

Artificial reefs in Norway. Experiences from different pilot experiments along the Norwegian coast



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NIVA

Eksperiments in Norway, Observations by diving



goals

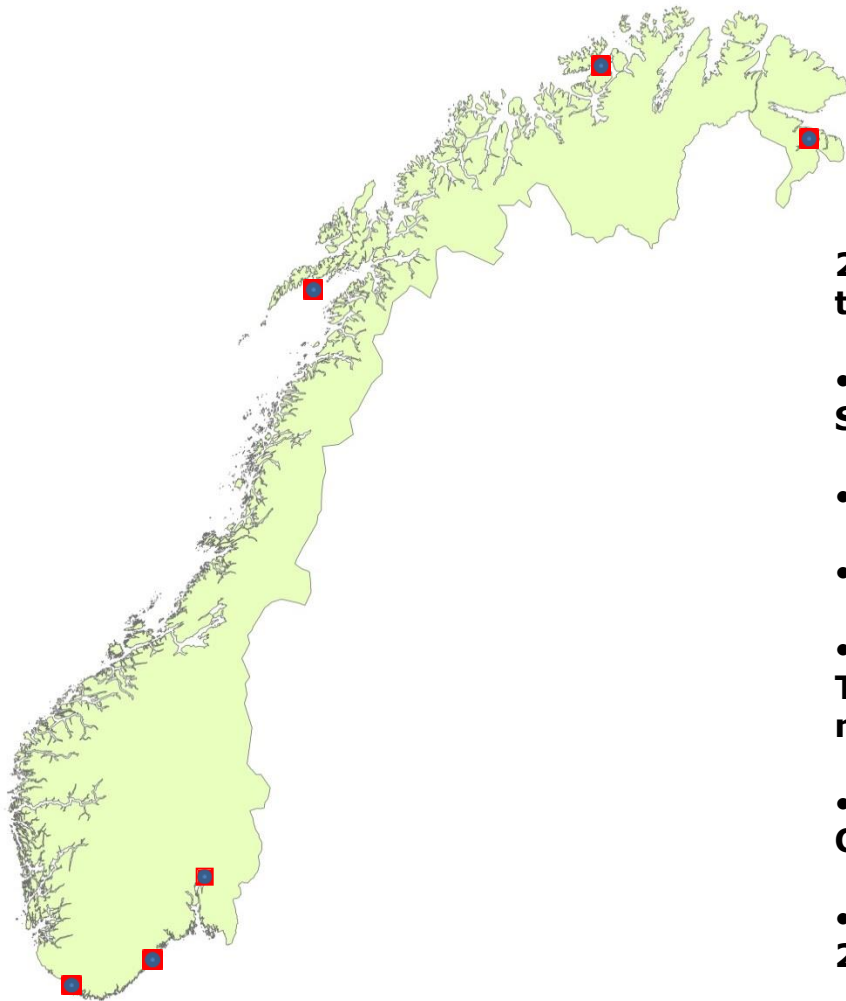
Increasing amount and diversity of habitats

Improve conditions for plants, animals and ecosystems that have been disturbed

Increase production of fish, crabs, etc.

Improve conditions for divers, or other recreational purposes

Research



2 "Fiskehus villages" in Lofoten more than 15 years

- **2 "Runde reef" in Risør 2002 (Reef Systems AS)**

- **Lobster habitats in Risør, 2004**

- **24 Runde reefs in Hammerfest i 2006**

- **>100 reefs from Fiskehus at Tjuvholmen, Oslofjord (plus >1000 mussel ropes) 2009**

- **5 reefs from Fiskehus in Bjørvika, Oslofjord, 2010**

- **3 Runde reef in Bøkefjord, Kirkenes, 2011**

- **2 PE REEFS at Flekkefjord, 2014**


Why make artificial habitats in Norway??



