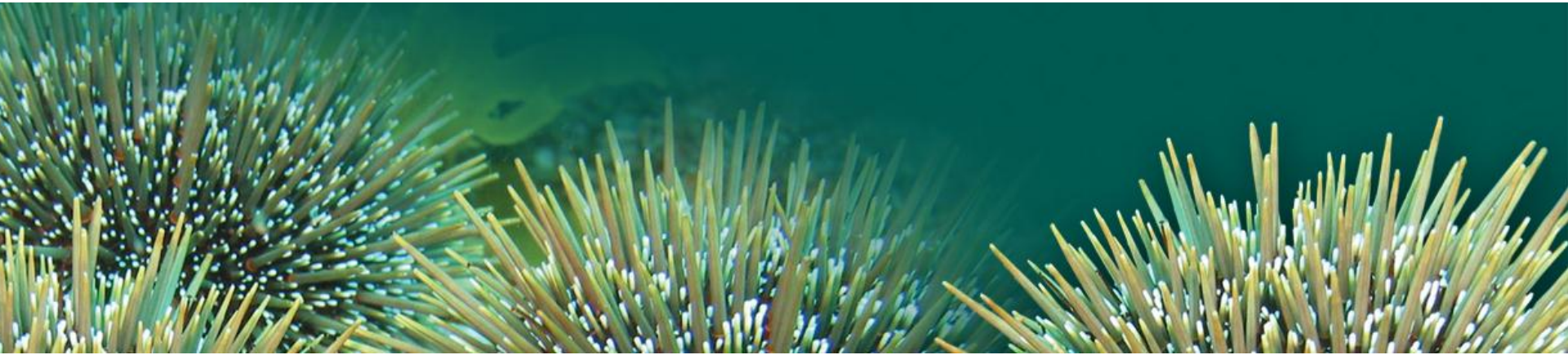


Sea urchins - the New Zealand experience



Phil James

Nofima-Marin

(Tromsø, Norway)



Outline



1. Comparison of sea urchin industries in NZ and Norway
2. Sea urchin as a seafood product
3. NZ research into sea urchin roe enhancement
4. Possible future research in Norway to utilise sea urchin resource



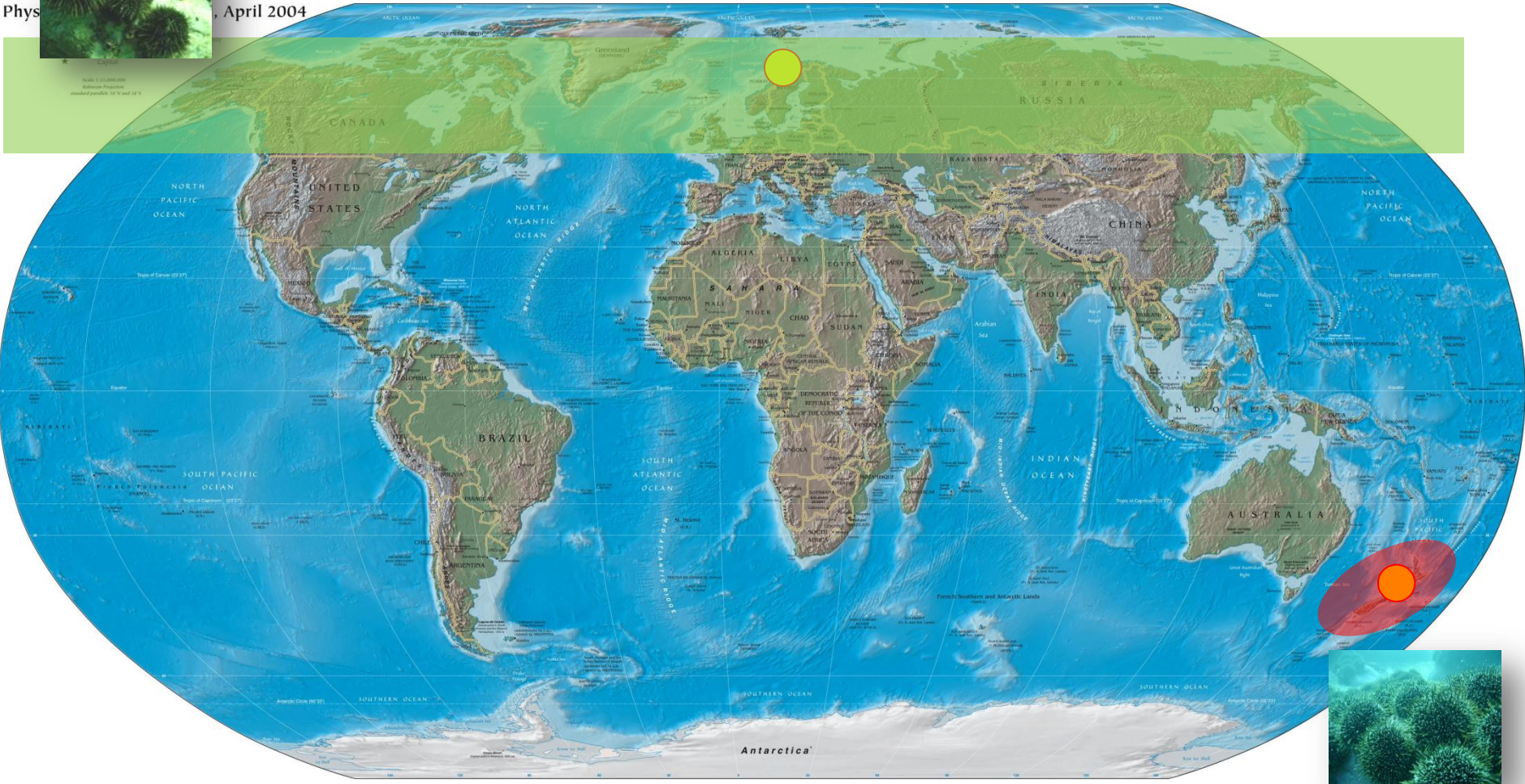
Norway and NZ

Green sea urchin (*Strongylocentrotus droebachiensis*)

April 2004



Phys



Kina (*Evechinus chloroticus*)

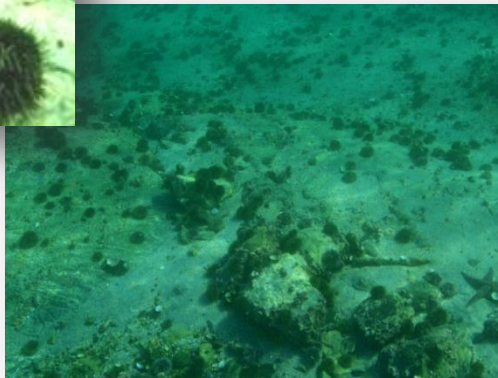
Norway and NZ - Similarities and differences



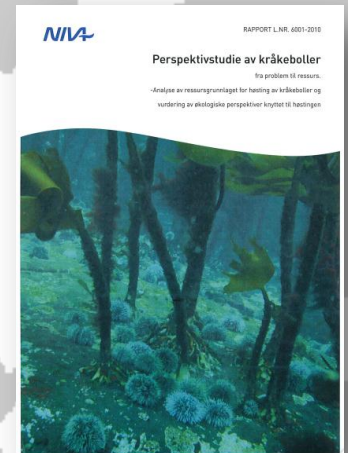
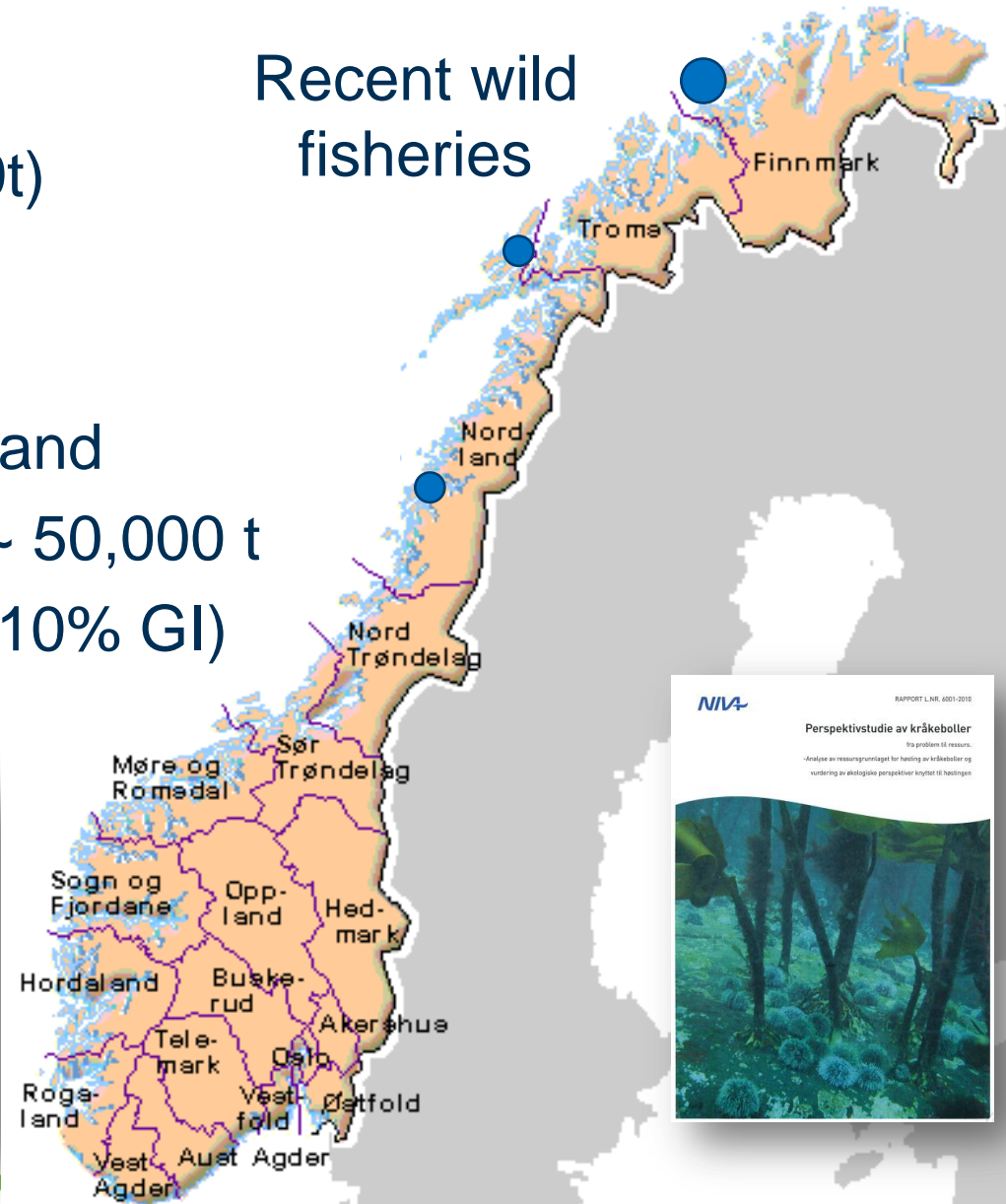
The sea urchin fishery in Norway



