MEDITERRANEAN ACTION PLAN (MAP)
REGIONAL MARINE POLLUTION EMERGENCY RESPONSE CENTRE FOR THE MEDITERRANEAN SEA (REMPEC)

Fifteenth Meeting of the Focal Points of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC)

Kappara, Malta, 13-15 June 2023

REMPEC/WG.56/INF.8
1 June 2023
Original: English only

Agenda Item 5: Introduction of non-indigenous species by shipping activities

Brief overview of the status of harmonisation of Ballast Water Management (BWM) measures

REMPEC
Malta, 2023

Note by the Secretariat

This document presents a brief overview of the status of harmonisation of Ballast Water Management (BWM) measures, as prepared by REMPEC, following the Regional Expert Meeting on the harmonisation of procedures in the Mediterranean pursuant to the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Kappara, Malta, 22-23 March 2023).

Background

1 The brief overview of the status of harmonisation of Ballast Water Management (BWM) measures, hereinafter referred to as the brief overview on BWM measures, was prepared by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), as requested by the Regional Expert Meeting on the harmonisation of procedures in the Mediterranean pursuant to the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Kappara, Malta, 22-23 March 2023), which was organised pursuant to the Programme of Work and Budget for 2022-2023 of the Mediterranean Action Plan (MAP) of the United Nations Environment Programme (UNEP), adopted by the Twenty-second Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean ("the Barcelona Convention") and its Protocols (Antalya, Türkiye, 7-10 December 2021).

2 The brief overview on BWM measures is presented in the **Annex** to the present document.

Action requested by the Meeting

3 **The Meeting is invited to take note** of the information provided in the present document.

******

Annex

Brief overview of the status of harmonisation of Ballast Water Management (BWM) measures

MEDITERRANEAN ACTION PLAN (MAP)
REGIONAL MARINE POLLUTION EMERGENCY RESPONSE CENTRE FOR THE MEDITERRANEAN SEA (REMPEC)

Brief overview of the status of harmonisation of Ballast Water Management (BWM) measures

Prepared by REMPEC consultants

This activity was financed by the Integrated Technical Cooperation Programme (ITCP) of the International Maritime Organization (IMO) as well as the Mediterranean Trust Fund (MTF) and was implemented by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), in cooperation with the Regional Activity Centre for Specially Protected Areas (SPA/RAC).

Definitions

Barcelona Convention means the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean.

BWM Convention means the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.

Mediterranean Sea area means the Mediterranean Sea proper including the Gulfs and seas therein with the boundary between the Mediterranean and the Black Sea constituted by the 41° N parallel and bounded to the west by the Straits of Gibraltar at the meridian of 005°36' W.

OSPAR Convention means the Convention for the Protection of the Marine Environment of the North-East Atlantic.

Precautionary principle means the principle as taken from the Convention on Biological Diversity, which reads: "*where there is a threat to significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat*".

Acronyms

BWE:	ballast water exchange
BWM:	ballast water management
BWM Convention:	International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004
BWMP:	Ballast Water Management Plan
BWMS:	ballast water management system
BWRB:	Ballast Water Record Book
GISIS:	Global Integrated Shipping Information System
HAOP:	harmful aquatic organisms and pathogens
HELCOM:	Baltic Marine Environment Protection Commission or Helsinki Commission
IAS:	invasive aquatic species
IMO:	International Maritime Organization
MEPC:	Marine Environment Protection Committee
REMPEC:	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
ROPME:	Regional Organization for the Protection of the Marine Environment
SRA:	same risk area
SPA/RAC:	Regional Activity Centre for Specially Protected Areas

Table of Contents

Figures

1 Introduction

The Mediterranean Sea comprises less than 1% of global oceans but, because of its strategic location, has a significant volume of shipping traffic. Passenger and merchant ships making port calls, together with ships transiting the area, represent just over 24% of global shipping. In 2019, this included 27% of the global fleet of oil and chemical tankers and 17.3% of worldwide cruises, with 453,000 port calls made by 14,403 ships. The majority of commercial maritime traffic is intra-Mediterranean[1].

Harmful aquatic organisms and pathogens (HAOP) are recognised as one of the main threats to the marine and coastal biodiversity of the Mediterranean. To date, nearly 1,000 marine species have been recognised as non-indigenous to the Mediterranean Sea. The take up in one location, and release in another location, of unmanaged ballast water by ships is a known vector of HAOP worldwide.

Recognising concern over the introduction of harmful aquatic organisms and pathogens (HAOP) via ballast water, the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) was adopted by the International Maritime Organization (IMO) in 2004.

The BWM Convention entered into force on 8 September 2017. The BWM Convention now has 94 contracting parties representing 92.41% of world shipping tonnage, including 13 of the Mediterranean coastal States that are Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention)[2].

The BWM Convention can be regarded as a risk management tool[3] as it requires ships to manage their ballast water so that aquatic organisms and pathogens are removed or rendered harmless before ballast water is released into a new location, with the purpose of preventing the spread of HAOP and at the same times it does offer multiple guidelines to anticipates the drawbacks of modifying the technical and work systems onboard to achieve the required standards (Baumler et al 2021).

The BWM Convention applies to all ships registered under Parties to the BWM Convention, which take up and use ballast water during international voyages. Ships registered to a flag that has not ratified the BWM Convention may not be issued relevant certificates under the Convention, however port States that are a Party to the Convention do expect ships to comply with the requirements of the Convention, to ensure no more favourable treatment is given.

Article 13(3) of the BWM Convention includes that Parties with common interests to protect the environment, human health, property, and resources in a given geographical area, in particular, those Parties bordering enclosed and semi-enclosed seas, shall endeavour, taking into account characteristic regional features, to enhance regional co-operation.

Reflecting on the threat of introduction of HAOP through ballast water in the Mediterranean Sea area, the Contracting Parties to the Barcelona Convention and its Protocols agreed at their 22nd meeting to adopt the Ballast Water Management Strategy for the Mediterranean Sea (2022-2027) (hereinafter referred to as the Mediterranean BWM Strategy (2022-2027)). This built on previous actions by the Contracting Parties, including the adoption of the 2012 Ballast Water Management Strategy for the Mediterranean Sea.

[1] UNEP/MED, 2022.
[2] The Contracting Parties to the Barcelona Convention are Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syrian Arab Republic, Tunisia, Türkiye, and the European Union.
[3] GEF-UNDP-IMO GloBallast Partnerships Programme and WMU, 2013.

The overall objectives of the Mediterranean BWM Strategy (2022-2027) are to:

- Establish a framework for a regional harmonised approach in the Mediterranean on ships' ballast water control and management that is consistent with the requirements and standards of the BWM Convention, as outlined in Article 13(3),
- Initiate some preliminary activities related to the management of ships' biofouling in the Mediterranean region, and
- Contribute to the achievement of Good Environmental Status with respect to "non-indigenous species" as defined in the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria.

The Mediterranean BWM Strategy (2022-2027) comprises six (6) Strategic Priorities, each of which is supported by a number of actions and activities that are described in more detail in the Action Plan (Section 4). Appendix 1 sets out a work plan and implementation timetable while Appendix 2 outlines supplementary information for regional harmonisation of BWM measures.

Strategic Priority 1 (Support ratification and implementation of the BWM Convention) of the Mediterranean BWM Strategy (2022-2027) stipulates that "*The Contracting Parties to the Barcelona Convention support the work for the minimisation of the introduction of invasive aquatic species carried out by the relevant organisations and fora, particularly the work of the IMO, and are committed to take all appropriate actions towards the ratification and implementation of the BWM Convention in the Mediterranean*".

The Actions associated with Strategic Priority 1 include:

- Action 1: Ratification of the BWM Convention,
- Action 2: Harmonisation of BWM measures in the Mediterranean region,
- Action 3: Development, adoption, and implementation of a regional protocol for port baseline surveys and biological monitoring in Mediterranean ports
- Action 4: Promotion of the use of risk assessment as a tool to assist in ballast water (and, more generally, invasive aquatic species) management and decision-making, and
- Action 5: Alignment of BWM measures with neighbouring regions.

This overview document informs Contracting Parties to the Barcelona Convention on existing regulations and developments of harmonised procedures in other parts of the world and should be seen as background information to the final draft regional harmonised procedures for the uniform implementation of the Ballast Water Management Convention in the Mediterranean Sea, as set out in the Annex to document REMPEC/WG.56/5.

2 Ballast Water Exchange Areas

2.1 Ballast Water Management Convention ballast water exchange requirements

The BWM Convention applies to all ships flagged to countries that are Party to the Convention, and those ships operating under the authority of countries that are Party to the Convention.

The ballast water exchange (BWE) regulations under the BWM Convention (regulations B-4 and D-1) provide a standard that must be met to undertake BWE in accordance with the BWM Convention.

These include that a ballast water exchange:

- must have an efficiency of at least 95% volumetric exchange of ballast water (regulation D-1), in accordance with the Guidelines for ballast water exchange (G6)[4],

and that ships must conduct ballast water exchange:

- at least 200 nautical miles from the nearest land and in water at least 200 metres in depth (herein referred to as the 200/200 requirement),
- if this is not possible, then ballast water exchange must be conducted at least 50 nautical miles from the nearest land and in water at least 200 metres in depth (herein referred to as the 50/200 requirement) (regulation B-4).