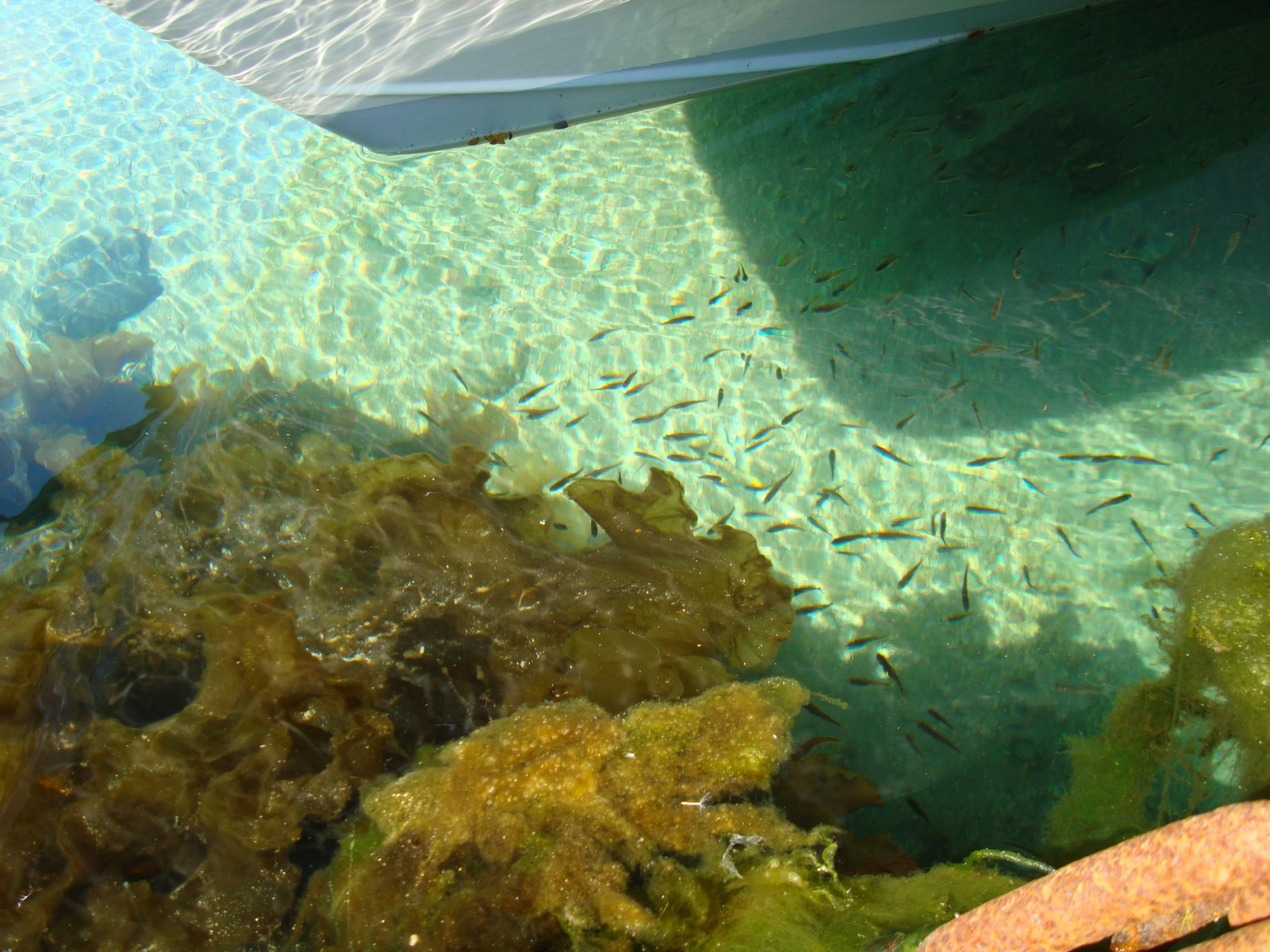
7 12:54 PM

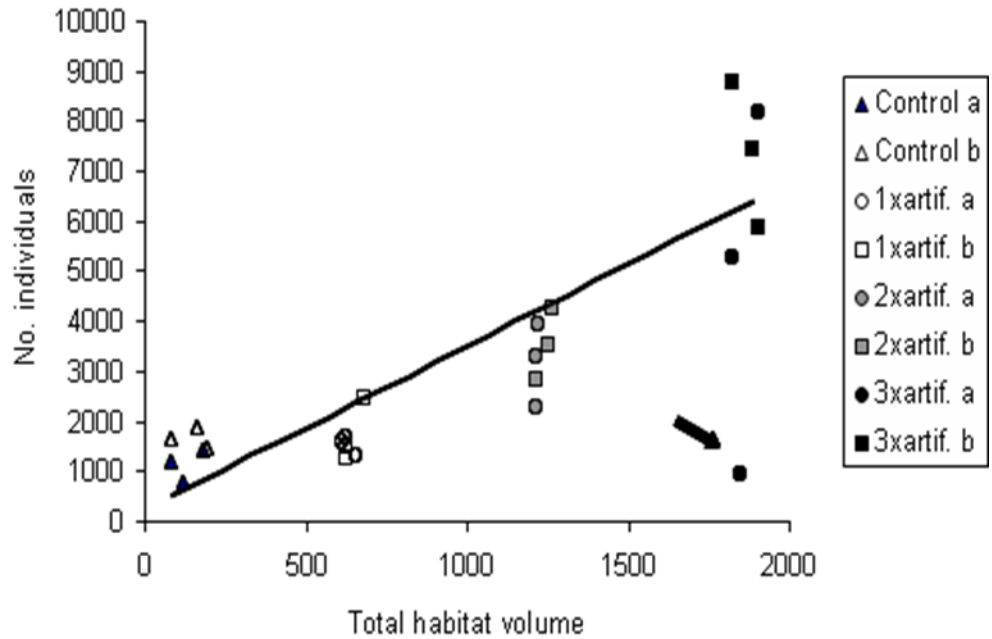
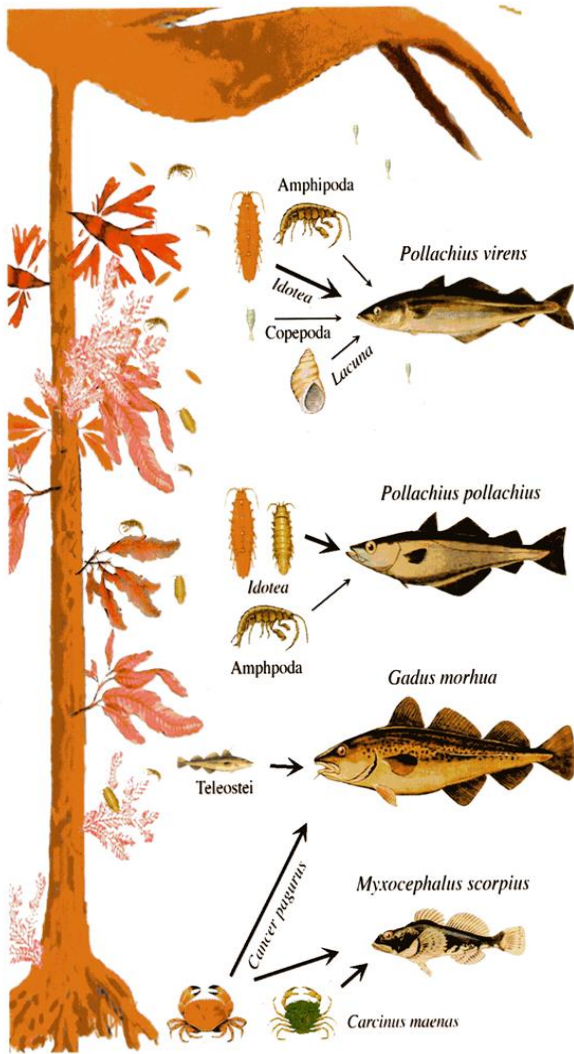


