"Train-the-Trainer" Seminar on Port State Control under the Ballast Water Management Convention with Emphasis on Sampling and Analysis of Ballast Water

2-4 June, Gebze, Kocaeli, Turkey

Organized by

GEF-UNDP-IMO GloBallast Partnerships Programme,

The Ministry of Transport, Maritime Affairs and Communications of the Republic of Turkey, and

The Scientific and Technological Research Council of Turkey (TÜBİTAK)

Project Number: XB/0102-02-18-03-2270

DELIVERY REPORT

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Summary Sheet

Title of the Workshop:	"Train-the-Trainer" Seminar on Port State Control under the Ballast Water Management Convention with Emphasis on Sampling and Analysis of Ballast Water
Host:	Republic of Turkey, Ministry of Transport, Maritime Affairs and Communications and TÜBİTAK-MRC
Venue:	Hotel Paradise (Darica Hotel, Gebze, Kocaeli, Turkey
Date:	2-4 June 2015
Type:	Global training
Organised by:	GEF-UNDP-IMO GloBallast Partnerships Programme
Supported by:	Republic of Turkey, Ministry of Transport, Maritime Affairs and Communications, and TÜBİTAK-MRC
No of Participants:	29 participants
Summary:	GloBallast provided this workshop to train 2 participants per Lead Partnering Country (LPC) of the Project on how to sample and analyse ballast water from ships, so they can in return deliver such training to their national authorities. The training provided the participants with the practical knowledge and tools to understand the CME system in the BWM Convention for port State control inspection, using the Guidelines for PSC under the BWM Convention (MEPC.252 (67)); to understand the different sampling methods and approaches for the D-1 and D-2 standards as stipulated in BWM.2/Circ.42 and to understand the samples' analysis procedures or techniques to test for compliance with D-1 and D-2. To that purpose, a hands-on training on board a ship was organized to demonstrate how to sample ballast water, followed by the visit of a marine biology laboratory where the samples were analysed. The workshop lasted three days and gathered 29 participants from six countries of the Mediterranean, WACAF and PERSGA regions. This report gives details of the training together with recommendations on future workshop delivery.
Key Words:	Ballast water management, sampling, analysis, harmful aquatic organisms and pathogens, aquatic ecosystems, compliance monitoring and enforcement, port State control.
Project Number:	XB/0102-02-18-03-2270
Co-ordinators:	Mr Antoine Blonce, IMO-GloBallast Mr Murat Korcak, IMO, MED Mr Turgay Buyuran, Republic of Turkey, Ministry of Transport Dr Arzu Olgun, TUBITAK-MRC
Consultants:	Dr Matej David, Dr Matej David Consult Dr Stephan Gollasch, GoConsult

Introduction

1 A global "Train-the-Trainer" Seminar on Port State Control (PSC) under the Ballast Water Management (BWM) Convention with Emphasis on Sampling and Analysis of Ballast Water was conducted in Gebze, Kocaeli, Turkey from 2 to 4 June 2015. The training was organised by the GEF-UNDP-IMO GloBallast Project in cooperation with the Republic of Turkey as Lead Partnering Country (LPC) in the GloBallast Project and the REMPEC and PERSGA, as the Regional Coordinating Organizations (RCOs) in the region.

2 Shipping is a global industry transporting billions of tonnes of ballast water around the world annually. Ballast water is carried by ships to help maintain stability and is discharged during the loading of cargo. With up to 10,000 species in transit with the global shipping fleet, there is little doubt that ballast water has the potential to cause widespread human health, environmental and economic damage as a result of the introduction of harmful and invasive species that reside in it.

3 Making ballast water safer is not only an environmental aspiration, but, once ratified, the 2004 IMO Ballast Water Management (BWM) Convention will (after 12 months) require the shipping industry to comply with its regulations. The BWM Convention introduces two standards, D-1 (ballast water exchange standard) and D-2 (ballast water performance standard), in a sequential implementation:

- The current D-1 (Ballast Water Exchange, BWE), Standard - requires ships to exchange a minimum of 95% ballast water volume;

- The D-2 (Ballast Water Performance) Standard requires that the discharged ballast water has organism concentrations below specified limits. These are:

    1. less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension;
    2. less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension.
    3. Indicator microbe concentrations shall not exceed:
        i toxicogenic *Vibrio cholerae* (O1 and O139) with less than 1 colony forming unit (cfu) per 100 millilitres or less than 1 cfu per 1 gram (wet weight) zooplankton samples*;*
        ii *Escherichia coli* less than 250 cfu per 100 millilitres*;*
        iii intestinal Enterococci less than 100 cfu per 100 millilitres.

4 The D-1 and D-2 standards will only be successful at minimizing the risk of invasive species if either BWE is carried out appropriately, or if Ballast Water Management Systems (BWMS) operate effectively and reliably, and if ship owners and operators comply with the BWM Convention.

5 Once a BWM approach has been established, based on the BWM Convention and national requirements, it is necessary to implement an accompanying mechanism to monitor compliance with that BWM approach and to provide for its enforcement. This mechanism is known as Compliance Monitoring and Enforcement (CME). CME is an essential component of the overall BWM regime, or National Strategic Framework, and is designed to:

- assess whether or not a ship has met the IMO and port State's BWM requirements; and
- when necessary, enforce those requirements.

6 The BWM Convention recognises the essential role of a CME system to any BWM regime (for example, in Article 9 on inspections). Furthermore, the BWM Convention provides considerable guidance as to what kinds of records should be maintained to facilitate the CME function, as well as on the application of the provisions, level of penalties, inspections, verification of records, violations etc.

7 One way of assessing compliance with BWM requirements is to sample ballast water. Sampling can also be done:

- for scientific research to assess the biology and chemistry of ballast water;
- to document potentially harmful or other organisms carried in ballast water for risk assessments, etc.; and
- for compliance monitoring, i.e. to assess compliance with BWM requirements which is the focus of this document.

8 Differences in organisms' diversity, size and behaviour, as well as differences in ship construction including the different availability of sampling points enhance the complexity of the ballast water sampling process. Hence, taking a representative sample is challenging, requires expertise, equipment and a methodology. This is usually not within the expertise of the PSCO, but it may be achieved by training and buying appropriate equipment, and this is especially valid for the relatively simple sampling and sample analysis process for checking compliance with the D-1 and indicatively the D-2 standard.

9 Following the GloBallast 4th Global Project Task Force (GPTF) meeting held in Brazil in October 2014, the 15 LPCs of the Project have requested the assistance of GloBallast to be trained on ballast water sampling and analysis in accordance with the BWM Convention, the Guidelines (G2) and the guidance contained in BWM.2/Circ.42.

Objectives

10 The objective of this training workshop was to train two participants per Lead Partnering Country (LPC) of the GloBallast Project on how to sample and analyse ballast water from ships, so they can in return deliver such training to their national authorities back in their country and to provide the participants with the practical knowledge and tools to understand the CME system in the BWM Convention for port State control inspection, using the Guidelines for PSC under the BWM Convention (MEPC.252 (67)); to understand the different sampling methods and approaches for D-1 and D-2 as stipulated in BWM.2/Circ.42; and to understand the samples' analysis procedures or techniques to test for compliance with D-1 and D-2.

