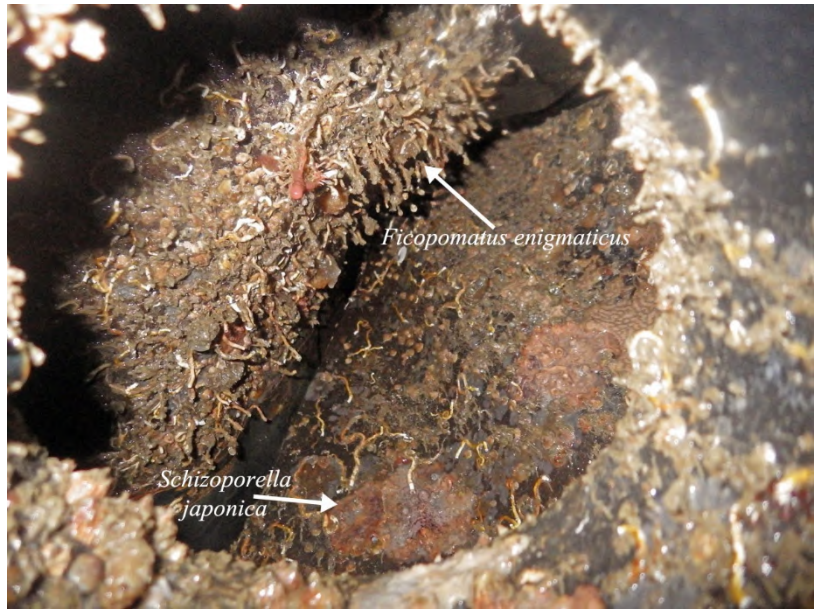


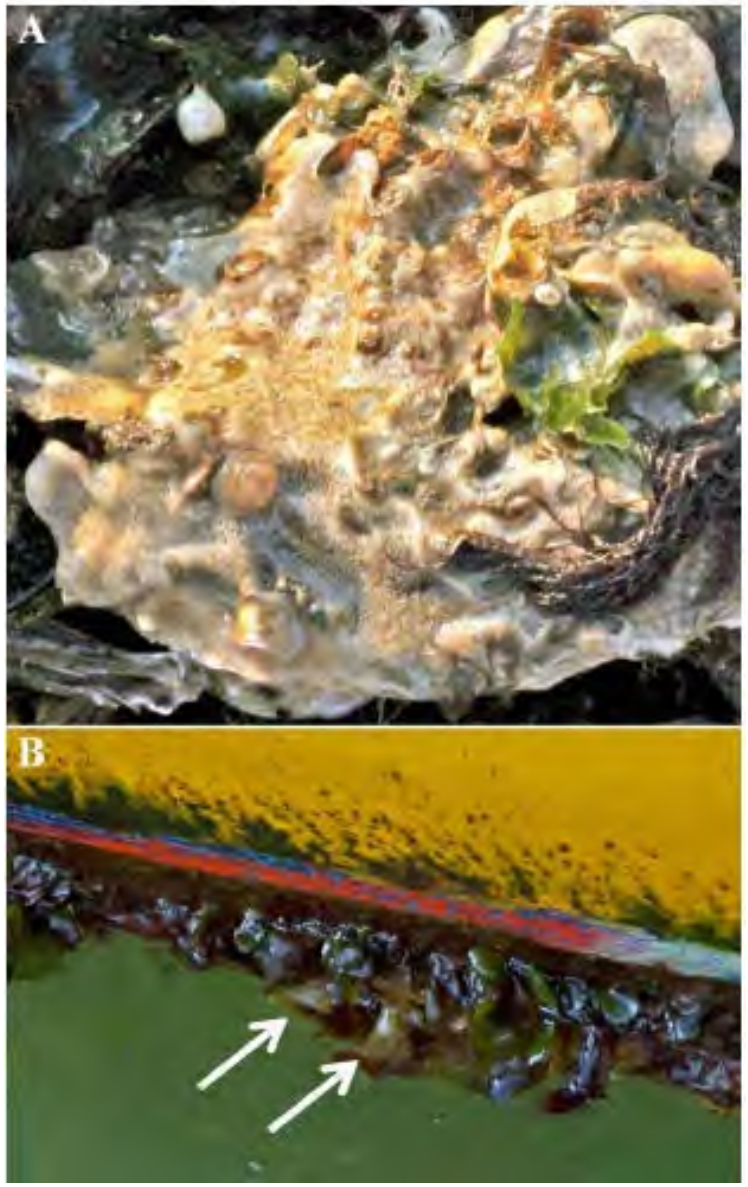
Netherlands Food and Consumer Product Safety Authority
Ministry of Agriculture, Nature and Food Quality

The neglected pathway for Marine Alien Species: Biofouling

Sander Smolders
Coordinating senior advisor, Office of Risk Assessment & Research

Arjan Gittenberger, GiMaRIS

Saa Kabuta, Rijkswaterstaat



Netherlands Food and Consumer
Product Safety Authority
Ministry of Agriculture,
Nature and Food Quality

