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26.08.2010

POTENTIAL FOR FARMING EDIBLE SEAWEEDS IN DENMARK, FAROE ISLANDS AND GREENLAND

Susse Wegeberg

- Challenges
- Native edible species
  - Cultivation performed
  - Other potential species
- Methods

- Denmark

- Faroe Islands

- Greenland

Denmark (Baltic Sea Area) (Nielsen et al. 1996)

- **Number of macroalgae species** 375
  - **Rhodophyta** 160
  - **Phaeophyceae** 125
  - **Chlorophyta** 90
- **Ratio (R:P:C)** 1.78 : 1.39 : 1.00

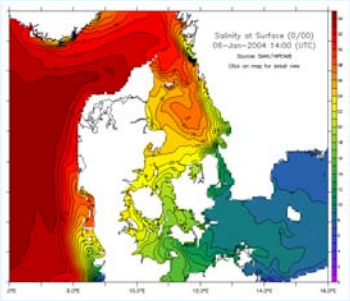
DK	R:P index ~ 1.28
Cold temperate regions:	R:P index ~ 1.1
Tropical regions:	R:P index ~ 4.3

(Lüning 1990)

Conditions of challenge in Denmark

- **Lack of suitable substratum**
  - **Relatively small and patchy occurrences of natural seaweed stocks – high work load to get "feed" stock**
  - **Farming seaweeds make sense**

Salinity



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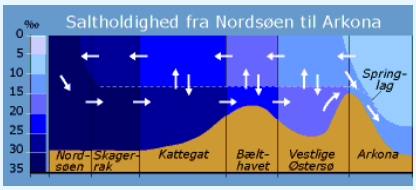
The impact of decreasing salinity

› Submergens



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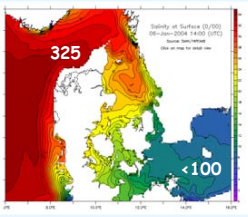
Decline in species number/distribution

› Rule of thumb: decrease of 10 psu ⇒ the number of red algal species is halved



Nielsen et al. 1995

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The impact of decreasing salinity

› Depauperation of thallus

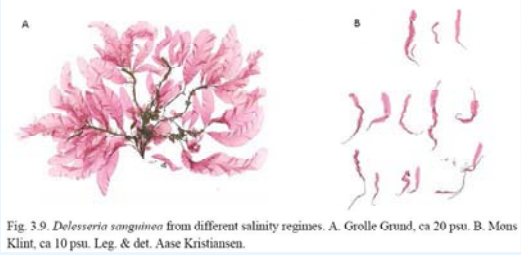
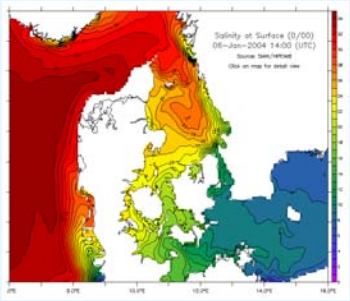


Fig. 3.9. *Delesseria sanguinea* from different salinity regimes. A. Grolle Grund, ca 20 psu. B. Mons Klint, ca 10 psu. Leg. & det. Aase Kristiansen.



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Species cultivated in Denmark (on trial)

- ***Ulva lactuca*** L.
- ***Chondrus crispus*** Stackh.
- ***Saccharina latissima*** (L.) C.E.Lane, C.Mayes, Druehl & G.W.Saunders

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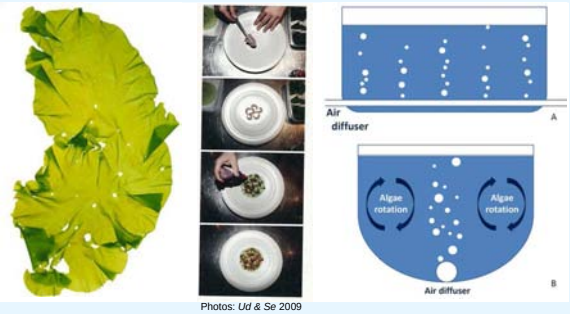
Ulva lactuca



