CLISED

Climate Change Impact on Ecosystem Health - Marine Sediment Indicators

(02/2014 - 01/2017)

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This project is funded by Norway Grants, the Polish-Norwegian Research Programme operated by the National Centre for Research and Development

Project Promoter and partners

Project promoter

Institute of Oceanology Polish Academy of Sciences, Sopot, Poland
Coordinator: **prof. Grażyna Kowalewska (Kowalewska@iopan.gda.pl)**

Project partner 1

University of Gdańsk (UG), Gdańsk, Poland
Contact: **prof. Hanna Mazur-Marzec (biohm@univ.gda.pl)**

Project partner 2

Norwegian Geotechnical Institute (NGI), Oslo, Norway
Contact: **prof. Gijs D. Breedveld (Gijs.Breedveld@ngi.no)**

Project partner 3

Norwegian University of Science and Technology (NTNU), Trondheim, Norway
Contact: **dr. Tomasz Maciej Ciesielski (tomasz.m.ciesielski@ntnu.no)**

Aim

✓ Comparison of the **Gulf of Gdańsk** (Baltic Sea) with **Norwegian fjords** – the **environmental state** & **climate change** over millennia based on sediment studies

Current environmental state concerns such phenomena like:
- primary production
- eutrophication effects
- pollution
- toxic algae blooms.

The climate indicators will characterize climate-driven environmental phenomena in the past, like:
- high primary production
- temperature & salinity changes
- oxygen depletion.

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CLISED climate - sediment

Implementation

- **sediment collection** at carefully selected sites
  - recent sediments (0–30 cm)
  - old sediments (up to 500 cm)
- ***in-situ* measurements** in water column and the near-bottom water: dissolved oxygen, temperature, salinity
- **sub-sampling** of the collected sediments
- sample **storage** (-20^{0}C, -80^{0}C)
- **analyses** of the sediment samples using different modern techniques (phytoplankton pigments, inorganic indicators, pollution indicators, geological proxies, biotoxins, toxicity)

Cruises

1. Gulf of Gdańsk, 11-17.04.2014
   r/v Oceania, IO PAN, Sopot
2. Oslofjord/Drammensfjord, 7-12.06.2014
   r/v Oceania, IO PAN, Sopot
3. Gulf of Gdańsk, 10.04.2015
   r/v IMOR, IM, Gdańsk
4. Trondheimsfjord, 26.08.2015
   r/v Gunnerus, NTNU, Trondheim
5. Oslofjord, 14.09.2015
   f/f Trygve Braarud, OU, Oslo
6. Balsfjord (Troms), 3.10.2015
   f/f Helmer Hanssen, TU, Tromsø

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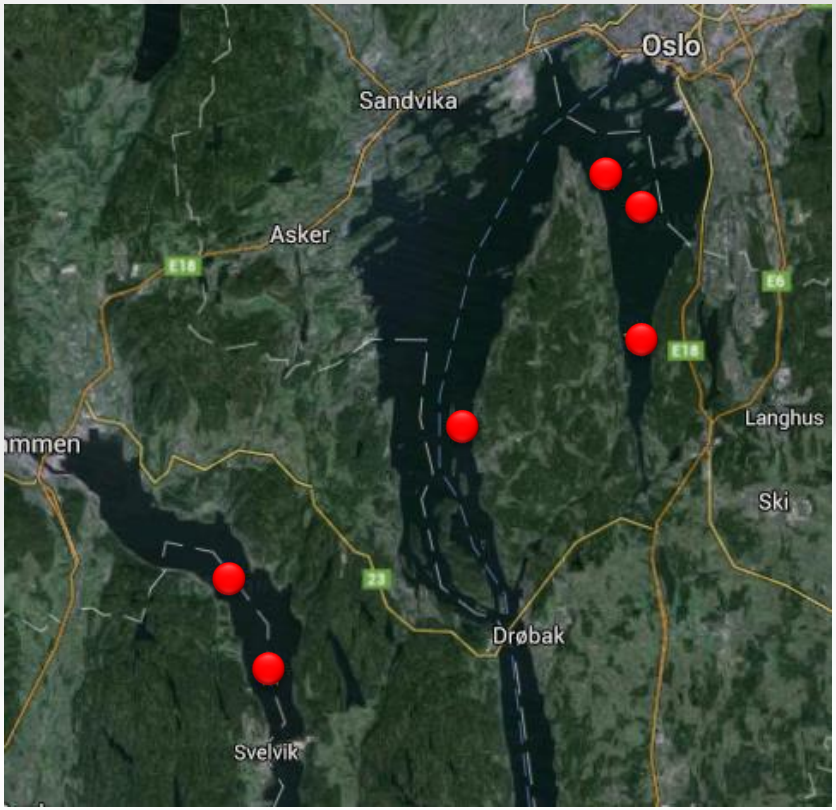
CLISED climate - sediment

