

Algae activities in Sweden

Eva Albers

Chalmers University of Technology, Göteborg

Swedish Academic key partner



CHALMERS



Algal Activities in Sweden - Summary

Academic activities

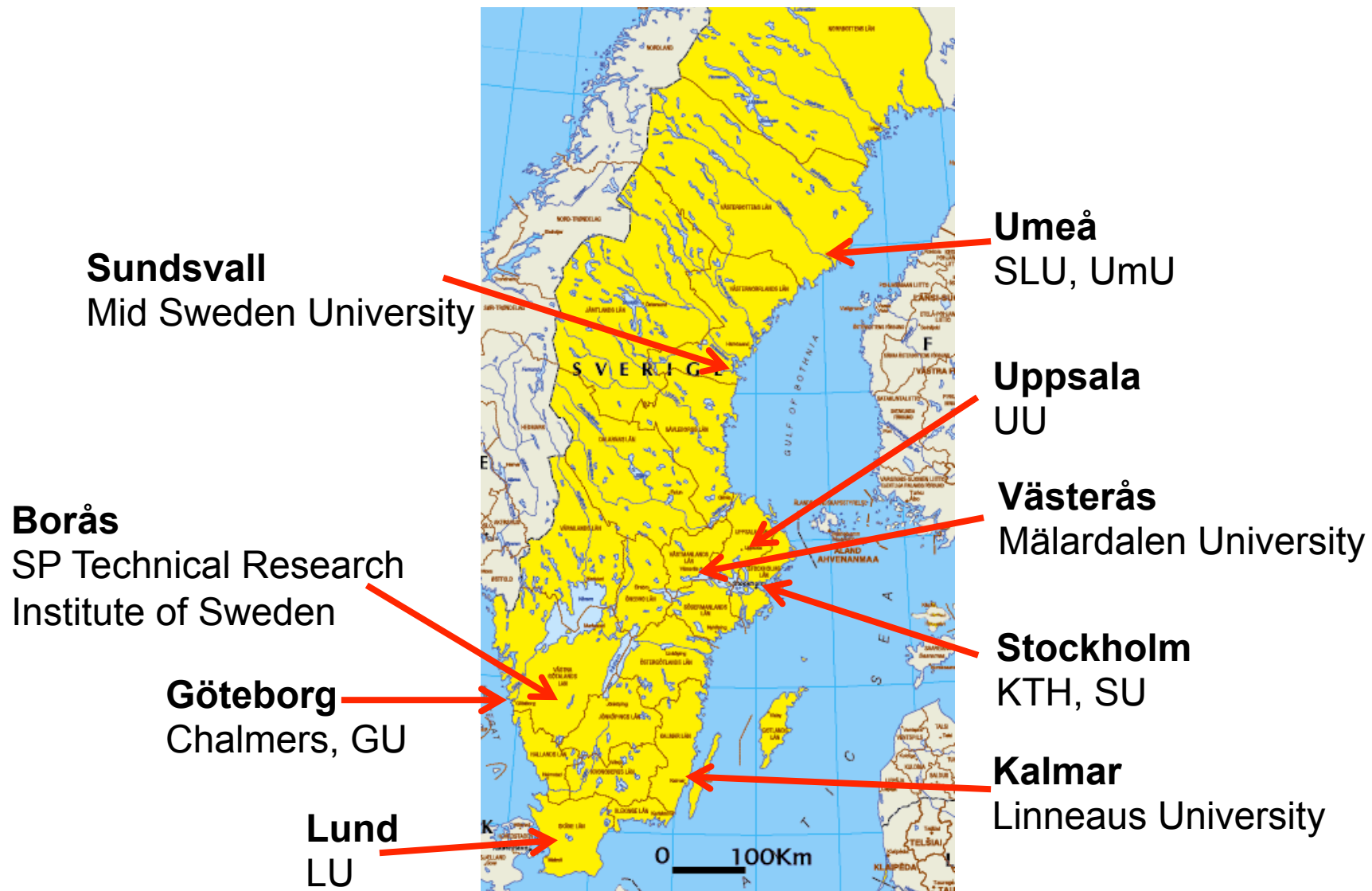
- Strong basic research in marine biology
- In applied research/ algal biotechnology – small & distributed groups
- Large focus on microalgae

Industrial activities

- Few companies
- Mostly small companies
- Both micro- and macroalgae



Academic activities in algal research



Applied research

- SP Technical Research Institute of Sweden, Borås
 - **Susanne Ekendahl, Niklas Strömberg**
 - Algal cultivation on flue gas, simple and cheap cultivation systems, large scale cultivation systems
- KTH (Royal Institute of Technology), Stockholm
 - **Fredrik Gröndahl**
 - System assessments of algae use
- AlbaNova University Center - KTH
 - **Björn Renberg**
 - Bioenergy from cyanobacteria



