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Background

MARITIME 18-2018 took note of the successful Interreg Baltic Sea Region Project application COMPLETE (Completing management options in the Baltic Sea Region to reduce risk of invasive species introduction by shipping). The project, with HELCOM participation, will be implemented during October 2017-October 2020 ([Outcome of MARITIME 18-2018](#), para 3.10).

This document provides a follow-up on the work conducted within the project since its presentation in MARITIME 19-2019 ([document 4-7](#)).

Action requested

The Meeting is invited to:

- take note of the information on the status of the project “Completing management options in the Baltic Sea Region to reduce risk of invasive species introduction by shipping ([COMPLETE](#)), 2017-2021”;
- take note that the COMPLETE project has been granted extension in duration and scope, and thus the COMPLETE PLUS “Practical implementation of the COMPLETE project outputs and tools” will be running from April to December 2021; and
- take note of the activities foreseen to take place within the COMPLETE PLUS project.

Status report of the COMPLETE project

Summary

The work towards the project overall objectives, harmonized monitoring of non-indigenous species (NIS), harmonized implementation of Ballast Water Management Convention (BWMC), and regional biofouling management strategy, has continued according to the project plan. In addition, the project has been offered a possibility to apply for a prolongation of 6 months for adjusting the project activities with the restrictions caused by the COVID-19 pandemic, therefore all activities are expected to be finalized by the end of the prolongation period, March 2021.

COMPLETE project has received funding for an extension stage project COMPLETE PLUS “Practical implementation of the COMPLETE project outputs and tools” from the Interreg Baltic Sea Region. The project will start in April 2021 and end in December 2021, and it will be implemented by 11 COMPLETE project partners. This status report presents also the planned activities for the extension stage project COMPLETE PLUS.

Interested parties and stakeholders who are so far not involved in the project and its extension stage are invited to get in contact with the lead partner (Management Coordinator Miina Karjalainen, miina.karjalainen@merikotka.fi). Further information is available at www.balticcomplete.com.

Project partnership

Project partners have long-term expertise and know-how in innovative solutions for shipping, risk assessment and management systems, surveillance and monitoring:

- Kotka Maritime Research Association (KMRA, coordinator)
- Klaipėda University (KU, scientific coordinator)
- Baltic Marine Environment Protection Commission – Helsinki Commission (HELCOM)
- Finnish Environment Institute, Marine Research Centre (SYKE)
- University of Gdansk (UG) – *partner in the COMPLETE project only*
- University of Helsinki, Department of Environmental Sciences (UH)
- Chalmers University of Technology (CHALMERS)
- Federal Maritime and Hydrographic Agency (BSH)
- South-Eastern Finland University of Applied Sciences (XAMK)
- University of Tartu (UTARTU)
- Keep the Archipelago Tidy Association (KAT)
- Latvian Institute of Aquatic Ecology (LIAE)

Associated organizations of the project represent shipping companies, port authorities, governmental bodies, environmental NGOs and research institutions from all Baltic Sea countries.

COMPLETE project activities

The COMPLETE project is aimed at tackling gaps and proposing operational frameworks and tools for a harmonized implementation of the International Convention for the Control and Management of Ship’s Ballast Water and Sediments (BWMC 2004), the Guidelines for the Control and Management of Ship’s Biofouling to Minimize the Transfer of Invasive Aquatic Species (IMO Biofouling Guidelines, 2011), as well as the EU Marine Strategy Framework Directive (MSFD), and the development of a common Baltic Sea Region biofouling management strategy.

WP2: Guidelines for surveillance and monitoring program of non-indigenous species

The overall aim is to develop a system to monitor the effectiveness of ship's ballast water/sediments and hull biofouling management measures and to evaluate the progress towards the HELCOM BSAP objective "No introductions of alien species from ships".

