HAFRANNSÓKNASTOFNUN

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Alien marine species in Icelandic waters

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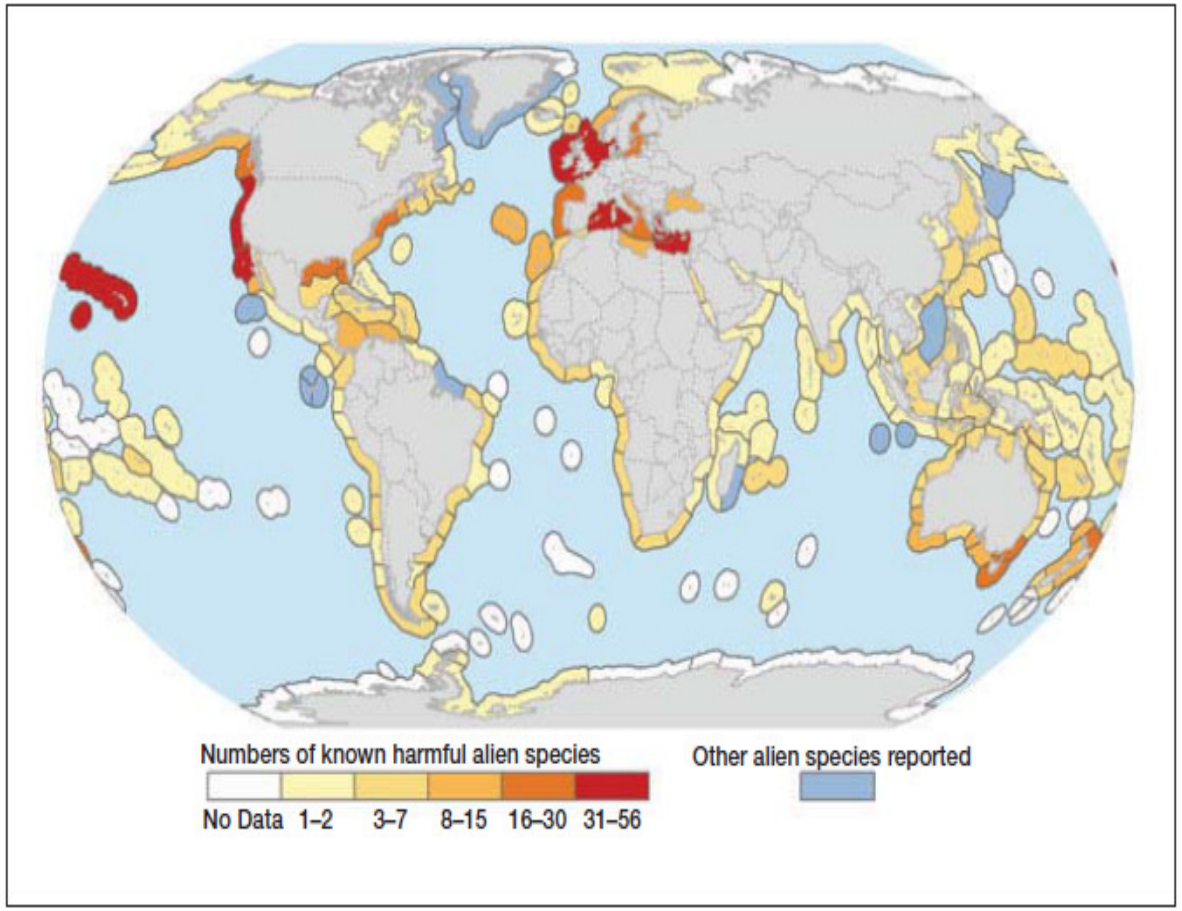
Alien marine species:

Introduced (none-native, none-indigenous or alien) species that affect the habitat and bioregions they invade

These do not have to be **invasive**, meaning having negative effects on economy, environment or health

Invasive species a world wide problem



(Molnar et al. 2008)

The main groups of marine invasive species

Crustacean

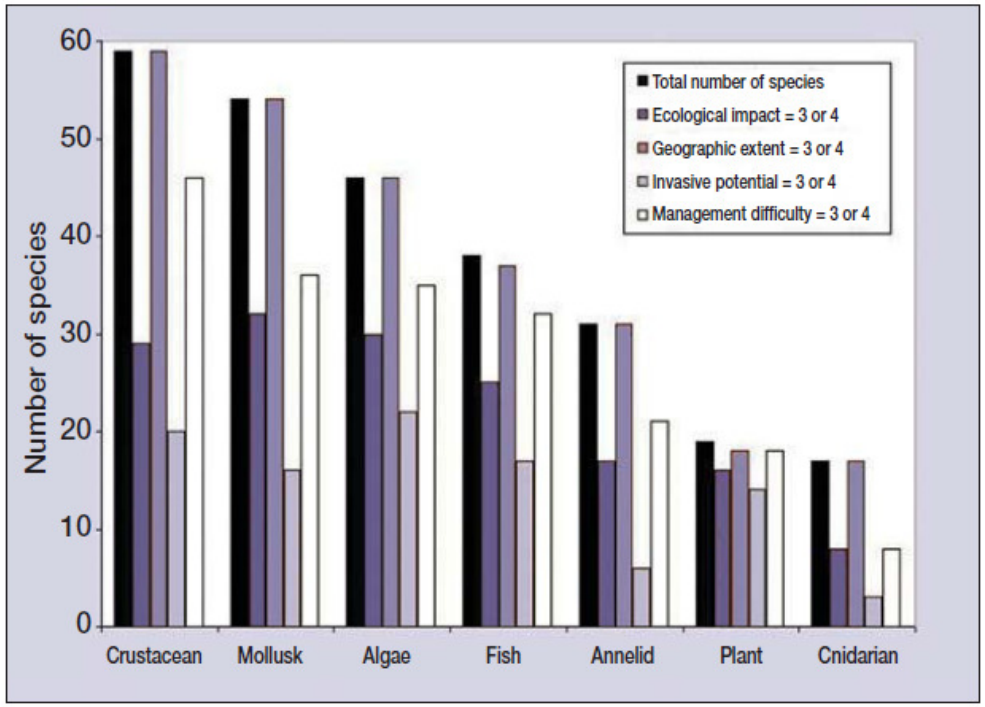
Molluscs

Algae

Fish

Annelid

Chidarian (sea anemone)