6 5:44 AM



U2 HG5 287HD+0 CA+05 19NO
D3 L2 0009.6MF 06C 12:51
C0700279





It seems like habitat is limited rather than food

Fiskehus in Lofoten

U2 HG3 001HD+0 CA+30 390CT84
D7 L5 0058.1MS 10C 02:23:19



U3 HG4 002HD+0 CA+40 39OCT84
D5 L3 0057.1MS 10C 02:30:19



Runde reef

2 i Risør (2002)

2 x 12 i Hammerfest (2006)

3 in Kirkenes



An underwater photograph showing a dense school of small, dark fish swimming in a shallow, clear water environment. The fish are concentrated in the center and right side of the frame. In the background, there is a large, branching, light-colored structure, likely a coral or sponge reef. The water has a slightly greenish tint. The overall scene is a naturalistic depiction of a reef ecosystem.

Runde reef, Risør

10 000 gobids pr reef

12 spp of fish recorded

Different algae species on top

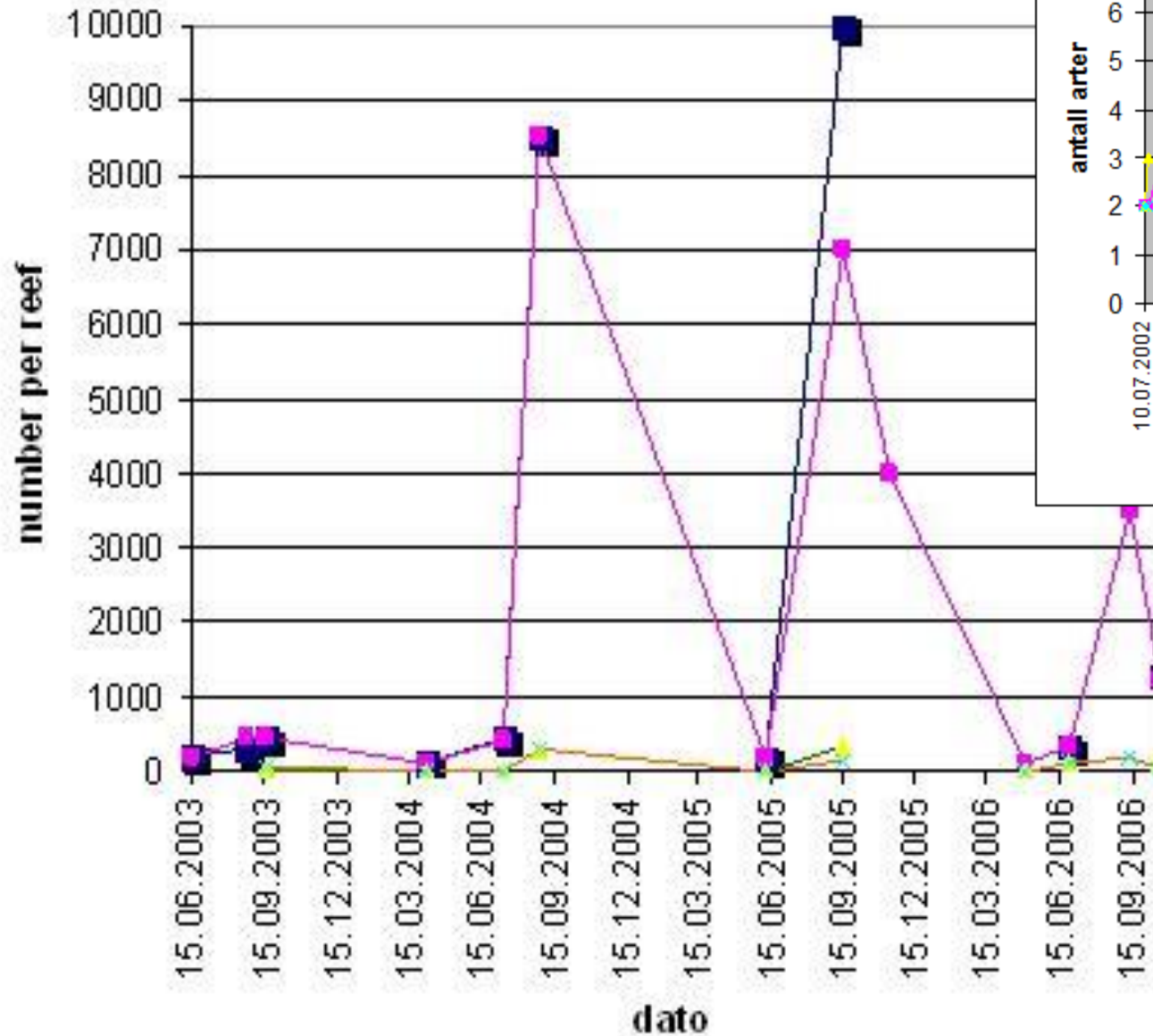
Ascidians dominated initially

More fauna species over time

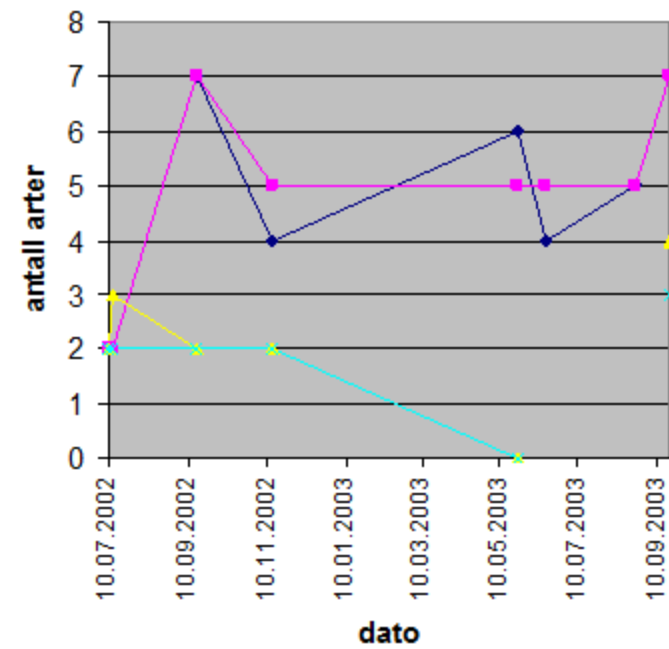
Small and larger mobile fauna

27 9:05 AM

Runde reef, number of fish



Reef, antall arter fisk

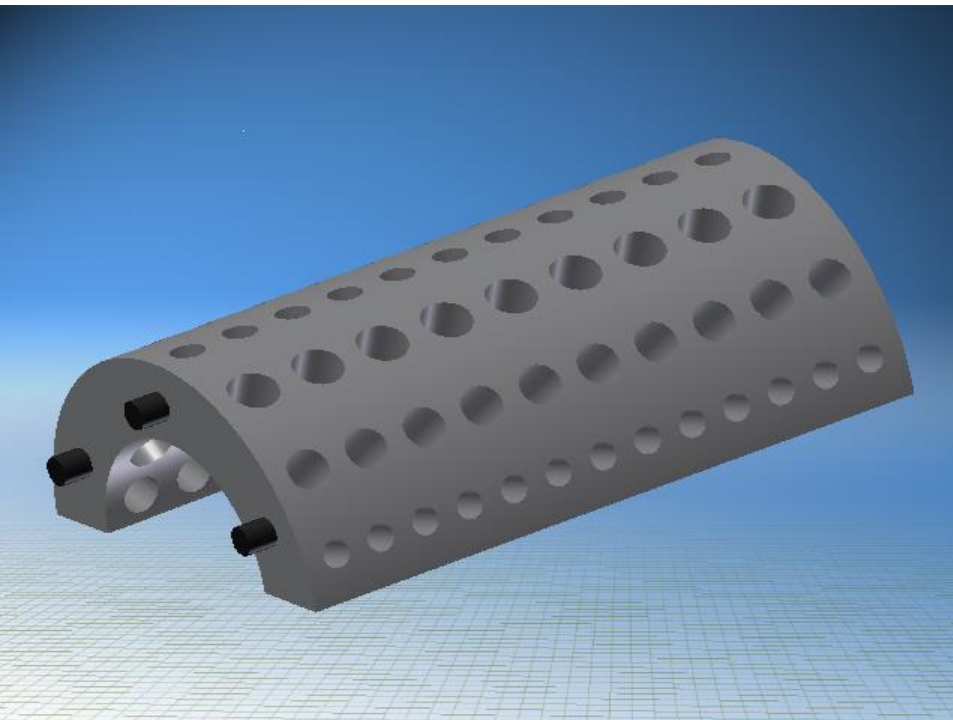












