Tang- den blå ressource

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Forskningsgruppen: Bioaktive stoffer- analyse og anvendelse

Leder af Tangnetværket

General Sekretær for den Internationale Tangforening ISA

DTU Food
National Food Institute

Menu

- Introduction
  - A world of seaweed
  - What is a seaweed?
- Applications
- Composition of seaweed- nutraceuticals
- Application of high added value product from seaweed
- Conclusion
- Future biorefineries

Seaweed / macroalgae

Seaweed *is a loose colloquial term encompassing macroscopic, multicellular, benthic marine algae. The term includes some members of the red, brown and green algae*

Differentiated into:

- Thallus: the algal body
- Lamina/frond: a flattened structure that is somewhat leaf-like
- Sorus: spore cluster
- Holdfast: specialized basal structure providing attachment
- Haptera:finger-like extensions of holdfast anchoring to benthic substrate

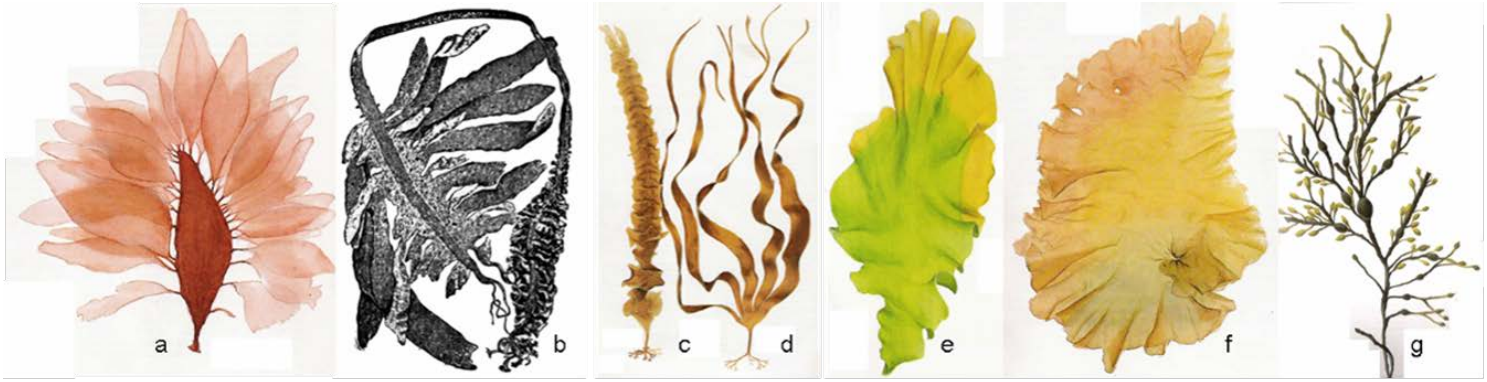
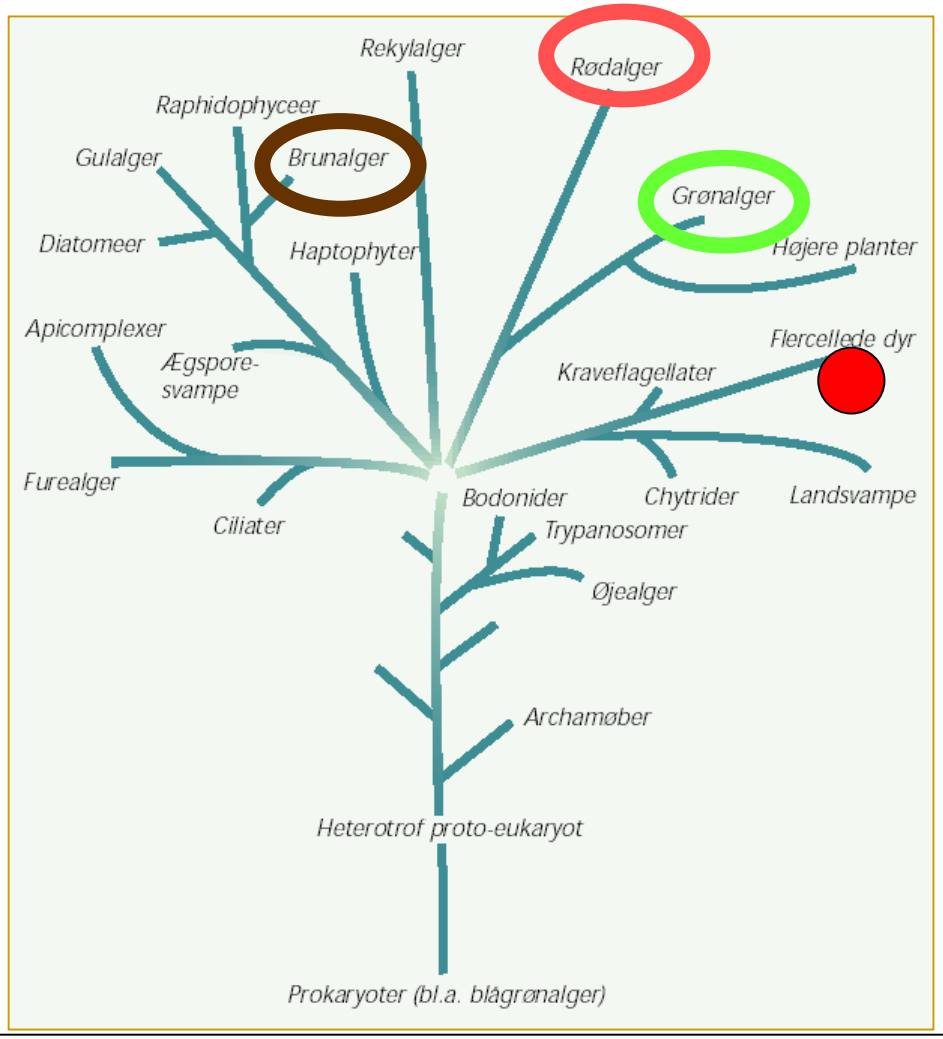
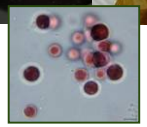
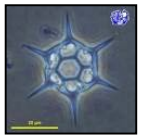
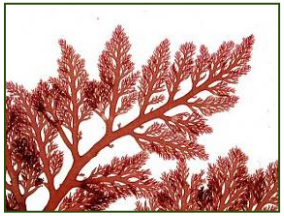


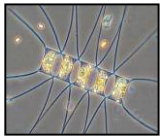
Figure 5. Sketches of some of the mentioned seaweeds; (a) *Palmaria*, (b) *Undaria*, (c) *Saccharina latisima* formerly *Laminaria saccharina*, (d) *L. digitata*, (e) *Ulva*, (f) *Porphyra* and (g) *Ascophyllum* (and www.commons.wikimedia.org; (Larsen and Hansen 1986).

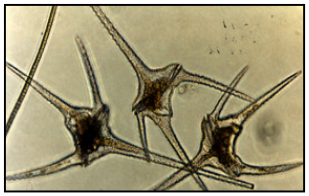
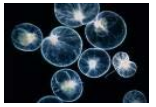
Diversity


Rekylalger
Rødalger
Raphidophyceer
Gulalger
Brunalger
Grønalger
Diatomeer
Haptophyter
Højere planter
Apicomplexer
Ægspore-
svampe
Flercellede dyr
Kraveflagellater
Furealger
Ciliater
Bodonider
Chytrider
Landsvampe
Trypanosomer
Øjealger
Archamøber
Heterotrof proto-eukaryot
Prokaryoter (bl.a. blågrønalger)





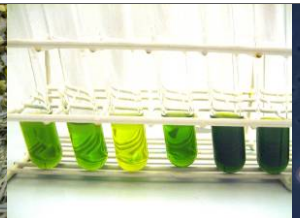
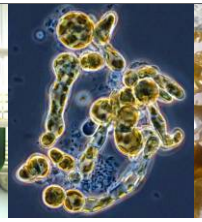



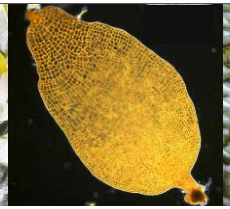
No roots- just holdfasts and haptera

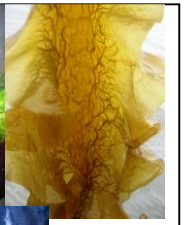
Nutrient uptake takes place at the entire thalli
and there is no need for benthic substrate

