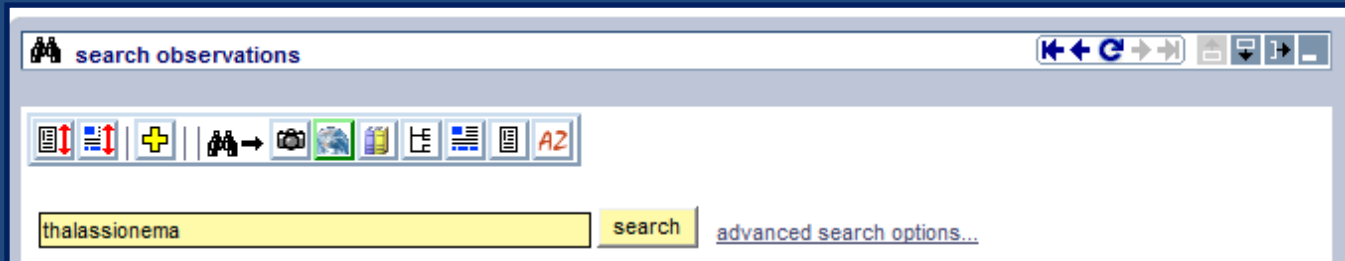
The grid displays 12 microscopic images of *Thalassionema nitzschioides*. Each image is accompanied by a caption "Thalassionema nitzschioides" and a scale bar. The images are arranged in three rows and four columns. Arrows from external labels point to specific images:

- USA**: Points to the top-right image (10 µm scale bar).
- Portugal**: Points to the middle-right image (10 µm scale bar).
- Germany (Helgoland)**: Points to the bottom-right image (10 µm scale bar).
- Germany (Wadden Sea)**: Points to the bottom-middle image (50 µm scale bar).
- France**: Points to the middle-left image (20 µm scale bar).

At the bottom left of the grid, there are navigation controls: "previous 1 2 next".

# PLANKTON\*NET search functions

- Observations



# Links to Pangaea

- 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‘

Sun Java(TM) System Communications Express 6.3 update 1

PANGAEA®  
Publishing Network for Geoscientific & Environmental Data

You are not logged in (LOG IN)

Always quote citation when using data

**Data Description**

**Citation:** Wiltshire, Karen Helen (2002): Abundance of dinoflagellates, dictyochophyceae, and prymnesiophyceae at time series station Helgoland Roads in 1994. *Alfred Wegener Institute for Polar and Marine Research, Bremerhaven*, Unpublished dataset #77552

**Project(s):** Biologische Anstalt Helgoland (BAH) [↗](#)  
Long-term Ecological Research at AWI (LTER) [↗](#)

**Coverage:** West: 7.9000 \* East: 7.9000 \* South: 54.1883 \* North: 54.1883  
Date/Time Start: 1994-01-03T07:50:00 \* Date/Time End: 1994-12-29T08:20:00  
Minimum DEPTH, water: 0.5 m \* Maximum DEPTH, water: 0.5 m

**Event(s):** HelgolandRoads (Kabeltonne) [↗](#) \* Latitude: 54.1883 \* Longitude: 7.9000 \* Elevation: -10.0 m \* Location: German Bight, North Sea [↗](#)  
\* Campaign: HelgolandRoadsTimeseries [↗](#) \* Basis: Meeresstation Helgoland [↗](#) \* Device: Monitoring [↗](#)

**Further details:** hdl:10013/epic.28563.d001

**Comment:** Investigator of phytoplankton samples: Klaus Tretner

**Parameter(s):**

#	Name	Short Name	Unit	Principal Investigator	Method	Comment
1	DATE/TIME <a href="#">↗</a>	Date/Time				Geocode
2	DEPTH, water <a href="#">↗</a>	Depth water	m			Geocode
3	Ceratum furca, fractionated <a href="#">↗</a>	C. furca frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	size: 50,250 µm.
4	Ceratum fuscus, fractionated <a href="#">↗</a>	C. fuscus frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	size: 15-30 µm, hdl:10013/de.awi.planktonnet.image.12595
5	Ceratum horridum, fractionated <a href="#">↗</a>	C. horridum frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	size: 45,300 µm, hdl:10013/de.awi.planktonnet.image.12597
6	Ceratum lineatum, fractionated <a href="#">↗</a>	C. lineatum frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	size unknown, hdl:10013/de.awi.planktonnet.image.14216
7	Ceratum tripos, fractionated <a href="#">↗</a>	C. tripos frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	size: 80,350 µm, hdl:10013/de.awi.planktonnet.image.12604
8	Dinophysis sp., fractionated <a href="#">↗</a>	Dinophysis sp. frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	class 1, size unknown
9	Dinophysis sp., fractionated <a href="#">↗</a>	Dinophysis sp. frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	class 2, size unknown
10	Dinophysis sp., fractionated <a href="#">↗</a>	Dinophysis sp. frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	class 3, size unknown
11	Dinophysis sp. <a href="#">↗</a>	Dinophysis sp.	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	
12	Gyrodinium sp., fractionated <a href="#">↗</a>	Gyrodinium sp. frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	class 1, size unknown
13	Gyrodinium sp., fractionated <a href="#">↗</a>	Gyrodinium sp. frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	class 2, size unknown
14	Gyrodinium sp., fractionated <a href="#">↗</a>	Gyrodinium sp. frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	class 4, size unknown
15	Gyrodinium sp., fractionated <a href="#">↗</a>	Gyrodinium sp. frac	#/l	Wiltshire, Karen Helen <a href="#">↗</a>	Quantitative phytoplankton method (Utermöhl, 1958) <a href="#">↗</a>	class 7, size unknown

<http://www.pangaea.de>

bio diversity data provider - Mozilla Firefox

http://planktonnet.awi.de/index.php/content...\_de/akobib/epic-12004/content

bio diversity data provider

details for image 12604

Ceratum tripos

image taken by M. Hoppert

image author: Maria Hoppert

image type: PHOTO

date image as: 04.10.1994

observed details: class 1

image sets: North Sea, Helgoland (Phytoplankton)

dataset: plankton.net

responsible institution: Alfred Wegener Institute for Polar and Marine Research

details for set Taz - Biotrons 1995

# 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 still 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