(Molnar et al. 2008)

Way of transport

Ballast water

External fouling of ships

Transfer af aquaculture animals

Aquarium trait

Naturally (currents)

Alien marine species in Iceland

- **Arthropods**
  - *Cancer irroratus*
  - *Crangon crangon*
- **Molluscs**
  - *Mya arenaria*
  - *Cerastoderma edule*
- **Fish**
  - *Oncorhynchus mykiss*
  - *Platichthys flesus*
- **Chidarian**
  - *Ciona intestinalis*
- **Macroalgae**
  - *Bonnemaisonia hamifera*
  - *Codium fragile*
  - *Fucus serratus*
- **Phytoplankton**
  - *Heterosigma akasiwo*
  - *Stephanopyxis turris*
  - *Mediopyxis helysia*
  - *Peridinella catenata*
  - *Neodenticula seminae*

Alien and invasive marine species in Iceland

- **Arthropods**
  - *Cancer irroratus; The rock crab*
  - *Crangon crangon; The brown shrimp*
- **Fish**
  - *Platichthys flesus; European Flounder*
- **Macroalgae**
  - *Fucus serratus; Seaweed*

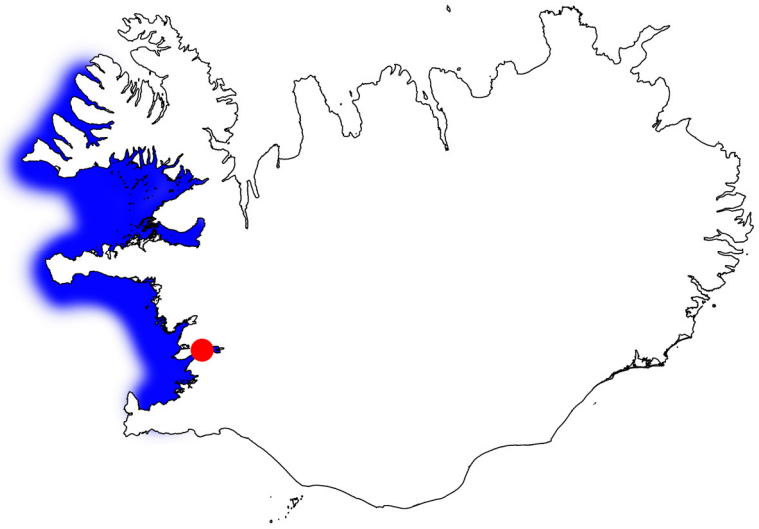
Cancer irroratus

(Atlantic rock crab)

Photo: Ó.S.Gíslason

- First observed in Iceland in 2006 in Hvalfjördur

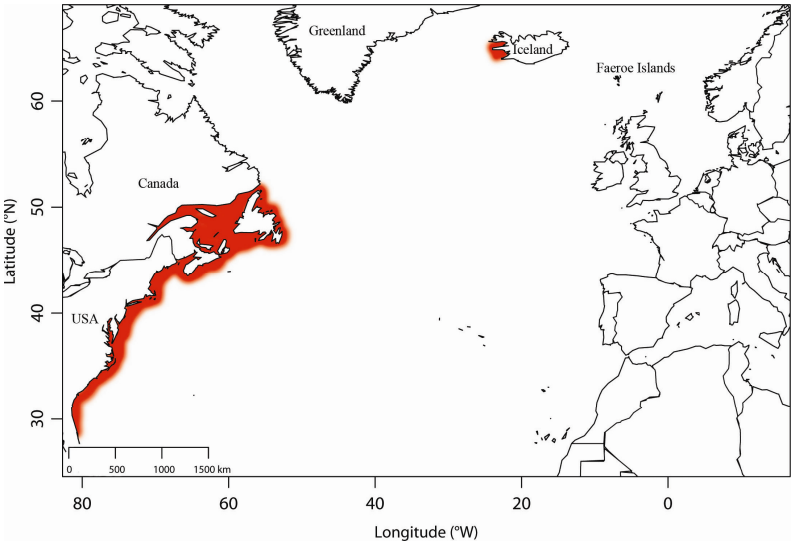
- Distribution:
  - Southwest and west Iceland



Cancer irroratus

- Widely distributed off the east coast of Canada and North-America

Photo: Ó.S. Gíslason



Cancer irroratus

- Introduced from Canada
- Transport:
  - Ballast water
- Impact:
  - Competing with the green crab (*Carcinus maenas) and the spider crab (Hyas araneus)in the area*

Cancer irroratus

- Increase in sea temperature has made it possible for the larvae to develop
  - Takes ca 50 days at 10°C
  - Conditions are from Vestmannaeyjar to Eyjafjördur