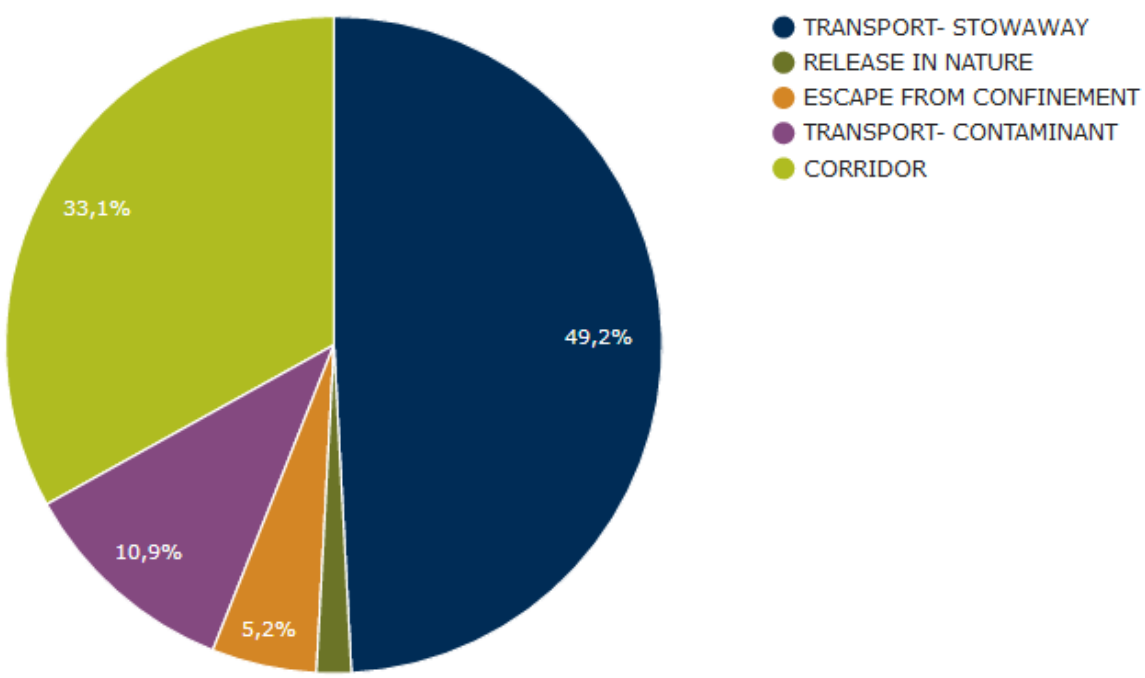
Outline

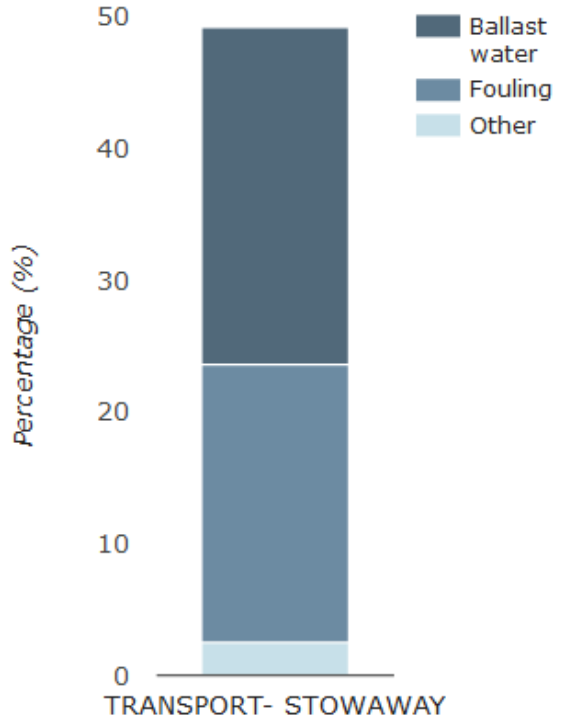
- Main Transport vectors
- Ballast water vs Hull fouling
- Hull fouling relevance in distribution NIS
- Dutch studies on hull fouling
- Boat owners awareness & behavior
- Hull fouling classification model
- Conclusions and Way forward…

Three main transport vectors in Europe

- Ballast water: ballast water convention
- Shellfish transports: a variety of rules and restrictions
- Hull fouling: minimal to no legislation!!