In situations where this cannot be met, a port State may designate BWE areas in accordance with the Guidelines on designation of areas for ballast water exchange (G14)[5]. Port States are not required to designate BWE areas, however designation of BWE areas may support ships to perform BWE while on a route where the 200/200 and 50/200 requirements are not possible (e.g. closer to the coast and in shallower depths), as long as doing so will not introduce unacceptable risk of introduction of HAOP. Alternative options to cater for unmanaged ballast water can also be explored, such as ballast water reception facilities.

As per regulation B-4 of the BWM Convention, if the safety or stability of the ship is threatened by a BWE operation, as determined by the master with sufficient justification, this operation should not be undertaken.

Ships should not normally be required to deviate from their voyage planned route or unduly delay their arrival for the purposes of meeting these requirements.

All BWE, or reasons for not undertaking BWE, must be recorded in the Ballast Water Record Book (BWRB).

Ballast water exchange (BWE) regulations were included in the BWM Convention as an interim risk mitigation measure until such time as ships are required to meet the regulation D-2 standard (at the latest 8 September 2024), in accordance with the ship-specific phasing in schedule (regulation B-3, as amended by resolution MEPC.297(72)[6]) of the BWM Convention (Figure 1).

It may also be the case after 2024 that a ship may need to utilise BWE as a contingency measure, if this is in accordance with the ship's Ballast Water Management Plan, as outlined in the Guidance on contingency measures under the BWM Convention (BWM.2/Circ.62, as may be amended)[7].

[4] IMO, 2017b.
[5] IMO, 2006.
[6] IMO, 2017e.
[7] IMO, 2017g.

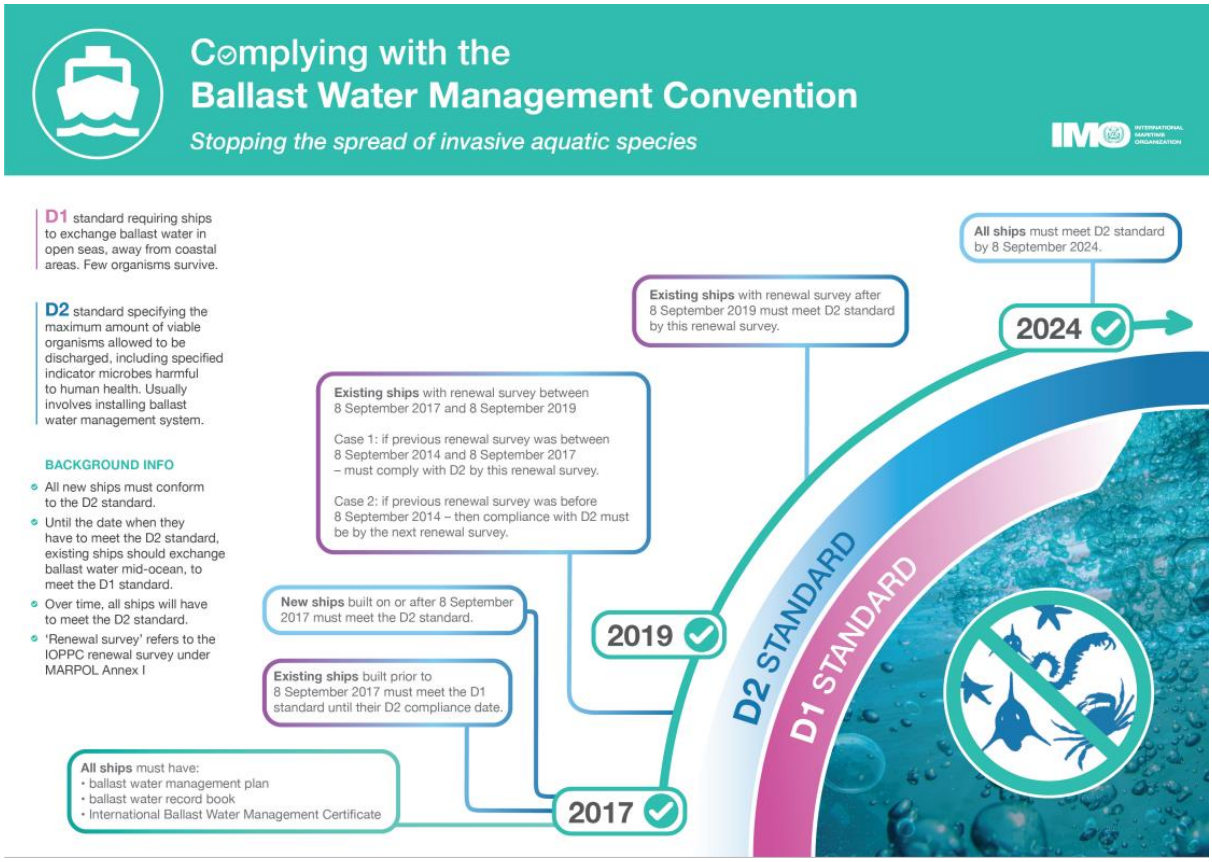

Figure 1. Infographic "Complying with the Ballast Water Management Convention", from the IMO Website.

The Guidelines (G14) provide a three-step process for designating an area as a BWE area: *identification, assessment* and *designation*. Port States should consult with adjacent or other States as appropriate when considering BWE areas, regardless of whether or not that State is a Party to the Convention. Before being implemented, BWE areas must be communicated to the IMO through the Global Integrated Shipping Information System (GISIS).

Ships operating in designated BWE areas that are not yet required to meet the D-2 standard and operating in areas where a full BWE (in accordance with regulation D-1) is not possible should:

- not be required to meet the regulation D-2 standard,
- not be required to use a ballast water reception facility or use other methods of ballast water management,
- not be required to have an exemption under regulation A-4, and
- record the reasons why BWE was not conducted in the BWRB, as per the guidance on Application of the Convention to ships operating in sea areas where ballast water exchange in accordance with regulations B-4.1 and D-1 is not possible (BWM.2/Circ.63[8]).

2.2 International and regional actions to designate ballast water exchange areas

The processes used to identify and assess BWE areas in various parts of the world have varied considerably, however they are all in line with the Guidelines (G14) and are based on an evaluation of risk associated with BWE in the relevant areas. Each country or region's interpretation of risk, and definition of acceptable level of risk, varies. As a result, the outcomes are also quite different.

[8] IMO, 2017h.

Australia undertook an assessment process to identify that, if ships could not meet the BWM Convention regulation B-4 requirements, BWE must be conducted at least 12 nautical miles from nearest land and in water at least 50 metres in depth[9]. The assessment used analysis of expert opinions to identify and assess biological risks, and analysis of shipping routes to identify BWE areas that would minimise the risk of harm from ballast water whilst also minimising the impact on shipping. The designated BWE areas were communicated to the IMO in BWM.3/Circ.1[10].

Norway designated specific BWE areas within the Norwegian Exclusive Economic Zone. The Norwegian Ballast Water Regulation entered into force on 1 July 2010. Norway designated three exchange areas on the basis of the areas being characterised by offshore directed water currents[11].

North Sea countries designated BWE areas in the North Sea which have been endorsed by the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Commission) and communicated to the IMO in BWM.2/Circ.56 [12] (Notification on ballast water exchange areas in the North Sea – Figure 2). The BWE areas in the North Sea were identified and assessed using remote sensing water quality data obtained through the European Space Agency Due Innovator II project. North Sea waters (excluding Norwegian waters) with an acceptable risk index (as determined by the North Sea countries) were designated for BWE[13].

Since no area in the Baltic Sea meets the regulation B-4.1 requirements, the Baltic Marine Environment Protection Commission (HELCOM) has also considered the identification of BWE areas for intra-Baltic shipping. Through an extensive study it was found that the potential exchange zone would be too small, and ships would likely have to decrease speed to ensure sufficient time to carry out exchange within the potential zone. As a result, no BWE area has been designated in the Baltic Sea[14]. Similarly, there has been no agreement on BWE areas in the Adriatic[15].

Ballast water exchange areas meeting Regulation B-4.1 may also be limited in other regions of the world (Figure 3). Several countries, including Singapore[16] and China[17] have communicated that ships which cannot meet the BWM Convention regulation D-1 requirements to conduct a full BWE, under specified circumstances, do not need to undertake a BWE. The reason must be recorded in the Ballast Water Record Book, in line with the guidance on Application of the Convention to ships operating in sea areas where ballast water exchange in accordance with regulations B-4.1 and D-1 is not possible (BWM.2/Circ.63[18]). These arrangements are temporary, and only apply until ships are required to meet the regulation D-2 standard.

[9] Knight, E. *et al.* 2007.
[10] IMO, 2017f.
[11] David, M. and Gollasch, S. 2016. *These areas do not appear to have been communicated to the IMO separately – coordinates for the Norwegian areas are not included in Circ.56*.
[12] IMO, 2015.
[13] Rak, 2016.
[14] David, M. and Gollasch, S. 2016.
[15] Rak, 2016.
[16] Maritime and Port Authority of Singapore, 2017.
[17] BIMCO, 2019.
[18] IMO, 2017h.