- Selv producing stock in Iceland

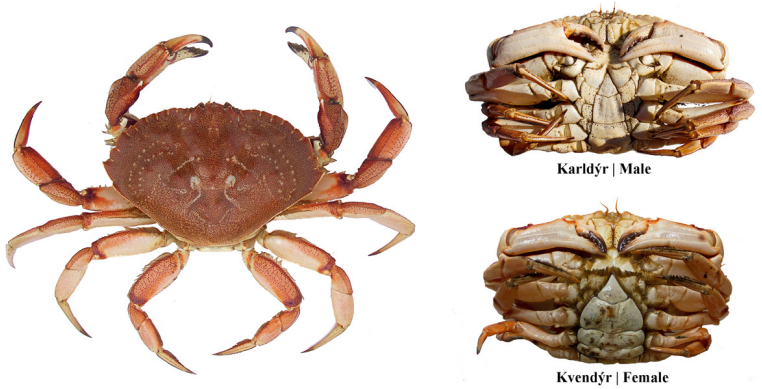
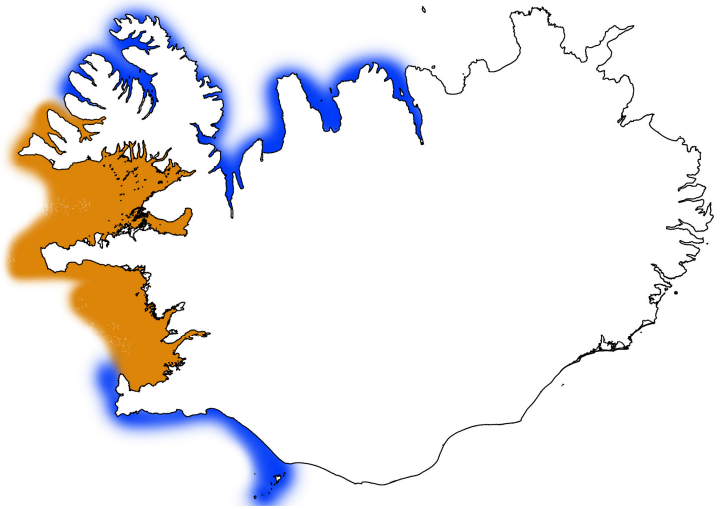


Photo: Ó.S. Gíslason



Cancer irroratus

An invading new species that can reproduce, grows fast and competes with other crab species in the same area.

Might become commercially valuable ?

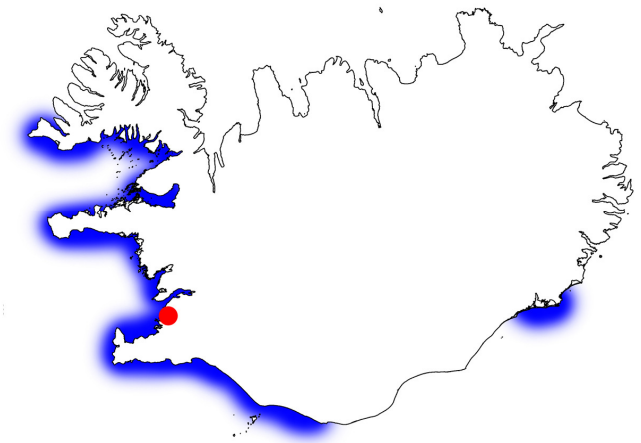
Photo: Ó.S. Gíslason

Crangon crangon

(The brown shrimp)

- Introduced from North-Europe where it is common
- First observed 2003 off southwest coast
- Distribution:
  - South and west Iceland, spreads fast
  - Recent increase in sea temperature hardly the cause of its invasion as it is common in the Arctic
- Transport:
  - Ballast water
- Impact:
  - Predating on plaice larvae (*Pleuronectes platessa*)

Photo: H. Björnsson



Platichthys flesus

(European Flounder)

- **Common in costal waters of Western Europe and introduced from there**
- **First observed in1999 in south Iceland**

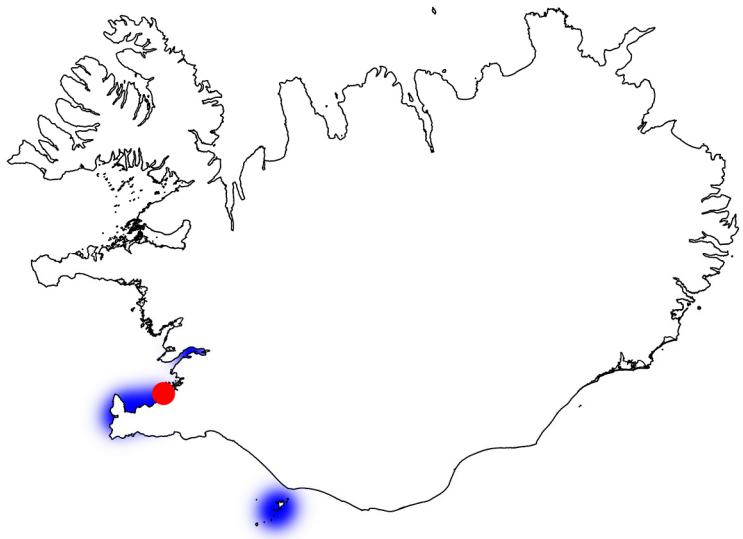
Drawing: H. Hlidberg

- **Distribution:**
  - Southeast all the way to the north
- **Transport:**
  - Sand (pumice) ballast ?
- **Impact:**
  - Investigations in southwest have shown predation on salmon larvae and competition for food with salmon, eel and stickleback

