



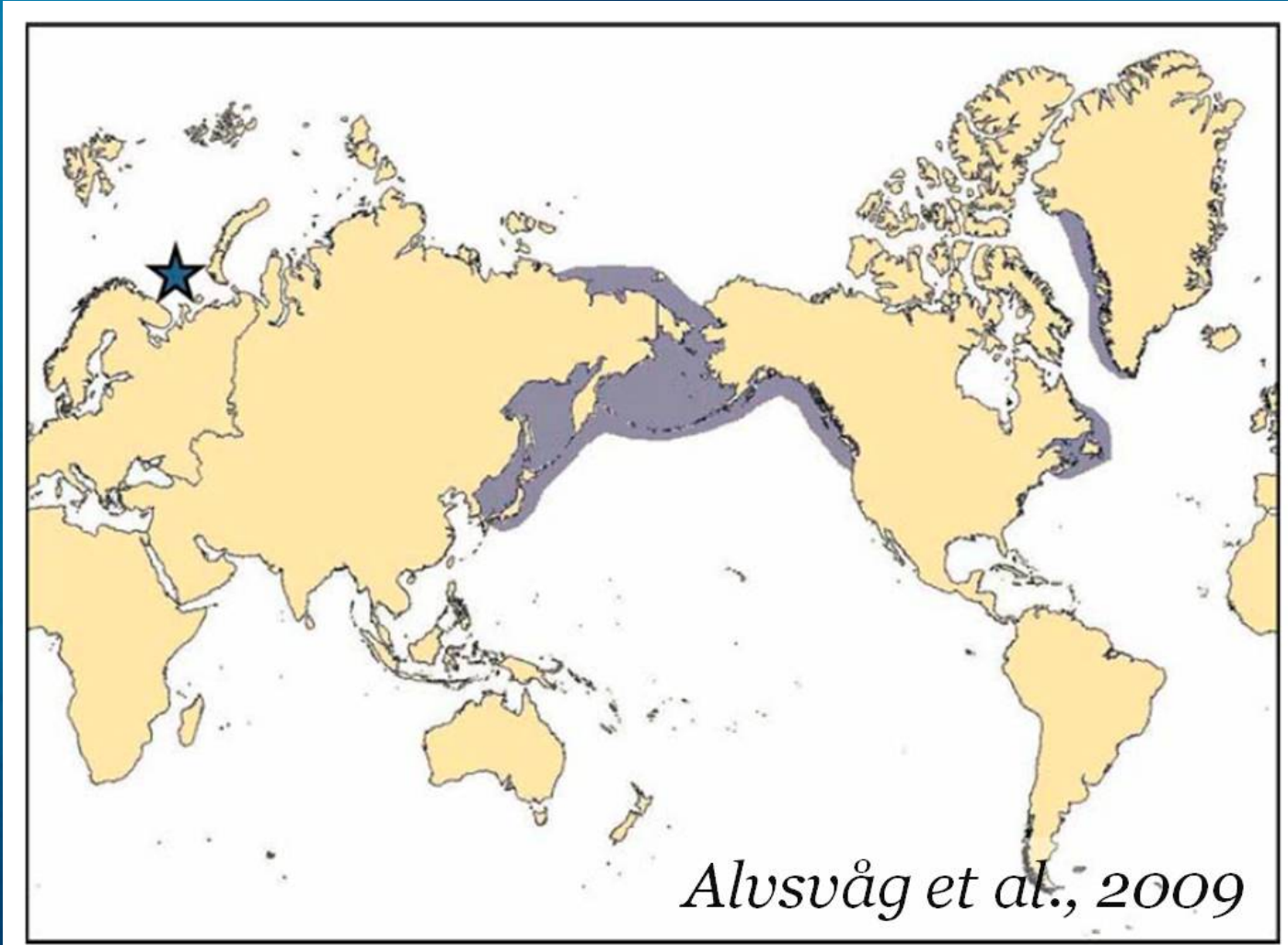
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# Future challenges in research and management of the invasive snow crab (*Chionoecetes opilio*) in the Arctic Barents Sea

Workshop; Spatial issues in Arctic resource management, Stockholm

# Natural distribution



# Possible origin



# Environmental demands

- Juveniles – temperatures  $< 3^{\circ}\text{C}$
  - Adults -  $< \sim 7 - 8^{\circ}\text{C}$
  - Adults – mostly soft bottom
- => Highly arctic adapted**

