LifeWatch ERIC

ENVRI FAIR

LifeWatch ERIC e-Science for NIS research workshop | 20-21 May 2021

An event organised within the framework of the LifeWatch ERIC Internal Joint Initiative and with the support of the ENVRI-FAIR project

Impact of NIS on marine ecosystems: what should be considered when assessing the environmental status under the EU Marine Strategy Framework Directive?

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NIS assessment for the EU MSFD

Descriptor of Good Environmental Status

D2. "*Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems*"

COMMISSION DECISION (EU) 2017/848

of 17 May 2017

laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU

Criteria for D2

D2C1	Primary	D2C2	Secondary	D2C3	Secondary
New NIS arrivals		Spread of established NIS		Impact of established NIS	

Criteria for D2: in details

(according to Decision 2017/848/EU)

D2C1 **Primary**

New NIS arrivals

The number of non-indigenous species which are newly introduced via human activity into the wild, per assessment period (6 years), measured from the reference year as reported for the initial assessment under Article 8(1) of Directive 2008/56/EC, is minimised and where possible reduced to zero.

Member States shall establish the threshold value for the number of new introductions of NIS, through regional or subregional cooperation.

D2C2 **Secondary**

Spread of established NIS

Abundance and spatial distribution of established NIS, particularly of invasive species, contributing significantly to adverse effects on particular species groups or broad habitat types.

Member States shall establish that list through regional or subregional cooperation.

D2C3 **Secondary**

Impact of established NIS

Proportion of the species group or spatial extent of the broad habitat type which is adversely altered due to NIS, particularly invasive NIS.

Member States shall establish the threshold values for the adverse alteration to species groups and broad habitat types due to NIS, through regional or subregional cooperation.

Criteria for D2: in details

(according to Decision 2017/848/EU)

D2C1 **Primary**

New NIS arrivals

D2C2 Secondary

Spread of established NIS

D2C3 Secondary

Impact of established NIS

	D2C1	D2C2	D2C3
Measurability (condition)	Easy (if a NIS monitoring system is in place)	Easy (if a NIS and basic biological monitoring system is in place)	Difficult (requires additional targeted studies)
Interpretation	Easy	Difficult	Difficult
Measures to achieve GES	Prevention, early detection and eradication	Eradication, isolation, control, mitigation	Eradication, isolation, control, mitigation

(Olenin et al. In prep.)

Environmental target for D2C1 ('new NIS arrivals')

as defined in Lithuania

"*During the reporting period (2012-2017), no NIS new to the Baltic Sea have appeared in the Baltic Sea waters within the jurisdiction of Lithuania that are introduced via human activity such as ships' ballast water, other ship vectors or aquaculture*".

Threshold value:

NIS new for the Baltic Sea in LT waters = 0

Criterion D2C1 (new NIS arrivals)
the result of the 2012-2017 assessment

AquaNIS
Information system on aquatic non-indigenous and cryptogenic species

D2C1 **Primary**

New NIS arrivals

The environmental target achieved!

[No NIS new for the Baltic Sea have appeared in the LT waters]

Good Environmental Status

Rangia cuneata
Foto: Dan Minchin

Dikerogammarus villosus
Foto: Eglė Šidagytė

Search criteria:
(*Taxonomy*) Species: Rangia cuneata
AND
(*Recipient region*): [LME: 23. Baltic Sea]

Additional column: Select: Next ››

Species	Recipient region	Date of the first record
Rangia cuneata	Sweden / Baltic Sea	2016
Rangia cuneata	Lithuania	2013
Rangia cuneata	Germany / Baltic Sea	2014 - 2015
Rangia cuneata	Poland	2011
Rangia cuneata	Estonia	2015
Rangia cuneata	Russia / Baltic Sea / Kaliningrad area	2010

Search criteria:
(*Taxonomy*) Species: Dikerogammarus villosus
AND
(*Recipient region*): [LME: 23. Baltic Sea]

Additional column: Select: Next ››

Species	Recipient region	Date of the first record
Dikerogammarus villosus	Lithuania	2015
Dikerogammarus villosus	Latvia	2015
Dikerogammarus villosus	Poland	2002
Dikerogammarus villosus	Germany / Baltic Sea	1990 - 2015

Criterion D2C2 (Spread of established NIS)

the result of the 2012-2017 assessment

D2C2	Secondary

Spread of established NIS

Threshold: Abundance and distribution did not change

[established invasive species are spreading]

***Environmental Status* => deteriorated**

Foto: Sergej Olenin

The round goby *Neogobius melanostomus*

Population status: outbreak

Foto: Eglė Šidagytė

The killer shrimp *Dikerogammarus villosus*

Population status: established, spreading

Criterion D2C3 (Impact of invasive NIS)