Cultivate in suspension or on other substrates

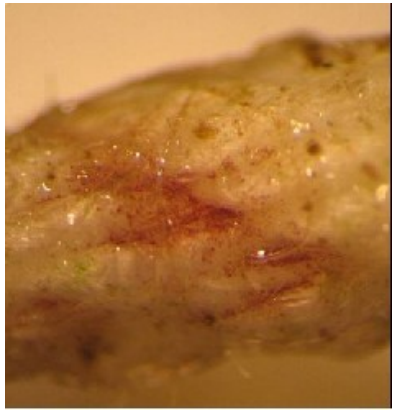
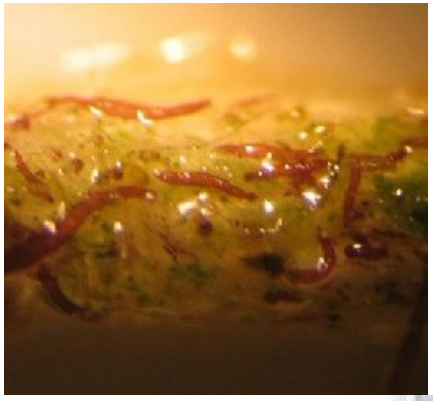
Figure 2. (a) Spores from *Palmaria palmata* settled on vinylon string (2 mm in diam), (b) spores germinated in 3 weeks in nursery tanks with added nutrient and aeration and transferred to the field at this stage, (c) harvestable thalli after 4 months of field cultivation (a-c seeded and cultivated by Maeve Edwards). (d-e) Seeded string with *Alaria esculenta* coiled around culture rope and (f) *Alaria* after approximately 120 days culture at sea (Arbona and Molla 2006).

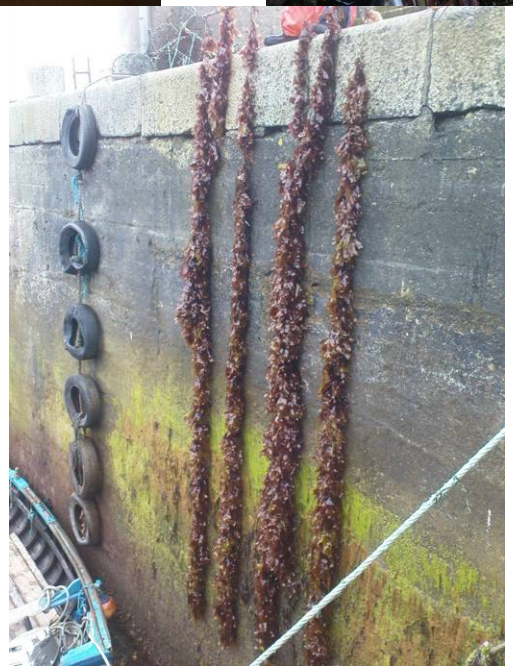
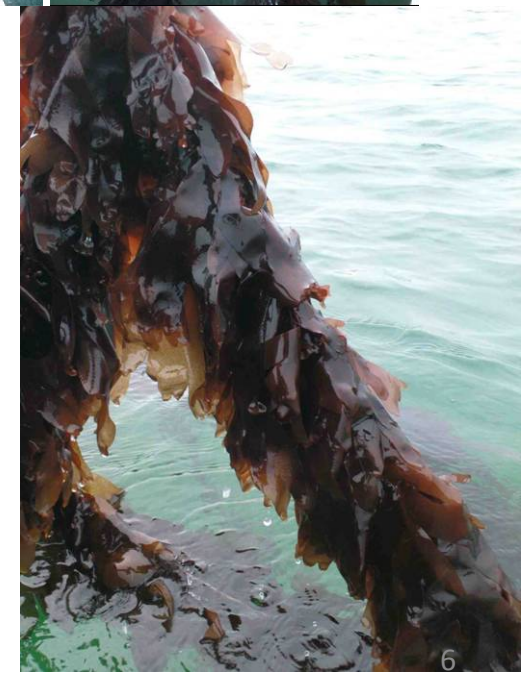


Ireland

Palmaria palmata
(”søl” in Danish)

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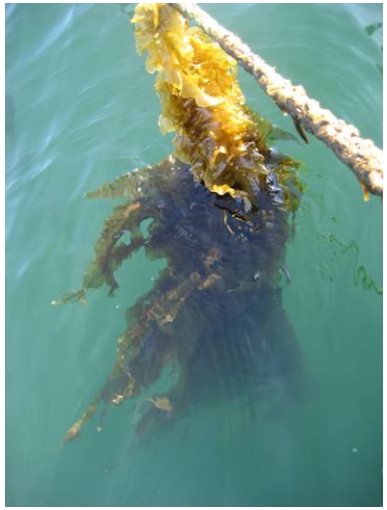
Horsens fjord



Saccharina latissima
(former *Laminaria saccharina*)
(”sukkertang” in Danish)

Cultivation

Harvesting of Laminaria japonica (Kombu) in Japan from long lines by boat (Photo: M. Ohno)

China knows how!

A Nori farm in Japan. Nets with seeded Nori are placed between a bamboo pole system (Photo: M. Ohno)

Polyculture in embayments in Yellow Sea region, China J. FANG

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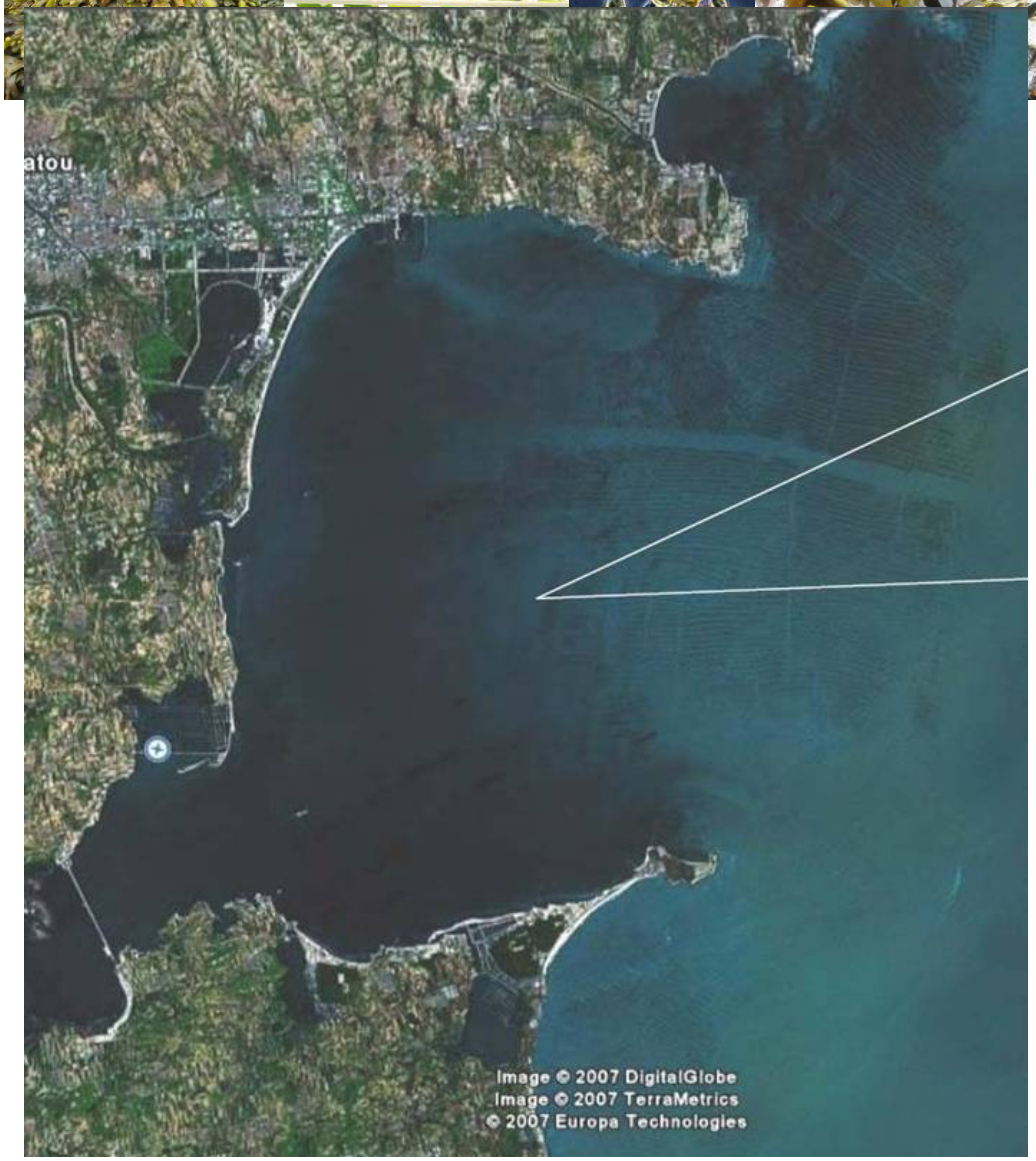
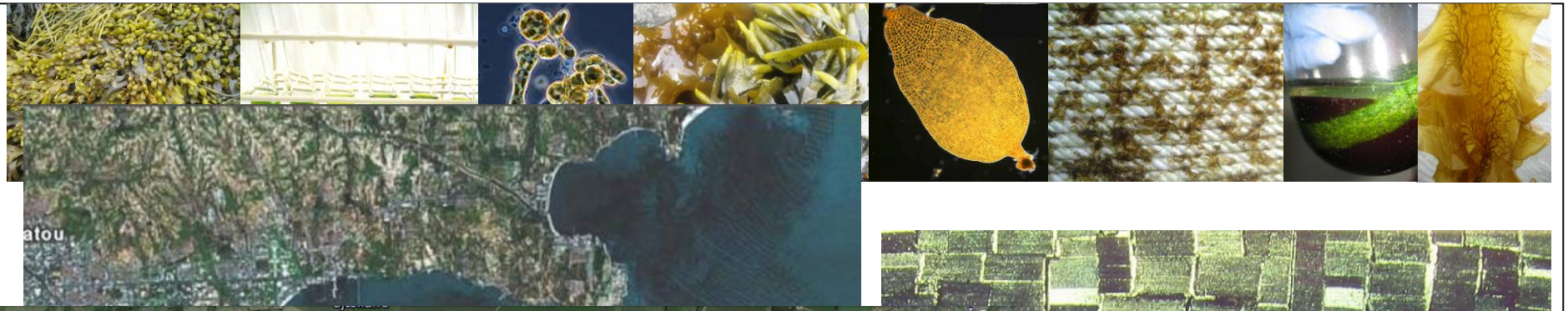
Korea