Applied research

- Linneaus University, Kalmar
 - **Catherine Legrand**
 - Phytoplankton products, algal productivity, algae for bioenergy
- SLU Umeå
 - **Francesco Gentili**
 - Algal cultivation on flue gas and waste water, development unit and pilot plant with four 6-10 m³ ponds (see latest newsletter)



Algae projects in Chalmers

Key Actors in the Nordic Algae Network:

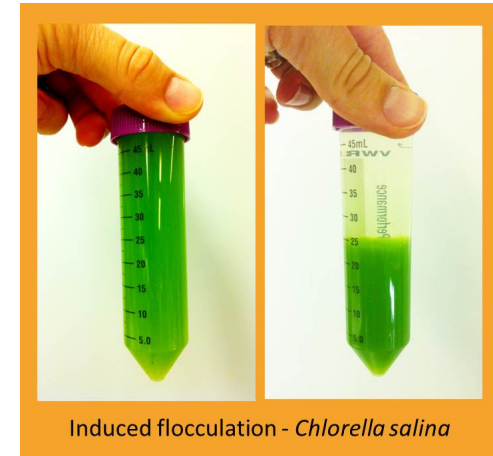
- **Eva Albers** - Industrial Biotechnology
- **Ingrid Undeland** - Food Science
- Our groups belong to the division of Life Sciences at department of Chemical and Biological Engineering



Algae projects in Chalmers

- **Microalgae flocculation**

- molecular mechanisms in the cells, triggering factors (*EA & Jenny Veide Vilg, cooperation with Anna Godhe, GU*)

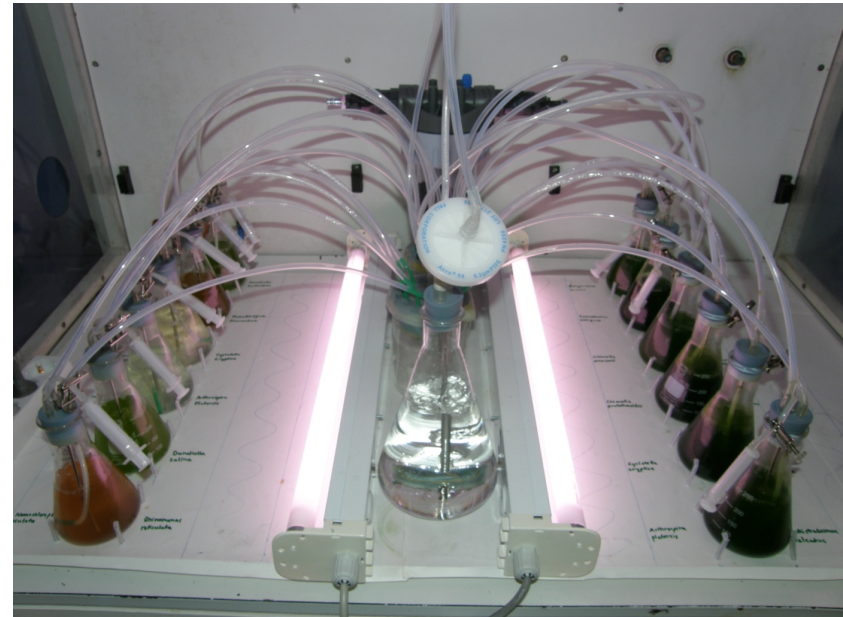


- **Algal carbohydrates for bioethanol production**

- link between culture conditions & cellular composition, hydrolysis methods for carbohydrates (*EA & Eko Agus Suyono, Indonesia*)
- algal biomass produced on waste material fermented to ethanol, link between species & fermentability (*EA & Francesco Gentili, SLU Umeå*)

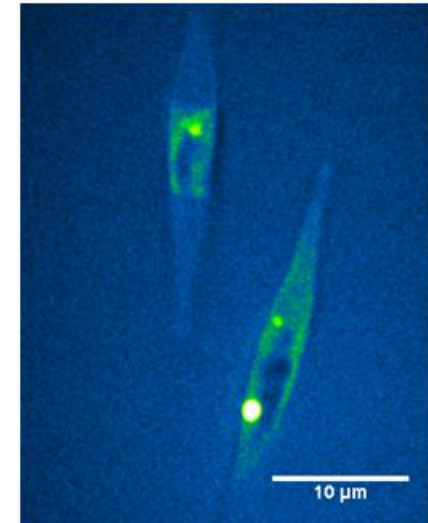
Algae projects in Chalmers

- **Use of flue gas as C-source in algal cultivation**
 - Effects on growth and cellular composition by (i) model gas, (ii) collected gas (*EA, Mathias Bark & Susanne Ekendahl – SP Technical Research Institute of Sweden*)
- **Integrating algal processes in Biorefinery concepts**
 - Process modelling of using algal cultivation as a CO₂ capture and waste treatment together with fermentation and biogas processes in industrial settings (*EA & Roman Hackl/Simon Harvey, Dept. Energy and Environment, Chalmers*)