Fucus serratus

- Introduced from Europe (Norway) to Iceland
- First reported in Iceland in 1900 in Reykjanes
- **Distribution:**
  - South Iceland
  - Spreads slowly
- **Transport:**
  - By stone ballast
- **Impact:**
  - On distribution of *Fucus distichus*

Photo: K. Gunnarsson



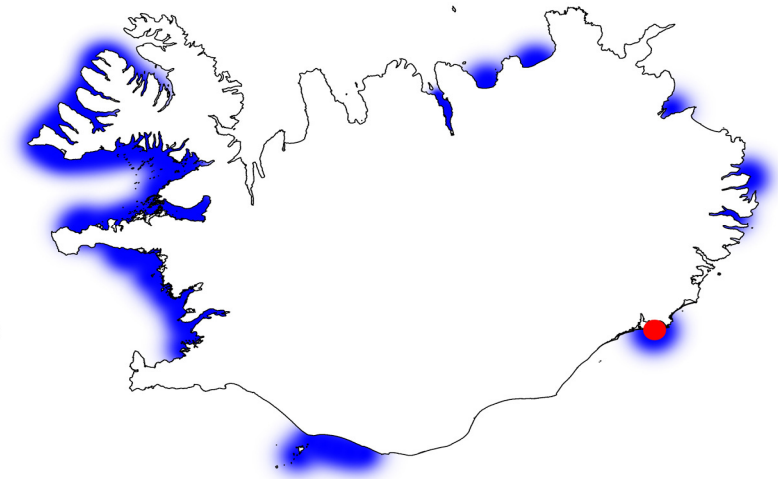
Alien but (still) not invasive species in Iceland

- **Molluscs**
  - *Mya arenaria*
  - *Cerastoderma edule*
- **Fish**
  - *Oncorhynchus mykiss*
- **Macroalgae**
  - *Bonnemaisonia hamifera*
  - *Codium fragile*
- **Phytoplankton**
  - *Heterosigma akasiwo*
  - *Stephanopyxis turris*
  - *Mediopyxis helysa*
  - *Peridinella catenata*
  - *Neodenticula seminae*
- **Ascidian**
  - *Ciona intestinalis*

Mya arenaria
(Sand gaper/soft shell clam)

- Introduced to the European waters 1200-1500
- First observed in Iceland 1958 in south east
- Distribution:
  - Wide, but in low density
- Transport:
  - By humans? (ballast)
- Impact:
  - ?

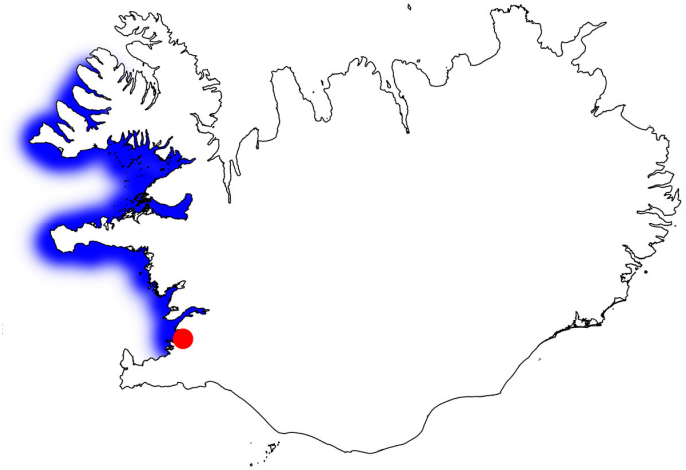
Photo: G.G. Thorarinsdottir



Cerastoderma edule
(Common cockle)

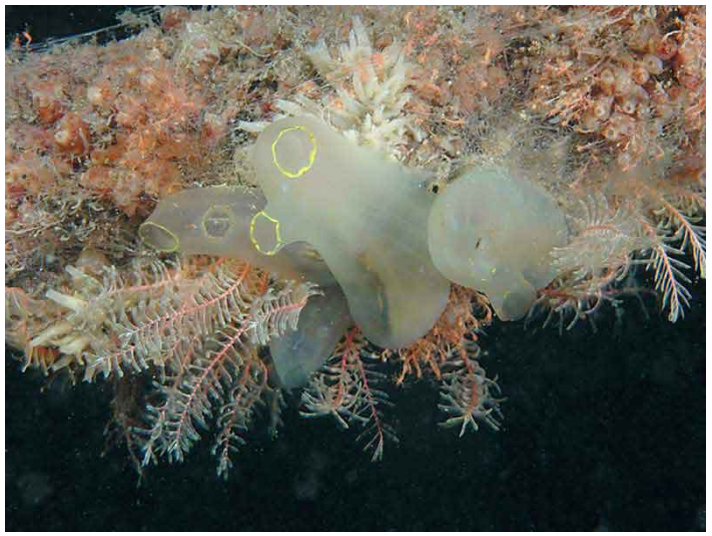
- First observed in Iceland 1948 in south west
- Distribution:
  - Sparese in southwest and west and in low densities
- Transport:
  - By humans? (ballast)
- Impact:
  - ?