- No historical fishery
- Variable catch (2009 100t)
- Minimal controls
- No domestic demand
- Strong international demand
- NIVA Report: estimates ~ 50,000 t (5,000t roe at 10% GI)



Recent wild fisheries



Collection of sea urchins in Norway



- Supply issues:
 - cold
 - dark
 - currents
- SCUBA
- ROV
- Trapping investigated
- Limited knowledge of:
 - reproductive season
 - seasonal variation
 - effects of environmental conditions on roe quality



Processing and markets for Norwegian sea urchin roe

- Post harvest grading and processing

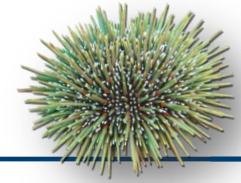


- Japan; prices range between
~ NOK 800 / kg roe
- Europe (France / Italy)
- Russia / China

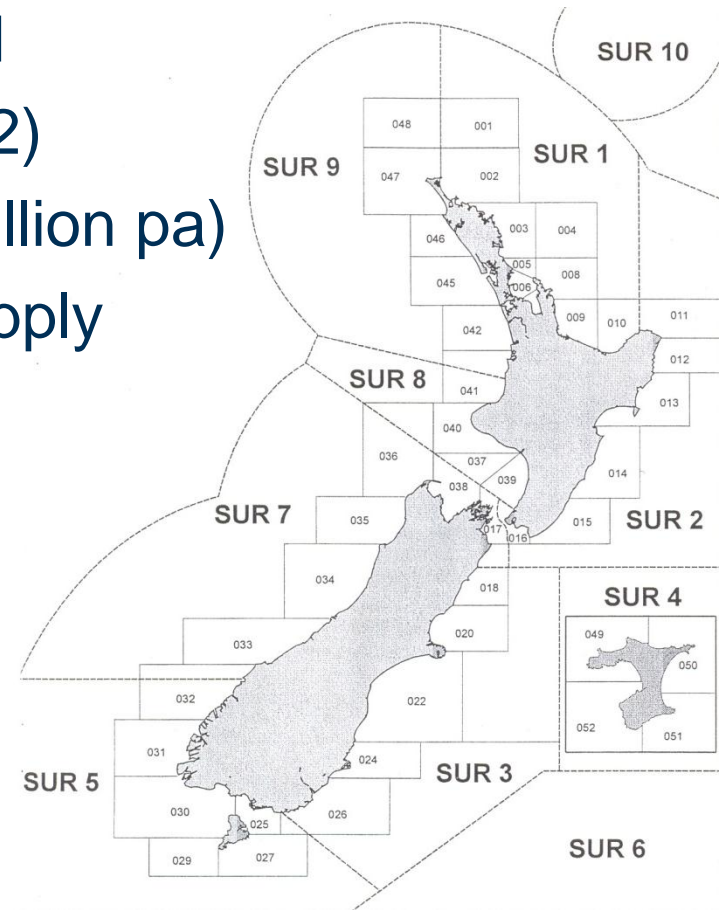
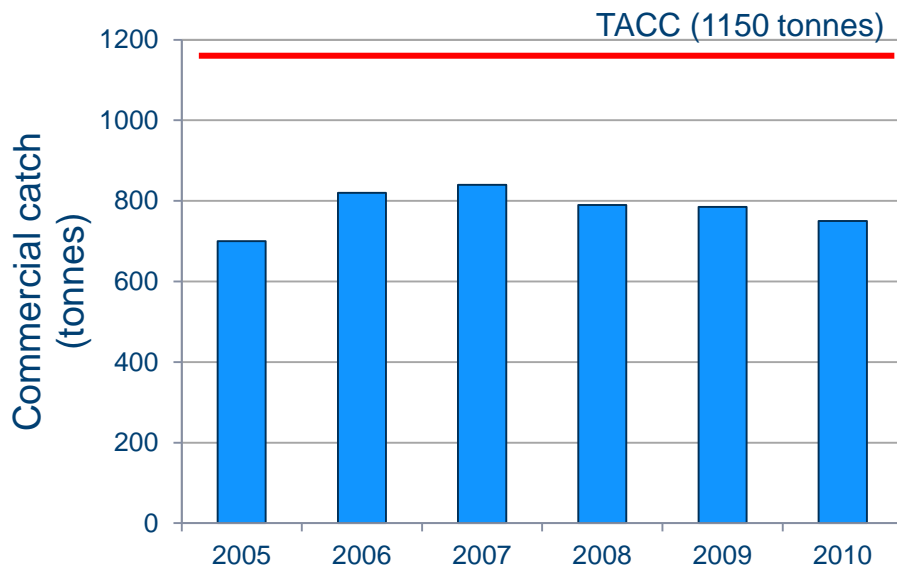




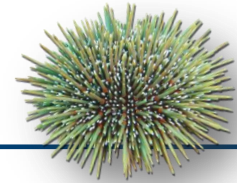
New Zealand sea urchin fishery



- Historical fishery (pre European)
- Only *E. chloroticus* (kina) collected
- Strictly controlled (QMS since 2002)
- Approx 1150t TACC (NZ\$ 5 – 6 million pa)
- Domestic demand greater than supply