Sampling sites – recent sediments (0-30 cm)

1. Gulf of Gdańsk

2. Oslofjord/Drammensfjord



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CLISED climate - sediment

Sampling sites – old sediments (up to 500 cm)

1. Gulf of Gdańsk
2. Trondheimsfjord
3. Oslofjord
4. Balsfjord

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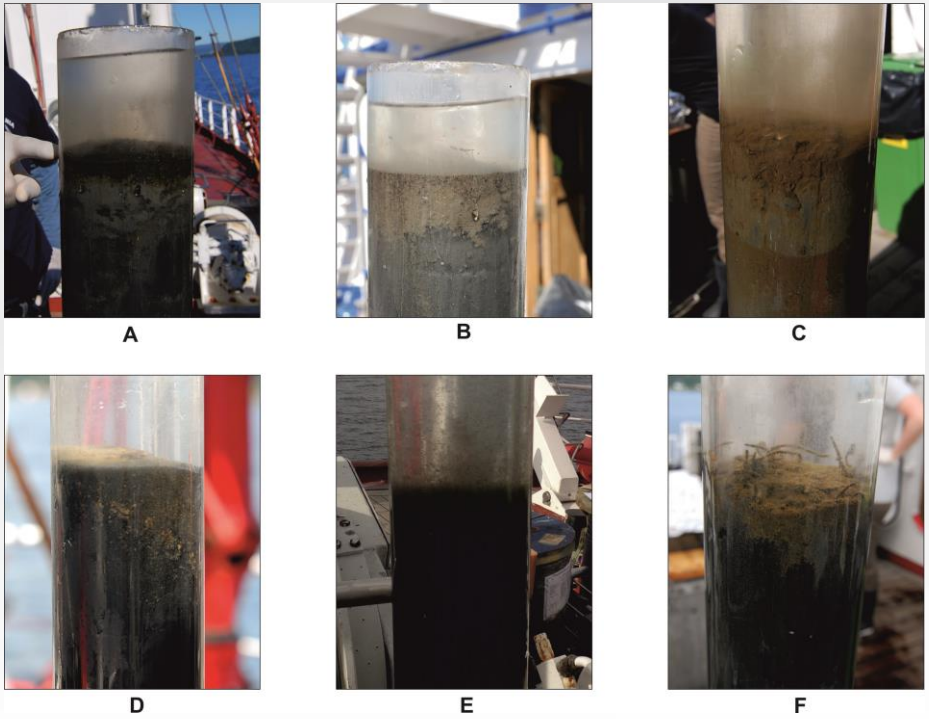
CLISED climate - sediment

Sediment collection

- **recent sediments (0-30 cm)**

  (Niemistö core sampler, GEMAX twin-core sampler)