- **Selecting innovative tools for detection of target harmful aquatic organisms and pathogens.**

The analysis of biological samples from Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden have now been completed. A consolidated technical report has been written covering the following issues: standardized e-DNA sampling protocol for hull biofouling and ballast water monitoring, manual on application of species/group specific molecular markers and molecular (DNA barcode) library for target non-indigenous species.

These outputs have been included as attachments to the draft HELCOM monitoring programme on NIS ([document 3MA-3 Rev. 1](#) to STATE&CONSERVATION 12-2020).

- **Biofouling assessment protocol for leisure boats and marinas**

For estimating the role of leisure boats on the spreading of NIS, a [Biofouling Assessment Protocol for Leisure Boats and Marinas](#) has been finalized. The document has also been annexed to the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting, attachment 3) and included in the Draft HELCOM Monitoring Programme on NIS ([document 3MA-3 Rev. 1](#) to STATE&CONSERVATION 12-2020). The protocol has been tested in Finland, Germany, Latvia and Poland, aiming to compare NIS fouling species in different parts of the Baltic Sea and to estimate the rate of secondary spread in the Baltic Sea area. The data will be presented in a scientific paper (The role of marinas in the spread of non-indigenous species in Baltic Sea fouling communities, to be submitted in December 2020).

In order to decrease the risk of introduction and spreading of NIS, [Recommendations for mitigating Potential Risks related to Biofouling of Leisure Boats](#) has been produced. These recommendations have also been included in the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting, attachment 4).

- **Assessment of overall biofouling potential and areas of risk**

The estimation of the potential surface area for commercial shipping for transmitting NIS from outside and inside the BSR has been finalized, and the biofouling potential of leisure boats has been assessed. The used methodology and preliminary results have been included in the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting).

The [map](#) of the risky areas for arrival and spread of NIS has been constructed to give basic environmental knowledge and support for biofouling management issues like e.g. identification of areas where the risk from in-water cleaning is low. The map has also been included in the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting).

- **Integrated monitoring system of non-indigenous species introductions by shipping and other vectors**

Draft HELCOM monitoring programme on NIS ([document 3MA-3 Rev. 1](#) to STATE&CONSERVATION 12-2020) has been compiled by the project team. The draft programme proposes to utilize observations of NIS available from the present programmes: HELCOM COMBINE (biological monitoring), HELCOM/OSPAR JHP

(port surveys), ICES BITS and other fish surveys as well as eRAS (Rapid Assessment Surveys), and to complement them with additional monitoring methods and surveys.

The Draft HELCOM Monitoring Programme on NIS takes into consideration all the work previously conducted, but also includes 6 attachments by the COMPLETE project:

- Attachment 1: Guidelines for collecting citizen observations on non-indigenous species (NIS)
- Attachment 2: Guidelines for the monitoring of marinas
- Attachment 3: Guidelines for the monitoring of mobile and sessile epifauna
- Attachment 4: Guidelines for the monitoring of non-indigenous species in ballast water of ships, which are accessible by molecular methods
- Attachment 5: Guidelines for the monitoring of non-indigenous species in biofouling, which are accessible by molecular methods
- Attachment 6: Guidelines for the monitoring of target non-indigenous species using molecular methods

The Draft HELCOM Monitoring Programme on NIS was presented to the State and Conservation meeting in May 2020. Following requests by the meeting, an expert meeting was held on 17 June 2020 to discuss the possible amendment needs. The finalized NIS monitoring manual will be submitted for consideration to STATE AND CONSERVATION 14-2021.

WP3: Ballast water risk assessment and management systems

The overall aim is to develop a fully operational and regionally harmonised structure for ships' ballast water management in the BSR.

- **Target species selection criteria and risk assessments**

The HELCOM/OSPAR Joint Harmonized Procedure (JHP) target species (TS) list serves as basis for the risk assessment analyses to taking decision whether ballast water management exemption (BWMC A-4) can be granted on ship voyages between selected ports. The final version of the TS selection criteria was submitted to HELCOM/OSPAR TG BALLAST. It has been acknowledged by TG BALLAST as also reflected in its outcome ([document 3-4](#) and [Outcome of TG BALLAST 9-2018](#), para. 3.8-3.13).

