INCREASED SUSTAINABLE OCEAN HARVEST?

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THE GLOBAL CHALLENGE

- The human population is expected to grow by 2–3 billions over the next few decades.
- This increase will require more food, energy and resources.
- Climate change may reduce the availability and production stability of arable land.
- In order to preserve terrestrial biodiversity we need to learn how to increase the sustainable harvest from the ocean.

SUSTAINABLE USE OF MARINE RESOURCES

- While total primary production is similar between land and oceans, only 2% of our food comes from the ocean.
- This is because we harvest resources from the bottom of the food chain on land, while from the top in the ocean.
- Common fisheries, e.g. cod and tuna, are at high fourth and fifth trophic levels, while crop and cattle are at the first and second trophic levels.
- Sun and nutrients enter at the bottom of the food chains, and that is where increased and sustainable harvest could be obtained without compromising the interests of future generations.

First trophic level: Microalgae

Aquaculture production of many fishes and shrimps depends on feed resources from capture fisheries. Furthermore, Atlantic salmon is increasingly relying on feed resources from plants such as soy, peas and beans.

The **University of Bergen** and **Uni Research** have set up a pilot facility for industrial-scale production of marine microalgae from industrial waste streams.

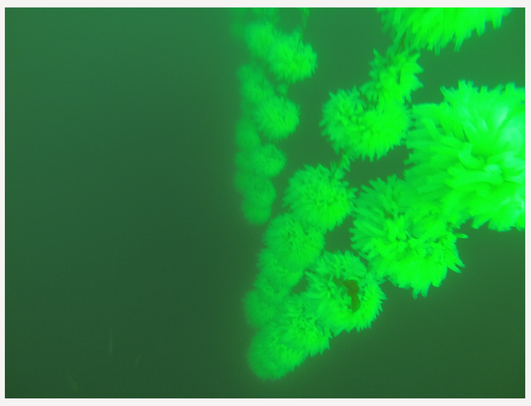
The goal is to test whether these microalgae, rich in marine oils, can be produced as a viable and complete fish feed component.

This may both increase the health benefits of the fish to the consumer, and decrease the eco-footprint from aquaculture.

Second trophic level: Tunicates

The tunicate *Ciona intestinalis* (above) is a highly efficient filter-feeding animal, attaining its food at the very base of the marine food web. It is a global species in high abundance in most costal areas.

Early industrial-scale experiments involving The **University of Bergen**, **Uni Research** and **Ocean Bergen** have obtained up to 100 times higher protein production rates per surface area compared to terrestrial system.



Potential utilizations include their protein, lipid and cellulose component for animals feed and biopolymer industry.

Above second trophic level: Mesopelagic fishes

Some recent studies suggest that the global production of fish living at 200–1000m depth at daytime is much larger than previously assumed.

But there are large uncertainties about their actual biomasses, species composition, trophic position, and ecosystem functions.

Consequently, future sustainable utilization of these fishes requires a substantial increase in the mesopelagic knowledge base.

Partners: University of Bergen, Uni Research, Ocean Bergen AS

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