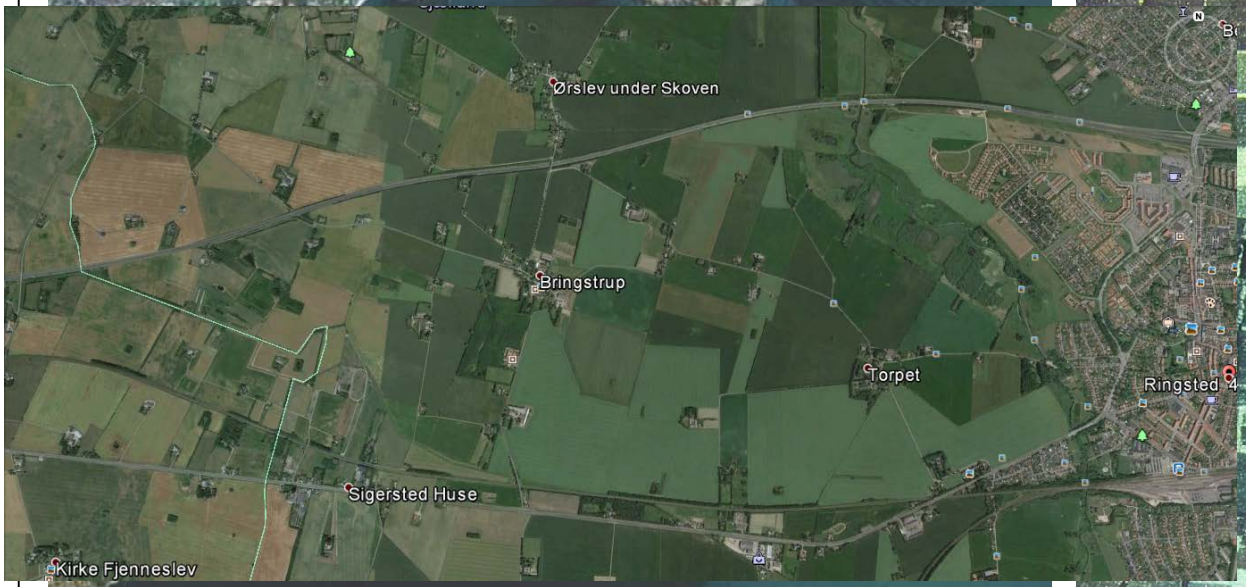


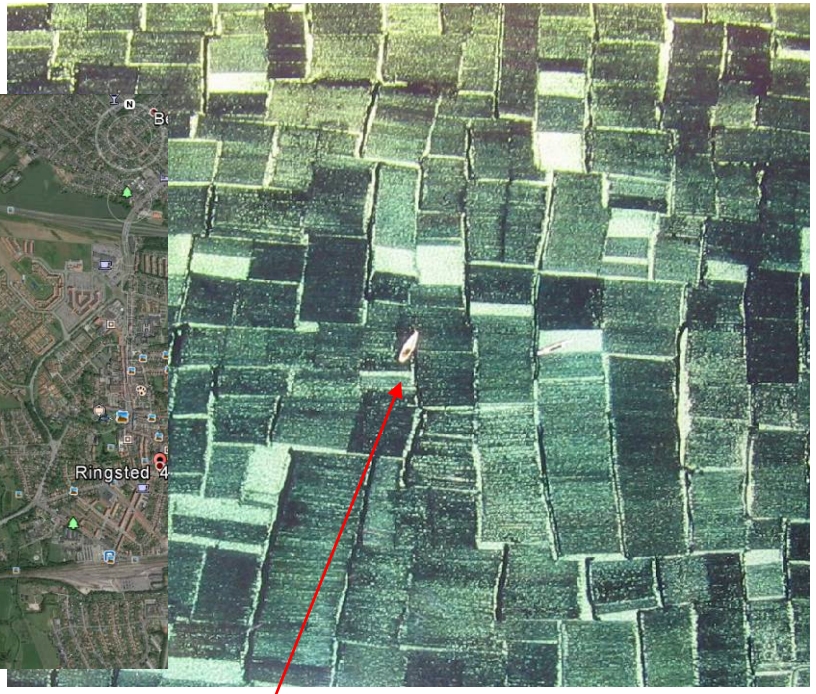
Polyculture in embayments in Yellow Sea region, China; Google Earth