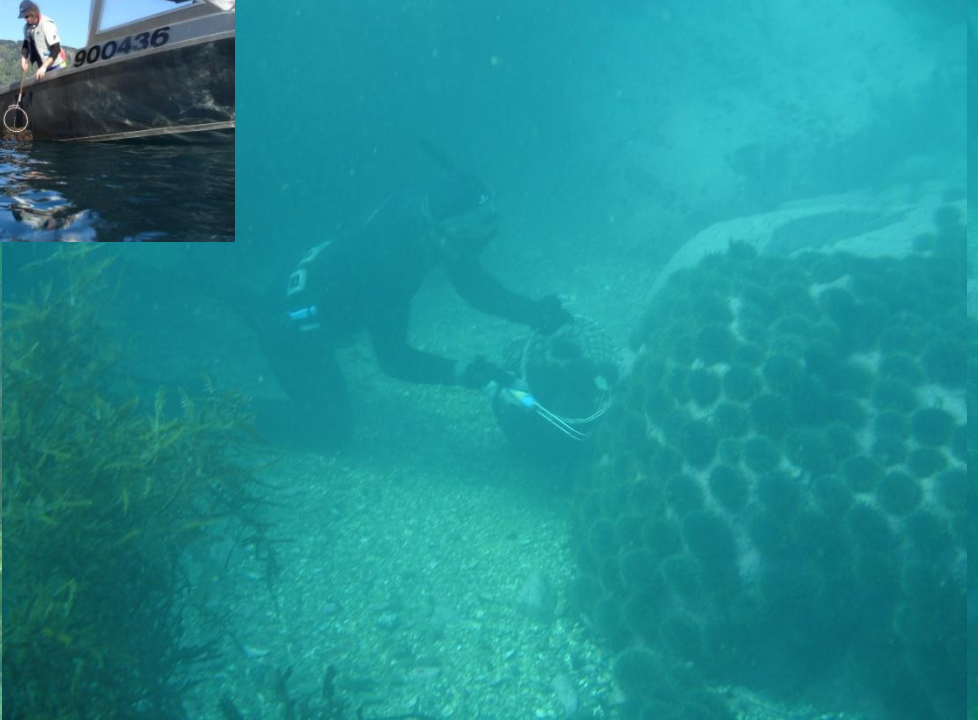
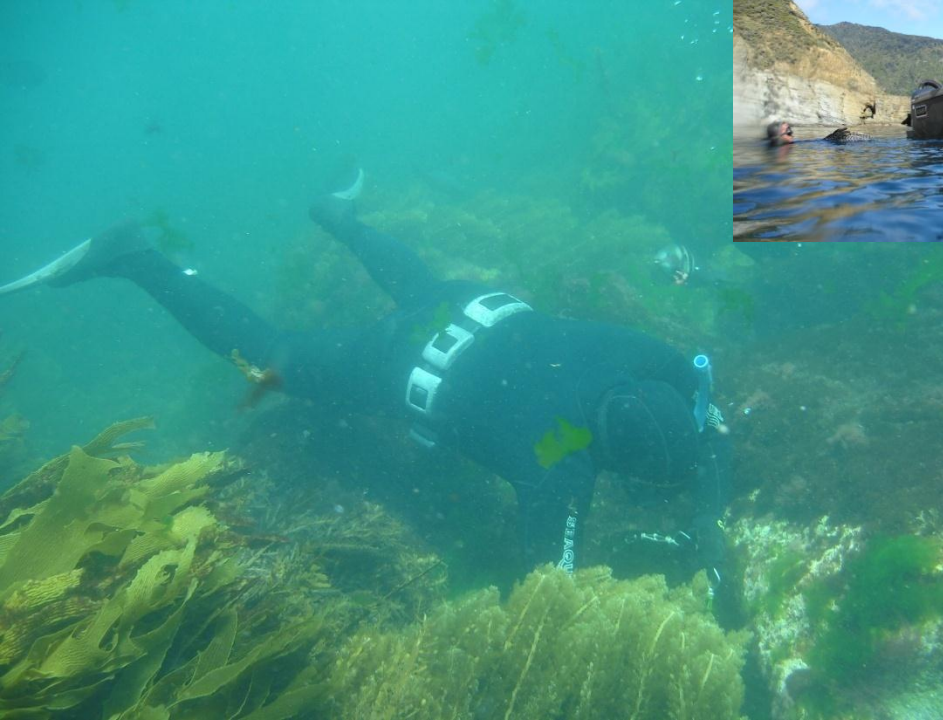


Collection of sea urchins in NZ

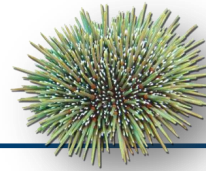


- Only collected on snorkel (dredge)
- Extremely variable roe quality and consistency due to:
 - reproductive cycle
 - feed availability
 - environmental conditions
- Difficult fishery; requires extensive local knowledge





NZ sea urchin processing



- 100% sold in domestic market
- Maori, Pacific Island, Asian
- No taste, colour, size grading
- 45-70 NZ\$/kg (180-280NOK/kg)
- Opportunities in Australia (not Japan for *E. chloroticus*)

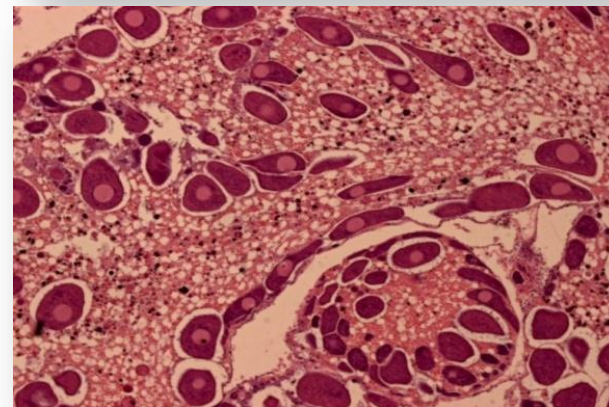
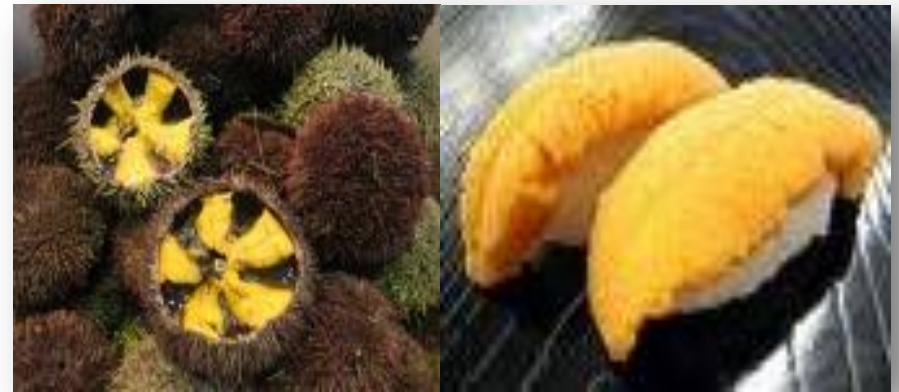
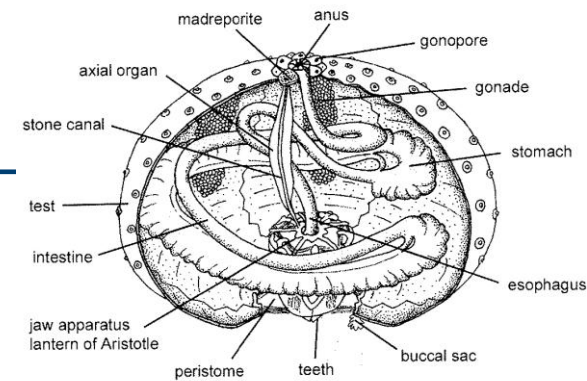


Sea urchin as a seafood product

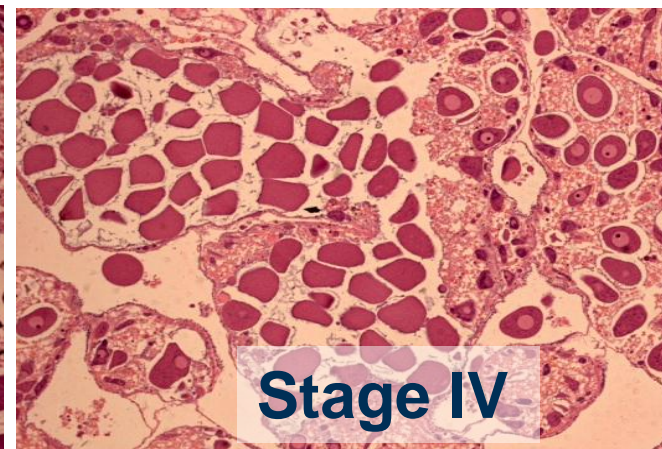
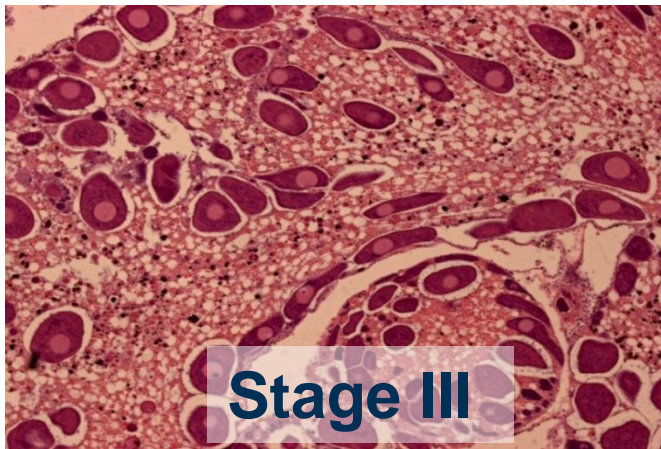
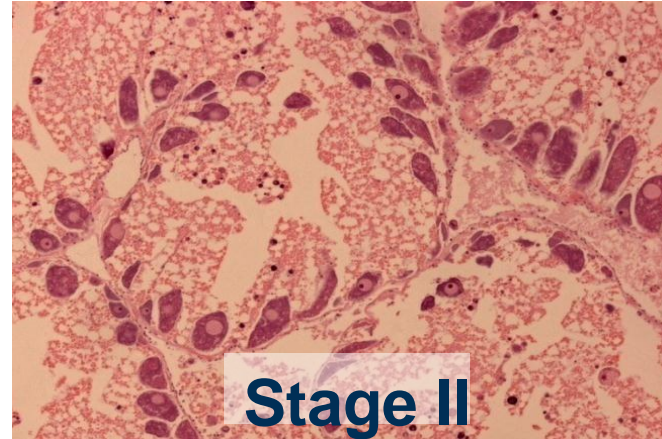
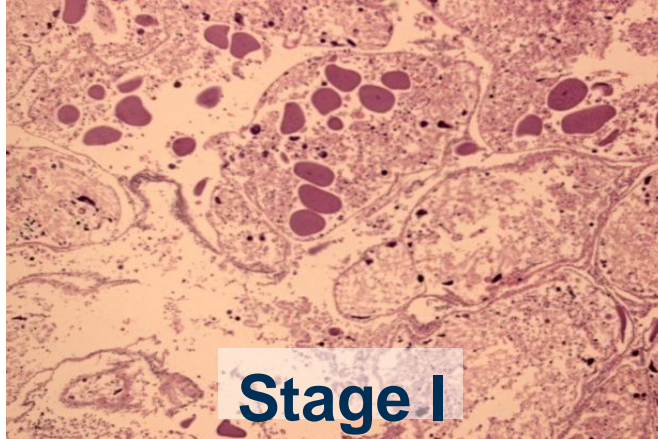


