July 2026

THE BALTIC CLIMATE SCHOOL

Climate change and the Baltic Sea: impact on ecosystems and biodiversity
or
Climate Change and Biological Invasions: Introduction Pathways Today and in the Future

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Coalition Clean Baltic

2026

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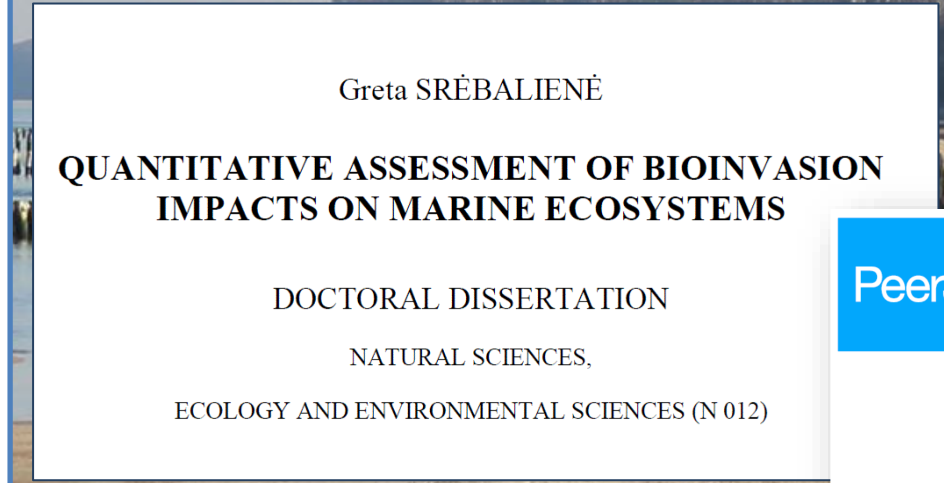
July 2026

About me

- Researcher at the Klaipėda University Marine Research Institute my work focuses on marine ecology, biological invasions, and biosecurity in aquatic ecosystems.
- PhD research was about quantitative assessment of bioinvasion impacts on marine ecosystems, with particular emphasis on non-indigenous species and their ecological effects.
- Currently working on the detection, risk assessment, and management of harmful aquatic organisms and pathogens transported by ships' ballast water, contributing to the development of regional early-warning systems for marine biosecurity.
- At present, we work on the international ECOMARINAS project. The project aims to promote sustainable recreational boating and the operation of small marinas in the Baltic Sea region by reducing their environmental impacts.



Greta SRĖBALIENĖ

QUANTITATIVE ASSESSMENT OF BIOINVASION IMPACTS ON MARINE ECOSYSTEMS

DOCTORAL DISSERTATION

NATURAL SCIENCES,

ECOLOGY AND ENVIRONMENTAL SCIENCES (N 012)

PeerJ

A comparison of impact and risk assessment methods based on the IMO Guidelines and EU invasive alien species risk assessment frameworks

Greta Srėbalienė[1], Sergej Olenin[1], Dan Minchin[1,2] and Aleksas Narščius[1]

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ABSTRACT

A comparative analysis of two risk assessment (RA) frameworks developed to support the implementation of the international Ballast Water Management Convention (BWMC) and European Regulation on Invasive Alien Species (IAS) was performed. This analysis revealed both differences and similarities between the IMO Risk Assessment Guidelines (IMO, 2007) and EU Regulation supplement on RA of IAS (EU, 2018) in RA approaches, key principles, RA components and categories of IAS impacts recommended for assessment. The results of this analysis were used to produce a common procedure for the evaluation of the bioinvasion risk and impact assessment methods intended to support international, regional and/or national policy on IAS. The procedure includes a scoring scheme to assess compliance with the key principles, RA components and categories of bioinvasion impacts taken into account by the methods. In these methods the categories of impacts on human health and economy are underrepresented comparing with impacts on environment.

Research Article

Bacteriological analysis of ballast water and port area: case study in the Baltic Sea port

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Abstract

This study highlights the role of ballast water management in preventing the global spread of harmful organisms. The entry into force of the International Convention for the Control and Management of Ships' Ballast Water and Sediments has created new challenges for policy and environmental managers. To adapt the most effective prevention strategies and enhance biosafety in the context of ballast water management systems, there is an increasing need for rapid analytical tools to detect microbes and assess the efficacy of ballast water treatment systems. In this study, ballast water was sampled from vessels before and after treatment at the port of Klaipeda, situated on the Baltic Sea coast. Results showed high levels of coliforms and *Escherichia coli* in untreated ballast water, with reduced levels after treatment, although statistical differences were not significant. No toxigenic *Vibrio cholerae* was found, but prior studies confirm the presence of other pathogenic *Vibrio* spp. Findings highlight the importance of ballast water monitoring and the potential for rapid monitoring methods to enhance biosecurity.

Key words: human health, vessels, indicator microbes, pollution, biosecurity

Biological Invasions and Environmental Genetics

Main resarch topics:

•**Information system on aquatic non-indigenous and cryptogenic species (AquaNIS)**

•**Marine Strategy Framework Directive**

Developing of NIS indicators; involvement of invasive species in overall marine environmental status assessments.

•**Implementation of the IMO Ballast Water Management Convention (BWMC)**

Port biological surveys. Early warning system on harmful aquatic organisms and pathogens. Ballast water sampling.

•**Socio-economy of biological invasion**

Team:

Dr. Sergej Olenin
Head, biogeography, indicators and impact assessment, ballast water management, marine policy – science interaction

Dr. Anastasija Zaiko
molecular methods, ecophysiology, functional ecology, impact assessment, biosecurity approach

Dr. Aurelija Samuilovienė
molecular methods, hybridization

Dr. Aleksas Narščius
ecoinformatics, AquaNIS data management

Dr. Greta Srėbalienė
impact assessment, NIS indicators, ballast water and biofouling monitoring and assessment

PhD student

Sebastiana Di Dio

Biofouling plates, sustainable paints, invasive species

Climate change and invasive species. Which came first?

- **Biological invasions: Human-mediated introductions have occurred for thousands of years, but they increased dramatically during the Age of Exploration (15th–18th centuries) through shipping, agriculture, and trade.**

- **Anthropogenic climate change: Although Earth's climate has always varied naturally, the current rapid warming caused by greenhouse gas emissions began with the Industrial Revolution and became particularly pronounced after the 1950s.**

Key message: Invasive species became a global problem long before climate change emerged as a major environmental issue.

Climate Change in the Baltic Sea: Biological Invasions

Changing physical conditions reshape ecosystems and biodiversity

Key Climate Changes

- ↑ Sea temperature
- ↓ Sea ice cover
- Changing salinity
- More marine heatwaves and storms
- Expanding hypoxia

Ecological Responses

- Species range shifts
- Earlier reproduction and longer growing seasons
- Habitat degradation
- Food-web changes
- Reduced ecosystem resilience

REVIEW OPEN ACCESS

Climate-Smart Invasive Species Management for 21st Century Global Change Challenges

Eva M. Colberg[1] | Bethany A. Bradley[2,3] | Toni Lyn Morelli[2,3,4] | Carrie J. Brown-Lima[1,2,4]

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Funding: This work was supported by Northeast Climate Adaptation Science Center, Grant No. G21AC10648-02.

Keywords: climate adaptation | climate change | invasive species management | natural climate solutions | natural resource management | review

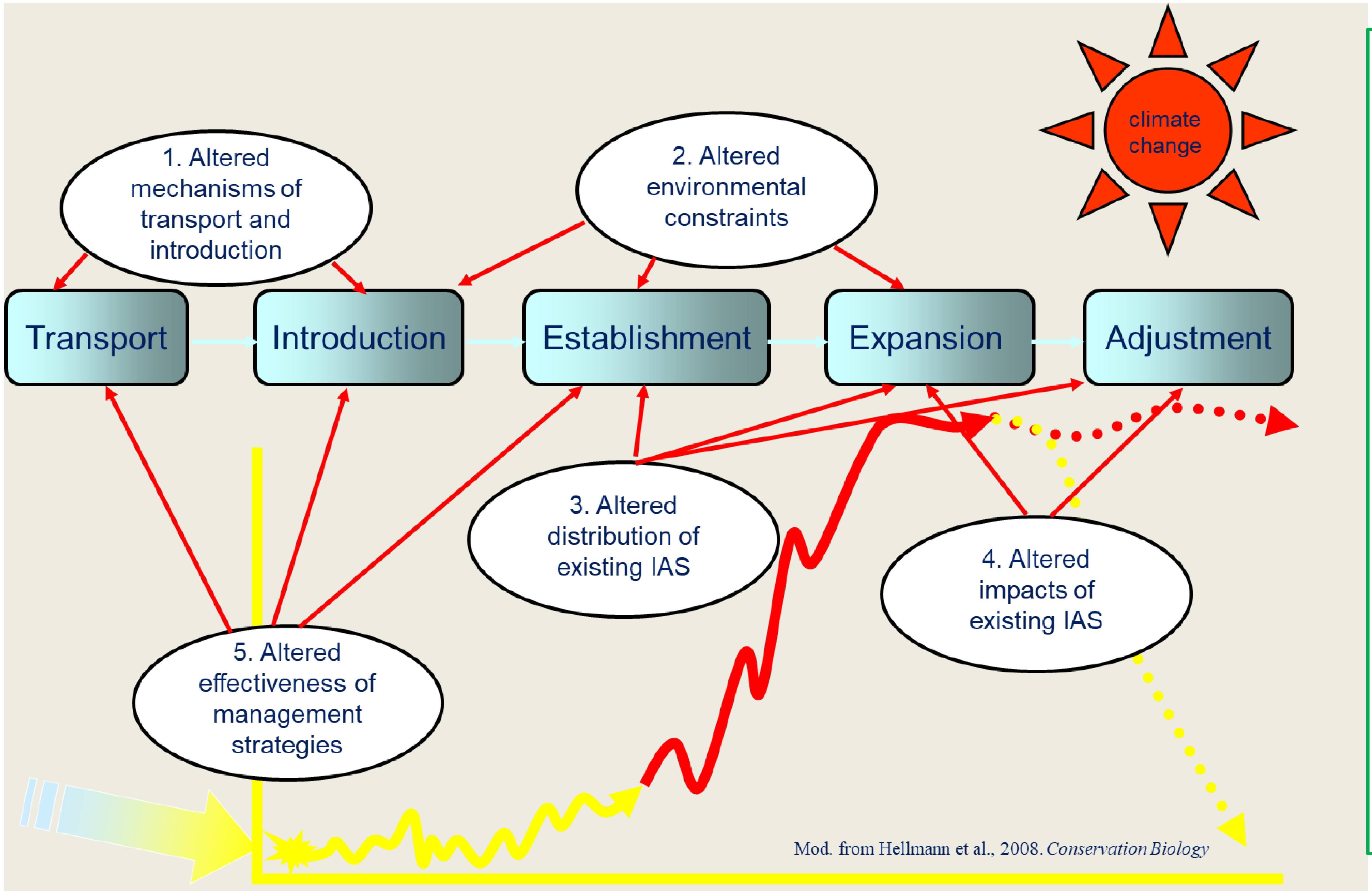
ABSTRACT

Addressing the global challenges of climate change and biotic invasions requires understanding their interactions and implications for natural resource management. To facilitate and support invasive species management in a changing climate, we review how climate change and invasions interact to impact the planning, action, and outcomes of invasive species management. Climate change is facilitating the introduction of new potential invasive species and altering pathways of introduction and spread, with implications for which species natural resource managers need to assess, monitor, and target. Climate-driven shifts in invasive species phenology require more flexible management timelines. Climate change may reduce the efficacy and feasibility of current treatment methods and make native ecosystems more vulnerable to invasion. Additionally, disturbance caused by extreme climate events can compound the spread and impacts of biological invasions, making invasive species management a necessary part of extreme event preparation and response planning. As a solution to these challenges, we propose climate-smart invasive species management, which we define as the approaches that managers and decision-makers can take to address the interactive effects of climate change and invasions. Climate-smart invasive species management includes considering potential shifts in species ranges, abundances, and impacts to inform monitoring, treatment, and policies to prevent new invasive species. Climate-smart management may also involve adjusting the timing and type of treatment to maintain efficacy, promoting resilient ecosystems through climate-smart restoration, and considering the effects of climate change when setting management goals. Explicitly considering the interactions of climate change and biological invasions within organizational decision-making and policy can lead to more effective management and promote more resilient landscapes.

Take-home message:

Climate change is accelerating biological invasions by facilitating the introduction and spread of non-native species, altering invasion pathways, reducing the effectiveness of current management strategies, and increasing ecosystem vulnerability. Effective management therefore requires climate-smart invasive species management, which integrates climate change into monitoring, prevention, restoration, and policy to build more resilient ecosystems.

How Can Climate Change Affect Invasive Alien Species?



- Climate change creates new pathways for invasive species, for example through shipping routes that open as sea ice retreats.
- Warmer temperatures enable invasive species to expand their range into habitats that are currently too cold for their establishment.
- The impacts of existing invasive species may change as environmental conditions shift.
- The effectiveness of invasive species management strategies may also be altered under changing climate conditions.

Mod. from Hellmann et al., 2008. *Conservation Biology*

Main Environmental Factors Affecting Invasive Species

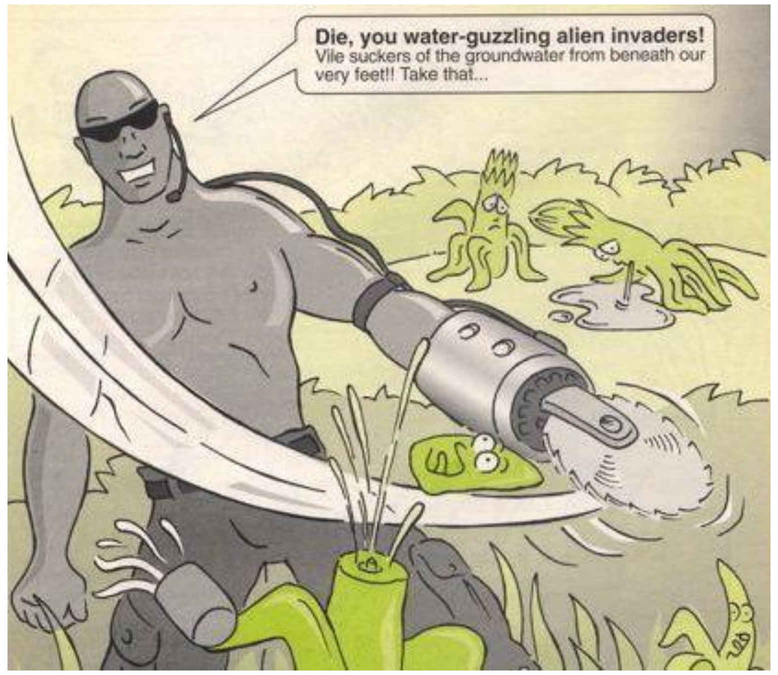
Climate change – Warmer temperatures and milder winters expand suitable habitats and increase survival.
Habitat disturbance – Dredging, coastal development, and storms create opportunities for invasion.
Eutrophication – Excess nutrients promote opportunistic invasive species.
Salinity changes – Favor species with broad salinity tolerance.
Hypoxia – Low oxygen levels stress native species but may benefit tolerant invaders.
Pollution – Some invasive species thrive in contaminated environments.
Biodiversity loss – Reduced native diversity lowers ecosystem resistance to invasion.

Key message:
Climate change and human-induced environmental disturbances increase ecosystem vulnerability, making the establishment and spread of invasive species more likely.

Invasive, Alien, Non-native, or Introduced?

This is the terminology most commonly used in invasion biology:

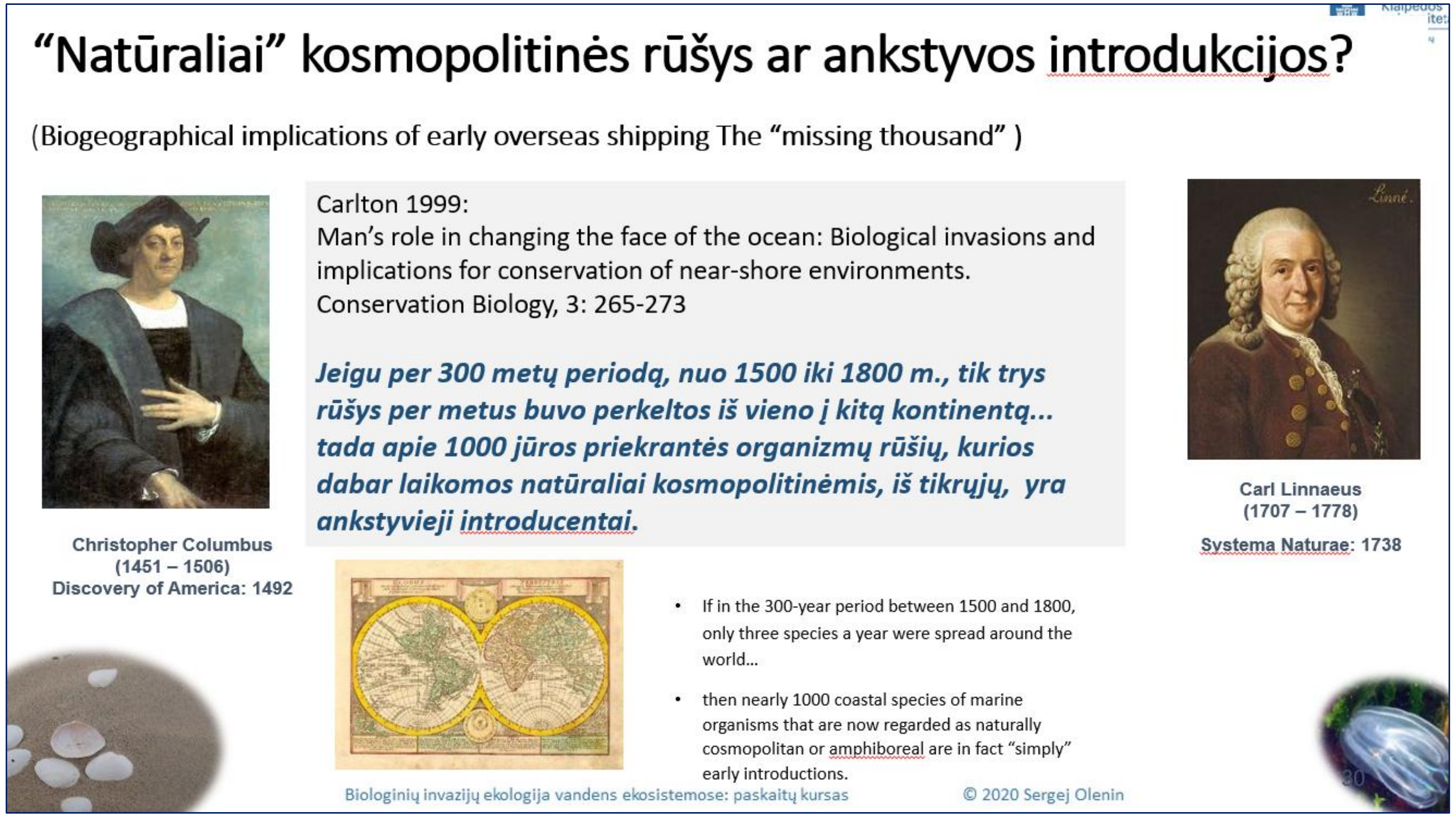
- **Invasive species** – species that spread and cause ecological, economic, or social harm.
- **Alien species** – standard term in European legislation (e.g., EU Regulation 1143/2014), synonymous with **non-native species**.
- **Non-native species** – widely used in scientific literature.
- **Introduced species** – species moved by humans outside their native range, regardless of whether they become invasive.