Seaweed production in Indonesia; travelling exhibition: Earth from Above

Boat







Seaweed production in Indonesia; travelling exhibition: Earth from Above

Boat

Polyculture in embayments in Yellow Sea region, China; Google Earth

A world of seaweed

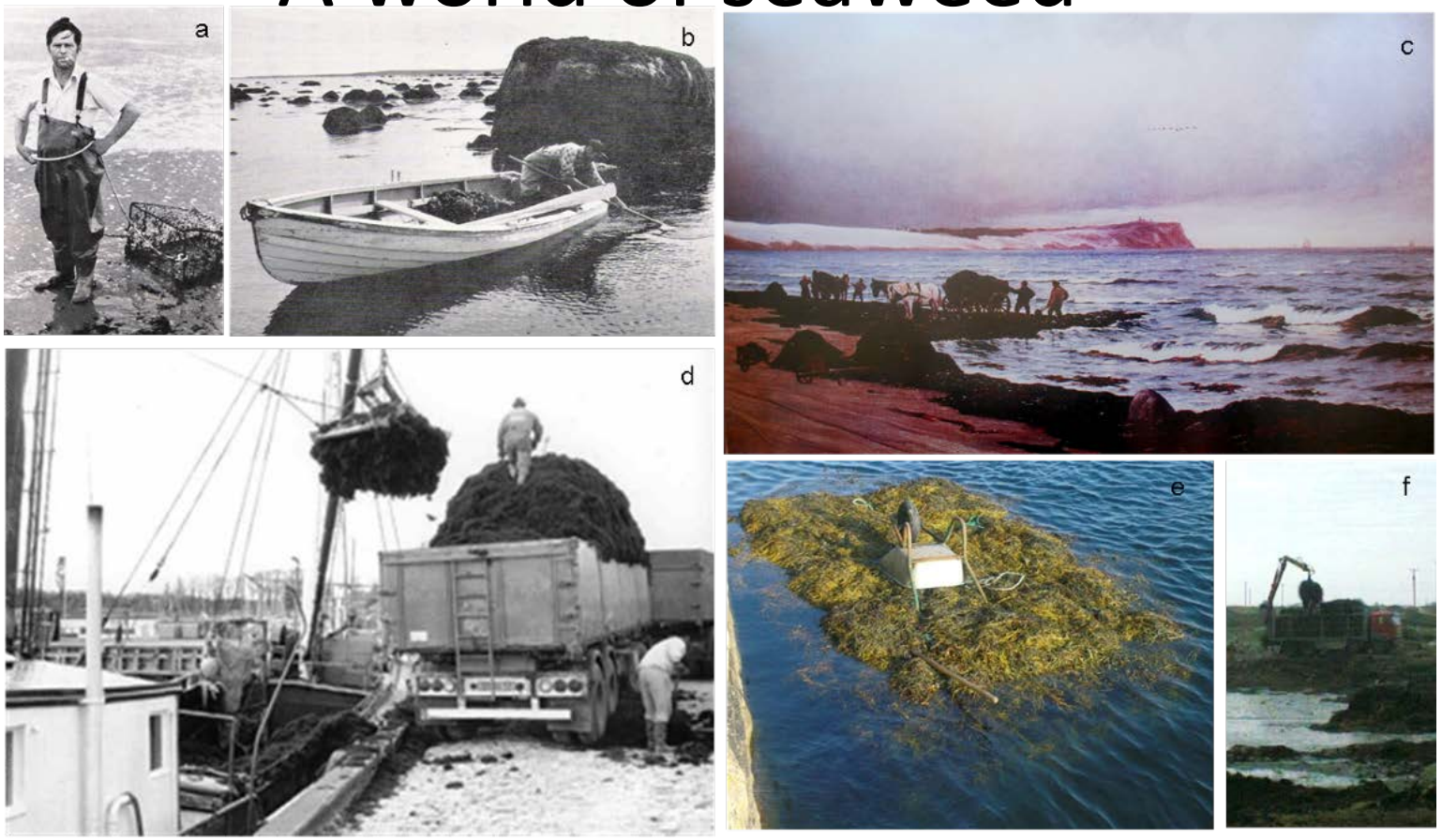


Figure 3. (a) “Storm toss” *Chondrus crispus* (Irish moss) harvester from 1975 (Prince Edwards Island, Canada) equipped with waders and basket to drag through the shallow water at the beach and (b) a typical Irish moss handraker (Pringle and Mathieson 1986). (c) Painting by Carl Locher (1882), Tangsamlere ved Hornbæk Strand (Seaweed collecters at Hornbæk beach, Denmark). (d) natural harvest of drifting populations of *Furcellaria lumbricalis* in Denmark getting loaded on trucks and sold to Litex A/S to extract the “Danish agar” (e) *Ascophyllum* handraked in Ireland 2008 at low tide and bundled to a metric tonnes “climeen” dragged up shore at high tide (wheel barrow upside down on top of the “climeen”), (f) where a lorry drives down to the shore at low tide and picks it up (pictures by Maeve Edwards).

The commercial seaweed production worldwide accounts for 20 % of the total aquaculture production

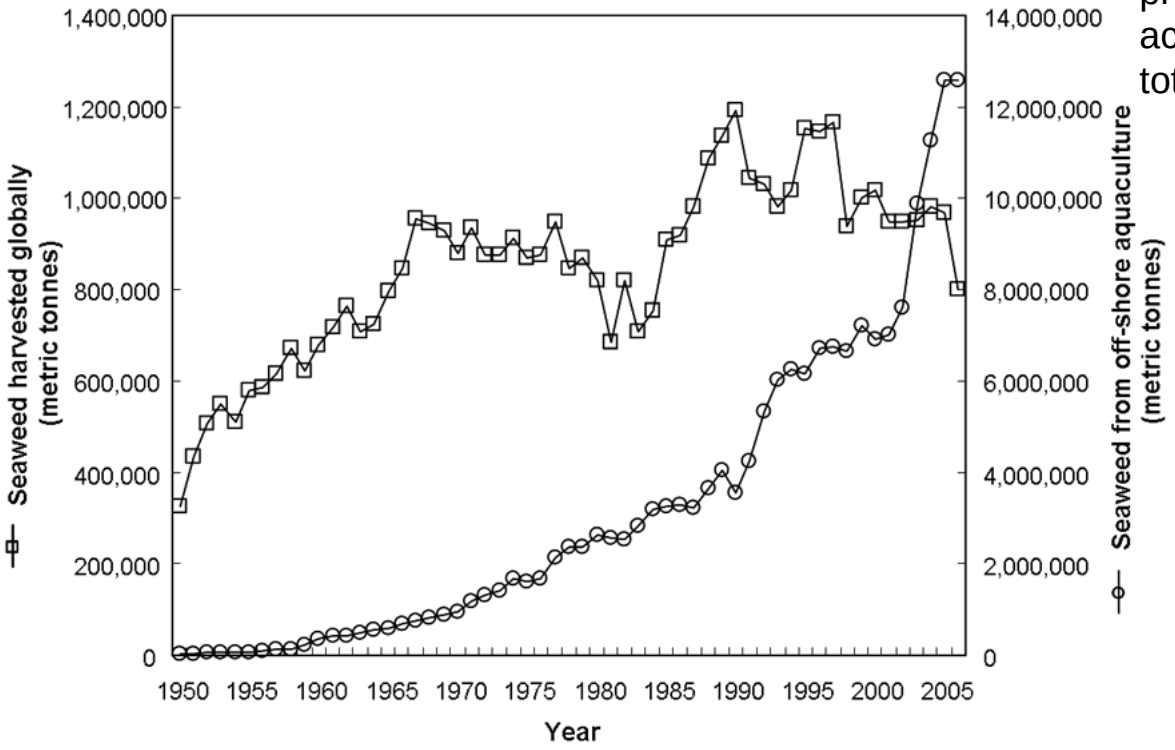


Figure 3. Globally harvested (□) and cultivated seaweed (○) in offshore marine and brackish water from 1950-2006 (FAO 2008).

Status

- Few eat seaweed! More people aware now:
  - Sushi wave
  - Seaweed book, media….. Etc.
  - Seaweed salad in fish stores

- Several Danish seaweed products on the Danish market: Dansk Tang and Nordisk Tang a.o.
- Demand from restaurants especially; NOMA and other restaurants. www.danish-seaweed.org

- Industrial classification code: Food safety, utilization of the raw material, cultivation, recently EU-regulation on organic seaweed cultivation

- Seaweed farms: 2 (Hjarnø Fish farm, Seaweed Societe)

- Dialog with: Ministry of Food, Agriculture and Fisheries:
  - Danish Veterinary and Food Administration
  - The Danish Directorate of Fisheries
  - Veterinary Control Office-Aquaculture Department

Danish products with seaweed

http://nordisktang.dk/

http://www.anitadietz.dk/

Cavi·art®

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- Ice cream from Skarø
  - Birch juice
  - With seaweed (sugar kelp)
  - Functional ice cream
  - Hospitals

