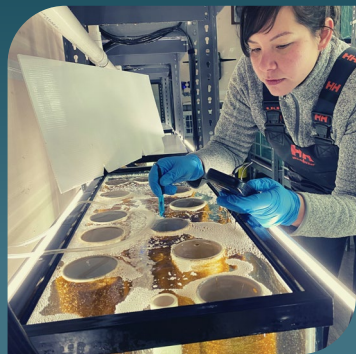


Kelp Aquaculture and Climate Change



Dr Jennifer Clark | Chief Scientist
Oct 20th 2023

Cascadia **Seaweed**

*Honoured to live and work on the unceded traditional and ancestral homelands
of the WSÁNEĆ (Saanich) Peoples*

Dr. Jennifer Clark

Marine phycologist: background in understanding how different life stages of seaweed will respond to climate change and population genetics



Chief Scientist

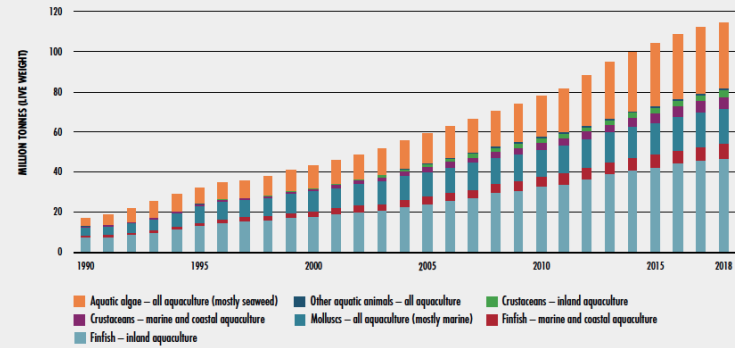
GLOBAL AQUATIC ALGAE PRODUCTION



Aquatic algae production

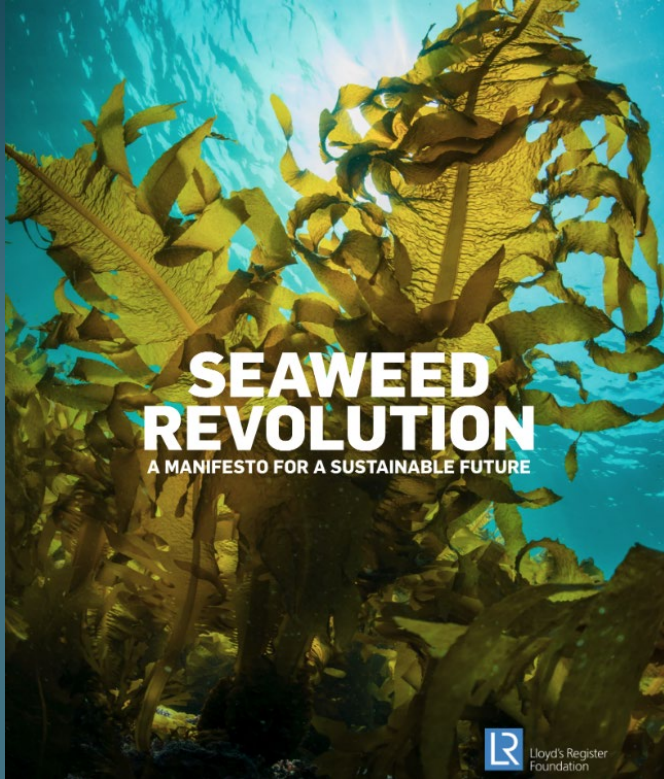
- Tripled from 2000 -2018
- 10.6 to 32.4 million tonnes
- 97% of the volume is farmed seaweeds

FIGURE 8
WORLD AQUACULTURE PRODUCTION OF AQUATIC ANIMALS AND ALGAE, 1990–2018



SOURCE: FAO.

WHY SEAWEED?



Nature based solution

- Food system and nutritious food
- Alternative materials and packaging
- Ecosystem benefits (Habitat provisioning, carbon and nutrient cycling, reduce ocean acidification, methane reduction)
- Job opportunities, economic growth
- Gender equality

2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



8 DECENT WORK AND ECONOMIC GROWTH



10 REDUCED INEQUALITIES



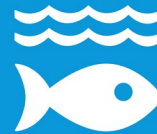
12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



17 PARTNERSHIPS FOR THE GOALS



Cascadia Seaweed

Cascadia Seaweed , founded in 2019

Grow seaweed on low-impact ocean farms and produce high value agricultural products .

