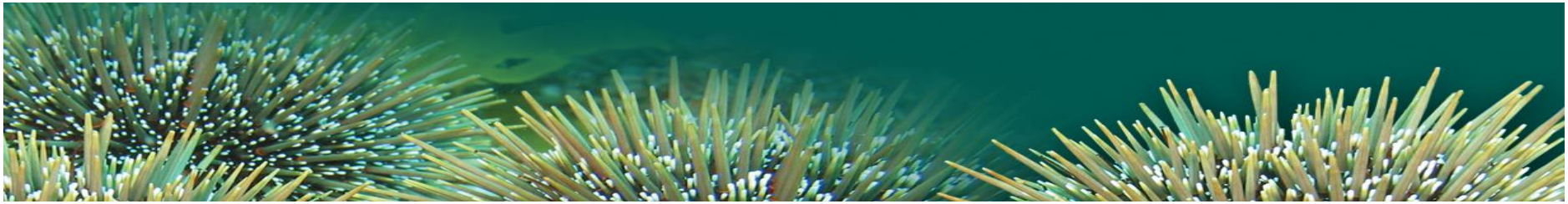


Sea urchin harvest: ecosystem recovery, integrated management of social-ecological system, ecosystem service and sustainability (ECOURCHIN) (2015-2017)

Wenting Chen

Norwegian Institute for Water Research

ECOURCHIN

Harvest urchins-restore kelp forest

NIVA Nofima

UiT Norges arktiske universitet

Berkeley University of California

Fram Centre

Nofima

NIVA
Norwegian Institute for Water Research

UiT
NORGES
ARKTISKE
UNIVERSITET

Berkeley
UNIVERSITY OF CALIFORNIA

Dagens Nord Norge:

Urchin dominated barren grounds

When urchin is away, kelp will grow back

Christie (1996), Fagerli et al

Photo:
Camilla With Fagerli, NIVA

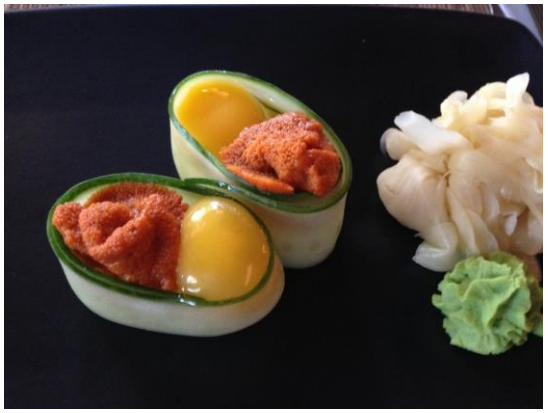
Urchin: a valuable product

Blue growth: a win-win solution?