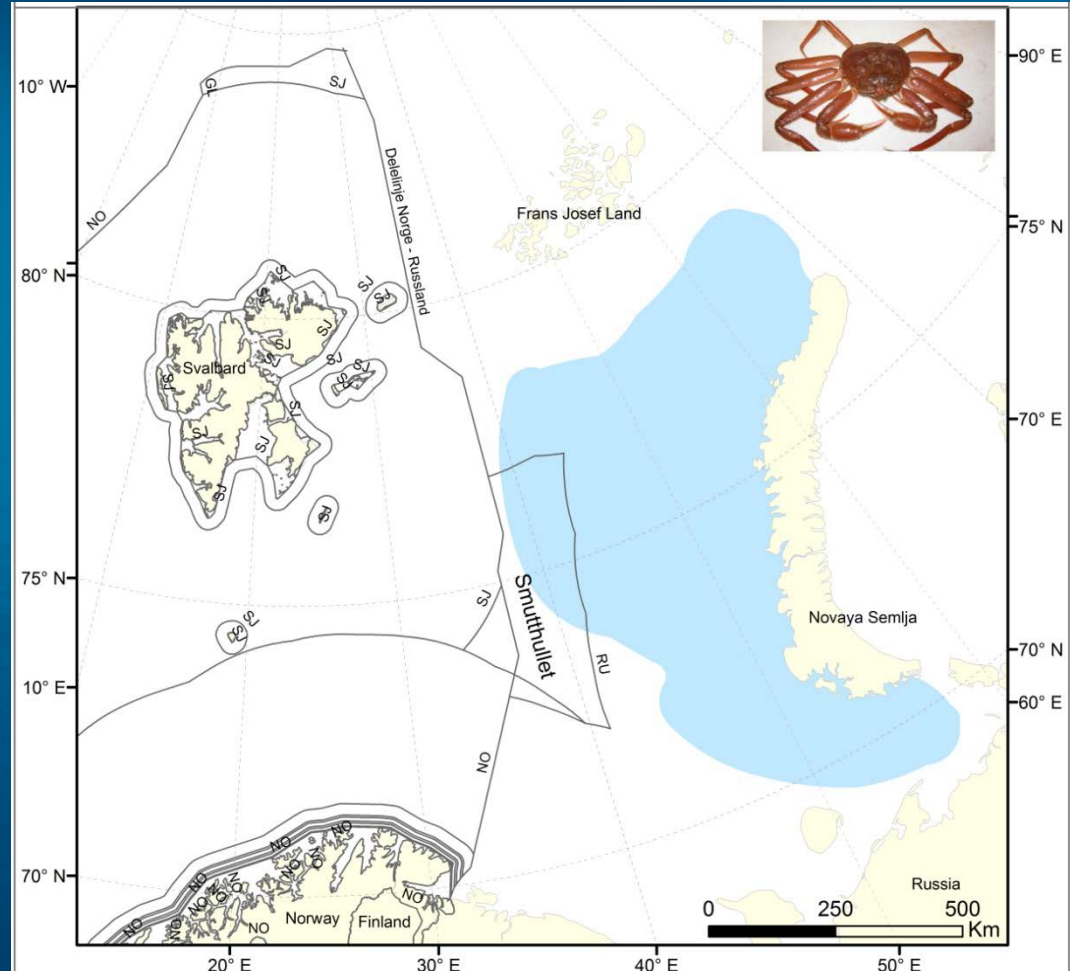


*Alaska CamSled*



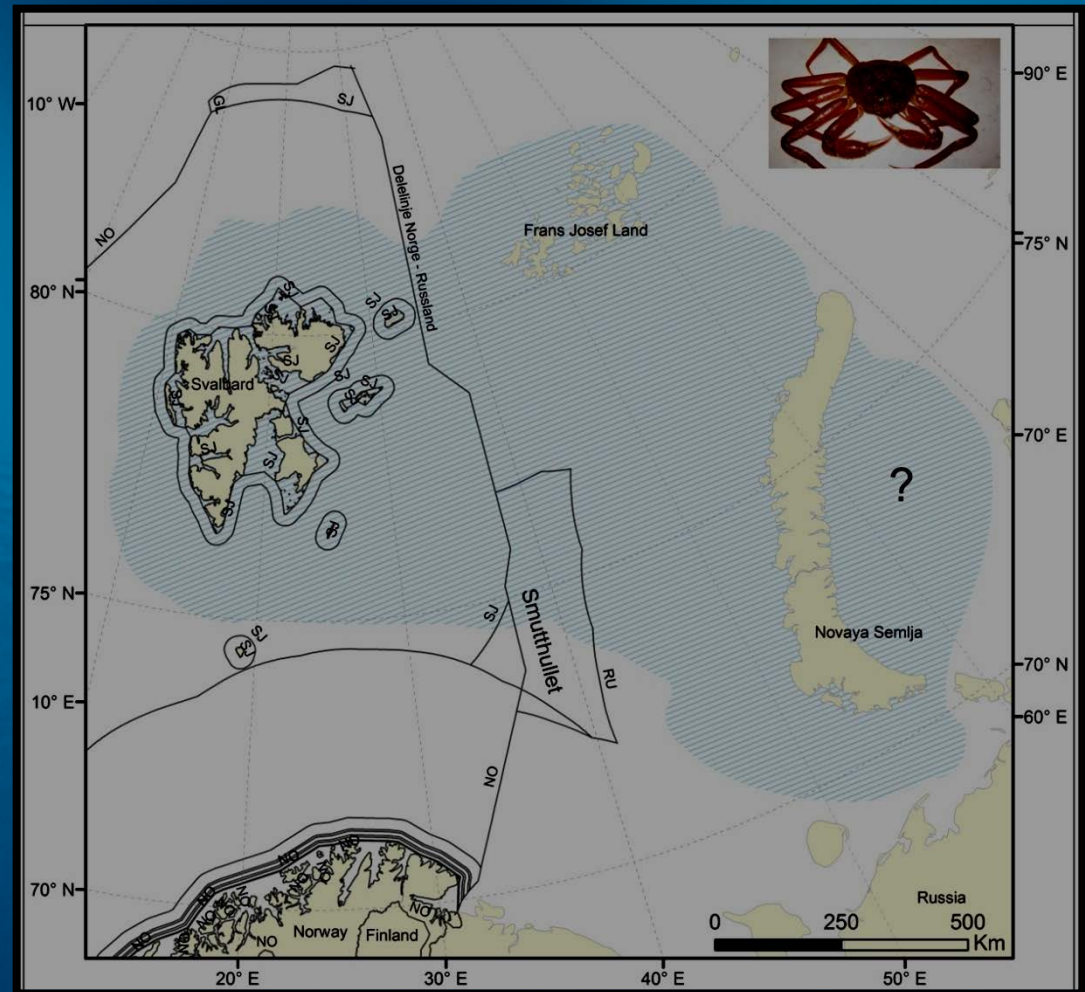
# Spreading potential in the Barents Sea?

## Situation today



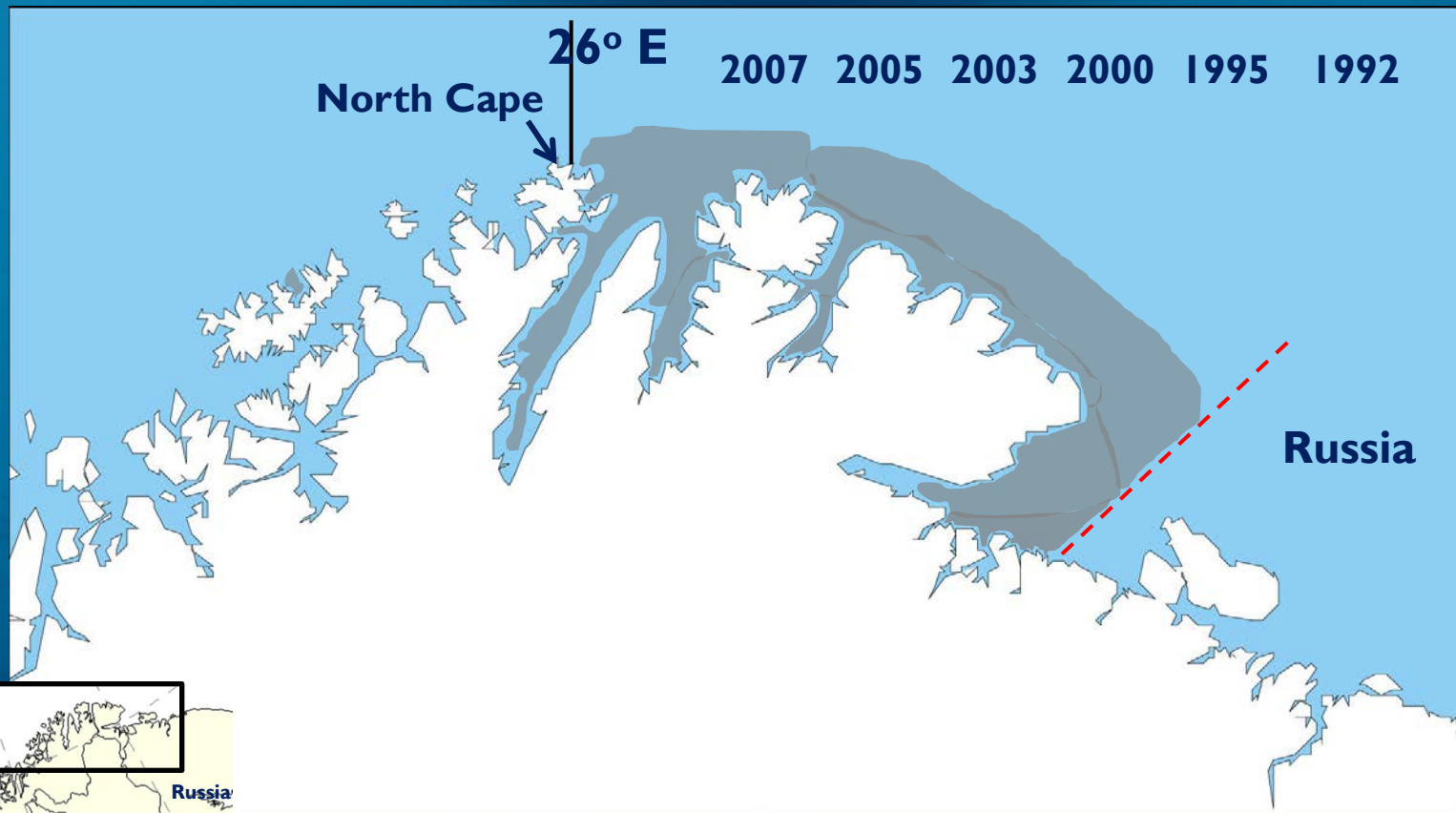
# Spreading potential in the Barents Sea?