Further work on the revision of the manuscript on target species selection criteria for risk assessment based on exemptions of ballast water management requirement under supervision of BSH has been performed. The paper is available online:

Gollasch S., David M., Broeg K., Heitmüller S., Karjalainen M., Lehtiniemi M., Normant-Saremba M., Ojaveer H., Olenin S., Ruiz M., Helavuori M., Sala-Pérez M. & Strake S. (2020). [Target species selection criteria for risk assessment based exemptions of ballast water management requirement](#). *Ocean & Coastal Management* 183.

- **Advanced risk assessment tool under the HELCOM/OSPAR Joint Harmonised Procedure**

The aim is to develop an improved online risk assessment (RA) tool under the JHP to allow administrations and ship owners to quickly identify routes that may qualify for exemptions in the HELCOM and OSPAR marine areas linked to the most updated knowledge on harmful aquatic organisms and pathogen introduction by shipping in the Baltic Sea and the North Atlantic.

Further development work has focused on (i) implementing a new risk assessment algorithm, (ii) managing the new ports addition to the RA tool database and developing a beta version of the tool that was presented

at TG BALLAST 10-2019 to gather input from the meeting and continue the work accordingly ([document 5-1](#)). The new link to the RA tool is available at https://maps.helcom.fi/website/RA_tool/.

- **Delivering the regionally harmonized fully operational early warning system**

The status of the regionally harmonized Early Warning System (EWS) aimed to minimize the uptake of ballast water which could be harmful for the recipient port or area and reduce the risk of spreading harmful aquatic organisms and pathogens was included as part of the status report on the COMPLETE project at the HELCOM MARITIME 19-2019 ([document 4-6](#)). The EWS was developed and presented at the [COMPLETE Stakeholder Conference](#) in Jurmala on 04-05/12/2019 and at the HELCOM/OSPAR TG Ballast meeting in Tallinn 17-18/12/2019 ([document 3-2](#)).

After presentations and discussions with stakeholders, work began with developing the fast track entry of data into [EWS](#), implemented as a new functional module in [AquaNIS](#). An online training course on the information system AquaNIS is planned to be organized in the end of October - beginning of November (time to be confirmed). The course will include two days lectures and practical exercise (2 hours each day) on: 1) data retrieval options (basic search, advanced search, species similarity calculation, nNIS index, etc), 2) data entering procedures (registration of new species, introduction events, species biological traits, library, etc).

- **Decision support system for the Baltic Sea ballast water management**

The ballast water management decision support system is aimed to support national authorities in their decision-making processes within the implementation of the Ballast Water Management Convention with regards to vessels calling their ports. All IMO developments (e.g. Experience Building Phase EBP) and the next stages of EMSA and Paris MoU developments influencing these decisions are currently followed and reviewed, focusing on the Baltic Sea Region. Work is progressing according to the project plan, to be finalized at the end of the project to provide the most recent situation and state of the art developments.

- **Training local authorities for the Ballast Water Management Convention**

Participants from the administrations and scientific sector of seven Baltic Sea countries, which are going to perform ballast water sampling and analysis met in a COMPLETE workshop organized in Hamburg in May 2019. The training workshop materials have been compiled into the [Ballast Water Sampling and Analysis Workshop](#) report, which is available at the project web page and has been shared among the participants. A short documentary movie from the training workshop called 'Short film about Ballast Water Management compliance monitoring' has also been produced and available at <https://www.balticcomplete.com/publications/movies>.

WP4 Evidence-based options for biofouling management in the Baltic Sea Region

Information on national regulations, common and best available technologies and practices concerning all aspects of biofouling, antifouling, and cleaning of commercial ships and recreational boats are scarce in the Baltic Sea Region. This information has been essential for drafting the Draft Regional Baltic Biofouling Management Roadmap.