From Barren grounds

One stone two birds

Direct export benefits



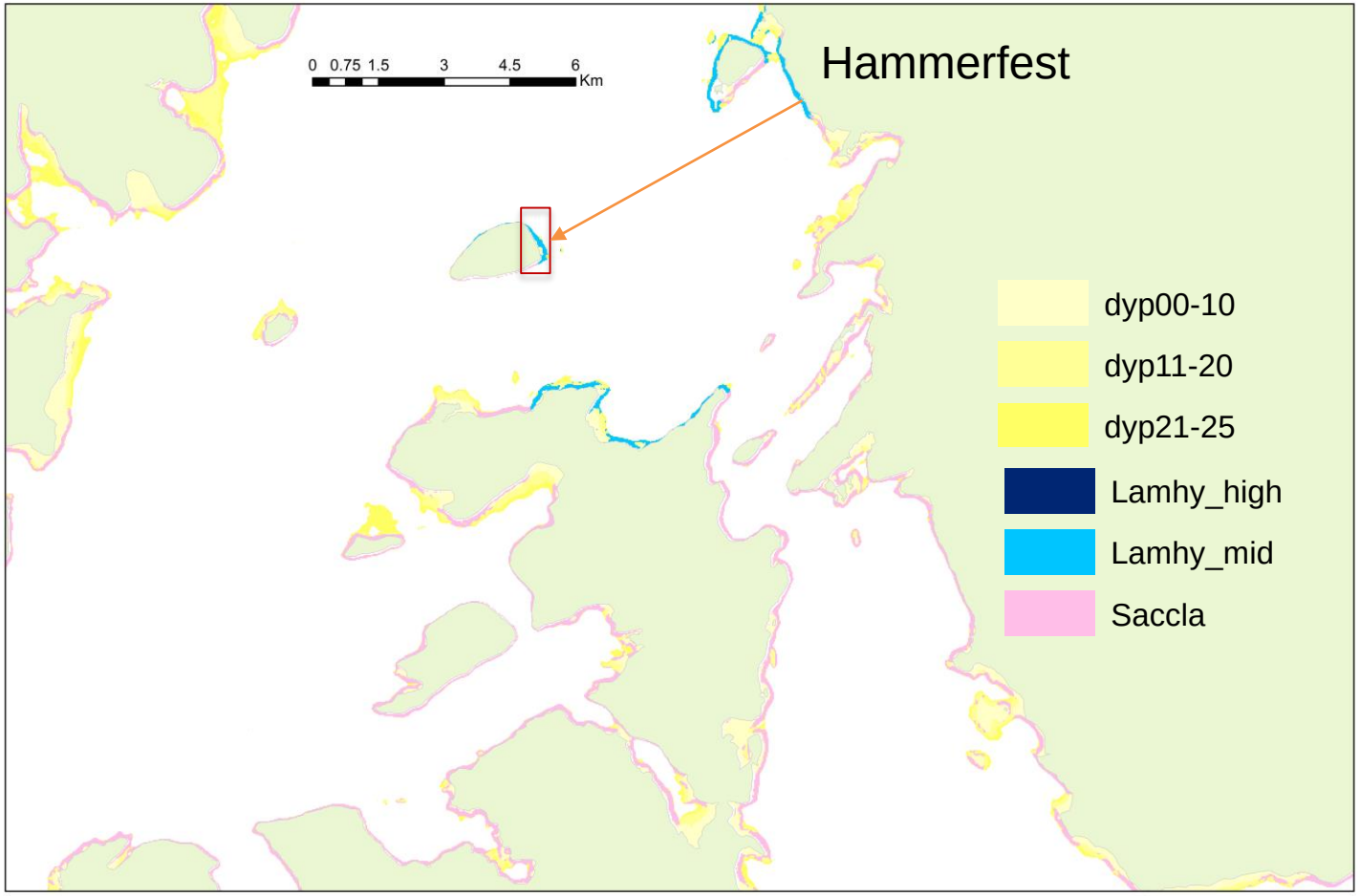
Kelp habitat recovery

Project objectives

- Identify current and future spatial distribution of sea urchins by GIS modelling (WP1)
- Study the impacts of sea urchin harvesting on the marine ecosystem, and habitats taking into account kelp recovery after the urchin harvesting. (WP2)
- Investigate optimal harvesting paths considering kelp-urchin dynamics and integrated social-ecological system (WP2)
- Study impacts of the new urchin industry and kelp recovery on ecosystem services and local communities including both economic and ecosystem service benefits. (WP3)

