

SDU 19. februar 2015

Flemming Gertz

Planter & Miljø

DET FAGLIGE NETVÆRK OM MARINE VIRKEMIDLER

INTRO TIL ANDRE MARINE VIRKEMIDLER

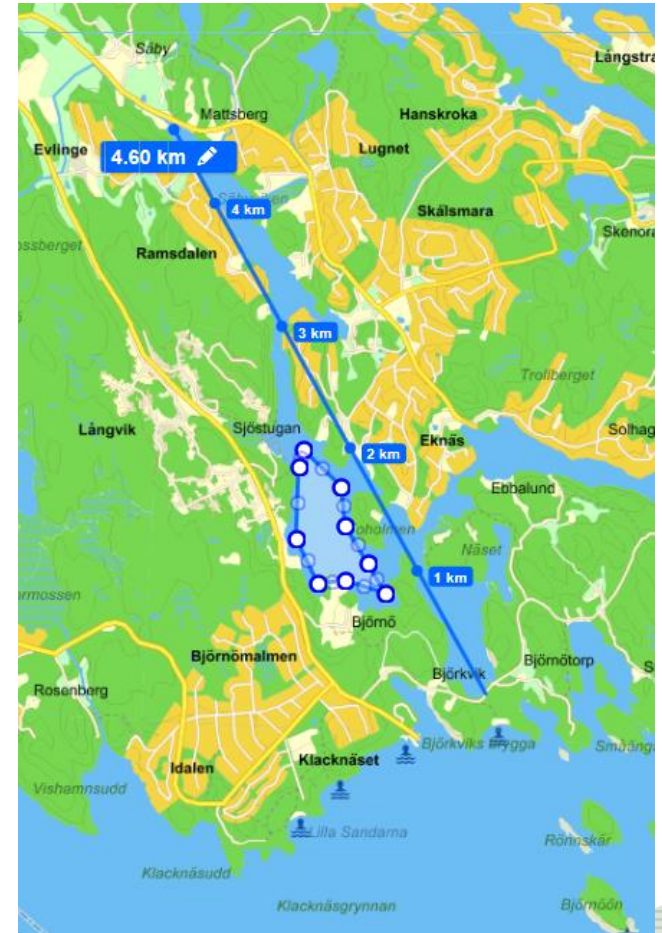
ALUMINIUM TREATMENT IN BJÖRNÖFJÄRDEN

EMIL RYDIN AND LINDA KUMBLAD BALTICSEA2020

- **bind phosphorus in the bottom sediments**
- **an aluminum treatment was performed in the summer of 2012 and 2013. The work was carried out by Vattenresurs AB**



ALUMINIUM TREATMENT IN BJÖRNÖFJÄRDEN



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- The aluminum treatment was carried out by [Vattenresurs AB](#), which uses a patented method where the aluminum solution is mixed into the bottom water and the bottom sediments with a kind of harrow that is pulled behind a barge
- Aluminum treatment is the same substance that is used in drinking water treatment in our larger water treatment works. Aluminum treatment has been used to fix phosphorus in lakes for more than 40 years in Sweden, as well as the United States and other parts of Europe. No negative side-effects have been seen to date, as long as very acidic conditions do not prevail in the water

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- As a result from the aluminum treatment the supply of phosphorus in the bottom water is reduced by more than 90 %. and the volume average with 50 %.
- The phosphorus in the bay has also been much lower than in the reference bay Fjällviksviken, and now corresponds with the levels and visibility in the water that was in the middle of the last century.
- <http://www.balticsea2020.org/english/alla-projekt/overgodning/eutrophication-ongoing-projects/54-living-coast>

