

# Benthic habitats of the West Greenland shelf: What is the impact of shrimp trawling?

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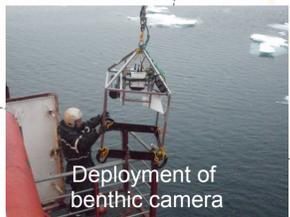
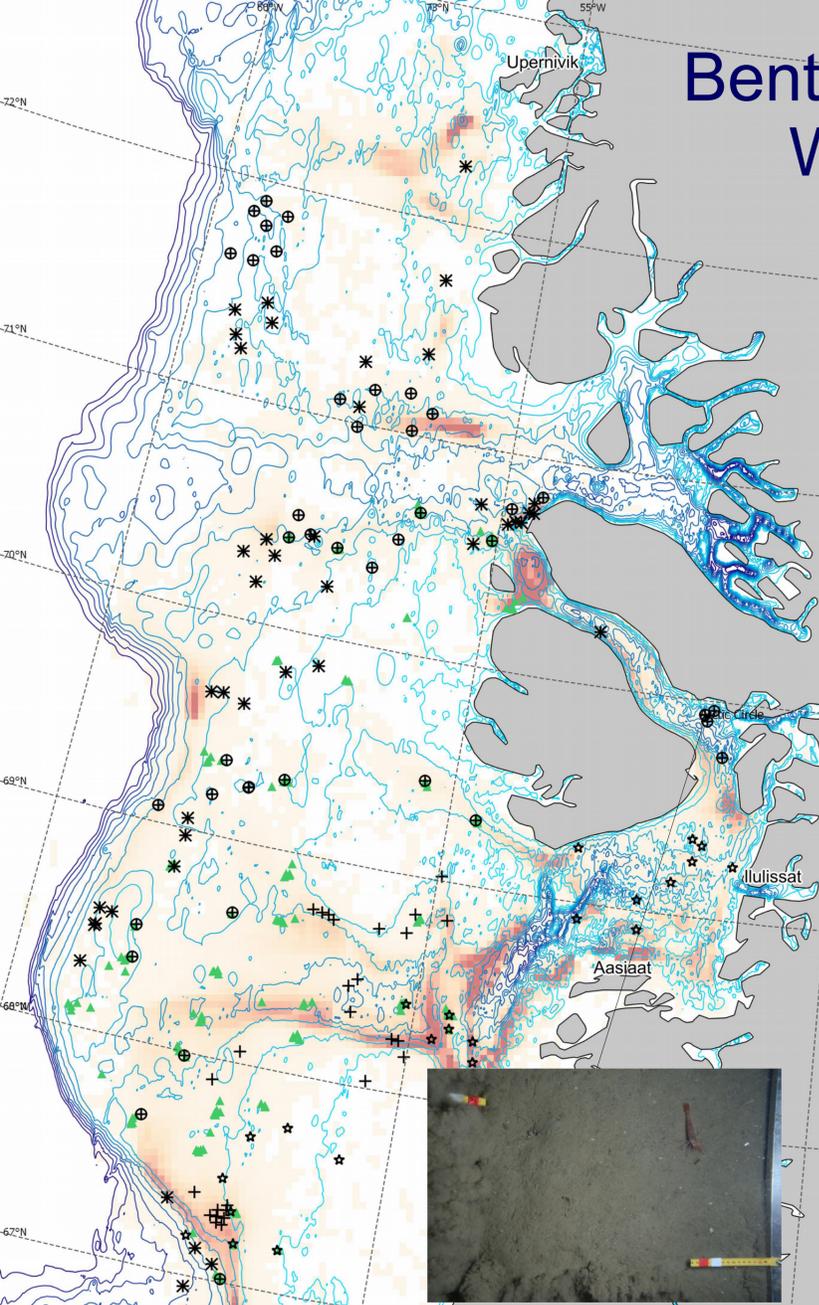
Epibenthic organisms are a critical component of the marine ecosystem, functioning as ecosystem engineers, habitat and a food resource. Our knowledge of the diversity, complexity and sensitivities of these habitats is limited particularly at higher latitudes and greater depths.

The west coast of Greenland is the site of a commercially important shrimp trawl fishery. Benthic camera surveys were conducted in this area, in collaboration with the Greenland Institute of Natural Resources (main map) at depths of 61-725m depth. Epibenthic taxa were identified and analysed.