In future -  
Possible  
distribution  
based on  
temperature  
and sediment  
types



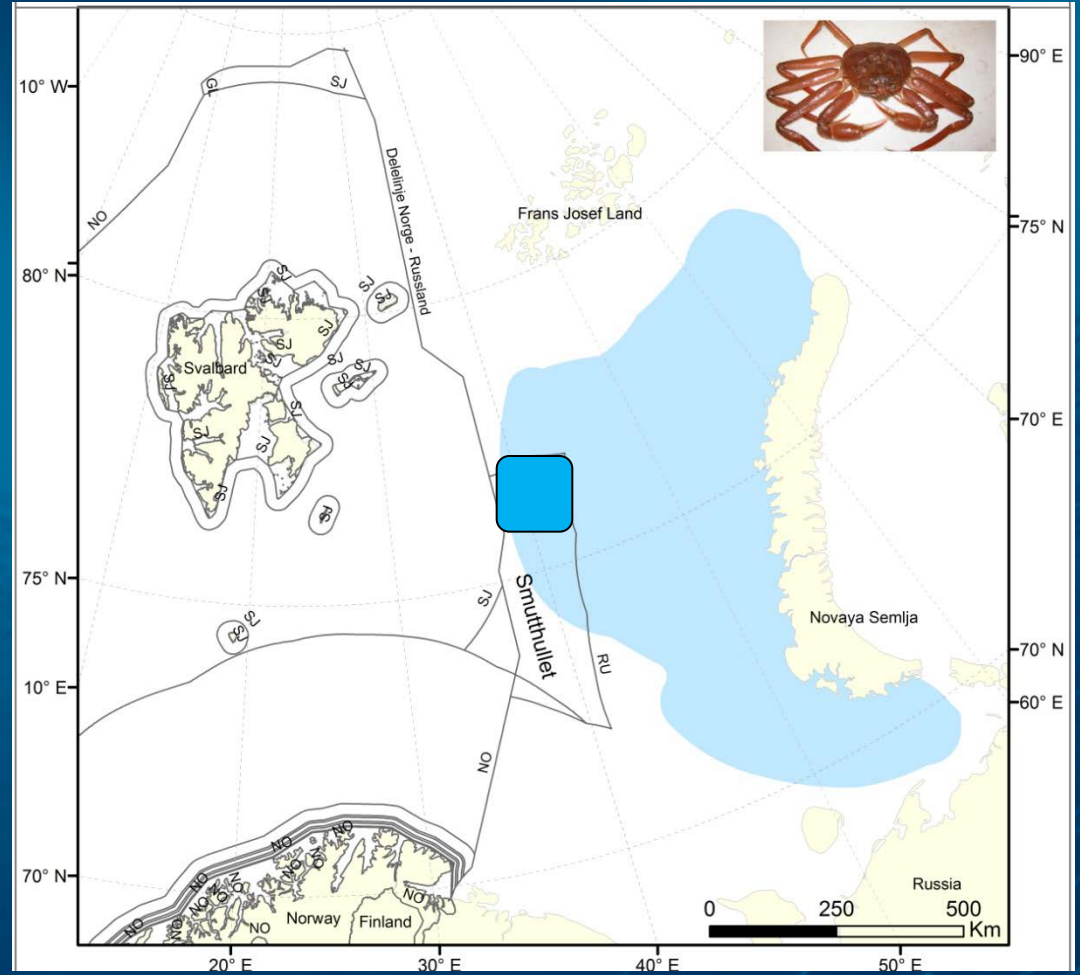
# Fishing or eradicate ?

## Norwegian red king crab management



# Fishery

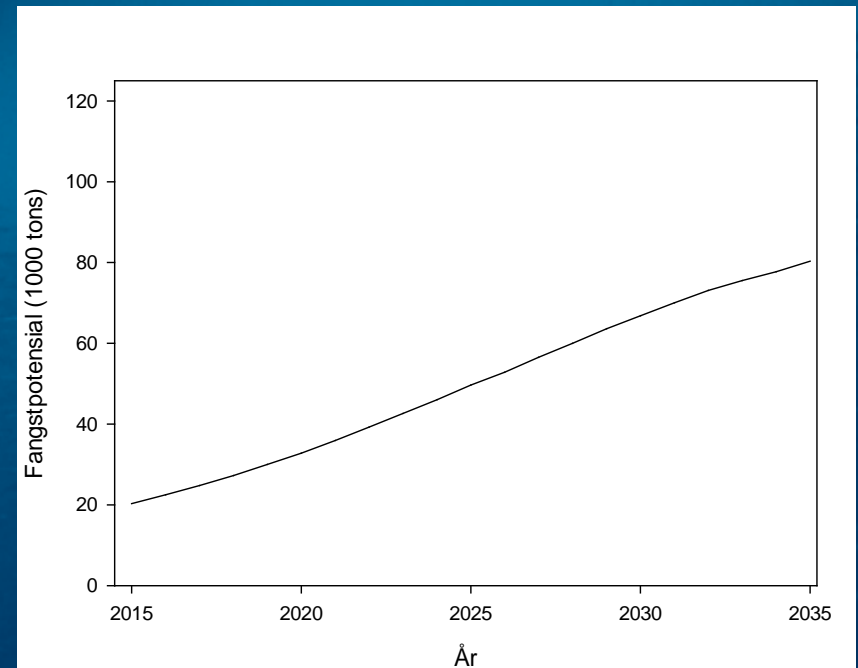
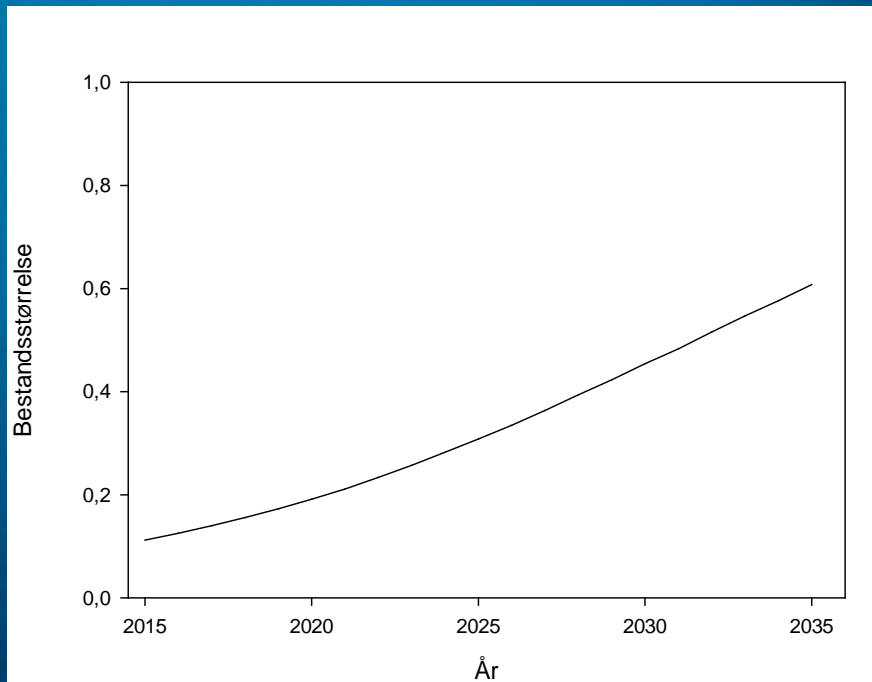
- 15 international large vessels operating today
- Landings in Norway 2014: 2-3000 tons
- Only fishing for large (> 100 mm) males