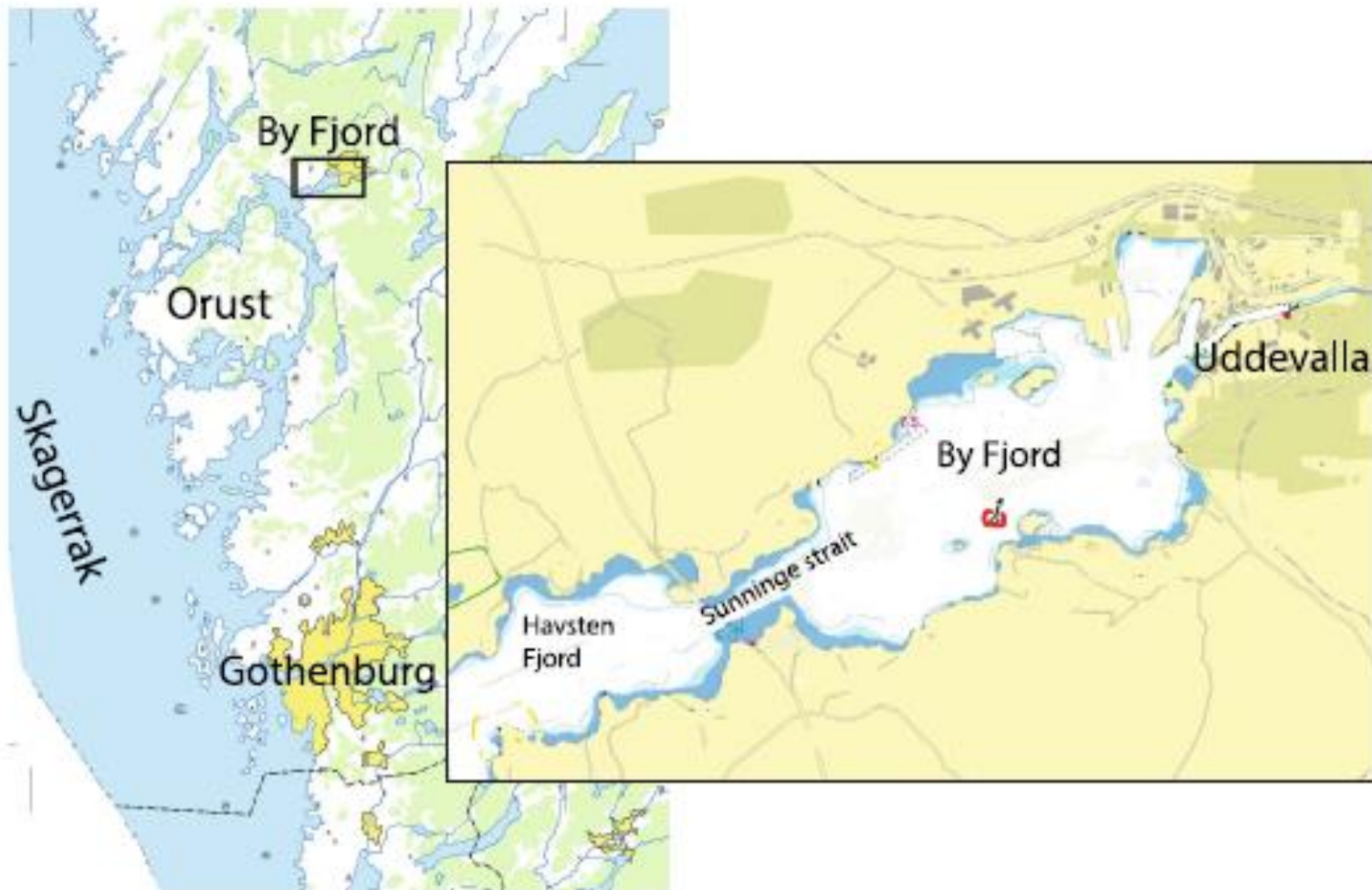
ALUMINIUM TREATMENT IN DK

Idé: Forlæng forårsperioden med fosforbegrænsning

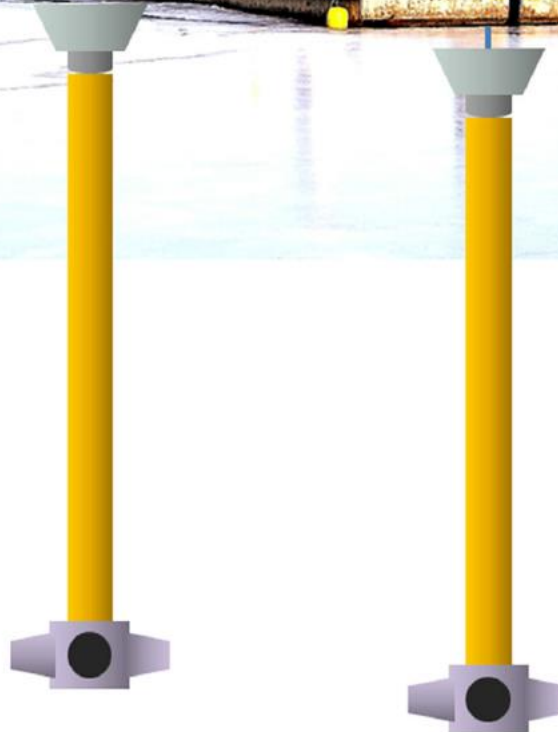
- Fx: Skive Fjord, Lovns Bredning, Hjarbæk Fjord



FORCED OXYGENATION OF THE DEEPWATER OF THE ANOXIC BY FJORD, WESTERN