Map of the designated ballast water exchange area in the North Sea (including correction by the "Kompromisslinie")

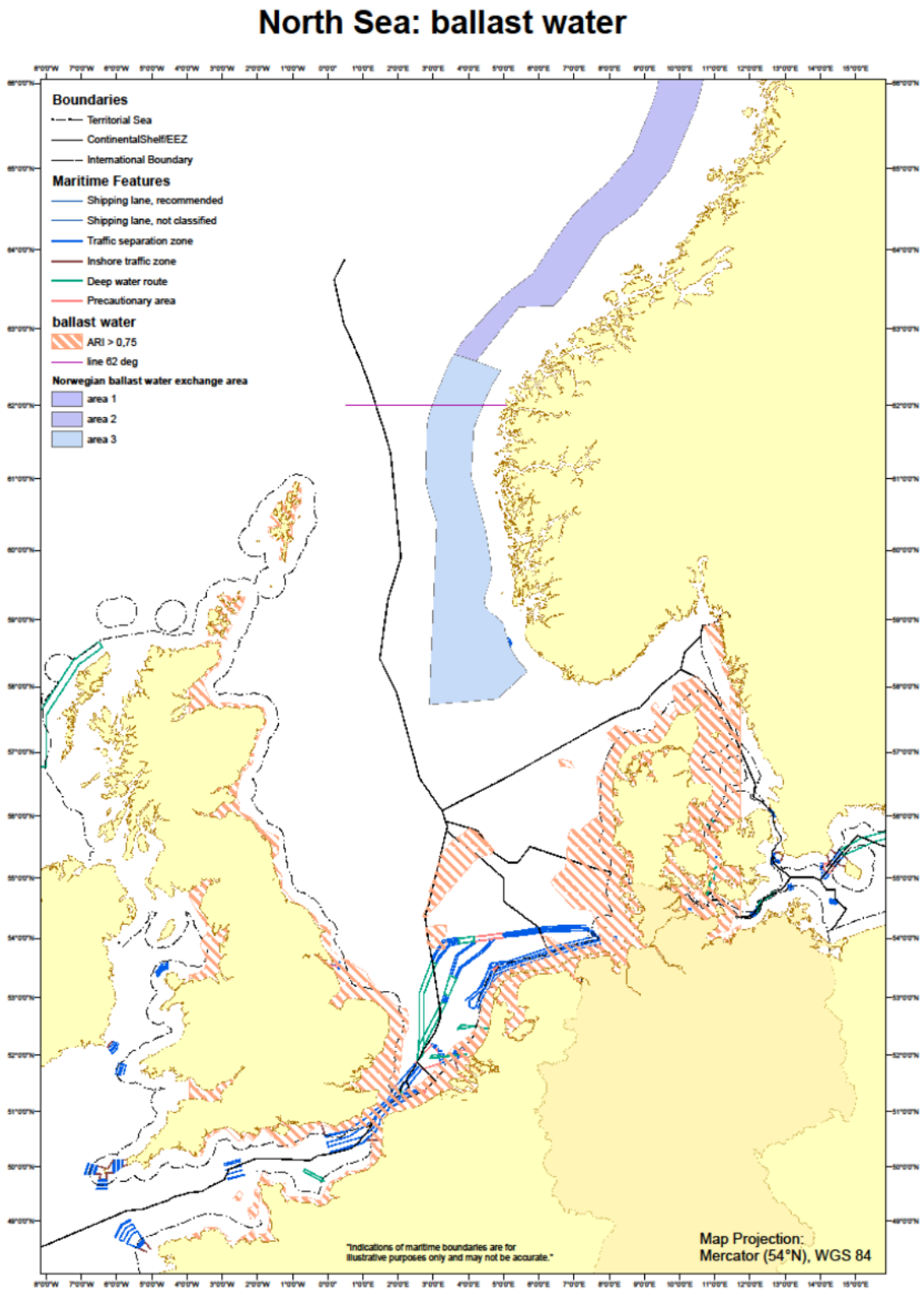

Figure 2. Zone approved for ballast water exchange in the North Sea. The areas with the high-risk index are depicted in red and define zones where exchange should be avoided[19]

[19] IMO 2015.

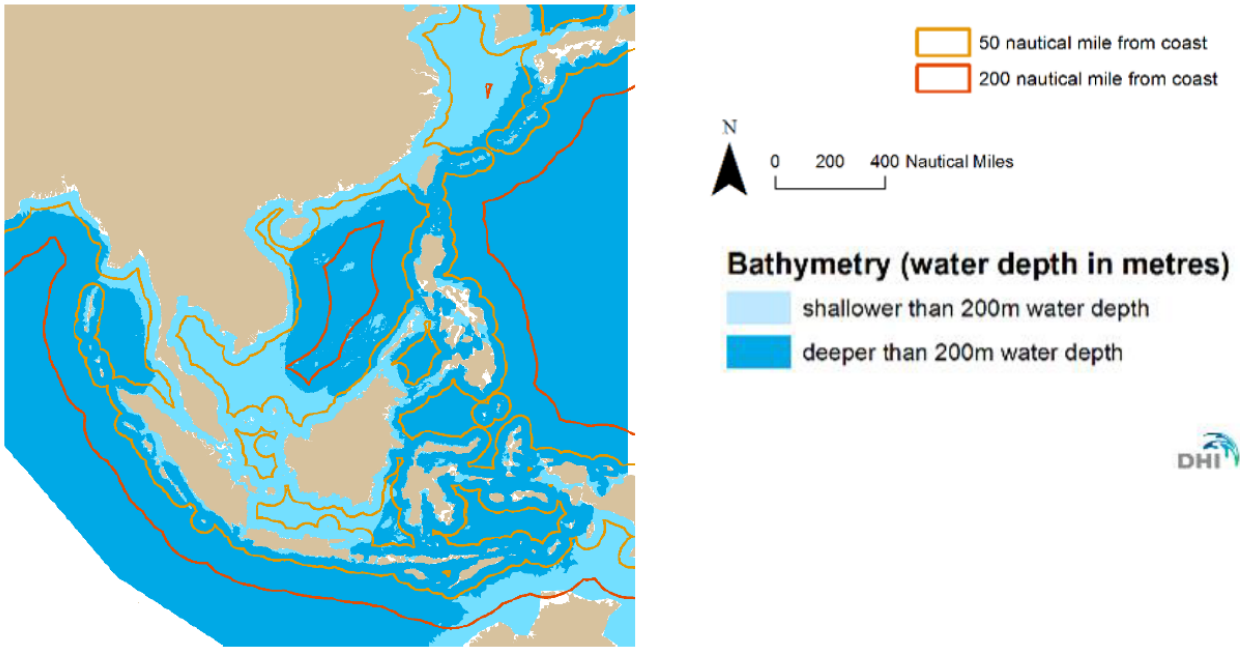

Figure 3: Example of areas for water exchange following the D-1 Standard of the BWM Convention in the South-East Asia area[20]

[20] MEPSEAS 2019.

3 Regulation A-4 Exemptions

3.1 Background and context

Under regulation A-4 of the BWM Convention, an exemption from the requirements in both regulations D-1 and D-2, to manage ballast water prior to discharge, may be issued to ships on voyages between specific ports and locations, but only:

- To ships that do not mix ballast water or sediments other than between the specified ports or locations, and
- Based on the 2017 Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7)[21].

Exemptions can only be effective for up to 5 years, are subject to intermediate review, and must be communicated to the IMO and recorded in a ship's Ballast Water Record Book.

Exemptions only apply to the requirement to manage ballast water in accordance with the BWM Convention:

- In the case of a ship that would be required to meet the regulation D-1 standard, an A-4 exemption may mean the ship does not have to undertake a ballast water exchange, or,
- In the case of a ship that would be required to meet the regulation D-2 standard in line with the BWM Convention's implementation schedule (Figure 1), an A-4 exemption may mean the ship does not have to, for example, utilise an on-board ballast water management system (BWMS) or discharge to a ballast water reception facility.

Regulation A-4 exemptions do not relieve a ship from other requirements of the BWM Convention, such as the requirement to hold an International Ballast Water Management Certificate, Ballast Water Management Plan and Ballast Water Record Book.

The intent of the Guidelines (G7) is to ensure that exemptions are applied for, assessed, and issued in a consistent manner based on scientifically robust risk assessment. An additional purpose of the Guidelines (G7) is to ensure that any exemptions granted do not impair or damage the environment, human health, property, or resources of adjacent or other States.

The Guidelines (G7) include three risk assessment methods that should be used, either individually or in combination, to determine the level of risk associated with the proposed exemption. The risk assessment methods are:

- Environmental matching risk assessment,
- Species biogeographical risk assessment, and
- Species-specific risk assessment.

Environmental matching risk assessments compare environmental conditions, including temperature and salinity, between donor and recipient ports. The degree of similarity between the ports provides an indication of likelihood of survival and establishment of harmful aquatic organisms and pathogens (HAOP) transferred between ports. The guidelines do not provide guidance on the degree of similarity that is acceptable, however the precautionary principle should be applied.

Species biogeographical risk assessments compare the biogeographical distributions of HAOP that currently exist in the donor and recipient ports and biogeographic regions. Overlapping species in the donor and recipient ports and regions are an indication that environmental conditions are sufficiently similar to allow a shared fauna and flora.