- **National biofouling regulations, cleaning procedures and facilities**

Data collected via online and e-mail questionnaires, national discussion events in project partner countries, the COMPLETE in-water cleaning workshop in Hamburg in May 2019 (report available [here](#)), the COMPLETE

stakeholder conference 'Towards solutions for sustainable shipping and boating: Better Biofouling and Ballast Water Management' in Jurmala in December 2019 ([conference web page](#)), and other relevant sources about the biofouling management regulations, cleaning procedures and cleaning facilities in Baltic Sea Region countries have been uploaded into a BSH Biofouling Management Database. The database has been specifically designed for this purpose and will be maintained/updated by the Federal Maritime and Hydrographic Agency (BSH) also after the COMPLETE project has ended. The most important findings of the regulations, procedures and facilities, and the link to the database, have been included in the proposal for a biofouling management roadmap ([document 4-1](#) to this Meeting).

- **Best practices for biofouling management from within and outside the Baltic Sea Region**

Guide on best practices of biofouling management In the Baltic Sea has been compiled, providing information and guidance for effective biofouling management strategies suitable for the Baltic Sea Region on the basis of international and regional experiences and research. The guide on best practices has been annexed to the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting, Annex 1).

The information about best practices for biofouling management in the BSR is based on several sources: the questionnaires sent out to the sailors and boat owners, information collected at the [in-water cleaning workshop](#) in May 2019 In Hamburg, to an extensive literature review, feedback received at the discussions in the ICES Working Groups WGBOSV and WGITMO, information received by participating in the in-water cleaning studies in Bremerhaven, Germany, and information received by participating in the IMO GloFouling project.

- **Guidance on antifouling systems cost-efficiency evaluation**

Guidance on performance of different anti-fouling systems and methods, efficiency towards different groups and stages of fouling and re-fouling has resulted two research papers:

Oliveira, D. R., Larsson, L. & Granhag, L. (2019). [Towards an absolute scale for adhesion strength of ship hull microfouling](#). Biofouling.

Oliveira, D. R. & Granhag, L. (2020). [Ship hull in-water cleaning and its effects on fouling-control coatings](#). Biofouling.

The PhD thesis based on the work of COMPLETE (Dinis Oliveira "Roughest hour – approaches to ship hull fouling management") was published in December 2019 and approved after public defence in January 2020. The thesis is available at: <https://research.chalmers.se/en/publication/514200>.

- **Benefits of biofouling management on ship speed, fuel consumption and emissions**

Studies have been conducted to clarify the impact of biofouling on ship operation and maintenance in practice. Information has been gathered by on-board measurements and interviewing the crew and other staff of the maritime sector. The ships participating in the study operated on regular routes, facilitating the comparison of separate voyages and achievement of reliable results. Main findings have been included in the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting). The first version of the optimization tool is being built and will be finalized by the end of the project.

WP5 Databases and user-friendly information support

The overall aim of WP5 is to develop information products, which will be maintained after the end of the project. These products will be used for collecting, summarizing and assessing data on harmful aquatic organisms and pathogens (HAOP), and for decision-making on choosing optimal antifouling system and cleaning options.

- **Information system on non-indigenous species and harmful aquatic organisms and pathogens**

Collaboration on data format and models for information exchange with HELCOM Decision Support Tool for exploring the potential risk of shipping routes and to help HELCOM countries with deciding on exemptions has been carried out (https://maps.helcom.fi/website/RA_tool/).

The functional module for the Early Warning System has been developed in [AquaNIS](#). The progress of AquaNIS was presented at TG BALLAST 10-2019 ([document 3-2](#)). The meeting agreed in principle on developing further the proposal for a regionally harmonized EWS and invited Lithuania to present it to the next TG Ballast meeting (scheduled to take place in November 2020) for further consideration.