Photo: G.G. Thórarinsdóttir

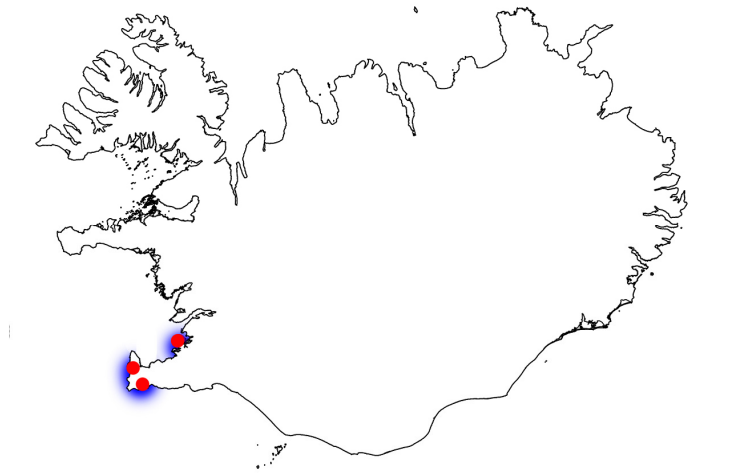


Ciona intestinalis
(Vase tunicate)

- First observed in Iceland 2010
- Distribution:
  - Southwest
- Transport:
  - Fouling on ships?
- Impact
  - ?

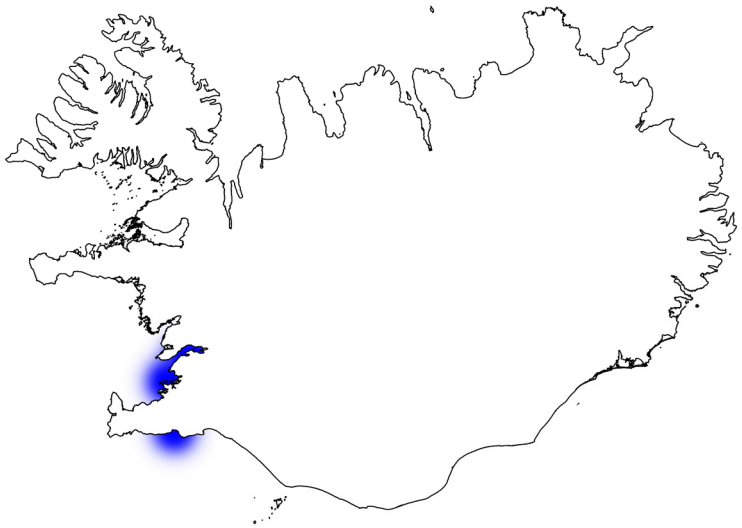


K.Hiscock



Oncorhynchus mykiss
(Rainbow trout)

- A Pacific species introduced worldwide except in the Antartic
- Imported to Iceland from Denmark in 1950 for aquaculture
- Distribution:
  - (Aquaculture stations) Rivers and ponds in the southwest
- Transport:
  - Escape from aquaculture stations in Iceland
- Impact:
  - None as it can not reproduce
  - A predator on native trout larvae ?



Bonnemaisonia hamifera

- Introduced from the Pacific to the Atlantic in end of the 19th century

- First reported in Iceland in 2004
- Distribution:
  - Southwest and west Iceland (only the *Trailliella* stage)
  - Condition for reproduction:

    Temperature>10°C in autumn
- Transport:
  - Ballast water?
- Impact:
  - None because of very restricted distribution and low density

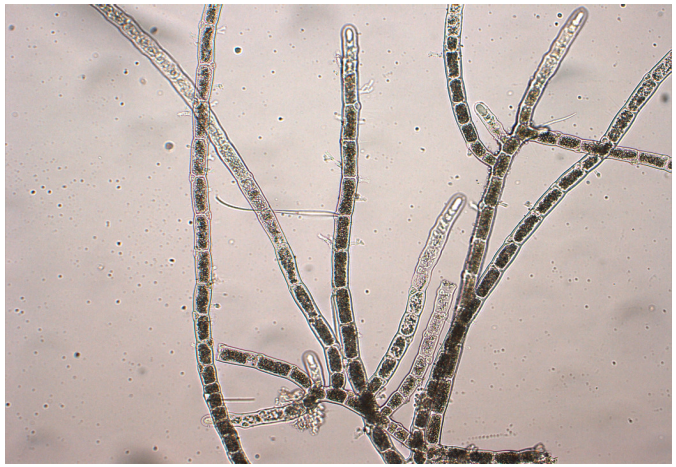
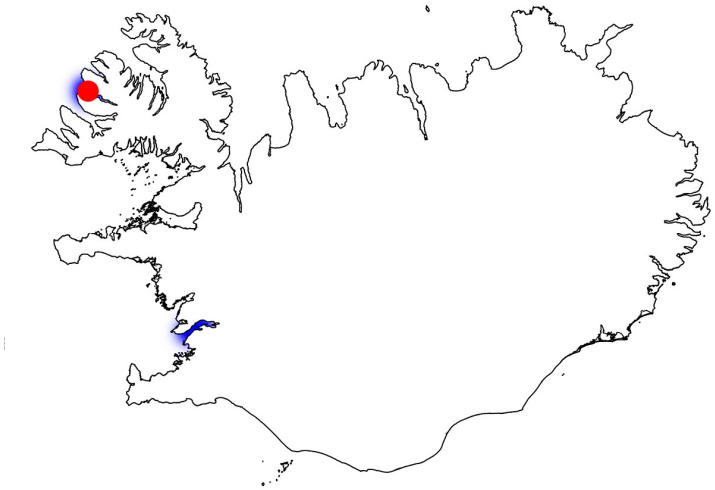