SWEDEN PROF. ANDERS STIGEBRANDT GOTHENBURG UNIVERSITY



FORCED OXYGENATION OF THE DEEPWATER OF THE ANOXIC BY FJORD, WESTERN SWEDEN



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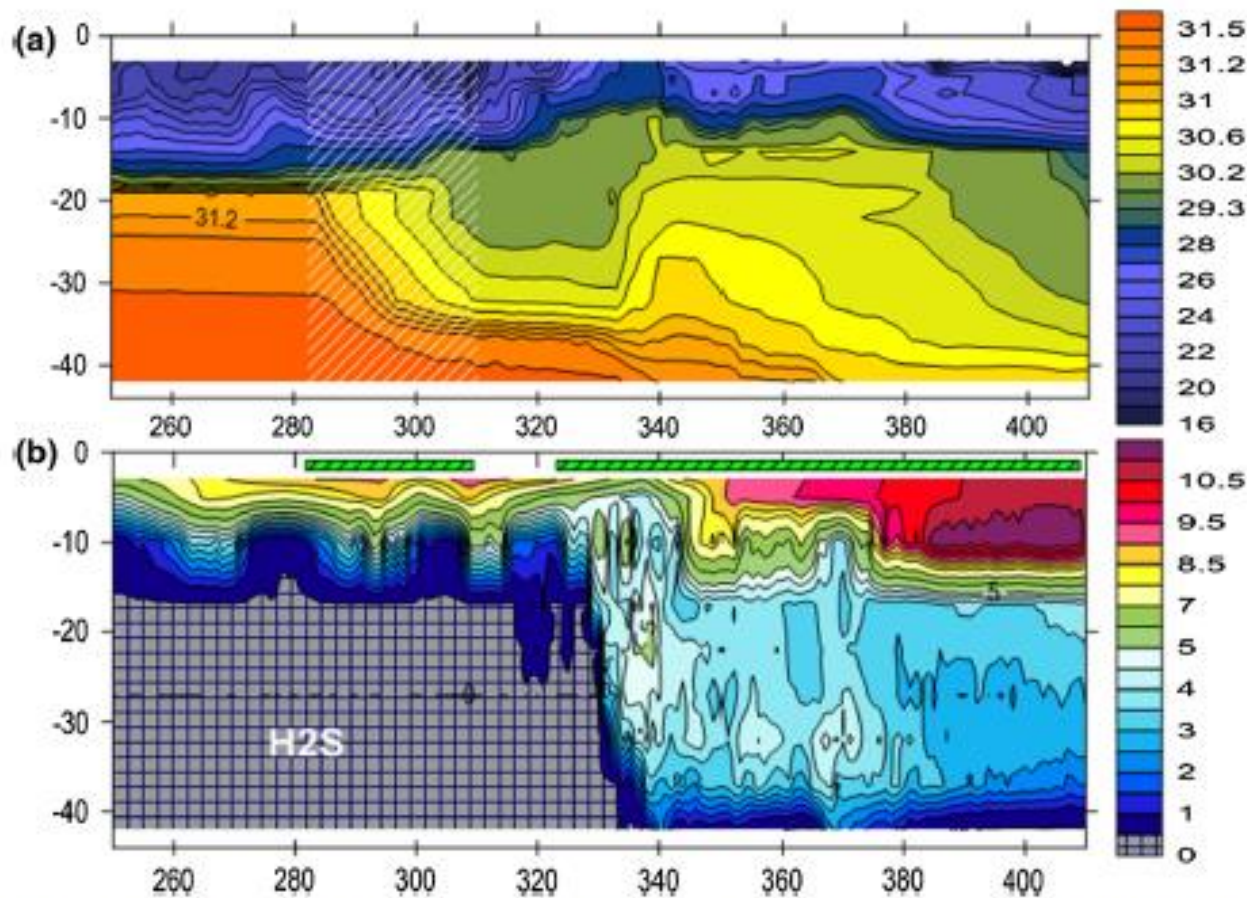
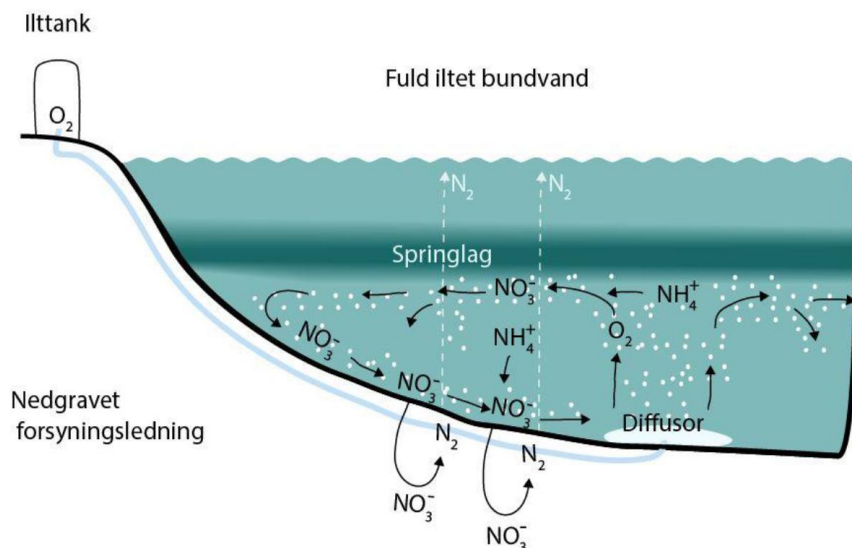