Positioned to address global challenges using biological solutions to increase food production, mitigate climate change, and advance Indigenous reconciliation .

Cascadia Seaweed cultivates 3 species of kelp.

Saccharina latissima (Sugar kelp),

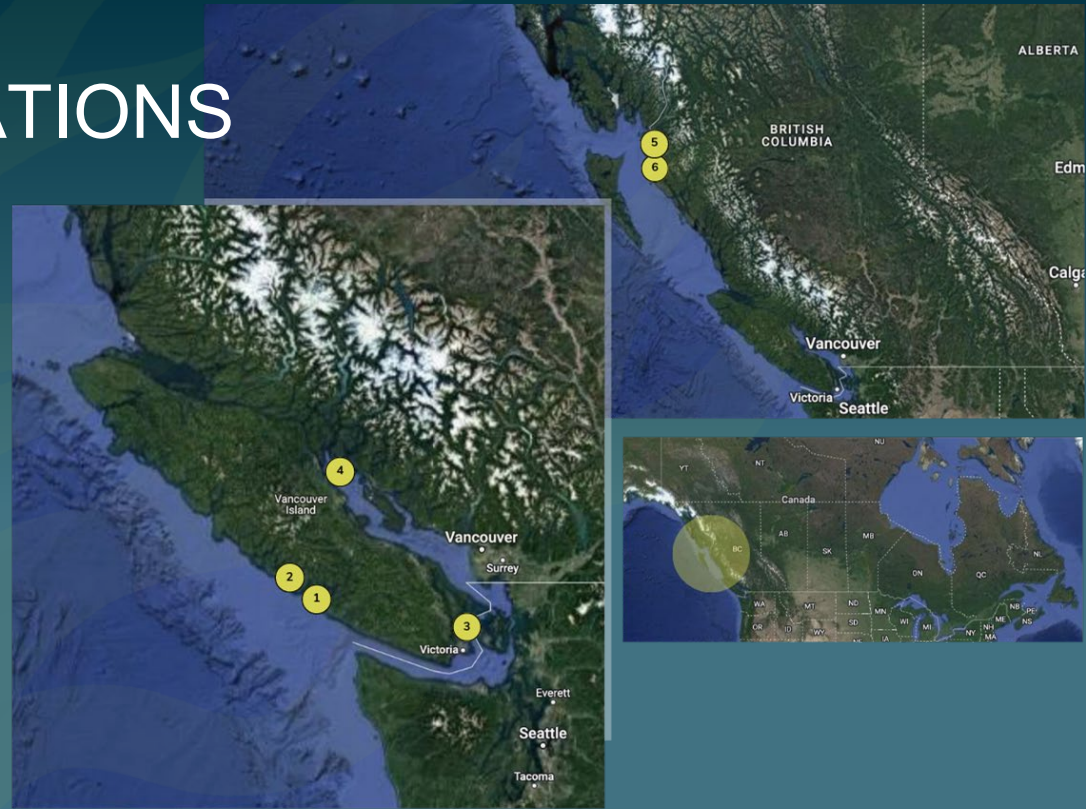
Alaria marginata (Winged kelp)

Macrocystis pyrifera (Giant Kelp)



FARMS & FIRST NATIONS PARTNERSHIPS

- ✓ 7 First Nation Partnerships
- ✓ First Nations own tenure and farm assets
- ✓ 8 operating farms = 105km of production line
- ✓ Providing revenue streams and jobs close to home