Photo: K. Gunnarsson



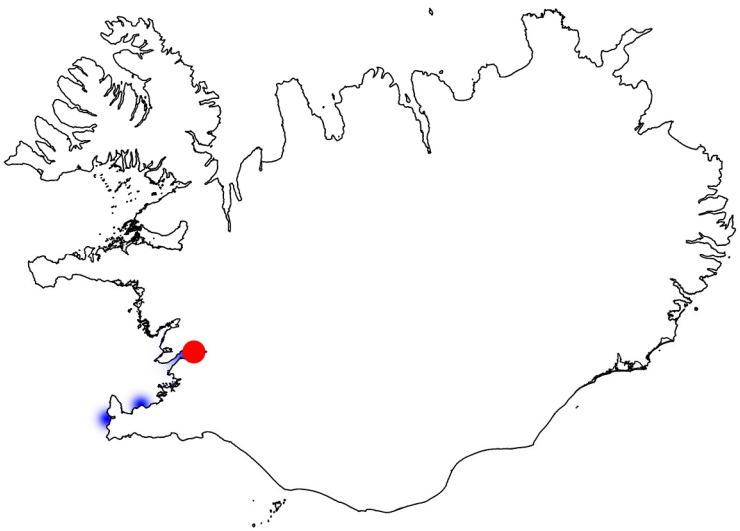
Codium fragile

- Introduced from the Pacific to the Europe in the 19th century (Ireland)
- First observed in Iceland in 1974

- Distribution:
  - Southwest Iceland in sheltered areas
  - Conditions for reproduction:

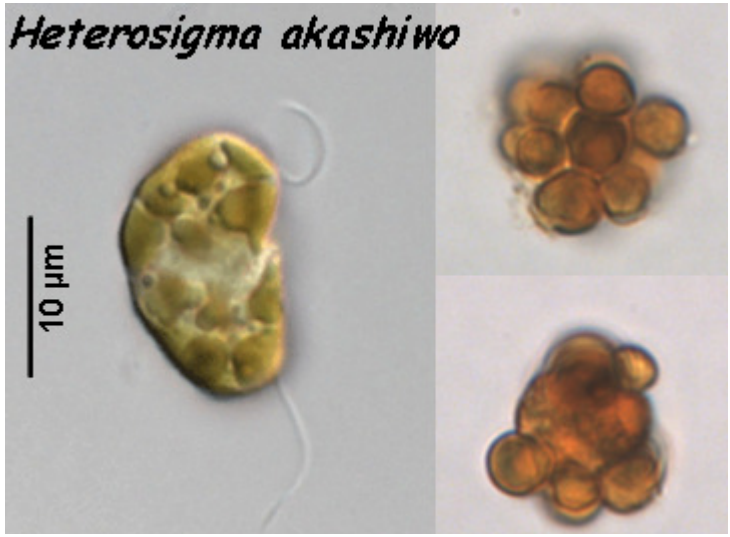
    Temperature>12°C in late summer
- Transport:
  - Ballast water?
- Impact:
  - None, because of very restricted distribution and low density

Photo: K. Gunnarsson



Heterosigma akasiwo

- Widely distributed in the world
- Registered once in Iceland in 1987
- Distribution:
  - Southwest, Hvalfjördur
- Transport:
  - Ballast water
- Impact:
  - Produces mucus that killed salmon in cages in Hvalfjördur



J. Larsen

Stephanopyxis turris

- A diatom species distributed both east and west in the North – Atlantic and North-Pacific
- First observed in Iceland in 1997
- Distribution:
  - Southwest; Hvalfjördur and Kollafjördur
- Transport:
  - Ballast water?

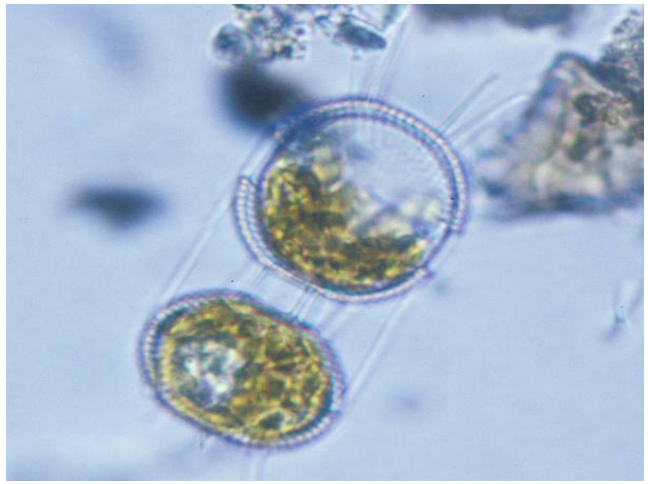


Photo: K. Gunnarsson

Mediopyxis helysia

- A diatom species of unknown orign, but now found on both sides of the North-Atlantic
- First reported in Iceland in 2007
- Distribution:
  - Breidafjördur in the west
- Transport:
  - Ballast water?