Fig. 3 Salinity (a) and dissolved oxygen mg L^{-1} (b) from the mooring in By Fjord from Sep 7, 2010 (day no 250) to Feb 14, 2011 (day no 410) (horizontal axis). The highlighted area in (a) shows the salinity reduction during the first pump period. The pumps were on as indicated by the green rectangles on top of (b). 12 CTD—7 of these with oxygen sensors—were mounted on the mooring during the time displayed

FORCED OXYGENATION OF THE DEEPWATER OF THE ANOXIC BY FJORD, WESTERN SWEDEN

- Hydrogen sulfide was replaced by oxygen
- phosphate decreased to typically only 20 % of what it was before the experiment.
- The DIP fluxes from sediments of became substantially lower after oxygenation
- large amounts of ammonium (20-40 ton) in the deepwater, and after oxygenation, nitrate (10 ton) became the dominating DIN component.
- benthic habitat quality (BHQ) improved over time

ILTNING MARIAGER FJORD



Overslag Erik Kock, DHI, 2014:

Resultater N fjernelse

Situation	Ton N/år	Forskel tonN/år
Nuværende N fjernelse	171	0
Iltning af NH ₄ , -DO i bundvand	205	34
Iltning af NH ₄ , +DO i bundvand	254	83

Dertil binding af P i sedimentet

Udgift: 5 mio kr pr år

- 1) Emil Rydin and Linda Kumblad Baltic Sea 2020:
»Anoxic sediments bind phosphorous after AI-treatment.«
- 2) Anders Stigebrandt Gothenburg University:
»Oxygenation of anoxic bottoms as a method to decrease the internal P-load and the eutrophication of the Baltic Proper«
- 3) Jouni Lehtoranta and Heikki Pitkänen, SYKE Finnish Environment Institute: “Benefits and disadvantages of artificial oxygenation under coastal marine conditions in the Baltic Sea”
- 4) Sven Blomqvist, Stockholm University : »Enhanced inactivation of P in Baltic sediments by addition of marl”