# Fishery

- Estimates of future harvest in The Barents Sea-  
Model input: depth data, bottom sediment data and  
production data from eastern Canada



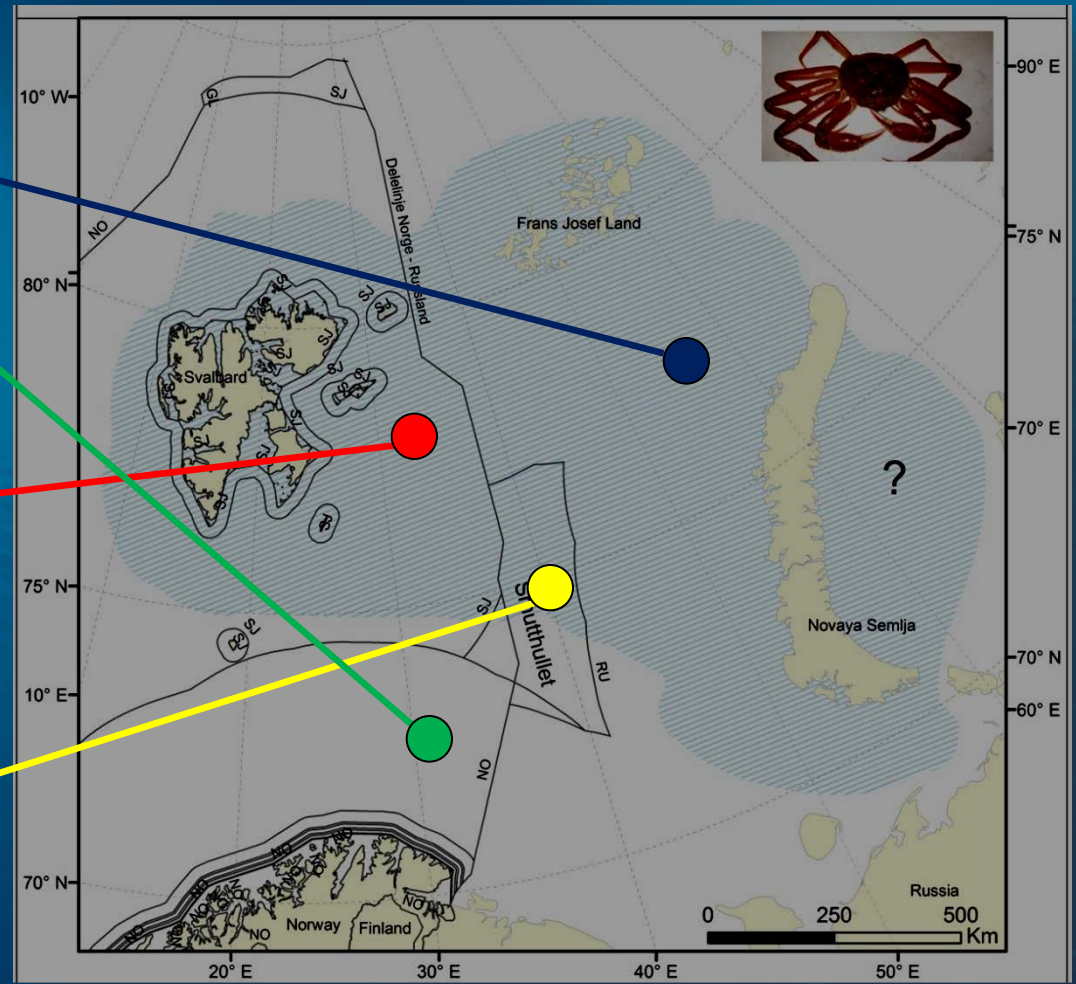
# Management challenges

REZ and NEZ :  
Joint or separate  
management  
Organized management  
structures (JRNFC)

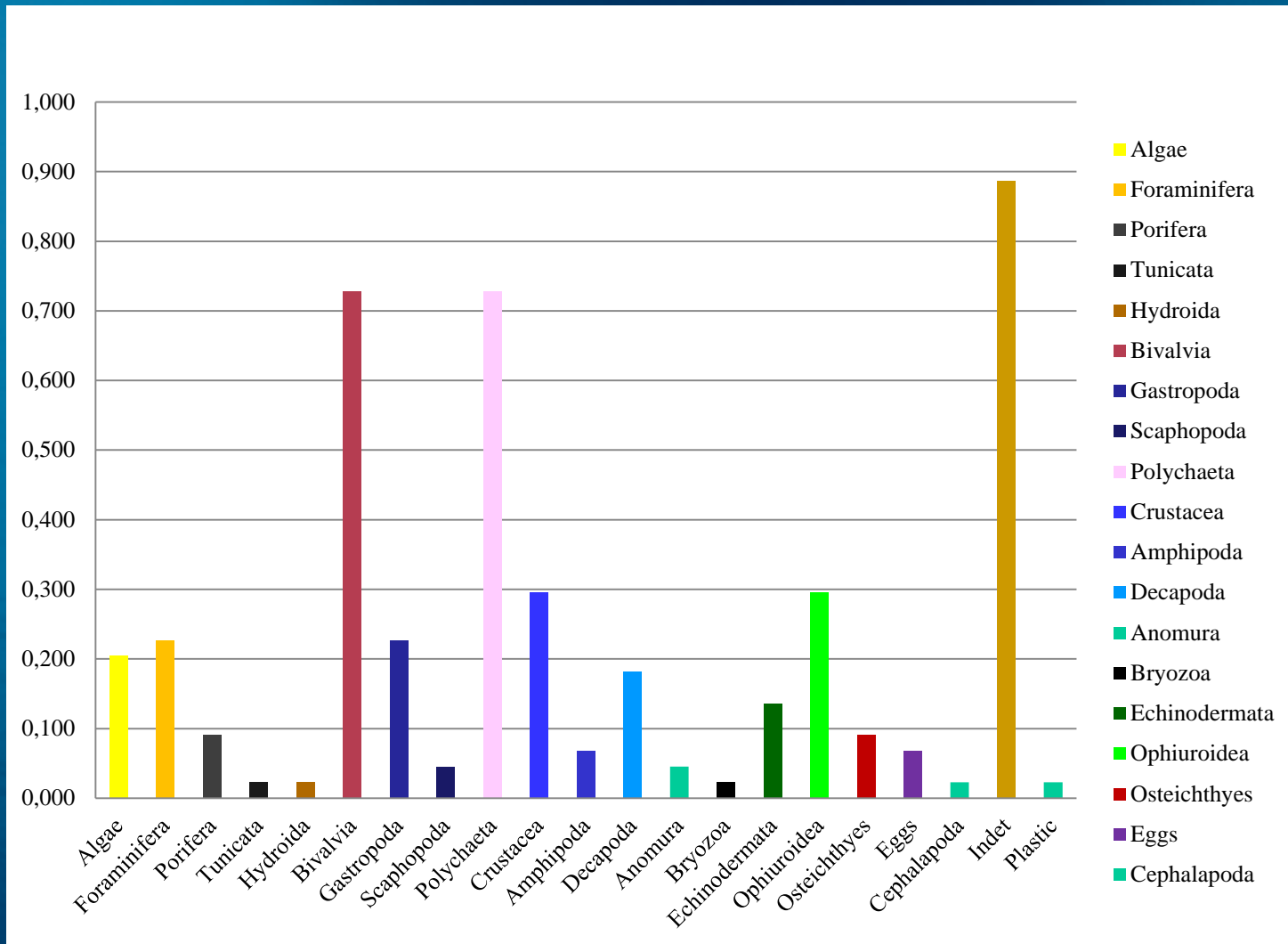
Svalbard fishery  
protection zone

- Equity
- No historic rights

International waters –  
NEAFC area.