[21] IMO, 2017c.

Species-specific risk assessments use information on life history and physiological tolerances to define a species' physiological limits and thereby estimate its potential to survive or complete its lifecycle in the recipient environment. To undertake a species-specific risk assessment, species of concern that may impair or damage the environment, human health, property or resources need to be identified and selected. These are known as target species.

Both the species biogeographical risk assessment and the species-specific risk assessment focus on target species. Whilst assessments based on target species can aid decision making, it should be considered that any species can become invasive when introduced to a new environment, whether it has a history of doing so or not. This is the basis behind the ballast water management standards in the BWM Convention which target all species. The selection of target species is subjective and there will be a degree of uncertainty associated with this approach. In addition, there is an ongoing need to update target species lists. For this reason, the IMO GloBallast Partnership has developed a framework for supporting the implementation of Port Biological Baseline Surveys[22] to ensure to regular update of biodiversity present in ports around the world. Traditional sampling methods and taxonomy or modern approaches making use of eDNA may be used equally as technology and procedures becomes available[23].

The Guidelines (G7) were amended in 2017 to include the same risk area (SRA) concept. An SRA is an agreed geographical area based on completion of a risk assessment carried out in line with the Guidelines (G7). Within an SRA the likelihood of transfer of species via ballast water is considered equivalent to the movement of those species via natural dispersal within the same area. Therefore, ballast water sourced within the SRA poses the same risk as ballast water sourced from another location within the SRA, so the locations of take up and discharge within the SRA are inconsequential.

If an area is declared an SRA, an exemption may be granted to any ship sourcing and discharging ballast water within the SRA, on the condition that ballast water is not mixed with ballast water sourced outside the SRA (Figure 4).

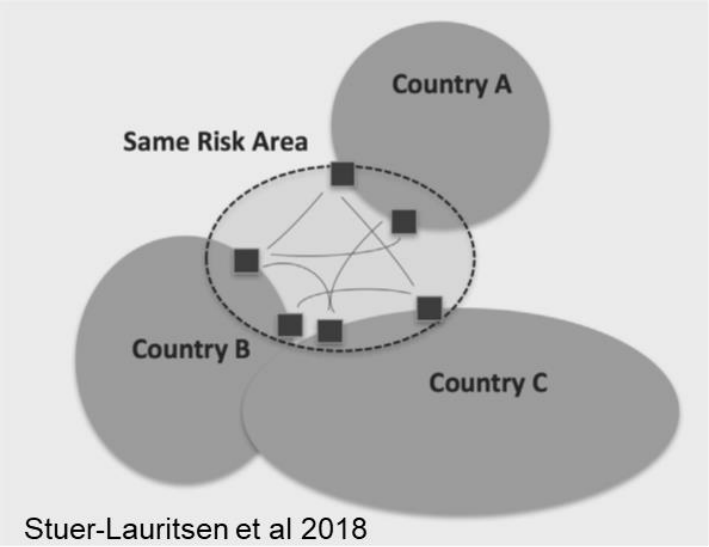

Figure 4: Extract from a peer reviewed publication offering a visual explanation of the concept of same risk area[24].

[22] Awad et al 2014.
[23] Finish Environnement Institute, 2022.
[24] Stuer-Lauridsen et al. 2018.

3.2 International and regional procedures for A-4 exemptions

Baltic Sea

The most comprehensive procedure developed for undertaking regulation A-4 exemption assessments is the Joint Harmonised Procedure for the Contracting Parties of HELCOM and OSPAR on the granting of exemptions under the International Convention for the Control and Management of Ships' Ballast Water and Sediments, Regulation A-4[25] (HELCOM-OSPAR JHP), adopted in 2013 and amended in 2015 and 2020.

The HELCOM-OSPAR JHP includes a port survey protocol, target species selection criteria, risk assessment, data storage and decision support tool, and administrative procedures.

Research in the Baltic undertaken prior to development of the HELCOM-OSPAR JHP informed the risk assessment procedure. The three risk assessment approaches in the Guidelines (G7) were considered and it was determined that the most appropriate approach in the Baltic was a two-step risk assessment, which is a combination of the environmental matching and species-specific risk assessments.

Step one of the HELCOM-OSPAR JHP risk assessment uses a risk assessment algorithm to determine high- or low-risk based on two key risk criteria – water salinity in the concerned ports, and presence of target species. The step one assessment provides an indication of the final decision (i.e., high risk after step one indicates that an exemption cannot be granted, unless step 2 indicates an acceptable risk; low risk after step one indicates an exemption can be granted, unless step 2 indicates an unacceptable risk).

Step two, the final detailed risk assessment, may include additional information on HAOP, species specifics (e.g., dispersal capacity), natural dispersal, and mitigation measures (e.g., volume of ballast water, position of discharge and uptake). As natural dispersal can be considered in step two, this process can be used to assess SRAs.

Denmark and Sweden Same Risk Area

An SRA between Denmark and Sweden was established in 2020[26] based on a study that identified relevant potential and existing HAOP in the region and determined the best estimate on the potential natural dispersal of each species[27] (Figure 5). Target species were identified through analysis of existing data.

[25] HELCOM-OSPAR, 2020a.
[26] HELCOM-OSPAR, 2020b.
[27] Hansen, F. T., & Christensen, A. 2018.

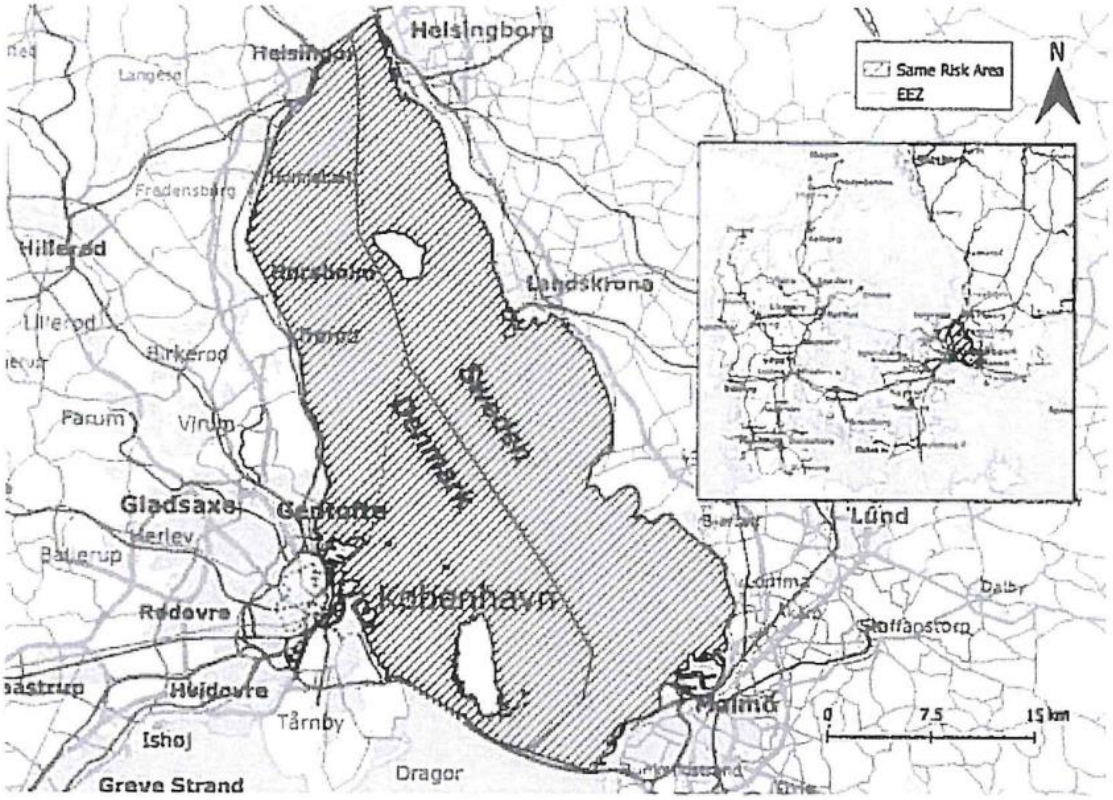

Figure 5. Map representation of the Same Risk Area in the Öresund, between Denmark and Sweden[28]

Adriatic Sea

A model for risk assessment in the Adriatic has been developed which is aligned with the Guidelines (G7) and combines the three risk assessment methods[29]. The model considers the Adriatic Sea as a single biogeographical unit. It is noted, however, that the data requirements in accordance with the Guidelines (G7) are prohibitive and, in the absence of this data, the precautionary principle has been applied and no risk assessment-based exemptions could be granted in the Adriatic area.

Singapore

Singapore has been active in the development of the SRA concept and has submitted multiple documents to the IMO, describing proposed technical tools that may be used (MEPC 70/INF21[30], MEPC 71/4/24[31]). As yet, an SRA has not been declared in the region however an approach to select species that are relevant in the context of risk assessment has been developed (Figure 6), and some hydrodynamic models for the region exist (Figure 7).

[28] IMO, 2022.
[29] Rak, G. 2016.
[30] IMO, 2016.
[31] IMO, 2017.