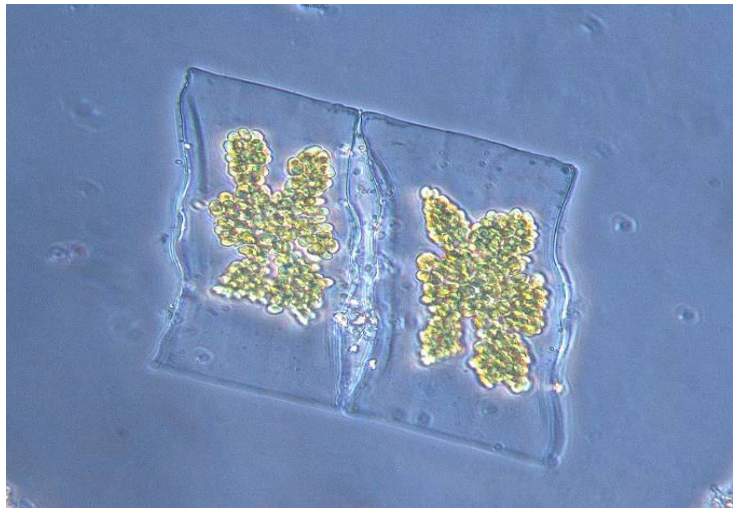
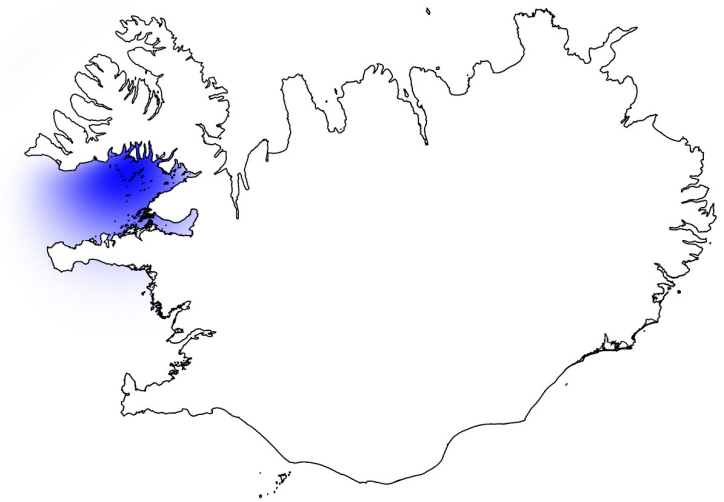


Photo: K. Gunnarsson



Peridinella catenata

- Widely distributed in the world
- First reported in Iceland last year
- Distribution:
  - South; Jökulsárlón, brakish glacier lagoon
- Transport:
  - ?