11 This training included a practical demonstration on board a ship to take samples from the ballast tanks, label, transport them to the laboratory and analyse them. Two consultants were contracted for this practical training. Their contribution included theoretical lectures and the practical shipboard sampling exercises and laboratory analysis.

Venues and dates

- 1 June 2015 afternoon: Preliminary visit to the Scientific and Technological Research Council of Turkey (TÜBİTAK) by Dr Arzu Olgun, with Dr Stephan Gollasch, Mr Murat Korcak and Mr Antoine Blonce.
- 2 June 2015: Hotel Paradise, Gebze, Kocaeli, for the welcome speeches and presentations by IMO-GloBallast representative and lectures by Dr Matej David and Dr Stephan Gollasch.
- 3 June 2015: Shipboard sampling demonstration took place with 29 Participants on board the bulk carrier Marbacan from Madeira (gross tonnage 20,491 tons, length 190 m,

- 4 June 2015: Lectures by Dr Matej David and Dr Stephan Gollasch followed by Analysis of the ballast water at the Scientific and Technological Research Council of Turkey (TÜBİTAK) and closing ceremony with distribution of certificates and USB sticks.

Roles

12 This event was co-organized by GloBallast, TUBITAK and the Republic of Turkey, Ministry of Transport, Maritime Affairs and Communications. IMO-GloBallast funded the travel of four participants from Turkey and two participants each from Croatia, Jordan, Ghana, Nigeria, and one participant from Egypt; as well as one representative from REMPEC and one from PERSGA. IMO-GloBallast also recruited the consultants, Dr Matej David and Dr Stephan Gollasch. The two Regional Coordinating Organizations (RCOs), REMPEC and PERSGA coordinated all the participants' travel and logistical details under the supervision of IMO-GloBallast.

Participants

13 There were 29 participants in total. Annex 2 gives a full list of the participants.

Cost

14 Funds for this activity were provided through the GloBallast Partnerships Project, Republic of Turkey, Ministry of Transport, Maritime Affairs and Communications and The Scientific and Technological Research Council of Turkey (TÜBİTAK), REMPEC and PERSGA.

Questionnaires

15 In preparation of this training event a questionnaire with eleven questions had been sent out to the participants and the following Table 1 provides their responses. In summary:

- The majority of the participants were in general interested to learn about ballast water sampling under the BWM Convention also expressing the interest to replicate such training events in their home countries.
- Ballast water reporting is mandatory in Croatia only. In Egypt and Turkey this is implemented as a voluntary measure. In the other countries ballast water reporting requirements are in different stages of development.
- The principles to identify BWE areas (distance and depth requirements) were mentioned in the responses, but it seems that no BWE area was designated yet. Should BWE not be possible the respondents stated that the use of BWMS is the best alternative.
- Croatia and Ghana reported that Port Biological Baseline Surveys (PBBS) were conducted.
- Ballast water risk assessments have not been carried out and BWM exemptions were not granted.
- Croatia and Ghana reported that ballast water sampling is carried out. Croatia refers to the activities in the BALMAS project (www.balmas.eu) and Ghana reported that a sampling trial period was recently completed.
- Regarding the installation of BWMS on board only Turkey stated that some of their vessels, especially those calling for US ports or when the keel was laid recently, have been equipped with BWMS.
- Participants from Croatia, Ghana, Nigeria and Turkey reported that they will become or are involved in PSCO training for BWM.

- Enforcements and penalties for the failure to meet BWM requirements are addressed in national legislations of Croatia, Ghana, Nigeria and Turkey. However, the latter reported that this only affects discharging of “dirty” ballast.

Table 1: Summary of responses to the pre-event questionnaire. (N/A = not applicable)

Questions	Country/Entity and name										
	REMPEC, Mr Franck Lauwers	**Croatia, Mr Milivoj Andraka**	**Croatia, Mr Toni Grgic**	**Egypt, Ms Eslam Ibrahim Aly Ahmed**	**Ghana, Mr Emmanuel Klubi**	**Ghana, Capt. William Eson Thompson**	**Nigeria, Mrs Catherine Nwuba**	**Nigeria, Mr Emmanuel Isiuwa**	**Turkey, Özer Özbey**	**Turkey, Ünal Hakan Atalan**	**Turkey, Tolga Güler**
Q1 What do you hope to gain from attending this event?	From attending this event, I hope to gain the necessary knowledge in the implementation of the BWM Convention with a view to future training and capacity-building activities in the Mediterranean region in relation to Port State Control under the BWM	Practical information on sampling and analyses of ballast water and sediment	To improve my knowledge of convention requirements and to learn about other countries experience of subject	I hope to benefit from the training theoretical and practical information about ballast water management, and so try to apply what I benefited in my country	Understand detail protocol in ballast water sampling and analysis for D-1 and D-2 compliance. Able to set up a laboratory protocol for training PSCO in taking and handling of ballast water samples for analysis of phytoplankton and zooplankton, chlorophyll-a as well as bacterial sample handlings	I hope to gain knowledge and experience for myself, and to share with other PSCOs for the benefit of my country and region	To equip myself with the skills and techniques for sampling and analysis of ballast water and to be able to impact the knowledge gained to my colleagues back home	I am hoping to gain knowledge of the responsibilities and requirement of port state Control officers in the implementation and enforcement of the ballast water management convention. I will also like to learn the techniques of collecting samples	National regulations on BWM and to support Compliance Monitoring and Enforcement	I have very less information about BWM convention and its requirements. I hope to gain information about what is BWM and implementation of convention after workshop	I hope, with this event ı will have more information's about BWM and this will help me to carry out more efficient surveys

	Convention with emphasis on sampling and analysis of ballast water				and sediment samples			from the ballast water tanks and methods of analysing the samples. The knowledge I will gain from this workshop will I share with my colleagues in NIMASA (Nigeria Maritime Administration and Safety Agency)			
Q2 Have you introduced the BW Reporting Form? Voluntary or Mandatory ?	N/A	Mandatory , using CIMIS information system 24 hours before arrival in Croatian ports	Yes, Mandatory	Voluntary	Unaware	No	In progress	Not yet	No	BW reporting form is filled by master sent to harbour master via agent before entrance	Yes we have introduced the BW Reporting form, it is voluntary

										to the port as mandatory implement ation	
Q3 Has the country identified and designate d areas for Ballast Water Exchange (BWE)? If yes, please indicate requireme nts in place.	N/A	No	Yes; at least 200 NM from the nearest coast at the sea depth of 200 meters at least but some specific area has not identified	No	No	No	No	No	As long as I know we have no BWE areas defined by a national legislation at the moment	There is no designate d area	My country has designate d that BWE operations are allowed at 200 miles distance and 200 meter depth or 50 mile distance or 200 meter depth minimum
Q4 What is required if BWE cannot be done (distance and depth limit not met) and no BWE	N/A	Nothing	To follow IMO guidelines; as far from the nearest coast as possible, but not closer than 50 NM to	Egypt signed the convention of the ballast water management 2007 but it is not yet ratified	The alternative is to treat the ballast water before releasing into the sea however if the ship is not equipped	On board treatment of ballast water to be done	Ballast water treatment system on board before discharge. Mid-stream discharge is being	If BWE cannot be done it is required to pass the ballast water through a ballast water	Unknown.	Unknown	In this case ships must be equipped by a Type Approved system for BWM (due date for BWT

