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CLISED
'Climate Change Impact on Ecosystem Health
- Marine Sediment Indicators', 02.2014-01.2017*
www.clised.eu

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

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Previous studies

Chlorophyll-a derivatives in sediments have been an object of studies in Marine Pollution Laboratory of IOPAN since almost twenty years. Discovery of undecomposed chlorophyll-a in deep Baltic sediments (Bothnian Bay, Gotland Deep and Bornholm Deep), formed up to 8 000 years ago, gave evidence for occurrence in prehistoric time comparable or even greater eutrophication than that observed nowadays. Relations between chl-a, chl-b and chl-c, as well as some carotenoids in deep sediments from the Gotland Basin suggested that the high pigment proxies originated from cyanobacteria.

Analysis of chloropigments-a in deep sediments (380 cm long core) from the Gulf of Gdansk (southern Baltic Sea) confirmed previous results for Eastern Gotland Basin sediment core that there are greater quantities of chloropigments-a in the deeper layers than in more recent sediments taken at the same site. Studies of this core indicated that there were periods of very high primary production and sedimentation, most probably caused by climate changes in the prehistorical and historical times, but the most intensive pigment maximum corresponded to sediments formed about 2000 years ago, during greatest development of ancient Rome.

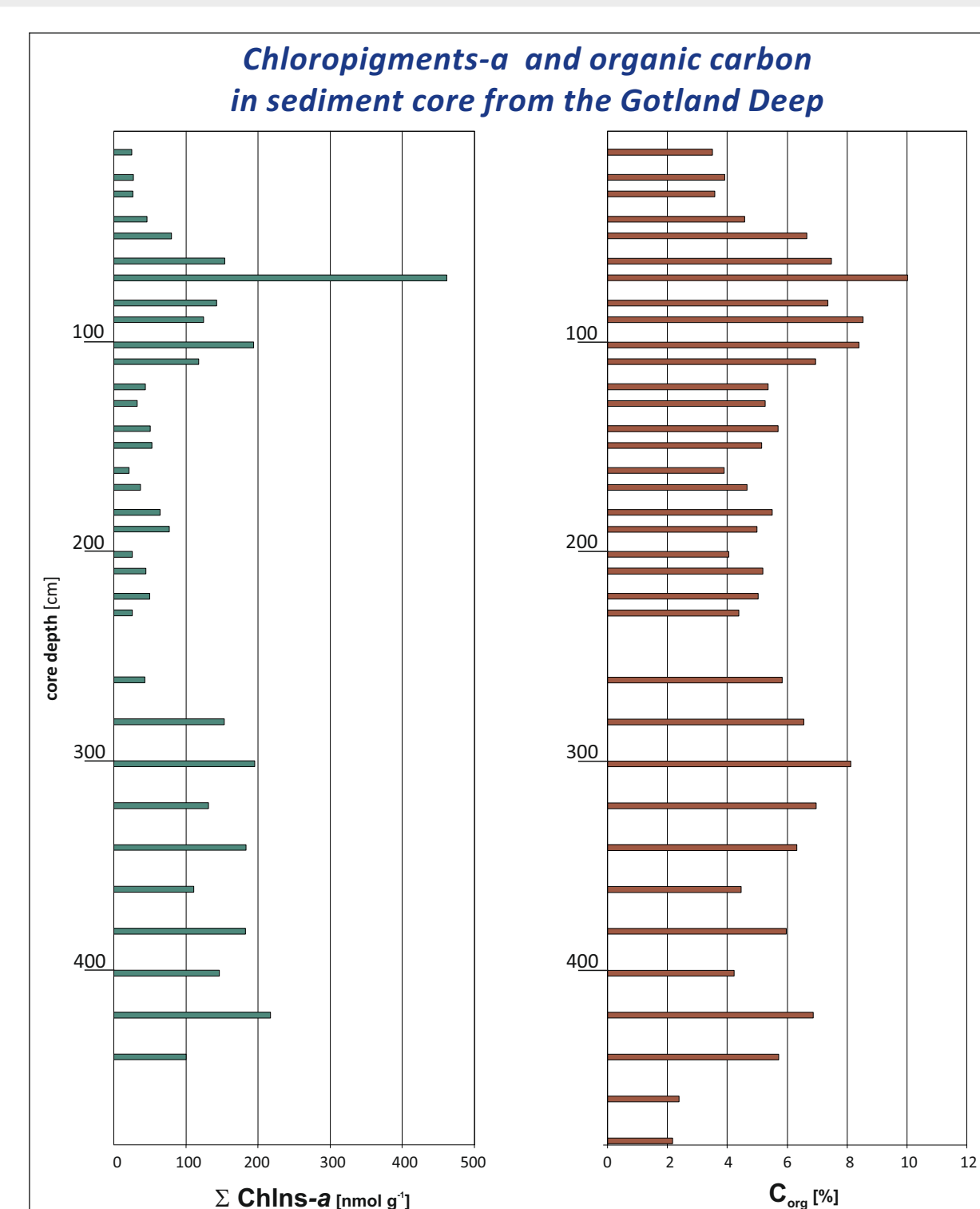
Gotland Deep

BASYS project EU (1996-1999)



Analyses
- Chl-a, -b, -c; Chl-a derivatives (HPLC-DAD)
- organic carbon

- discovery of **undecomposed chlorophylls -a, -b, -c** in deep sediments
- **eutrophication and cyanobacteria blooms** occurred in the Baltic also in the past few thousands years



M.Voss, G. Kowalewska, W. Brenner, 2001. Microfossil and biogeochemical indicators of environmental changes in the Gotland Deep during the last 10,000 years, *Baltica*, 131-140.

G.Kowalewska, 2001. Algal pigments in Baltic sediments as markers of ecosystem and climate changes, *Climate Research*, 18: 89-96.

G.Kowalewska, B.Winterhalter, H.M.Talbot, J.R.Maxwell, J.Konat, 1999. Chlorins in sediments of the Gotland Deep (Baltic Sea), *Oceanologia*, 41, 81-97.

G.Kowalewska, B.Winterhalter, J.Konat, 1998. Chlorophyll a and its derivatives in deep Baltic sediments. *Oceanologia*, 40, 65-69.

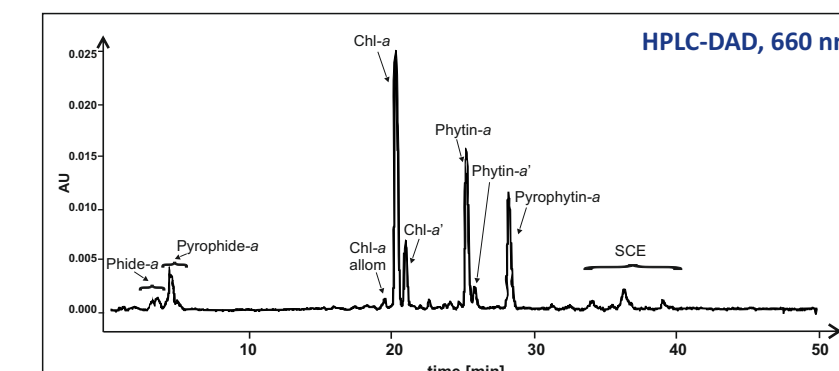
Gdańsk Deep (station P116)