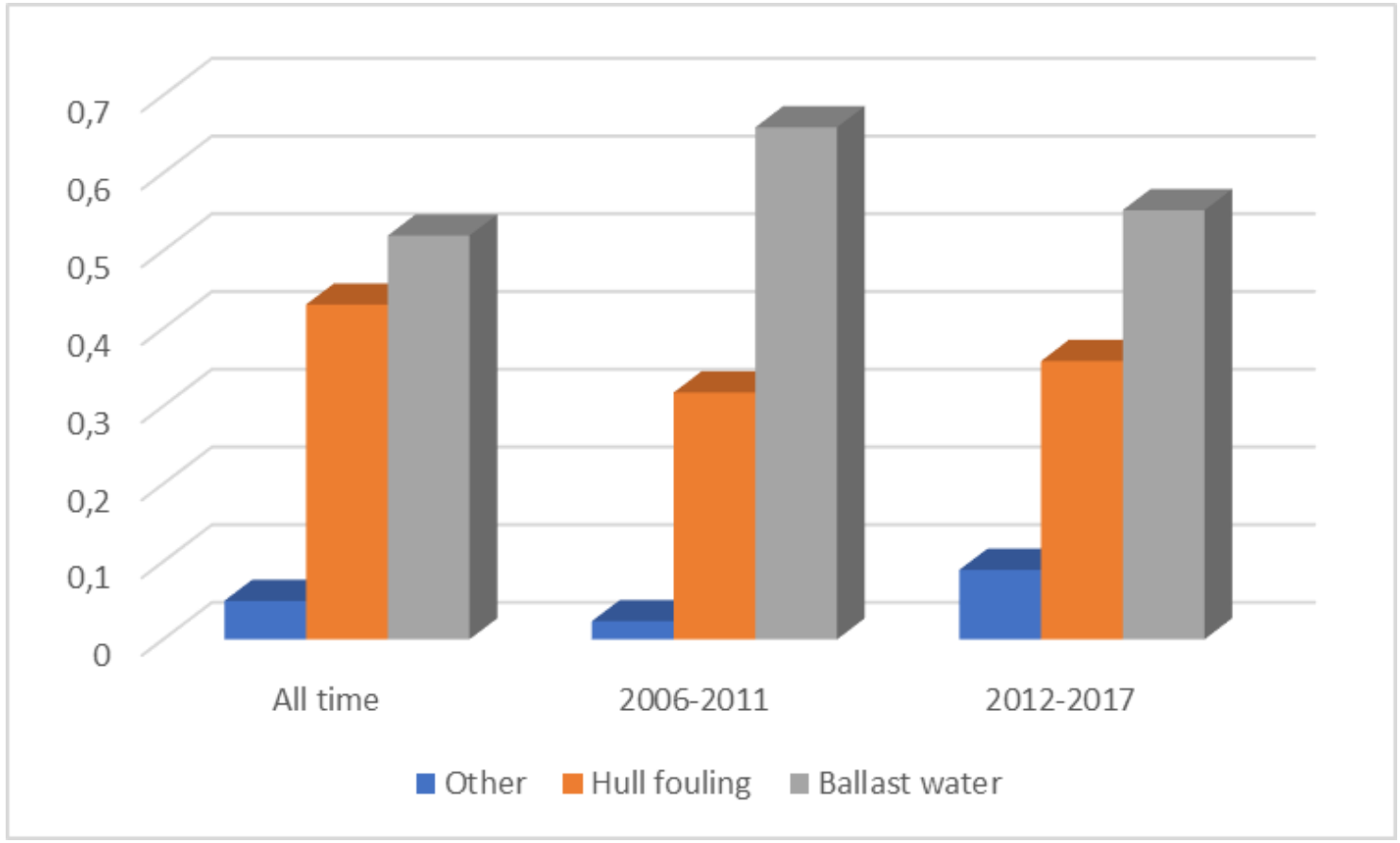
Mode of introduction of non-indigenous species in European Seas