Area is designated?			the nearest land and the sea depth should not be less than 200 metres		with this facility it should be sent back to its point of origin		encouraged	treatment equipment before discharging it in port			systems for any type or age of ships is 31.12.2016)
Q5 Has the country undertaken Port Biological Baseline Surveys (PBBS)?	N/A	Yes, only for the Port of Rijeka	Yes, every international traffic port.	No	Yes	This has been done for the Port of Tema, and yet to be done for the Port of Takoradi	No but training has been carried out through IMO-GloBallast Partnership	No	I've no information but I have observed TUBITAK personnel collecting Ballast Water samples from ships and ports	No	Not yet
Q6 Have ballast water risk assessments been carried out in the country?	N/A	No	No	No	Unaware	No	No	No	Unknown.	No	There are some academic studies and articles about it
Q7 Are BWM exemptions be applied for and if not	N/A	Reception facilities for ballast water do not exist	No port reception facilities	No	Unaware	No	Minimal knowledge	Unaware	As far as I know we've not accepted or given any BWM	Unknown	There is not any exemptions given about BWM

are the authorities aware of how this can be arranged (G7)?									exemptions so far		
Q8 Is there a ballast water sampling programme in the country?	N/A	Yes, according to BALMAS program	Yes	No	Yes to some extend	This is yet to be fully implemented. A trial programme was recently done	Not yet	Not yet	Unknown	No	Not completely. It has been carried out in some designated areas
Q9 Do you know if your fleet is being equipped with BWMS?	N/A	No	No	unknown	No	No, our fleet is not being equipped at the moment	Yes	For now our fleets under our registry are not equipped with BWMS	Some of our fleet especially working to US or lately keel laid have been equipped with BWTS already	Unknown	Unknown
Q10 Are you training your PSCOs on inspections related to BWM?	N/A	Yes	Yes	No	Yes	Yes	Yes	Yes	I've introduced a little presentation on BWM to our PSC officers	No	This training will be the first

									last month		
Q11 Enforcement and penalties in national legislation ?	N/A	Ordinance on Ballast water management and control./Off. Gazette 55/07 and 128/2012/	National regulation, gazette no.55/07, 128/12	unknown	Yes	Not yet	Yes	Not yet	Unknown	According to Environment Law (number 2581), only discharging of dirty ballast is prohibited	Unknown

Activity

16 The training was officially opened on Tuesday 2 June 2015 at 9am by Mr Antoine Blonce, Technical Adviser GloBallast (his opening remarks can be found in Annex 3), followed by introductory remarks from Dr Arzu Olgun (TUBITAK) and Mr Turgay Buyuran, GloBallast Focal Point for Turkey who both welcomed all the participants.

17 The IMO-GloBallast representative, Mr Blonce delivered the opening speech congratulating Turkey and TUBITAK for organising this training and making all arrangements to enable the participants to board a ship for a practical demonstration of what the consultants' lectures would be about.

18 He also reminded the participants that this workshop was a "train-the-trainer" activity and should be followed by a similar training carried out by the trained participants at the national level once they are back in their respective home countries.

Current status of the BWM Convention and developments at IMO in terms of PSC and Sampling presented by IMO Representative, Mr Markus Helavuori

19 The presentation addressed the latest updates at IMO regarding the extended application timeframe as per Resolution A.1088 (28), the Guidance on sampling (BWM.2/Circ.42) and the PSC guidelines recently adopted at MEPC 67. The circular contains the current state-of-the-art science with respect to sampling and analysis of ballast water and includes provisions for further improvement and standardization in light of future development of the sampling and analysis techniques. The sampling trial period will start once the Convention enters into force and the goal at the end of the trial period is to have a set of accepted procedures that can be used for sampling and analysing ballast water in a globally consistent way.

20 The consultants then introduced themselves, detailing their background and their studies and findings on on-board sampling. They asked the participants to briefly present themselves and to describe their national BWM requirements. The answers to the pre-event questionnaires (presented in the Table 1 above) were discussed in plenary session.

Ballast Water sampling under the BWM Convention presented by Dr Matej David

21 The need for compliance control sampling with BWM requirements as set out in the BWM Convention and the G2 Guidelines was the subject of this presentation to provide basic guidance for a port State control inspection to verify compliance with the requirements of BWM Convention. Ballast water sampling may be conducted in a two tier approach. Tier 1 is the initial inspection which is focussed on checks of a valid certificate, consultation of the ballast water record book and ensuring that an officer has been nominated for ballast water management on board the ship and to be responsible for the BWMS, and that the officer has been trained and knows how to operate it. BWS according to G2 may be performed, but the sampling and sample analysis should not result in an undue delay and should neither prevent ballast water discharge before the BWS results become available. Should no valid certificate be available, or clear grounds exists for doubts in the ballast water compliance condition, or BWMS does not correspond to the certificate, or the crew being unfamiliar with BWM procedures, this leads to Tier 2, the detailed inspection. Tier 2 is dependent on the conditions of Article 9 of the Convention. The consequence is, as stated in Article 9.3 of the BWM Convention: "In the circumstances given in paragraph 2 of this Article, the Party carrying out the inspection shall take such steps as will ensure that the ship shall not discharge ballast water until it can do so without presenting a threat of harm to the environment, human health, property or resources."

22 In cases when indicative BWS has shown a "high" organism load (clear grounds) and the detailed sampling inspection in a previous port documents failed compliance, Article 10.3 of the BWM Convention applies: "If the sampling described in Article 9.1(c) leads to a result, or supports information received from another port or offshore terminal, indicating that the ship poses a threat to the environment, human health, property or resources, the Party in

whose waters the ship is operating shall prohibit such ship from discharging ballast water until the threat is removed." However, what can be done with such a vessel? Options include no discharge (resulting in a problem with the cargo operation), ballast water discharge to a port reception facility (or from tank to tank avoiding ballast water discharge if possible) and ballast water operation in a designated discharge/contingency area. If none of these options are available how can such vessel prove again to be compliant?

23 Different BWS approaches were developed for the indicative and in detail D-2 compliance checks.

- Indicative test (G2 Guidelines, 6.3):

    - Prior to testing for compliance with the D-2 standard, it is recommended that, as a first step, an indicative analysis of ballast water discharge may be undertaken to establish whether a ship is potentially compliant or non-compliant.
    - Such a test could help the Party identify immediate mitigation measures, within their existing powers, to avoid any additional impact from a possible non-compliant ballast water discharge from the ship.