TSAWOUT
First Nation



UCHUCKLESAHT
Tribe Government



KLAHOOSE
First Nation



GITXAALA
First Nation



TSESHAHT
First Nation



AHOUSAHT
First Nation



METLAKATLA
First Nation

Cascadia Operations

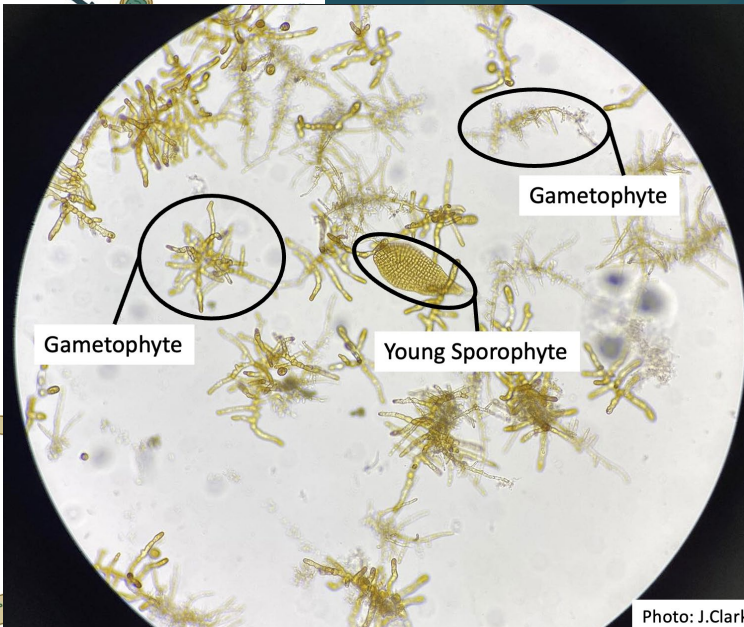
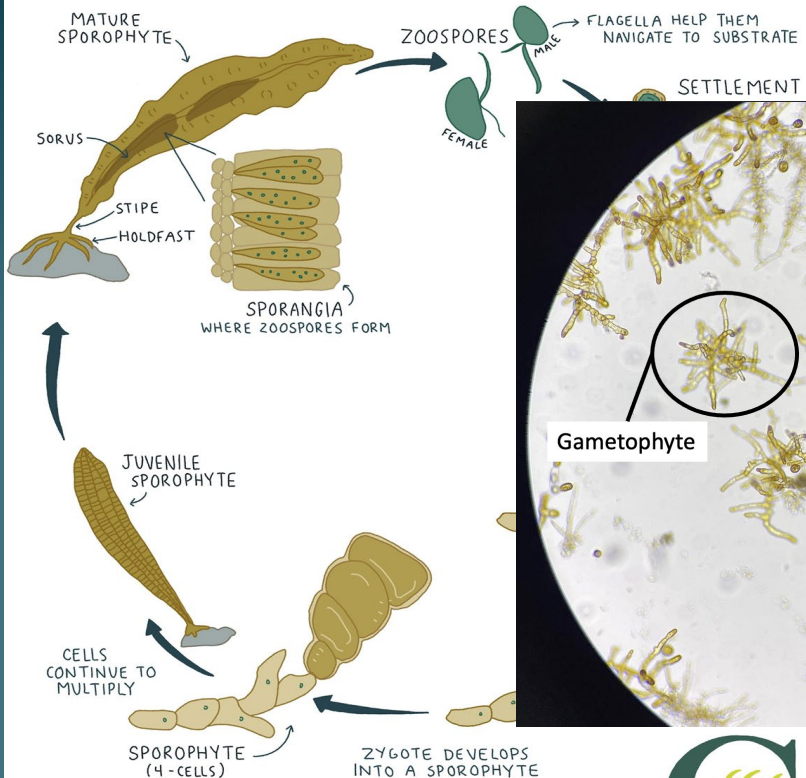