# Effects on the benthic ecosystem?



# The new king of the Barents Sea?



*Crab drawing courtesy of [www.sustainable sushi.net](http://www.sustainable sushi.net)  
Royal accoutrements courtesy of Snow Crab Love*



***(My prophecy)***

*Workshop; Spatial issues in Arctic  
resource management, Stockholm*

A photograph of a sunset over the ocean. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the water. The sky is filled with dark, dramatic clouds, some of which are illuminated from below by the setting sun. The water in the foreground is dark blue with small, choppy waves. The overall mood is serene and contemplative.

*Thank you!*

# Ns



*Workshop; Spatial issues in Arctic  
resource management, Stockholm*

# Ns



*Workshop; Spatial issues in Arctic  
resource management, Stockholm*

# Ns





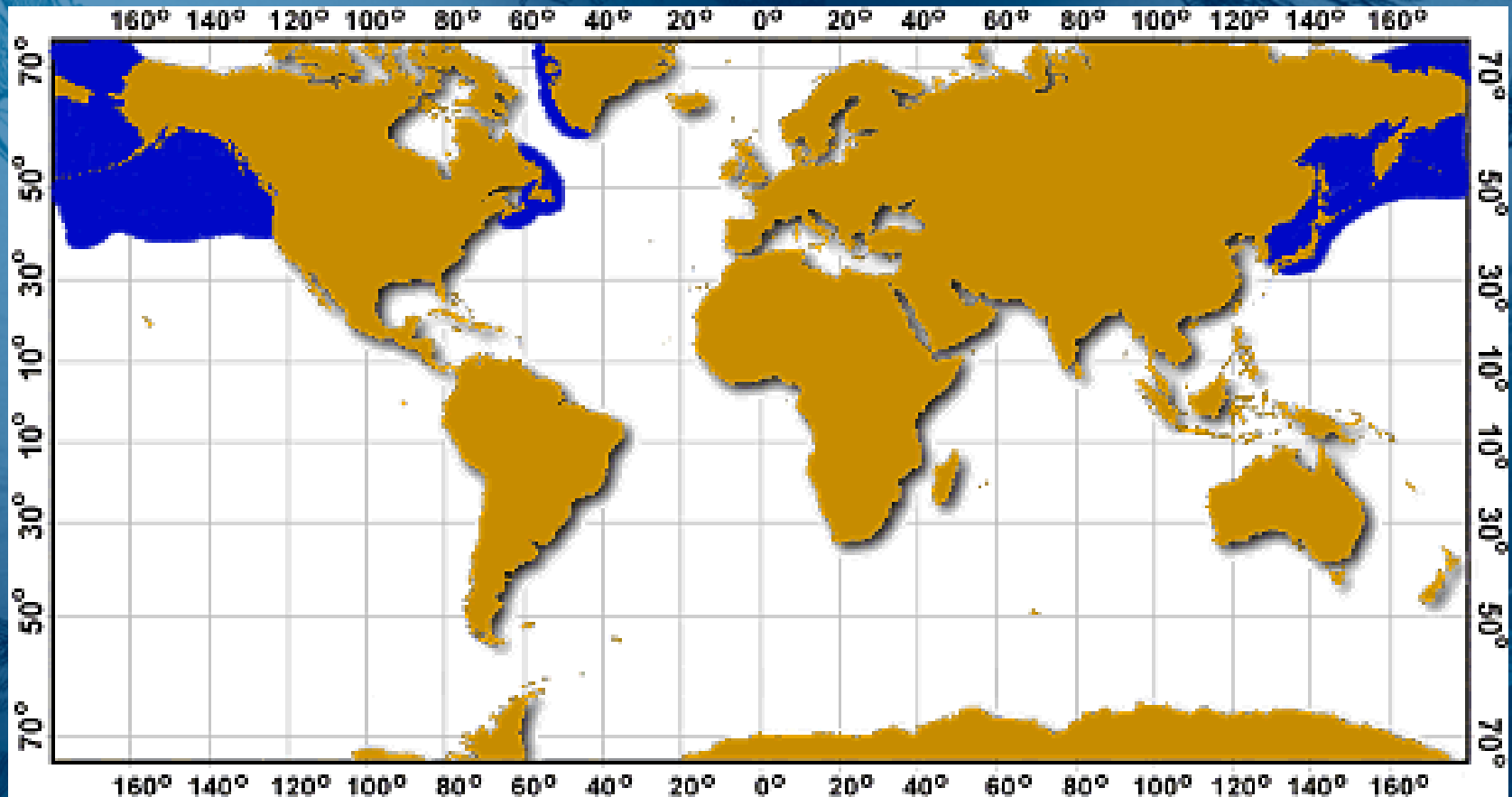
**Ns**



# Ns

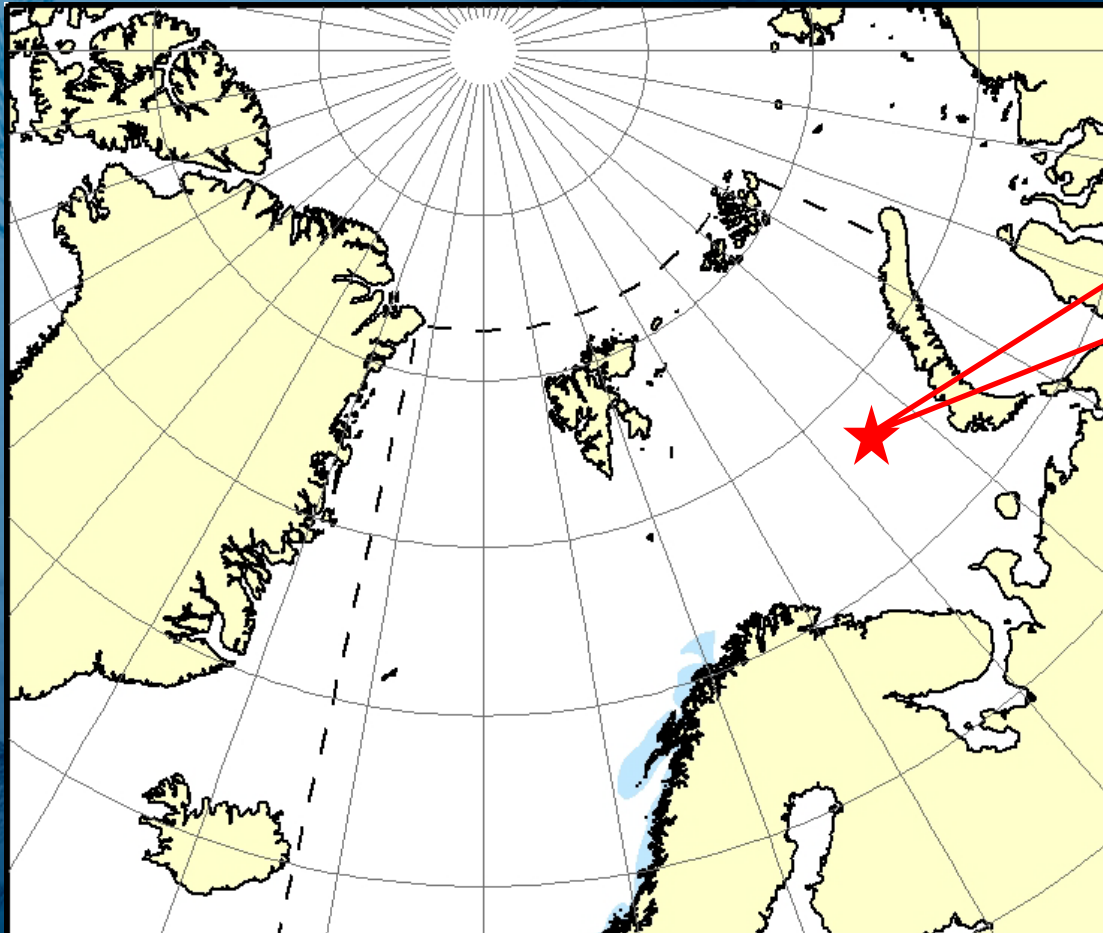


# Native areas



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# First recordings

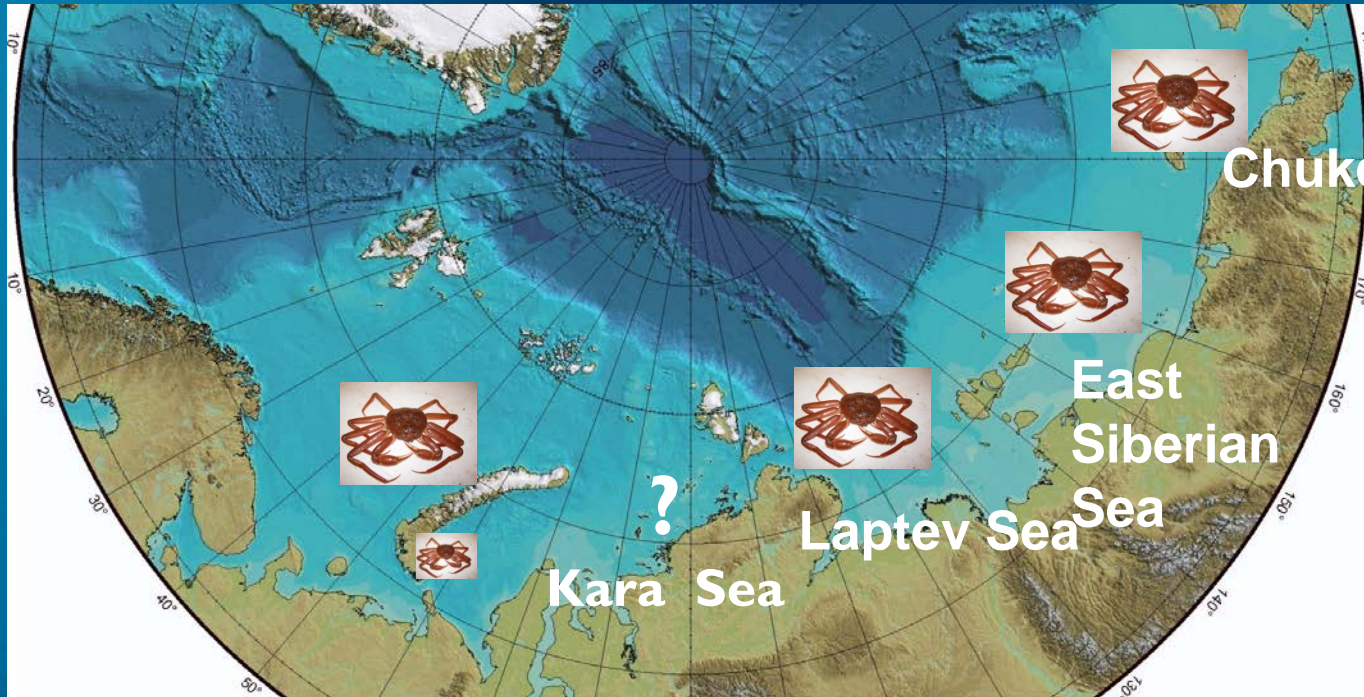


First  
recording  
1996, 5 crabs

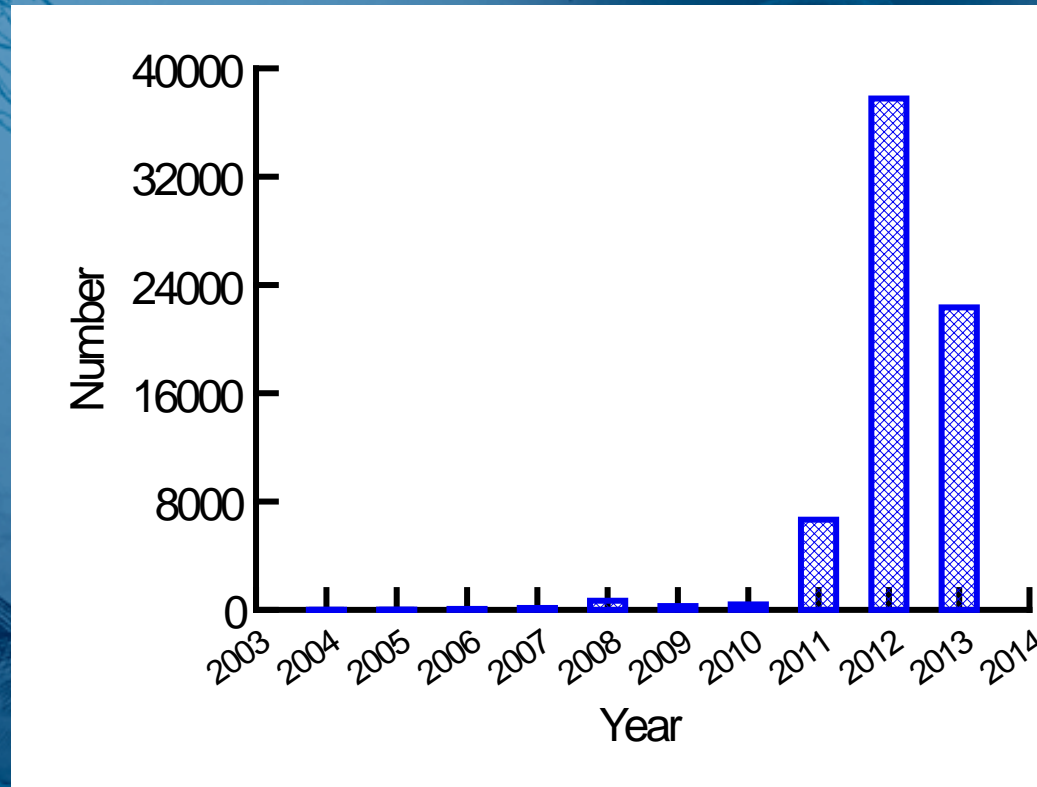


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# Origin ?