- For the detailed test (G2 Guidelines, 6.2):

    - The sampling protocol should result in samples that are representative of the whole discharge of ballast water from any single tank or any combination of tanks being discharged;
    - The sampling protocol should take account of the potential for a suspended sediment load in the discharge to affect sample results;
    - The sampling protocol should provide for samples to be taken at appropriate discharge points;
    - The quantity and quality of samples taken should be sufficient to demonstrate whether the ballast water being discharged meets with the relevant standard;
    - Sampling should be undertaken in a safe and practical manner;
    - Samples should be concentrated to a manageable size;
    - Samples should be taken, sealed and stored to ensure that they can be used to test for compliance;
    - Samples should be fully analysed within the test method holding time limit using an accredited laboratory; and
    - Samples should be transported, handled and stored with the consideration of a chain of custody.

24 One of the biggest challenges in BWS is to take a sample which is representative of the whole ballast water discharge. Clear guidance is needed how to do BWS for CME and IMO is currently working towards the preparation of such a document. Open questions and issues include:

- How to sample for D-1?
- How to sample for D-2?
- What is a representative sample?
- What should be the sample volume?
- How many samples to take?
- Where to take samples?
- When to take samples?
- Which sampling gear to use?

25 IMO agreed on a trial period of BWS and analysis in accordance with the BWM Convention and Guidelines G2. This 2 - 3 year trial period will be used gaining experience, reviewing, improving and standardizing the BWS Circular as well as to list sample analysis protocols, methodologies and approaches for the D-1 and D-2 standards compliance tests.

26 New Guidelines for port State control under the BWM Convention provide basic guidance for PSC inspection to verify compliance with the requirements of the BWM Convention. The inspection process is four stage:

1. "initial inspection" documentation check (International Ballast Water Management Certificate (IBWMC), Ballast Water Management Plan (BWMP), Ballast Water Record Book (BWRB)), visual check of equipment, ensuring that an officer has been nominated for BWM on the ship, check if the crew is familiar to operate BWMS;
2. "more detailed inspection" where the operation of the BWMS is checked and the PSCO clarifies whether the BWMS has been operated adequately, may result in sampling;
3. "indicative analysis", sampling for compliance with D-2, no undue delay because of sample analysis; and
4. "detailed analysis", sampling for compliance with D-2, no undue delay while waiting for sample analysis results.

27 Under the BWM Convention, ballast water sampling takes part of the Tier 1 inspection (Article 9.1), and ballast water discharge is not allowed when Tier 2 (= detailed inspection occurs), i.e., Article 9.3 says that ship shall not discharge ballast water when Article 9.2 conditions are met., while PSC guidelines introduce ballast water sampling as a step (3) after more detailed inspection (step 2).

28 There are different control actions identified under PSC Guidelines when a ship is found non-compliant, as an alternative to warning, detention or exclusion of the ship:

- retention of all ballast water on board;
- require the ship to undertake any repairs required to the BWMS;
- permit the ship to proceed to exchange ballast water in a location acceptable to the port State;
- allow the ship to discharge ballast to another ship or to an appropriate shipboard or land-based reception facility; or
- allow the ship to manage the ballast water or a portion of it in accordance with a method acceptable to the port State.

29 The conclusions of the presentation were that the BWM Convention introduces BWS as one of the methods for CME, but the G2 Guidelines do not describe BWS in a sufficient level of detail. Correct BWS for CME is very important also because of possible consequences for vessels when non-compliant. BWS Guidance introduces a transitional period important also for PSC to test and introduce reliable BWS system for CME. Furthermore, PSC Guidance introduces a four step inspection process, but there may be some implementation issues.

D-1 and D-2 Ballast Water Sampling for Compliance Monitoring and Enforcement recommendations presented by Dr Matej David

30 Suitable compliance control sampling methods and approaches are described to address both the D-1 standard and the indicative and detailed sampling for the D-2 standard.

31 For compliance with the D-1 standard a BWE efficiency of at least 95 % volumetric exchange should be reached and the BWE should be performed >200 NM from nearest land and in water depths of at least 200 m. Should this be impossible then conduct BWE >50 NM from nearest land and in water depths of at least 200 m. For D-1 compliance it is recommended to check the water salinity. The world ocean salinity is above 30 PSU which means that should the vessel have conducted BWE as required, the ballast water salinity should be above 30 PSU. Only small quantities like >50 ml of water are needed to do this measurement. However, our studies have shown that the water salinity inside a ballast tank is not homogenous when we measured the salinity in-tank from different depths and in-line during different times of a ballast water discharge. We therefore recommend for compliance checks with D-1 to take more than one sample with ~10 minute delay to identify if the salinity

is changing through the discharge process. It is important to take the sample as soon as possible after the ballast water discharge has started to prevent possible discharges of non-compliant ballast water.

32 Compliance checks with the D-2 standard require to check for viable organism densities per size class, i.e. <10 organisms of ≥50 μ m/m³, <10 organisms of <50 and ≥10 m/ml and the presence of colony forming indicator microbes (*Escherichia coli* <250 cfu/100 ml, Enterococci <100 cfu/100 ml, *Vibrio cholerae* <1/100 ml). This may be done in an indicative and in a detailed analysis.

33 Indicative sampling for compliance with the D-2 standard is recommended prior to detailed sampling to avoid any additional impact from possible non-compliant ballast water and in case tanks have direct discharge to the environment. For this analysis it is recommended to use in-tank sampling points to avoid discharge of ballast water and also as no in-line sampling points may be installed on a vessel. The sampling is also possible in-line after the ballast water discharge was started, the indicative test will still deliver result faster than a detailed test.

34 Two principles apply. **Principle 1:** To prevent possible non-compliant ballast water discharge only one group of organisms is enough to indicate/identify non-compliance! Considering the three organism groups addressed in the D-2 standard, phytoplankton indicative analysis tools (Pulse-Amplitude Modulated - PAM – fluorometry based) are practical for on board use and need small water quantities, zooplankton samples may be concentrated on board and brought to a laboratory for fast analysis, but no indicative analysis tool for bacteria is currently known. In **Principle 2** the indicative test may be followed/expanded to become a detailed test. It may also be considered to sample indicatively as it would be the first part of the detailed test and to include all groups of organisms.

35 For the detailed D-2 compliance control sample representativeness is a key feature and refers to organism diversity, concentration and viability and requires a biological, statistical and shipping related compromise. Representativeness can be seen as of the whole discharge of ballast water from any single tank or any combination of tanks.