Presentation was given and feedback was received for the AquaNIS progress in data gathering and functional improvement at the experts' meetings: the International Council for the Exploration of the Sea (ICES) Working Group on the Introductions and Transfers of Marine Organisms (WGITMO) and the ICES/IOC/IMO WG Ballast and Other Ship Vectors (WGBOSV) (March 2019, Gdynia). The utilization of AquaNIS for citizen observations platform has been under discussion. Information concerning new species introductions in the Baltic Sea has been sent by the project partners to the information system AquaNIS.

- **Decision support tool for selection of optimal antifouling system and cleaning options**

A first version of a decision analysis tool has been developed to support sustainable biofouling management in the Baltic Sea. The tool will integrate knowledge related to cost-effectivity of different antifouling strategies. The tool allows comparisons of a) NIS introduction risk, b) ecotoxicological risk due to biocidal anti-fouling systems, c) CO₂ emissions resulting from fuel consumption, as well as d) costs related to fuel consumption, in-water cleaning, and coating, given different ship types, their operational profiles and the alternative biofouling management strategies. The structure of the tool and the first results have been presented in the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting).

- **Interactive user-friendly map on hull cleaning services**

An [interactive map](#) representing good practices for hull cleaning services covering the entire BSR has been produced. It combines technical and visual solutions for easy processing of the placed information - location of in-water cleaning services for commercial shipping and leisure boats as well as contact information of organizations, used technology and methods of filtration and collection. It focuses primarily on hull cleaning service providers and these services' seekers. The map has also been included in the Draft Regional Baltic Biofouling Management Roadmap ([document 4-1](#) to this Meeting).

WP6 Stakeholder involvement and strategy development processes

Draft regional Baltic Biofouling Management Roadmap has been submitted to HELCOM MARITIME for consideration ([document 4-1](#) to this Meeting). It provides an overview of the COMPLETE project outputs and deliverables related to biofouling management in the Baltic Sea Region, contributing to the implementation of the IMO Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species ([resolution MEPC.207\(62\)](#)) which are currently under review ([MEPC.1/Circ.811](#)), and

the Guidance for minimizing the transfer of invasive aquatic species as biofouling (hull fouling) for recreational craft ([MEPC.1/Circ.792](#)) in the Baltic Sea Region.

Also under the tasks developed by this WP6, the [COMPLETE Stakeholder Conference](#) “Towards solutions for sustainable shipping and boating: better biofouling and ballast water management” was held on December 4-5 2019 in Jurmala, Latvia. Over seventy participants from Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Netherlands, Norway, Poland, Sweden and the HELCOM Secretariat joined the stakeholder conference, representing different stakeholders from policy makers at international, regional, and national level (e.g. maritime and environmental administrations) as well as local administrations, ports/port authorities, chemical safety authorities, shipping companies, boating associations, environmental NGOs, and companies providing hull cleaning services or antifouling systems. The final conference of the project where the project outputs will be presented is planned to be held in spring 2021.

COMPLETE PLUS project

COMPLETE PLUS (implementation time April-December 2021) aims to ensure that COMPLETE project outputs and tools will be operationalized to guarantee their sustainable use by all relevant actors and stakeholders. Further information about the COMPLETE PLUS will be shared at the COMPLETE web page (www.balticcomplete.com).

WP2: Assuring sustainable use of the COMPLETE products for ballast water management

The overall aim is to develop a mechanism assuring future sustainable use and further development of the COMPLETE products that facilitate the regionally harmonised implementation of the Ballast Water Management Convention after the end of the project as well as the EU MSFD in relation to descriptor 2 on NIS.

- **Operationality testing of the Early Warning System on Harmful Aquatic Organisms and Pathogens**

The main task is to test the operationality of the system. This will be done by: 1) further improving the functional module for EWS in AquaNIS, i.e. developing and testing a simplified (fast-track) record format to ensure timely communication of the warning signal; 2) developing the operational link with the updated TS list; and 3) online training of project partners and individual stakeholders (associated organizations) on the use of the new reporting format. Ship-owners will also be contacted proposing them how this kind of warning about the critical biological conditions should be sent out to the ships/captains informing them. Another task is to clarify the communication channels for the warning signal.