WP1&2: Sustainable urchin harvesting: where and how much

Scenario: harvest along the fully recovered kelp forest

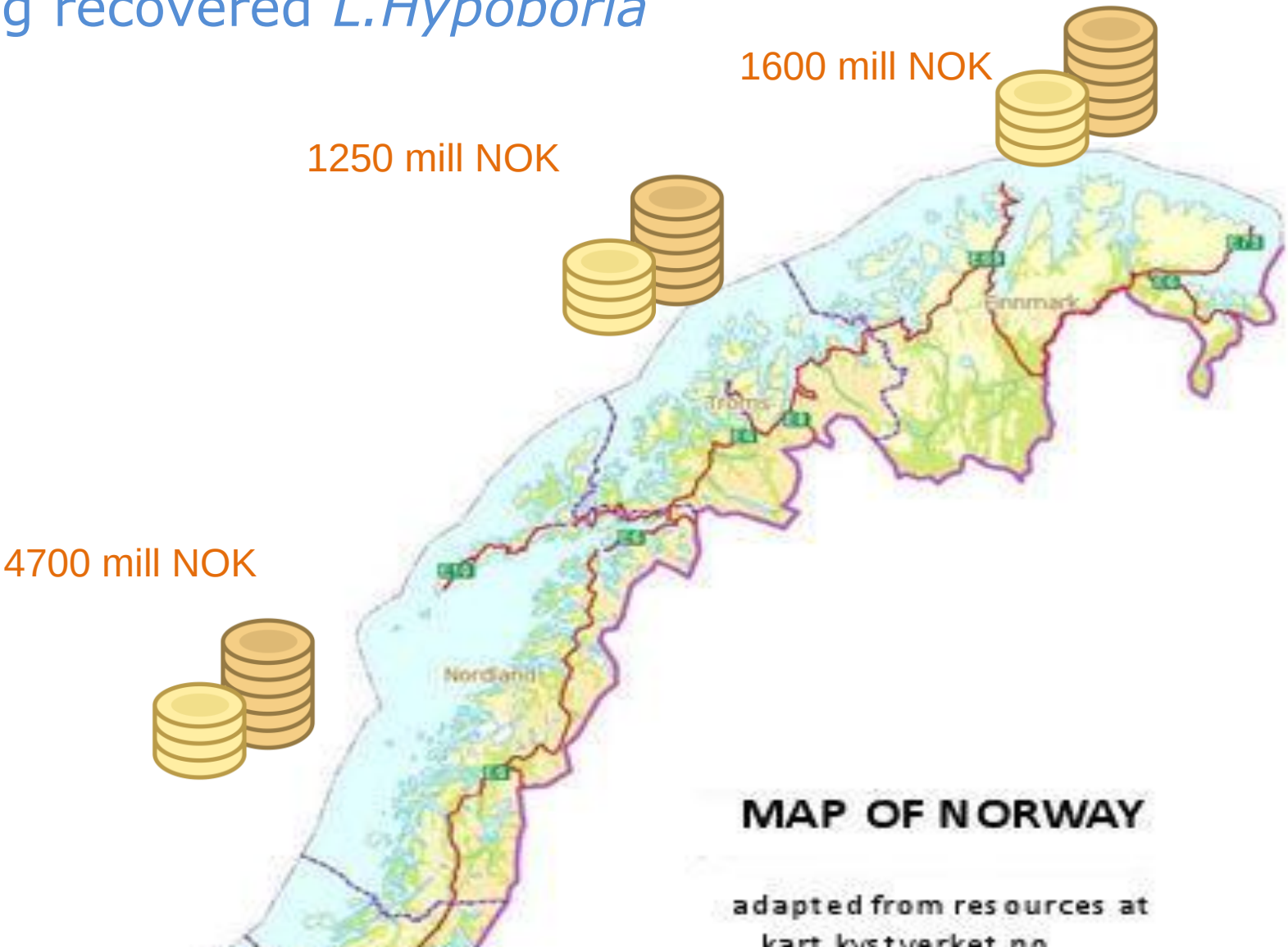


- Where to harvest: GIS
- How much to harvest(per rectanguler):
  - 1 diver 500kg per day
  - 480kg large urchins each season

Chen et al (in preparation)