*Ocean
and land
operations*

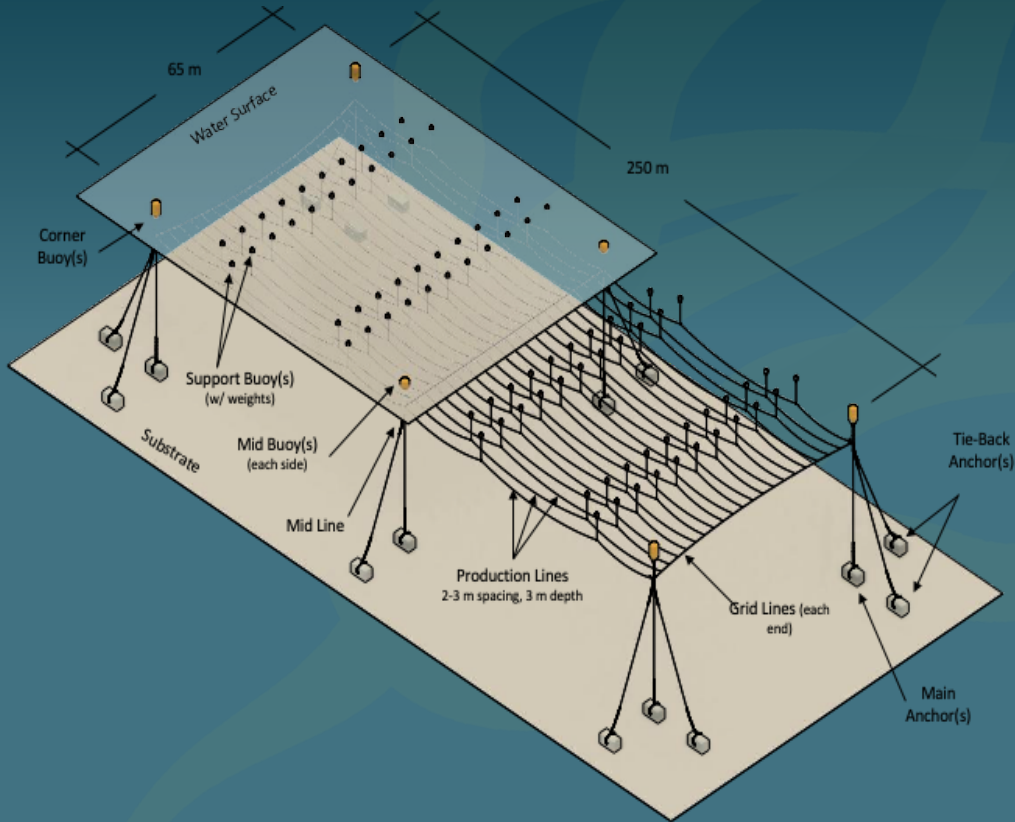
*Ocean
operations*

*Land
operations*

KELP LIFE CYCLE




FARM DESIGN





OUR PRODUCTS

 **Cascadia Plant Health**
Biostimulants
for land-based crop farmers

 **Cascadia Animal Health**
Feed supplements
for beef and dairy cattle farmers



Climate Change Impacts on Kelp Aquaculture

Ocean warming 1.5 °C by 2050 (IPCC 2023)

Increased frequency and intensity of extreme climate events

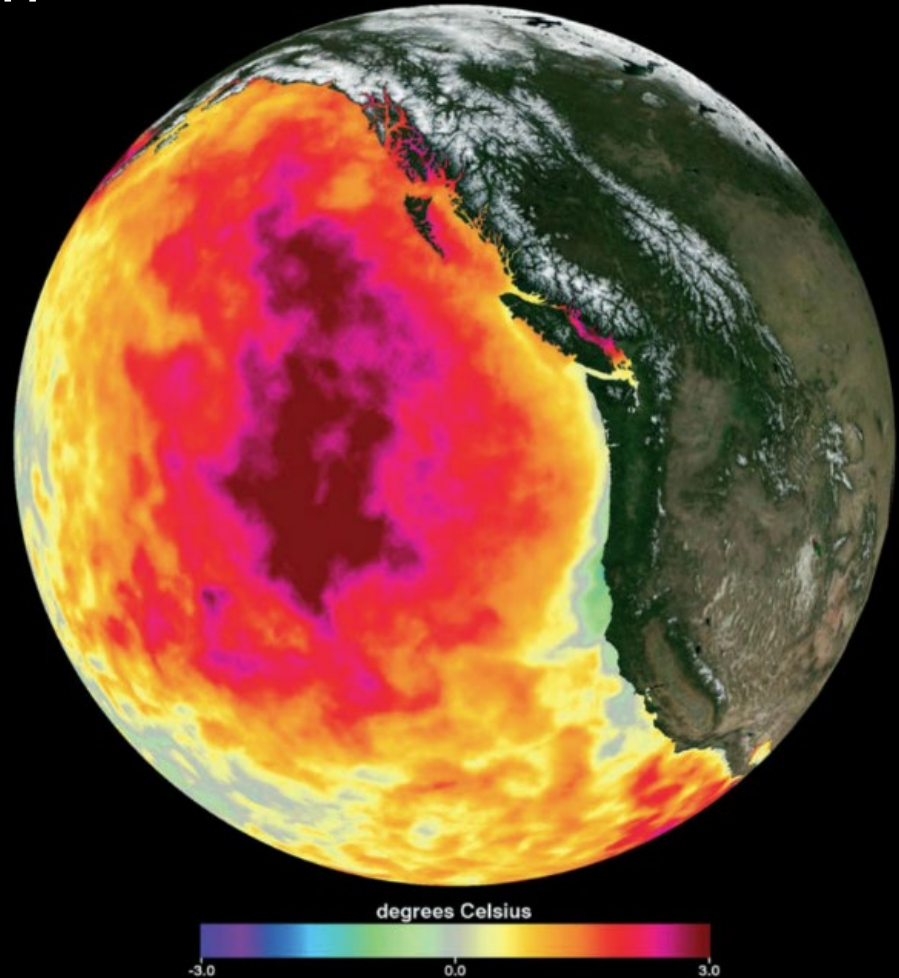
- Heatwaves, droughts, atmospheric rivers
- Spore production decreases 18 °C
- Atmospheric river of 4m killed our kelp

