

Storskala endringer i kystnære økosystemer i Midt- og Nord-Norge

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**Complex interactions between effects of ocean
warming and predation on recovery of kelp beds,
Northern Norway**

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Ocean warming ++



Southern Norway:
Kelp losses and kelp
overgrown by turf algae

Ocean warming



Northern Norway:

Sea urchin density reduction ----- and kelp recovery
after 45 years with barren deserts

Take advantage of this event to increase knowledge on processes
and drivers.

Surveys, field and lab experiments, fishing, stomach content

Jan-Mayen

Barent Sea

Cancer pagurus



+ ocean warming

69°N

63°N

Carcinus maenas



Paralithodes camtschaticus

Kelp recovery
1990-2018
660 km
24 km/yr

A mosaic
pattern of
barrens and
recovered kelp
forests

North
Sea

Norge

Sverige

Oslo

Stockholm

Helsinki

Tallinn

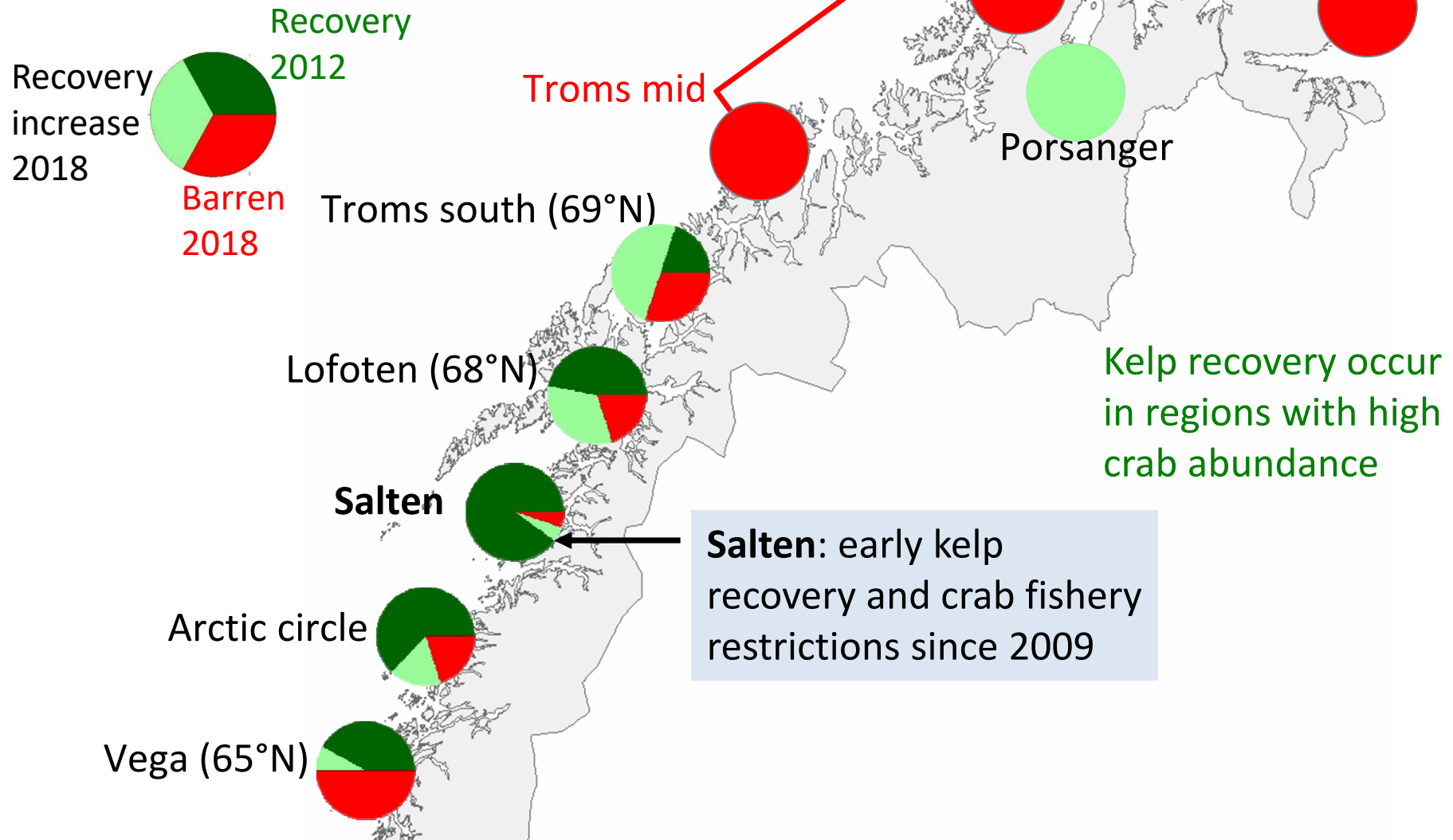
Estland

Riga

Litauen



Kelp recovery 2012 - 2018



Sea urchin threats at different life stages



High **temperature**
critical for sea urchin
larvae

Predation

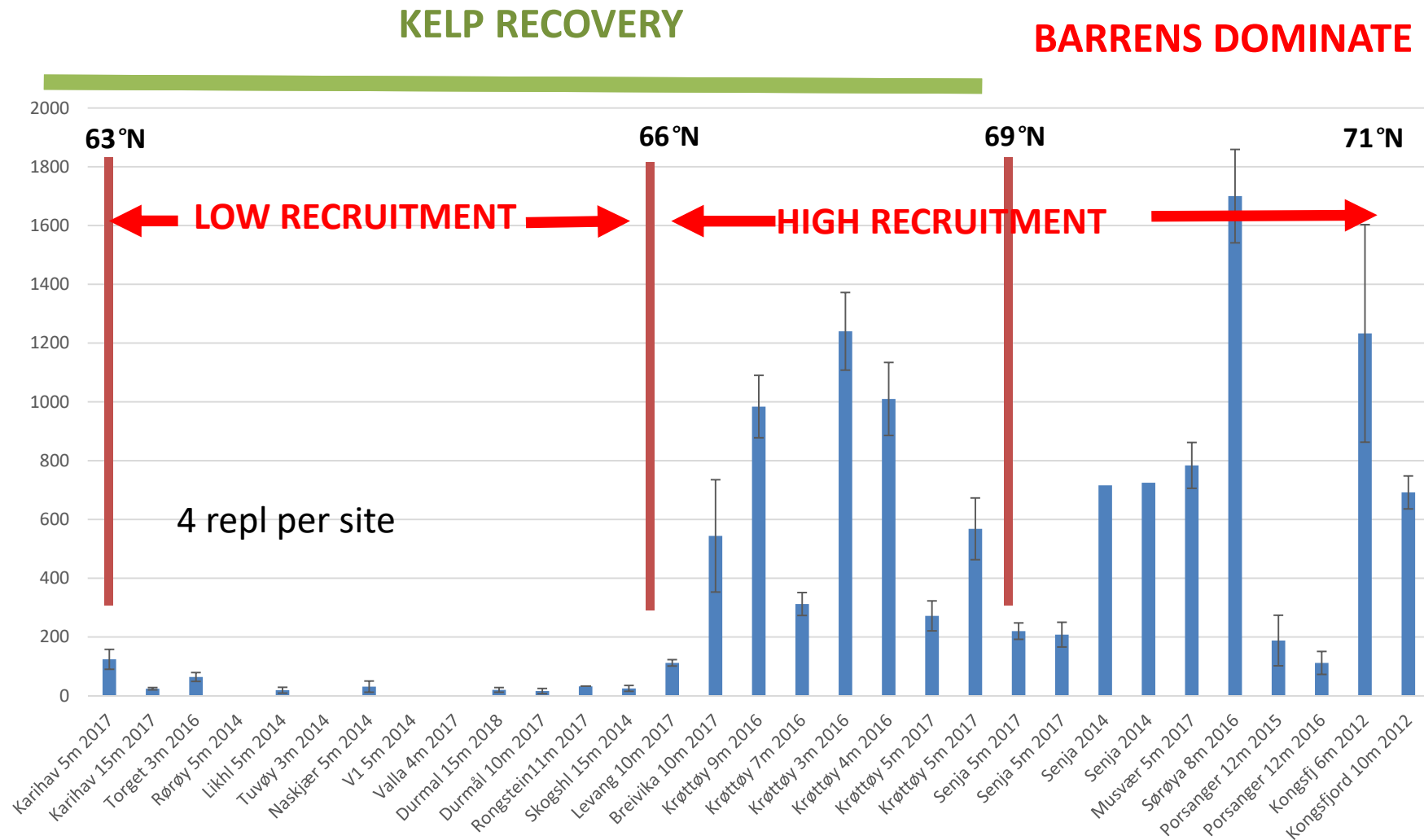
refuge habitats
for juvenile
urchins