36 Sample representativeness is related to the sampling point, sample timing (sampling start and end) and duration, number of samples and sample volume. From our studies we recommend the following:

- Sample in-line (at discharge) as this represents discharge of organisms to the environment and D-2 is a discharge standard. To enable such a sampling, a sampling point needs to be installed on board;
- In-tank sampling represents the organism potentially to be discharged (organisms may remain in the tank with remaining water) therefore it is difficult to prove compliance with the discharge standard (need to reveal very high organism numbers – e.g. 1000 organisms sampled from a tank of 100 m3);
- For in-line sampling use a sampling bin for sampling larger water volumes and water discharge from that bin needs to be provided on the vessel;
- Do not start sampling during the first 5 minutes after the start of the ballast water discharge and do not sample in the last 5 minutes before end of discharge because at these times high patchiness of organisms occurs and more sediment is present in that sampling periods which may negatively affect organisms survival in the sample and also the sample processing;
- A sampling duration of ca. 10 minutes is recommended because longer sampling times negatively affect the survival of organisms >50, hence a sample is underestimating the “real” organisms concentration; and shorter sampling times are still representative for organisms in the group <50 and ≥10 µm;
- Two or more instantaneous samples should be taken because the averaged biological content of two random samples has shown to be representative, alternatively a sample may be taken over the entire discharge time as appropriate;

- If more than one ballast water source is on the vessel, than at least one sample should be taken from each ballast source as sampling needs to be representative of the whole discharge;
- We suggest sample quantities which showed best results and the concentrated sample is easy to carry
    - For organisms ≥50; 300 – 500 litres of sample, concentrated to ca. 5 litres for transport and concentrated further to 100 ml for analysis;
    - For organisms <50 and ≥10; 5 – 6 litres of a continuous drip sample during sampling, subsample of ca. 100 ml for transport;
    - For bacteria; 1 litre separated from the continuous drip sample for transport.

37 The presentation continued to describe in detail different sampling tools which may be applied according to the in-line and in-tank sampling access points. Lastly personal protective equipment was described.

38 It was concluded that:
- BWS for CME is a complex process;
- Different CME approaches and tools are available;
- Organisms are patchy distributed in tanks what influences BWS results;
- Very important is to choose the right approach and tools for the purpose of sampling (D-1, D-2, indicative, detailed analysis);
- Methods and tools for ballast water sampling CME exist (e.g., methods used for type approving BWM systems could be also used also for CME);
- New CME methods and tools may be developing;
- New CME methods and tools need to be tested and validated first before use for CME; and
- A harmonised sampling approach is needed, to avoid that the ballast water of a vessel is proven compliant in one port, but would not be proven compliant in another port just because of different sampling methods or approaches used.

Ship and tank selection for ballast water sampling for compliance monitoring and enforcement presented by Dr Matej David

39 Considering limited time and resources, without a system to select ships, the “critical” / “high risk” possibly non-compliant vessels may not be checked, instead “low risk” ships could be checked which may not be needed. The level of risk posed is a triggering element and the BWM Convention has triggering elements in Article 9. Other triggering elements include, e.g., information about non-compliance from previous port(s) the vessel called. A Decision Support System (DSS) may support PSC decision making in this complex process.

40 Risk Assessment (RA) is needed to be applied to each ship arrival and this should be based upon the origin (donor port/area?) of the ballast water to be discharged and the presence of Harmful Aquatic Organisms and Pathogens (HAOP) in the donor port. RA principles are data reliability, environmental compatibility of the ballast water source area with the ballast water recipient area and the presence of HAOP in the ballast water donor area. Low risk is assessed when very high environmental incompatibility occurs and when no HAOP are present. In cases when high environmental compatibility occurs and 41 HAOP are present, different levels of risk are triggered by different HAOP profiles, e.g., human pathogens, target species, harmful algae.

41 General triggering elements for PSC action are included under regional Memorandum(s) of Understanding (MoU), e.g., random selection, identification of risks. These include, e.g., notification from a previous port on possible BWM non-compliance, level of risk for ballast water to be discharged and false reporting history of the vessel. Triggering elements may become available before a vessel arrives and when a vessel is already in a port resulting in a two tiered approach.

42 Tier 1: the ship is randomly selected under a regular BWM verification process, the vessel is selected for PSC inspection under a separate process or the ship is not trustworthy or has a false reporting history. Tier 2 refers to BWM Convention triggering elements when the vessel is in a port, which includes no valid certificate, the condition of the vessel or equipment does not correspond with BWMS certificate, the master and crew are not familiar with BWM procedures or have not implemented these, PSA received notification that a vessel was found non-compliant with the D-2 standard in a previous port, or any ballast water intended for discharge was identified as high or extreme risk.

43 Discharge of ballast water should not be allowed when a valid certificate is missing, the condition of the vessel or equipment does not correspond with BWMS certificate, the master and crew are not familiar with BWM procedures or have not implemented these or when high or extreme risk is posed by the ballast water intended to be discharged.

44 After the ship to be checked was selected, the tank(s) to be sampled should be identified. We recommend to consider the following tank selection principles:

- ballast water to be discharged originates from different sources and also with different uptake dates (different holding times on board);
- ballast water from all different sources need to be tested, but this is time consuming;
- have a tank prioritization result possibly prior any discharge, tank(s) to be sampled first should be selected;
- the same RA principles to select tanks may be used as for vessel selection for CME; and
- when a vessel has more ballast tanks with the same level of risk / same ballast water origin, give priority to those with shorter in-tank holding time.

45 The tank selection criteria RA may consider the following elements, but may not be limited to:

- the environmental compatibility of the ballast water donor area with the ballast water recipient area;
- the potential presence of harmful aquatic organisms and pathogens in the ballast water donor area;
- if appropriate, the presence of target species in the ballast water donor area; and
- the in-tank holding time.

46 The tank priority criteria follow the principle that the higher the risk identified, the higher is the priority. Give priority to:

- tank(s) from another biogeographical area with higher environmental compatibility with the discharge area;
- tanks with a ballast water origin area where HAOP or target species are present;
- tanks with shorter in-tank holding time;
- tanks to be discharged first.

47 For in-tank sampling accessibility, the ease of the sampling access point may be used as an additional criterion to identify the tank to be sampled, considering also that ballast water in some tanks may not be accessible at all for in-tank sampling. For in-line sampling the tank(s) which is(are) currently being discharged when PSC comes on board may be sampled first to enable stopping of ballast water discharge if needed and not to wait until the »targeted tank« is ready to be discharged.

48 It is concluded that a system is needed for the selection of vessels and tanks for CME for the purpose of the BWM Convention and that it is important to have a regional PSC approach implemented (e.g. MoU). RA is an important tool to support the CME process and that DSS for targeting vessels eases the PSC decision process.

Ballast water sample handling and transfer to the laboratory presented by Dr Stephan Gollasch

49 The presentation addressed ballast water sample handling recommendations and suggestions how to transfer a sample to the laboratory. It is recommended to label the sample(s) taken on the bottle and not on the bottle lid to avoid confusion should more than one bottle be opened at the same time for analysis. The sample should be labelled in minimum with an identification code including the date, start/end time of the sampling event, the D-2 organism group addressed by the sample, the sampling point used, the water volume sampled and whether or not preservative were used. The label should be secured with transparent tape that it cannot fell off or the sampling bottle(s) could be placed in separate bags so that if a label fells of the label and sample bottle can be found in the same bag.

50 After sampling the samples should be transported to the laboratory as soon as possible that at best the sample processing should be completed within 6 hours after sampling. For sample transport it is recommended to use Styrofoam boxes with cooling / heating elements. The sample transport should occur in controlled temperature conditions and the temperature be documented with temperature loggers. For sample shipment a temperature slightly cooler than the ambient sampling temperature is recommended.