Changes in phenology

- Earlier springs = earlier fouling
- Later summers = delayed sorus production

Sea Surface Temperature Anomaly (SSTA)

May 2015



Seaweed Farming and Impacts

Direct

- Water quality
- Carbon Assimilation
- Nutrient cycling
- Habitat provisioning

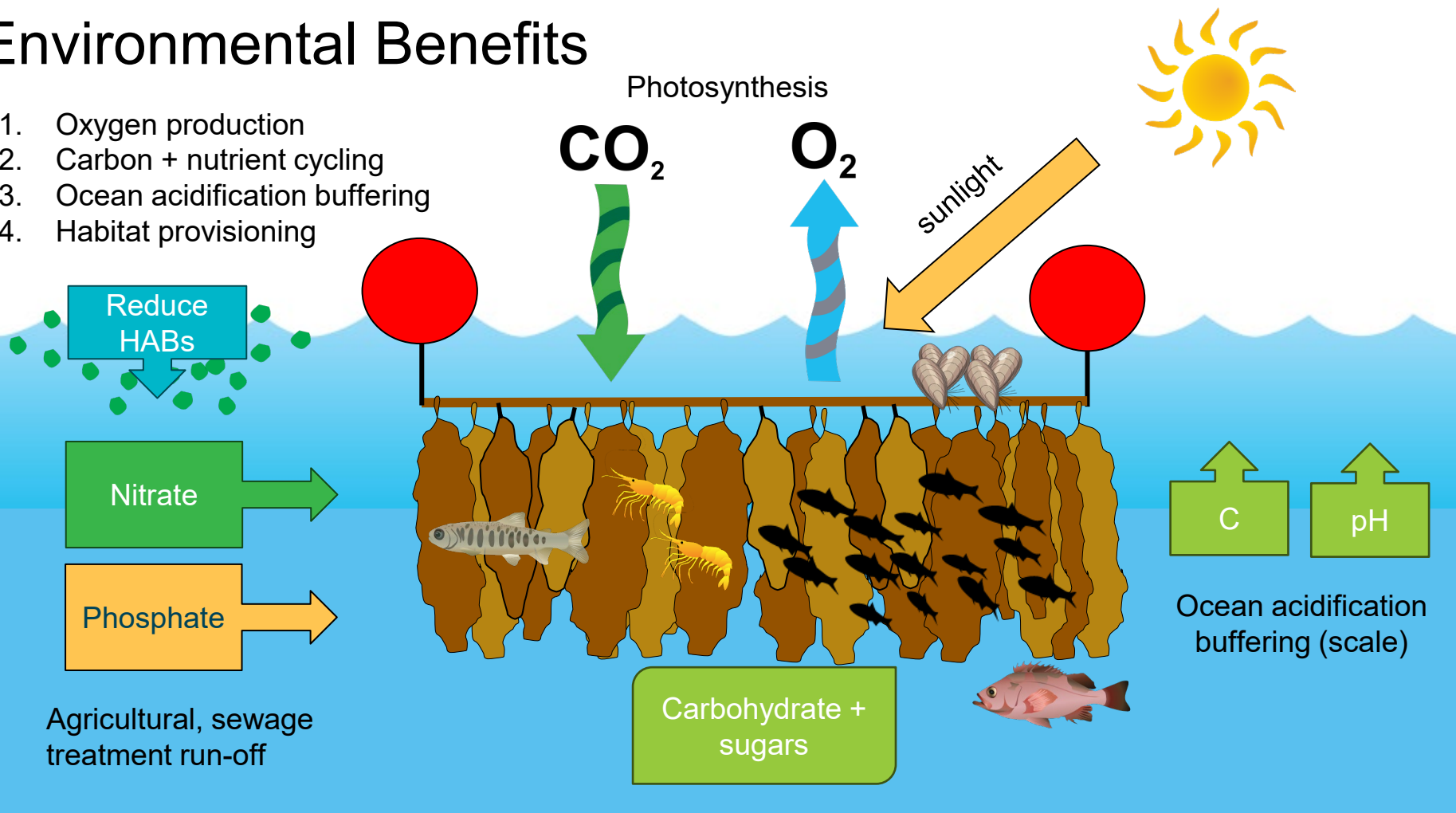
Indirect

- Reduction of Enteric Methanogenesis in Cattle
- Reducing need for fertilizer using biostimulants
- Replacement of carbon intensive inputs in food/agriculture

