# Establishment and maintenance of regular photographic monitoring of rocky bottom localities from North Norway to Spitzbergen

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# Why monitoring rocky bottom substrate?

- Characteristics of macrozoobenthic organisms
  - Sessile and/or have reduced motility as adults.
  - Lifespan from years to decades.

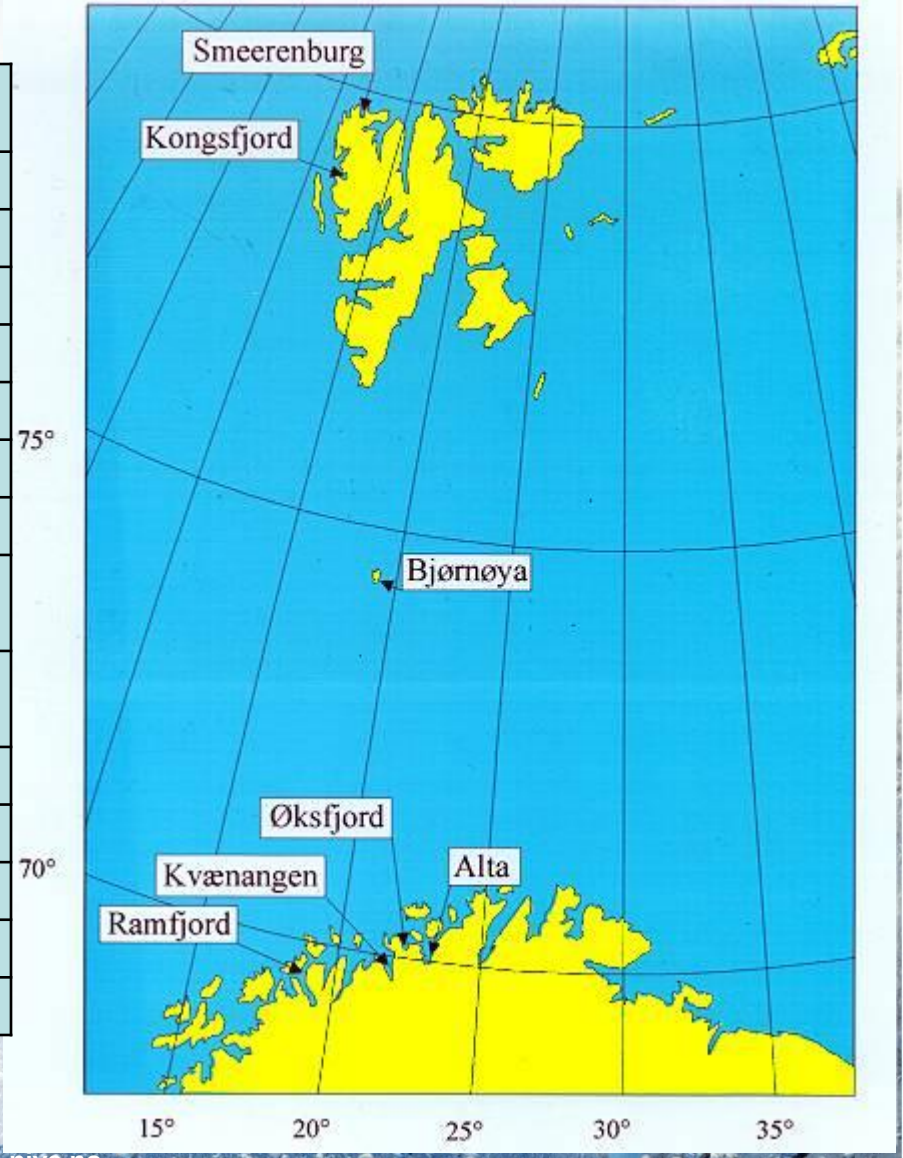
  ➔Potential for accumulating environmental influences over long periods of time.

  ➔**These groups of taxa can be considered as excellent indicators of alterations in marine ecosystems….natural, human made etc.**
- Organisms on rocky substrate vs. soft sediment
  - Less infaunal organisms.
  - Predomination of filter-feeding organisms.