51 The sample shipment should be documented with a chain of custody form, to record sampling event details, the purpose of the sample shipment, sample types and number of samples. All personal involved in the sample shipment should sign the form as the samples are handed over.

52 After the sample has arrived in the laboratory it should be split to generate separate samples for the analysis of the three D-2 organism groups (if this was not yet done on board). For bacteria analysis a 1 L bottle should be filled and handed over the sample processing team. For phytoplankton analysis 2 x 100 ml bottles should be filled, one to enable a living phytoplankton analysis and another with preservatives as a back-up. For zooplankton analysis the plankton net cod-end, which was stored in a bucket, should be emptied into a filter (30 µm mesh). A wash bottle filled with the filtered water is to be used to empty the material collected on the 30 µm filter into a jar. The wash bottle and jar should be forwarded to the microscopists for immediate sample processing.

Sample analysis procedures or techniques used to test for compliance with D-1 presented by Dr Stephan Gollasch

53 Compliance methods to evaluate whether or not the D-1 standard was met need to document if the BWE was carried out in coastal or offshore waters. This may be done by documenting tracers of human activity (presence of e.g. Nitrogen or Phosphorous may indicate nearshore BWE (river run-off in urban areas)), presence of colored dissolved organic matter (CDOM), findings of coastal species (e.g. harpacticoid copepods, barnacles), high sediment load in the sample or by salinity measurements. For salinity measurements it is assumed that if the salinity is below 30 psu it is unlikely that it was exchanged at sea in offshore areas.

54 The weaknesses of the first three mentioned approaches were described and salinity checks were recommended as best compromise. However, BWE in coastal/port areas in high-salinity environments (above 30 psu) will result in compliance salinity measurements, but the water does not originate from offshore areas (non-compliance with D-1). Further, BWE in designated ballast water exchange areas (within 50 nm from nearest land) may result in lower salinity than the offshore water due to e.g. substantial freshwater influence by river run offs. Here the BWE would be compliant, but salinity measurements alone would show non-compliance. Therefore, the place where BWE was conducted must be known to draw CME conclusions.

Sample analysis procedures or techniques used to test for compliance with D-2, indicative and detailed sample processing, introduction of sample analysis methods presented by Dr Stephan Gollasch

55 Compliance with the D-2 standard can be evaluated indicatively and in a detailed sample processing approach. Several organism detection technologies were presented also outlining their strengths and weaknesses. The difficulties in organism detection include that almost all types of organisms are found in ballast water with the dominant groups being crustaceans, mollusks, worms and phytoplankton. Living fishes were also found with a body length of up to 15 cm. Ballast water biota also include critical species such as human pathogens and harmful/toxic alga. The organism detection tools in addition need to be capable to identify the minimum dimension of organisms to sort them into the two D-2 size categories and to identify if the organisms found are living or dead (viability analysis). Other aspects to consider when aiming to identify the most suitable organism detection technologies are the time needed to a result, the required expertise of the sample analyst, the portability of tools to possibly enable their use on board direct after sampling and the capital and running costs.

56 For the indicative analysis, the consultants recommended to use for the organisms <50 and ≥10 µm in minimum dimension pulse-amplitude modulated (PAM) fluorometry. This portable tool identifies living phytoplankton by measuring the algal response to a light stimulus. The measured PAM signal allows a semi-quantitative evaluation of living algae in a sample, but does not provide direct algal cell counts. This tool is easy to operate so that a measurement by PSC directly after sampling on board is enabled and the result is available in a few minutes. For the organisms ≥50 µm in minimum dimension, the consultants use a stereomicroscope to indicatively analyse the sample. However, this method is not portable and requires biological expertise and sample processing in a laboratory so that this cannot be done by PSC on board. For bacteria, the consultants are not aware of an indicative method which gives colony forming unit estimations in less than 6 hours. Therefore it was concluded that for an indicative analysis the phytoplankton PAM test is most suitable because it can be done on board directly after sampling and it delivers results in ca. 2 minutes.

57 However, a new indicative method was developed, and is available since very recently, which uses the content of AdenosinTriPhosphate (ATP) in a sample and transfers this measurement into calculated organism counts. As ATP occurs in all species and by using filtration this method could possibly identify all D-2 organisms. The consultants mentioned that they have not yet seen validation results of this method and have not tested this method or considered it in depth.

58 For the detailed analysis, the consultants recommended to use for the organisms <50 and ≥10 µm in minimum dimension a viability stain and an epifluorescence microscope to analyse phytoplankton. The working principle of the stain Fluorescein DiAcetate (FDA) was described and its applicability was critically reviewed. Zooplankton in this size class may be analyzed with a standard bright field microscope and the viability could be tested by gently poking intact, non-moving organisms. For the organisms ≥50 µm in minimum dimension we propose to use a stereomicroscope with the organism poking method. For bacteria several standard methods are available to document colony forming units and with selective bacteria growth media the number per water volume can be determined. However, the incubation time is up to 2 days.

59 All detailed sample analysis methods require a laboratory environment and high level biological expertise for sample processing. It was therefore concluded that these methods are not suitable for PSC use on board a vessel. It is recommended that either the sample taken by PSC is transported to the laboratory as soon as possible after sampling or that a van may be equipped with the above mentioned sample analysis tools as a mobile laboratory. This van may be driven to the pier where the vessel is sampled so that longer sample transport times can be avoided.

Practical demonstration on board the bulk carrier Marbacan: Sampling for D-1 on a ship in the Port of Gebze, in tank sampling, performed by Dr Matej David and Dr Stephan Gollasch

60 Wednesday 3 June was dedicated to the practical demonstration of the sampling approaches on board a ship. The Turkish authorities managed to get authorization for all participants to board the bulk carrier Marbacan from Madeira (gross tonnage 20,491 tons, length 190m).

61 Permission to board the ship for training was granted from 10 am to 3 pm. The participants were divided in two groups: one was trained in the morning until lunch and the second group was trained in the afternoon.

62 Dr David started by asking the ship's Chief Officer to see the ship's ballast water record book and the ballast water management plan to know which tank the samples should be taken from as seen in Picture 1.

Picture 1: C/O of the Marbacan and Dr David

63 Dr David and Dr Gollasch then demonstrated to the participants the different practical methodologies for sampling ballast water for determining compliance with the standards described in regulations D-1 and D-2 as displayed on the following pictures 2 to 4.

Picture 2: Samples were taken from the tank through a sounding pipe using a water column sampler

Picture 3: Measuring salinity using a simple refractometer

Picture 4: Demonstration of the use of the phytoplankton indicative analysis tool (Pulse-Amplitude Modulated fluorometry ("PAM")

Practical demonstration of the analysis of ballast water in the TUBITAK-MRC marine laboratories by Dr Gollasch, Dr David and Dr Arzu

64 On the last day of the training on Thursday 5 June, Dr Gollasch gave the last presentations on sample analysis procedures and techniques used to test for compliance with D-1 and D-2.

