Loss of kelp forests in Northern Norway

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MarHab
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1970: Sea urchin blooms and overgrazing of kelp forests reported

Foto: S Fredriksen

Large scale loss of kelp forests

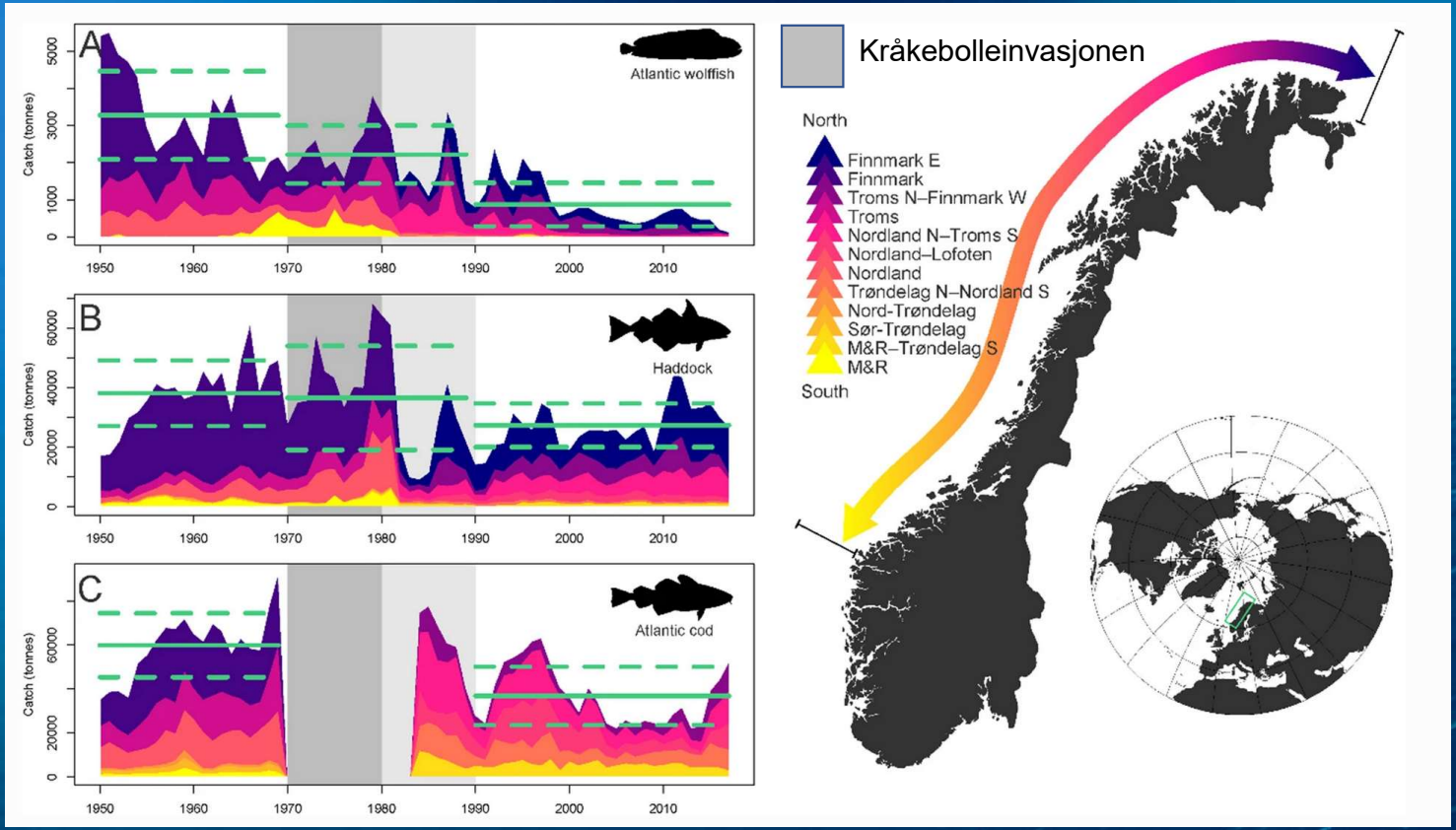
- Mid and North Norway: Sea urchin invasion
- Healthy kelp forests