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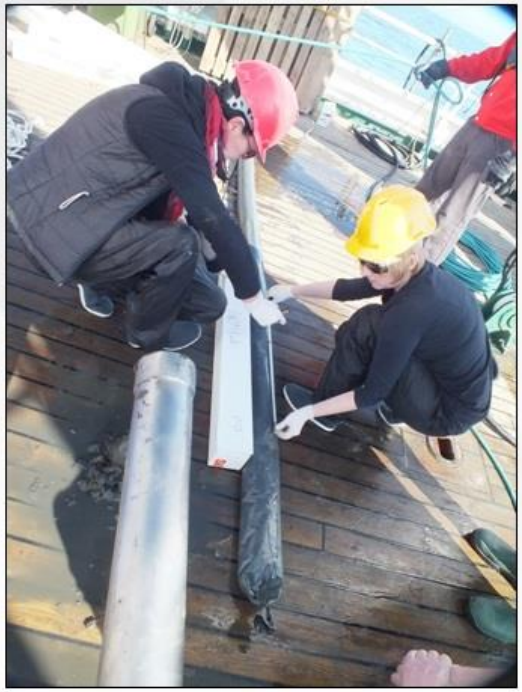
CLISED climate - sediment

Sediment collection

- **old sediments (up to 500 cm)**

  (vibro-corer, gravity corer)



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CLISED climate - sediment

Sediment collection

- **sub-sampling**

Sampling summary

- 1st year – 2014: **recent sediments** (0-30 cm)

  12 stations
  120 sediment cores
  640 sediment layers
  672 sub-samples

- 2nd year – 2015: **old sediments** (up to 500 cm)

  4 stations
  9 long sediment cores
  1504 sediment layers
  4080 sub-samples

- Total: *ca.* **5000** cm of cores, Ø = 10 cm, **4752 sub-samples**

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Analyses

- grain-size & humidity
- Pb-210 dating / C-14 dating
- C_{org}, N_{tot}, black carbon, $\delta^{15}N/^{14}N$, $\delta^{13}C/^{12}C$ - EA/IRMS
- phytoplankton pigments; HPLC-DAD, FL
- contaminants (PAHs, OTs, NPs) - GC-MS
- Elements (69 & their forms) - HR-ICP-MS
- Biotoxins – DNA analyses, LC-MS/MS
- Diatoms (geological proxies)
- genotoxicity, mutagenicity, endocrine-disrupting activity - CALUX assays

Results

- **scientific paper *(submitted for publication)***

  'Pigments in recent sediments as environmental indicators – comparison of the Gulf of Gdańsk (southern Baltic) and the Oslofjord/Drammensfjord (Norway)',

  authors: M.Szymczak-Żyła, M.Lawręc, A.Winogradow, A.Zaborska, G.D.Breedveld, G.Kowalewska*

- **scientific conferences**

  9th International SedNet conference *(oral presentation)*, Kraków 23-26.09.2015

  'Marine sediment indicators in the Gulf of Gdańsk and Oslofjord - a comparison of climate change impacts on the ecosystem'

  authors: G.Kowalewska, H.Mazur-Marzec, G.D.Breedveld, T.Ciesielski, A.Filipkowska, M.Szymczak-Żyła, L.Lubecki, M.Lawręc, A.Oen

- 31st IAS Meeting, 22-25.06.2015 *(poster),* Kraków (International Association of Sedimentologists)

'Chloropigment in deep marine sediments as proxies of climate change - driven eutrophication'

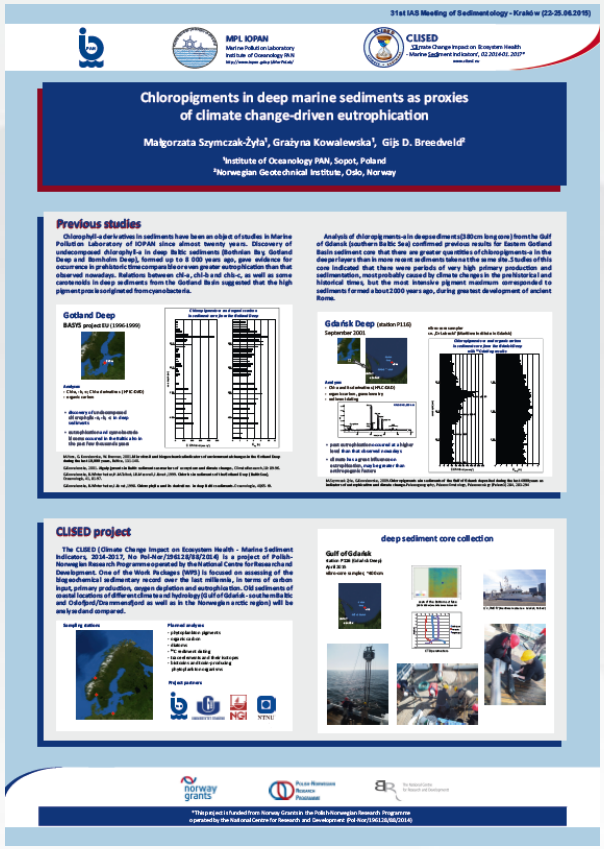
authors: M.Szymczak-Żyła, G.Kowalewska, G.D.Breedveld