Pagal: IUCN 1999; Clinton 1999; Boudouresque & Verlague 2002.

Cryptogenic species

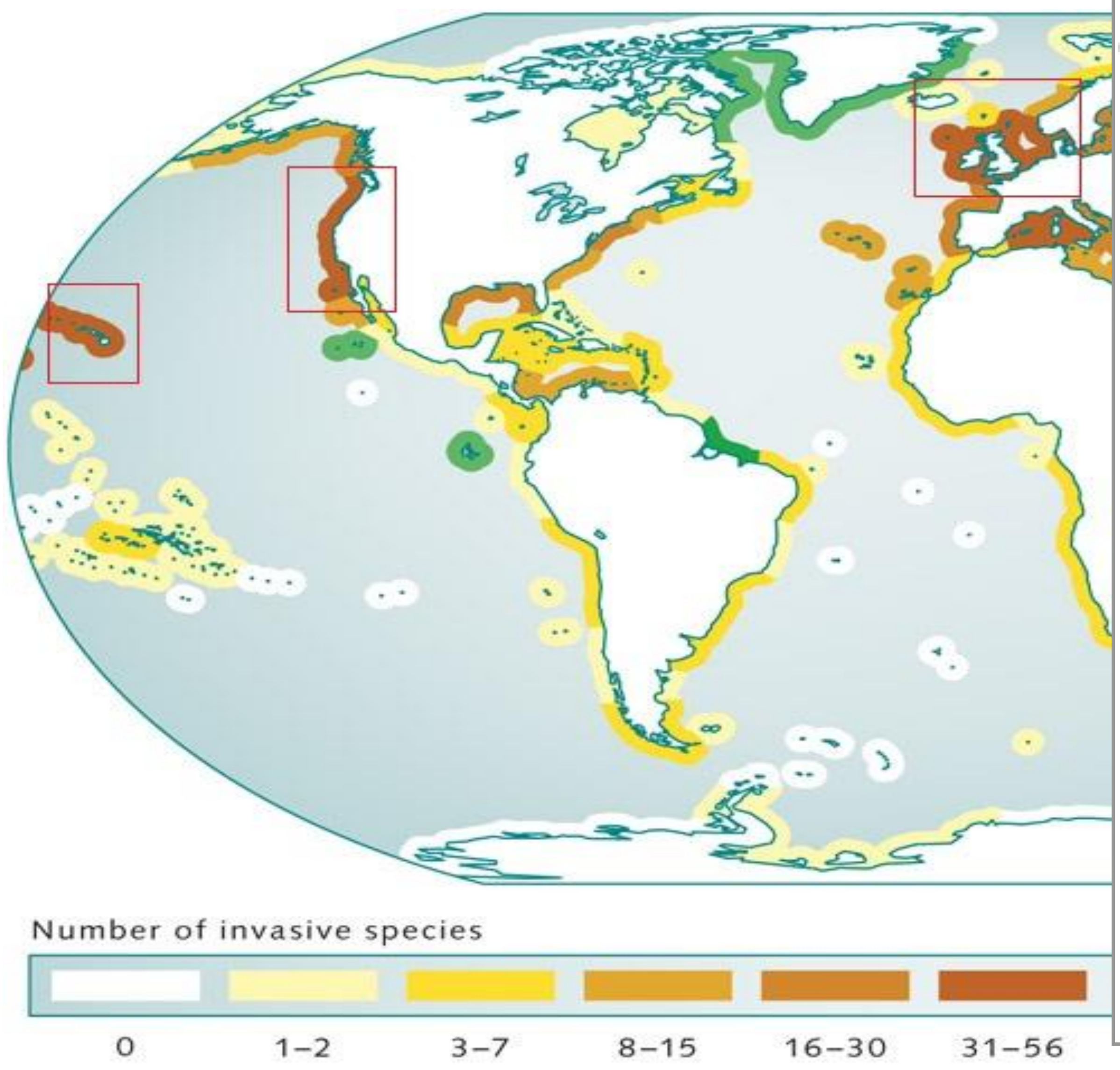
- **Cryptogenic species** are species of uncertain or unknown origin, i.e. it cannot be reliably demonstrated if they are introduced or native (Carlton 1996). For example, the true origin of a species may remain obscure because of insufficient taxonomic knowledge or due to a lack of records from the time before they possibly were introduced to a certain area. Especially unicellular organisms with wide global distributions are often considered as cryptogenic.

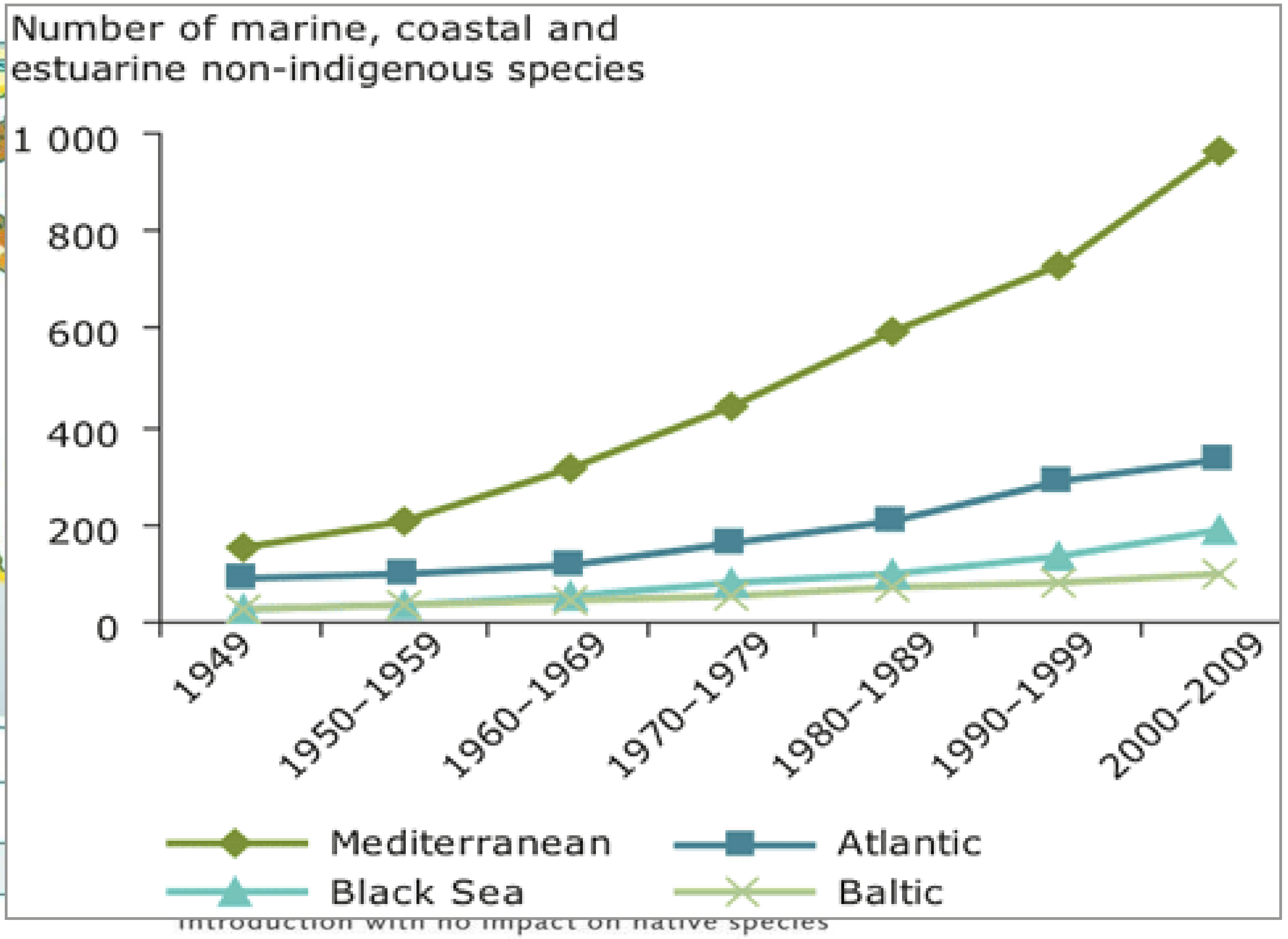


The smaller an organism is, the easier it is to overlook it in biological research, and the more difficult it is to assign a status to a species (native, non-indigenous, or cryptogenic).

Non native species distribution

Non-native species are becoming an increasingly important global issue (Bonizzoni M., 2013).
Climate change and its associated effects are contributing to the growing number of harmful plant and animal species worldwide.

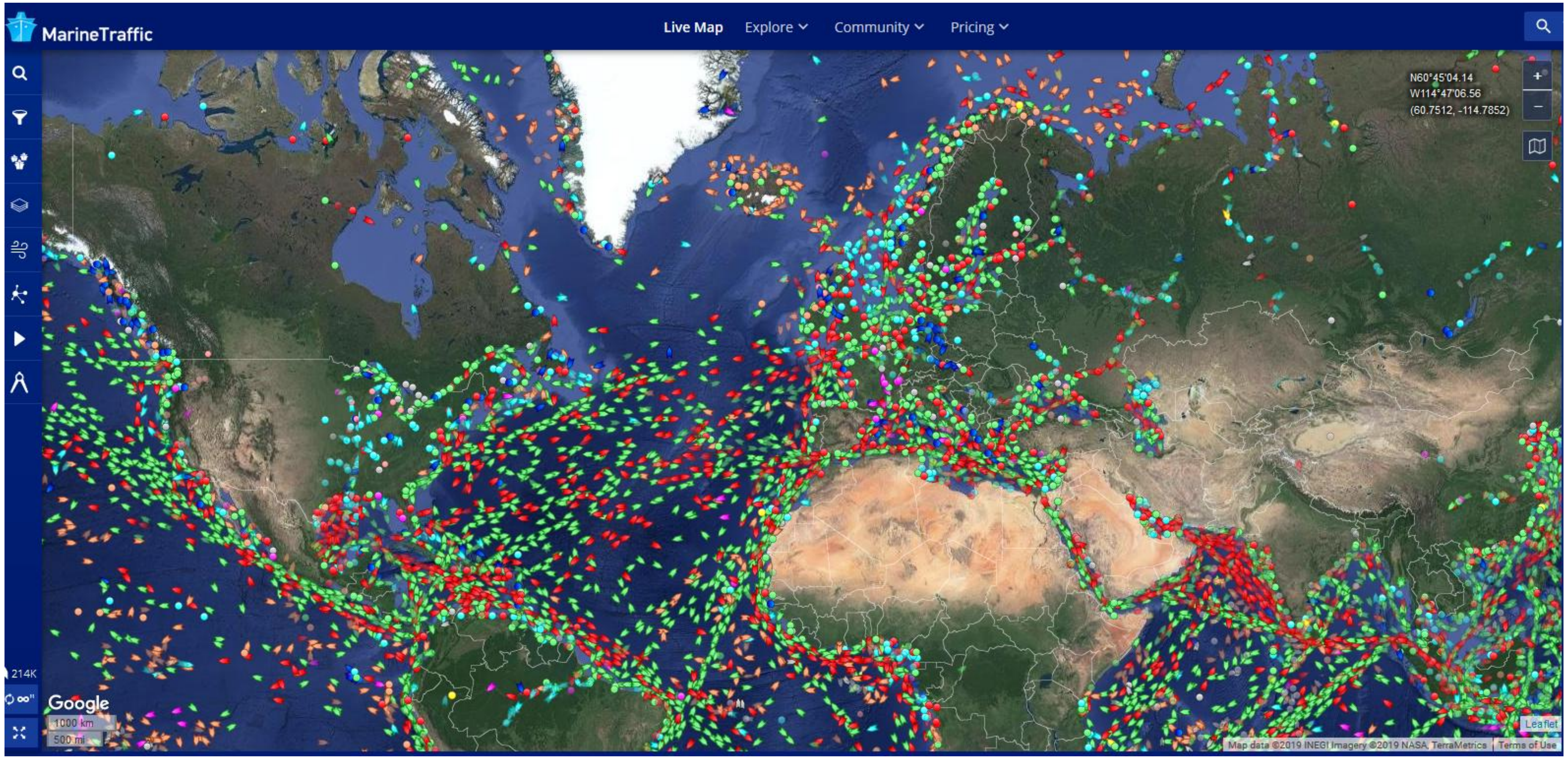




- **The highest numbers of non-native species have been recorded in the Mediterranean Sea and the North Sea. The lowest numbers are found around Atlantic islands, along the coasts of the Indian Ocean and Antarctica, and in the Arctic Ocean.**

The ecological roulette:
many ways of moving aquatic species

(*Sensu:* Carlton & Geller, 1993)



(All ship types @ marinetraffic.com)

(Photo: S. Olenin)

(Photo: D. Minchin)

(Photo: Macreadie et al 2011)

Introduction pathways

Aquaculture

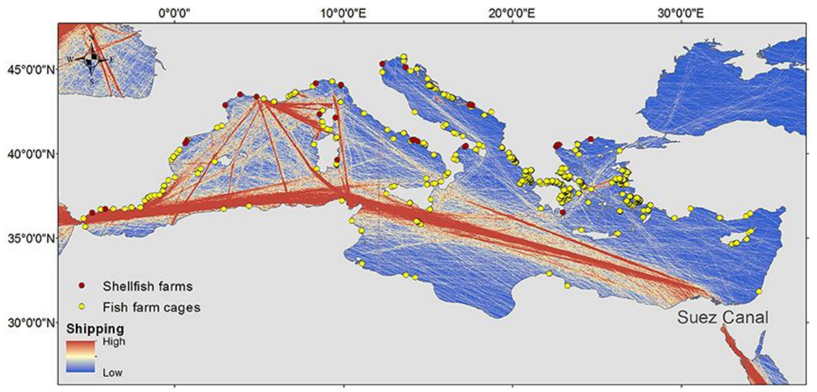
- Import of aquaculture species, Accidental releases into natural waters and subsequent spread, Transport equipment, Packaging materials

Resource Enhancement – Intentional Introductions

- Deliberate introduction of new fishery target species and forage organisms (1962–1964).

Breaking Natural Barriers

- Creation of waterways connecting previously isolated river basins.
- **Lessepsian migration** through the **Suez Canal**.



Aquarium Trade and Live Food

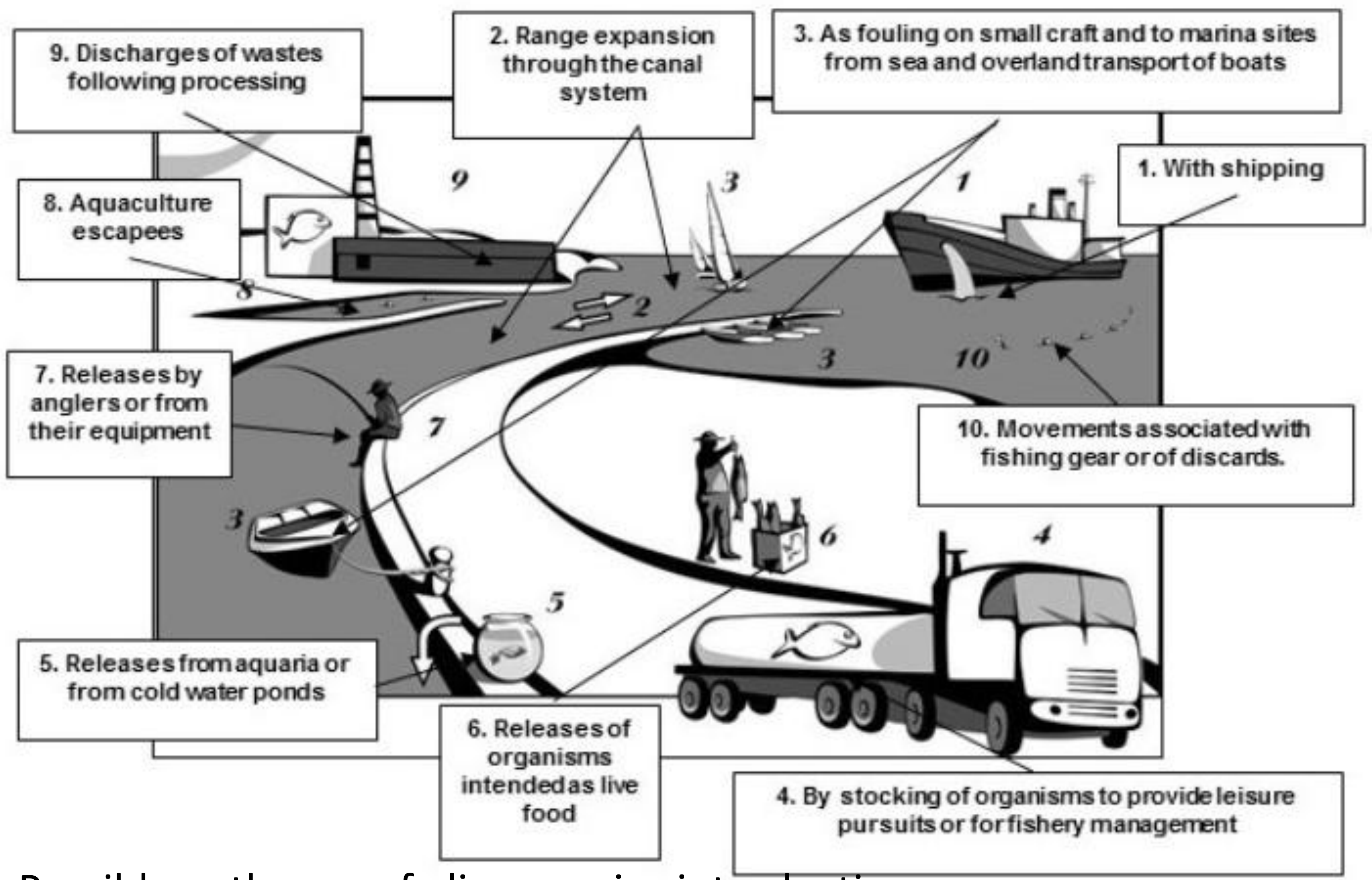
- Trade in aquarium animals, plants, and live food. Release into natural waters.
- Disposal of packaging materials (e.g., algae). Release of live bait.