- **Updating the Target Species list based on the new criteria developed during the COMPLETE project**

Updating the Target Species list requires checking through all relevant available evidences (including scientific literature) on impacts of the NIS potentially to be introduced to the Baltic Sea. The workload on the analysis of the latest publications will be shared between the partners involved as every species ending up to the TS list needs scientific reference(s) for the impacts. The current Baltic TS list includes 41 species, which needs to be checked against the new modified criteria developed during the COMPLETE project. In addition, publications on impacts for several other potential species to be introduced to the BSR needs to be searched and read carefully through. A proposal for a mechanism for further updates will be created using the established regional cooperation.

- **Establishing operational data flow on NIS**

During COMPLETE, a Draft HELCOM Monitoring Programme on NIS has been presented to HELCOM countries. Carrying out these recommendations would produce new types of NIS observations data. However, mechanisms to share such harmonized NIS data among national administrations are lacking.

This activity analyzes and defines solutions for those NIS data flows and develops solutions for extracting required data for the HELCOM NIS Core Indicator (“Trends in arrival of new non-indigenous species”) also used in reporting for EU MSFD. At present, the NIS data flows consist of:

- present open sea monitoring data flow (zooplankton, zoobenthos, phytoplankton): established within HELCOM countries by reporting data to ICES, where part of the monitored species are NIS observations;
- port survey data: established within HELCOM countries by reporting data to the HELCOM/OSPAR Ballast Water Exemptions Decision Support Tool as part of the JHP;
- coastal monitoring data (mobile/sessile epifauna): currently not established;
- marina sampling protocol: currently not established; and
- additional data flows such as citizen science or molecular data on TS: currently not established.

Developing an operational regional data flow to ensure the accessibility of all the NIS data would be directly useful for the HELCOM NIS core indicator also reducing manual effort related to the indicator assessment.

[WP3 From biofouling roadmap to practical implementation in the Baltic Sea Region](#)

One main aim of the COMPLETE project has been to deliver the Draft Regional Baltic Biofouling Management Roadmap. COMPLETE PLUS will support the practical implementation of the recommendations and tools.

- **Evaluation and information on technical solutions for optimized management of biofouling**

In COMPLETE, Guidance on choosing anti-fouling systems and methods, and recommendations on hull cleaning optimization have been made based on extensive experimental work. These recommendations provide detailed information on cost-efficient and environmentally safe management options for hull cleaning. The activity will be guiding both commercial shipping and leisure boating sectors in selecting the most environmentally sustainable antifouling and biofouling solutions for the Baltic Sea.

- **Implementation of biofouling management toolkit**

The COMPLETE project has developed the first version of a decision support tool for evaluating the biofouling risk and its cost-effective management. In this activity, the main focus is on facilitating the pilot use of the toolkit and communicating the main findings to the relevant end-users such as ship owners, port and traffic authorities.

- **Developing a Risk Assessment procedure for in-water cleaning (IWC)**

As an important addition to the implementation of the Draft Regional Baltic Biofouling Management Roadmap, this proposed activity will develop a concept for a common BSR risk assessment procedure taking into account three relevant aspects of in-water cleaning: risk of species introduction, risk of contaminants and microplastic input as well as safety of the workers who are performing cleaning in-water. The risk

assessment concept will be based on experiences from the project but also on experiments performed in other research studies from all over the world.

- **Implementing the proposed biofouling roadmap**

Among the contents of the Draft Regional Baltic Biofouling Management Roadmap, the following ones will be further developed and eventually translated into HELCOM documentation for consideration and subsequent adoption in the HELCOM framework, if possible:

- Guidance/Best practice on information to be included in the Biofouling Management Plan and Biofouling Record Book;
- Guidance/Best practice on biofouling management strategies (e.g. selection AFS and waste management);
- Guidance/Best practice on cleaning practices for commercial shipping; and
- Guidance/Best practice for biofouling management in the leisure boating sector.