65 The venue was TUBITAK-MRC and the presentations were followed by practical analysis at TUBITAK-MRC using their facilities as shown on Picture 5.

Picture 5: Participants analyzing ballast water samples using a stereomicroscope, TUBITAK facilities

Conclusions

66 Each presentation was followed by a lively questions and answers session. The following lists the key recommendations and findings concluded after each talk.

Ballast water sampling (BWS) under the BWM Convention

67 The BWM Convention introduces BWS as one of the methods for CME, but the G2 Guidelines do not describe BWS in detail. Correct BWS for CME is very important also because of possible consequences for vessels when non-compliant.

68 MEPC agreed on a trial period of BWS and analysis in accordance with the BWM Convention and Guidelines G2. This 2 - 3 year trial period will be used gaining experience, reviewing, improving and standardizing the BWS Circular as well as to list sample analysis protocols, methodologies and approaches for the D-1 and D-2 standards compliance tests.

69 The conclusions of the presentation were that while the BWM Convention introduces BWS as CME method the G2 Guidelines do not describe BWS in a sufficient level of detail so that further work is needed to answer the outstanding questions and to prepare a detailed step-by-step BWS protocol.

D-1 and D-2 Ballast Water Sampling for Compliance Monitoring and Enforcement recommendations

70 BWS for CME is a complex process and different approaches and tools are available for CME. It is very important to choose the right approach and tools for the purpose of sampling (D-1, D-2, indicative and detailed analysis).

71 For compliance with the D-1 standard a BWE efficiency of at least 95 % volumetric exchange should be reached and the BWE should be performed >200 NM from nearest land and in water depths of at least 200 m. Should this be impossible then conduct BWE >50 NM from nearest land and in water depths of at least 200 m. For D-1 compliance it is recommended to check the water salinity. The world ocean salinity is above 30 PSU which means that should the vessel have conducted BWE as required, the ballast water salinity should be above 30 PSU. Only small quantities like >50 ml of water are needed to do this measurement. However, our studies have shown the water salinity inside a ballast tank is not homogenous when we measured the salinity in-tank from different depths and in-line during different times of a ballast water discharge. We therefore recommend for compliance checks with D-1 to take more than one sample with ~10 minute delay to identify if the salinity is changing through the time of discharge. It is important to take the sample as soon as possible after the ballast water discharge has started to prevent possible discharges of non-compliant water.

72 Indicative sampling for compliance with the D-2 standard is recommended prior to detailed sampling to avoid any additional impact from possible non-compliant ballast water and in case tanks have direct discharge to the environment. For this analysis it is recommended to use in-tank sampling points to avoid discharge of ballast water and also as no in-line sampling points may be installed on a vessel. The sampling is also possible in-line after the ballast water discharge was started, the indicative test will still be faster than a detailed test.

73 For the detailed D-2 compliance control sample representativeness is a key feature and refers to organism diversity, concentration and viability and requires a biological, statistical and shipping related compromise. Representativeness can be seen as of the whole discharge of ballast water from any single tank or any combination of tanks.

Ship and tank selection for ballast water sampling for compliance monitoring and enforcement

74 Considering limited time and resources, without a system to select ships, the “critical” / “high risk” possibly non-compliant ships may not be checked, instead “low risk” ships could

be checked which may not be needed. A DSS may support PSC decision making in this complex process.

75 Triggering elements may become available before a ships arrives and when a ship is already in a port resulting in a two tiered approach. Tier 1: the ship is randomly selected under a regular BWM verification process, the vessel is selected for PSC inspection under a separate process, or the vessel is not trustworthy or has a false reporting history. Tier 2 refers to BWM Convention triggering elements when the vessel is in a port, which includes no valid certificate, the condition of the vessel or equipment does not correspond with BWMS certificate, the master and crew are not familiar with BWM procedures or have not implemented these, PSA received notification that the ship was found non-compliant with the D-2 standard in a previous port, or any ballast water intended for discharge was identified as high or extreme risk.

76 After the ship to be checked was selected, the tank(s) to be sampled should be identified. We recommend to consider the following tank selection principles:

- have a tank prioritization result possibly prior any discharge, tank(s) to be sampled first should be selected;
- the environmental compatibility of the ballast water donor area with the ballast water recipient area;
- the potential presence of HAOP in the ballast water donor area;
- if appropriate, the presence of target species in the ballast water donor area; and
- the in-tank holding time.

77 It is concluded that a system is needed for the selection of ship and tanks for CME for the purpose of the BWM Convention and that it is important to have a regional PSC approach implemented (e.g. MoU). RA is an important tool to support the CME process and DSS for targeting ships eases the PSC decision process.

Ballast water sample handling and transfer to the laboratory

78 It is recommended to label clearly all sample(s) taken with an identification code and that after sampling the samples should be transported in temperature controlled conditions to the laboratory as soon as possible that at best the sample processing can be completed within 6 hours after sampling.

79 For sample transport it is recommended to use Styrofoam boxes with cooling / heating elements. During sample transport the temperature should be documented with temperature loggers. For sample shipment a temperature slightly cooler than the ambient sampling temperature is recommended.

80 The sample shipment should be documented as a chain of custody form.

Sample analysis procedures or techniques used to test for compliance with D-1

81 Compliance methods to evaluate whether or not the D-1 standard was met need to document if the BWE was carried out in coastal or offshore waters and it was concluded that the best method is measuring salinity. It is assumed that if the salinity is below 30 PSU it is unlikely that it was exchanged at sea in offshore areas. However, BWE in coastal/port areas in high-salinity environments (above 30 PSU) will result in compliance salinity measurements, but the water does not originate from offshore areas (non-compliance with D-1). Further, BWE in designated ballast water exchange areas (within 50 nm from nearest land) may result in lower salinity than the offshore water due to e.g. substantial freshwater influence by river run offs. Here the BWE would be compliant, but salinity measurements alone would show non-compliance. It was recommended that the place where BWE was conducted must be known to draw CME conclusions.

Sample analysis procedures or techniques used to test for compliance with D-2, indicative and detailed sample processing, introduction of sample analysis methods

82 Compliance with D-2 can be evaluated indicatively and in a detailed sample processing approach and methods exist for both approaches. If one organism group exceeds the compliance threshold numbers in D-2, non-compliance is documented. This means also that PSC may start with the easiest CME method, which was concluded to be pulse-amplitude modulated (PAM) fluorometry to indicatively analyse for viable phytoplankton. This tool is easy to operate so that a measurement by PSC directly after sampling on board is enabled and the result is available in a few minutes. The measured PAM signal allows a semi-quantitative evaluation of living algae in a sample, but does not provide direct algal cell counts. For the other two D-2 standard organism groups no indicative detection method could be identified, which is portable, provides results promptly, delivers (estimations of) organism counts and can be operated by PSC.