Photos: *Ud & Se* 2009

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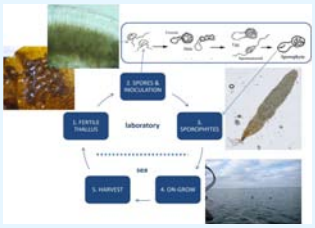
From presentation by PD Jensen, Bioenergidag 2008

Saccharina latissma

- **Great Belt (Birkeland 2009)**
- **Limfjorden (Wegeberg 2010)**
- **Kattegat, Dyngby (Marifood Aps.)**



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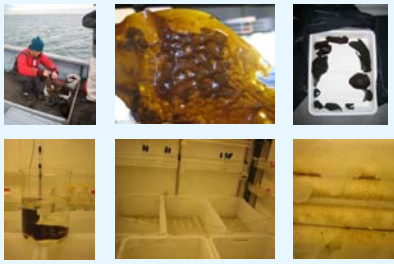

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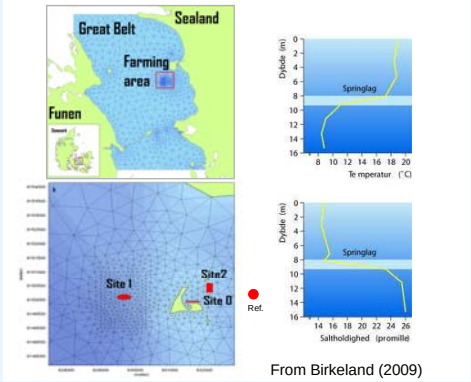
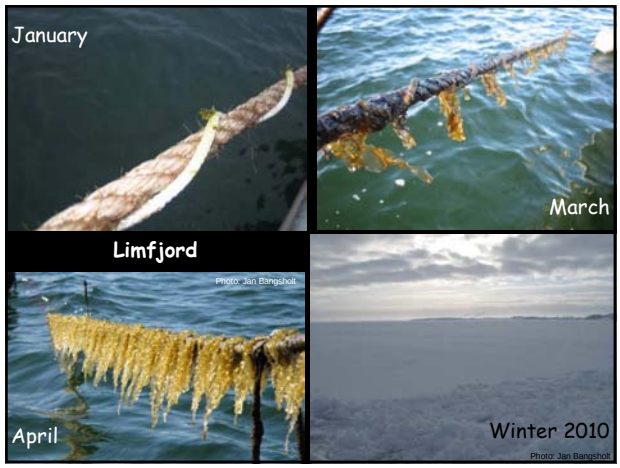


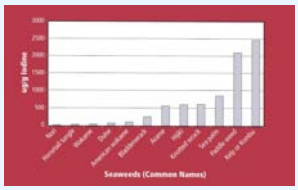
From Birkeland (2009)



Marifood Aps.

Photos: Marifood Aps.

- Relatively deep location
- Early on-grow in sea
- Manipulated sporulation



Iodine

In *S. latissima* from Marifood Aps. the iodine content is app. 10 % of the iodine in Chinese kelp

Iodine intake limit:

1100 µg day^{-1}

From Teas et al. (2004)

Edible seaweed species in Denmark

Species farmed in DK

- ***Ulva lactuca*** L.
- ***Chondrus crispus*** Stackh.
- ***Saccharina latissima*** (L.) C.E.Lane, C.Mayes, Druehl & G.W.Saunders

Potential species?

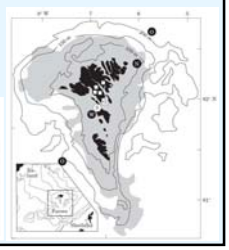
- ***Codium fragile*** (Suringar) Har.
- ***Osmundea truncata*** (Kütz.) K.W.Nam & Maggs
- ***Palmaria palmata*** (L.) Kuntze
- ***Porphyra umbilicalis*** (L.) Kütz.