Algae projects in Chalmers

- **Production of long chain n-3 PUFA (EPA and DHA) using microalgae**
 - optimization of cultivation conditions, evaluation of mild lipid extraction techniques, advanced microscopy (CARS) as a research tool (*IU & EA & Annika Enejder (Molecular Microscopy) & PhD-student*)
- **Cellular effects from brown seaweed (*Fucus vesiculosus*) extracts subjected to gastrointestinal digestion**
 - MTT and antioxidant tests using Caco 2 cells (*IU & Rosa Jonsdottir/Hordur Kristinsson, Matis*)



Industrial activities using algae

Sydkoster
Ostrea Sverige AB

Grebbestad
Tångbrödsspecialisten
Everts Sjöbod

Lysekil
N-research
Marin Biogas

Göteborg
Algi Nutrition AB



Gustavsberg
AstaReal AB

Hammenhög
SimrisAlg AB

Industrial Algae activities in Sweden

SimrisAlg AB - Hammenhög (www.simrisalg.se)

- Focus areas are production of food supplements and food ingredients (e.g. omega-3 and pigments) in their facilities with 2000 m² of green houses



Astra Real AB – Gustavsberg (www.bioreal.se)

- A research based biotech company, originally Swedish and now owned by Fuji Chemical Industry CO, Japan.
- Dedicated to the production, research and marketing of bulk ingredients for use in feed, food and dietary supplement retail products based on natural astaxanthin from *Haematococcus pluvialis*



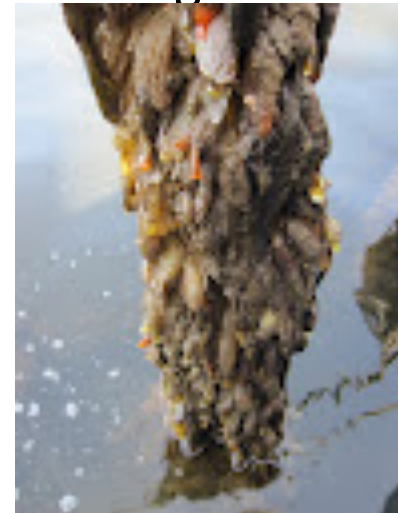
Industrial Algae activities in sweden

N-research – Lysekil (www.n-research.se)

- Assists customers in developing and testing new technologies in the marine field
 - products for ballast water, water filtering, environmental friendly anti-fouling paints and oily water separators.
- Uses microalgae cultures as model systems in tests of water purification
- Acts as consultants for other actors that want to grow microalgae for productions of ingredients/biogas

Marine Biogas – Lysekil (www.marinbiogas.se)

- Daughter company to N-research
- Has patented a technique for multitrophic culturing of *Laminaria* with sea squirts
- The biomass is then used for biogas production



Industrial Algae activities in sweden

Tångbrödsspecialisten – Grebbestad (www.tangbrod.se)

- Produces hard bread with kelp *Laminaria digitata*



Everts Sjöbod – Grebbestad (www.evertssjobod.se)

- Arranges nature experiences with the ocean in focus
- Examples are lobster, oyster and crab and mackerel safaris combined with tasting of these delicatesses
- Plan to extend their offers with macroalgae safari



Industrial Algae activities in sweden

Algi Nutrition AB - Göteborg

- Studies alginates from macroalgae as blood pressure lowering agents with the aim of producing food supplements/food ingredients
- The working hypothesis is that the alginates can reduce sodium uptake from our diet
- Collaborates with Tångbrödsspecialisten in order to incorporate the alginates into bread

Ostrea Sverige AB – Sydkoster & Marstrand (www.ostrea.se)

- Produces oysters *Ostrea edulis*, and for this purpose also has cultivation of microalgae



Next Nordic Algae Network workshop - Sweden

- **28th February, 2013**
- Held at Chalmers University of Technology
- In fakultetsvåningen, at the Johanneberg campus, in central Göteborg
- Check website for more and updated information