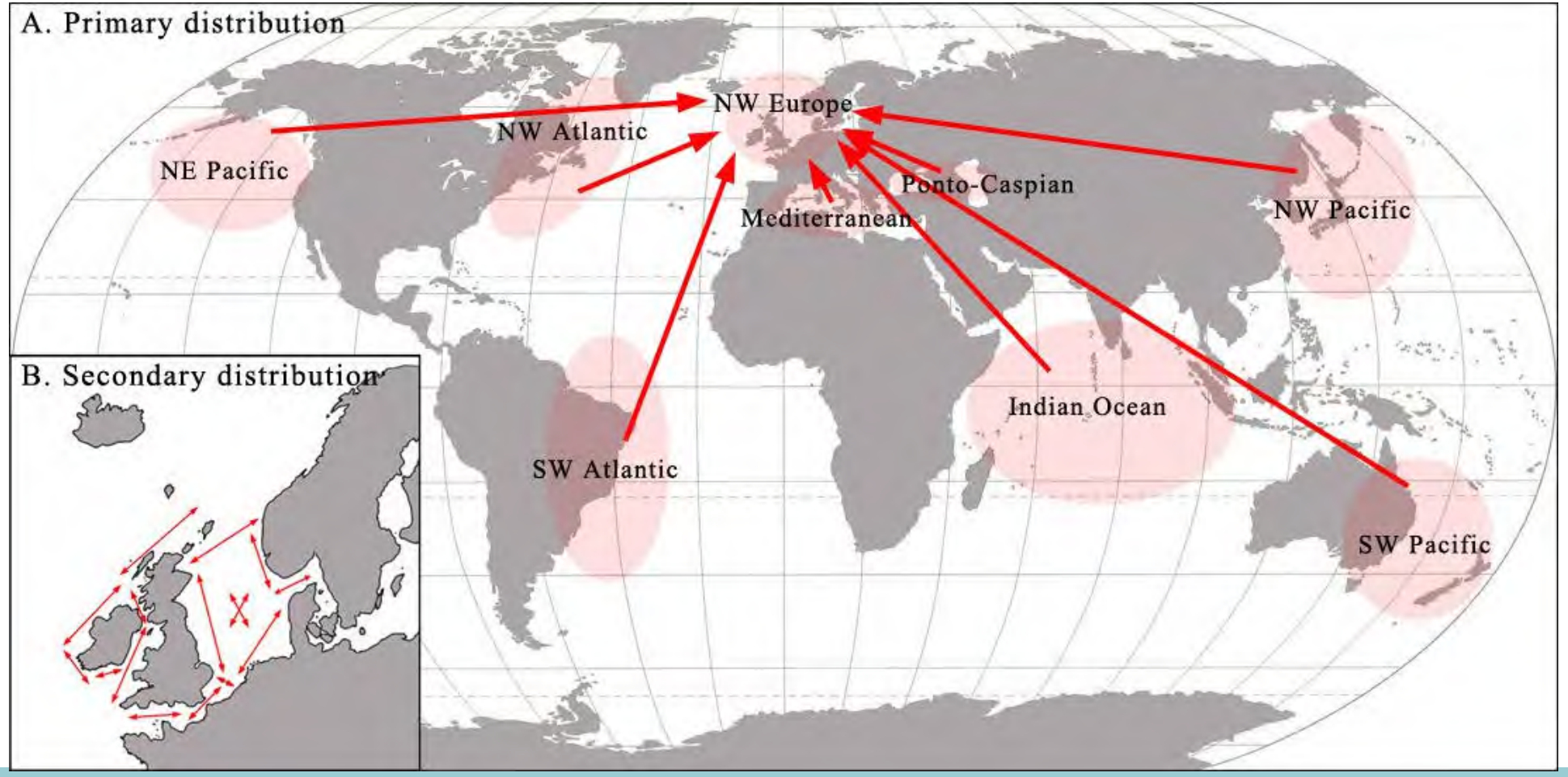
https://www.eea.europa.eu

Ballast water versus Hull fouling



https://www.eea.europa.eu

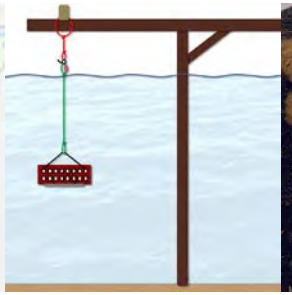
Relevance of hull fouling in the distribution of alien marine species



Alien fouling species focused studies in the Netherlands

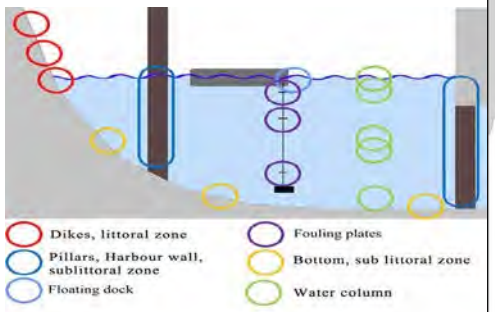
SETL-project

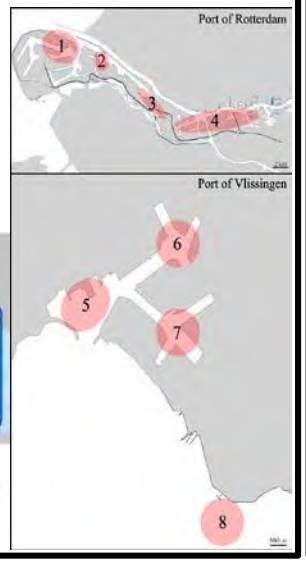
Since 2006: fouling plates checked 3 monthly.
Surveys of
2055 pleasure craft hulls

Commercial ports

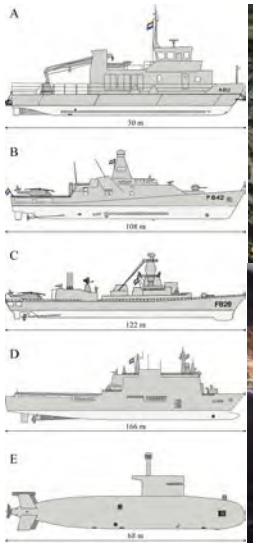
Since 2014: All marine habitats OSPAR/HELCOM port surveys





Naval port of Den Helder

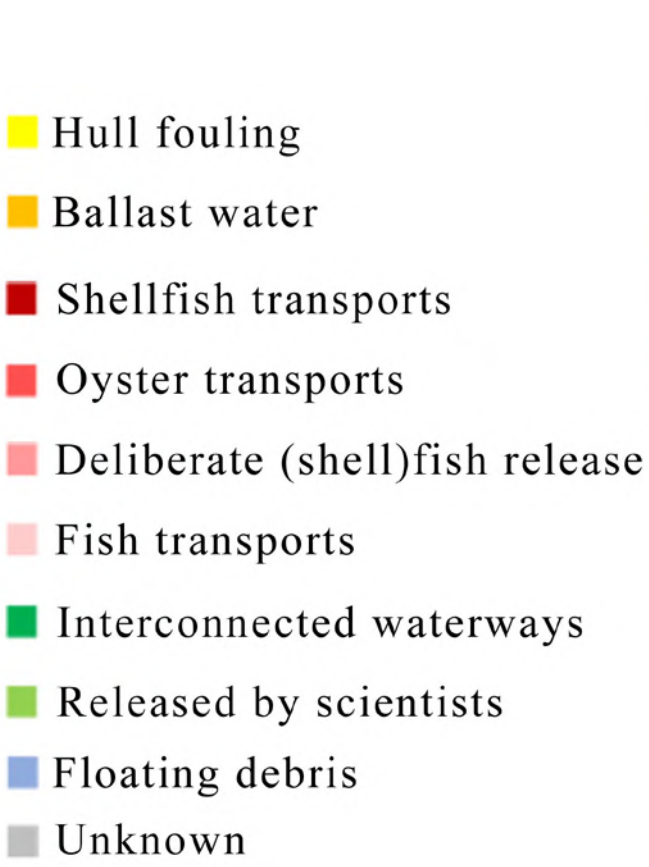
2015-2018:
Port surveys & surveys of alien hull fouling species