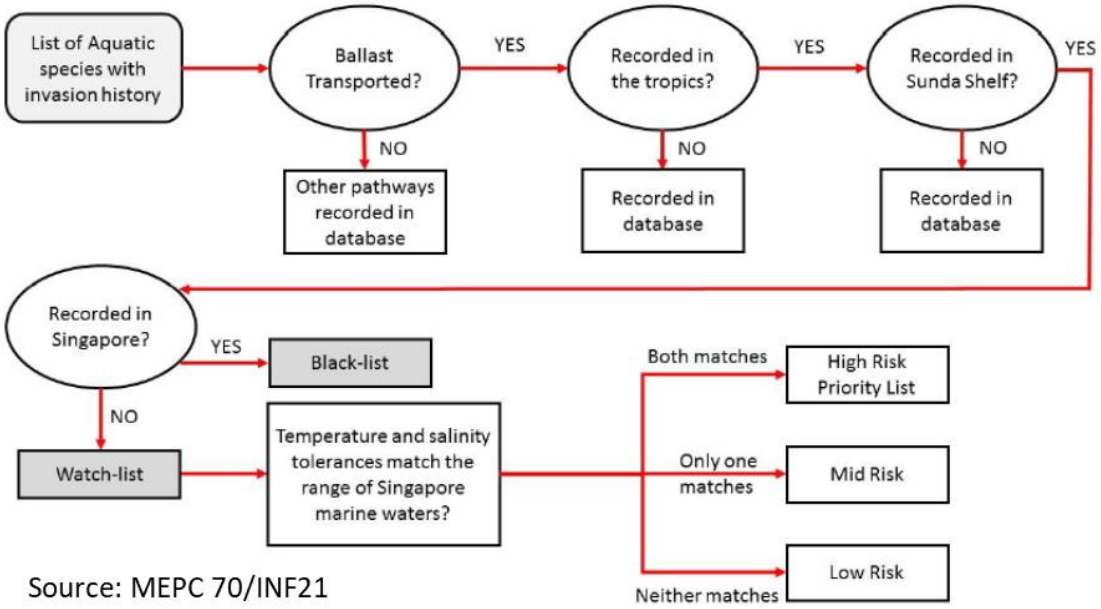

Figure 6: Flowchart of data mining process relevant to create a blacklist and watch list of aquatic invasive species[32].

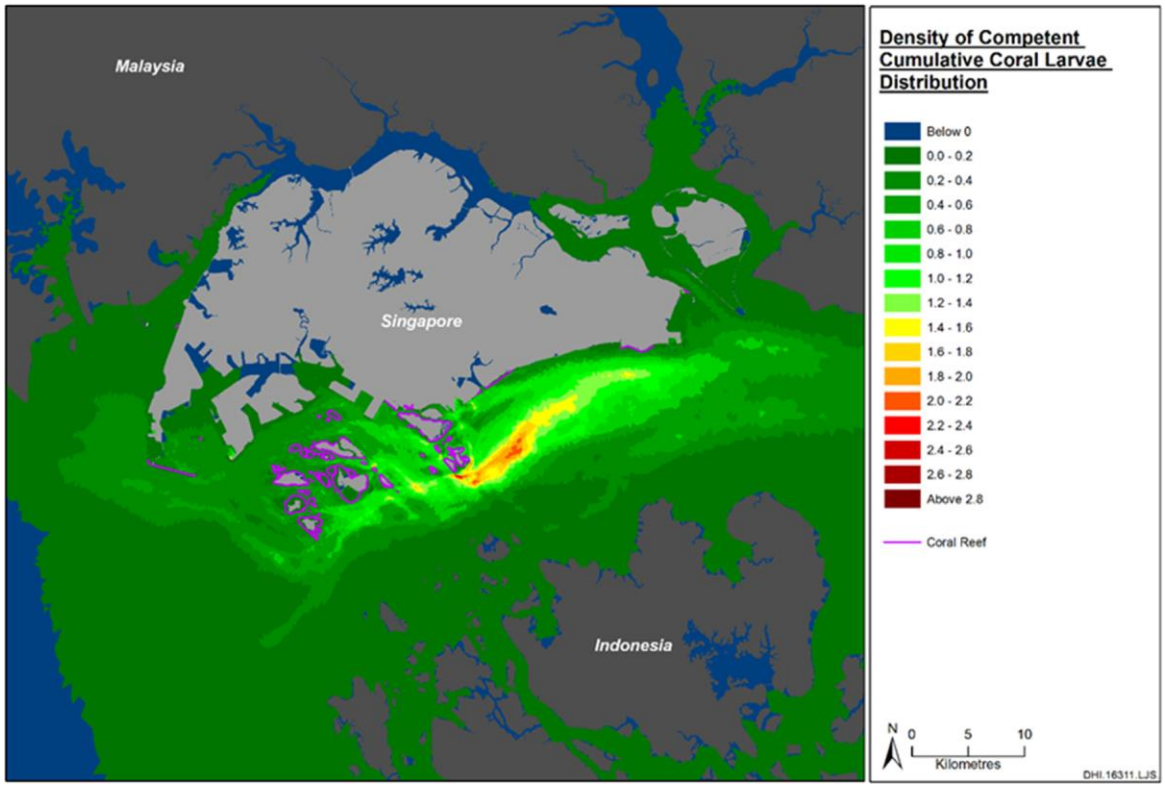

Figure 7: Snapshot of an agent-based model (here combined hydrodynamic and biological model) representing the cumulative density of coral competent larvae 45 days after a spawning[33]

[32] IMO 2016.
[33] Stuer-Lauridsen et al 2018.

China and Republic of Korea

The China Waterborne Transport Research Institute carried out a risk assessment, in accordance with the Guidelines (G7), in 2018 to evaluate a potential SRA in the Yellow Sea. The study used hydrodynamic modelling and agent-based modelling activities to assess the level of connectivity based on target species. The study concluded that the level of connectivity was too low to support the creation of an SRA in the Yellow Sea.

4 Sediment Reception Facilities

4.1 Background and context

Dormancy is a widespread life history adaptation in the plankton, both among phytoplankton and zooplankton and is a trait common to many organisms invading new habitats. Phytoplankton, for example, produces resting spores that may survive unproductive seasons in the sediment[34]. However, some marine crustaceans are known to rest[35] and some may be in diapause many years (Figure 8). Phytoplankton, Zooplankton and bacteria may therefore have life stage surviving in the sediment of ballast water tanks[36] and recent information shared during the experience building from the members of the Global TestNet suggest that the majority of failure in meeting D-2 standard during commissioning tests is indeed due to contamination of treated water by organisms from the sediment[37]. Managing sediment should therefore be regarded as an important step in dealing with the risk of transfer of invasive species.

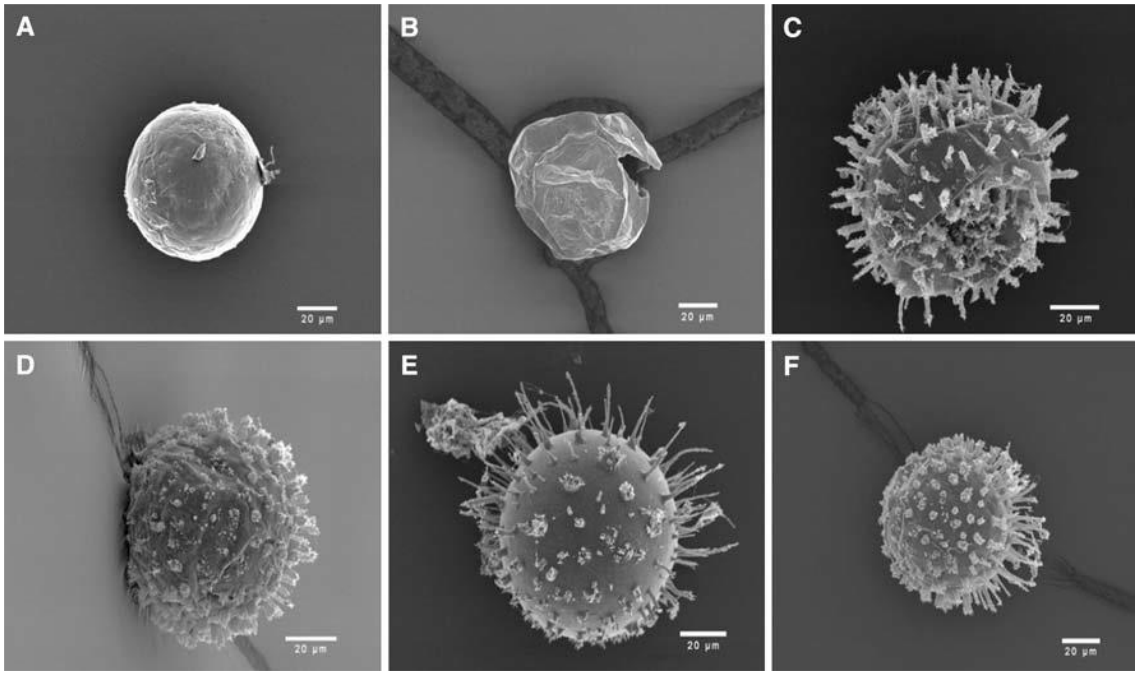

Figure 8: Resting stages of plankton organisms can survive very harsh conditions in the sediments. Here, surface structure of copepods resting eggs produced in Limfjord (Denmark)[38]

Article 5 of the BWM Convention includes that each Party undertakes to ensure that, in ports and terminals designated by that Party where cleaning or repair of ballast tanks occurs, adequate facilities are provided for the reception of sediments, and that such facilities shall operate without causing undue delay. Article 14(2) of the BWM Convention includes that Parties shall notify the IMO of the availability and location of reception facilities for ballast water and sediments.