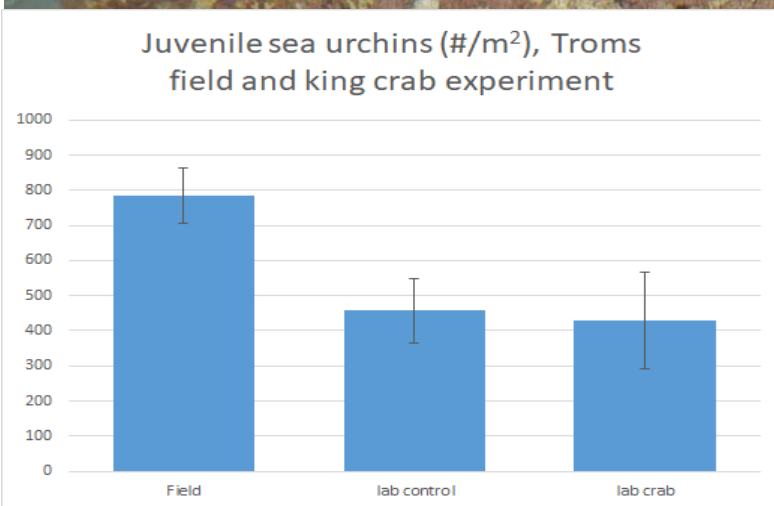
Crabs and
other predators

Temperature stress for recruitment of juvenile *S. droebachiensis* south of 66°N?

Density of juvenile sea urchins in maerl (#/m²)



1 king crab per tank, 6 days,
maerl bed with natural density of
juvenile sea urchins



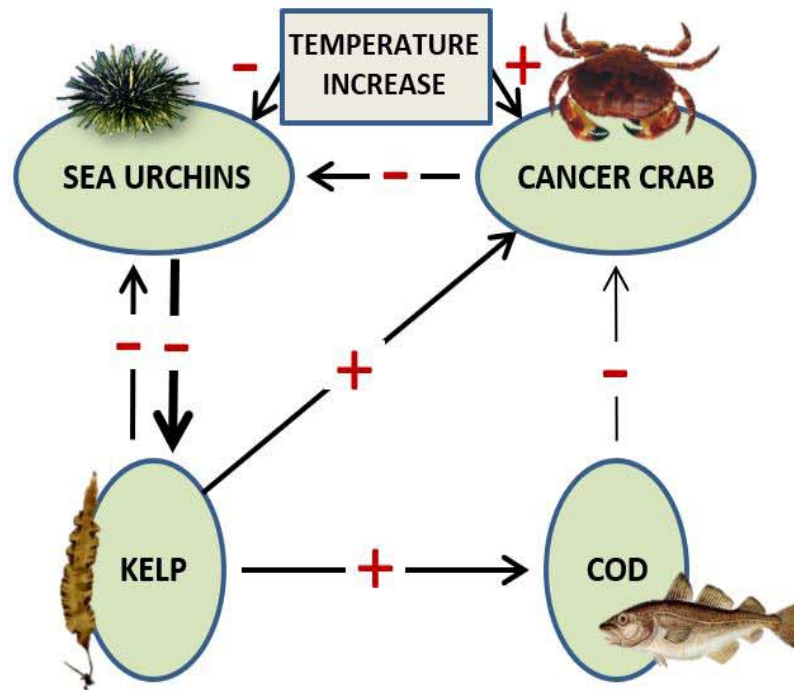
Interactions:

Valid on individual levels

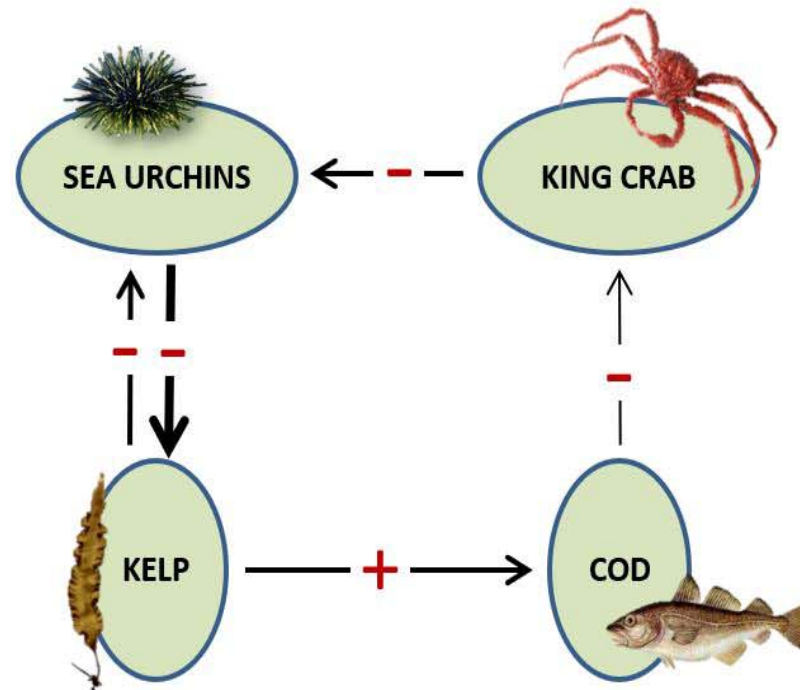
Hypotheses/correlations on population levels

Christie et al. 2019. Ecology and Evolution

A) Southern kelp recovery area



B) Northern kelp recovery area



The ways forward.....