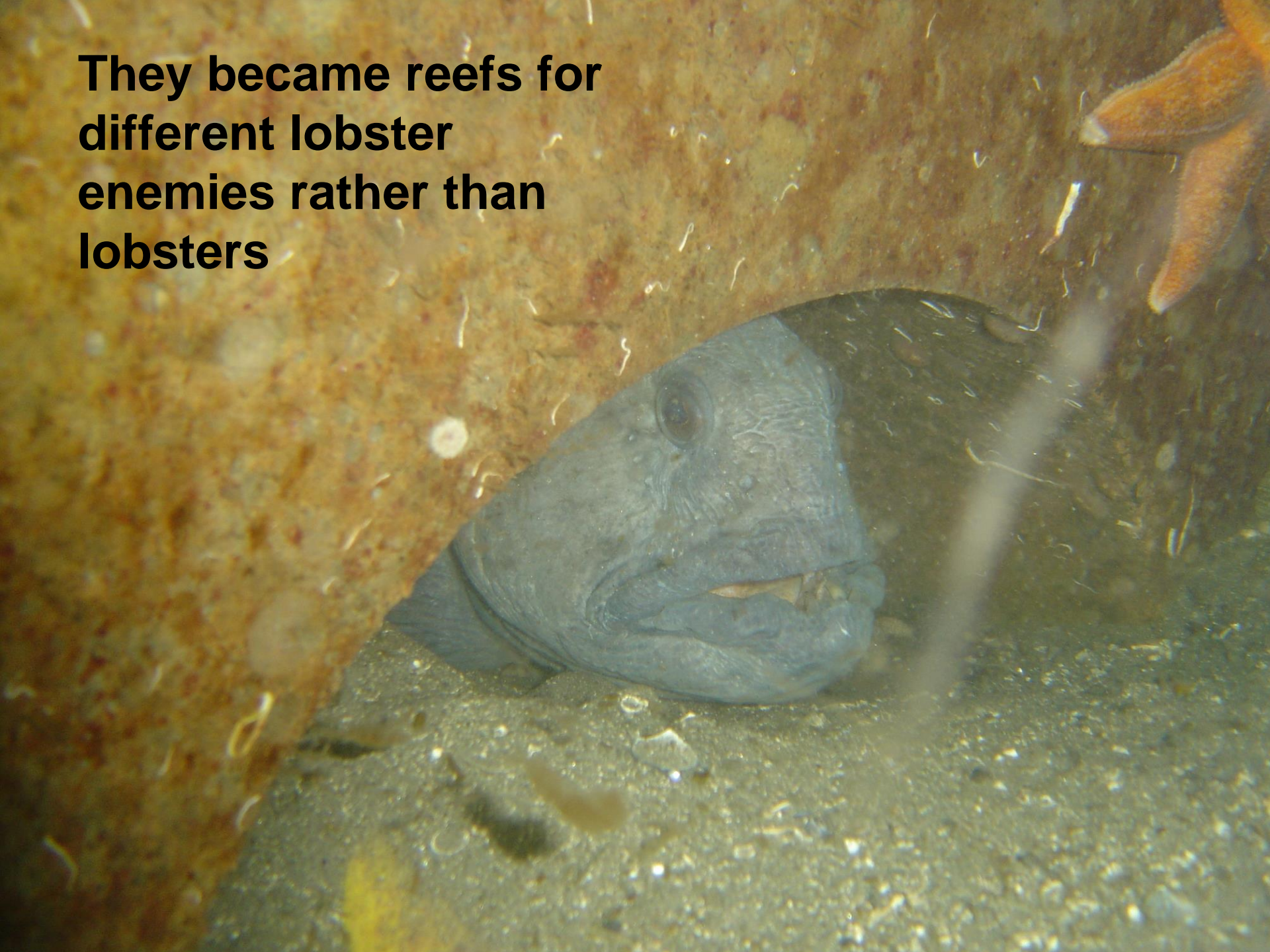
RISØR

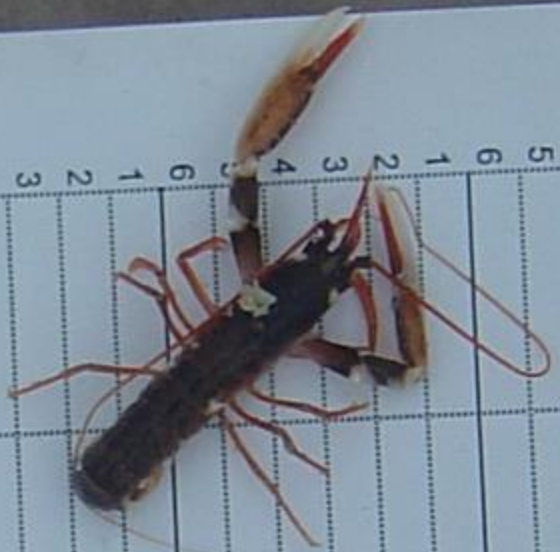
Experiments with different habitats and lobsters

Reefs combined with protection of underwater cables



**They became reefs for
different lobster
enemies rather than
lobsters**





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Fjell/blokk

Stein (2-100cm)

Flatt

Svakt skrå. Ruglete

Jevnt

Spredd

Dom.

0





Lobsters

A resource

Bioturbator

**Artificial habitats
improve local stock, but
high mortality of
juveniles**

Hammerfest

12 reefs at Sletnes ca 10 m depth (Sørøya)