Harvesting value in 3 northern counties for the next 50 years

along recovered *L.Hypoboria*

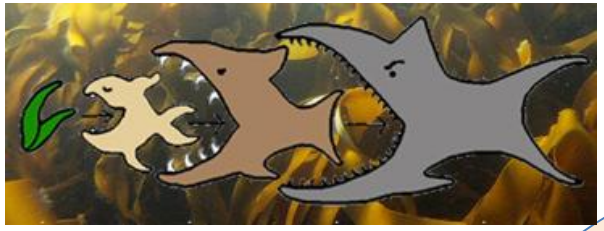


WP2& WP3
Community effects and ecosystem services benefits from kelp restoration

Fishery

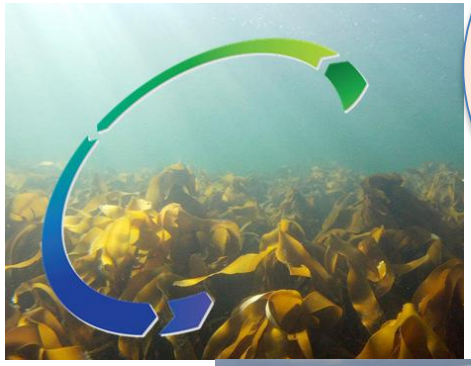
Kelp harvesting

Carbon storage



Ecosystem services provided by kelp forest

Photosynthesis



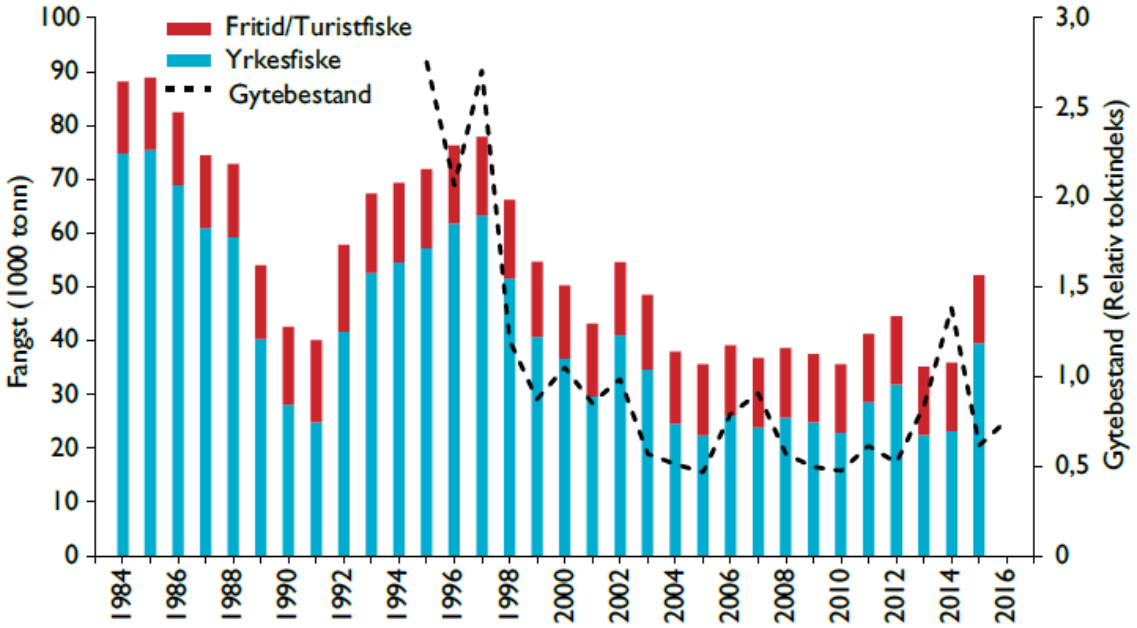
Bioremediation

Wave damping

Tourism

Production services: increased value of coastal cod from kelp recovery

Coastal cod northern of 62 N°



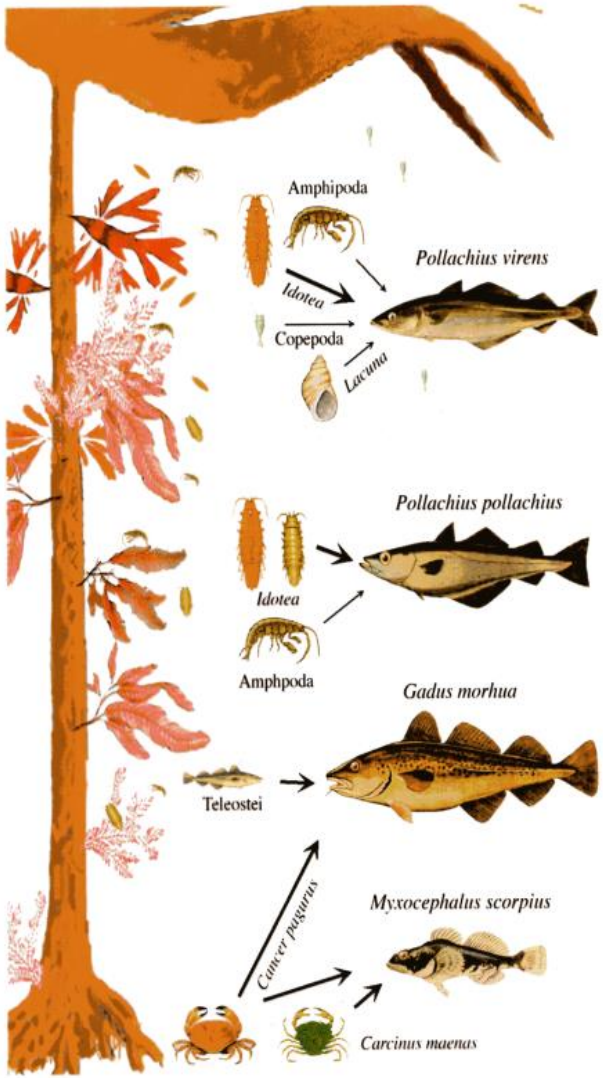
Anslag for fangst og gytebestandsindeks av norsk kysttorsk.