The Guidelines for sediment reception facilities (G1)[39] provide guidance for the provision of facilities for the reception of sediments that are provided in accordance with Article 5 of the BWM Convention. The Guidelines (G1) recognise that some countries, areas, and ports have requirements relating to the disposal of waste materials from ships which may include sediment, and the guidelines are not intended in any way to replace or adversely impact any local or national requirements.

[34] Hallegraeff and Bolch 1992.
[35] Alekseev et al. 2007.
[36] Drillet and Hansen 2010.
[37] Global TestNet 2021.
[38] Hansen et al. 2010.
[39] IMO, 2006a.

It is a general requirement that each sediment reception facility should provide the resources to enable, as far as practicable, their use by all ships wishing to discharge sediment from ballast water tanks.

Acknowledging that sediment reception facilities will be specialised, the Guidelines (G1) include factors that should be taken into account when considering the provision of a sediment reception facility, including, but not limited to:

- Relevant regional, national, and local legislation,
- Site selection
- Collection, handling, and transport of sediment,
- Sampling, testing and analysis of sediment,
- Storage of sediment and sediment conditions,
- Estimated required capacity (volume/weight) including moisture content of the sediment the facility will handle,
- Environmental benefits and costs,
- Proximity of available sites to local ballast tank cleaning and repair facilities,
- Effect on the environment of construction and operation of the facility,
- Training of facility staff,
- Equipment required to offload sediment from ships, such as cranes,
- Human health (e.g. presence of H_2S…etc),
- Safety,
- Maintenance,
- Operational limitations, and
- Waterway access, approaches, and traffic management.

GloBallast Monograph 23: guidance on best management practices for sediment reception facilities under the BWM Convention [40] provides additional detail on these factors and examples of best management practices for shipyards with sediment reception facilities.

4.2 International and regional procedures for sediment reception facilities

According to the IMO's Global Integrated Shipping Information System (GISIS), 116 ports/terminals are registered as having sediment reception facilities in accordance with the BWM Convention. In the Mediterranean Sea, the Spanish Port of Barcelona reportedly has sediment reception facilities. Facilities are also registered in Canada, Denmark, Estonia, Germany, Latvia, Myanmar, Romania, Russian Federation, Saudi Arabia, and Ukraine.

Adriatic

According to GloBallast Monograph 23, best sediment management practices for ports and shipyards were developed as part of the Ballast water management system for Adriatic Sea protection project (BALMAS project), based on an evaluation of current sediment cleaning services in 24 shipyards in Italy, Slovenia, Croatia, Montenegro, and Albania. The BALMAS general guidelines were modified in GloBallast Monograph 23.

Türkiye

Türkiye's 2010 ballast water management national strategy[41] included a division of labour that assigns shipyard managers the responsibility of executing sediment reception from ships.

[40] GEF-UNDP-IMO GloBallast Partnerships Programme and Florida Institute of Technology. 2017.
[41] Undersecretariat for Maritime Affairs of Türkiye, 2010.

Singapore

Singapore requires shipowners, ship managers, operators, and ship masters to liaise directly with shipyards with cleaning or repair services for ballast water tanks for the use of ballast water sediment reception facilities[42].

Australia

Australia's ballast water management requirements[43] prohibit the disposal of ballast tank sediment in Australia's Exclusive Economic Zone. Ships may discharge ballast tank sediment outside 200 nautical miles from nearest land and in waters at least 200 metres in depth or at an approved land-based facility.

[42] Maritime and Port Authority of Singapore, 2017.
[43] Australian Government, 2020.

5 Ballast Water Reporting

5.1 Background and context

The BWM Convention does not require Parties or ships to implement mandatory ballast water reporting. However, to guide implementation of the BWM Convention, the Guidelines for ballast water exchange (G6)[44] includes that, where a port State requires specific information regarding the management of ballast water on a ship bound for a port, offshore terminal or anchorage area in that port State, a completed ballast water reporting form may be submitted prior to entry into that port State in a timeframe required by that port State.

The Guidelines (G6) include a template ballast water reporting form.

Ballast water reporting can be useful to:

- Guide compliance and enforcement activities, including to target inspections,
- Build a dataset to allow administrations and scientists to evaluate the relevance and impact of regulations,
- Risk assess ballast water on incoming ships to determine if mitigating actions may be needed.

It is of uttermost importance to clarify what the data are to be used for taking into account that once ships comply with D-2 Standard, the biological risks are likely low and that targeting ships is usually done to assess compliance rather than biological risks.

When considering implementing ballast water reporting, it is important to consider:

- Does the administration have legal power to require mandatory reporting,
- Does the administration, country or region have a system to collect and analyse reported information,

And, if reports will be used for compliance and enforcement purposes,

- Does the administration have officers available (including out of hours) to analyse and log information submitted and communicate with ships regarding the outcome of the analysis.

Any systems used to submit and receive pre-arrival reports should allow for the submission of reports from ships with poor internet connectivity.

Systems should also be compliant with any relevant privacy requirements associated with collecting and sharing the information. This equally applies if information is to be collected by an authority and stored nationally or regionally.

Ships without the ability to submit pre-arrival reports should also be considered. If a time window prior to arrival in which reports should be submitted is provided, this should allow sufficient time for the review and assessment of the information and communication with the ship.

Alternative options to mandatory reporting prior to each arrival, such as simple voluntary reporting or annual reporting, can also be useful.

Simple reporting would include minimal information on the ballast water management approach, whether the ballast water management system is working (if relevant), whether contingency measures have been implemented, and the expected volume and location of discharge. This approach has been implemented in Singapore (Figure 9).

[44] IMO, 2017b.

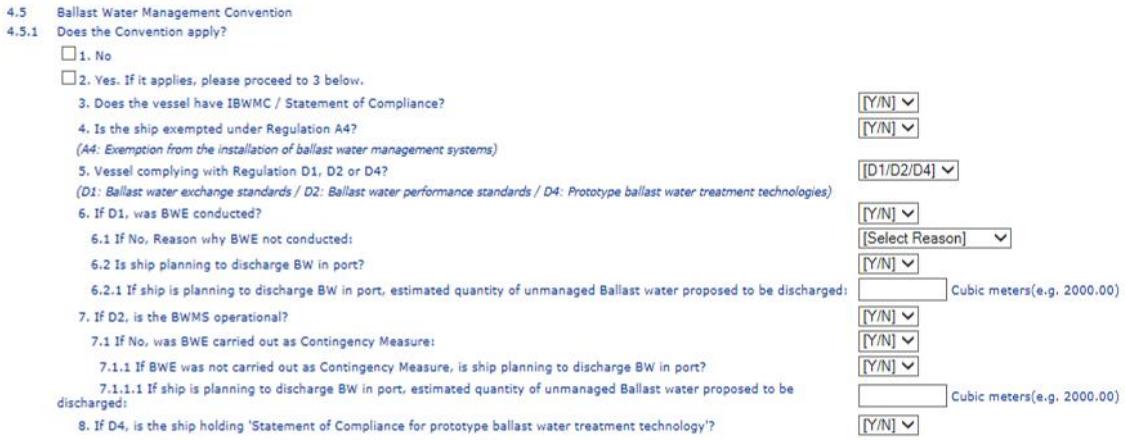
4.5 Ballast Water Management Convention
4.5.1 Does the Convention apply?
☐ 1. No
☐ 2. Yes. If it applies, please proceed to 3 below.
3. Does the vessel have IBWMC / Statement of Compliance? [Y/N]
4. Is the ship exempted under Regulation A4? [Y/N]
(A4: Exemption from the installation of ballast water management systems)
5. Vessel complying with Regulation D1, D2 or D4? [D1/D2/D4]
(D1: Ballast water exchange standards / D2: Ballast water performance standards / D4: Prototype ballast water treatment technologies)
6. If D1, was BWE conducted? [Y/N]
6.1 If No, Reason why BWE not conducted: [Select Reason]
6.2 Is ship planning to discharge BW in port? [Y/N]
6.2.1 If ship is planning to discharge BW in port, estimated quantity of unmanaged Ballast water proposed to be discharged: Cubic meters(e.g. 2000.00)
7. If D2, is the BWMS operational? [Y/N]
7.1 If No, was BWE carried out as Contingency Measure: [Y/N]
7.1.1 If BWE was not carried out as Contingency Measure, is ship planning to discharge BW in port? [Y/N]
7.1.1.1 If ship is planning to discharge BW in port, estimated quantity of unmanaged Ballast water proposed to be discharged: Cubic meters(e.g. 2000.00)
8. If D4, is the ship holding 'Statement of Compliance for prototype ballast water treatment technology'? [Y/N]

Figure 9 : Example of simplified ballast water reporting through pre-arrival notification in Singapore[45][46]

Annual reporting reduces the resource needs to assess and monitor incoming reports but still provides information to target arrivals for inspection, based on type of ballast water management used.