Overfishing of urchin predators towards 1970

Wolffish

Haddock

Coastal cod



"every hook held a wolffish" when gear was deployed in virgin grounds (Interview of fishermen, Bodø)

Norderhaug et al. (2021)

Modernisation of the coastal fishing fleet during the last century

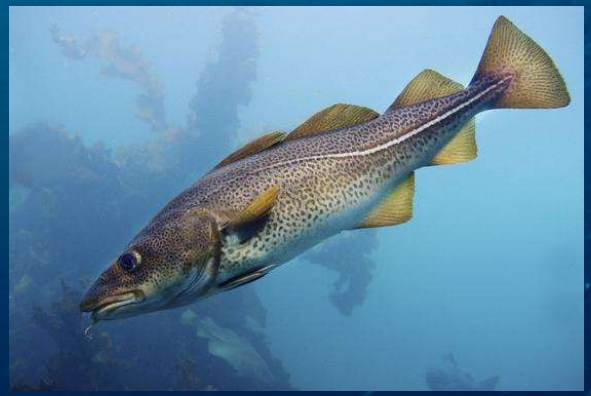
Foto: National archives

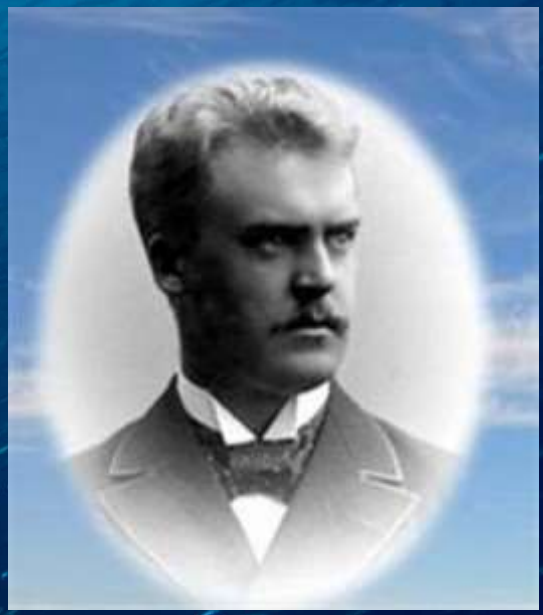
- Larger vessels and engines, introduction of power block and nylon lines
- Government loans to bolster the coastal fisheries