September 2001



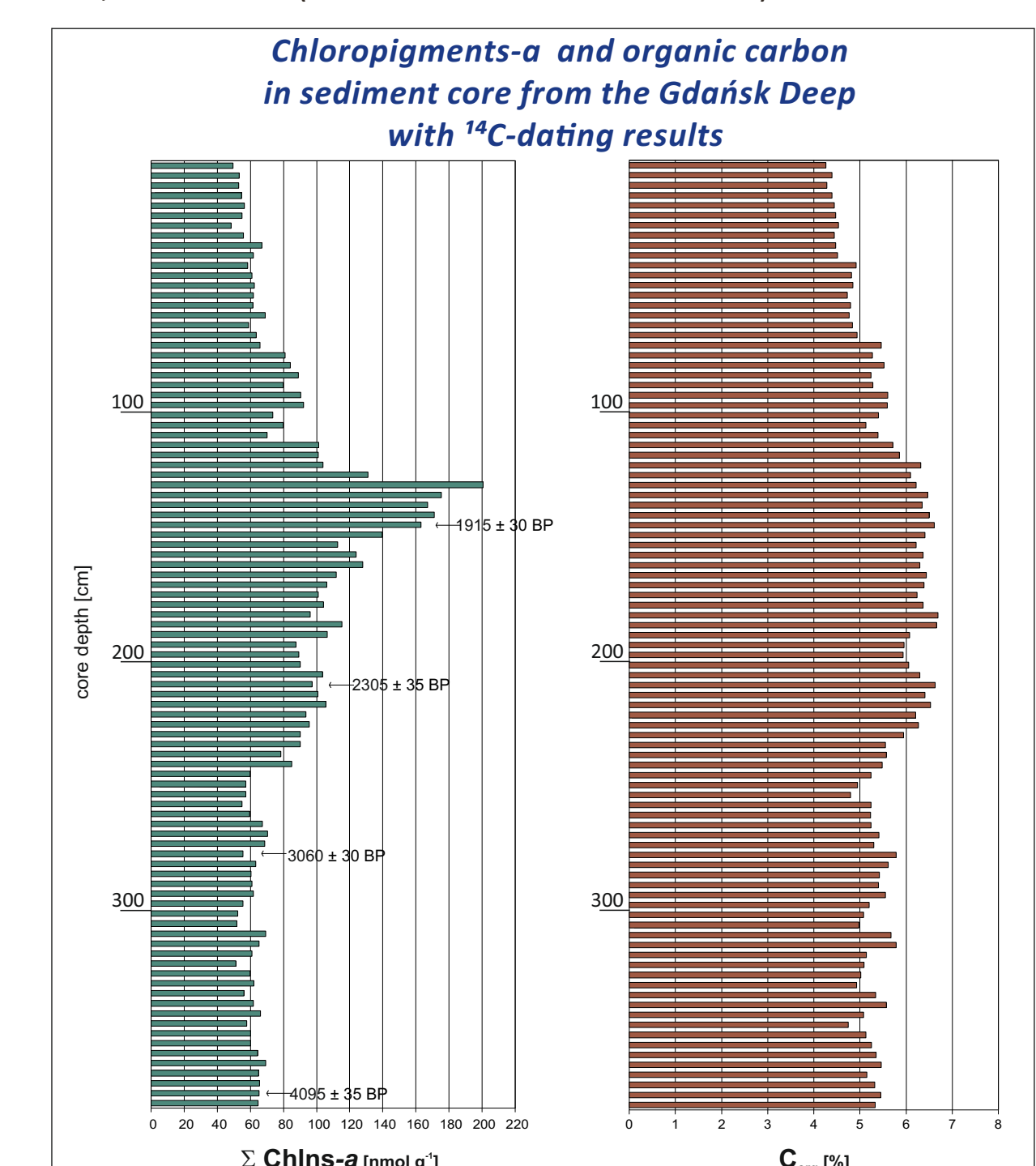
Analyses

- Chl-a and its derivatives (HPLC-DAD)
- organic carbon, granulometry
- sediment dating



- **past eutrophication** occurred at a **higher level** than that observed nowadays
- **climate** has a **great influence** on **eutrophication**, may be greater than **anthropogenic factors**

vibro-core sampler
r.v. „Dr Lubecki” (Maritime Institute in Gdańsk)



M.Szymczak Żyła, G.Kowalewska, 2009. Chloropigments a in sediments of the Gulf of Gdansk deposited during the last 4000 years as indicators of eutrophication and climate change. *Palaeogeography, Palaeoclimatology, Palaeoecology (Palaeo3)* 284, 283-294

CLISED project

The CLISED (Climate Change Impact on Ecosystem Health - Marine Sediment Indicators, 2014-2017, No Pol-Nor/196128/88/2014) is a project of Polish-Norwegian Research Programme operated by the National Centre for Research and Development. One of the Work Packages (WP3) is focused on assessing of the biogeochemical sedimentary record over the last millennia, in terms of carbon input, primary production, oxygen depletion and eutrophication. Old sediments of coastal locations of different climate and hydrology (Gulf of Gdańsk - southern Baltic and Oslofjord/Drammensfjord as well as in the Norwegian arctic region) will be analysed and compared.

Sampling stations



Planned analyses

- phytoplankton pigments
- organic carbon
- diatoms
- ¹⁴C sediment dating
- trace elements and their isotopes
- biotoxins and toxin-producing phytoplankton organisms

Project partners



deep sediment core collection

Gulf of Gdańsk

station **P116** (Gdańsk Deep)

April 2015

vibro-core sampler, ~400 cm