Shipping: Ballast Water and Biofouling

- Larvae of aquatic organisms are taken up with ballast water, transported to another region, and released, where they can establish and reproduce in a new environment.

Main pathways of intro

- **Ballast water**
- **Biofouling**
- **Aquaculture**
- **Release from aquaria**
- **Stocking/ culture**
- **Spread from neighbouring countries**



Possible pathways of alien species introductions

Ballast water discharge

Photo: Sergej Olenin

Biofouling

Photo: https://www.lovesail.com/ls-news/2017/02/biofouling/

Navigation buoys, abandoned ships and oil platforms, other floating structures





(Photo:
Macreadie et al 2011. Rigs-to-reefs: will the deep sea benefit from artificial habitat? Front Ecol Environ; 9)

Main pathways of intro

- **Ballast water**
- **Biofouling**
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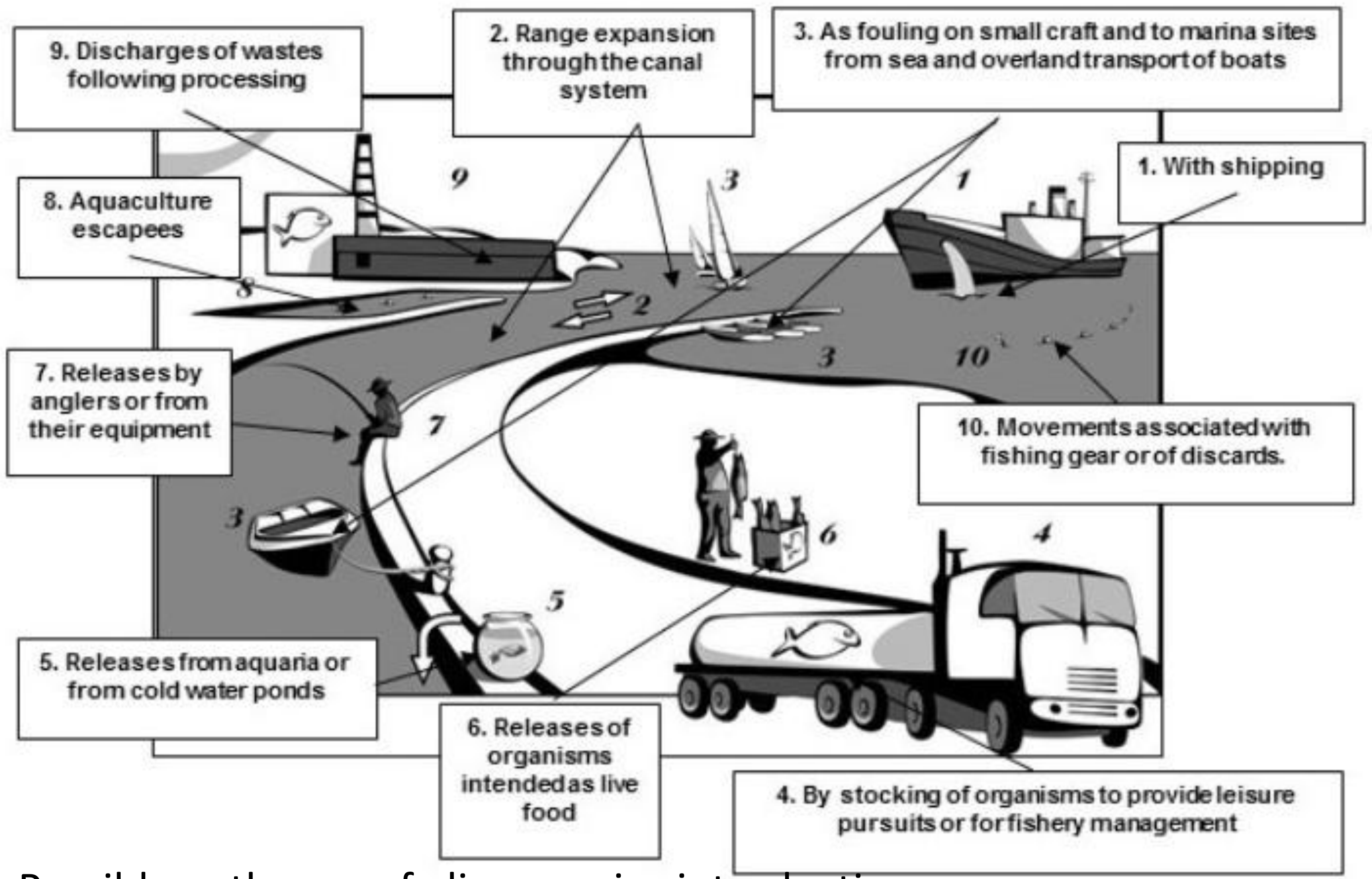


Possible pathways of alien species introductions

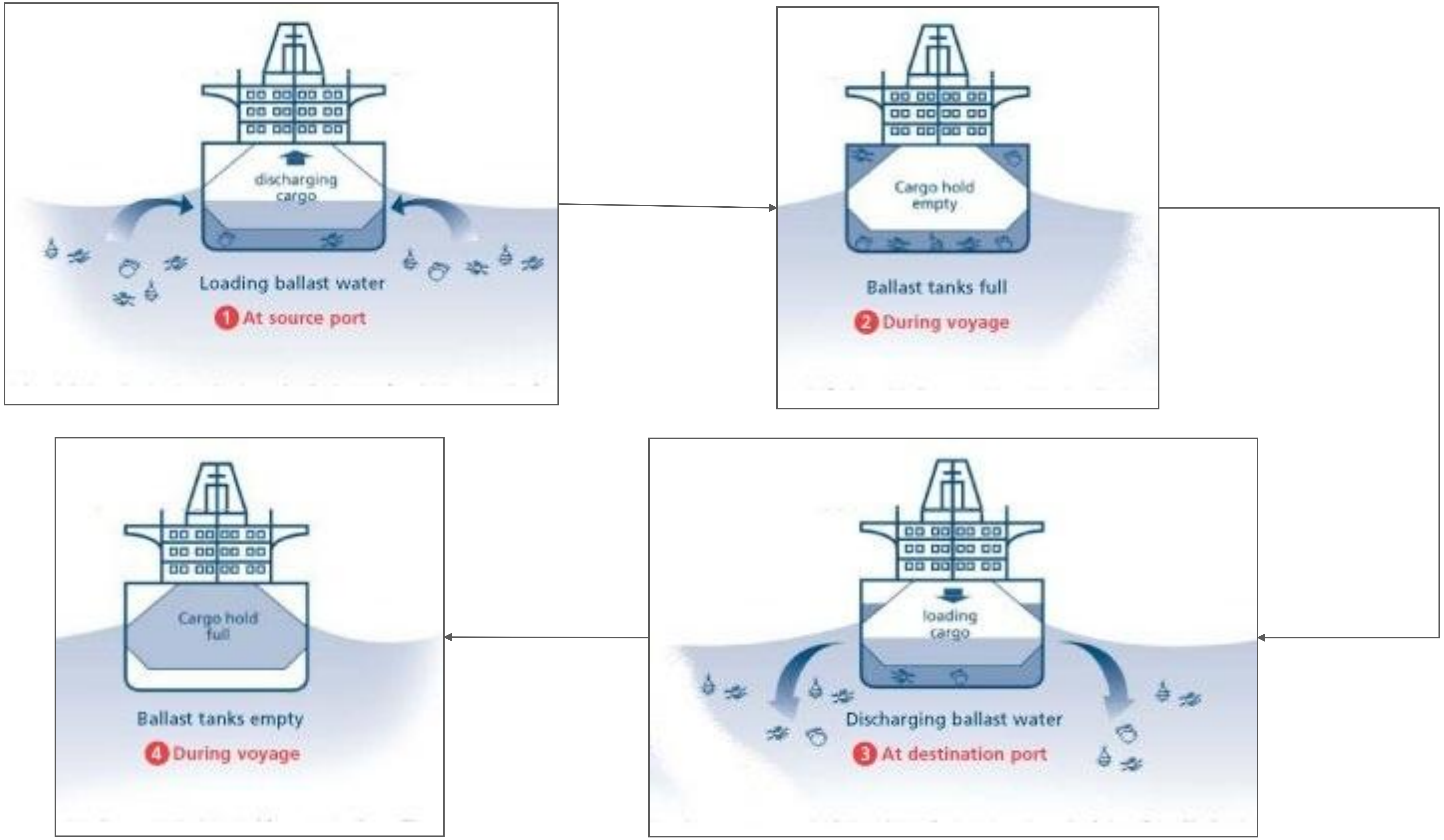
Ballast water discharge

Photo: Sergej Olenin

Biofouling

Photo: https://www.lovesail.com/ls-news/2017/02/biofouling/

Invasive species spread through ballast water



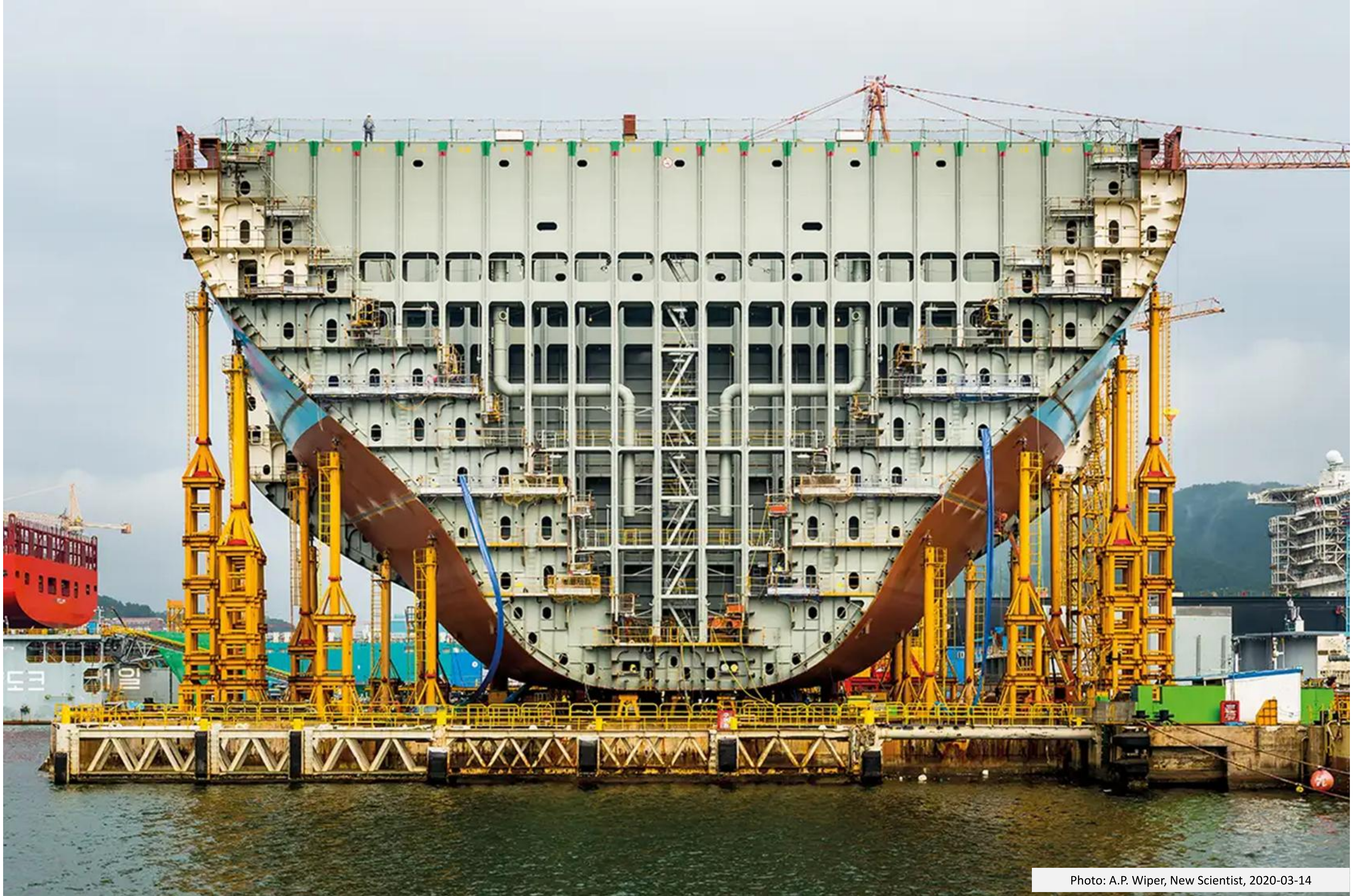


Photo: A.P. Wiper, New Scientist, 2020-03-14

Ballast water discharge

Ships from more than 50 countries arrive directly at Baltic Sea ports.
It is estimated that approximately 2,000 large vessels (excluding recreational boats) transit the Baltic Sea every day. Most of these vessels originate from the North Sea or the Ponto-Caspian region. Other shipping routes connect the Baltic Sea with more distant regions, including the Mediterranean Sea, northwestern Africa, the east coast of North America, and Asia. Even assuming a relatively low propagule concentration in the total volume of ships' ballast water tanks, a substantial number of propagules are released into the Baltic Sea ecosystem each year.

Balastinio vandens išpylimas Klaipėdos uoste
(foto: S.Olenin)

Ballast water is one of the primary vectors of aquatic biological invasions. It is estimated that more than 5,000 species of freshwater, brackish, and marine organisms may be transported worldwide in the ballast water of ocean-going ships on any given day.

Klaipeda University
Marine Research Institute

Policy relevance and management in case of alien species

Convention on Biological Diversity (1992)

EU Water Framework Directive (2000)

IMO Ballast Water Management Convention (2004)

Baltic Sea Action Plan (HELCOM) (2007)

EU Marine Strategy Framework Directive (2008)

Regulation on Invasive Alien Species (2014)

There is a need for an approach to measure the effectiveness of the policy measures in preventing biological invasions.

The IMO Ballast Water Management Convention

Aim of the BWMC

to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens via shipping, through the control and management of ships' ballast water and sediments

INTERNATIONAL MARITIME ORGANIZATION

History – dates

1991 – IMO published voluntary guidelines for controlling BW discharge;

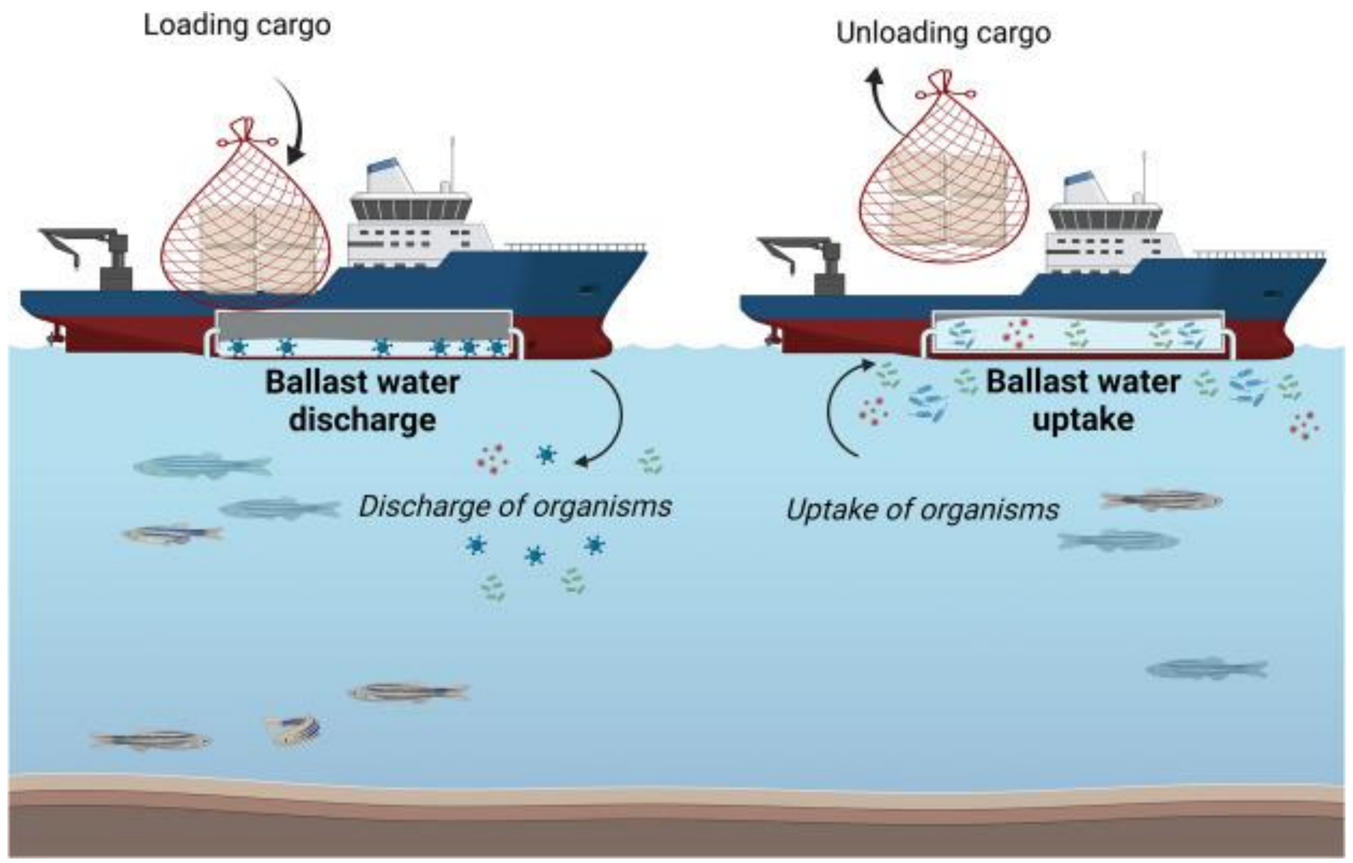
1993 and 1997 – IMO released further BW guidelines:

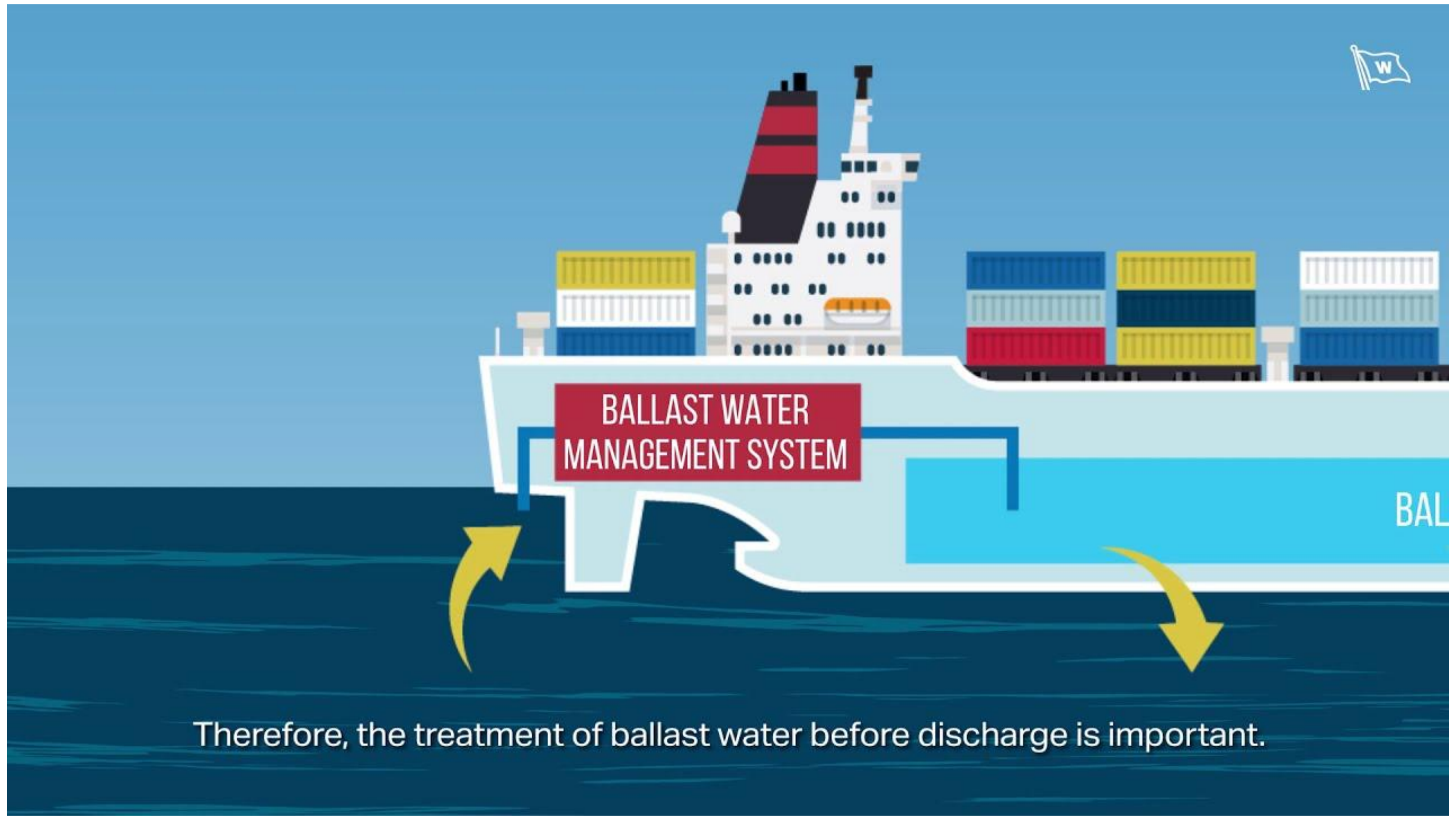
2004 – IMO adopts the International Convention for the Control and Management of Ship's Ballast Water and Sediment (BWMC);

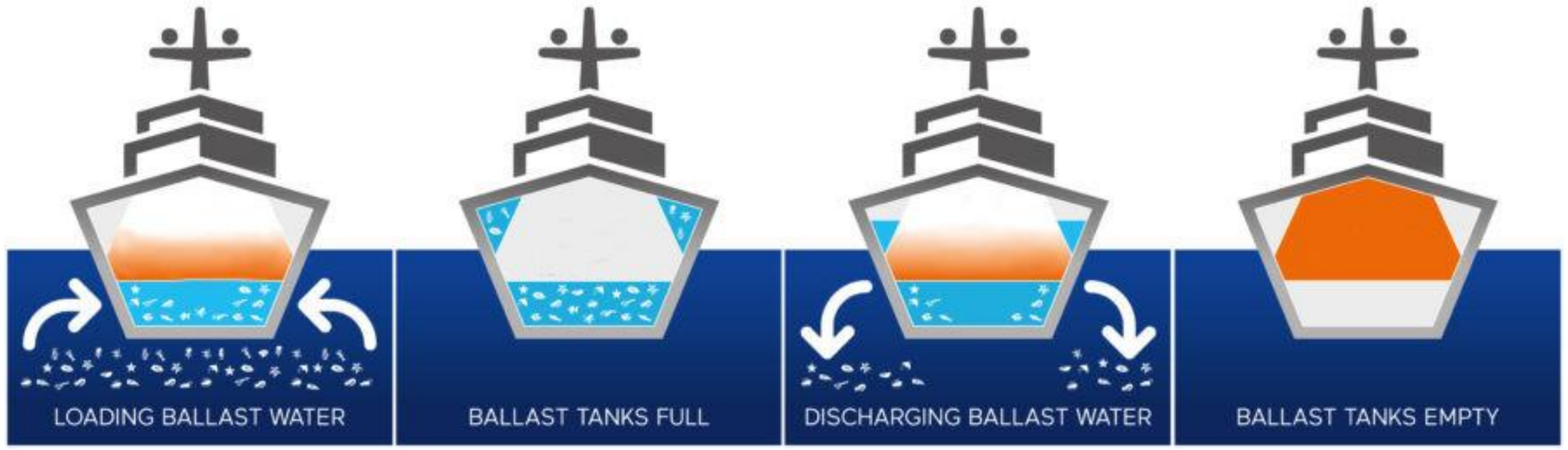
2016 – The IMO BWMC is ratified;

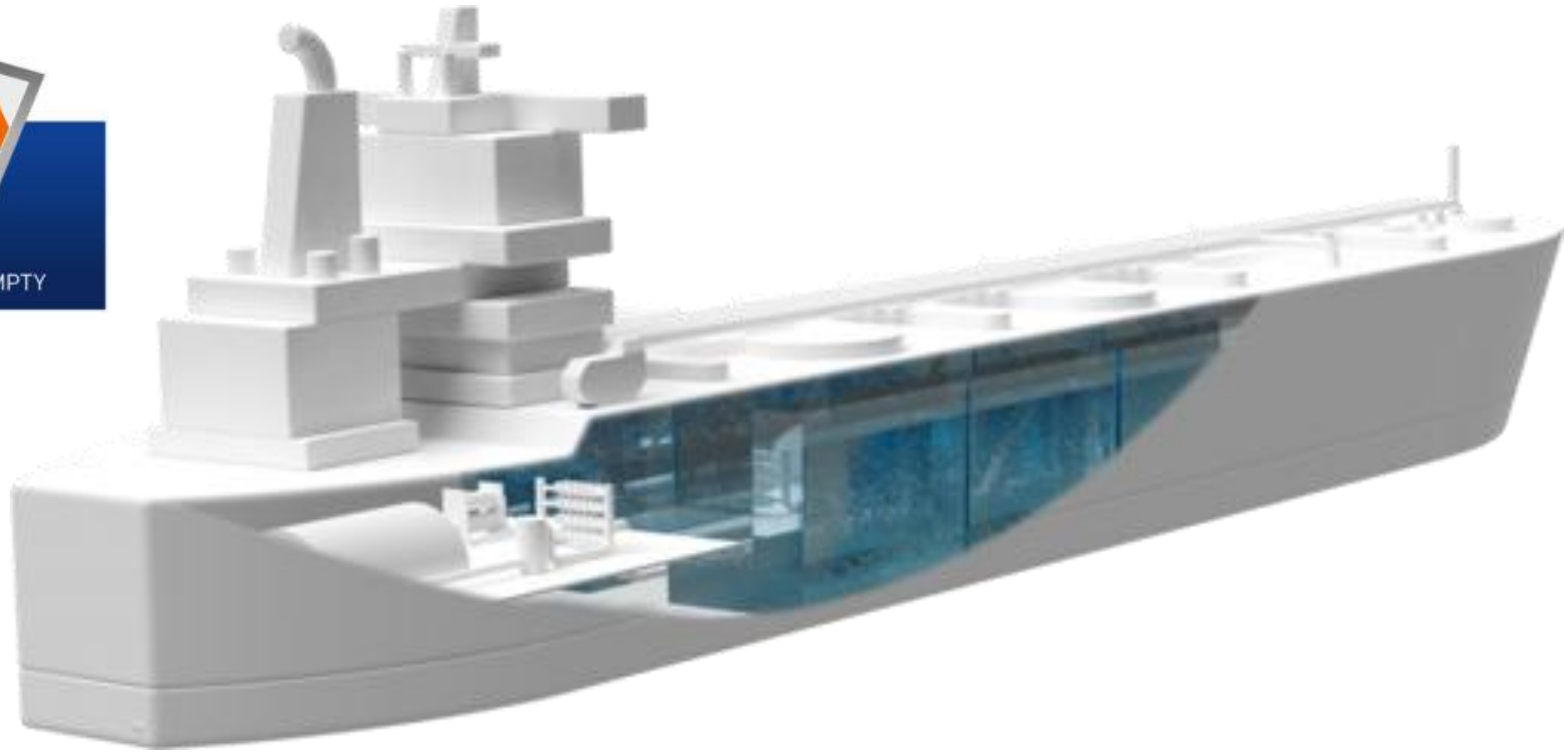
2017 – The BWM Convention comes into force.

Photo: Sergej Olenin

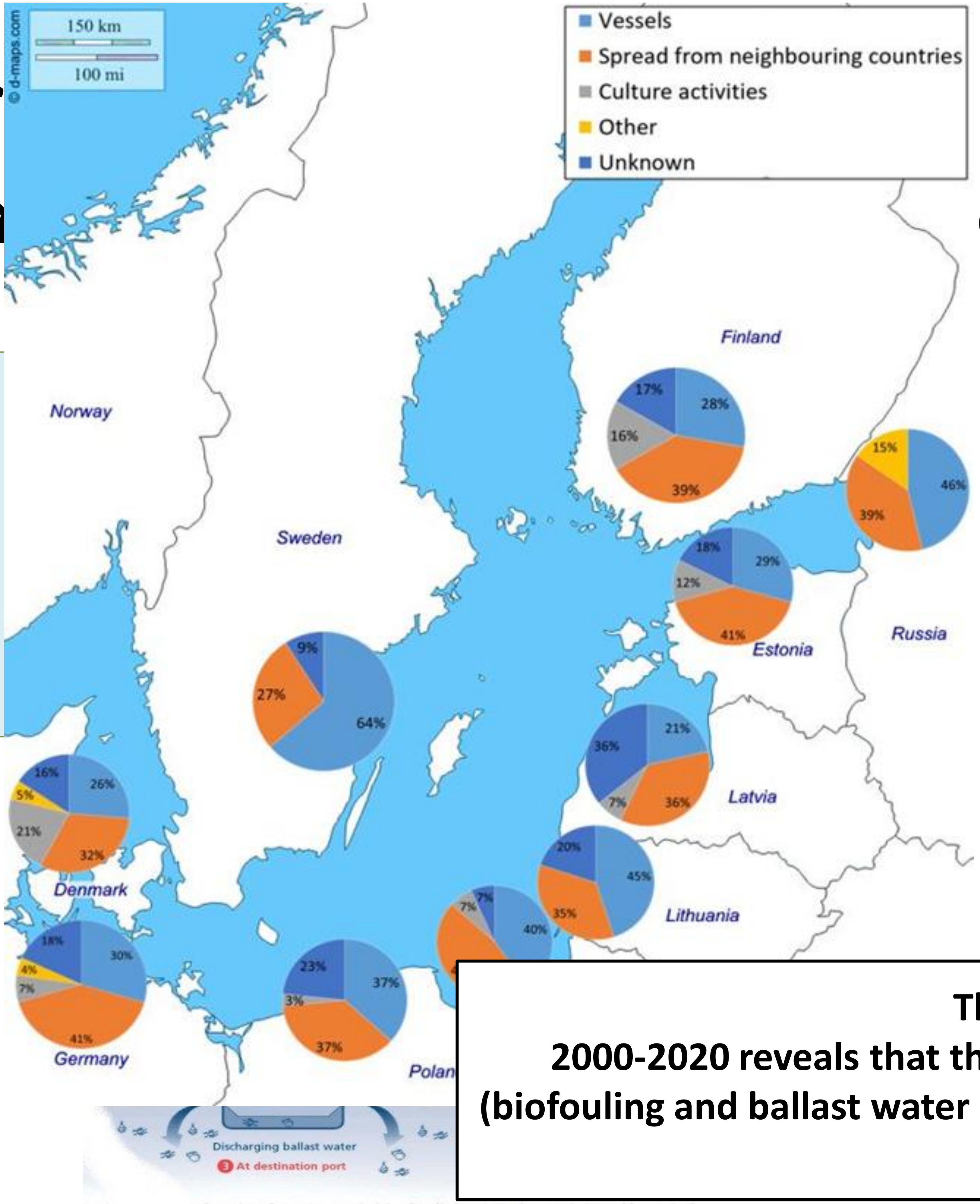

Loading cargo
Unloading cargo
Ballast water discharge
Ballast water uptake
Discharge of organisms
Uptake of organisms

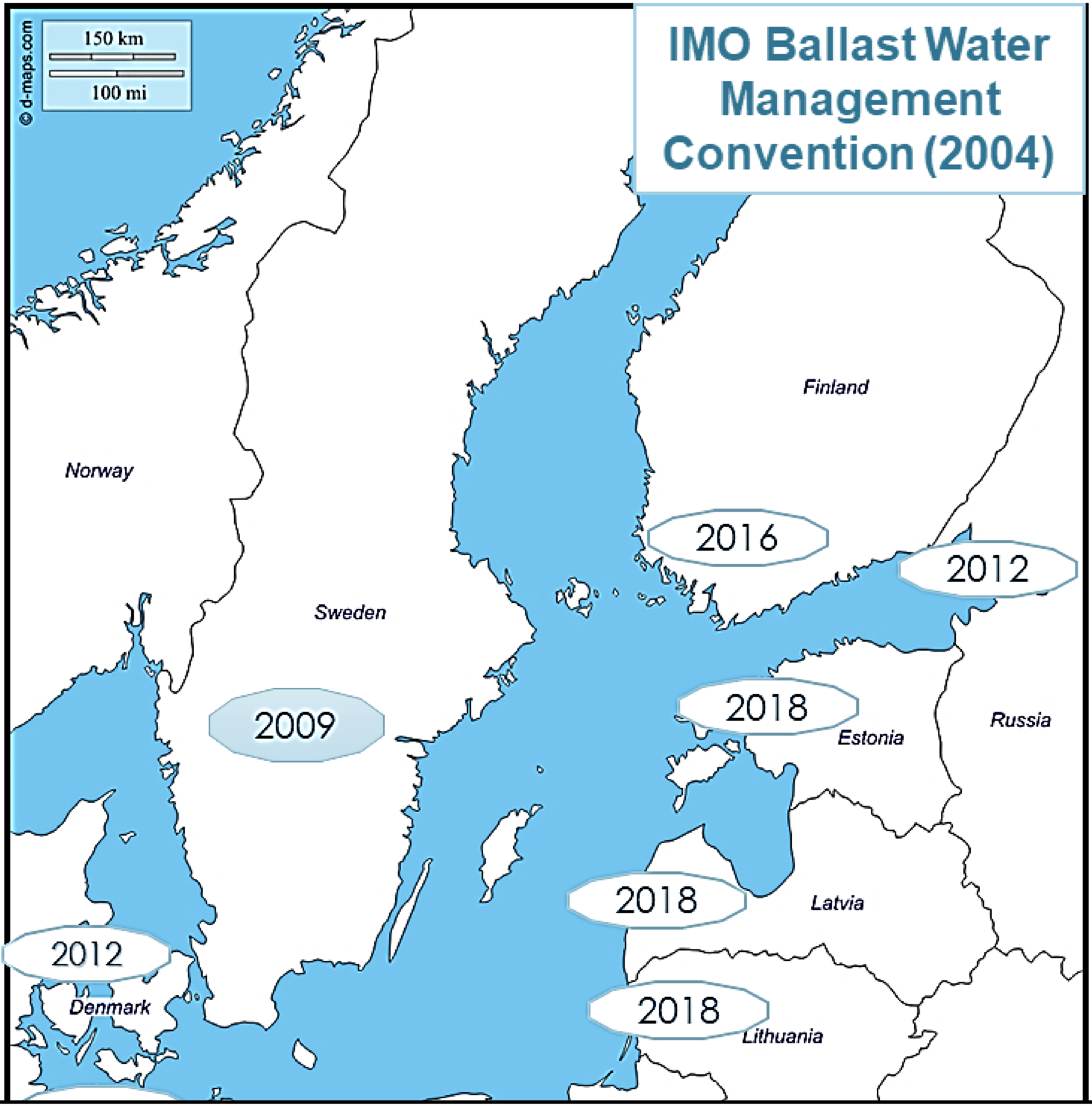

BALLAST WATER MANAGEMENT SYSTEM
Therefore, the treatment of ballast water before discharge is important.


LOADING BALLAST WATER
BALLAST TANKS FULL
DISCHARGING BALLAST WATER
BALLAST TANKS EMPTY



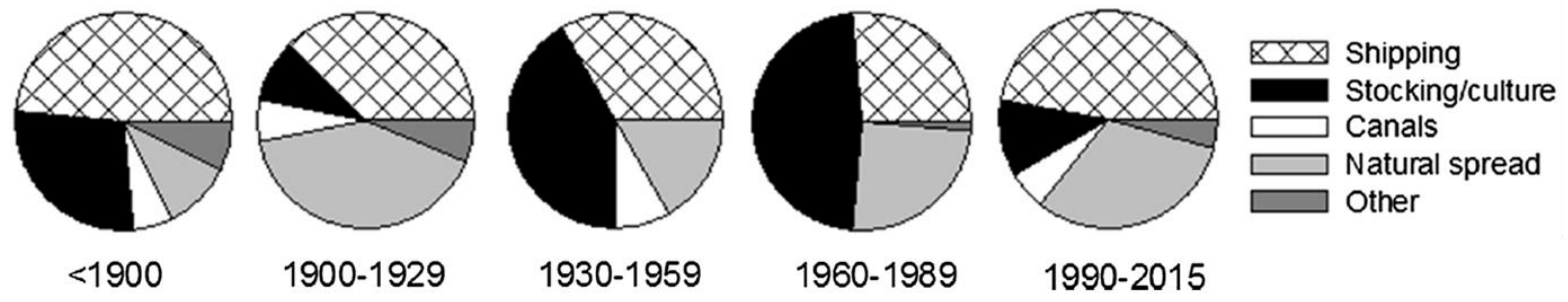
S… Ma… e





The pathway analysis for the period 2000-2020 reveals that the "natural" spread from neighbouring regions and vessels (biofouling and ballast water and sediments) are responsible for most cases of alien species introductions into the Baltic Sea.