Previously unwanted fish (“ufisk”) on the menu

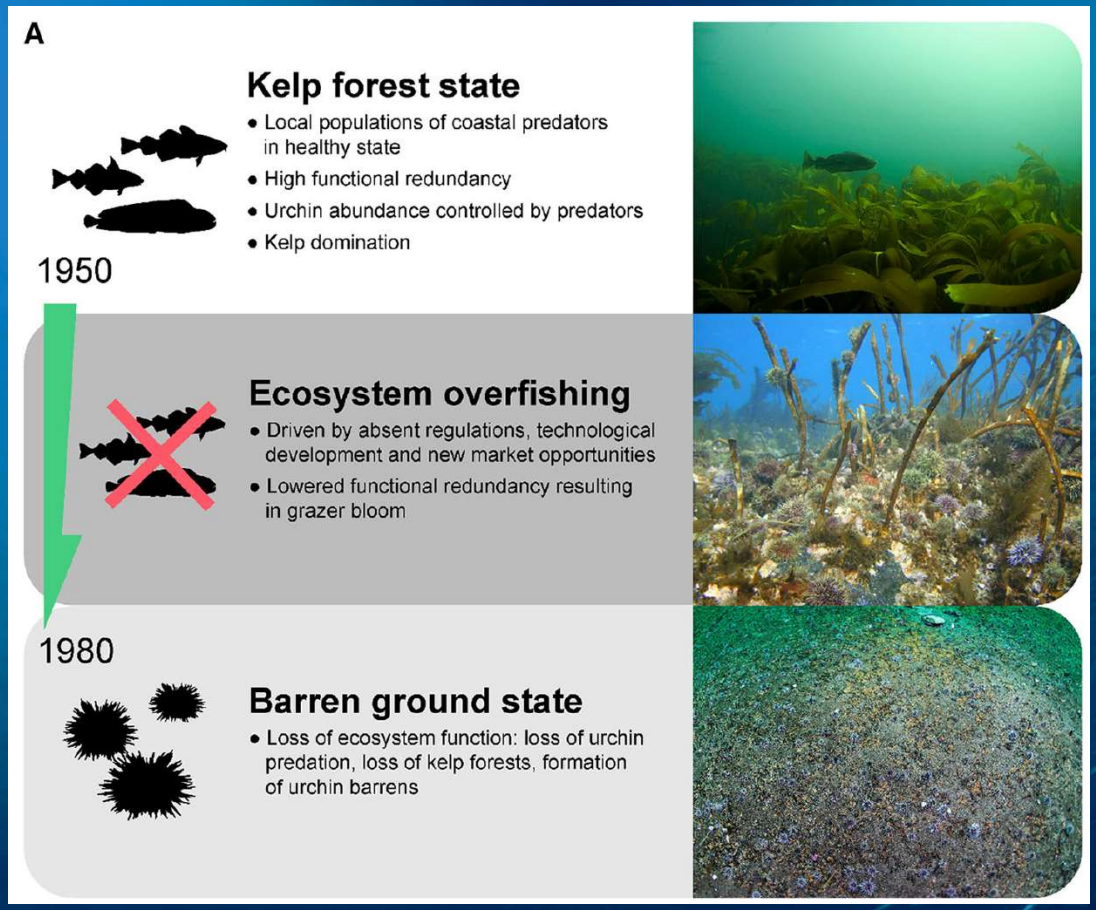
Emerging understanding of population structures

- Historical perception of the coast being seeded with fish eggs from an inexhaustible source from the ocean (Johan Hjort, 1914)
- Molecular methods has changed this perception during the last decades
- Many coastal stocks are vulnerable to local fishing due to isolation and limited connectivity