Sea urchin – a complex product

- Sea urchin roe (gonad) is a very complex product
 - *size, colour, texture, firmness, taste (umami)*
- Size of roe measured as gonad index or GI
- Unique cellular structure (two cell types)
 1. Reproductive cells (RC)
 2. Nutritive phagocytes (NP)

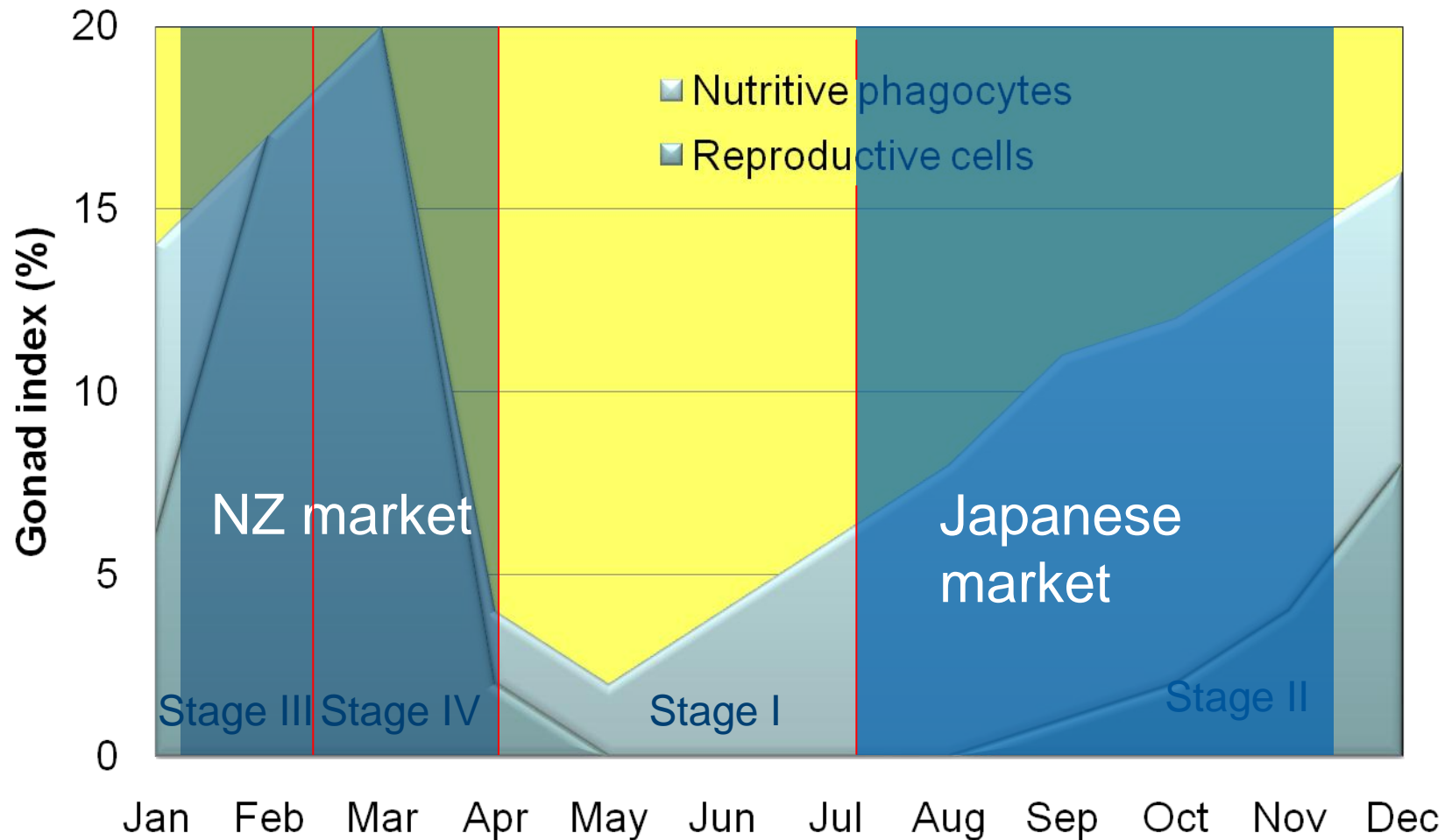


Gametogenic cycle in wild sea urchins



- Stage I - intergametogenesis and NP phagocytosis
- Stage II - pre gametogenesis and NP renewal
- Stage III - gametogenesis and NP utilisation
- Stage IV - end of gametogenesis, NP exhaustion and spawning

Gametogenic cycle (condition) in wild sea urchins



- The size (amount) and the quality of roe is constantly changing

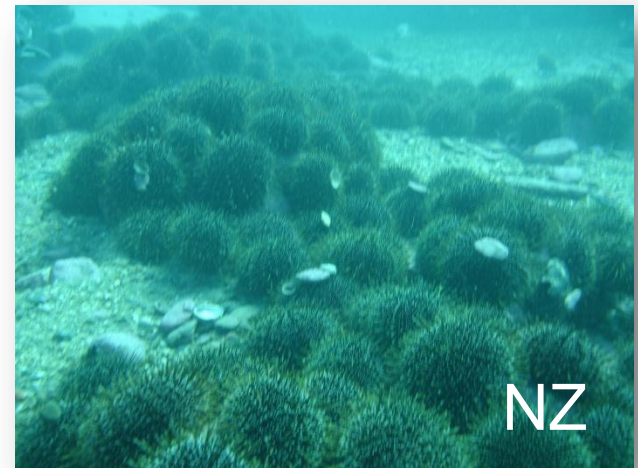
NZ research into variation in quality and sea urchin roe enhancement



Roe enhancement of poor quality sea urchins

Both Norway and NZ have significant stocks of low GI urchins (barrens)

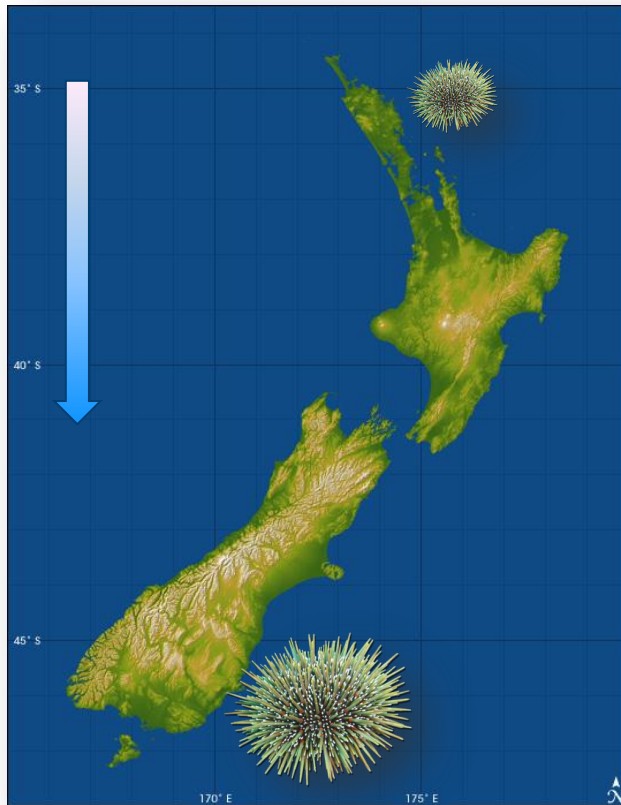
- 1. What is the economic cut off point for fishing?*
- 2. Where are the urchins with high GI and when can they be harvested?*
- 3. What sea urchins are suitable for roe enhancement?*



Biomass of 50,000 tonne of sea urchins in Norway

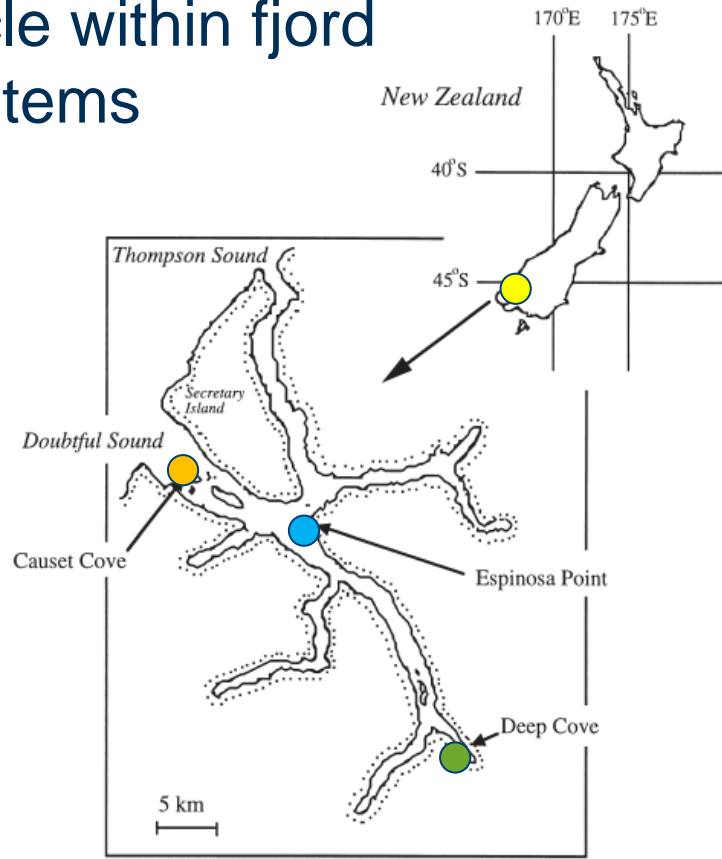
Latitudinal variation in sea urchins and condition