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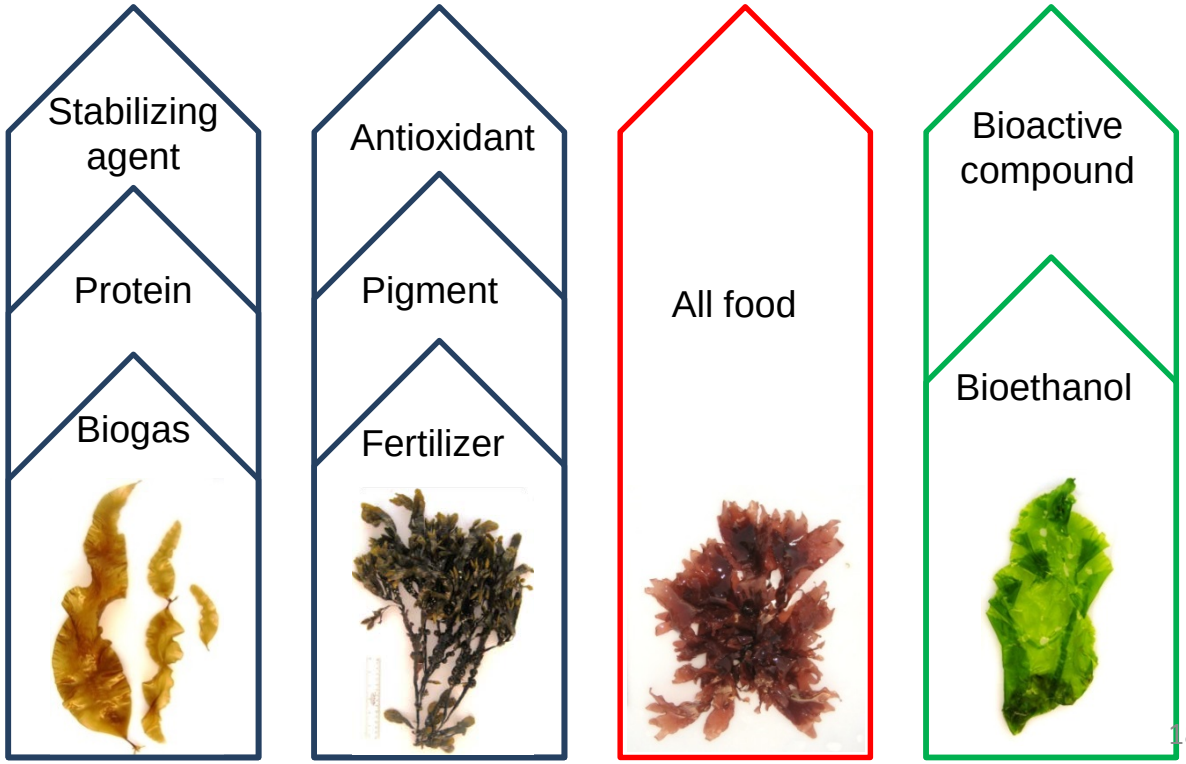
Future biorefineries- multi extraction of ingredients

Biorefinery- (also) future use of seaweed biomass

- GRAS extraction : possible to extract multiple compounds from same biomass
- Different species (or season) different optimized utilization/biorefinery
- Multiple high value added products and less/no waste



Seaweed composition

- Difficult to conclude on the contents of the different components as they vary with species, geography, environment, within populations and season
- Proteins: Generally low content: 5-15% of dry weight

  Green and red: 10-30%

  Palmaria and *Porphyra (red)*: up to 47%
- Polysaccharides: 35-60%
- Lipids: only up to 4%, rich in the omega 3-fatty acids
- Minerals: Na, K, P, Ca, Mg, Fe, I
- Vitamins: Vitamin A, B1, B2, B6, B12, C, D og E
- Flavour enhancer = umami

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Minerals & vitamins

- Seaweed contain more minerals than any other food. This is mainly due to the the surface cell wall polysaccharides that freely and selectively absorb inorganic nutrients from the sea. This also include undesirable compounds…..

Table 8. Mineral contents in marine algae[8)]

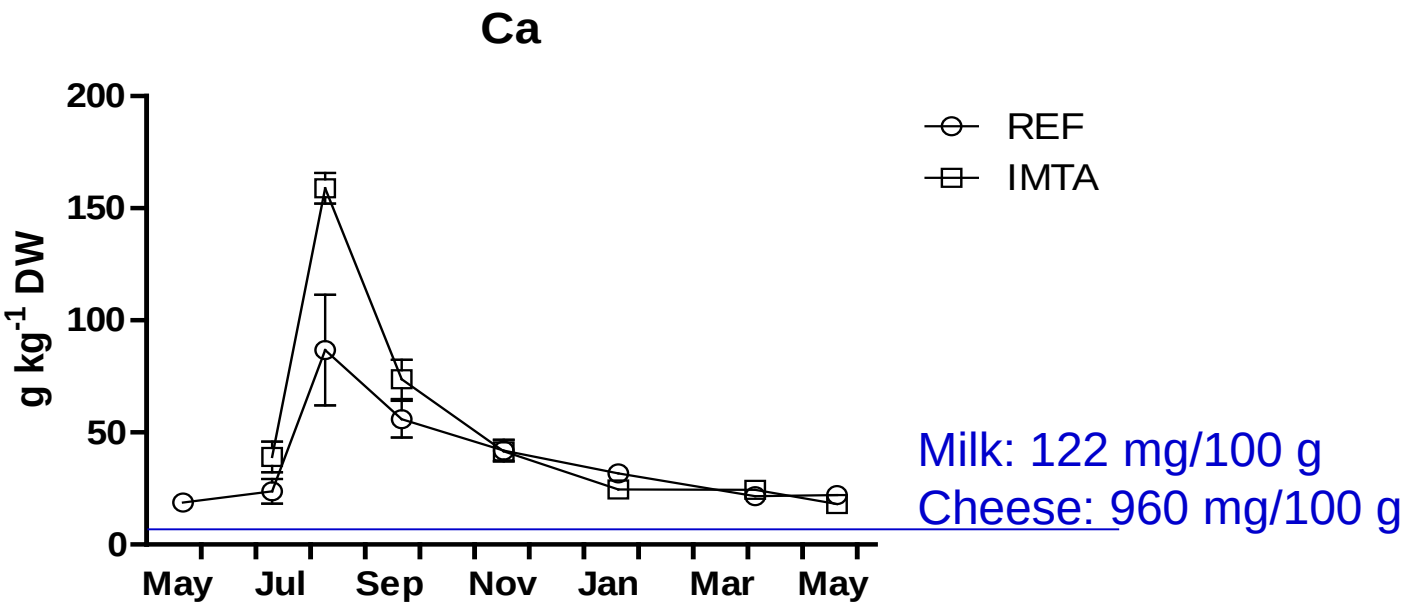
	Minerals (mg/100g)					Vitamins (/100 g)			
	Na	K	Ca	P	Fe	A(IU)	B_1(mg)	B_2(mg)	C(mg)
Enteromorpha compressa (Aonori)	530	3,200	840	740	32.0	12,000	0.56	1.90	40.0
Undaria Pinnatifida (Wakame)	6,100	5,500	960	400	7.0	1,800	0.30	1.15	15.0
Hizikia fusiformis (Hiziki)	1,400	4,400	1,400	100	55.0	310	0.01	0.14	0
Laminaria saccharina (Konbu)	2,800	6,100	710	200	3.9	560	0.48	0.37	25.0
Porphyra complex (Amanori)	120	2,100	390	580	12.0	14,000	1.15	3.40	100.0
Tomato	2	230	9	18	0.3	220	0.05	0.03	20.0
Spinach	21	740	55	60	3.7	1,700	0.13	0.23	65.0
Carrot	26	400	39	36	0.8	4,100	0.07	0.05	6.0
Orange (Valencia)	1	190	20	20	0.1	42	0.01	0.03	40.0

The values refer to the analyzed data of the products which are available in the market.

(Murata and Nakazoe 2001)