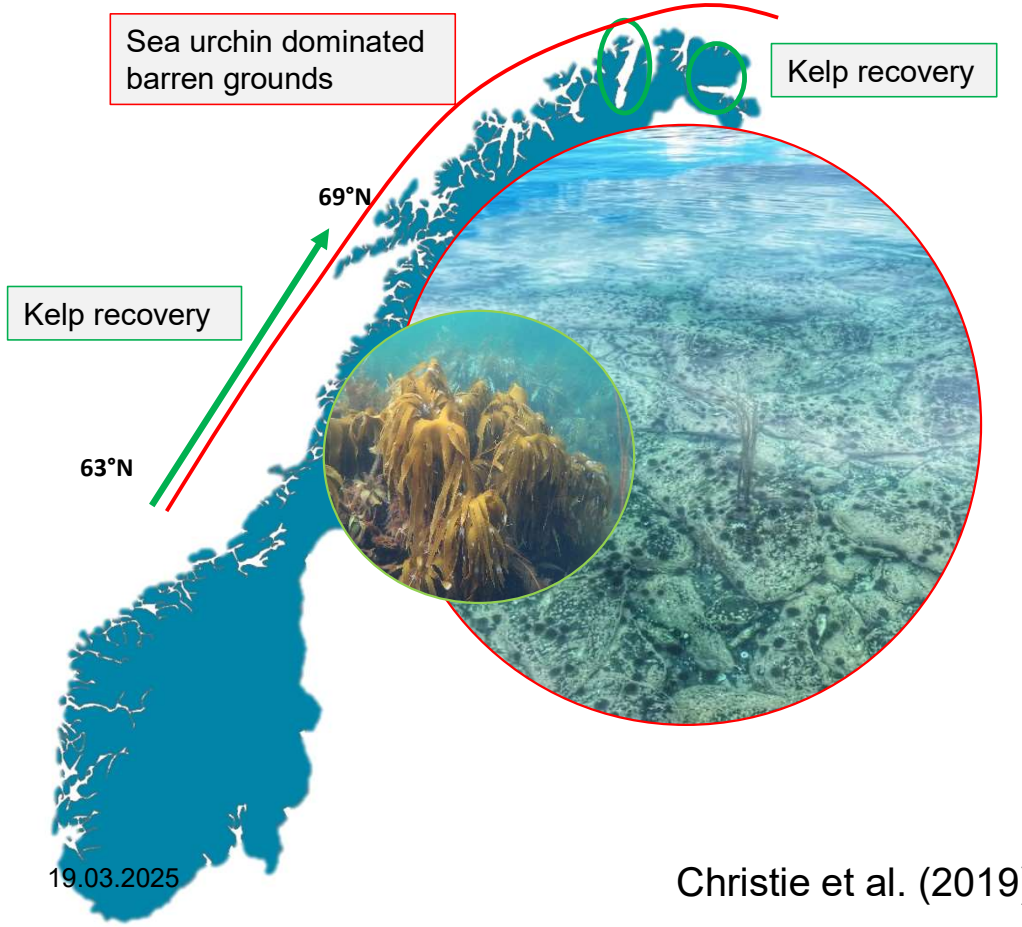


Loss of predator function



Norderhaug et al. (2021)

Recovery of kelp forests since the 1990s

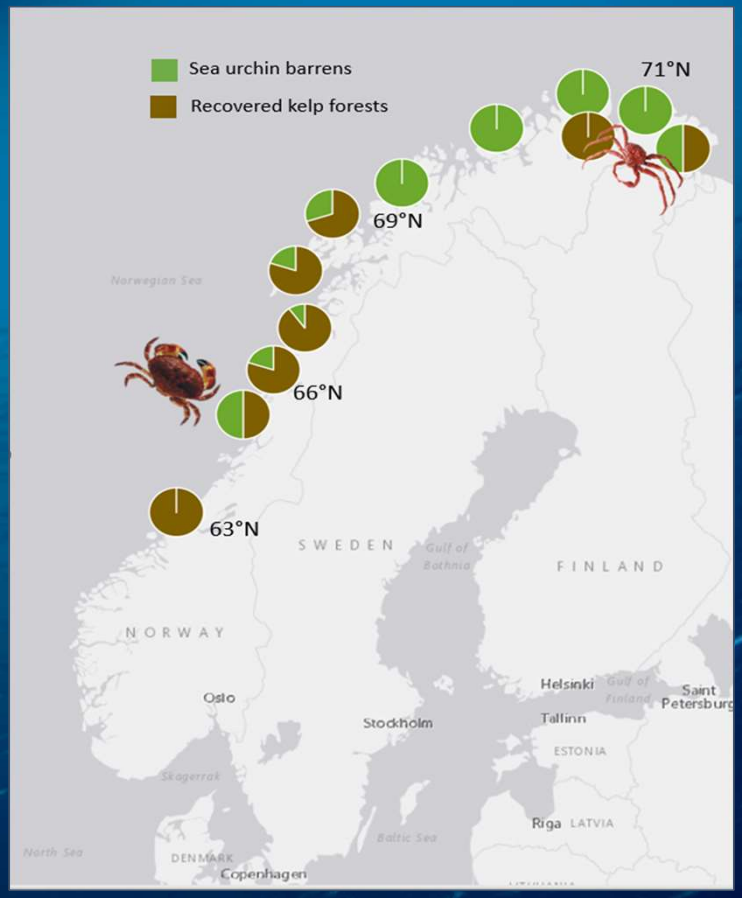


Christie et al. (2019)

- **Most of the grazed area is still barren ground**
- **Sea urchins are retreating and kelp forests have recoved since the 1990s (South and locally in the North)**
- **Coastal fish stocks are still low**

Recovery likely due to global warming

- Reduced urchin recruitment due to warming (Fagerli et al. 2013).
- Expansion of predatory crabs (*Cancer pagurus* in the South (Fagerli et al. 2013) and *Paralithodes camtschaticus* in the North (Christie et al. 2024))



Camilla With Fagerli

Conclusions

- Large areas of kelp forests were grazed down by a bloom of sea urchins in the 1970s.
- The urchin bloom was likely caused by overfishing of urchin predators
- Since the 1990s kelp forests have recovered in parts of the grazed area
- The recovery is likely caused by global warming and expansion of crabs