- Large latitudinal variation (thermocline)
- Morphology and 'economic cut off point'



Spatial variation in fjords in NZ

- Significant differences in GI and gametogenic cycle within fjord systems



(similar pattern in Tromsø)

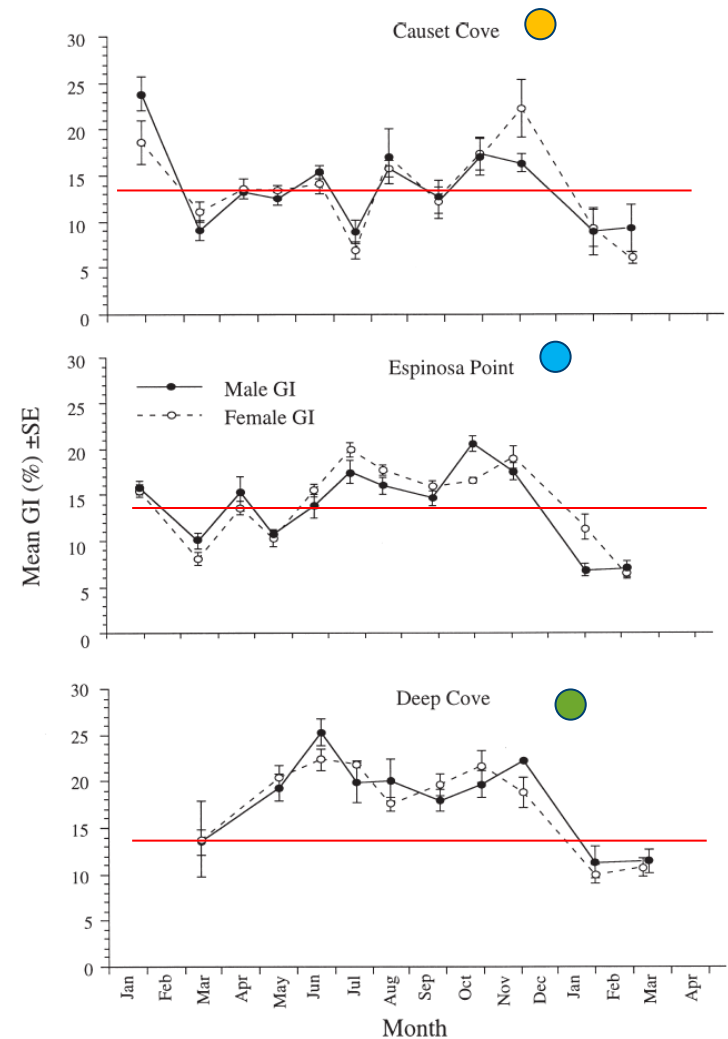
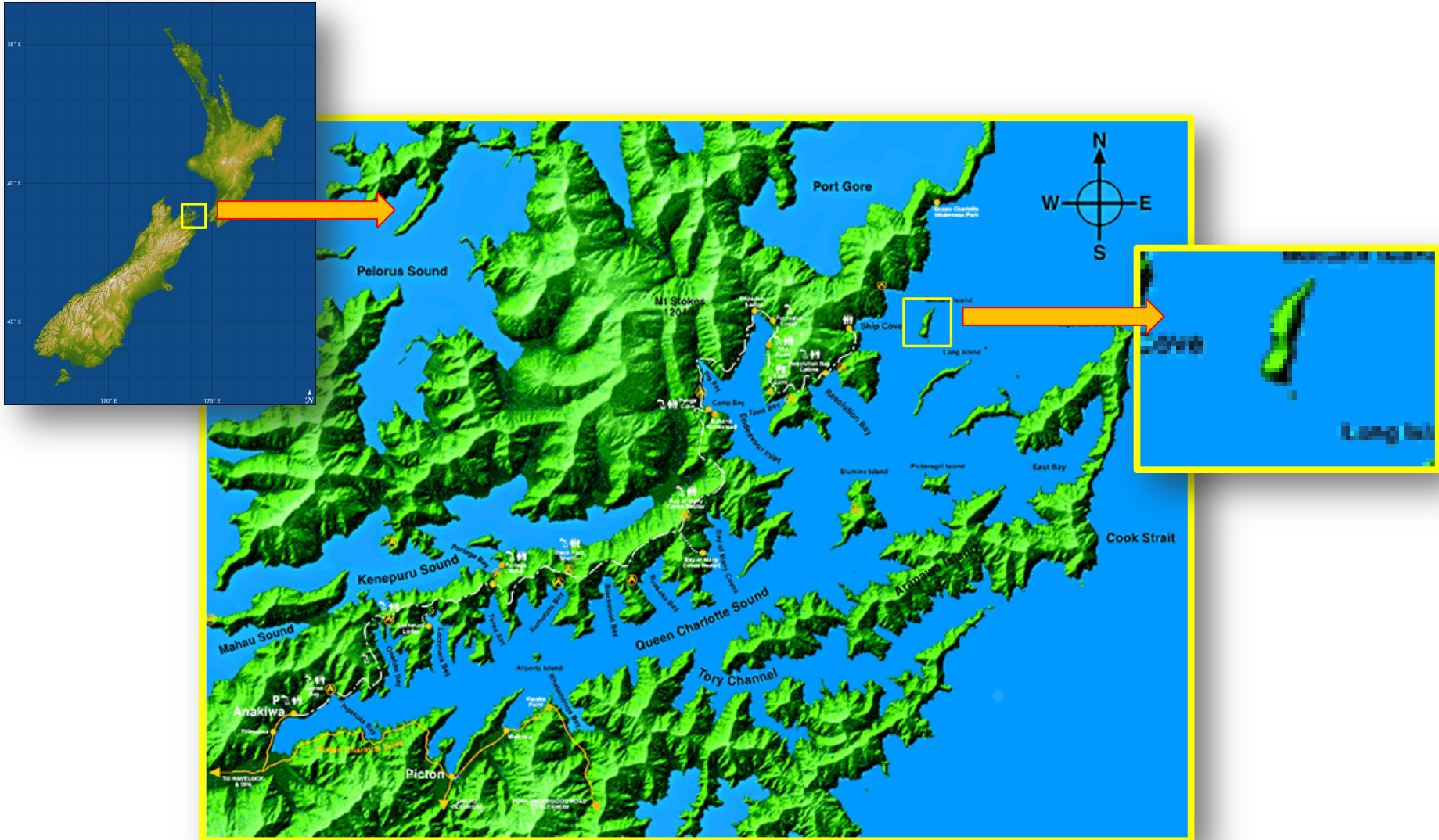
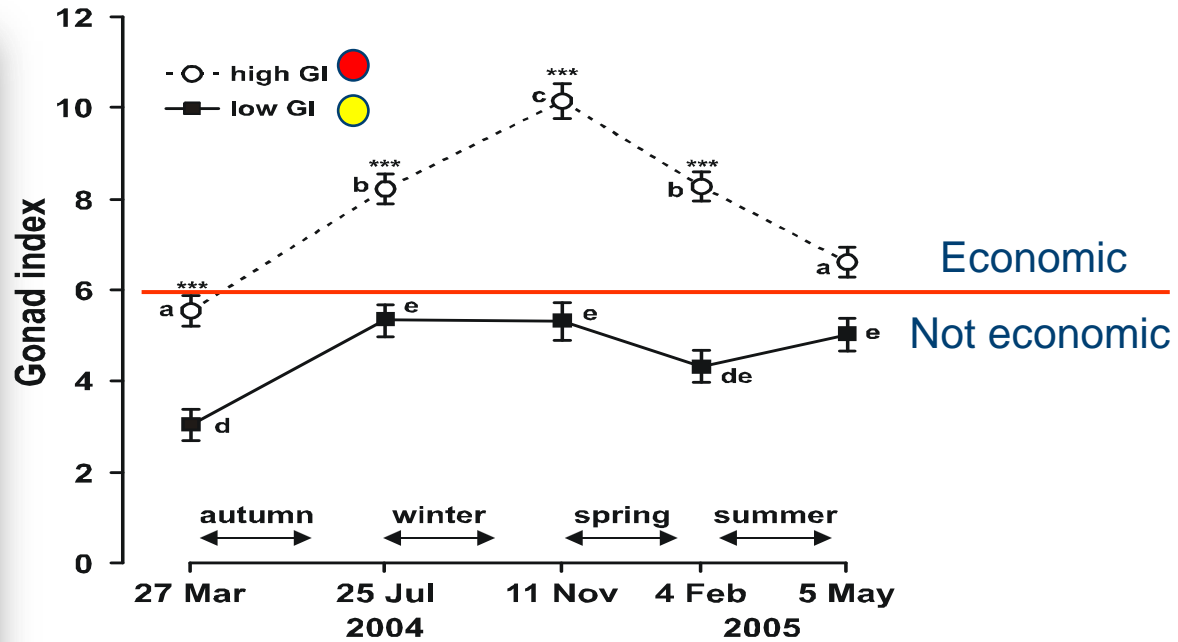
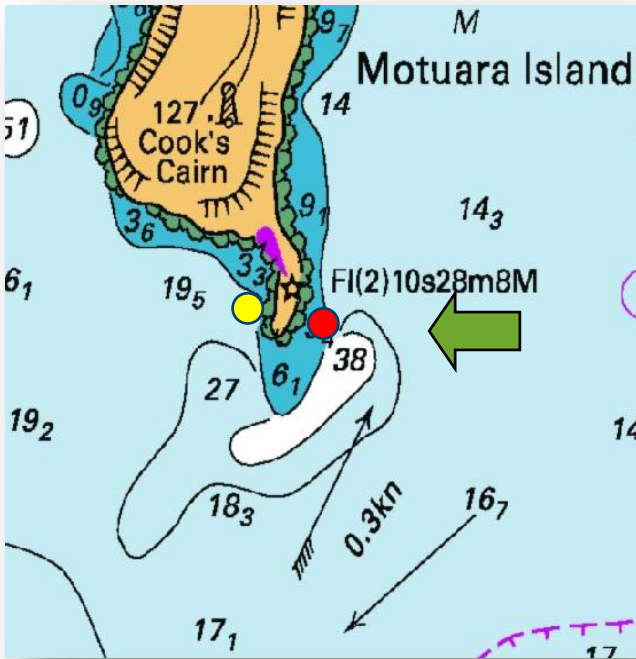