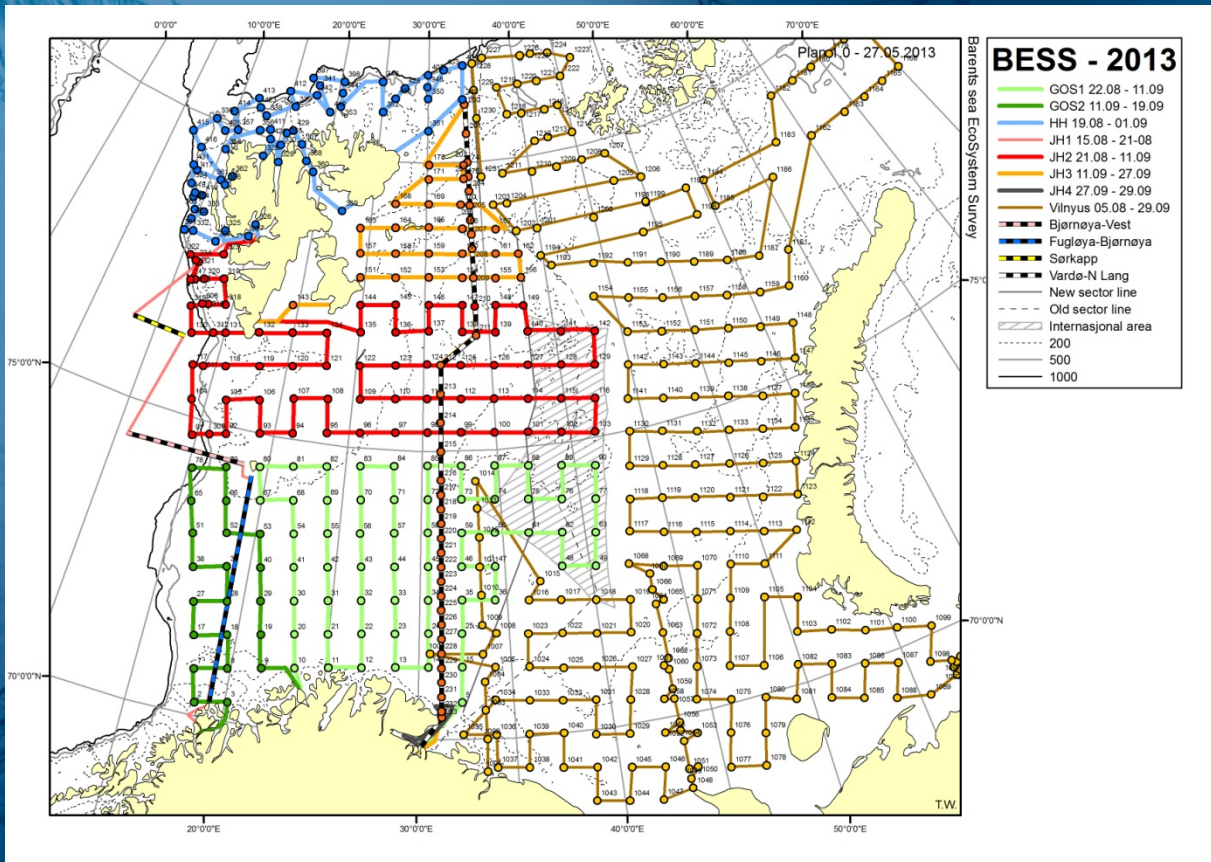
# Population development



**Development typical for an invasive non-native species !**



# Data

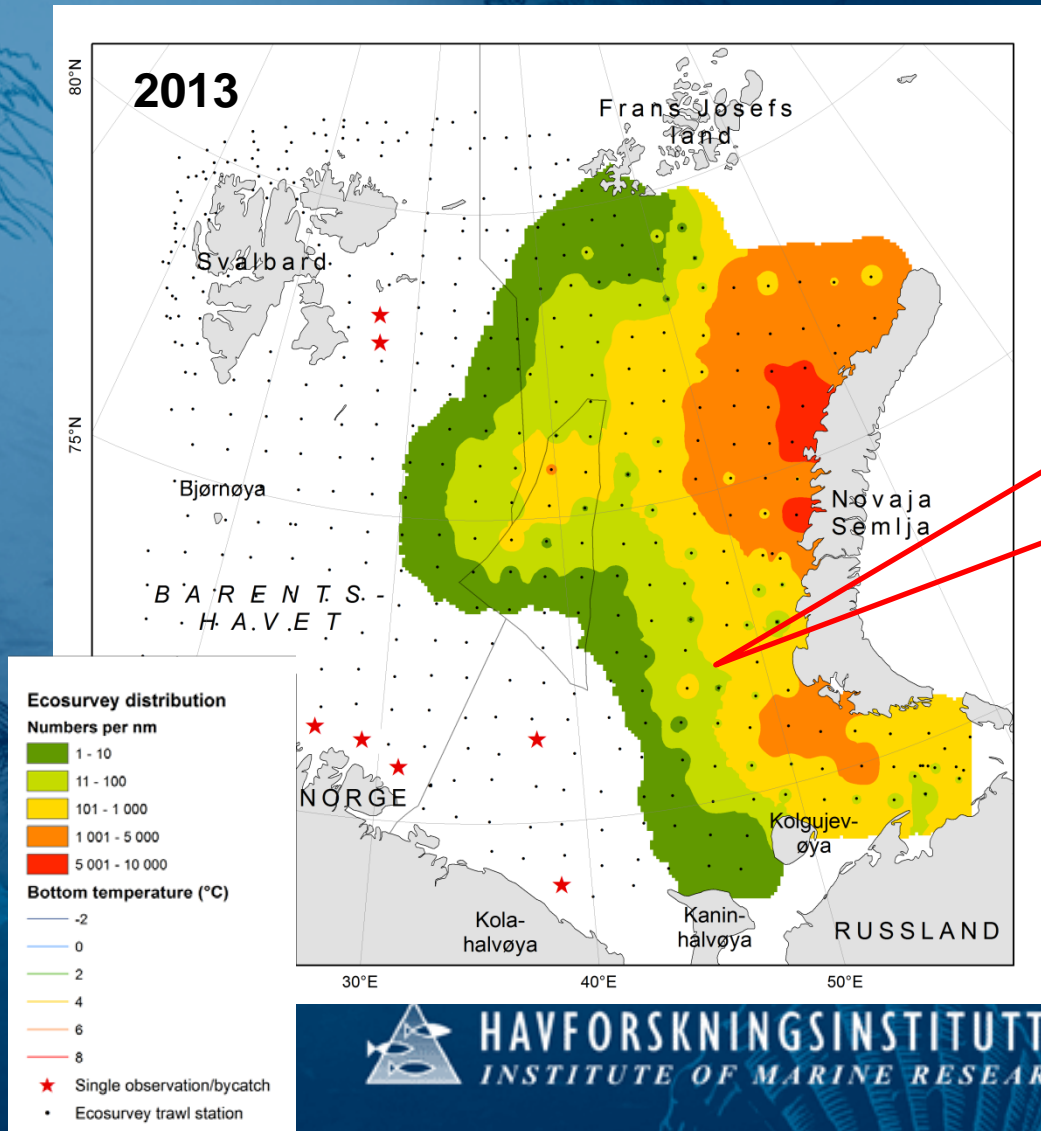


N – R  
Ecosystem  
survey 2004  
- 2013



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# Spread in the Barents Sea



First recording 1996



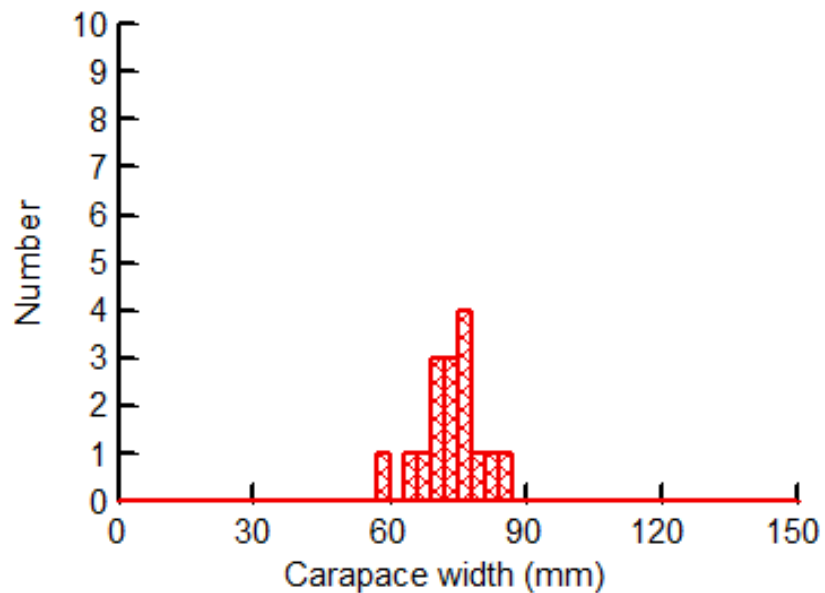
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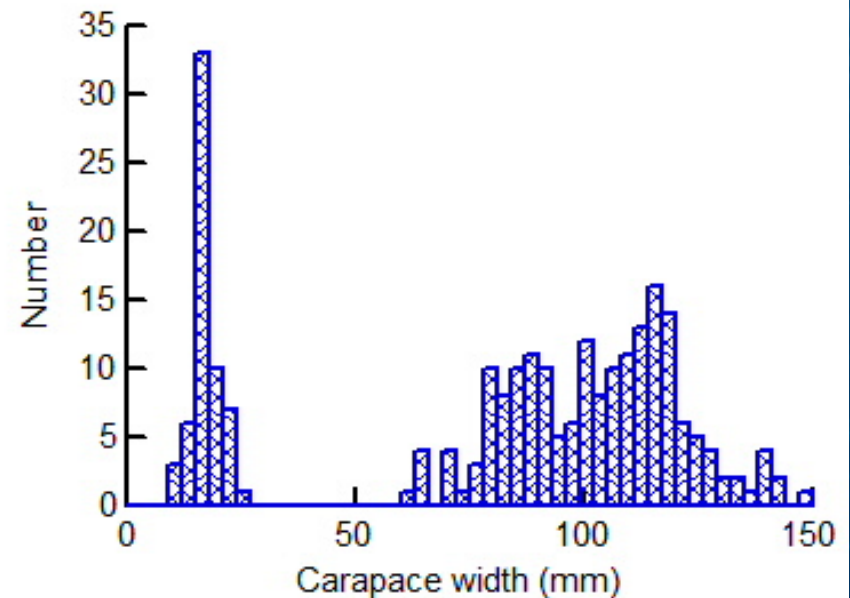
# Size distribution

## Norwegian catches 2013 - 2014

Females (N = 16)



Males (N = 244)

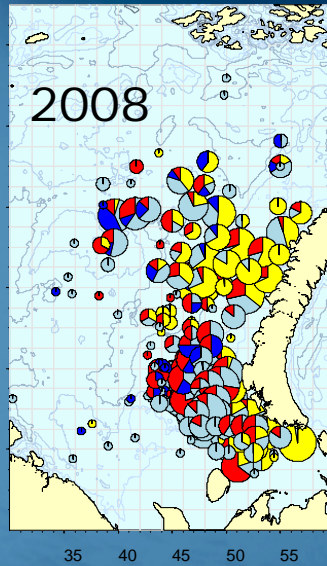