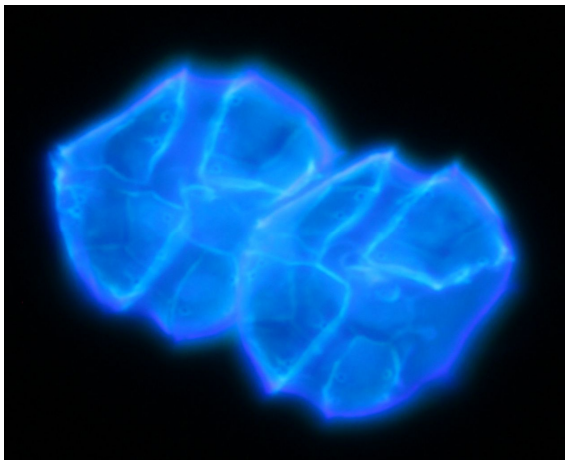


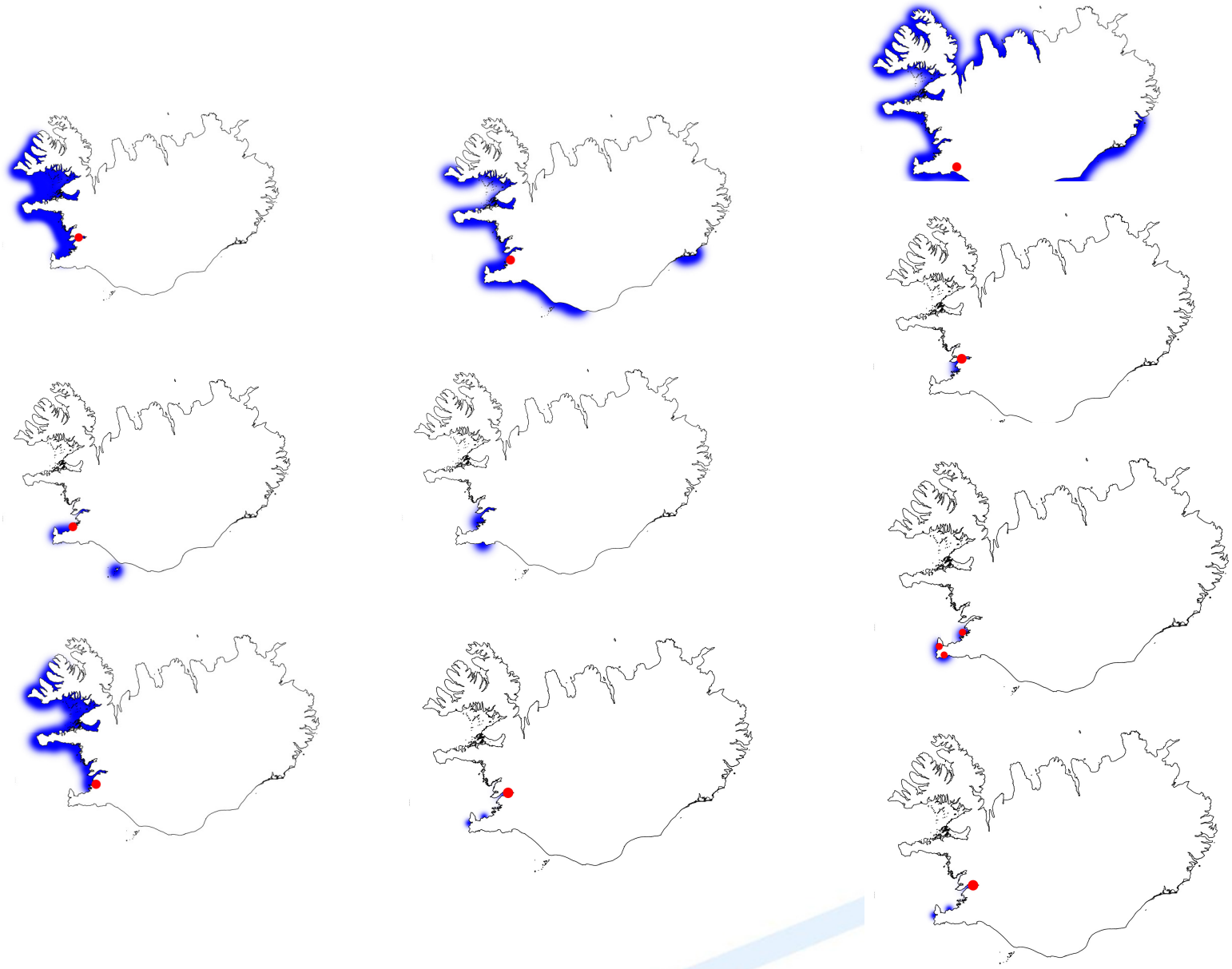
Photo: H. Gudfinnsson

Transport af alien species to Iceland

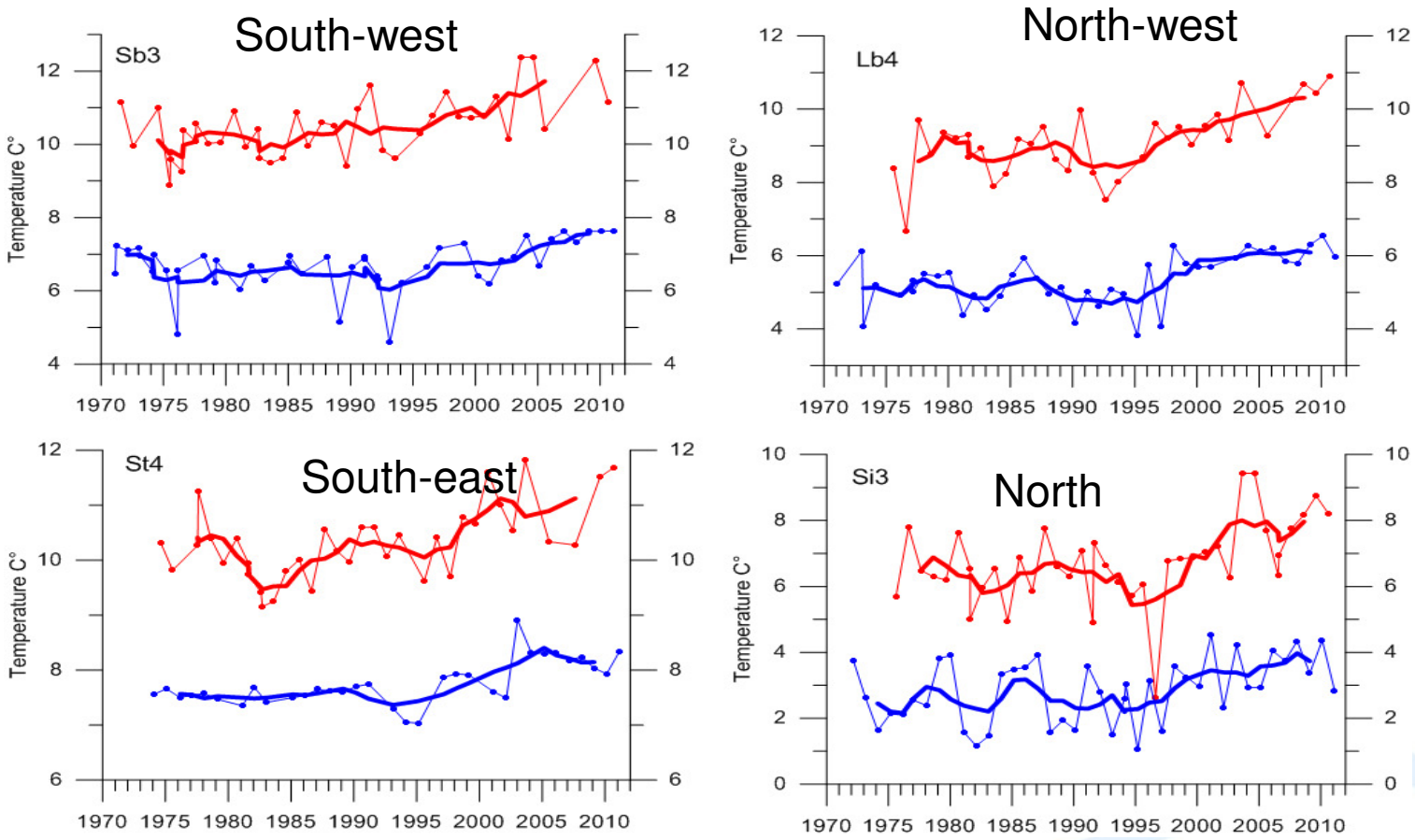
- Ballast water
- External fouling of ships
- Aquaculture
- *Transport by currents*

- Increased sea temperature in the last decades makes it possible to survive
- Most of the species first reported in Hvalfjördur

Out of 15 species 10 were first observed in south-west Iceland



Increased sea temperature makes it possible to survive



Conclusion

- Few alien species and very few invasive
- Most of them are probably transported by ballast water
- Most of them are first reported from south-west Iceland
- Increasing sea temperature makes it possible for some species to survive and reproduce

- **Prevention strategies in Iceland about ballast water:**

  New regulations on handling of ballast water were introduced in Iceland in 2010 to prevent introduction of alien marine species. According to them it is forbidden to discharge ballast water in Icelandic jurisdiction

- Aquaculture:

  New regulations on import af aquaculture animals are on their way

- Fouling?

Thank you!