Introductions of aquatic non-indigenous species (NIS) to the Baltic Sea: what do we know?



- **Shipping, deliberate stocking and natural spread of the previously introduced NIS from the North Sea to the Baltic are the main introduction pathways, with considerable dynamics over time.**
- **The deliberate stocking was the most important pathway in the past (4-6 decades ago), while now shipping and natural spread strongly dominate.**

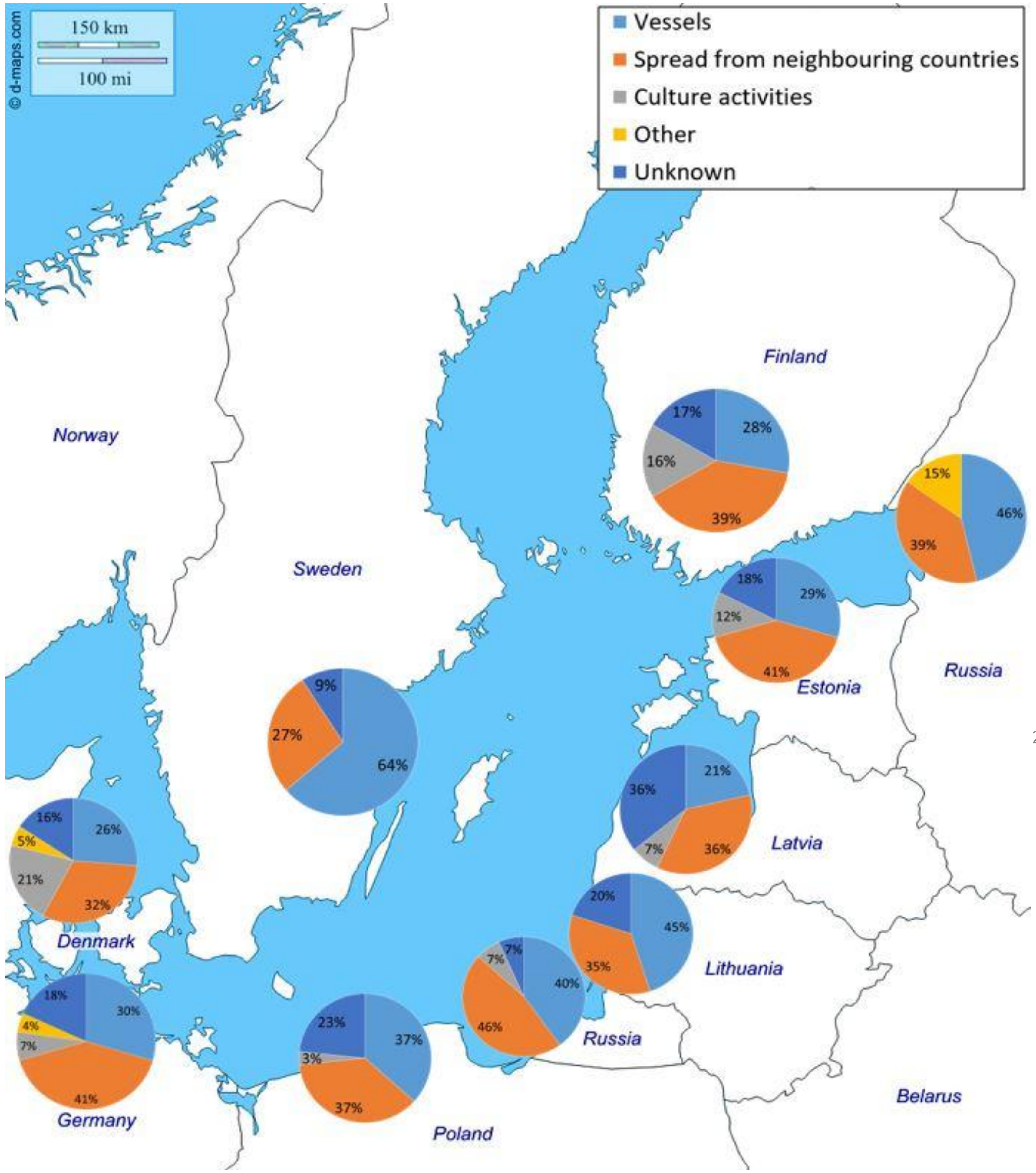
Biol Invasions
DOI 10.1007/s10530-016-1316-x

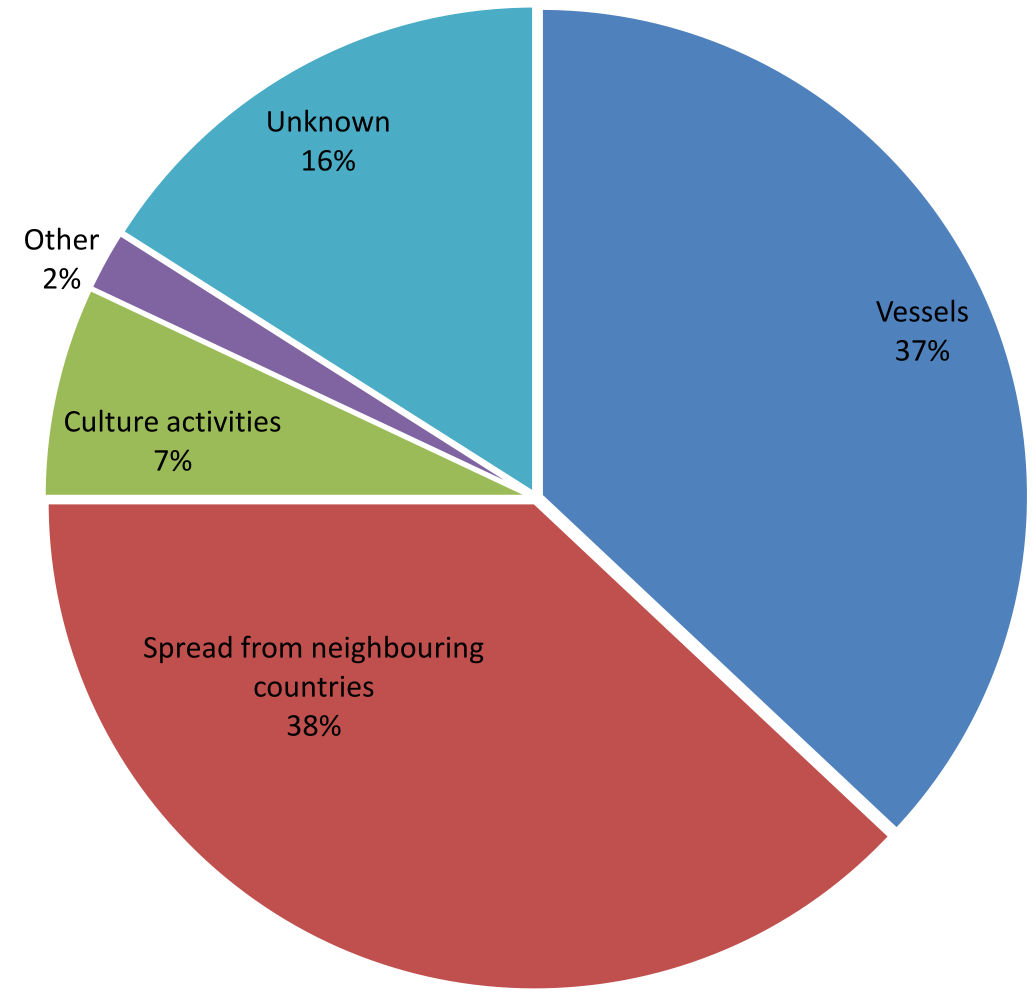
ORIGINAL PAPER

Dynamics of biological invasions and pathways over time: a case study of a temperate coastal sea

Henn Ojaveer · Sergej Olenin · Aleksas Narščius · Ann-Britt Florin · Elena Ezhova · Stephan Gollasch · Kathe R. Jensen · Maiju Lehtiniemi · Dan Minchin · Monika Normant-Saremba · Solvita Strāke

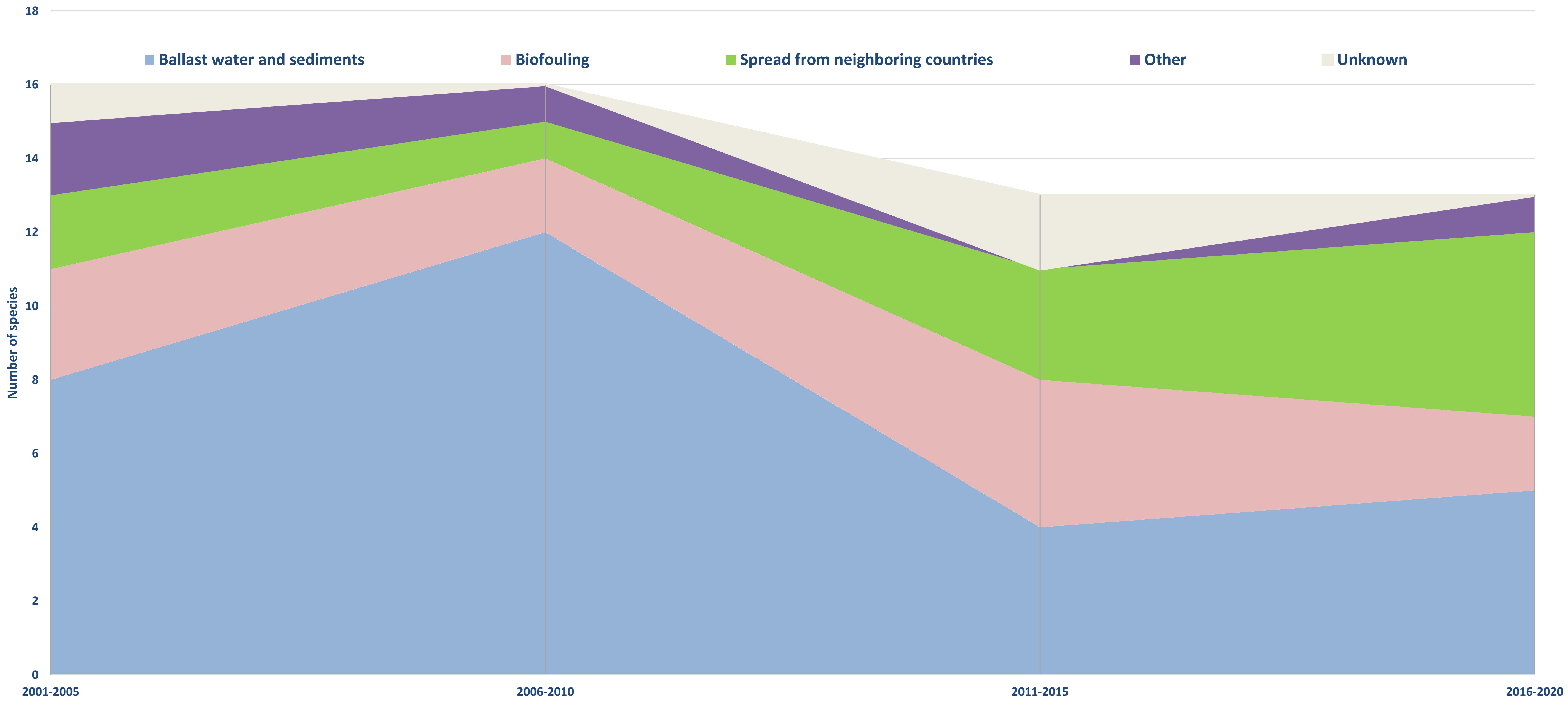
An index *nNIS* for assessment of new arrivals of non-indigenous species into the Baltic Sea region during





The pathway analysis at the *nNIS* L2 for the period 2000-2018 reveals that the "natural" spread from neighboring regions and vessels (ballast water and sediments) are responsible for most cases of NIS introductions into the Baltic Sea.

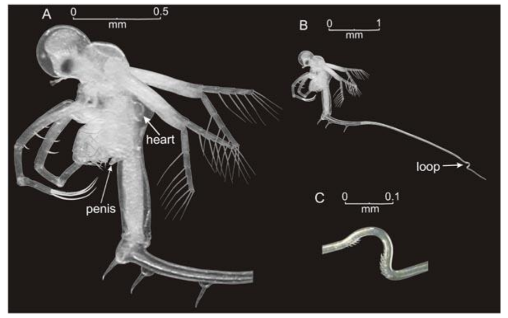
A closer look: NIS introductions to the Baltic Sea in the XXI century and the role of ballast water



Out of 60 species introduced since 2001, 29 NIS were introduced by ballast water and sediments, with a decreasing trend from 2010. An increase of the pathway spread from neighboring countries was observed.

Chinese mitten crab

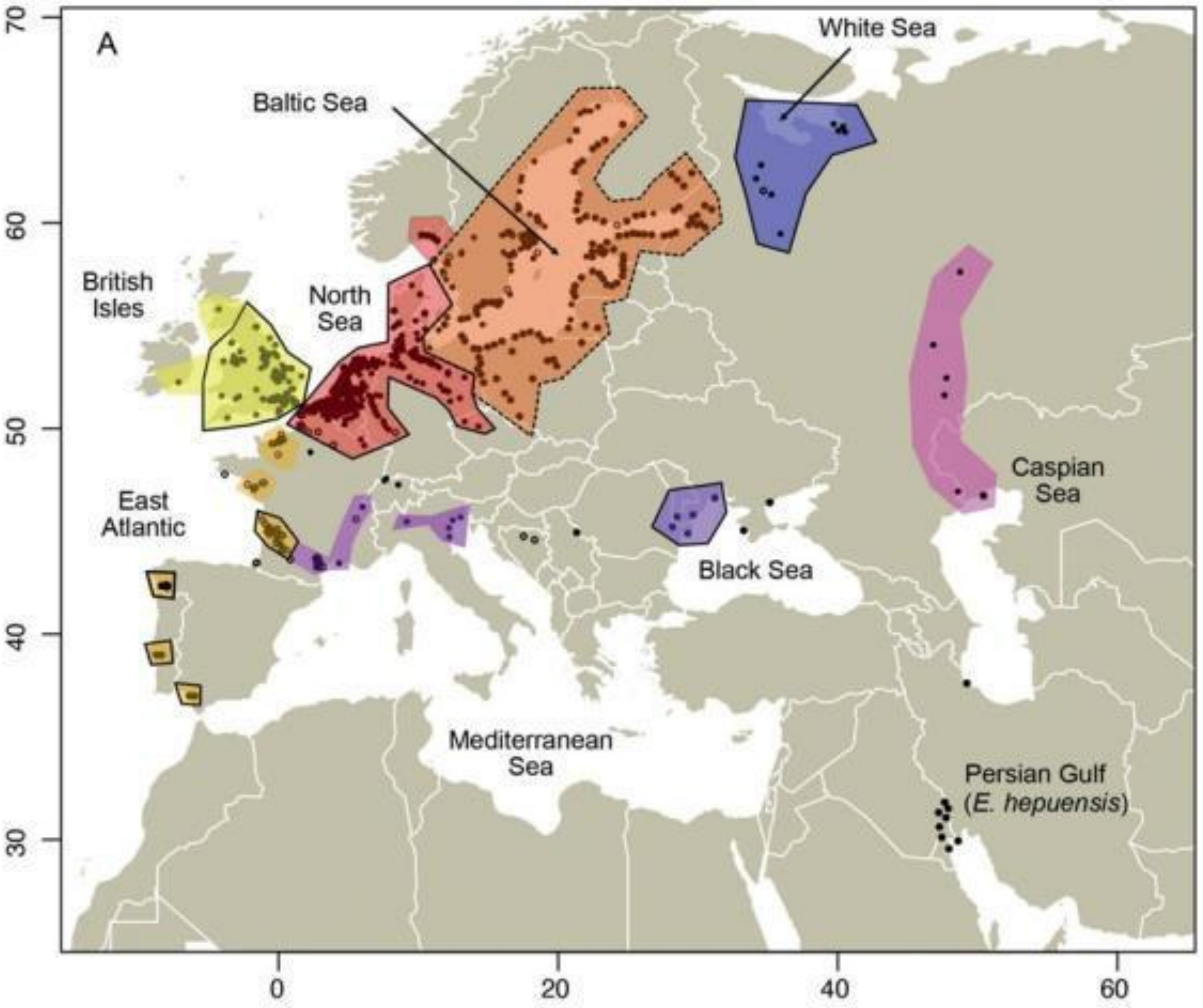
Vibrio cholerae



Cercopagis pengoi

Round goby

Chinese mitten crab distribution in the Baltic Sea



The Chinese mitten crab (*Erioche*
to the coastal rivers and estuaries
along the Yellow Sea, from Fujian
in the north, including the Korean

Map source: https://www.interregnorthsea.eu/clancy/about-the-mitten-crab?utm_source=chatgpt.com

Chinese mitten crab in Lithuania

Kiniškas krabas pusryčiavo Jakuose (2)