Fig. 2 Changes in the male and female gonad index (GI) between 27 January 1993 and 28 February 1994 for *Evecchinus chloroticus* from Doubtful Sound, Fiordland, New Zealand.

Small scale variation – Marlborough Sounds study



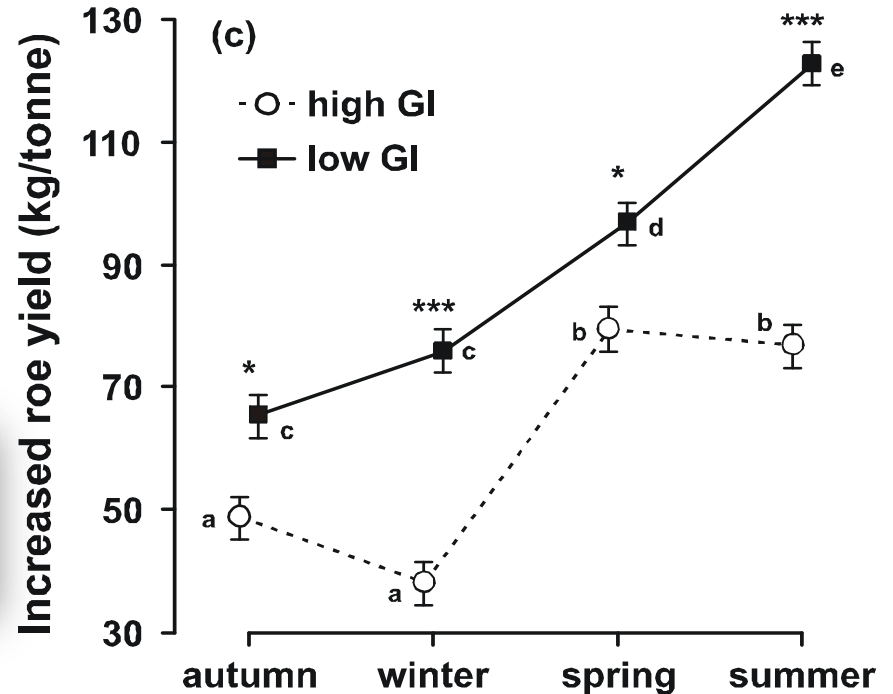
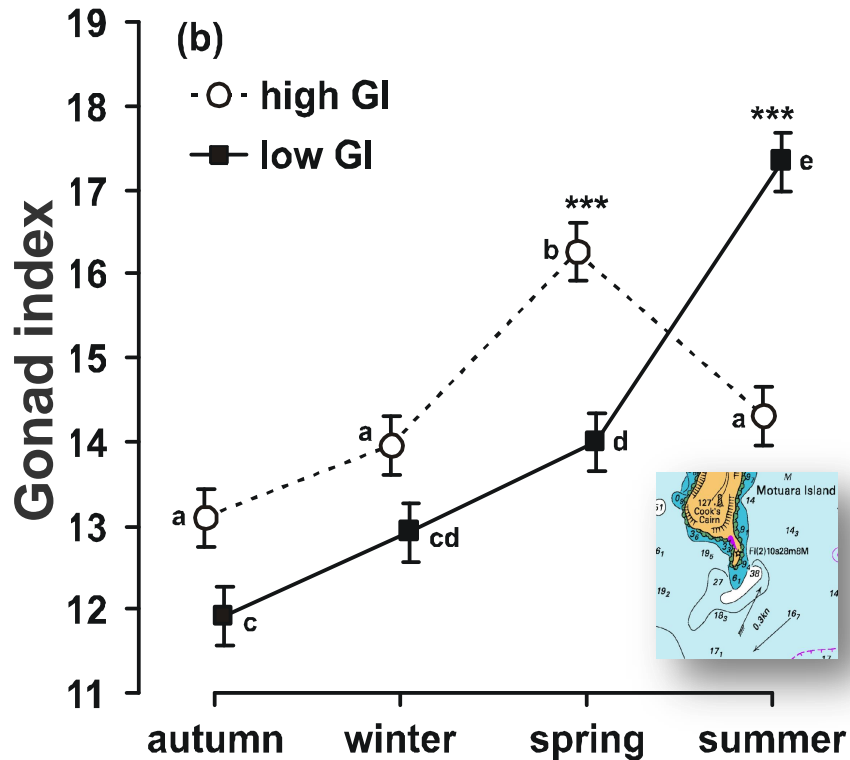
Small scale variation in GI



Depends on environmental conditions

- feed availability
- currents (water movement)

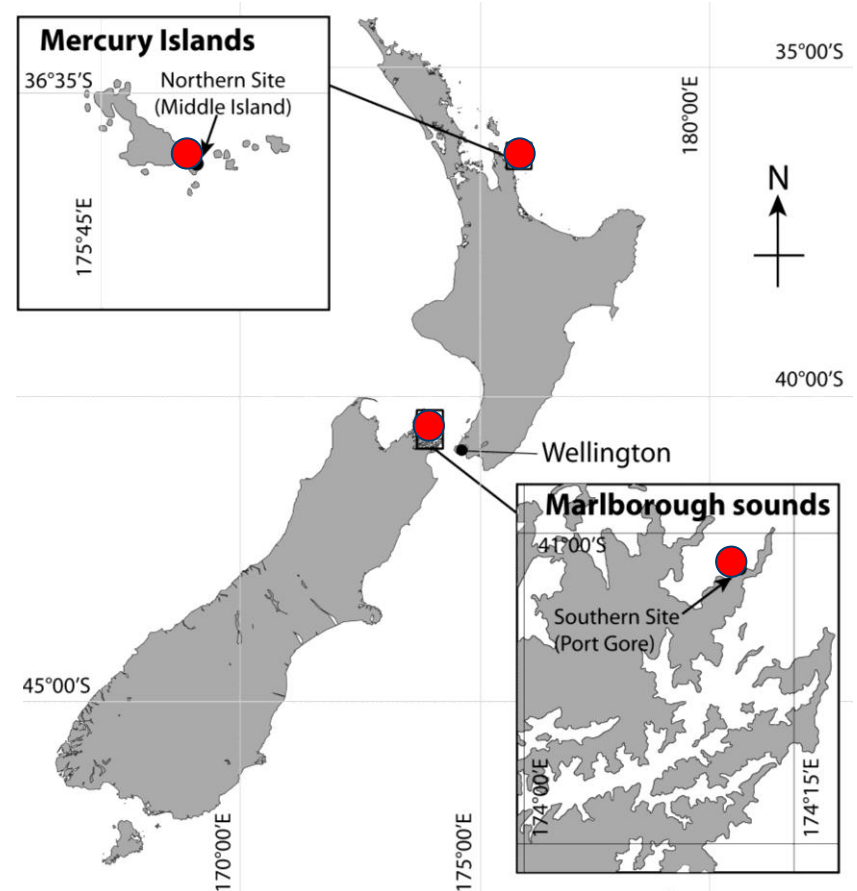
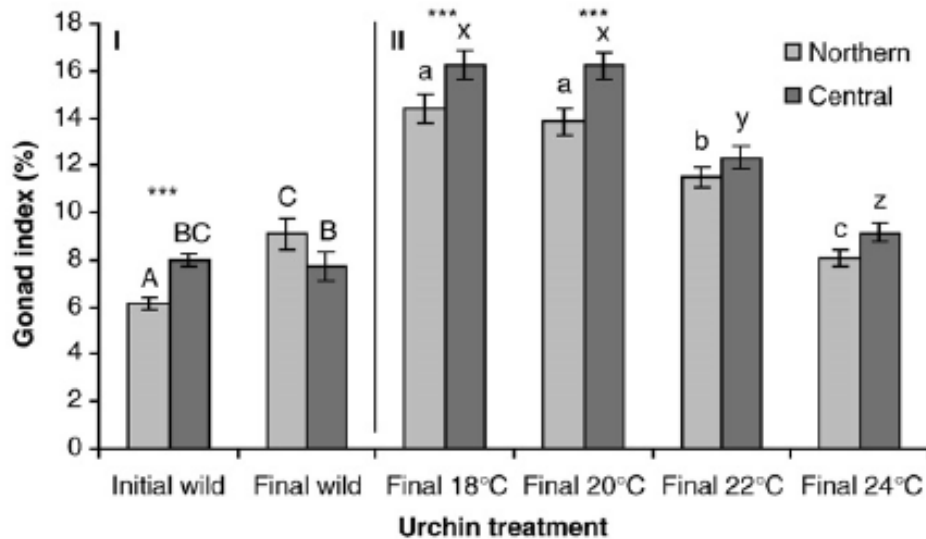
Roe enhancement of low vs. high GI sea urchins