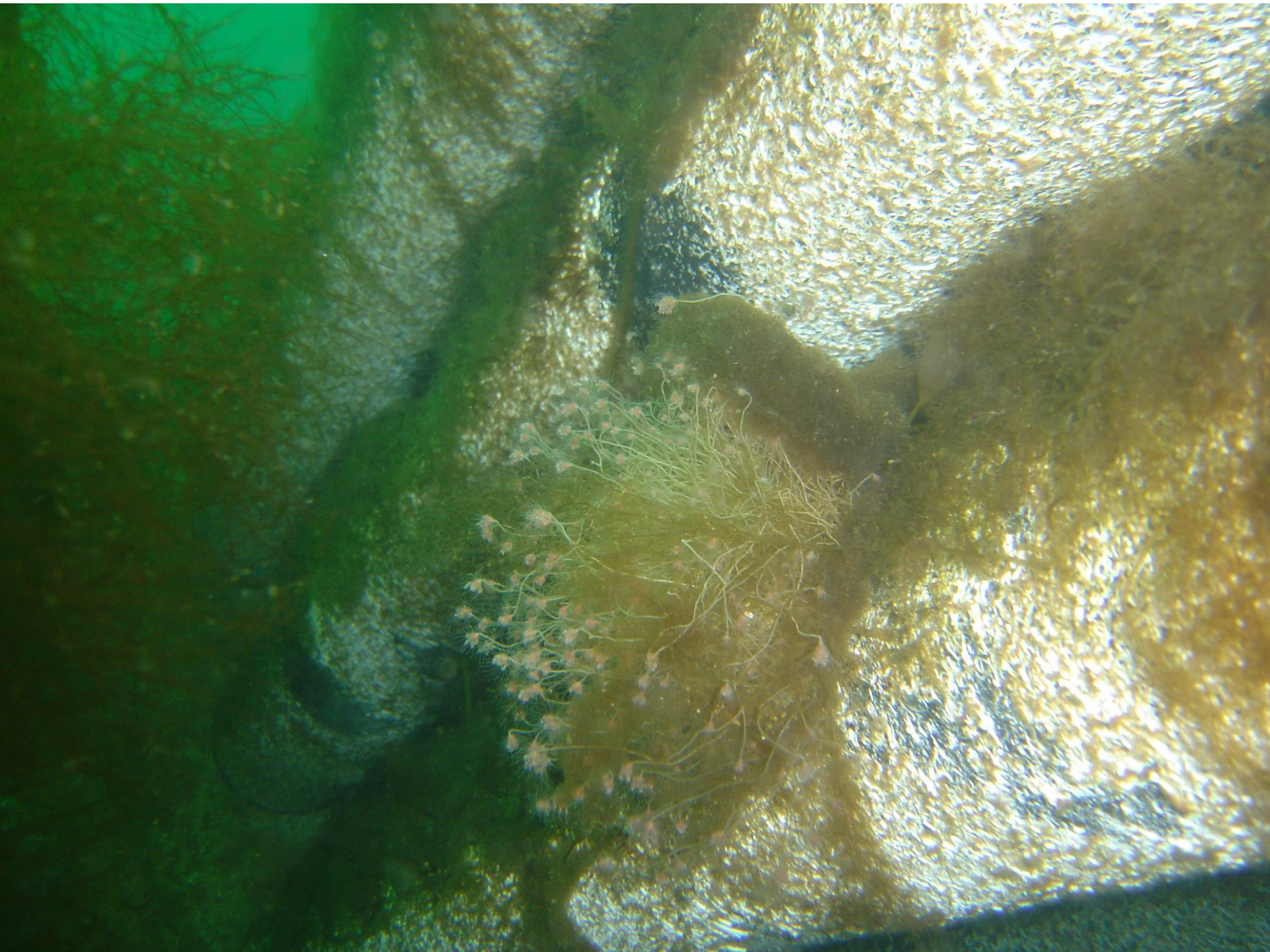
12 reefs at Fagervik ca 20 m depth (Seiland)