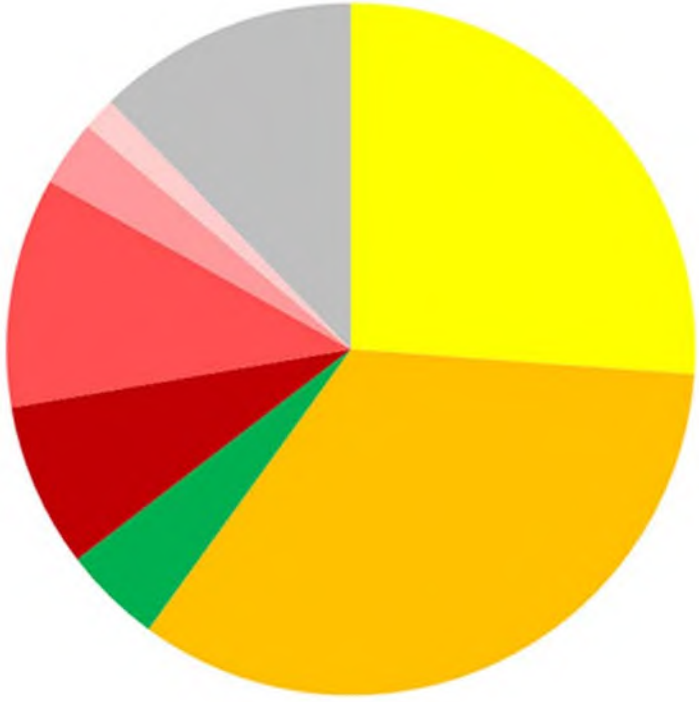


Wadden Sea: all marine habitats

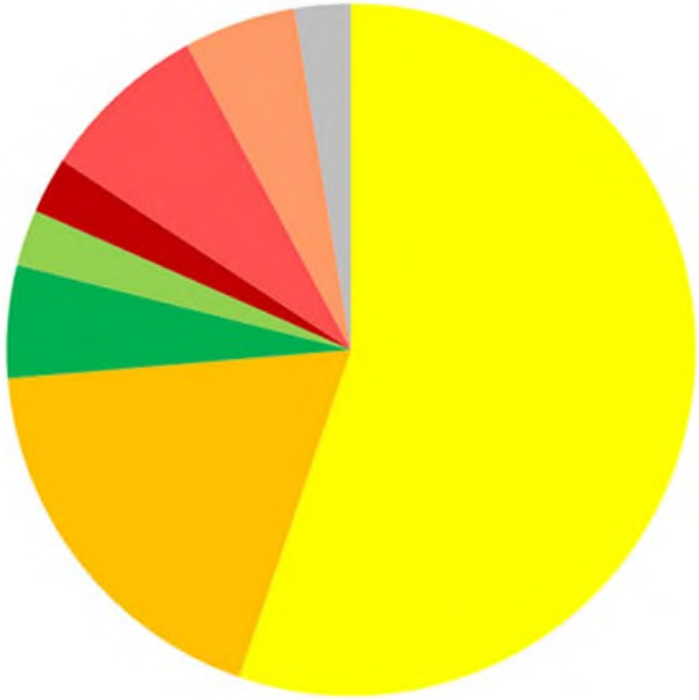
2009 , 2011, 2014, 2018:
Alien species surveys