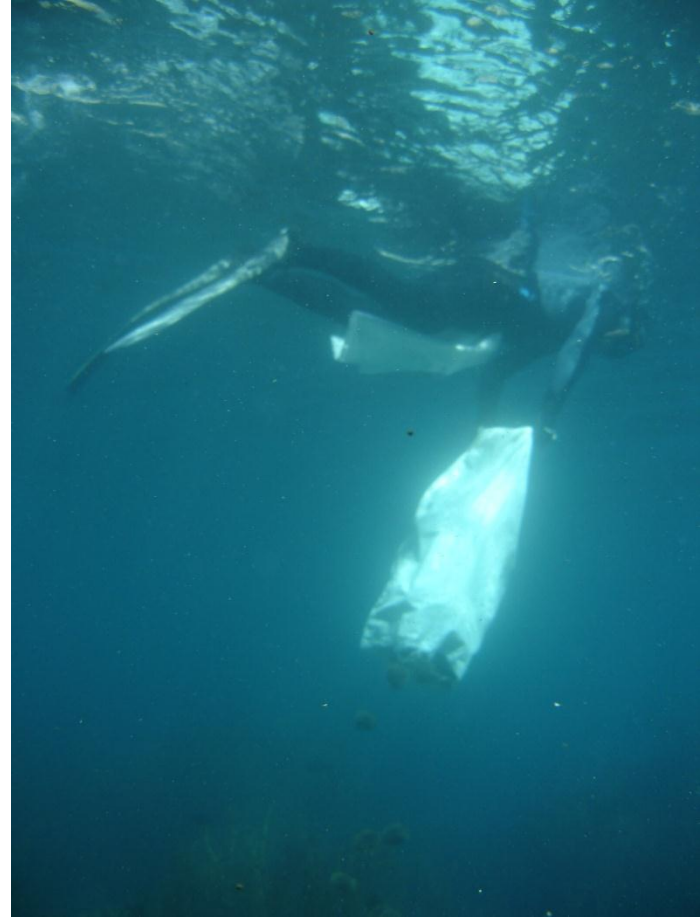
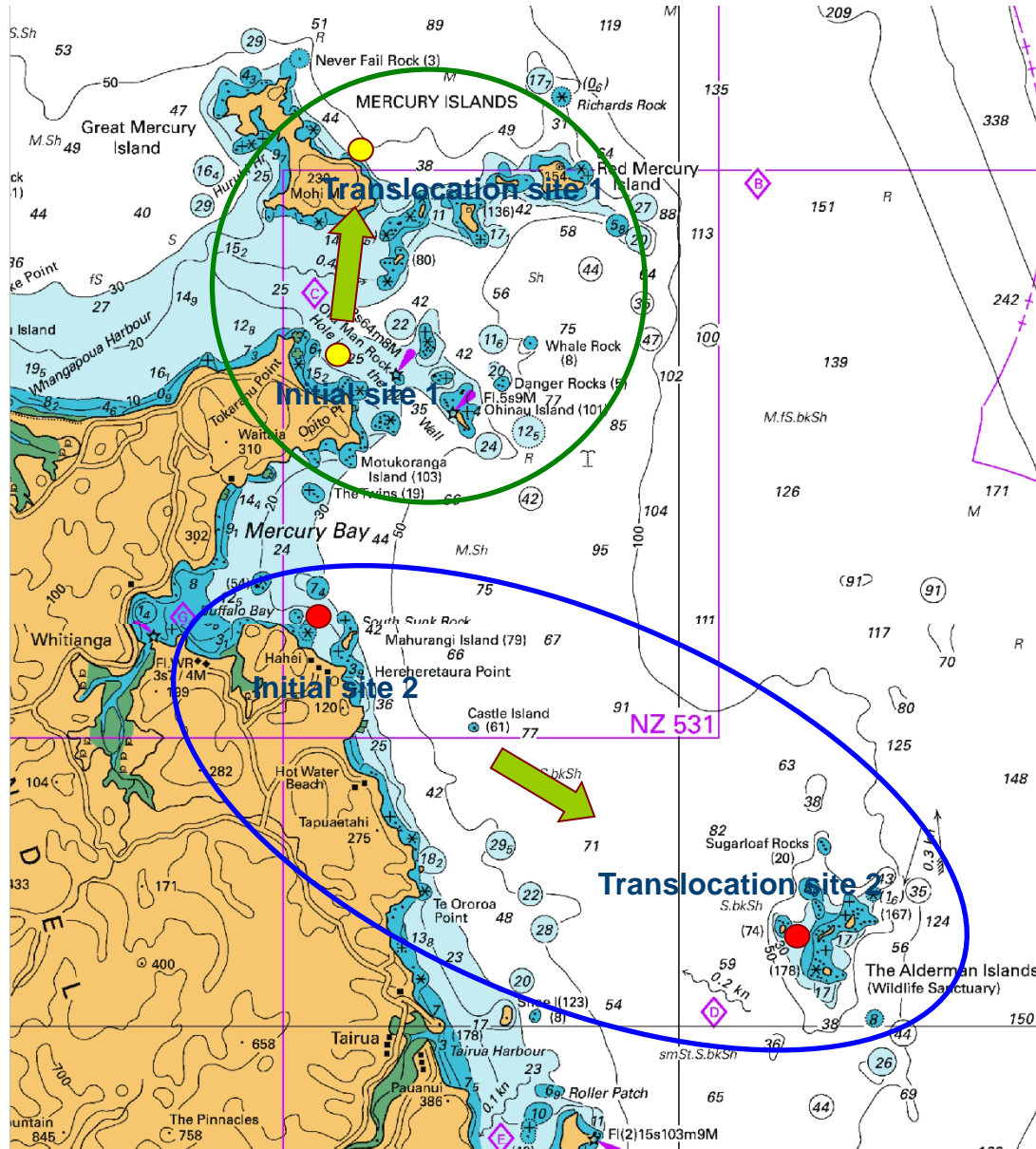
- Significant increase in yeild from low initial GI sea urchins
 - especially in summer and winter
 - related to temperature and food supply (similar results in Norway)

Latitudinal variation in roe enhancement

- Significant differences in the increase in GI from sea urchins collected at different latitudes