Estimated catch and spawning stock survey index of Norwegian coastal cod. Hatched line showing spawning stock survey index.

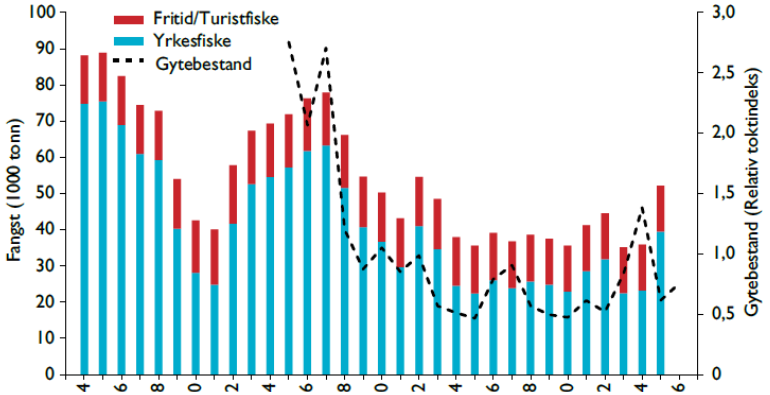
HI repport (2017)

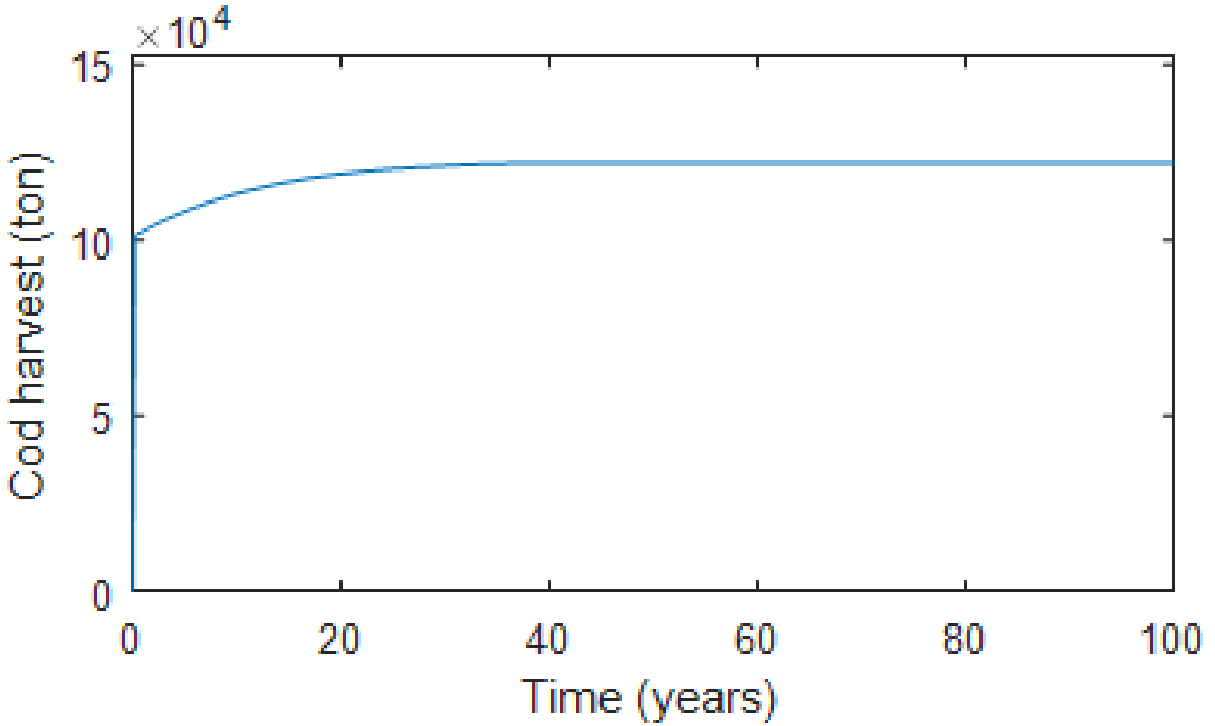
Ecosystem service value provided after full recovery of kelp forest: coastal cod