2012-09-21, 14:24 Tautvydas LUKAŠEVIČIUS Spausdinimo versija | Pasidalink A+ A-

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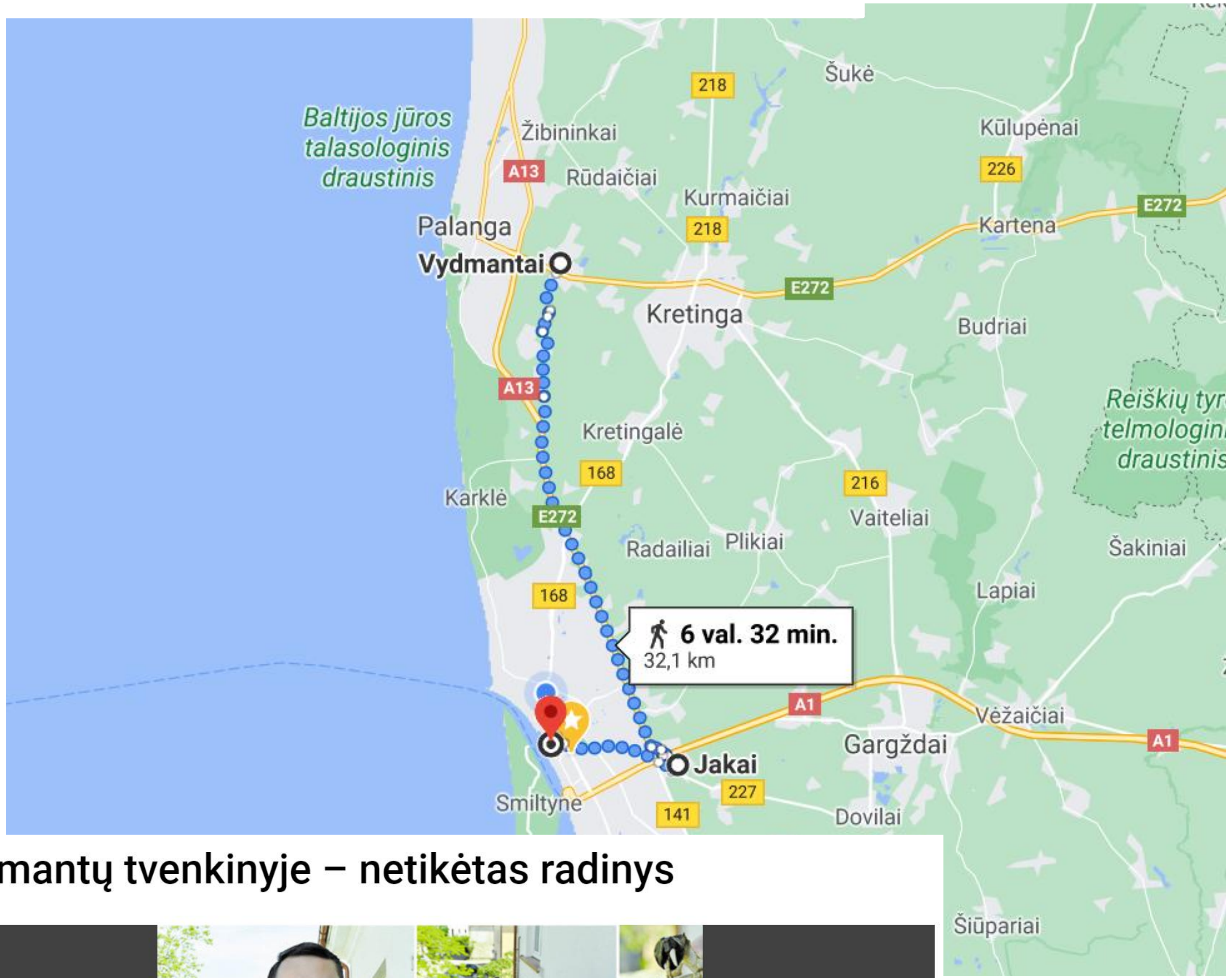


Vydmantų tvenkinyje – netikėtas radinys

„Pajūrio naujienų“ nuotr. / Vydmantų seniūnijos talkininkų pagautą gauruotažnyplį krabą (lot. Eriocheir sinensis) seniūnas Rimvydas Šakinis parodė ir „Pajūrio naujienoms“. Krabas – nedidelis, tamsiai pilkas, pilvas – balkšvas, smėlio spalvos. Šalutinės kojos turi plaukelius, o žnypl

Mud crab

Mud crab (*Rhithropanopeus harrisii*)

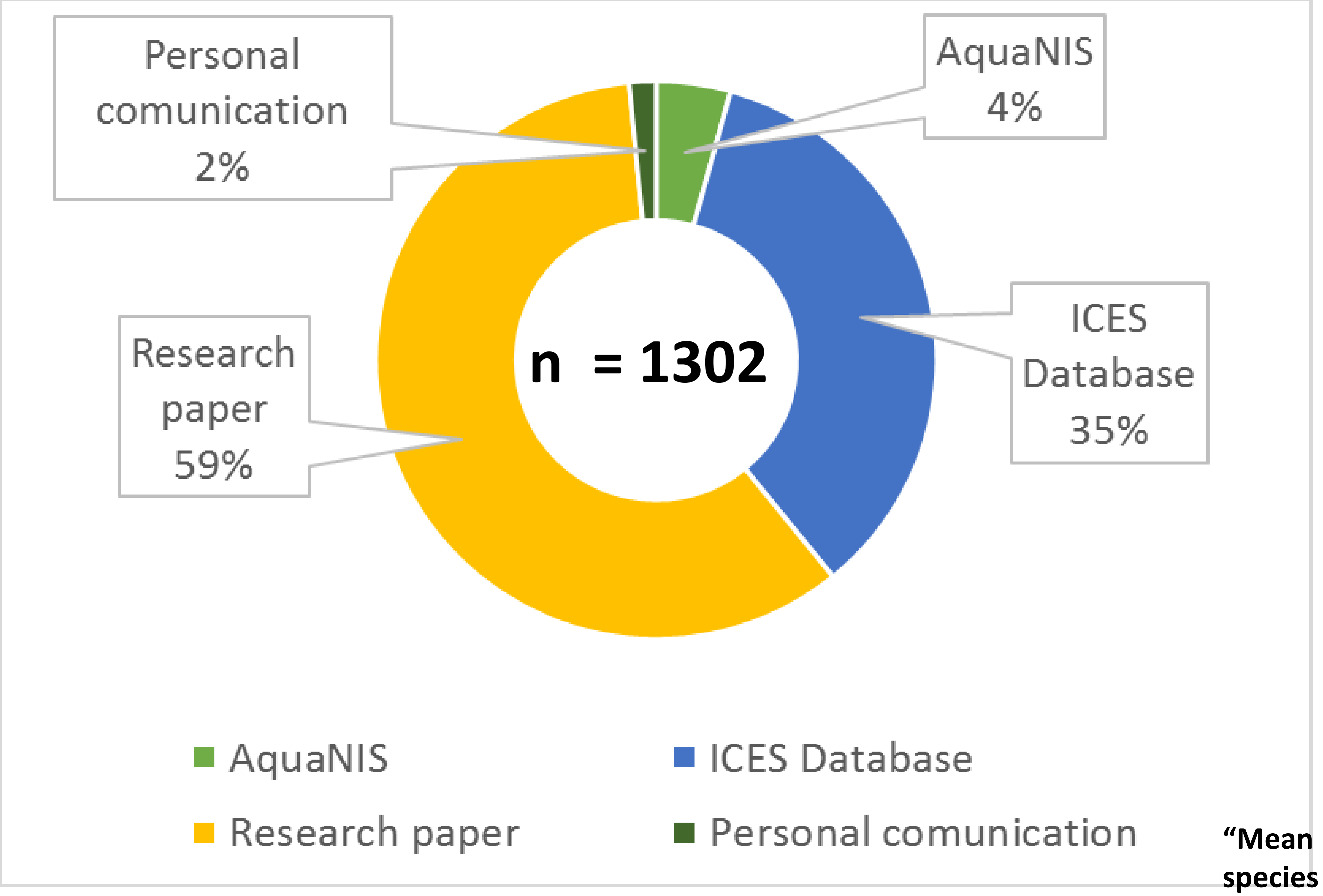
- The **mud crab** (*Rhithropanopeus harrisii*) is native to the Atlantic coast of **North America**, particularly the estuaries and lagoons of the eastern United States. Its natural range includes the **Chesapeake Bay**, the **Gulf of Mexico**, and other brackish coastal ecosystems.
- The species is established throughout much of the Baltic Sea, particularly in **brackish coastal waters**, estuaries, lagoons, and harbors. Established populations have been reported from:
- Distribution in the Baltic Sea (Germany, Denmark, Poland, Lithuania (including the Curonian Lagoon and Port of Klaipėda), Latvia, Estonia, Finland (especially the Gulf of Finland), Sweden)

Size:

- **Carapace width:** typically **15–25 mm**
- **Maximum recorded carapace width:** approximately **30 mm**
- **Body length:** approximately **10–20 mm**

How fast species are spreading? How can were measure it?

The method:
Mean Expansion Rate of a NIS - Expansion is defined as any increase in a species area of occupancy or extent of occurrence, irrespective of the pathways and vectors involved.



Gathering geo-referenced data

Exact coordinates

The coordinates of sampling points where the species was found, extracted from the data provider source (ICES data centre, scientific articles).

Map digitalization

Coordinates extracted manually from the published map(s) using software such as Google Maps, ArcMap.

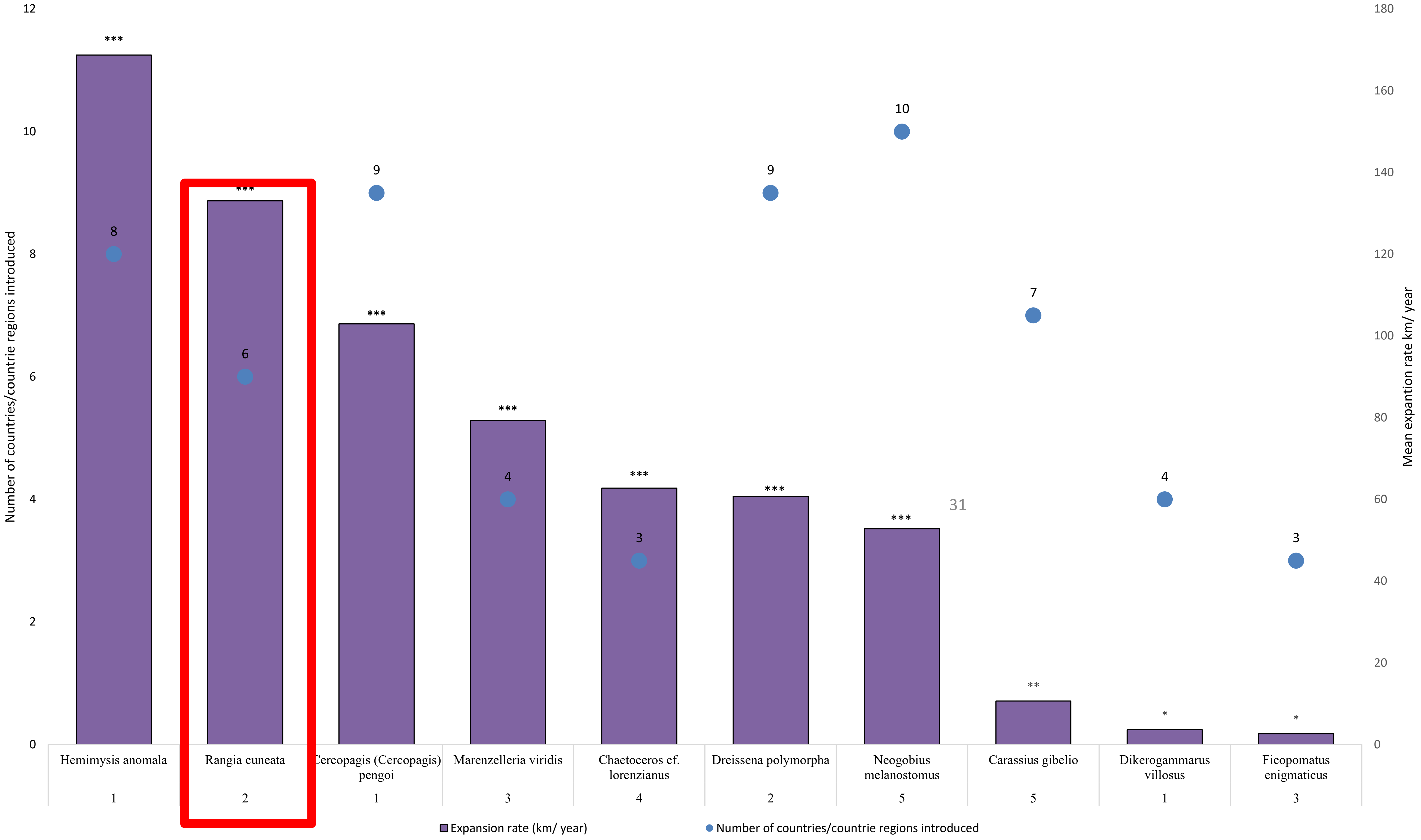
Expert judgment

Extraction of data by an expert based on verbal description of a finding location (e.g. "a species was found in the northern part of the Curonian Lagoon")

"Mean Expansion Rate" method as a measure of the invasiveness of non-indigenous species and in order to distinguish between the natural and anthropogenic patterns of a spread.

“Mean Expansion Rate” method as a measure of the invasiveness of non-indigenous species and in order to distinguish between the natural and anthropogenic patterns of a spread.

Comparative analysis of selected NIS in the Baltic sea region

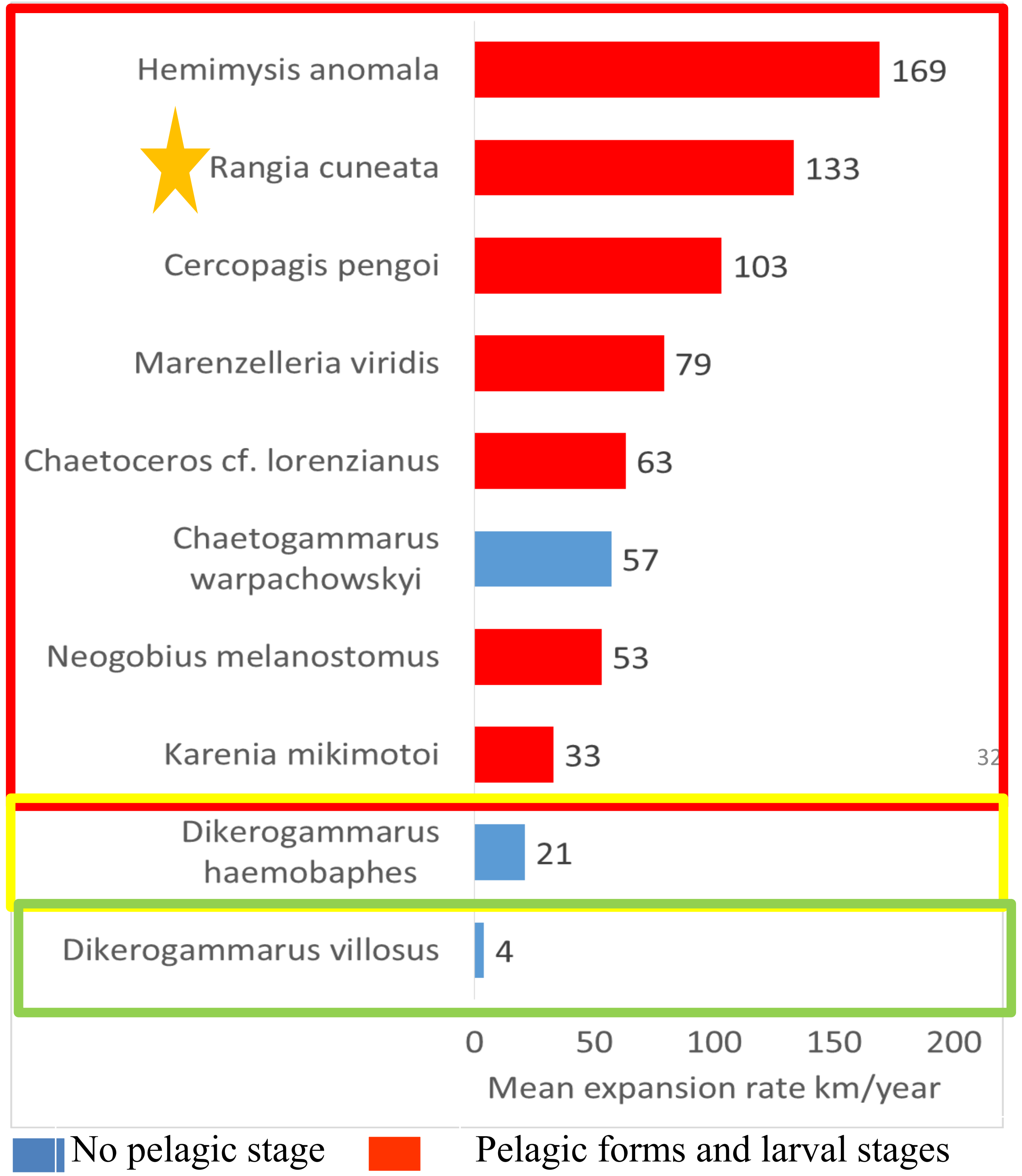


The highest speed was counted for mysid (*H. anomala*) 168 km/year, the lowest speed was detected for the Australian tubeworm *Ficopomatus enigmaticus* and the killer shrimp *Dikerogammarus villosus*.

Species with wider salinity tolerance range and pelagic stage have a higher invasion potential.

Invasion potential category: *** high invasion potential > 30 km/year; ** moderate>10 km/year; * restricted - >0,3 km/year.