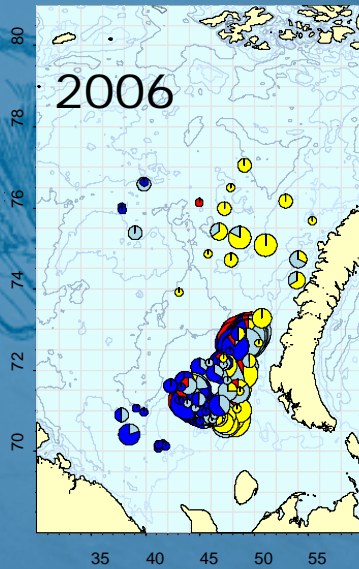


# Size groups

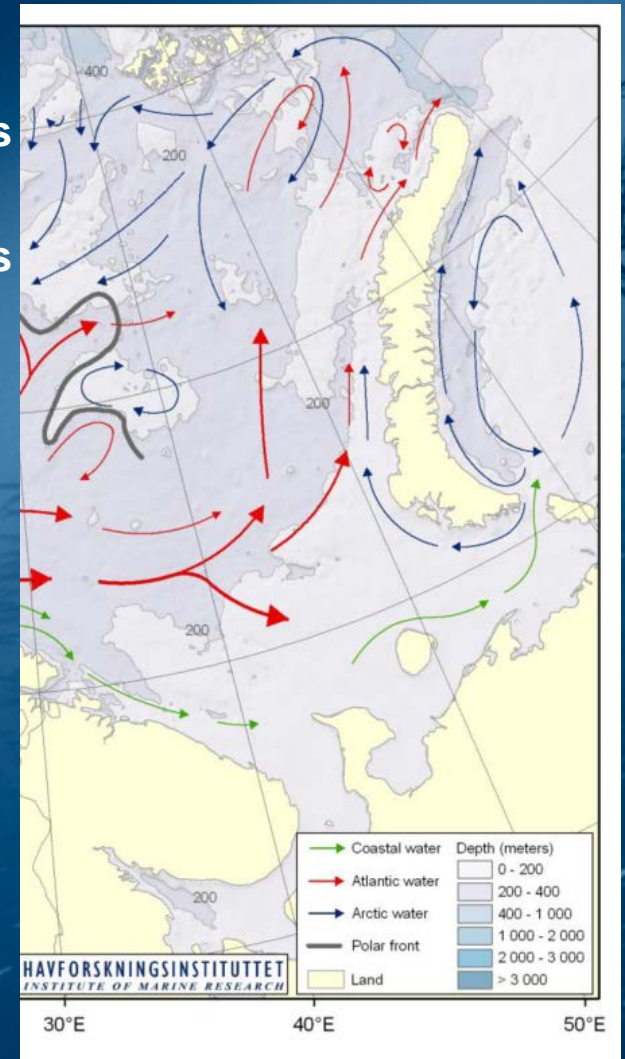
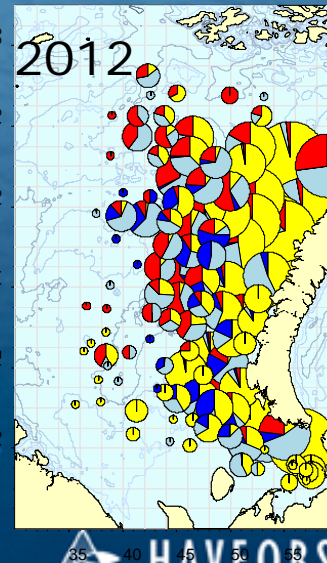
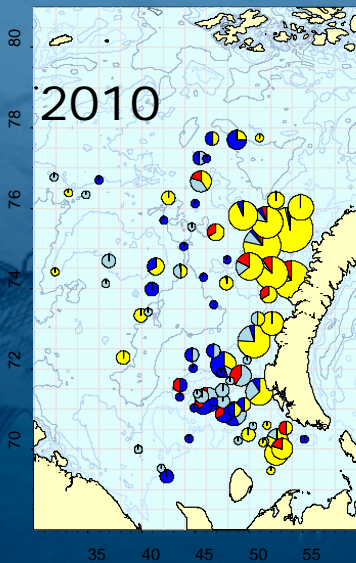
- Juvenile crabs < 50 mm CW (?)
- Sublegal males 50 – 100 mm CW
- Legal males > 100 mm CW
- Mature females > 50 mm CW



# Geographic distribution - size



- Juveniles
- Sublegal males
- Legal males
- Mature females



# Impact on ecosystem

- Likely a major player in the future BS ecosystem
- Effects mainly on benthic communities
- Arctic benthic ecosystems – particularly vulnerable ?
- Plastic !!