Vondolia et al. In preparation



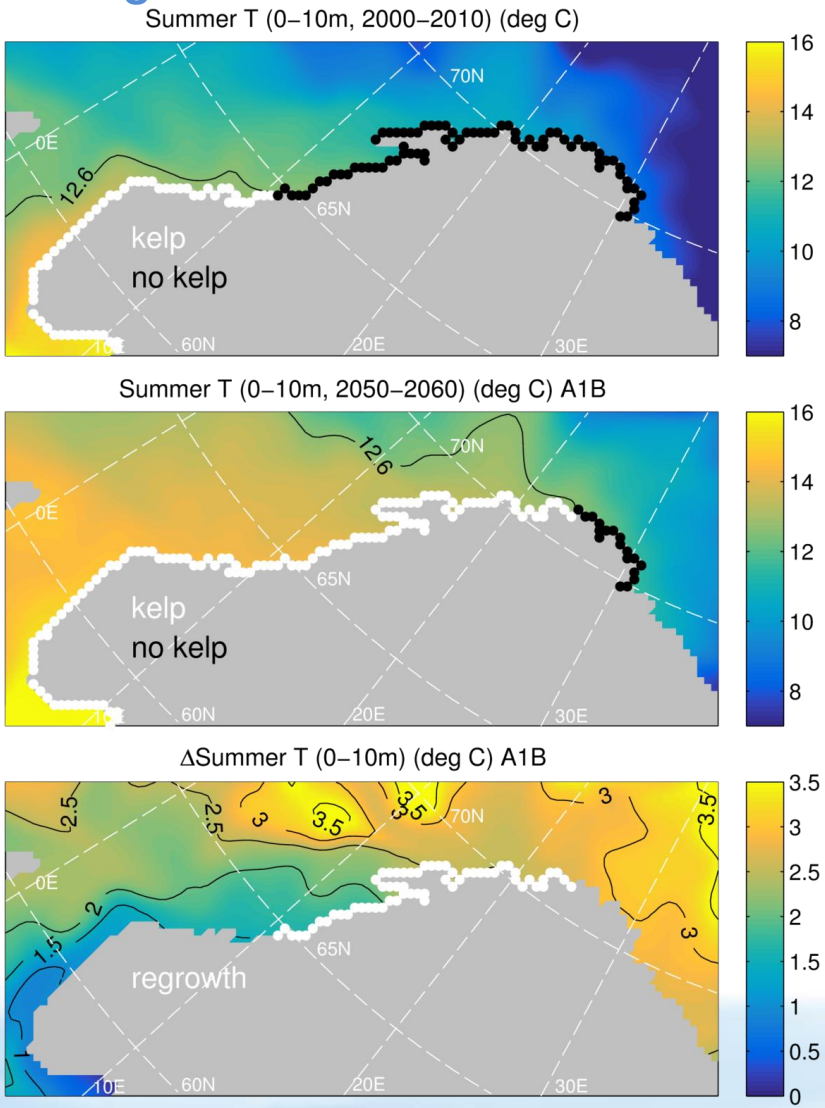
+1billion NOK/year





Carbon value

Ecosystem services for marine and climate management- Potential socioeconomic effects of climate change



A hotspot in the north of Norway between 65 N and 70N

Saccharina regrowth over 50 years

Mean kelp carbon storage = 1 kg C/m2

→ Regrowth carbon storage = 60*111000*625 = **4.2 Mt C**

→r=5%
Reduction of social cost of carbon
= 4.2 Mt C* 27 USD per metric ton of C
= 113,4 M USD= **935 M NOK**

→r=2.5%
Reduction of social cost of carbon
= 4.2 Mt C* 98 USD per metric ton of C
= 412 M USD= **3393 M NOK**

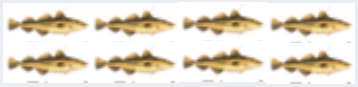
Value of regional carbon regulating service has a global effect.