Trace metals- Calcium

Dansk sukkertang



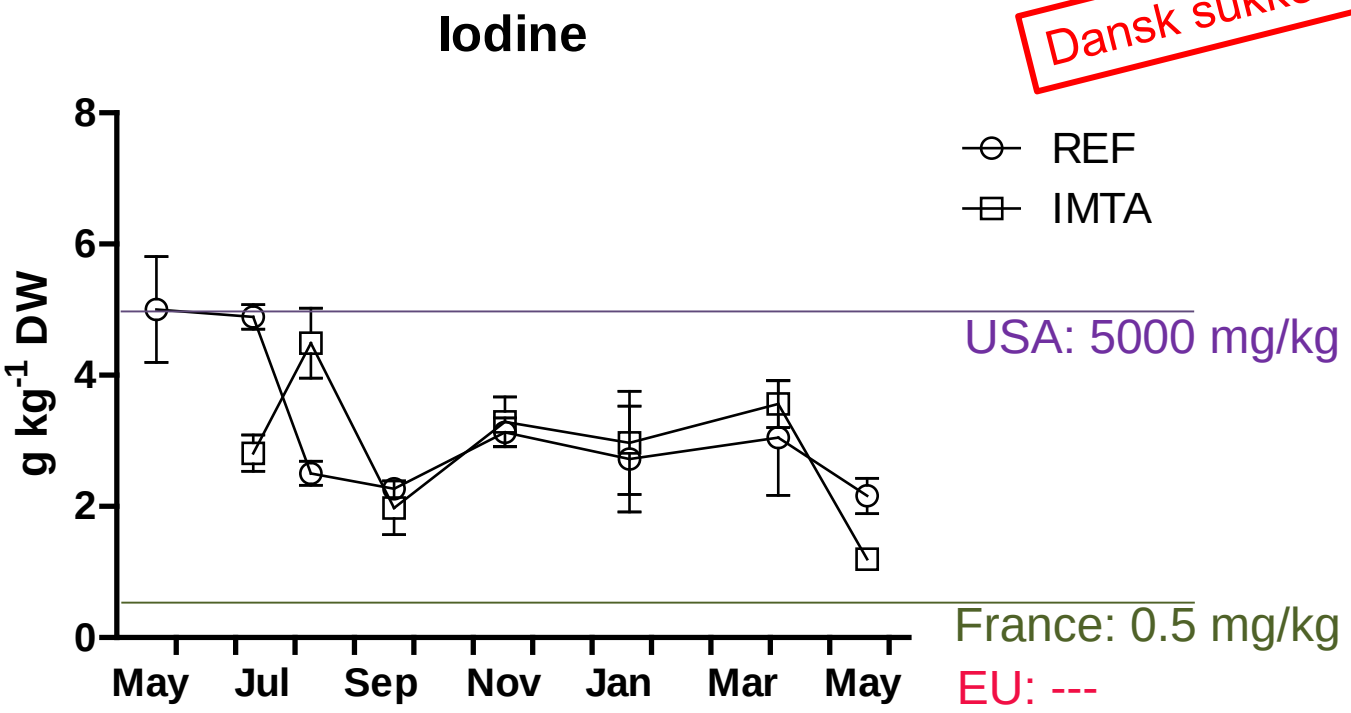
Milk: 122 mg/100 g

Cheese: 960 mg/100 g

Source: www.foodcomp.dk

KOMBI-opdræt: Funded by GUDP, duration 2012-2015

Iodine



Dansk sukkertang

Siden år 2000 har det i dansk saltproduktion været lovpligtigt at tilsætte 13 mg jod til hvert kilo køkkensalt og salt brugt i brødproduktion. Kun gourmetsalte er fritaget.
I Polen tilsættes 30 mg jod til hvert kilo salt, og i Sverige 50 mg per kilo (Videnskab.dk)

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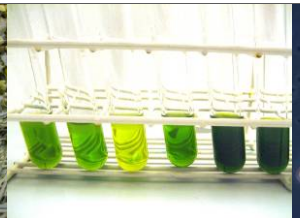
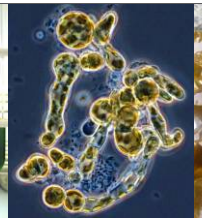
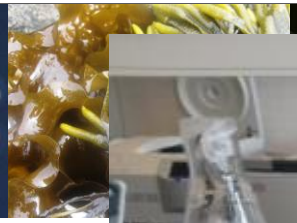
KOMBI-opdræt: Funded by GUDP, duration 2012-2015

Food ingredients- seaweed stabilisors (E407)

Laboratory scale

Protein extraction with enzymes

Before extraction

After extraction

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Pilot scale

5% protein in this seaweed

Protein fraction with 30–35% protein content.

High quality protein?

Anti-oxidants?

Natural colours?

Polysaccharides

Dietary fibres

Table 5. Polysaccharides in seaweed species with characteristics, source and bioactivity

	Characteristics	Source and content	Bioactivity
Polysaccharides	Total	*Saccharina latissima* [a] *Sargassum pallidum* [b,c]	Antitumor action [a, b] Potent anti-coagulant [c] Decrease in LDL-cholesterol in rats [d] Anti-herpetic [e]
Phycolloids	Algins/alginic acid	*Undari pinnatifida* [a]: 24 % [r] *Laminaria digitata*: 32 % [g] *Laminaria* sp. [k] *Sargassum vulgare* [l] *Ascophyllum nodosum*: 28 % [g]	Anticancer [a]
	Carrageenans	*Chondrus crispus* [H] *Eucheuma cottonii* [m]	Antitumor and immunomodulation [l,k] Anti-HIV [k], but no efficacy on humans [l]
	Agar	*Gracilaria* sp., Gigartina sp. etc. [m]	
Fucoidan ranging from typical fucoidans (major components) to low sulphate-containing heteropolysaccharide-like fucans (minor components) [o]	Fucan composed of neutral sugars other than fucose and a high content of uronic acid(s) [o]	*Sargassum horneri* [c] *Sargassum vulgare*: uronic acid, xylose and fucose accounted for >90 % of total sugars [l] *Fucus vesiculosis* [o] *Undaria pinnatifida* [p]	Potential antiviral [c] Slightly anticoagulant activity [o] Anti-herpetic [p]
	Fucoidan=fucan sulphate, containing mainly L-fucose, sulphate, and no uronic acid [o,q]	*Laminaria digitata*: 5.5 % [g] *Laminaria* sp. [k] *Ascophyllum nodosum* [t]: 12 % [g] *Undaria pinnatifida* [p,s,t]: 1.5 % [r] *Fucus vesiculosis* [o] *Eisenia bicyclis* [k]	Potential antiviral (HIV and HSV) [e,s,t,v] Anticoagulant [o,x] Anti-arteriosclerosis [a] Anti-cancer [a,v] Potential antiviral against human cytomegalovirus and avian flue [s] Anti-tumor activity [k] Inhibits growth of *Cryptosporidium parvum* in mice [z]
Mannitol		*Laminaria digitata*: 13 % [g] *Laminaria* sp. [k] *Sargassum mangarevense*: 1-12 % [æ] *Ascophyllum nodosum*: 7.5 % [g]	Effectively protects the photosynthetic apparatus from low-salinity damage [ø,å]
Laminaran	Branched (soluble) and unbranched (unsoluble) polysaccharide: beta 1-3,beta 1-6-glucan [å,β]. 84-94 % sugar and 6-9 % uronic acid [α]	*Laminaria digitata*: 14 % [g] *Laminaria* sp. [k]: 99 % of total sugars [α] *Fucus vesiculosis*: 84 % of total sugars [α] *Ascophyllum nodosum*: 4.5 % [g];90 % of total sugars[α] *Undaria pinnatifida* 3 % [r]	Only found in brown seaweed [a]
Phycarine		*Laminaria digitata* [o]	Immune system, stimulation of macrophage phagocytosis [δ]
Porphyran	Polysaccharide: polymer of acidic saccharide containing sulphate groups, β-1,3-xylan [$]	*Porphyra umbilicalis*: 48 % [g] *Porphyra* sp. [$]	Potential apopototic/programmed cell death activity [$]
Ulvan	Polysaccharide, highly branced polymers of soluble dietary fiber and contain rhamnose, glucuronic acid and xylose [μ,π]. Structurally similar to the mammalian glycosaminoglycans [ω]	*Ulva lactuca* [ω]	Cytotoxicity and cytostaticity, HU colon cell line [ω]

a= (Murata and Nakazoe, 2001), b= (Ye et al., 2008), c= (Athukorala et al., 2007), d=(Amano et al., 2005), e= (Ghosh et al., 2009), f= (Je et al., 2009), g= (MacArtain et al., 2007), h= (Bartsch et al., 2008a), i= (Dietrich et al., 1995), j= (Yan et al., 2004), k= (Zhou et al., 2006a), l= (Skoler-Karpoff et al., 2008), m= (FAO, 2008), n= (Vlieghe et al., 2002), o= (Nishino et al., 1994), p= (Hemmingson et al., 2006), q= (Matsubara et al., 2005), r= (Marais and Joseleau, 2001), s= (Lee et al., 2004), t= (Maruyama et al., 2007), u= (Yamamoto et al., 1984), v= (Schaeffer and Krylov, 2000), x= (Mayer and Hamann, 2004), y= (Han et al., 2008), z= (Smit, 2004), æ= (Zubia et al., 2008), ø= (Gessner, 1971), å= (Lobban and Harrison, 1994), α= (Rioux et al., 2007), β= (Deville et al., 2007), δ= (Mayer et al., 2007), $= (Plaza et al., 2008), ω=(Kaeffer et al., 1999), μ= (Bobin-Dubigeon et al., 1997), π= (Michel and Macfarlane, 1996)

Pigments

- Which pigments do you know?
- Fucoxanthin: pigment/cartenoid from *Fucus* species (6%)

  - Increased metabolisme (Plaza et al 2008)

    - Anti-obesity
    - Possible up-regulation of UCP1 in BAT (brown adipose tissue)
    - 2% lipids from *Undaria* reduce White AT (g/kg body weight) of mice and rats (Maeda et al 2008)

Table 10. Pigments in seaweeds, source and bioactivity.