Based on marine alien species recorded along the Dutch coastline



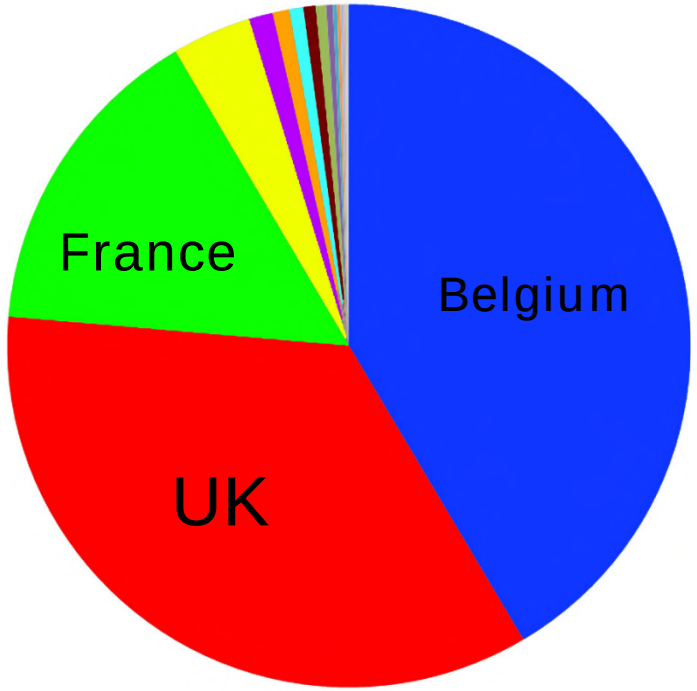


Primary distribution into Europe

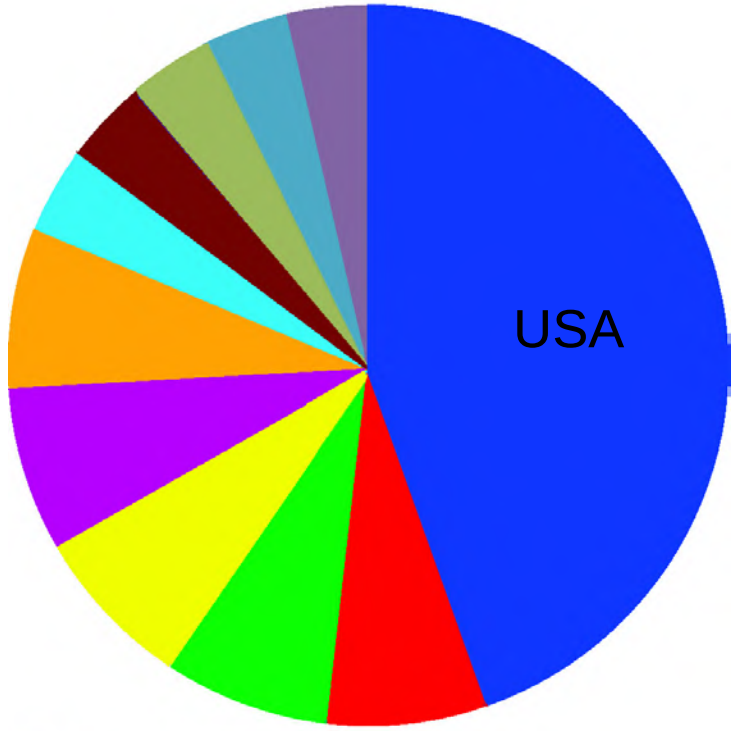


Secondary distribution throughout Europe

Origin of boats that visited the small marina of Breskens in 2002-2010



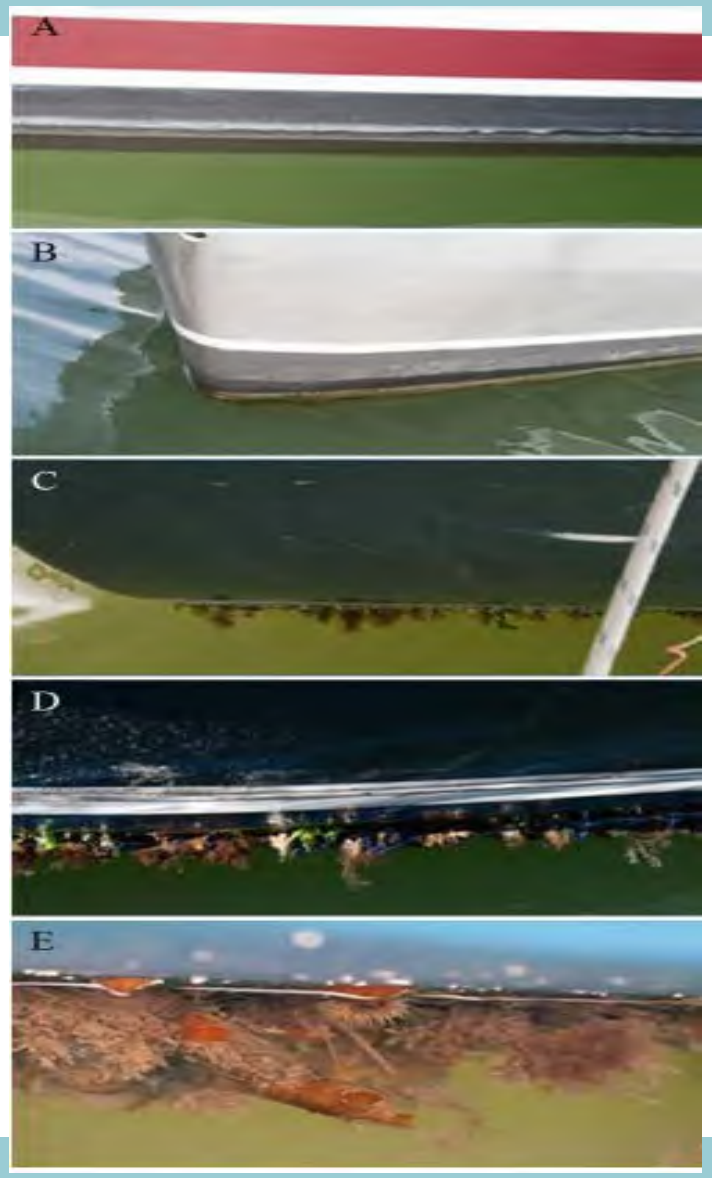
Belgium (1051)
United Kingdom (884)
France (384)
Germany (95)
Sweden (29)
Norway (20)
Denmark (17)
Finland (14)
Guernsey (13)
Jersey (8)
Poland (5)
Italy (4)
Russia (4)
Spain (4)
Estonia (2)
Malta (1)
Slovenia (1)



