RISK ASSESSMENT OF POTENTIAL INVASIVE SPECIES IN GREENLAND SEAS

Kim Gustavson, Tom Christensen and Susse Wegeberg Aarhus University, Denmark

Ole Geertz-Hansen Greenland Institute of Natural Resources

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RISK ASSESSMENT OF POTENTIAL INVASIVE SPECIES IN COSTAL WATER AT GREENLAND

- AIMS:
 - > Identified potential invasive species in Greenland seas
 - > Assess the risk for biological invation in Greenland seas
 - > Improve our knowledge base
- Activities:
 - > Literature survey
 - > Risk assessment
 - > Participation in meetings
 - > Reporting to authorities in Denmark and Greenland







Minerals and oil activities - Ballast water and biofouling

As adviser for the authorities in Greenland we recommend that all shipping activities are regulation according to:

- > IMO Ballast Water Management Convention
- IMO Guidelines for the control and management of ships' biofouling





Selected scientific articles and reports obtained from literature search

Identified potential invasive marine species for arctic waters

Reference	Marine species in focus	Nation/area/region
ABA (2013)	Paralithodes camtschaticus	Arctic
ARIAS (2017)	Paralithodes camtschaticus	Norway
Gederaas et al. (2012)	Caprella mutica, Chionoecetes opilio, Crassostrea gigas, Ensis directus, Heterosiphonia japonica, Homarus americanus, Mnemiopsis leidyi, Paralithodes camtschaticus, Sargassum muticum, Acartia tonsa, Bonnemaissonia hamifera, Codium fragile, Styela clava	Norway
Goldsmith (2016)	Littorina littorea, Mya arenaria, Paralithodes camtschaticus, Apmhibalanus improvisus, Botrylloides violaceus, Carcinus maenas, Caprella mutica, Membranipora membranacea	Canadian Arctic
Goldsmith et al. (2014)	Streptospinigera niuqtuut, Paralithodes camtschaticus, Caprella mutica, Dumontia contorta	Canadian Arctic
Husa et al. (2014)	Bonnemaissonia hamifera, Caprella mutica	Narvik, Norway
Kourantidou et al. (2015)	Paralithodes brevipes, Paralithodes camtschaticus, Chionoecetes opilio, Neodenticula seminae	Arctic
AND ENERGY		

Selected scientific articles and reports obtained from literature search

Identified potential marine invasive species for arctic waters

Reference	Marine species in focus	Nation/area/region
Molnar et al. (2008)	Acartia tonsa, Carcinus maenas, Dreissena polymorpha,	Arctic
	Ectopleura crocea, Mya arenaria, Sphaeroma walkeri, Teredo navalis	
MST (2017)	Acartia tonsa	Scandinavia
Rinde et al. (2017)	Caprella mutica, Crassostrea gigas, Sargassum muticum	Scandinavia
Spirinov & Zalota (2017)	Paralithodes camtschaticus, Chionoecetes opilio	Russia
Thomassen et al. (2017)	Chionoecetes opilio,Cancer irrortus, Paralithodes camtschaticus, Acartia	Svalbard
	tonsa	
Thorarinsdottir et al. (2014)	Fucus serratus, Cancer irriratus, Crangon crangon, Platichthys flesus	Iceland
AND ENERGY		

List of marine species identified as invasive in Arctic waters. Based on Kourantidou et al. (2015)

Popular name	Scientific name	Area
Red king crab	Paralithodes camtschaticus	Barent Sea, Norway
Hanasaki king crab	Paralithodes brevipes	Alaska
Snow crab	Chionoecetes opilio	Barents Sea
Diatom, planktonic	Neodenticula seminae	Labrador Sea, Irminger Sea





List of species suspected to become invasive in Greenland seas. Based on Molnar et al. (2008), Kourantidou et al (2015), MST (2017).

Popular name	Scientific name	Area for introduction
Arcartia copepod	Acartia tonsa	Scandinavia
European green crab	Carcinus maenas	Europe
Hydroid	Ectopleura crocea	Bering Sea
Soft-shell clam	Mya arenaria	Iceland
Marine pill bug	Sphaeroma walkeri	Beaufort Sea
Naval shipworm	Teredo navalis	Atlantic Arctic



RISK ASSESSMENT – METHODOLOGY

IMO – Risk Assessments under regulation A-4 of The BWM Convention:

- Environmental matching risk assessment relies on comparing environmental conditions between locations including temperature and salinity between donor and recipients
- Species' biogeographical risk assessment compares the <u>overlap of native and potential</u> <u>invasive species</u> to evaluate environmental similarity and to identify high risk invaders
- Species-specific risk assessment use information on life history and physiological tolerances thereby estimate its potential to survive or complete its life cycle in the recipient environment.
- Combinations



CLIMATE CHANGES - SPECIES TO INVADE ARCTIC WATERS?

Thresholds were based on the number of days required at critical minimum temperature and salinity values for successful reproduction. Thresholds were projected into the future <u>based on ocean climates forecast</u> <u>modelling</u>.





MAY ACARTIA TONSA OUT-COMPETE HIGH ARCTIC COPEPODS?



Strong seasonality of light leading to strong seasonality in food availability - may Acartia Tonsa cope to long winter without food?

Large storage of lipids and slow metabolism





Detection and Monitoring - Greenland

- Hunters and fishermen (e.g. crabs)
- Research ships in Greenland
- Research stations
- INTER-ARC Rapid response to environmental emergency alerts
- ► CBMP?





Photo of hunter with his GPS.



FURTHER WORK

Continue to identify potential invasive species in Greenland seas.

Risk assessment will include:

- > Life history of the species
- > Physiological tolerances of the species
- Possibility of the species to cope with arctic environmental conditions including long dark winters
- > Regional pathways

Potential invasive species ? Assessment methodology?