Pigments		Source	Effect
Carotenoids	Fucoxanthin Has an unique structure including an unusual allenic bond and 5,6-monoepoxide in its molecule [k,l]	*Ascophyllum nodosum* [l]: 660 mg/kg dw [k] *Undaria pinnatifida* (not destroyd by cooking) [l] *Fucus serratus* and *F. Vesiculosis* [l] *Sargassum siliquastrum* [m]	Weight reduction in white adipose tissue in rats and mice with 0.5 and 2 % added to feed [k,n,o] Antioxidant activity [p] Protective effect on UV-B induced cell injury in human fibroblast [q] Preventive effect on cerebrovascular diseases [r] Increase the metabolism [r] Decreased growth of leukemia and prostate cancer cells [k] Anti-obesity effect [r,k] Reduced blood glucose and plasma insulin in rats and mice [r] Increased the level of hepatic docosahexanoic acid (DHA) in rats and mice [r] Inhibits chemical carcinogenesis [s]

Lipids

- **Low in total lipids (max 4% of dry weight)**
- **But good quality**
- **Around 50% omega-3 fatty acids**

  (Poly Unsaturated Fatty Acids (PUFA)

→ reduction of

-cardiovascular diseases

-cerebrovascular diseases (Plaza et al 2008)

→ active against

-edema

-inflammatories/erythema

-blood flow (Khan et al 2007)

DTU

Proteins

10-30 % DW	10-47 % DW	5-15 % DW

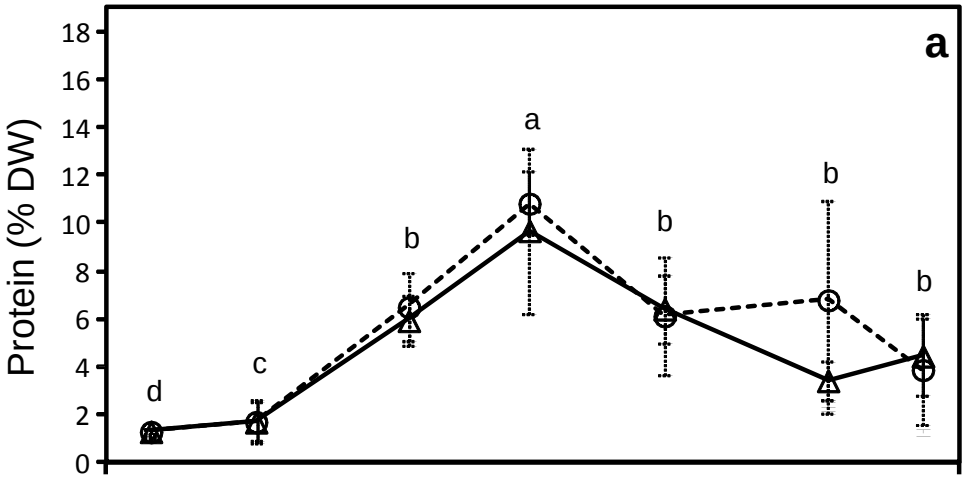
Soy beans: 35 %

- Fish feed
  - Increased gowth[1]
  - Better coloration[2]
  - Less need for fish meal
- Livestock
  - anti-infectious (weanling pigs) [3]
  - Greater weight at birth (sheap) [4]
  - Better wool (sheap) [5]
  - Greater milk yield (cows) [5]
  - Less landbased area to produce feed

[1]Ergün et al, 2008. [2]Soler-Vila et al, 2009. [3]Gardiner et al, 2008. [4]Nordic Seaweed Project, 2008. [5]McHugh, 2003.

Seasonality in biomass composition

Dansk sukkertang



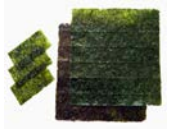
Example…
Protein content varied markedly seasonally.
No significant difference for the tested parameters between the two sampling sites.

The protein concentration varied markedly reaching a maximum of 10.8% DW in November and a minimum of 1.3% DW in May 2013.

KOMBI-opdræt: Funded by GUDP, duration 2012-2015

Amino acids

The nutritional value of proteins referred to as "amino acid score" is evaluated based on the composition of essential amino acids. The amino acid score of the proteins of the marine algae ranges from 60 to 100, a value higher than that of the proteins in cereal and vegetables. The amino acid score of proteins in *Porphyra* was 91 and *Undaria* was 100



and the same as that of animal foods

Table 6. Amino acid composition of *Porphyra tenera* protein: comparison with ovalbumin[a]

Amino acid	Composition (g amino acid/100 g protein)	
	Porphyra tenera protein	Ovalbumin
Tryptophan	1.3	1.0
Lysine	4.5	7.7
Histidine	1.4	4.1
NH_3	5.1	5.3
Arginine	16.4	11.7
Aspartic acid	7.0	6.2
Threonine	4.0	3.0
Serine	2.9	6.8
Glutamic acid	7.2	9.9
Proline	6.4	2.8
Glycine	7.2	3.4
Alanine	7.4	6.7
Cystine	0.3	1.4
Valine	6.4	5.4
Methionine	1.7	3.1
Isoleucine	4.0	4.8
Leucine	8.7	6.2
Tyrosine	2.4	1.8
Phenylalanine	3.9	4.1
(Total)	(98.2)	(95.4)

[a] Data taken from Ref. 6

(Arasaki and Arasaki 1983)

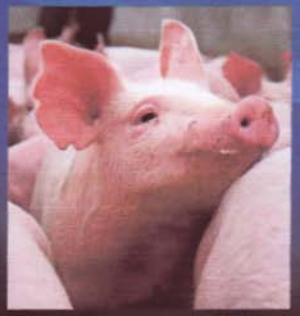
Aspartic and glutamic acids dominated the amino acid profile, accounting for up to 49% of the total

Dansk sukkertang

Forsøg med ½ kg AgroMix(=new*add) i ét ton svinefoder….. i DK

Intensive pig farming

- Intensive pig farming susceptible to many diseases including: trichinosis, Taenia solium, cysticercosis, and brucellosis. Pigs are also known to have a lot of parasitic ascarid worms
- Antibiotics major issue in EU and US, Legislation will demand reduction or total ban in EU and strong emphasis on natural products (Turner et al., 2001)



Seaweed as additive known to:

- Reduce enterobacteria, bifidobacteria, lactobacilli and E.coli populations (Reilly et al, 2008 O'Doherty et al, 2010)
- Improvement of pig gut health and increase of iodine in meat (Dierick et al, 2009)
- Antibacterial effect and prebiotic effect (O'Sullivan et al. 2010)
- Reduce scouring/ Diarrhoea (Williams et al, 2001)
- Ammonia reduction (O'reilly et al, 2008)
- Increased weight gain

(Ocean Harvest)

Medicin and dietary supplements

- Bioactive compounds
  - Lowering cholesterol
  - Lowering blood pressure
  - Anti-cancer*
- Omega 3-fatty acids
- Vitamins
  - A, $B_{1,2,6,12}$, C, E
- Minerals
  - iodine

*Murata and Nakazoe, 2001. Han et al., 2008

Examples of investigations on applications

- *Undaria /* Wakame in pasta
  - Antioxidant properties, due to the content of phenols, lipid composition and fucoxanthins analysed
  - 10 % addition did not change the flavour of the pasta
  - n-3:n6 fatty acids relationship vas 1:3 in the seaweed pasta and 1:15 in the normal pasta
  - Heat from cooking did not destroy the fucoxanthin

(Prabhasankar et al 2009)

- *Undaria* in synergy with fish oils in rats
  - Analysed the lipid concentration in liver and serum and the enzymatic activity involved in the fatty acid metabolism of the liver
  - Reduced concentration of tricylglyceroles in serum and liver
    - Seaweed(19%), fish oil (4%)
    - Greatest reduction was with diet of both seaweed and fish oil
  - Synergetic effect between seaweed and fish oil in the enzymatic activity