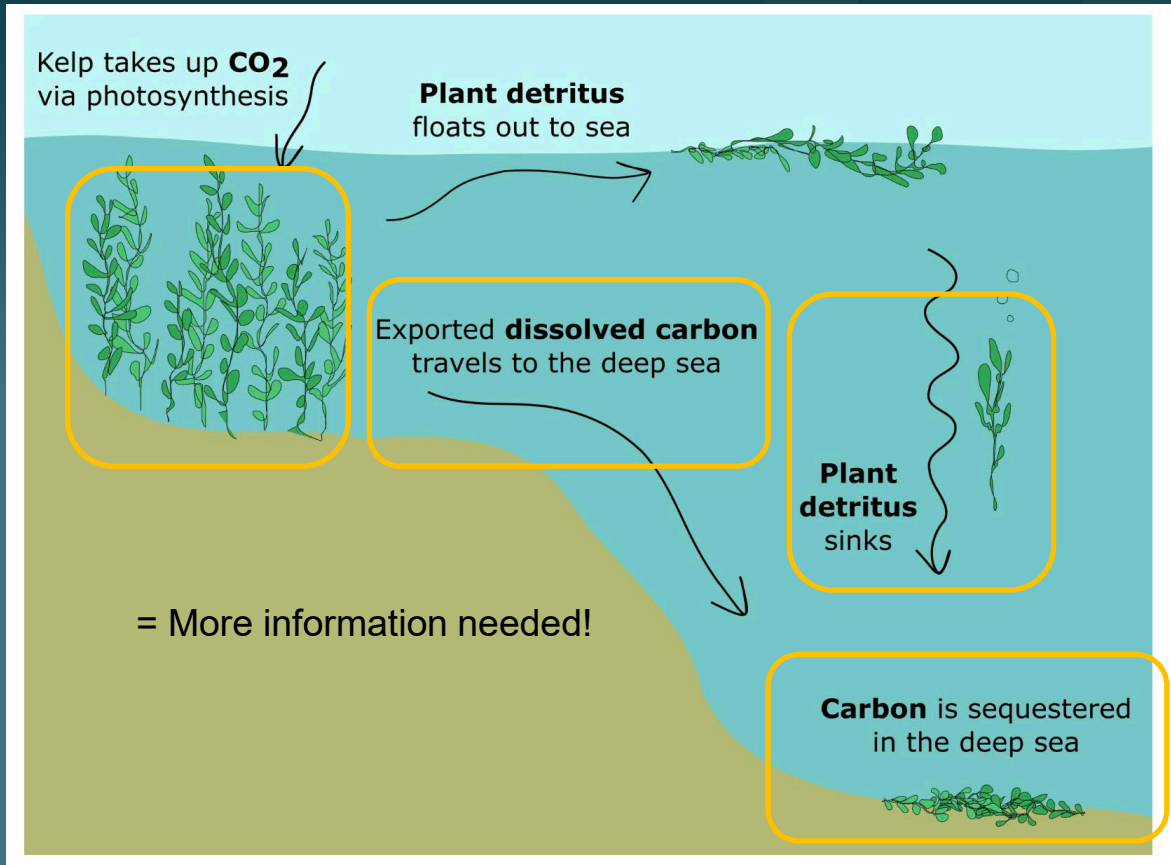


Environmental Benefits

1. Oxygen production
2. Carbon + nutrient cycling
3. Ocean acidification buffering
4. Habitat provisioning



Carbon Sequestration Uncertainties



Other organisms living in kelp could potentially contribute to more CO₂ from detritus

Kelp could stay on continental shelf, consumed by bacteria and detritivores

Needs to sink >1000 m

Not sure whether kelp will make it to the deep sea. Effects of high organic input on deep sea ecosystems?