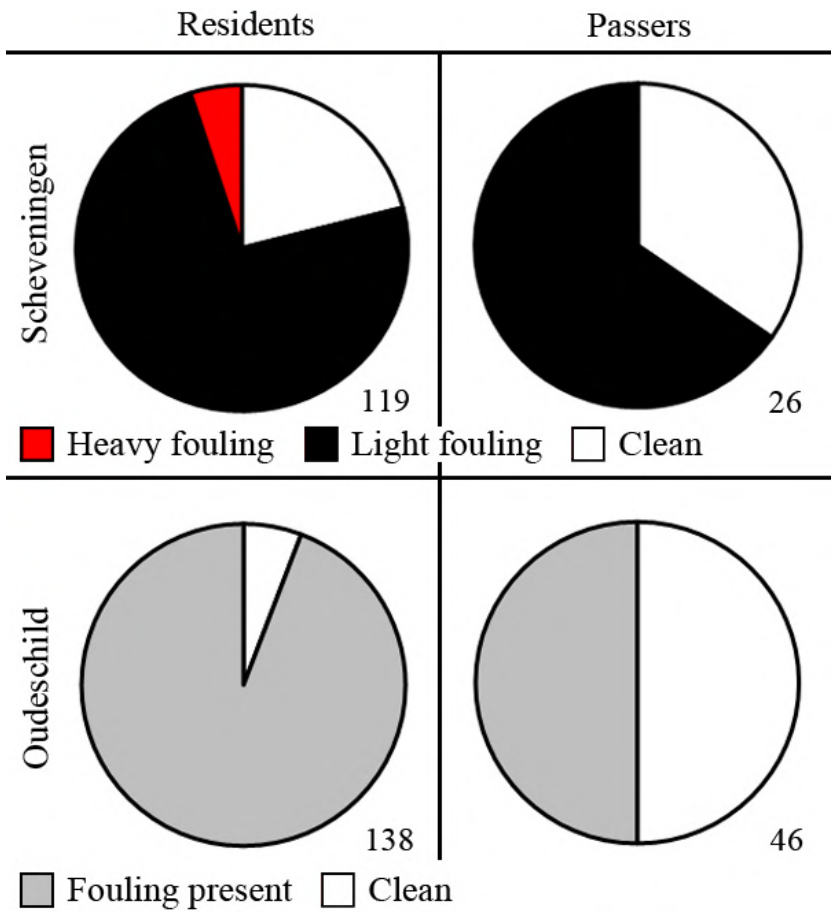
USA (12)
Australia (2)
Canada (2)
Nigeria (2)
South Africa (2)
Brittish Virgin Islands
Japan (1)
Martinique (1)
Mexico (1)
New Zealand (1)
Sierra Leone (1)

Hullfouling classification

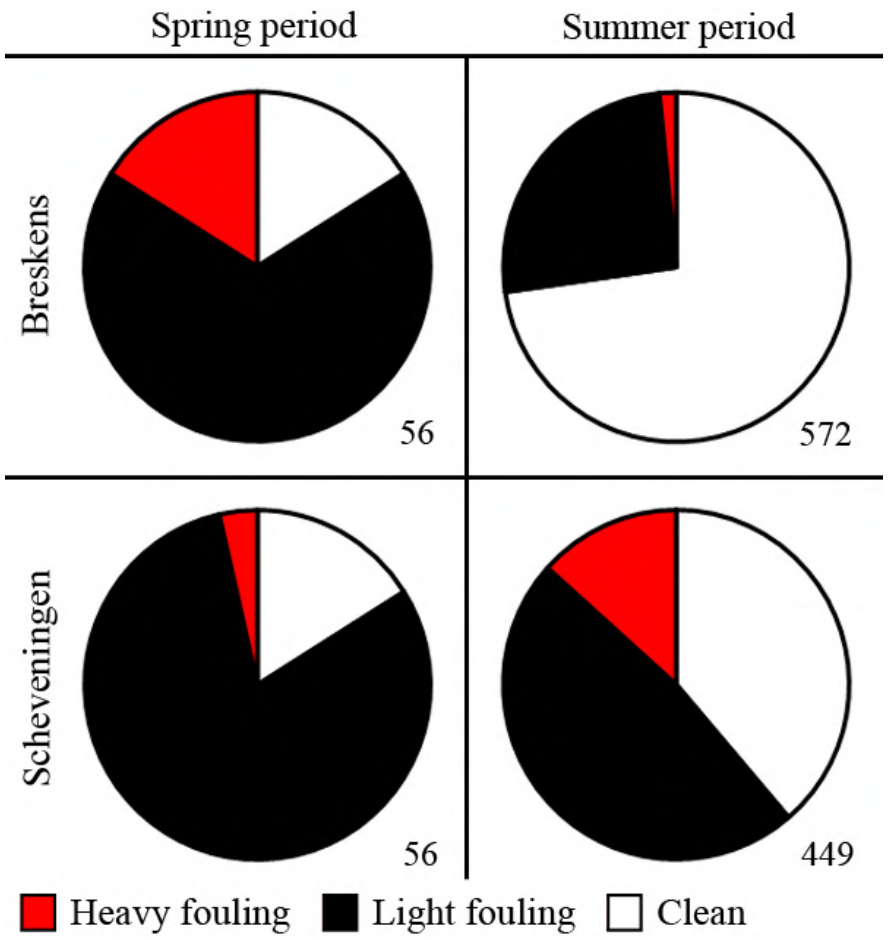
	Rank:	Description
Clean	A	No visible fouling. Hull entirely clean, no biofilm* on visible submerged parts of the hull.
Light Fouling	B	Light fouling. Hull covered in biofilm and 1-2 very small patches of marcrofouling (only one taxon).
	C	Considerable fouling. Presence of biofilm, and macrofouling still patchy but clearly visible and comprised of either one single or several different taxa.
Heavy fouling	D	Extensive fouling. Presence of biofilm and abundant fouling assemblages consisting of more than one taxon.
	E	Very heavy fouling. Diverse assemblages covering most of visible hull surfaces.