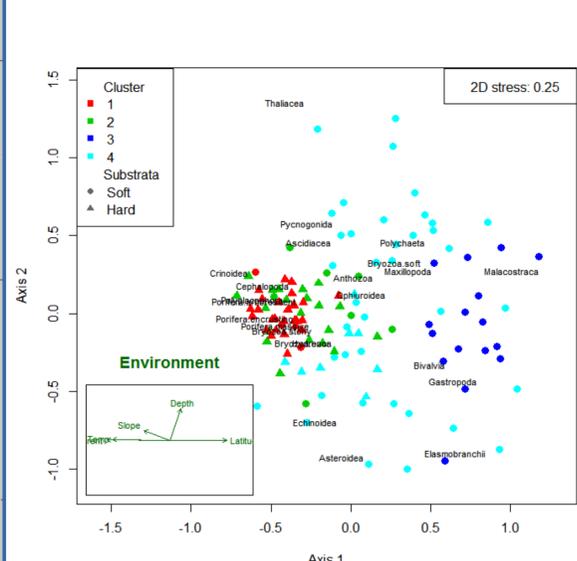
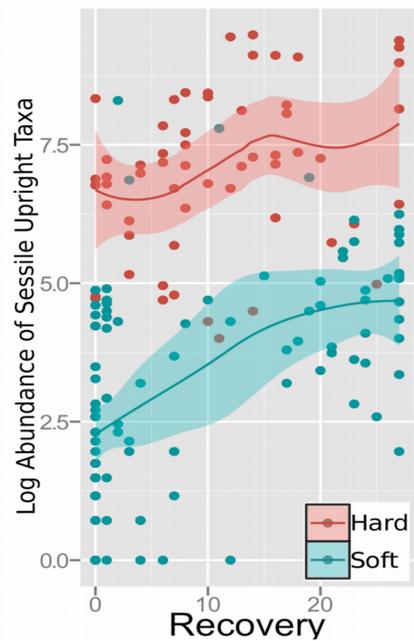
There are significant differences of composition and diversity in sites with hard and soft substrate (fig 1). Hard substrate communities are relatively diverse. Soft sediment sites are less diverse, but include commercially exploited shrimp. We observe a negative association of biodiversity and fishing pressure for some areas, with sessile, habitat forming species showing greatest vulnerability (fig 2).

A historical comparison was performed using benthic images taken in the 1970s & 1980s (Carlsson & Kanneworff, 1994). We see lower diversity in the present, indicating a loss of diversity over the past 40 years (fig 3). Some groups have increased over this time (e.g. Ophiuroids), others have declined (e.g. Anthozoa).

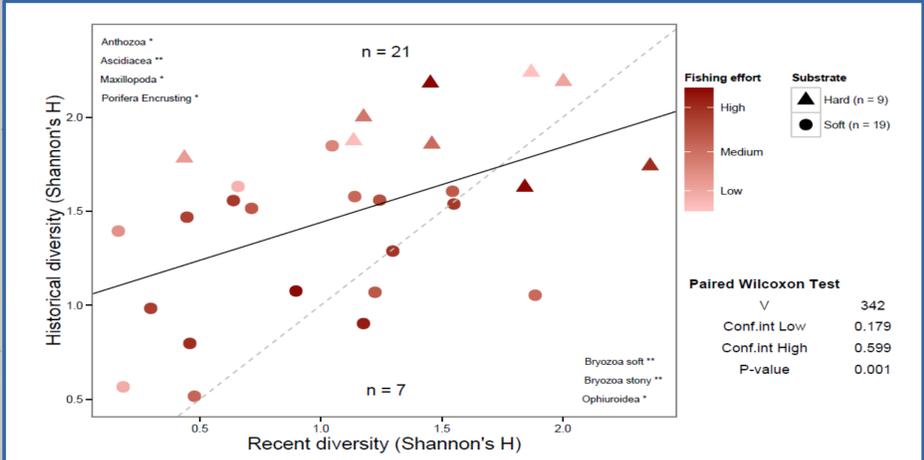
We conclude that trawling has influenced community composition and diversity in West Greenland, reducing habitat complexity and favouring mobile fauna.



**Fig 2. Response of abundance of sessile upright fauna (including corals and sponges) to recovery time (years since trawling). Abundance is higher for sites that have remained untrawled for many years. This relationship holds after allowing for environmental conditions (temperature, depth, current speed).**



**Fig 1. Multidimensional scaling plot showing community composition for 120 sites in West Greenland. Southern, warmer, rockier sites are preferred by sessile, habitat forming taxa such as porifera and bryozoa. Northern, muddier, colder sites are preferred by Gastropoda, Malacostraca (including commercial shrimp) and Bivalvia (Yesson et al. 2015).**



**Fig 3. Past and present benthic diversity. Points above the dashed line show a decline in diversity (n=21). Declines are not related to regional trawling effort between observations (redness of points). Taxa listed are significantly more abundant in the past (top left) / present (bottom right).**

## References

- Yesson et al. (2015) Community composition of epibenthic megafauna on the West Greenland Shelf. *Polar Biology*. Doi:10.1007/s00300-015-1768-y
- Carlsson & Kanneworff (1994) Problems with bottom photography as a method for estimating biomass of shrimp (*Pandalus borealis*) off West Greenland. *NAFO Sci. Counc. Stud.* 20:93-102

## Acknowledgements

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- Legend**
- Camera Stations [N=239]
  - + 2011 [49]
  - x 2012 [48]
  - \* 2013 [42]
  - ⊕ 2014 [49]
  - ☆ 2015 [51]
  - ▲ Historical Images
  - Depth Contours
  - 1,000m
  - 100m
  - Cumulative Trawling Impact
  - Low
  - Intermediate
  - High