Faroe Islands

- **Challenges**
- **Native edible species**
  - **Cultivation performed**
  - **Other potential species**
- **Methods**

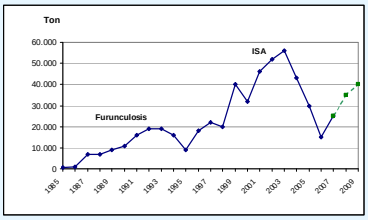
Faroe Islands (Tittley et al. 2005)

- **Number of macroalgae** 260
  - **Rhodophyta** 112
  - **Phaeophyceae** 86
  - **Chlorophyta** 62
- **Ratio (R:P:C):** 1.80 : 1.39 : 1.00
- **R:P index:** 1.3



Challenges - Legislation

ISA - Infectious Salmon Anaemia



www.fiskaaling.fo

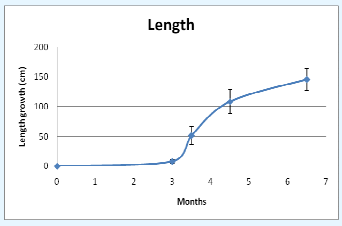
- 1984: recognised for the first time in Norway
- 1996: outbreaks in Canada
- 1998: outbreaks in Scotland
- 2000: outbreaks in the Faroe Islands
- Outbreaks in Chile

Alaria esculenta - cultivation trial

Photos: Agnes M Mortensen

Elongation rate of *Alaria esculenta*

- **2 cm d^{-1}**
- **Ca. 1 m $season^{-1}$**



Mortensen et al. 2005

Potential species: *Palmaria palmata*

Cultivation has been succesfully achieved on ropes and in tanks:

- **Ireland** (Edwards 2007)
- **Germany**

(Sylter Algenfarm GmbH & Co.KG)

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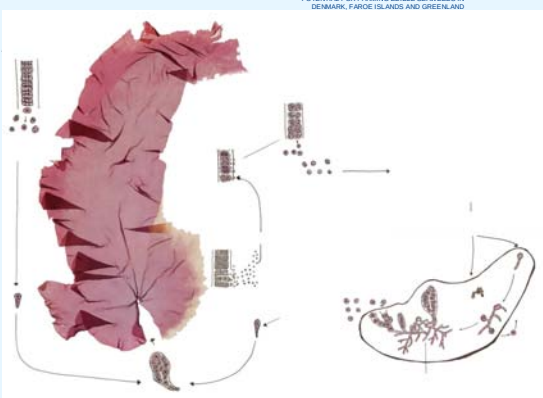

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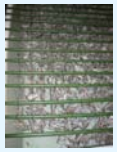

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Porphyra umbilicalis

- **Research in cultivation on neutral spores in Maine, USA**
  - Seeding nets with neutral spores of the red alga *Porphyra umbilicalis* (L.) Kützing for use in integrated multi-trophic aquaculture (IMTA)**(Blouin et al. 2007)**

Greenland

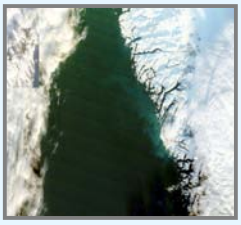
- Challenges
- Native edible species

Greenland (Pedersen 1976)

- **Number of macroalgae** 183
  - **Rhodophyta** 48
  - **Phaeophyceae** 80
  - **Chlorophyta** 55
- **Ratio (R:P:C):** 1.00 : 1.67 : 1.15 **R:P index:** 0.6

- **Short season**
- **Low temperatures**
- **Ice**

- **Early on-grow in sea**
- **Deep location for on-grow**
- **Open water areas/polynias**



Paamiut, January 2010 (DMI, COI)

Potential species in Greenland

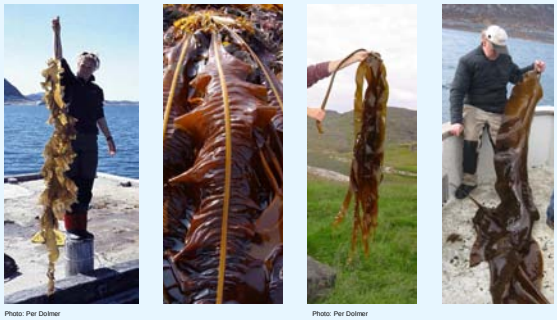


Photo: Per Dolmer

Photo: Per Dolmer

Harvest of natural stocks?

Biomasse (kg/m²)	Total	Agarum clethratum	Alaria esculenta	Laminaria nigripes	Saccharina latissima
Eksponeret	8.2	0	3.5	4.4	0.2
Semi-eksponeret	4.5	1.2	1.2	0.3	1.8
Beskyttet	3.0	1.1	0.8	0.2	0.7

Wegeberg (2007)

Photo: Per Dolmer