  ➔Increases the observational success regarding image analysis

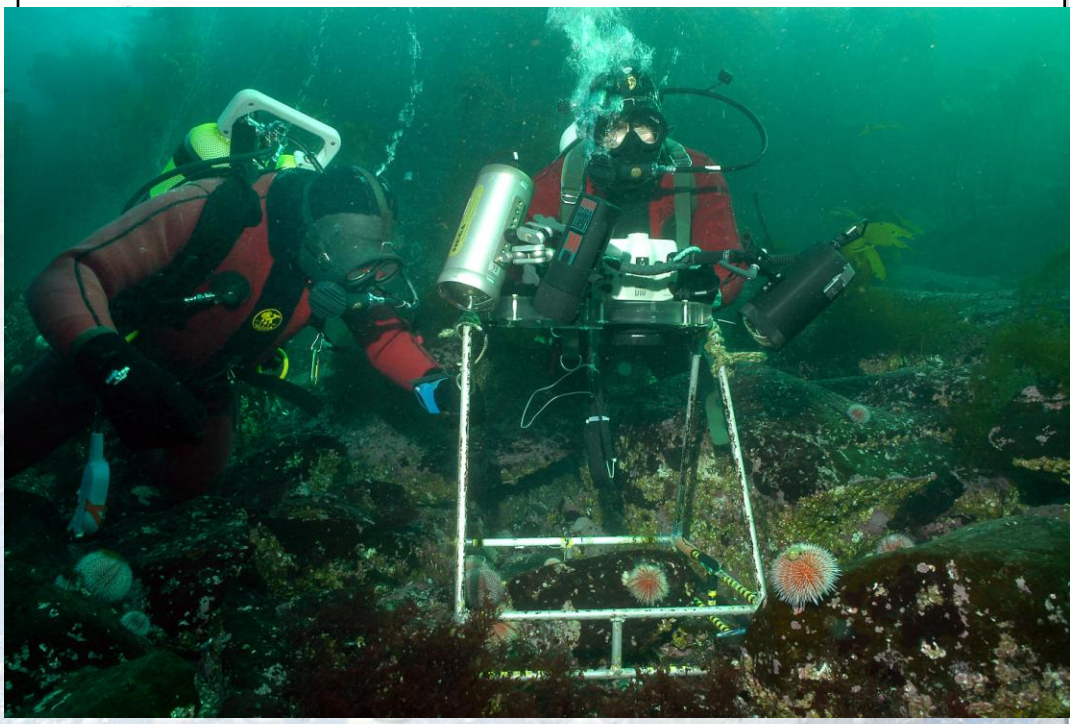
# Permanent stations, localities

| Locality | Depth | Initiated | Regularity |
|---|---|---|---|
| **Svalbard** | | | |
| Smeerenburgfj. | 15 | 1980 | 1 |
| Kongsfjord | 15 | 1980 | 1 |
| Bjørnøya | 15 | 1980 | 1 |
| Heleysundet | 15 | 1997 | Terminated |
| Sagaskjæret | 15 | 2006 | 1 |
| (Brennevinsfj.) | 15 | 1982 | Terminated |
| **Coast of northern Norway** | | | |
| Haugbergnes | 10, 20, 30 | 1976 | 4-6 times/yr the first years; 2 times/yr thereafter |
| Kvænangen | 5, 15 | 1980 | 1 |
| Øksfjord | 5, 15 | 1980 | 1 |
| Altafjord | 5, 15 | 1980 | 1 |
| (Malangen) | 5, 15 | 1980 | Terminated |
| (Porsangen) | | 1980 | Terminated |



# Methodology in fieldwork, practical solutions

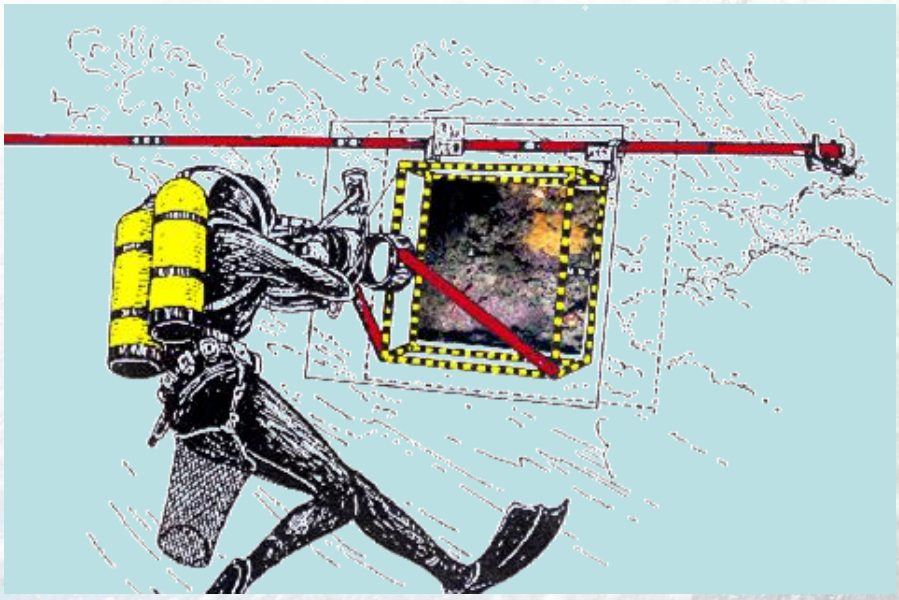
- Steel bar (divides the control and treatment areas at the Svalbard localities).
- Metal rig with digital camera and flashes (50  50 cm frame at the seafloor -  the *reference frame, 0.25m²*).
- Introducing digital camera optimises time spent scuba-diving