OA services project: Chen et al. In preparation

Quantifying supporting services

Choice experiment

Marine Ecosystem Restoration in Changing European Seas

	Option A	Option B	No Change
Biodiversity			
Nurseries			
Total area of kelp forest recovered			**None**
Annual increase in personal income tax			**0**

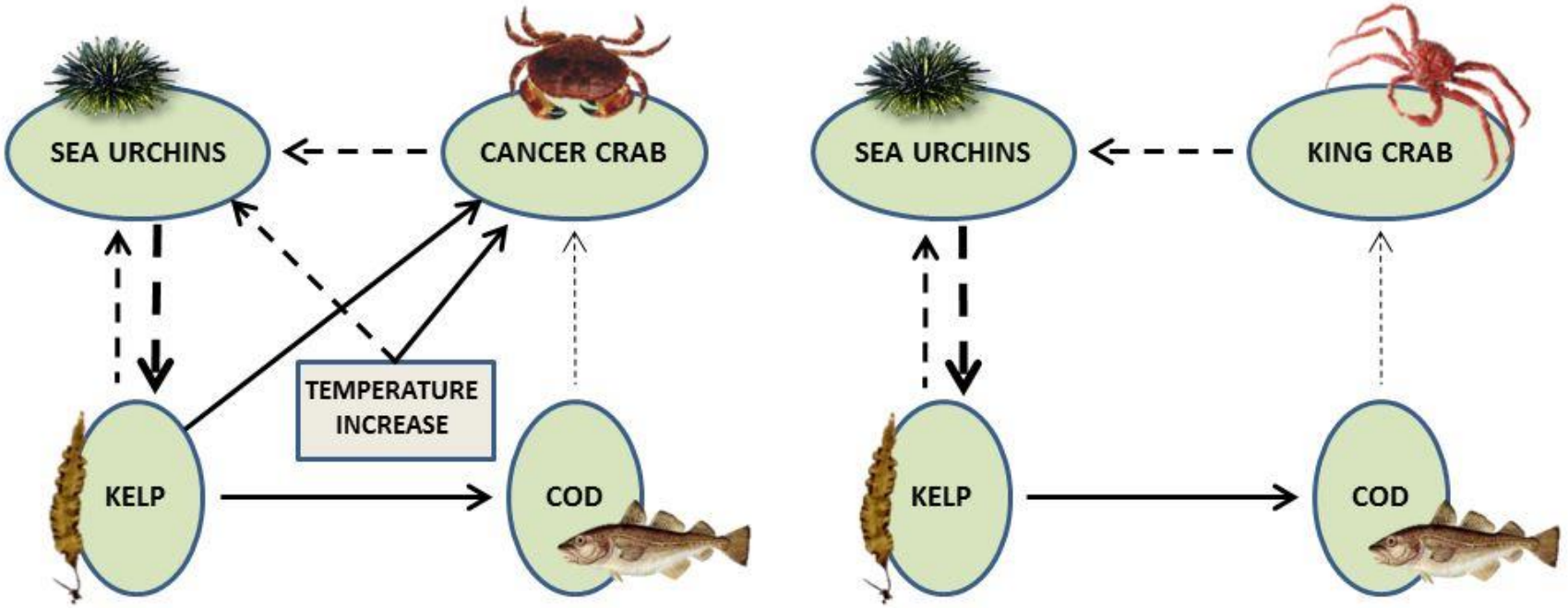
ECOURCHIN
Harvest urchins-restore kelp forest

NIVA

Fram Centre

Next step

- Multi trophic level effects; Integrated ecosystem service ocean management and governance
- Nature capital/Ecosystem Accounting (SEEA) and sustainable resource management
- Climate change effect on sustainable ocean resource management



På Forskingstoget i Oslo i September 2015