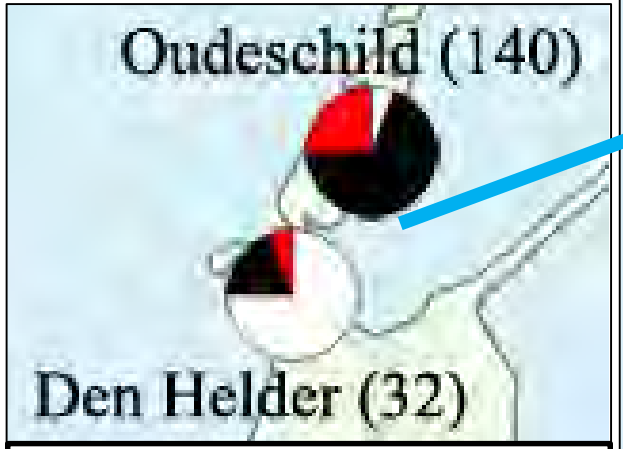
Passers or Residents



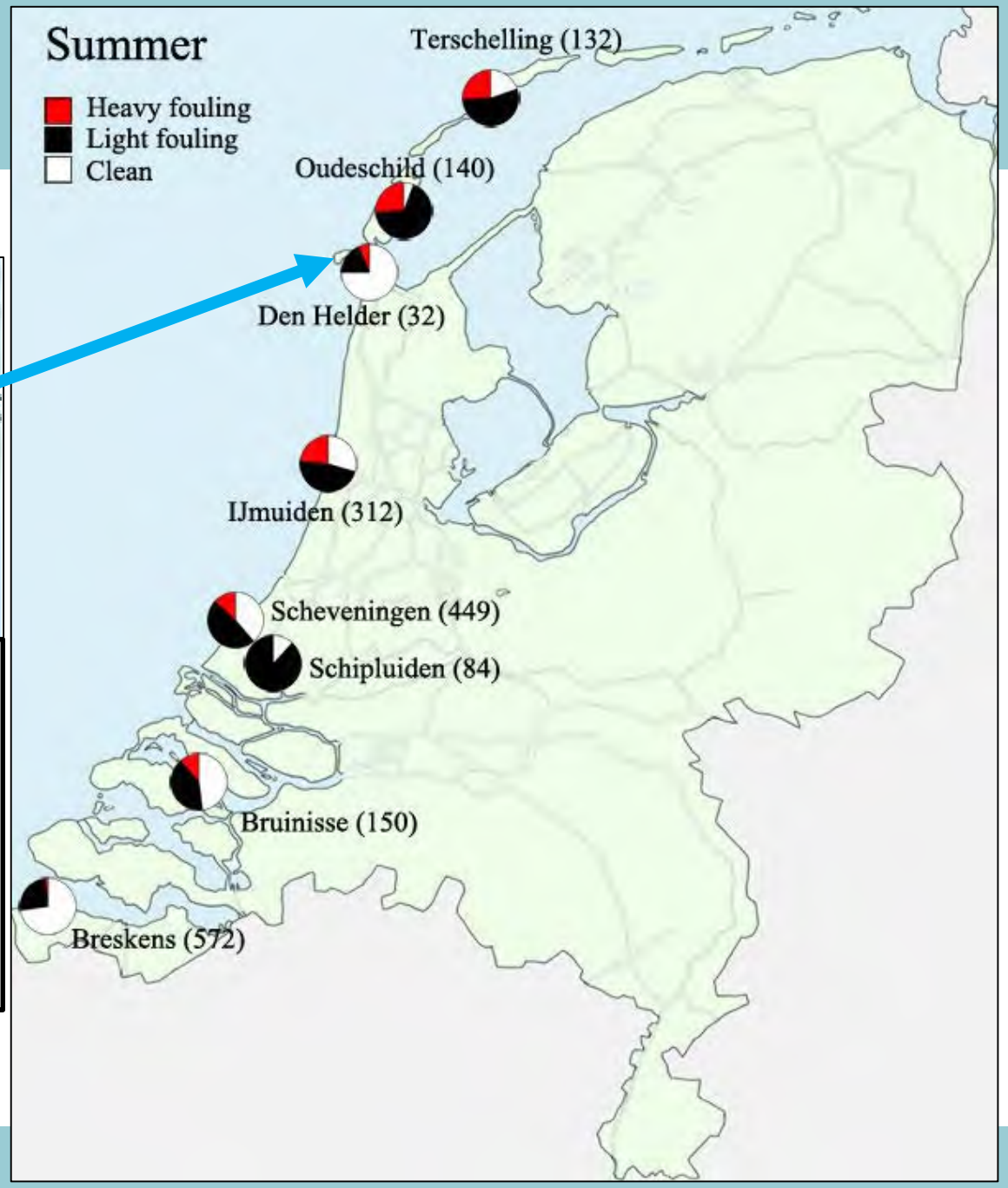
Seasons



Pleasure craft fouling appears to be strongly related to owner behaviour



Port of Den Helder is a military port. The marina within this port is only used by military staff, which are here assumed to spend more effort on the maintenance of their pleasure crafts.



Conclusions

1. Hull fouling is and will be more and more the main pathway of marine NIS within the North East Atlantic ocean

2. Recreational shipping is an important factor when it comes to secondary distribution

3. Boat owners attitude and boat type is crucial in addressing the problem of hull fouling

4. Lack of knowledge on degree of hull fouling and species communities on commercial ships; especially in and around niche areas