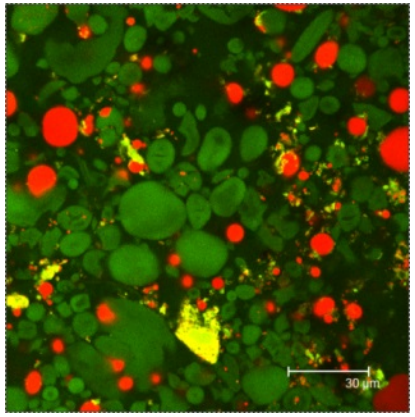
(Murata et al 2001)

Applications

Nordic Seaweed extracts as natural antioxidants in omega-3 PUFA enriched granola bars

- Oxidative stability

To investigate the ability of Icelandic *F. vesiculosus* extracts to inhibit lipid oxidation in fish-oil-enriched granola bars



- Microstructure

To investigate whether addition of the seaweed extracts affected the physical microstructure of the oil droplets in granola bars

Ditte B Hermund, PhD student, DTU Food, Denmark

Ayşe Karadağ, TUBITAK Marmara Research Center, Turkey
Rósa Jónsdóttir and Hordur G Kristinsson, Matís, Iceland
Charlotte Jacobsen, DTU Food, Denmark

Conclusions

- Seaweeds are divers and so are the applications
  - Whole seaweed- ingredient
  - Specific compounds
  - More than one compound from same biomass
  - Different composition depending on season
- Bioactive effects are proven scientifically and present research
- Already biomass available worldwide
- Danish products at the market
- More uses of blue biomass- demands more large areas at sea
  - Is there space
  - Political will
  - Societal- visual polution

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Why eat seaweed?

Taste good: Different taste and also used as flavour enhancer

Healthy: Low in calories, low in fat, high in sugars (but dietary fibres), antioxidants

High content of vitamins and minerals

Health effects (scientifically): anti-cancer, anti-virus, lower the risk of cardiovascular diseases etc.

Easy: Dried and long shelf-life. Collect yourself

Beautyful: Sprinkle as decoration or build in….


Henrik Høegh »Udsigterne er langtfra så mørke, når det gælder fødevarekontrol« S6

Torsdag 1. juli 2010 NR. 206 ÅRGANG 4

24timer

FORMIDDAG 18° EFTERMIDDAG 24°

SAML MISS MARPLE

Tyve går efter mærket
Dyre tasker frister tyve mere end indholdet i tasken » S2

Tag springet
I Østrig kan vovehalse afprøve, om modet rækker rejser » S16-17

Du bliver, hvad du spiser – også på Roskilde » S24-25

Tang er det nye superfood

Regeringen, forskere og kokke har fundet sammen i troen på, at tang er fremtidens kur mod sult og sygdomme

Slagtermester og restauratør Peter Steen har i sin restaurant Gourmandiet flere produkter med tang, for han vil have danskerne til at få øjnene op for de kvaliteter, der er i den spise

LÆS MERE » S4-5

SUNDHED Slagtermester og restauratør Peter Steener fortaler for mere tang i danskernes mad. Foto: Kristian Djurhuus

Tyrkiet 1 uge 1.699,- SPIES

Danish Seaweed Network

Tang som food og non-food

Invitation til tangnetværksmøde
mandag d. 23. marts kl. 16
DTU Aqua
Søltoft plads bygning 221,
lokale 237 (2. sal)
2800 Kgs. Lyngby

16.00 Velkomst
Præsentationsrunde af fremmødte

Tang i køkkenet
Ole G. Mouritsen
Forfatter og professor SDU

Dansk tang i helsekost
Torben Sønnichsen
Bioliving

Den gode kemi i tang
Susan L. Holdt
DTU Aqua

Plantestoffer og Sundhed
Hvad arbejder de med på Institut for Kemi-, Bio- og Miljøteknologi, SDU
Xavier Fretté/Bent Lyager

ca. 18.00 En lille anretning og snak

Hypoglossum sp.
foto: Susan L.Holdt

Tilmelding til Susan senest ons. d. 18. marts
på email: susan@akvakultur.dk eller 2627 2707

420 members from industry, universities, restaurants, organizations, or persons that work with or have interest in seaweed

The network group started in winter 2008

Meetings and newsletters

tangnet nyt

4.tangnet-nyt, april 2010

Midler til Tangnetværket
Levnedsmiddelcentret (LMC) har givet midler til at tangnetværket styrker netværksarbejdet, formidling, møder, temadage osv. indenfor området hvor tang anvendes som fødevare.
Styregruppen fra AU, SDU samt DTU planlægger næste netværksmøde mandag d. 31. maj i Odense og har temadage på Samsø i tan"g"erne til sensommer.

Økologisk tang
Regelsættet (EU's Økologiforordning) er på plads og det er vedtaget, at det er Sektion for Akvakultur i Vejle, der skal

udtryk og brugte det flittigt, når vi oplevede noget positivt. Og det var altid med en varm tanke til Lisbeth. Det var også Lisbeth, der lærte os, at stikke hænderne i en spand med iskoldt vand for at vende fingere til kulden, når der skulle sorteres alger på en kold tidlig forårsdag. Lisbeth utrolige og smittende gnist for sit fag og sine alger er en af hovedgrundene til, at vi er en række af hendes gamle studerende, der i dag arbejder med alger og forsøger at bringe den entusiasme videre, der var Lisbeths varemærke.
Ære være Lisbeths minde.
Michael Bo Rasmussen og andre, AU

Kommende netværksmøde
Så er det næste tangnetværksmøde fastsat til mandag **d. 31. maj** kl. 15 på Syddansk Universitet i Odense. Temaet og invitationen følger.

Sexet tangmad
Den irske læge Prannie Rathigan har formået at gøre tang sexet, som en af hendes anmeldere siger. Hun har ligesom vores danske Ole G. Mouritsen (der har skrevet bogen: Tang-grøntsager fra havet) været nomineret til flere fornemme kogebogspriser.
Se bogen og bestil på: www.prannie.com

Danskere til tangsymposium i Mexico

Dansker delegationen i Mexico

og det forklares at tang kan anvendes til mange forskellige ting. Der skal i et andet afsnit bygges et halvtag med rist under hvorpå tangen fra tangfarmen kan ligge og tørre for den skal i sælkde.

Havets spisekammer
Denne overskrift rummer 2 emner med
Fra tang til torsk:
Kom og smag på havets spisekammer

Tangdage på Samsø

Onsdag 29/9 – Fredag 1/10 2010

Spis, kend og bliv klogere på din tang.
På tangdagene kan du lære at kende eller blive bedre til at artsbestemme og spise den danske tang. Dette er krydret med spændende foredrag for tang-norderne og det brede publikum.
Find dine waders frem og tag nogle dage til Samsø for at plukke og artsbestemme tang.
Eksperterne og de omvandrende tangleksika Poul M. Pedersen og Ruth Nielsen fra Biologisk Institut, KU, vil også deltage og lære fra sig.
Dagene henvender sig til medlemmer af Tangnetværket, samt andre med interesse i tang.
Formålet er at blive bedre til tangbestemmelse, anvendelse og formidling om tang som fødevare samt andre formål. Tangdagene vil blive betalt af midler tildelt fra Levnedsmiddelcentret , LMC, (forplejning, nattely samt materialer).

Plan

Onsdag:
Ankomst ca. kl. 17 til Thomasminde i Nordby
(mere om Thomasminde og færgetider nedenfor)
Laver mad sammen
Hygger

Torsdag:
Smøre madpakker og af sted til felten med gummistøvler/waders, snorkel eller dykkerudstyr.
Artsbestemme tang
Tidlig aftensmad i Thomasminde
Foredrag om tang på Samsø Akademi i Ballen (kl. 19).
Åben for det brede publikum
Den brede anvendelse af tang og potentialet i DK

Fredag:
Nørde-foredrag
Vi går i dybden med tang
Tangekspert fra udlandet holder oplæg
Artsbestemme tang fortsat
Frokost: Der tilberedes sushi og tilbehør af indsamlet tang
Afgang eller blive weekenden over!

DTU

Interested in macroalgae?

- suho@food.dtu.dk

or

www.tangnet.dk

the Seaweed Network in Denmark