- ECSA 55 Conference, 6-9.09.2015 *(poster),* London (Estuarine Coastal Sciences Association)

'Chloropigments proxies in recent sediments – comparison of the Gulf of Gdańsk (Poland) and Drammen/Oslofjord (Norway)'

authors: M.Szymczak-Żyła, G.Kowalewska, A.Filipkowska, L.Lubecki, M.Lawręc, A.Zaborska, A.Winogradow

31 IAS, Kraków 2015, 23-26.09



Chloropigments in deep marine sediments as proxies of climate change-driven eutrophication

Małgorzata Szymczak-Żyła[1], Grażyna Kowalewska[1], Gijs D. Breedveld[2]

[1]Institute of Oceanology PAN, Sopot, Poland
[2]Norwegian Geotechnical Institute, Oslo, Norway

Previous studies

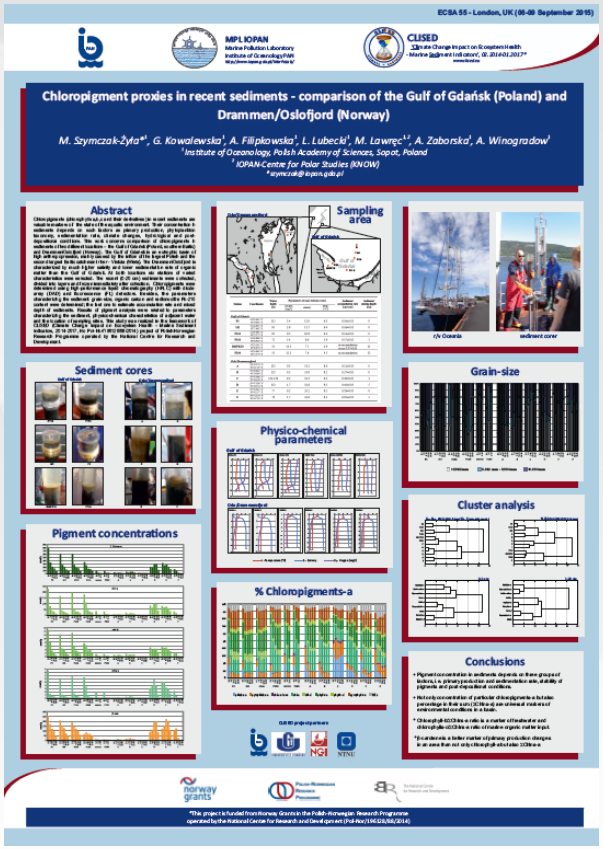
Gotland Deep

Gdańsk Deep

CLISED project

deep sediment core collection

55 ECSA, London 2015, 6-9.09



Chloropigment proxies in recent sediments - comparison of the Gulf of Gdańsk (Poland) and Drammen/Oslofjord (Norway)

M. Szymczak-Żyła*[1], G. Kowalewska[1], A. Filipkowska[1], L. Lubecki[1], M. Ławrynowicz[1,2], A. Zaborska[1], A. Winogradow[1]

[1]Institute of Oceanology, Polish Academy of Sciences, Sopot, Poland
[2]IOPAN-Center for Polar Studies (KNOW)
* szymczak@iopan.gda.pl