Oceans 2050

Carbon burial in sediments below seaweed farm
(*in review, Nature Climate Change*)

- 20 farms globally
- 2 - 300 years old
- 1- 15,000 ha in size
- Varied results - dependent on age of farm, sedimentation rate, environment, harvesting techniques

OCEANS 2050
GLOBAL
SEAWEED
PROJECT
BLUE CARBON



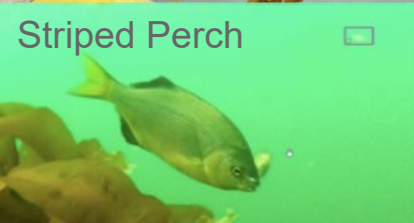
Tom Campbell

Evaluation of coastal kelp farms as novel habitat for migrating salmonids and their prey

BC Salmon Restoration Innovation Fund

- Kelp Cams
- Algorithms developed from annotated video to detect fish species and other organisms
- Two farms and two reference sites

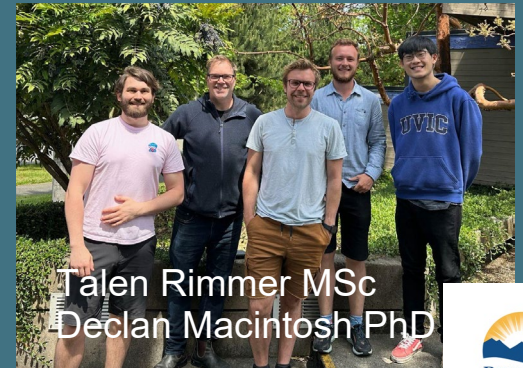
Herring



Striped Perch



Dr. Colin Bates



Talen Rimmer MSc
Declan Macintosh PhD

Reduction of Enteric Methanogenesis



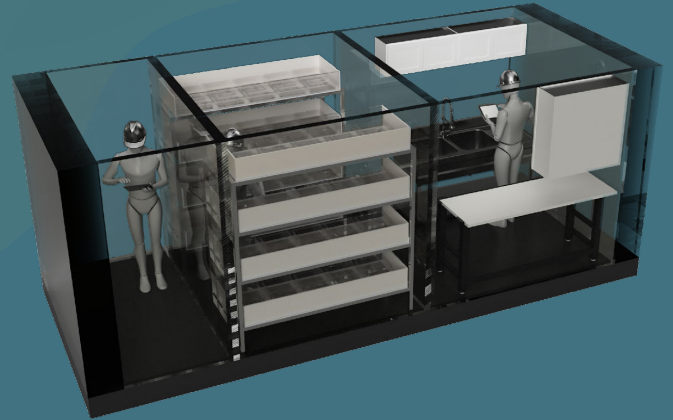
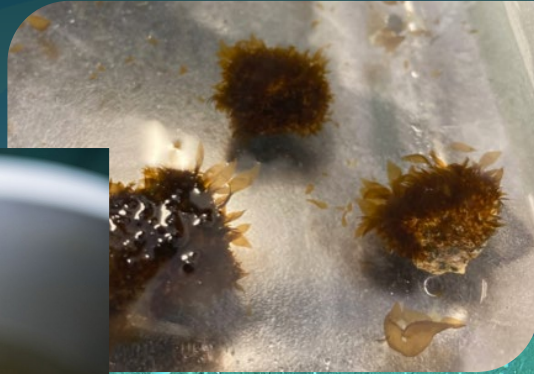
- Methane is a greenhouse gas
- Contributed by cow belches and flatulence
- Reduction of Methane by <90% by a red seaweed
- Kelps ~30%