5.2 International and regional procedures for ballast water reporting

In a review of ballast water reporting requirements in 2019, Lloyd's Register[47] found the following countries or regions had mandatory reporting for ballast water:

- Australia[48],[49]
- Bahrain (ROPME)
- Canada
- China
- Croatia[50]
- Iraq (ROPME)
- Islamic Republic of Iran (ROPME[51])
- Israel
- Kuwait (ROPME)
- New Zealand
- Oman (ROPME)
- Peru
- Qatar (ROPME)
- Republic of Korea
- Saudi Arabia (ROPME)
- Ukraine
- United Arab Emirates (ROPME)
- United Kingdom
- United States

[45] MEPSEAS 2019.
[46] Maritime and Port Authorities of Singapore 2019 (detailed information).
[47] Lloyd's Register, 2019.
[48] Australian Government, 2020.
[49] Available at: https://www.agriculture.gov.au/biosecurity-trade/aircraft-vessels-military/vessels/mars.
[50] https://mmpi.gov.hr/UserDocsImages/arhiva/2007/060221-Prijava%20Dolaska-NOA-%20F.xls.
[51] Regional Organisation for the Protection of the Marine Environment (ROPME) requires all ships passing the Strait of Hormuz to complete a regional ballast water reporting form.

Whilst the following have either voluntary, or partially mandatory, ballast water reporting:

- Argentina[52];
- Brazil;
- India[53];
- Mauritius[54];
- Singapore[55]; and
- Türkiye[56].

ROPME's regional ballast water reporting form is included in document MEPC 60/INF.2[57]. It is consistent with the example ballast water reporting form in the Guidelines (G6).

[52] http://www.termap.com.ar/TermapWeb/Paginas_e/Download/Document%209.8%20Ballast%20water%20reporting%20form.pdf.
[53] http://www.bwmindia.com/?q=node/8.
[54] https://blueconomy.govmu.org/Documents/Marine%20Notices/43a1of2008.pdf.
[55] https://cdn.gac.com/prod/docs/SINGAPORE_Annex-A-Pre-Arrival-Notification-pc21-026.pdf

[56] https://www.rempec.org/en/knowledge-centre/online-catalogue/segment-3-bw-risk-assessment-system-a_-olgun.pdf.
[57] IMO, 2009.

6 Contingency Measures

6.1 Background and context

Contingency measure means a process undertaken on a case-by-case basis after a determination that ballast water to be discharged from a ship may not be compliant, to allow ballast water to be managed such that it does not pose any unacceptable risks to the environment, human health, property, and resources.

The Guidelines for Ballast water management and development of Ballast Water Management Plans (G4)[58] were amended in 2019 to include that the Ballast Water Management Plan (BWMP) may include contingency measures developed taking into account guidelines developed by the IMO.

The Guidance on contingency measures under the BWM Convention (BWM.2/Circ.62[59]) provides guidance to support ships and port States to apply sound and practical measures in the case of a ship unable to manage ballast water in accordance with its approved BWMP to meet the regulation D-1 or D-2 standards.

The guidance includes that the port State, the flag State and the ship should work together to agree on the most appropriate solution to allow for the discharge of ballast water found to be non-compliant. It is also noted that ships are required to do their best to correct any malfunction to a ballast water management system (BWMS) as soon as possible.

Contingency measures may be particularly relevant for ships operating in ports with water quality that is poorer than that used during the ship's BWMS type approval process.

In 2018 INTERTANKO released guidance to its members on practical contingency measures and the establishment of a standardised reporting procedure between the ship, company, port State and flag State[60]. The guidance provides a framework for reporting on inoperable BWMS and requesting the use of contingency measures from the port State, as well as providing model reporting forms to allow consistency and uniformity as well as example contingency measures for owners to consider including in their BWMP.

Meanwhile other countries, such as Singapore and Australia, have issued industry targeted guidance on contingency measures. The Australian Ballast Water Management Requirements[61] includes that ships installed with a BWMS and wishing to utilise a contingency measure should incorporate ship-specific contingency measures into the BWMP, noting that doing so does not permit a ship to discharge unmanaged ballast water in Australian waters. It also includes that the contingency measures and BWMP should be approved by a classification society.

6.2 Examples of contingency measures

The Guidance on contingency measures under the BWM Convention (BWM.2/Circ.62) provides a number of possible contingency measures, including:

- Actions predetermined in the Ballast Water Management Plan of the ship,
- Discharging ballast water to another ship or to an appropriate shipboard or land-based reception facility, if available,

[58] MEPC.127(53) amended by MEPC.306(73); IMO, 2005 and 2019.
[59] IMO, 2017g.
[60] IMO, 2019.
[61] Australian Government, 2020.

- Managing the ballast water or a portion of it in accordance with a method acceptable to the port State,
- Ballast water exchange carried out to an approved plan in accordance with regulation B-4 to meet the standard in regulation D-1. The ship and the port State should consider the potential disruption to the cargo handling operation plan of the ship and the potential impact to relating parties including port operators and cargo owners, or
- Operational activities such as modifying sailing or ballast water discharge schedules, internal transfer of ballast water or the retention of ballast water on board the ship. The port State and the ship should consider any safety issues and avoid possible undue delays.

The INTERTANKO guidance on contingency measures for tankers also describes a number of possible contingency measures, including:

- Repair BWMS at the ballast loading port,
- Repair BWMS *en route* [although it should be noted that fixing the BWMS *en route* may not necessarily fix the issue of untreated ballast water],
- Ballast water exchange mid-ocean without BWMS,
- Ballast water exchange mid-ocean through the BWMS,
- Ballast water exchange in a designated ballast water exchange area,
- Shore based mobile treatment systems at the ballast discharge port,
- Discharge to a port reception facility at the ballast discharge port,
- Retain ballast water on board,
- Use water from a public water supply, and
- Partial ballast water discharge at 12 nautical miles from the nearest land (in the United States only).

7 Additional Measures

7.1 Background and context

Regulation C-1 of the BWM Convention provides that Parties may require ships to meet a specified standard or requirement if it determines that measures in addition to the requirements of the BWM Convention are necessary to prevent, reduce or eliminate the transfer of harmful aquatic organisms and pathogens (HAOP) through ships ballast water and sediments.

In accordance with regulation C-1.3, a Party or Parties intending to introduce additional measures shall:

- Take into account guidance developed by the IMO,
- Communicate their intention to the IMO at least 6 months, except in emergency situations, prior to the projected date of implementation of the additional measure, including:
    - The precise coordinates where additional measures is/are applicable,
    - The need and reasoning for the application of additional measures,
    - A description of the additional measures, and
    - Any arrangements that may be provided to facilitate ships' compliance with the additional measure(s),
- To the extent required by international law, as appropriate, obtain the approval of the IMO.

Regulation C-1.2 includes that, prior to establishing any additional measures, a Party or Parties should consult with adjacent or other States that may be affected by such standards or requirements.

The Guidelines for additional measures regarding ballast water management including emergency situations (G13)[62] provide guidance under regulation C-1 for use when determining if additional measures are necessary.

The guidelines state that a Party, or Parties, may require ships, in accordance with international law, to meet or exceed a specified standard or requirement. Before a Party intends to introduce additional measures, it should assess the need for and nature of the measures and the character of the concern. The additional measure(s) should be clearly identified and the economic consequences resulting from the additional measure(s) should be taken into account. The guidelines also provide procedures to follow when establishing additional measures.

Article 7(2) of the BWM Convention includes that a Party implementing the BWM Convention shall not require additional survey and certification of a ship of another Party, nor shall the Administration of the ship be obligated to survey and certify additional measures imposed by another Party. Verification of such additional measures shall be the responsibility of the Party implementing such measures and shall not cause undue delay to the ship.

7.2 Example of Additional Measures

To date there are no examples of additional measures reported in the IMO's GISIS.

[62] IMO, 2007.

8 Warnings

8.1 Background and context

Regulation C-2 of the BWM Convention (Warnings concerning ballast water uptake in certain areas and related flag State measures) includes that a Party shall endeavour to notify mariners of areas under their jurisdiction where ships should not uptake ballast water due to known conditions.

Warnings may be issued for areas:

- Known to contain outbreaks, infestations or populations of HAOP which are likely to be of relevance to ballast water uptake or discharge,
- Near sewage outfalls, or
- Where tidal flushing is poor or times during which a tidal stream is known to be more turbid.

In addition to notifying mariners, the Party shall notify the IMO and any potentially affected coastal States.

8.2 Examples of Warnings

To date there are not example of Warnings which have been found on IMO's GISIS or through notification from port authorities. Recent submissions to the IMO suggested that warnings are used in the context of port with challenging water condition[63] but so far this suggestion has not been considered as a way to manage challenges posed by inoperable BWMS in some ports due to water quality issues.

[63] IMO 2022a.