Abstract

Sampling area

Sediment cores

Grain-size

Physico-chemical parameters

Pigment concentrations

% Chloropigments-a

Cluster analysis

Conclusions

Project promotion

- **leaflets**

- **XI Conference of Marine Chemistry Section of the Polish Scientific Committee on Ocean Research, IO PAN, Sopot, 24.10.2014 *(poster)***

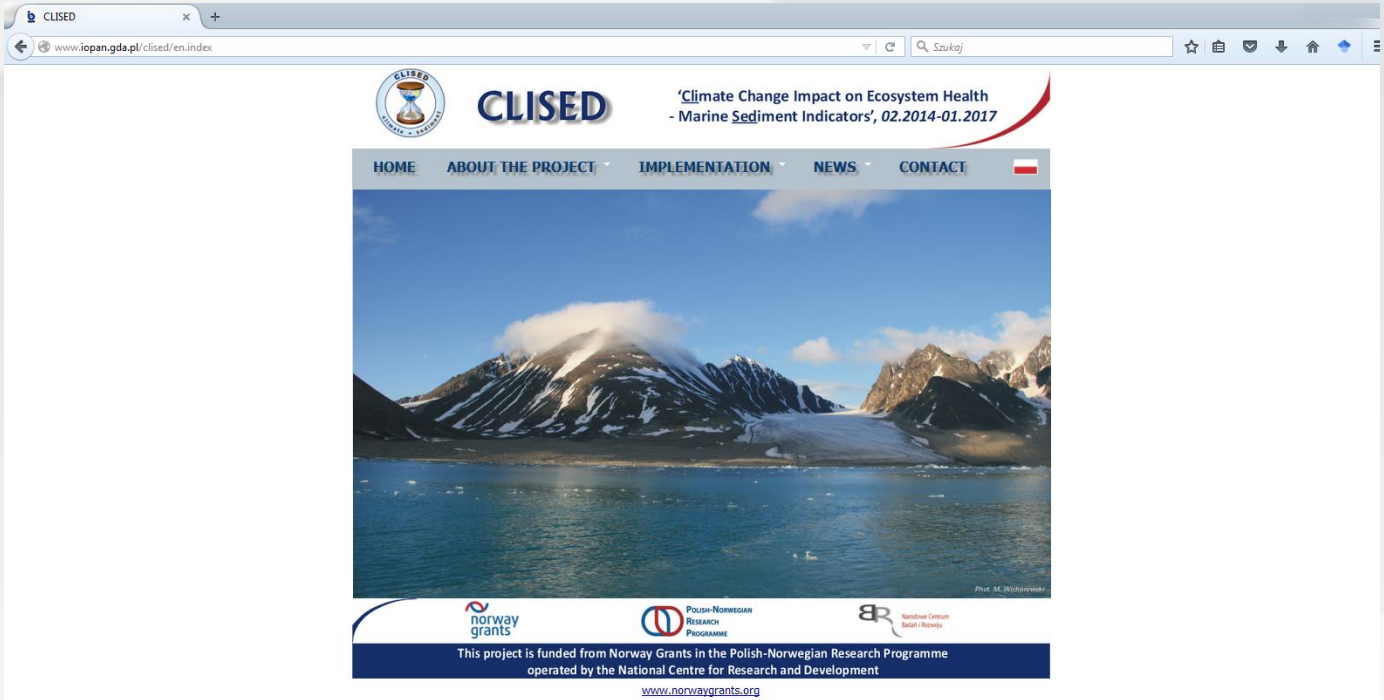
'Indicators of environmental state – recent sediments of the Gulf of Gdańsk and the Oslo'

authors: G.Kowalewska, M.Szymczak-Żyła, A.Filipkowska, L.Lubecki, I.Złoch, A.Zaborska, A.Winogradow, H.Mazur-Marzec, A.Toruńska-Sitarz, A.Krakowiak, T.Ciesielski, M.Ardelan, G.D.Breedveld, A.Oen

- **VIII Sopot Day of Science, Sopot, 23.05.2015 *(poster)***

'Climate Change Impact on Ecosystem Health - Marine Sediment Indicators', 02.2014-01.2017

- **webpage (http://www.iopan.gda.pl/clised/)**



Webpage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