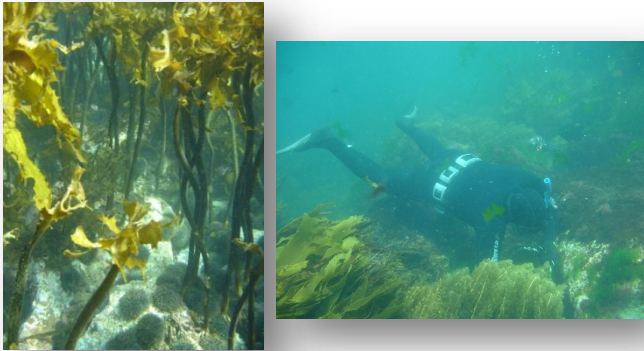


Translocation of sea urchins

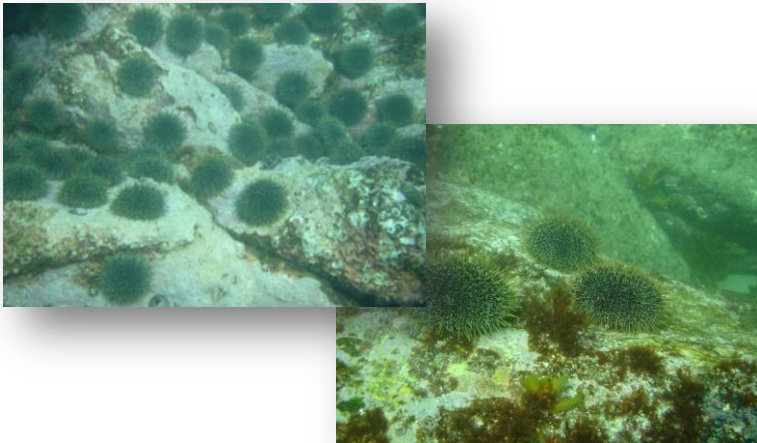


Translocation

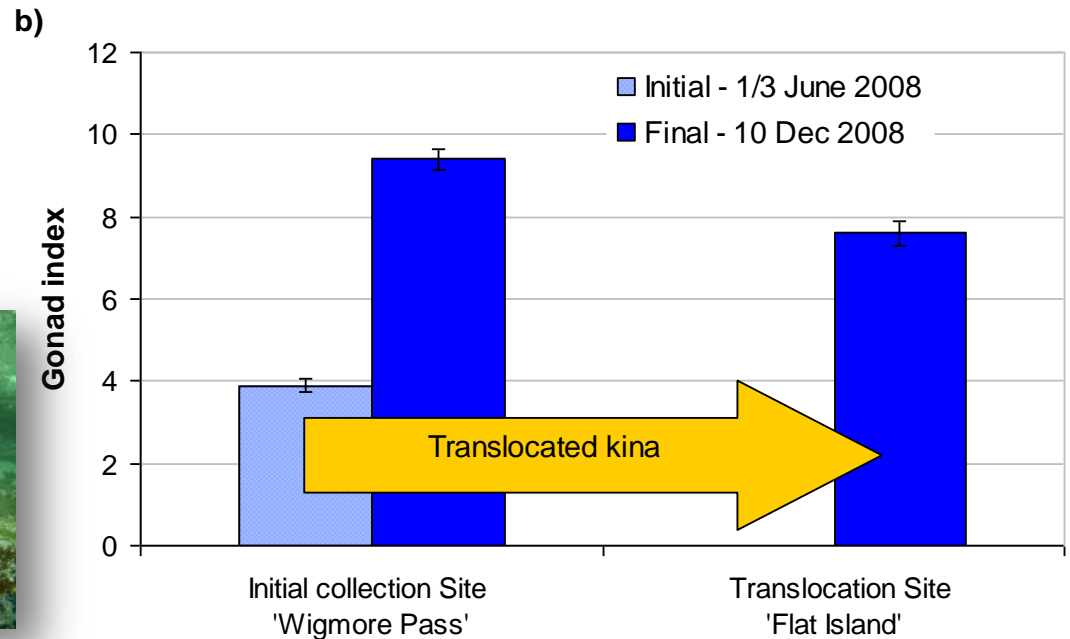
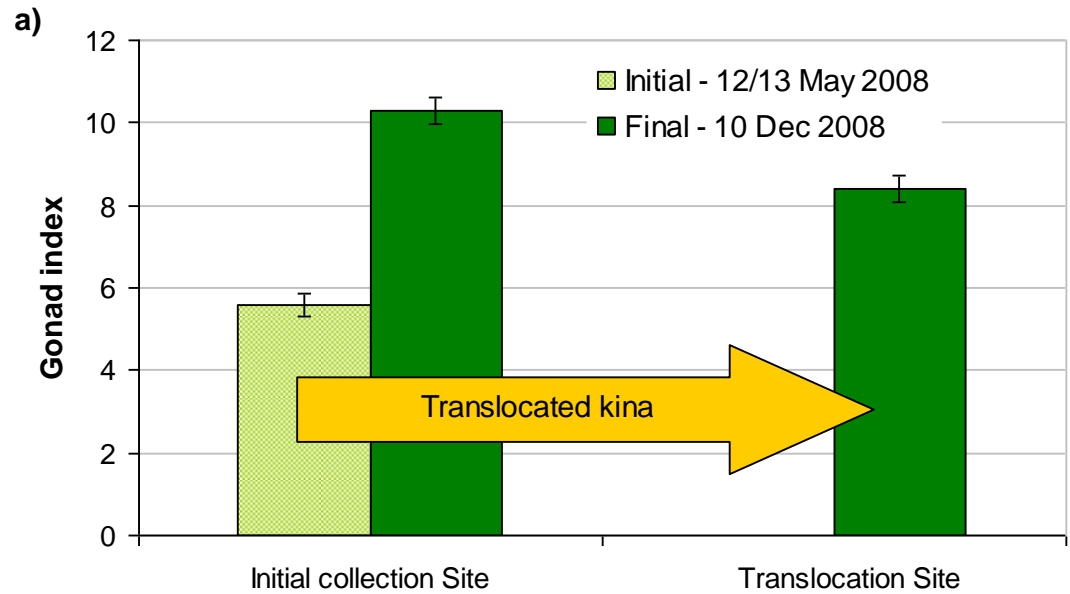
Significant increase in GI at both initial and translocation sites



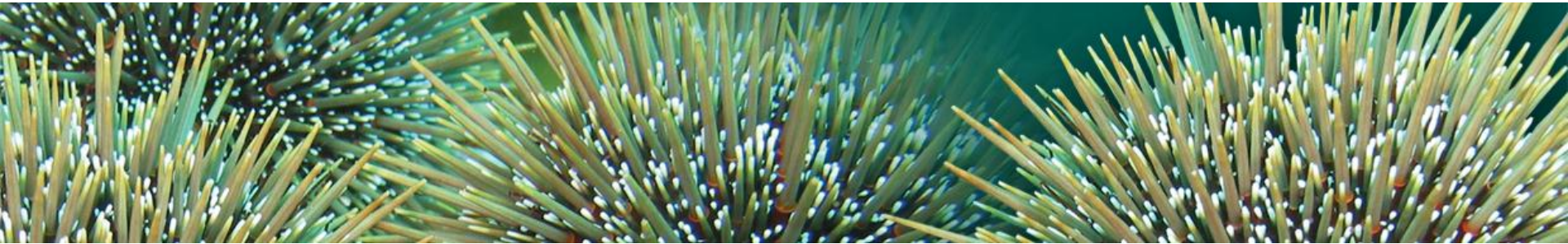
- Site selection



- Site revegetation



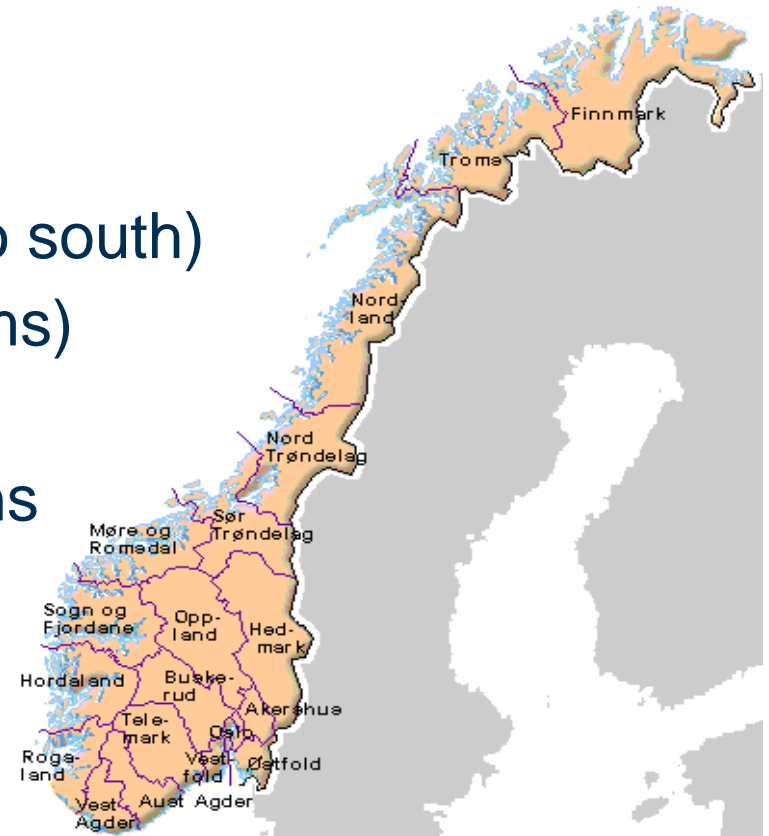
Possible sea urchin research in Norway



Knowing when and where to fish urchins?



- Improve the basic understanding of the reproductive cycle of sea urchins in Norway
 - large scale (latitudinal, north to south)
 - small scale (within fjord systems)
- Describe environmental conditions that effect GI
(currently monitoring 2 populations in Tromsø)



Alternative fishing techniques for sea urchins

In addition to current methods:

- Trapping / novel trapping techniques
 - in areas of very high current
 - during winter months
- Snorkel teams in certain conditions
- Determine extent and range of parasitic nematode (*hinomermella matsi*)
- Other suggestions?



Key questions for development of the Norwegian sea urchin fishery

- *Where are the good quality sea urchins?*
- *When can they be harvested?*
- *What is the most effective way to harvest them?*
- *How to utilise poor quality sea urchins?*