9 References

- Alekseev VR, De Stasio BT and Gilbert JJ, 2007. Diapause in aquatic invertebrates: Theory and human use. Monographiae biologicae, v. 84. Springer
- Australian Government, 2020. Australian ballast water management requirements. Version 8. Available online at: https://www.agriculture.gov.au/sites/default/files/documents/australian-ballast-watermanagement-requirements.pdf
- Awad, A., Haag, F., Anil, A.C., Abdulla, A. 2014. GEF-UNDP-IMO GloBallast Partnerships Programme, IOI, CSIR-NIO and IUCN. Guidance on Port Biological Baseline Surveys. GEF-UNDP-IMO GloBallast Partnerships, London, UK. GloBallast Monograph No. 22. https://wwwcdn.imo.org/localresources/en/OurWork/PartnershipsProjects/Documents/Mono22_English.pdf
- BIMCO, 2019. China and South Korea agree on ballast water exchange rules. Available online at: China and South Korea agree on ballast water exchange rules (bimco.org)
- David, M. and Gollasch, S. 2016. Ballast water management options for vessels. In book: Ballast water management system for Adriatic Sea protection (BALMAS) (p.77). Available online from: https://www.researchgate.net/publication/313115533_Ballast_water_management_options_for_vesselS
- Drillet and Hansen 2010 - The challenge of identification and viability assessment of organisms in resting stages - International Ballast Water Management Conference, Singapore
- Finish Environment Institute (2022). Roadmap for implementing environmental DNA (eDNA) and other molecular monitoring methods in Finland Vision and action plan for 2022–2025. https://helda.helsinki.fi/bitstream/handle/10138/342992/SYKEra_20-2022_Roadmap%20for%20implementing%20environmental%20DNA.pdf?sequence=4&isAllowed=y
- GEF-UNDP-IMO GloBallast Partnerships Programme and WMU, 2013. Identifying and Managing Risks from Organisms Carried in Ships' Ballast Water. GEF-UNDP-IMO GloBallast Partnerships, London, UK and WMU, Malmö, Sweden. GloBallast Monograph No. 21
- GEF-UNDP-IMO GloBallast Partnerships Programme and Florida Institute of Technology. 2017. Guidance on Best Management Practices for Sediment Reception Facilities under the Ballast Water Management Convention. GloBallast, Monograph No. 23.
- Global TestNet 2021. Data submitted by Global TestNet to support the Experience Building Phase of the BWMC. Available online https://www.globaltestnet.org/getmedia/998ff2ac-2c78-4c14-8c92-9887827f67a9/EBP_submission_from_Global_TestNet-LAST.pdf
- Hansen, F. T., & Christensen, A. 2018. https://eng.mst.dk/media/220200/335-2018-same-risk-area-case-study-final-report.pdf
- HELCOM-OSPAR, 2020a. Joint Harmonised Procedure for the Contracting Parties of HELCOM and OSPAR on the granting of exemptions under International Convention for the Control and Management of Ships' Ballast Water and Sediments, Regulation A-4. Adopted as OSPAR Agreement 2013-09 and by HELCOM Ministerial Meeting Copenhagen 3 October 2013 Amended by HELCOM HOD 48-2015 (June) and OSPAR Agreement 2015-01 and HELCOM HOD 59-2020 and OSPAR Agreement 2020-01. https://helcom.fi/wp-content/uploads/2021/01/HELCOM-OSPAR-Joint-Harmonized-Procedurefor-BWMC-A-4-exemptions_2020.pdf
- HELCOM-OSPAR, 2020b. Designation of Oresund as a Same Risk Area (SRA). Presented by Sweden and Denmark. JTG-Ballast 20/08/01. Available online at: https://portal.helcom.fi/meetings/TG%20BALLAST%2011-2020-763/MeetingDocuments/0801_Designation%20of%20%C3%96resund%20as%20a%20Same%20Risk%20Area%20(SRA).pdf

- Hallegraeff and Bolch 1992. Transport of diatom and dinoflagellate resting spores in ship ballast water: Implications for plankton biogeography and aquaculture. J. Plankton Res. 14: 1067–1084,
- Hansen, B. W., G. Drillet, R. M. Kristensen, T. F. Sørensen, and M. T. Tøttrup. 2010. Production, hatching success and surface ornamentation of eggs of calanoid copepods during a winter at 57 7N. Mar. Biol.157: 59–68
- IMO, 2005. Resolution MEPC.127(53). Guidelines for ballast water management and development of Ballast Water Management Plans (G4). Available online at: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.127(53).pdf. The Guidelines were amended by resolution MEPC.306(73). Available online at: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.306(73).pdf
- IMO, 2006. Resolution MEPC.151(55). Guidelines on designation of areas for ballast water exchange (G14). Available online at: ttps://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.151(55).pdf
- IMO, 2006a. Resolution MEPC.152(55). Guidelines for sediment reception facilities (G1). Available online at: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.152(55).pdf
- IMO, 2007. Resolution MEPC.161(56). Guidelines for additional measures regarding ballast water management including emergency situations (G13). Available online at: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.161(56).pdf
- IMO, 2009. MEPC 60/INF.2. Implementation of ballast water exchange area outside the ROPME special area. Submitted by ROPME/MEMAC.
- IMO, 2015. BWM.2/Circ.56. Communication received from the Government of the Netherlands: Notification on ballast water exchange areas in the North Sea.
- IMO, 2016. MEPC 70/INF.21. Same risk area approach to exemptions under regulation A-4 of the Ballast Water Management Convention. Submitted by Singapore.
- IMO, 2017. MEPC 71/4/24. Proposed amendments for the inclusion of the same risk area concept to risk assessment in the Guidelines (G7). Submitted by Belgium, Denmark, Singapore and INTERFERRY.
- IMO, 2017b. Resolution MEPC.288(71). 2017 Guidelines for ballast water exchange (G6). https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.288(71).pdf
- IMO, 2017c. Resolution MEPC.289(71). 2017 Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7). Available online at: https://archive.iwlearn.net/globallast.imo.org/wpcontent/uploads/2015/01/G7-GUIDELINES-FOR-RISK-ASSESSMENT-UNDER-REGULATION-A-4-OF-THE-BWM-CONVENTION.pdf
- IMO, 2017e. Resolution MEPC.297(72). Amendments to the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004. Amendments to regulation B-3 (Implementation schedule of ballast water management for ships). Available online at: https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.297(72).pdf
- IMO, 2017f. BWM.3/Circ.1. Communication received from the Government of Australia: Australia's implementation of the BWM Convention and ballast water exchange requirements.
- IMO, 2017g. BWM.2/Circ.62. Guidance on contingency measures under the BWM Convention.
- IMO, 2017h. BWM.2/Circ.63. Application of the Convention to ships operating in sea areas where ballast water exchange in accordance with regulations B-4.1 and D-1 is not possible.

- IMO, 2019. Ballast Water Management Convention and BWMS Code with guidelines for implementation. 2018 Edition. Supplement, December 2019.
- IMO, 2022. MEPC 78/4/5. Designation of a Same Risk Area in Öresund between Sweden and Denmark.Submitted by Denmark and Sweden.
- IMO 2022a - MEPC 79/INF.6. Comments on challenging water conditions. Submitted by Global TestNet
- Knight, E. et al. 2007. Knight, E., Barry, S., Summerson, R., Cameron, S and Darbyshire, R. 2007. Designated exchange areas project – providing informed decisions on the discharge of ballast water in Australia (Phase 2). Australian Government Bureau of Rural Sciences. Available online at: https://www.researchgate.net/publication/266529915_Designated_Exchange_Areas_Project_-_Providing_informed_decisions_on_the_discharge_of_Ballast_Water_in_Australia_Phase_2
- Lloyd's Register, 2019. National Ballast Water Management Requirements. Available online at: https://maritime.lr.org/l/941163/2022-01-13/2tdzw/941163/1642095304fcokrquv/lr_s_national_ballast_water_management_requirements_22.03.19.pdf
- Maritime and Port Authority of Singapore, 2017. Port Marine Notice No. 120 of 2017. Available online at: pn17-120.pdf (marintech.sg)
- Maritime and Port Authority of Singapore, 2019. Port Marine Notice No. 19 of 2019. Available online at: https://britanniapandi.com/wp-content/uploads/2020/01/MPA-pc19-019-11-2019.pdf
- MEPSEAS, 2019, MEPSEAS Training Course on the Legal Implementation of the Ballast Water Management Convention. Available online https://mepseas.imo.org/resources
- Rak, G. 2016. Legal and policy aspects relevant for the ships' ballast water management in the AdriaticSea Area. BALMAS Project Final Report. Rapporto ISPRA 250/2016, pp. 64.
- Stuer-Lauridsen, F., Drillet, G., Thorbjorn Hansen, F. and Saunders, J. 2018. Same Risk Area: An area-based approach for the management of bio-invasion risks from ships' ballast water. Marine Policy 97 (147-155).
- Undersecretariat for Maritime Affairs of Türkiye, 2010. National Ballast Water Management Strategy for Türkiye. Available online at: https://archive.iwlearn.net/globallast.imo.org/wpcontent/uploads/2015/03/Turkey-Ballast-Water-Management-National-Strategy.pdf
- UNEP/MED, 2022. UNEP/MED, 2022. Ballast Water Management Strategy for the Mediterranean Sea (2022-2027). Decision IG.25/17. Available online at: https://wedocs.unep.org/bitstream/handle/20.500.11822/37139/21ig25_27_2517_eng.pdf