Comparing mean expansion rate of the Baltic Sea NIS (selected)



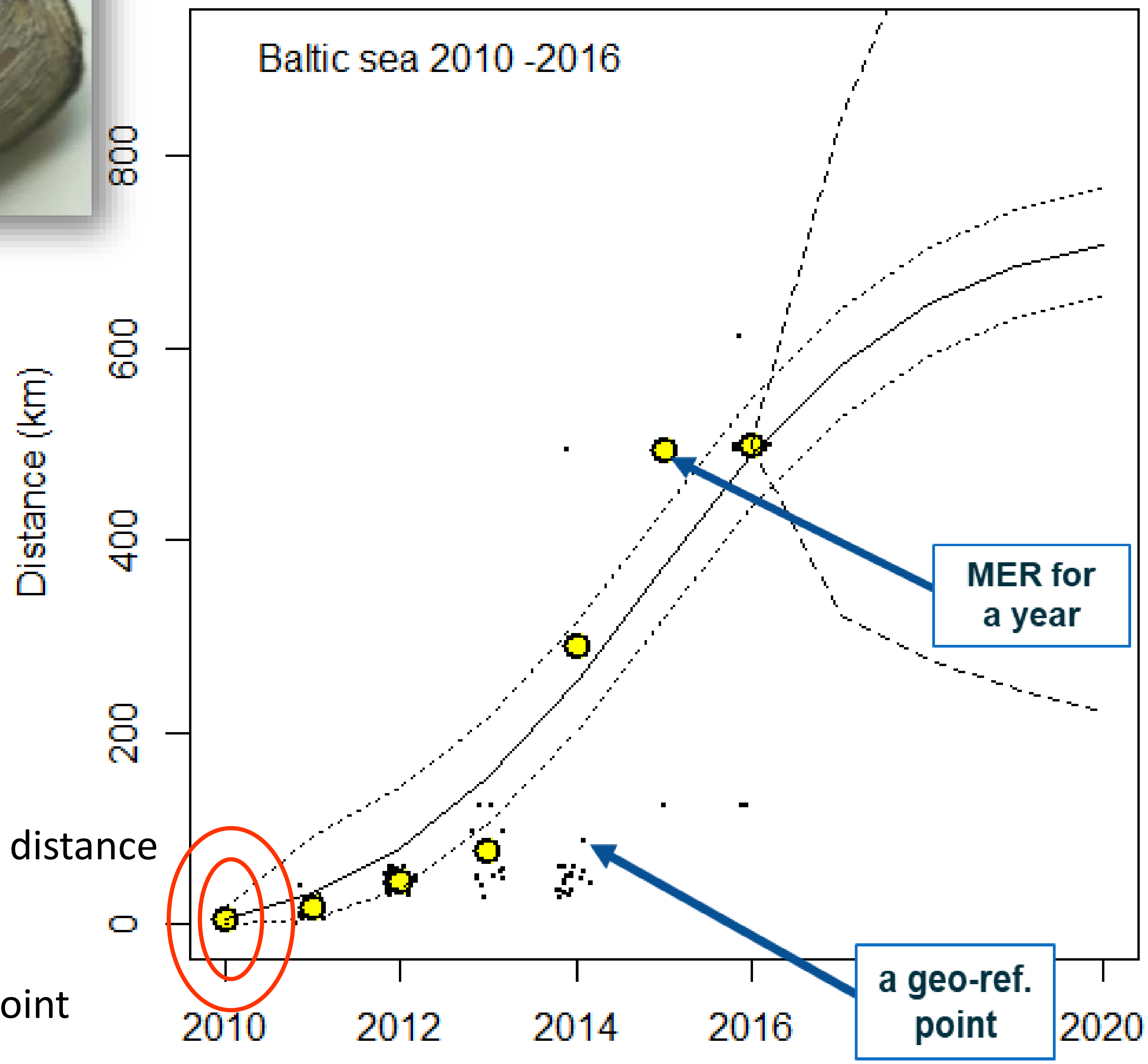
MER – Invasive potential	
Small	< 0,3 km/ year
Restricted	≥ 0,3 km/ year
Moderate	≥ 10 km/year
High	≥ 30 km/year

Invasion potential scale for Norwegian terrestrial and aquatic species
(by Sandvik et.al. 2013)

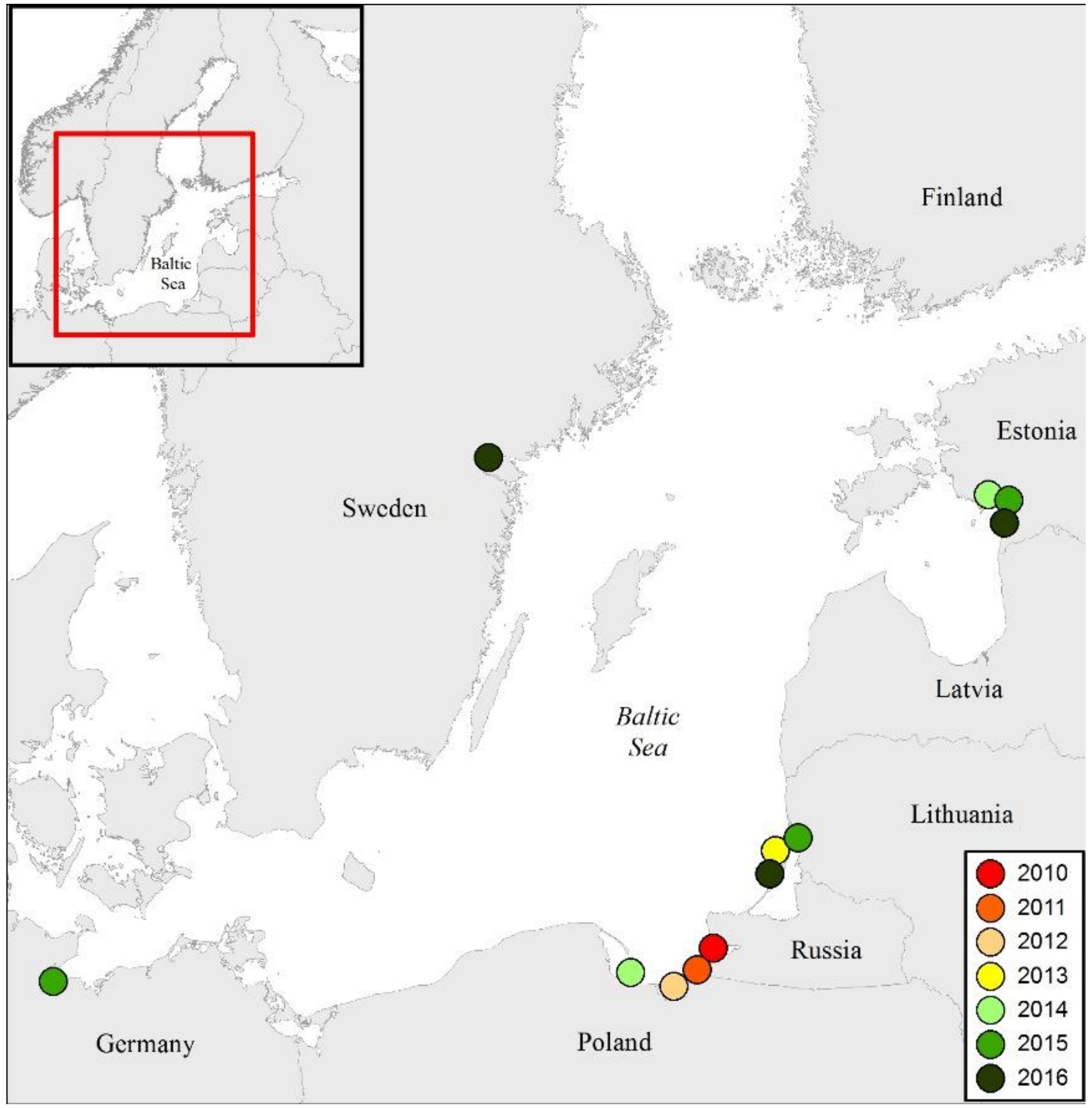
MER values are higher for species having pelagic stages (holo- and meroplankton), this implies possibility of transfer in ballast waters

“Mean Expansion Rate” method as a measure of the invasiveness of non-indigenous species and in order to distinguish between the natural and anthropogenic patterns of a spread.

The Rangia cuneata case study in the Baltic Sea: natural and/or human induced spread?



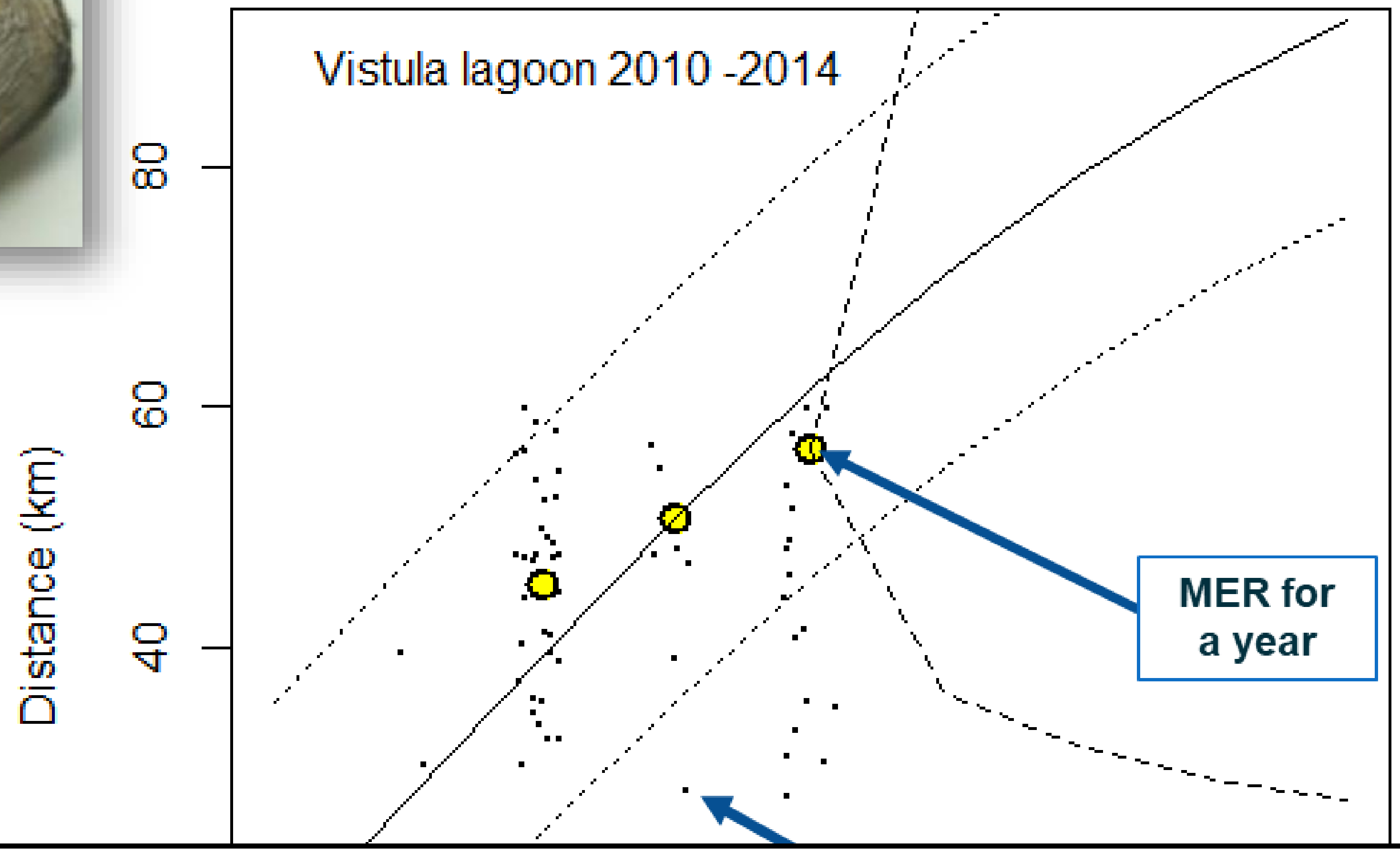
The measured distance from the primary introduction point

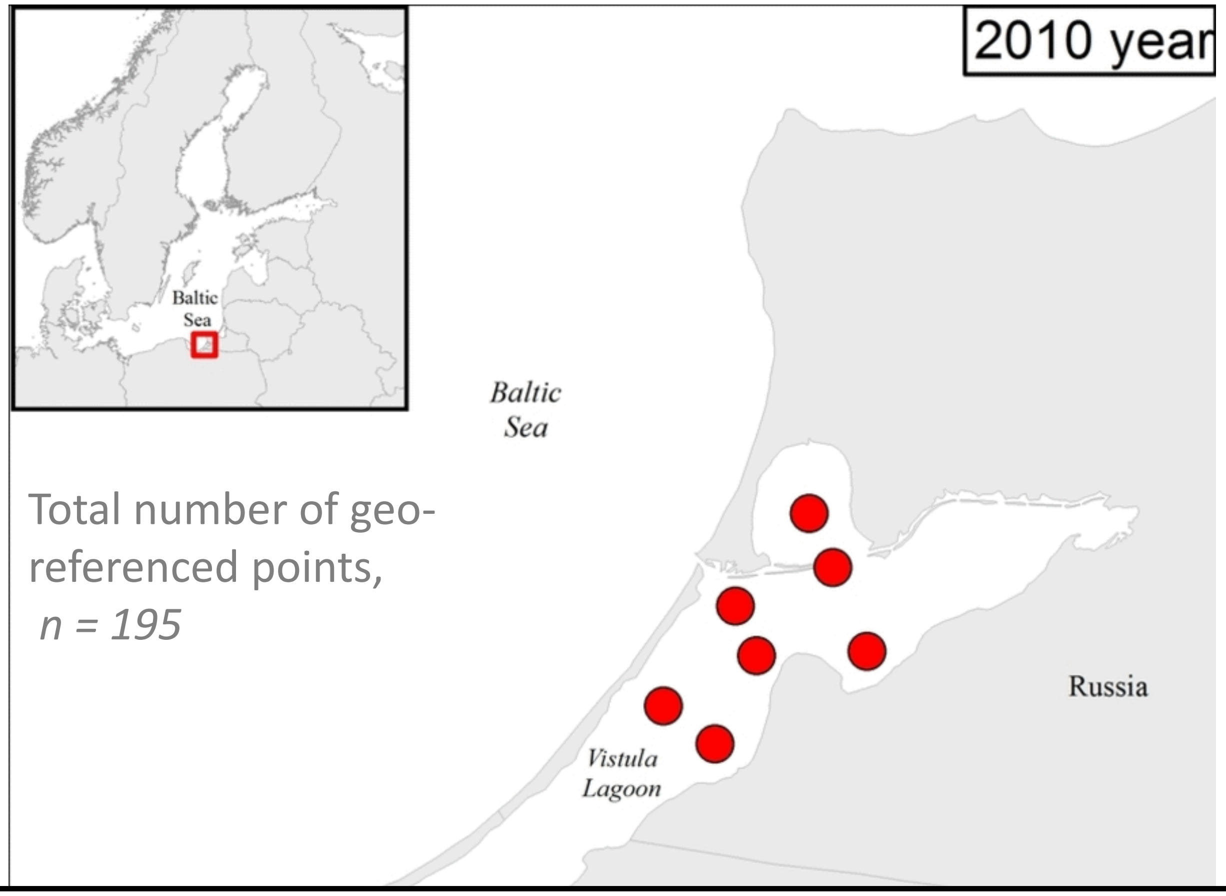


Sources: Rudynskaja, Warzocha, J. et al. (2016)

On the scale of the entire Baltic Sea mean expansion rate was 133 km/year (2010-2016), maximum expansion distance in kilometers 763 km.

The *Rangia cuneata* case study in the Vistula Lagoon:
natural expansion after first human induced introduction?

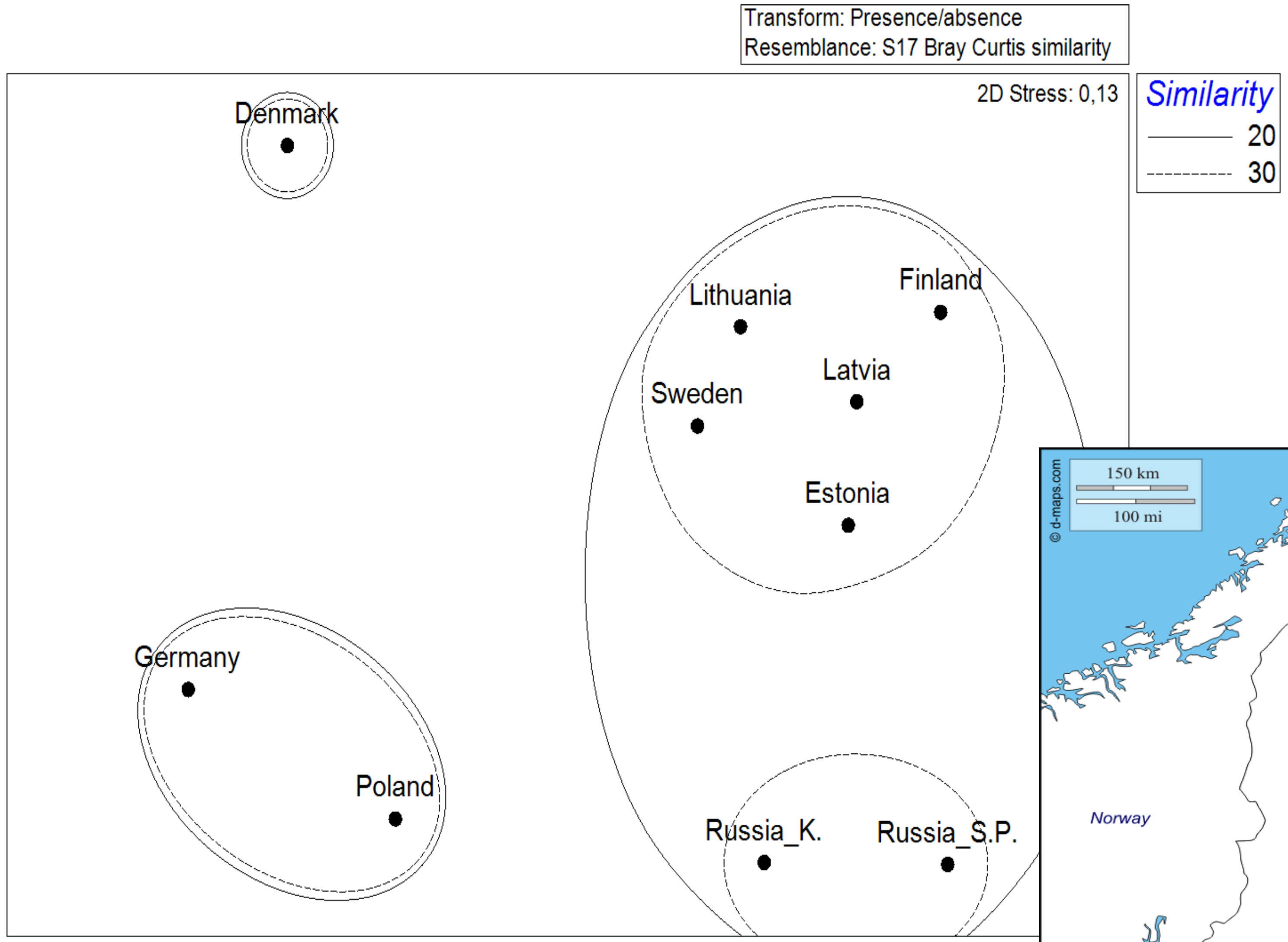




Based on the MER values the spread of *Rangia cuneata* in the Vistula Lagoon is regarded as being natural, while on the scale of the entire Baltic Sea it is eight times higher, implying human-mediated transportation (due ballast water or other vectors).