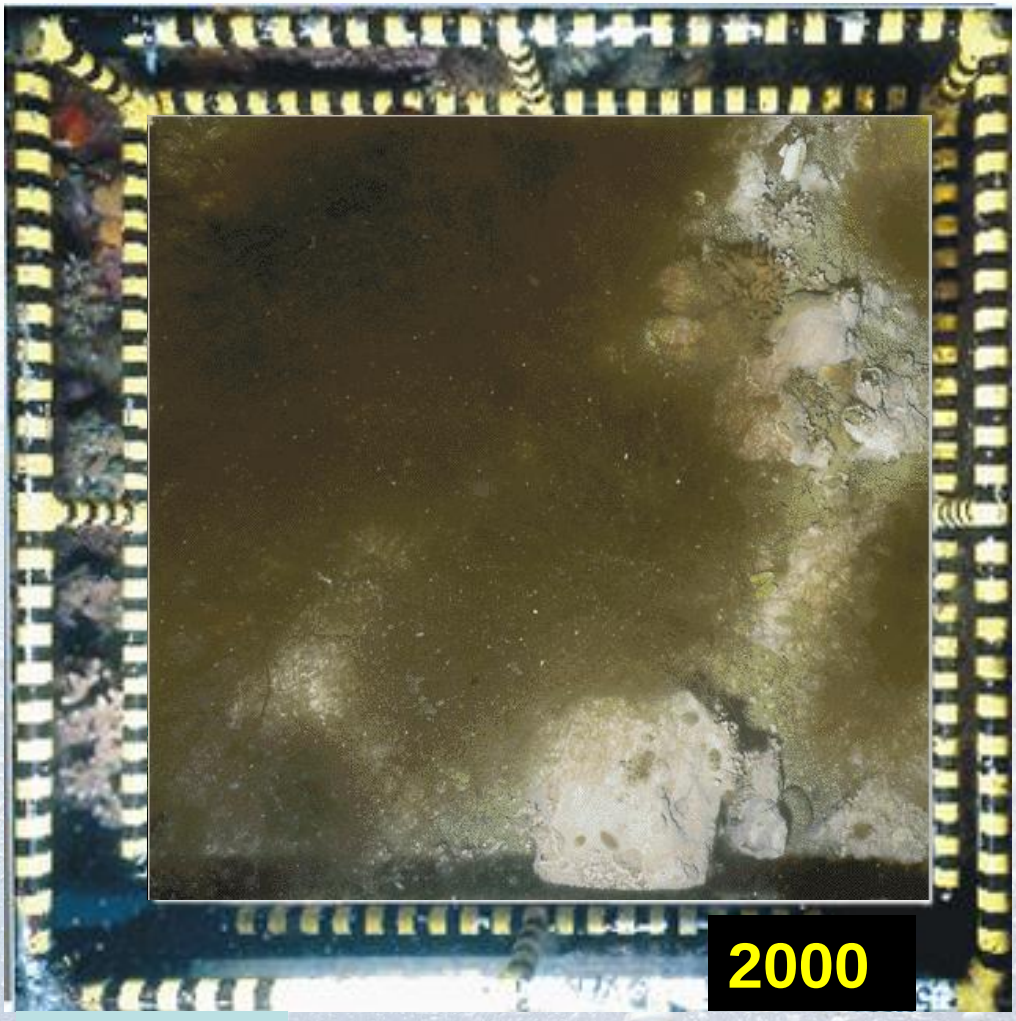
# Methodology in fieldwork, practical solutions

**“pro & con’s” regarding the technique:**

- Non-destructive sampling on the localities➔ repetitive investigations.
- Large amount of raw-data collected with limited time expenditures.
- Quantitative sampling.
- ***The method follows up guidelines given in Norsk Standard***
- Limitation in lower size of organisms that can be identified.
- Must disregard infaunal (where sediments are accumulated) and cryptic organisms.
- The use of scuba diving in sampling.