Runde reef in Hammerfest after 1 day

U4 HG4 294HD+0 CA+35 07JUL06
D4 0009. 1MS 07C 11:10:36









Tjuvholmen, Oslo harbour





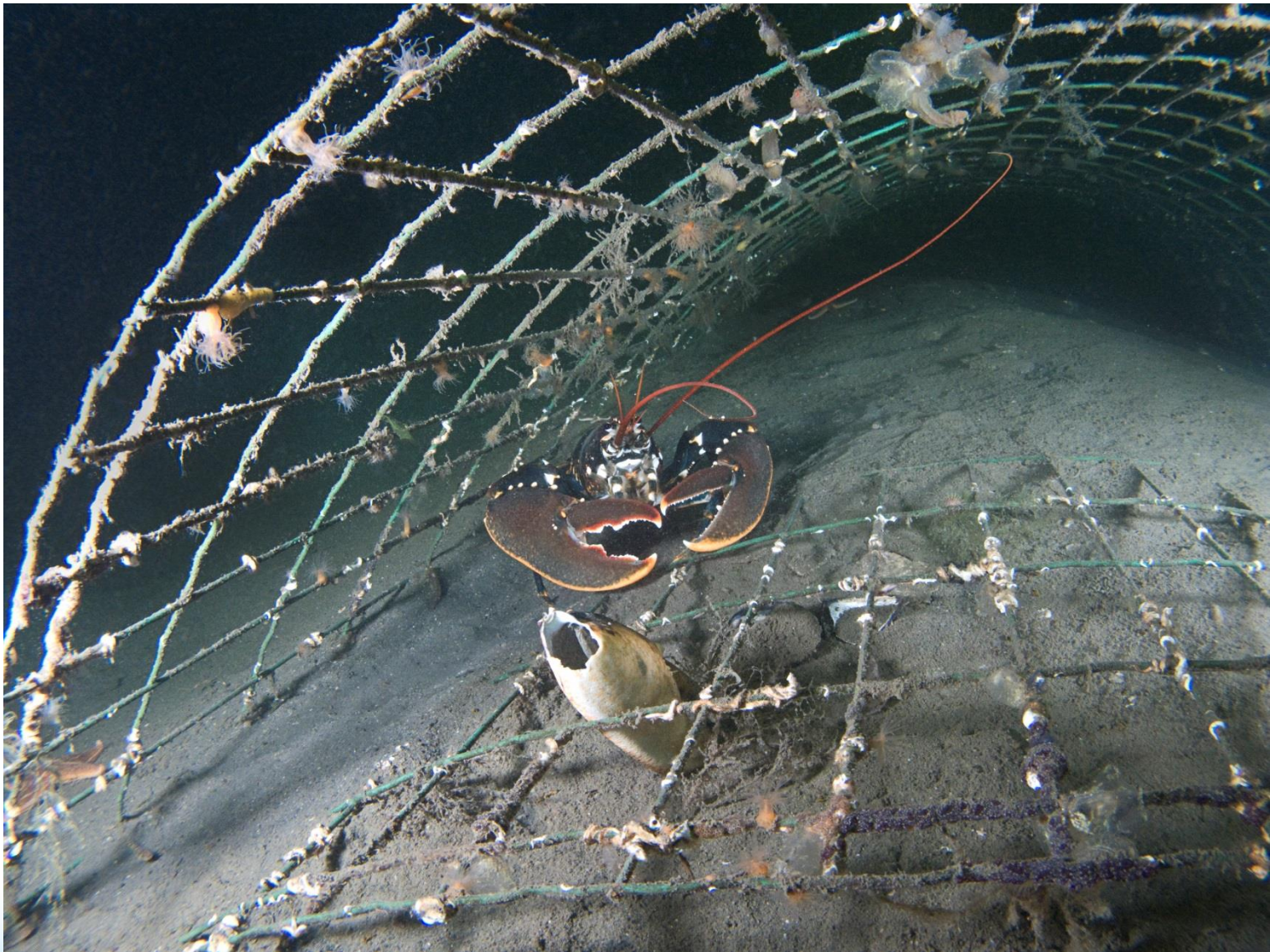


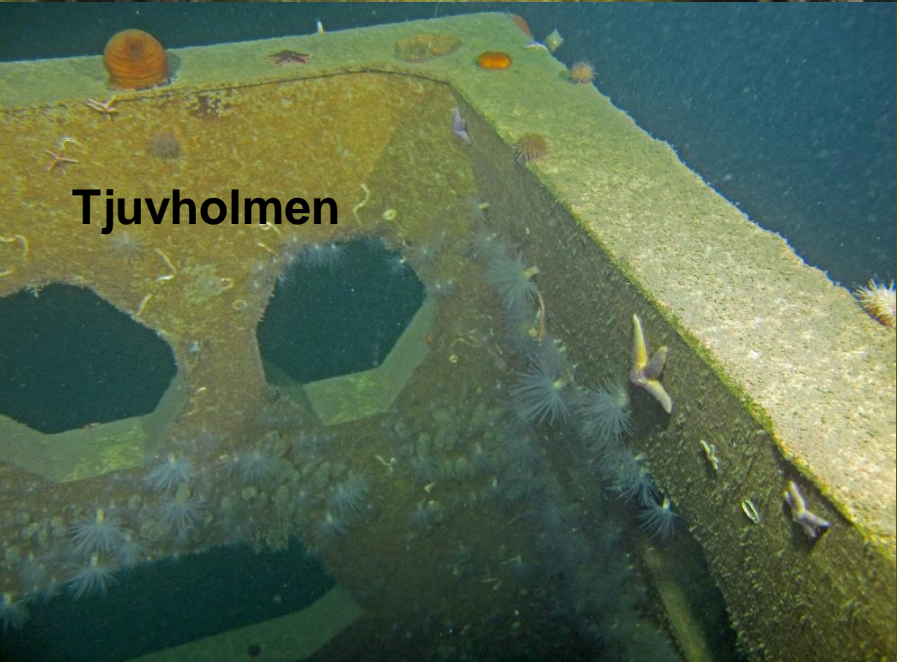
1000 mussel ropes contribute to filtering of 1500 m³ water per day