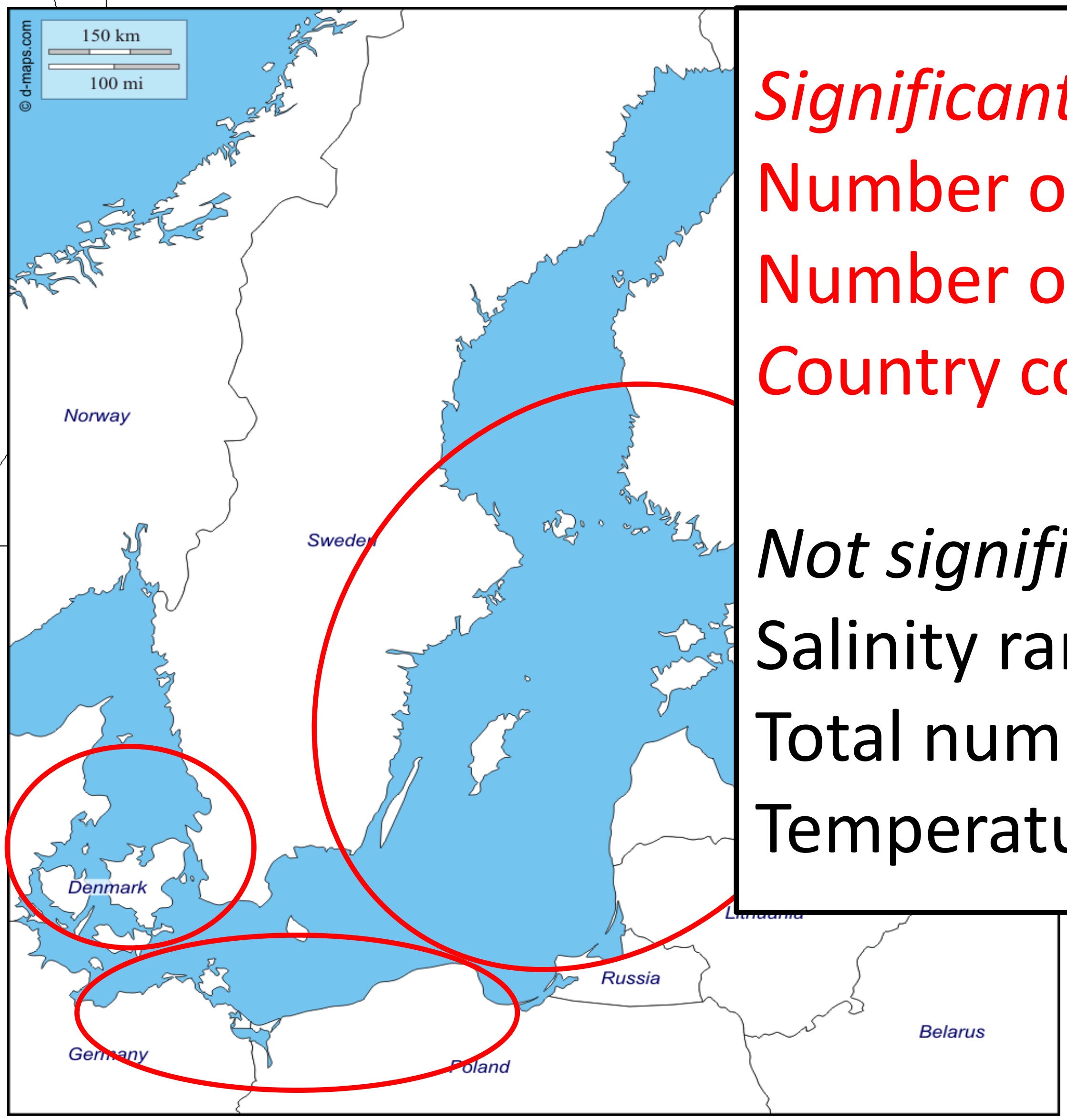
An index *nNIS* for assessment of new arrivals of non-indigenous species into the Baltic Sea region during the 2000 - 2009 and 2010 - 2018 periods;

Taxonomic similarity based on *nNIS* L1 values



Taxonomic similarity of NIS in the Baltic Sea during the period 2000 – 2018:

1) the south-western part (Denmark);
2) Germany and Poland;
3) the Baltic proper and Northern Baltic countries.



Significant correlation
Number of monitoring stations 0.74*
Number of ports (container liner) 0.55**
Country coastline length 0.51**

Not significant correlation
Salinity range 0.33
Total number of ports 0.39
Temperature range 0.28

*P<0.05; **P<0.01

Does it work: how the ballast water regulation effects the introduction of new NIS?

Contents lists available at ScienceDirect
Journal of Great Lakes Research
journal homepage: www.elsevier.com/locate/ijglr

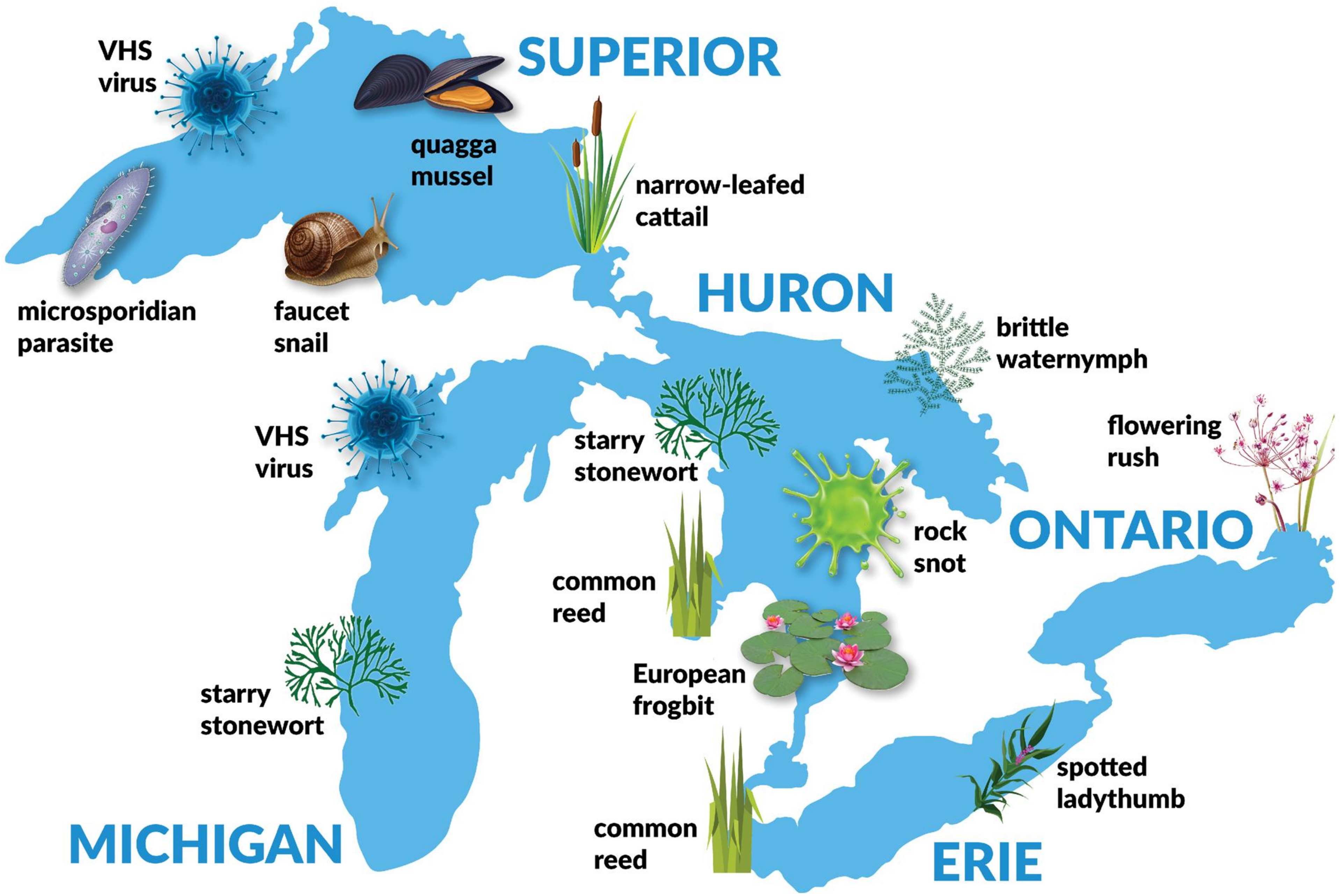
Review

Recent history of nonindigenous species in the Laurentian Great Lakes; An update to Mills et al., 1993 (25 years later)

R.A. Sturtevant [a,*], D.M. Mason [b], E.S. Rutherford [b], A. Elgin [c], E. Lower [d], F. Martinez [e]

Sturtevant, R. A., et al., 2019

Waterways to the Great Lakes Ballast Water management since1993.
The introduction slowed by ballast water regulations for ocean – faring ships.



Source: U.S-Canadian State of the Great Lakes 2019 report

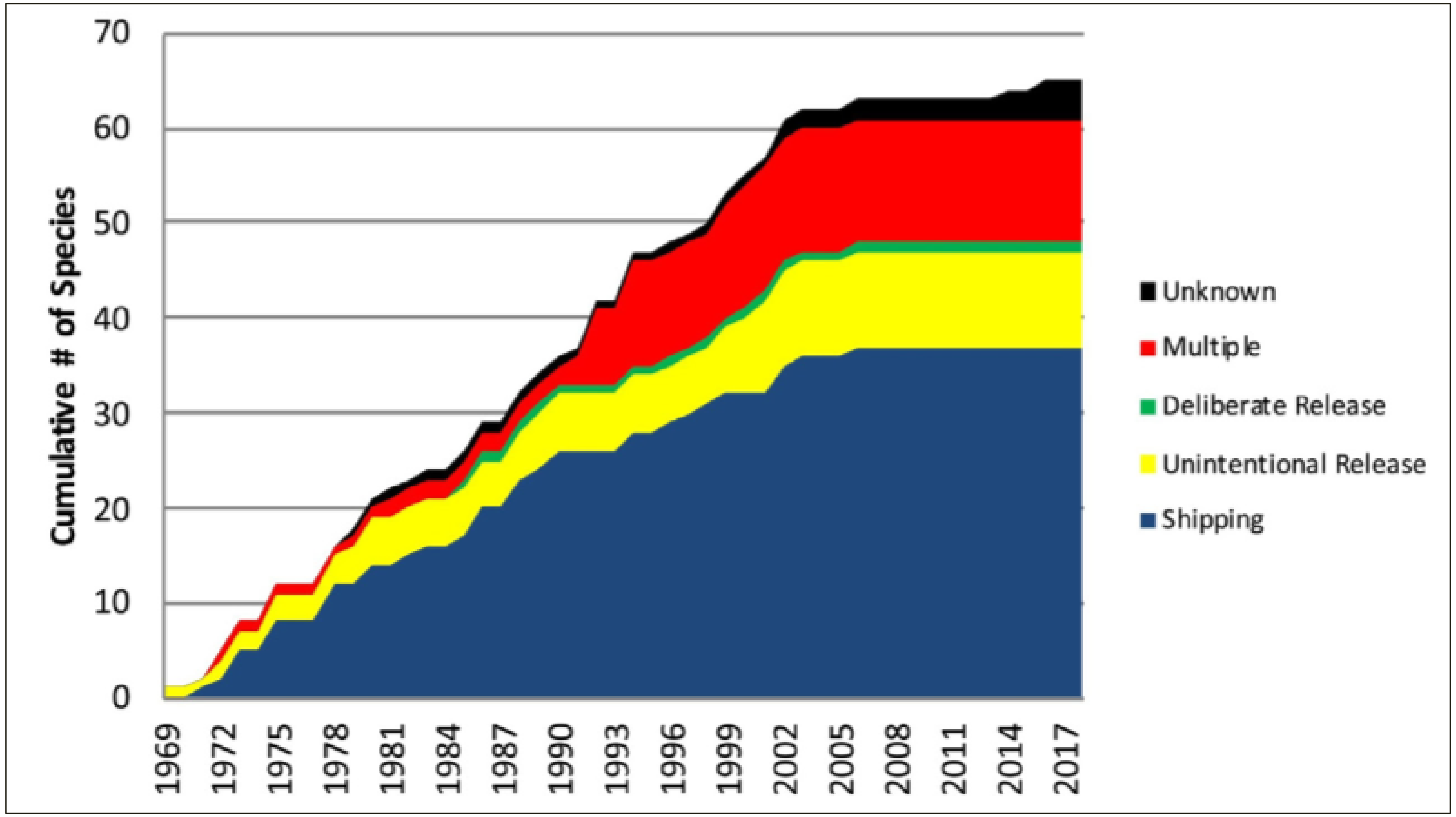
NIS are traveling between lakes.

It works! The significant decline in ballast water introduction of new NIS in the Great Lakes

- **Ballast exchange requirements on the Great Lakes started in 1993 pursuant to the Nonindigenous Aquatic Nuisance Prevention and Control Act with an exemption for vessels declaring 'No Ballast on Board' (NOBOB), and saltwater flushing of residual ballast sediments in NOBOB vessels was required starting in 2006.**

- **Over the most recent 25 years, the rate of introduction of NIS capable of becoming established has declined.**

- **With the 2006 expansion of ballast regulations to include residual ballast sediments in vessels declaring 'No Ballast on Board', the rate of new invasions has fallen to a low of only 0.25 species per year.**



Source: Sturtevant, R. A., et al., 2019

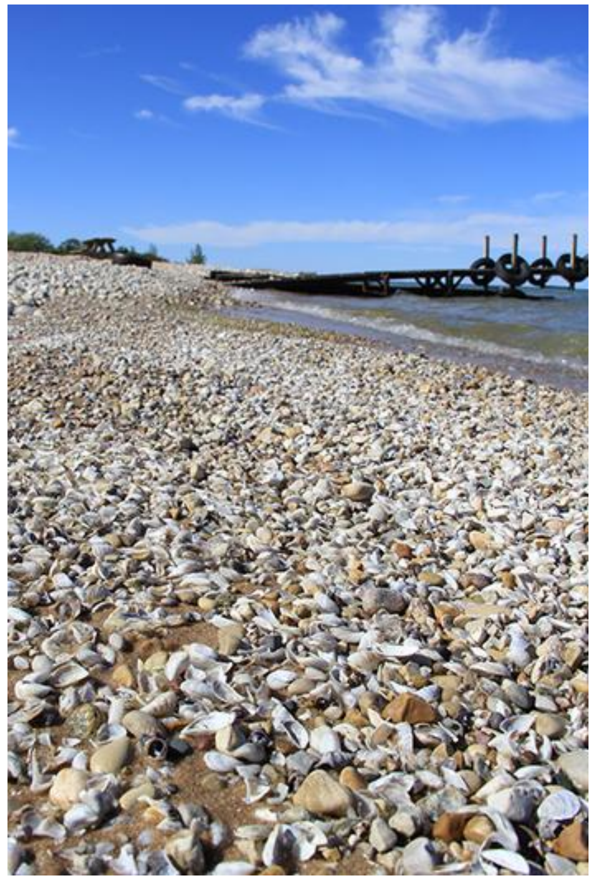
Cumulative number of nonindigenous species introductions to Great Lakes by vector.

Ecological and Economic Impacts of Biological Invasions

- **Species introductions can lead to significant ecological and economic problems.**
- A species introduced or translocated into closed aquaculture systems may escape into the surrounding natural environment.
- Once escaped or dispersed, an introduced or translocated species may successfully establish a self-sustaining population within the intended area or spread beyond the original introduction zone.
- Hybridization with native populations can reduce genetic diversity.
- Competition with native species for food and space, as well as predation, can lead to declines or local extinctions of native populations.
- Some of these impacts may persist even after the introduced species has been removed.







One more thing to remember!

- NIS are not "bad or good",

  this is just a <u>biogeographical category</u>,
  indicating species introduced outside their natural range due to intentional or unintentional human activity!

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A call to arms: The war against invasive species

These species don’t belong here. They are plaguing the landscape, with untold economic and biodiversity impacts. We need to eradicate them whenever possible: This is war.”

They're Here

From 1950s sci-fi flicks to the more recent *Signs*, our cinematic tradition reveals that the fear of extraterrestrial invasion has long occupied human consciousness. It is disconcerting to consider menacing life forms taking up residence on our planet and destroying the world as we know it or, worse, removing us entirely.

Courtesy U.S. Fish & Wildlife Service

Brown Tree Snake

Lietuvą okupuoja vis daugiau invazinių gyvūnų ir augalų (87)

Lithuania is being increasingly occupied by invasive animals and plants

“Giant Crab 'Red Army' Invades Norway”

“The Cold War might be over, but a red army of monster crustaceans — marshaled by Soviet-era leaders — is threatening to invade Western Europe, according to environmentalists…”

Power of communication

- **Misconceptions about invasive species.**
- **Invasive species are not our "enemy"—the labels "good" and "bad" are not appropriate in this context.**
- **We cannot "win" this war, and militaristic language should not be used where it does not belong.**
- **Invasion biology should not promote xenophobia.**
- **Loss of public trust in science.**

INVITATION TO WORKSHOP

MARINE INTRODUCED SPECIES: CAN THEY BE GOOD?
Exploring the assumptions behind the concern about 'invasions'.

Bergen, Norway, February/March 2009

Organized by: Ståle Knudsen,
Associate Professor
Department of Social Anthropology
University of Bergen,
Norway

Frontiers

Participate in the article collection on Biological Invaders: Always the Bad Guys?

Dear Dr. Olenin,

This is a quick update about the opportunity to contribute to the article collection **Biological Invaders: Always the Bad Guys?** hosted by Dr(s) **Bruce Arthur Osborne, Margherita Gioria** in **Frontiers in Ecology and Evolution** - section **Population and Evolutionary Dynamics** .

Find out more about the collection here.

Participation

Received: 2020-09-21

Biological invasions from different points of view.

Dialogue between biologists and social anthropologists about non-native species

Dogmas of invasion biology

- ***"Biological invasions are the second most important threat to biodiversity worldwide (after habitat destruction)"***
- ***"Biological invasions lead to loss of marine biodiversity"***
- ***"Biological invasions are the leading cause of marine species extinctions"***
- ***"Alien species cannot become part of the accepted native biota"***

(e.g. Wilson 1992; Perrings et al 2005; Schaffelke et al 2006; Zhu & Wang 2008; Molnar et al 2008; Felline et al; 2014; Assis et al 2015; Giakoumi et al 2016 ; Schmiedel et al 2016; Ricciardi et al 2017…)

Don't judge species on their origins

Conservationists should assess organisms on environmental impact rather than on whether they are natives, argue **Mark Davis** and 18 other ecologists.

(NATURE | VOL 474 | 9 JUNE 2011)

Conservation Biology

Explore this journal >

Review

The Potential Conservation Value of Non-Native Species

MARTIN A. SCHLAEPFER, DOV F. SAX, JULIAN D. OLDEN

First published: 22 February 2011 Full publication history

DOI: 10.1111/j.1523-1739.2010.01646.x View/save citation

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Environmental Science & Policy 59 (2016) 67–73

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Environmental Science & Policy

journal homepage: www.elsevier.com/locate/envsci

ELSEVIER

Alien species: to remove or not to remove? That is the question

Giuseppe Bonanno*

CrossMark

July 2026

THE BALTIC CLIMATE SCHOOL

THANK YOU

Coalition Clean Baltic