# Time series of one frame (0.5×0.5 m) at one locality




(F. Beuchel, NCFS)

# Image processing, data analysis

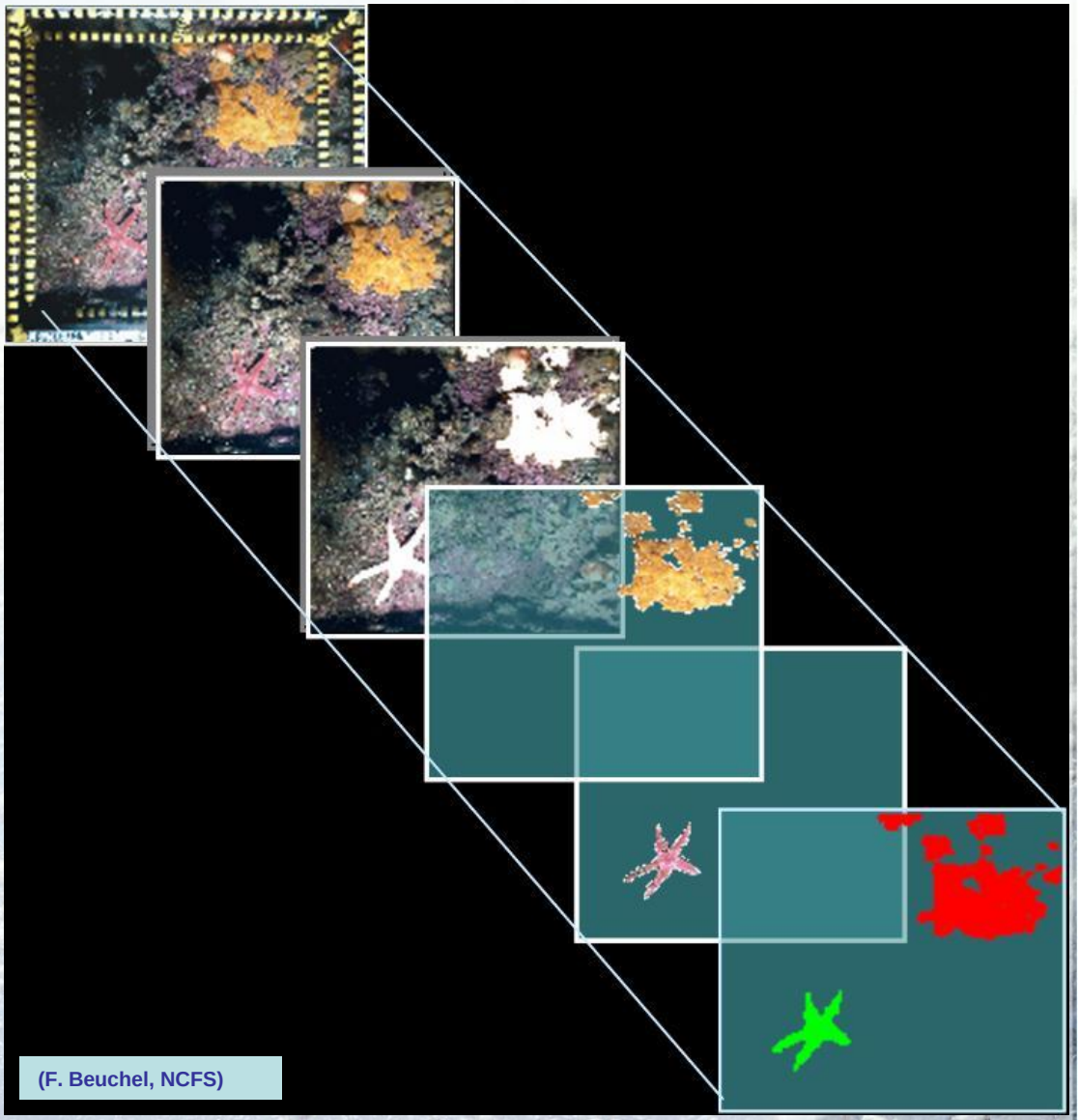
Digital/ scanned photograps; imported into Adobe Photoshop

Area of inner frame selected; reconstructed to a square (0.25 $m^2$)

Selection of species, aggregates, bottom features etc.