Asparagopsis taxiformis

KELP RESTORATION

Green Gravel



Canada

National Research
Council Canada
Conseil national de
recherches Canada

Engagement Exercise 1

Sea weed Products

- Group work to find the most interesting product made OF seaweed
- There are lots! Toothpaste, ice-cream, running shoes, bio-packaging

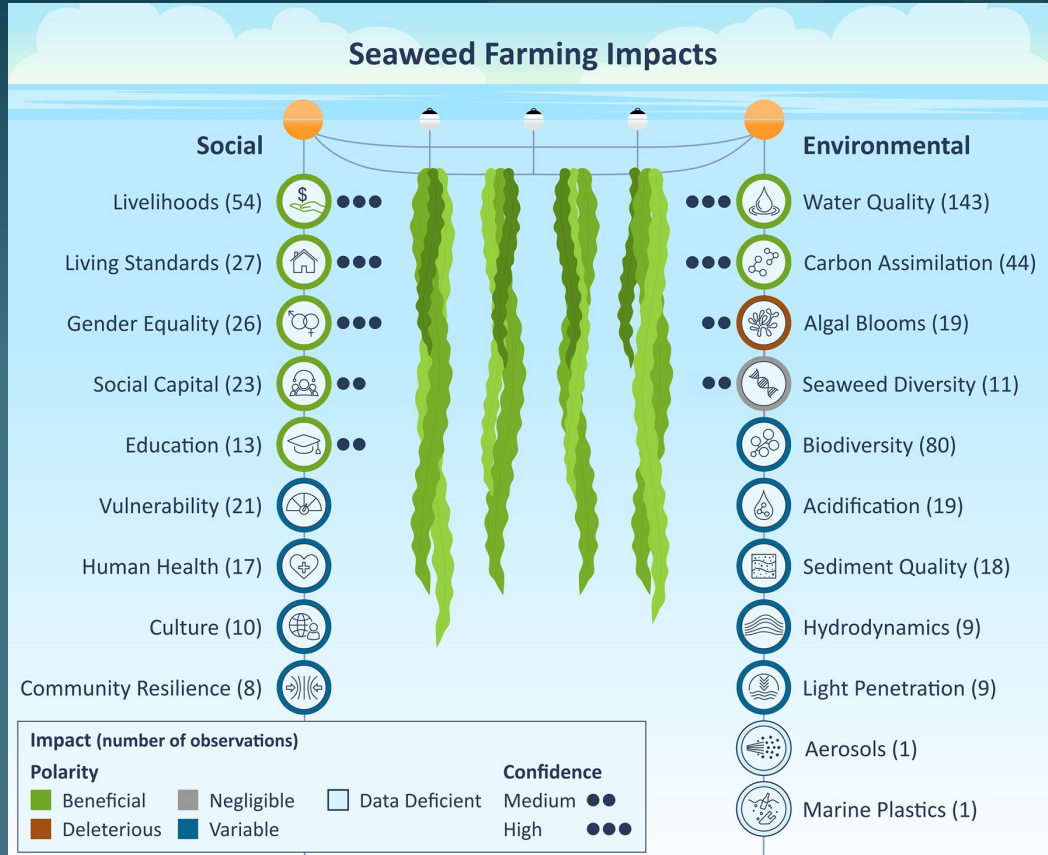
Learning Outcomes

- Utilise different research tools to find products, which seaweed it is made from and why
- Find out where and how the seaweed is grown (wild harvest, cultivated, cultured)
- Determine how it was processed to make the final product



NotPla edible drink pods offered to London Marathon

Engagement Exercise 2



Pros and Cons of Sea weed Farming

Individual or Group work

- Discuss Social and environmental impacts of sea weed farming

Learning Outcomes

- Understand the socioeconomical and ecological impacts of sea weed farming.

Careers and Resources

Vancouver Island University

- Fisheries and Aquaculture Technology
- BSc, BA, Diploma

North Island College

- Aquaculture Technician Certificate
- Aquaculture Technician Diploma
- Other projects

Pacific Seaweed Industry Association

Seaweed Manifesto

Safe Seaweed Coalition





ANY QUESTIONS? LET'S DIVE IN!

Dr. Jennifer Clark

Chief Scientist - Cascadia Seaweed



jclark@cascadiaseaweed.com



[@jenn_seas_seaweed](https://twitter.com/jenn_seas_seaweed)

Cascadia **Seaweed**