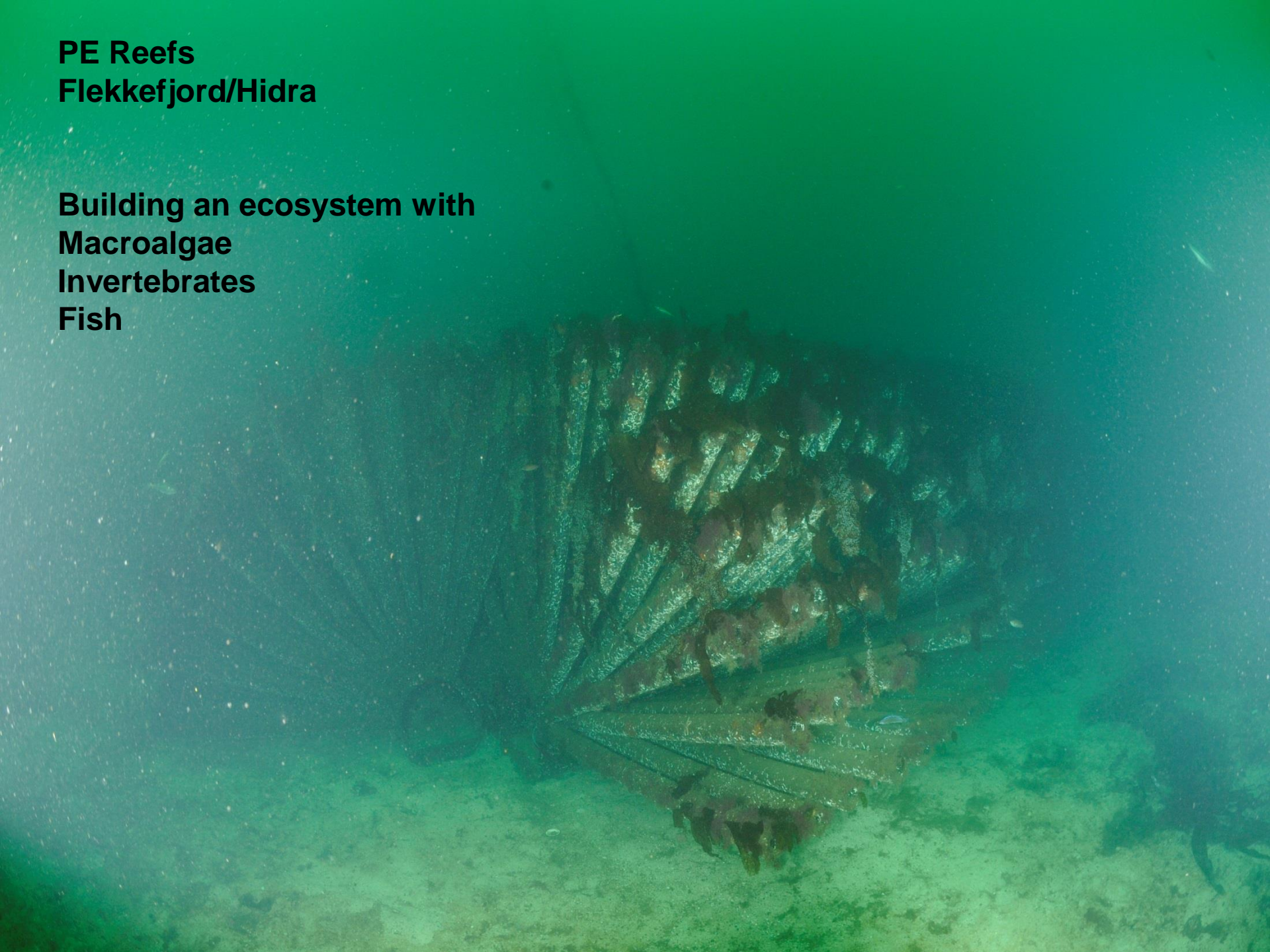


Tjuvholmen

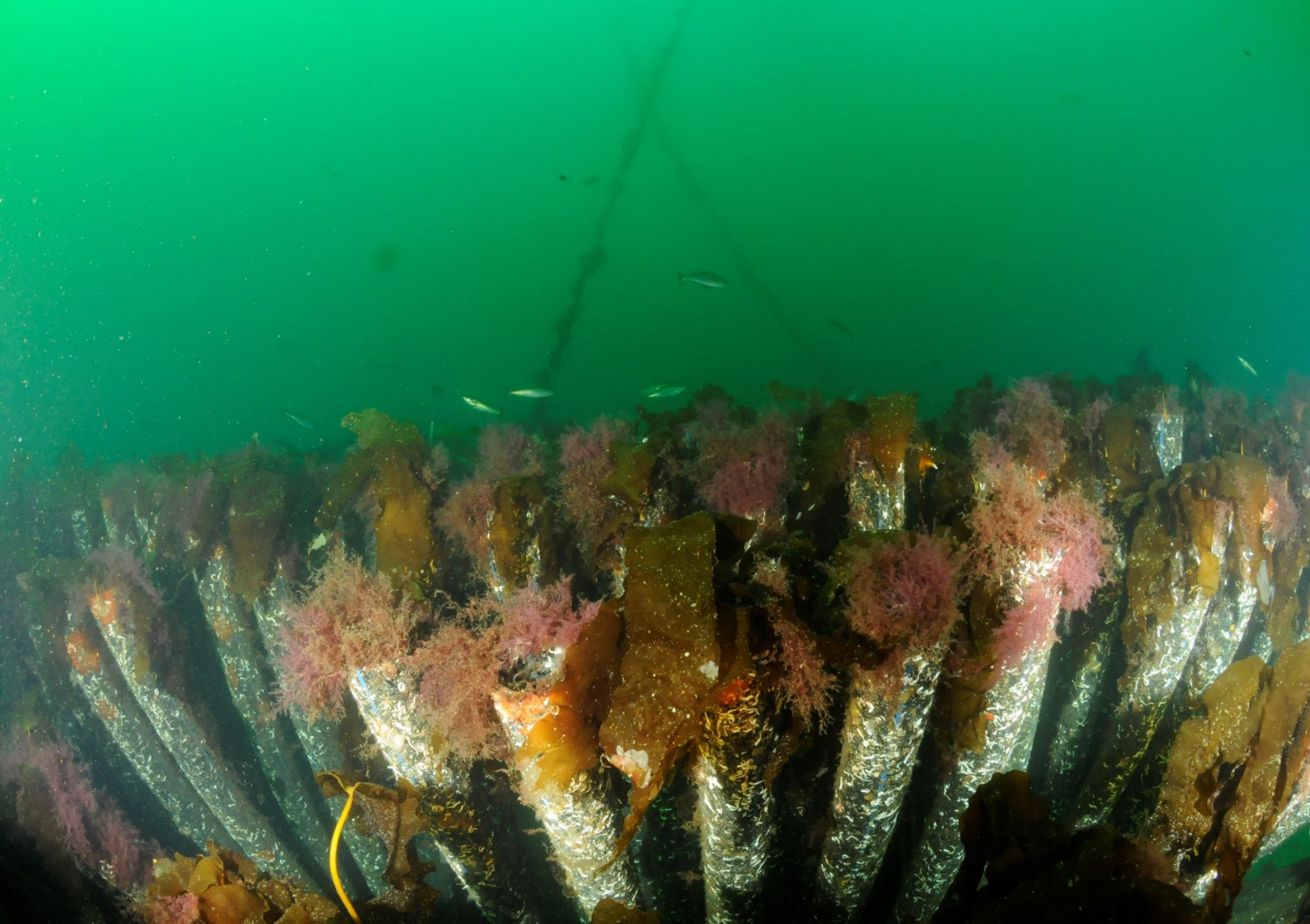
Bjørvika

**PE Reefs
Flekkefjord/Hidra**

**Building an ecosystem with
Macroalgae
Invertebrates
Fish**











Observations

About 15 species of fish

Kelp/algae

Crabs

starfish

Tube worms

Hydroids

Anemones

Sea squirts

Sponges

.....

more

Sampling among algae

>40 species of mobile fauna

5 – 8000 ind/m²

Food chains

Ecosystems



Conclusion

- All studies have shown positive results, increasing abundance and diversity of macroalgae, invertebrates and fish
- Enhance colonisation of disturbed sites
- But, who will pay and who will benefit?

'Rigs to Reef'