the result of the 2012-2017 assessment

D2C | Secondary

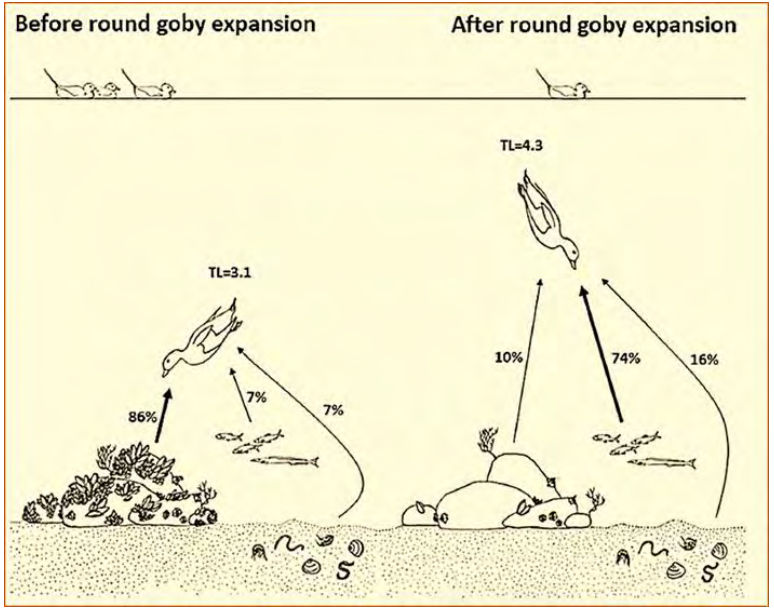
Impact of established NIS

Threshold: The magnitude of the NIS effect did not increase

[Biopollution level increased from BPL=1 (weak) to BPL=4 (extreme)]

***Environmental Status* => deteriorated**

The population of the round goby has entered an expansion phase, it is found everywhere, has become the most abundant fish species, blue mussel settlements have significantly decreased, the food web has changed – the overall biopollution level (Olenin et al. 2007) has been assessed as extreme.



(Skabeikis et al. 2018. Biol. Invasions)

D2 (NIS) assessment: what's the bottom line?

D2C1 **Primary**

New NIS arrivals

Good Environmental Status

Reported to EU

D2C2 **Secondary**

Spread of established NIS

Bad Environmental Status

D2C3 **Secondary**

Impact of established NIS

Bad Environmental Status

Q1: but what is the "real" situation?

Q2: is everything OK with the MSFD D2 criteria?

Q3: what else should be considered when assessing the state of the marine environment?
(impact on human health, impact on economy)

Classification of impacts

Srėbalienė, G., Olenin, S., Minchin, D., & Narščius, A. (2019). A comparison of impact and risk assessment methods based on the IMO Guidelines and EU invasive alien species risk assessment frameworks. PeerJ, 7, e6965.

PeerJ

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

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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,

41 categories of impacts

Table 1. Impact categories used in risk assessment frameworks: human health (6 categories), economy (11), environment (20), social-cultural aspects (4)

Impact types	Categories	Impact types	Categories
Social and cultural	Recreation and tourism locations	Environment	Parasite on native species
	Education and research		Predation
	Spiritual and religious locations		Hybridization
	Interference with monitoring		Parasite vector
Economical	General management costs		Habitat change or loss
	Fisheries		Competition
	Aquaculture		Pathogen on native species
	Changes to wildlife habitat		Food web changes
	Cost of changes to environment		Nutrient regime alterations
	Irrigation and abstraction		Biodiversity alteration
	Navigation		Pathogen vector
	Tourism		Herbivory/grazing
	Health care costs		General ecosystem services
	Biotechnology		Keystone species
	Opportunity costs		Threatened or endangered species
Human health	Human pathogen		Toxicity on native species
	Human parasites		Species abundance
	General impact		Pest vector
	Toxic to human		Pest on native species
	Poisoning to human		Hydrological cycle changes
	Venomous organisms		

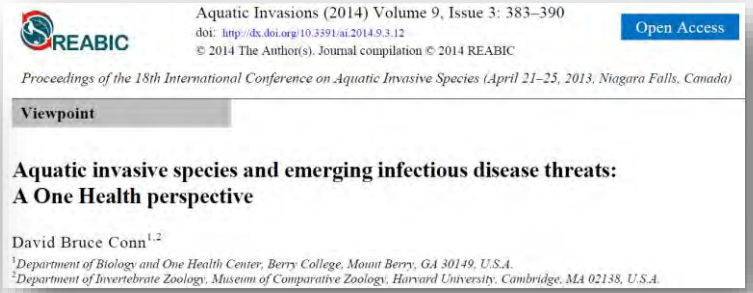
20 categories of impact

Table 1.

Categories and subcategories of hazard to human health associated with invasive alien species (IAS).

Impact on human health	
INVASIVE ALIEN SPECIES (IAS)	
(1) IAS cause diseases or infections	
	(1a) IAS are pathogens/parasites
	(1b) IAS are vectors/reservoirs of pathogens/ parasites (alien/native)
	(1c) IAS favor pathogens/parasites and/or their vectors/reservoirs
(2) IAS expose humans to	
	(2a) wounds from bites/stings
	(2b) allergens
	(2c) biotoxins
	(2d) toxicants
(3) IAS facilitate injuries, death, and psychological diseases through other mechanisms	
(4) IAS have other negative effects on human livelihood	

Mazza et al. 2014. Biological invaders are threats to human health: an overview, Ethology Ecology & Evolution, 26:2-3, 112-129, DOI: 10.1080/03949370.2013.863225



REABIC

Aquatic Invasions (2014) Volume 9, Issue 3: 383–390
doi: http://dx.doi.org/10.3391/ai.2014.9.3.12

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Open Access

Proceedings of the 18th International Conference on Aquatic Invasive Species (April 21–25, 2013, Niagara Falls, Canada)

Viewpoint

Aquatic invasive species and emerging infectious disease threats: A One Health perspective

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Diseases associated with freshwater can be assigned to the categories of:

1) **water-borne** such as typhoid and cholera;

2) **water-carried** such as cryptosporidiosis and giardiasis;

3) **water-based** such as schistosomiasis and diphyllobothriasis;

4) **water related** such as malaria, dengue, chikungunya, and filariasis;

5) **water-washed** such as trachoma and viral conjunctivitis; and

6) **water-dispersed** such as Legionellosis

(Yang et al. 2012, cit. by Conn, 2014).

Thank you!

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