Transfer to separate transparency layers

Specific RGB-code to each feature ($255^3$ possibilities); measurement of cover and abundance



(F. Beuchel, NCFS)

# Results

- Variations in biodiversity.
- Succession patterns.
- Interannual changes in benthic communities (though restricted to **rocky** bottom areas).
- Relations to climatic indices. Results from Beuchel et al. 2006.

# From Beuchel et al. 2006

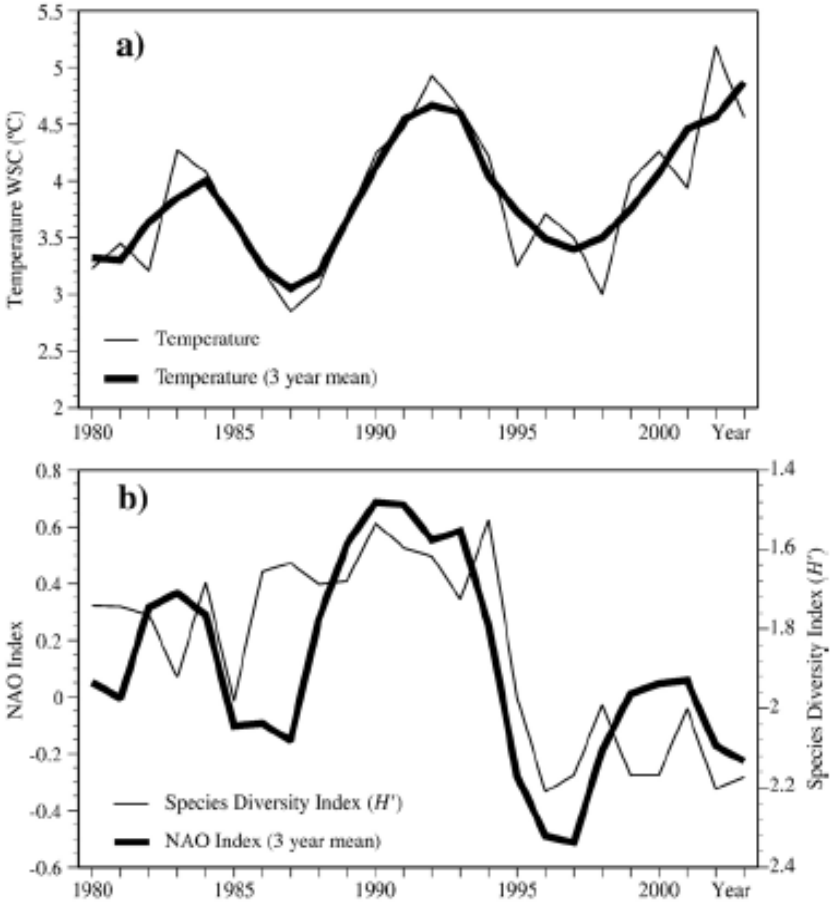



Fig. 2. a) Mean autumn (August–September) temperature of the WSC at about 79°N between 100 and 300 m depth. Data from station E1 (close to Kvadehuken) from Saloranta and Haugan (2001), Schauer et al. (2004) and Tverberg (pers. comm.). b) Correlation between the NAO Index (3-year mean calculated from September–August) and Shannon–Wiener diversity index ($H'$). The secondary $y$-axis scale (species diversity) is inverted.

# From Beuchel et al. 2006

- ” The most striking congruence was found between the NAOI as large-scale climate driver and benthic species diversity. A fundamental change in the community structure between **1994 and 1996** coincides precisely with a major shift in the NAOI-regime from a positive to a negative mode. The changes in the benthic community during this period are mostly reflected in the appearance of dense carpets of brown algae and a decline of actinarians, with a resulting increase in biodiversity.”

# Other possible dataoutput from the monitoring

- Growth; species specific analysis
- Stereo photographic possibilities (calculating volumes/ measures of colonial organisms….future perspective).
- *Summing up the amount/ number of photographs collected during the yrs……..*

| | | | |
|---|---|---|---|
| Spildra + Kvænangen + Brattholmen | 144 | | |
| Haugbergnes | 60 | | |
| Svalbard | 20 | ca 30 yrs | stereophotography |
| | 224 | 6720 | 13440 pics raw data |