83 For the detailed analysis we recommend to use for the organisms <50 and ≥10 µm in minimum dimension a viability stain and an epifluorescence microscope to analyse phytoplankton. Zooplankton in this size class may be analysed with a standard bright field microscope and the viability could be tested by gently poking intact, non-moving organisms. For the organisms ≥50 µm in minimum dimension we propose to use a stereomicroscope with the organism poking method. For bacteria several standard methods are available to document colony forming units and with selective bacteria growth media the number per water volume can be determined. However, the incubation time is up to 2 days.

84 All detailed sample analysis methods require a laboratory environment and high level biological expertise for sample processing. It was therefore concluded that these methods are not suitable for PSC use on board a vessel.

85 A harmonized approach is needed, not that one vessel is compliant in one port, but not in another because of the different sample processing methods used.

86 To conclude this report, here are a few notes from the different discussions that took place:

- What to do if D-1 cannot be met and no emergency treatment is possible? It was suggested to respond to this situation in a regionally harmonized approach and strategy. A regional agreement (MoU) is needed that vessels in such conditions do not just call for another nearby port where the non-compliant ballast water may be discharged.
- Ballast water samples should be analysed in accredited laboratories. This accreditation should be conducted by following international instruments and not only by national approaches to guarantee maximum transparency and quality standards.
- Although all possible sampling and sample transport quality control may be implemented and followed, a certain amount of trust is needed as independent control is not always possible for the entire chain of activities (e.g. sample transport by external freight forwarding companies, external laboratories to process certain sample types).
- The participants expressed their fear that PSCO may be directed to the wrong sampling points or that water to be sampled may be pumped from a different tank than what PSCO has originally selected.
- Shipowners may require a documentation to proof that the sample is actually from their vessel and not from any other. This may be achieved in a way that the BWM responsible vessel crew member accompanies the PSCO sampling team as observer. Further, the samples taken could be sealed to show that when the samples arrive in the laboratories the seal is undamaged. This may be done by photographic documentation before the samples are sent and after arrival in the laboratories. In addition a chain of custody may be implemented with all personal involved in sample taking and forwarding to sign this document.

- The sample transport conditions should be properly documented by using temperature loggers to ensure that any possible negative affect, which may have occurred during the sample shipment, is documented.
- It was understood that in certain occasions sounding pipe sampling is the only appropriate sampling method (e.g. when a high risk is assessed).
- It was further highlighted that the ship selection criteria need to be transparent so that the vessel owner may be able to follow why their vessel was selected for the sampling event.

Closure of the activity

87 At the closing ceremony of the activity, certificates of attendance and USB sticks with all background materials (including different scientific papers, study reports and other materials which may be of help for a better understanding of the sampling and analysis processes provided by GloBallast, Dr. Gollasch and Dr. David) and presentations were handed out to the participants. The GloBallast representative reminded all delegates that this "train-the-trainer" workshop should be followed-up by a similar activity at the national level, with them becoming the trainers for their colleagues and other BWM related stakeholders in their home countries.

88 To support the training at the national level, it was also noted that GloBallast just released an e-learning course on Compliance Monitoring and Enforcement of the BWM Convention (http://globallastlearning.com). It was strongly recommended to the delegates that they could register for free on this GloBallast learning portal and they were also invited to undertake the Interreg IVB funded e-CME training course, coordinated by the World Maritime University (WMU) for additional training material, such as on board videos of ballast water sampling and additional background information of the BWM Convention (http://e-cmeballastwater.eu/). If participants take both courses (available free of charge online), they will be likely fully trained to replicate this training. Follow-up for the national level trainings will be done by GloBallast and its Regional Coordinators.

89 Special thanks from all participants were finally addressed to the Government of the Republic of Turkey, the staff of TUBITAK-MRC, the GloBallast Project Coordination Unit, the IMO-representative, the Regional Coordinating Organizations REMPEC and PERSGA, and the IMO consultants for the organization of this very successful activity.

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Annex 1 Programme

Train-the-Trainer workshop on sampling and analysis of ballast water
Gebze, Republic of Turkey, 2-4 June 2015

Day 1: Tuesday 2 June 2015 – Paradise Island Hotel – Theory

08:45 – 09:10	**Registration**
09:10 – 09:20	Welcoming remarks: - *IMO-GloBallast: Mr Antoine Blonce, Technical Adviser, GloBallast Partnerships Programme* - *Ministry of Transport, Maritime Affairs and Communications of Turkey: Mr Turgay Buyuran, Maritime Expert and GloBallast Focal Point* - *TUBITAK-MRC: Dr Arzu Olgun, Chief Senior Researcher*
09:20 – 10:00	Current status of the BWM Convention and developments at IMO in terms of PSC and Sampling *IMO representative: Mr Markus Helavuori*
10:00 – 10:10	Presentation of TUBITAK-MAM *Dr Arzu Olgun, Chief Senior Researcher*
10:10 – 10:35	Short Introduction of each participants and their expectations on the training
10:35 – 11:05	Ballast water sampling under the BWM Convention *IMO-GloBallast Consultant: Dr Matej David*
11:05 – 11:20	**Coffee break**
11:20 – 12:10	Ballast water sampling under the BWM Convention, continued *IMO-GloBallast Consultant: Dr Matej David*
12:10 – 13:40	**Lunch break**
13:40 – 15:15	Ballast water sampling for Compliance Monitoring and Enforcement (CME) under the BWM Convention (ballast water exchange standard (D-1), ballast water performance standard (D-2), indicative and detailed sampling, in-tank and at discharge sampling, introduction of sampling gear, representativeness, sample volumes, timing, number of samples) *IMO-GloBallast Consultants: Dr Matej David*
15:15 – 15:45	**Coffee break**
15:45 – 17:00	Selecting vessels and tanks for ballast water sampling for CME *IMO-GloBallast Consultant: Dr Matej David*
17:00 – 17:15	Ballast water sample handling and transfer to the laboratory *IMO-GloBallast Consultant: Dr Stephan Gollasch*
17:30	**End of Day 1**

Day 2: Wednesday 3 June 2015 - Practical Sampling on board the Marbacan vessel

09:00 – 11:00	**Drive to port**
11:00 – 13:00	1st group for hands-on Sampling for D-1 and D-2 on a ship, in tank sampling, in-line sampling, sample storage and transport
13:00 – 13:30	**Lunch break**
13:30 – 15:00	2nd group for hands-on Sampling for D-1 and D-2 on a ship, in tank sampling, in-line sampling, sample storage and transport
15:00 – 17:00	**Drive to hotel and End of Day 2**

Day 3: Thursday 4 June 2015 – TUBITAK MAM – Ballast water analysis, theory and practice

08:15	**Pick up all participants and transfer from Hotel to TUBITAK**
09:15 – 09:45	Sample analysis procedures or techniques used to test for compliance with D-1 *IMO-GloBallast Consultant: Dr Stephan Gollasch*
09:45 – 11:00	Sample analysis procedures or techniques used to test for compliance with D-2, indicative and detailed sample processing, introduction of sample analysis methods *IMO-GloBallast Consultant: Dr Stephan Gollasch*
11:00 – 12:00	**Coffee break (+ preparation of laboratory for analysis)**
12:00 – 13:00	**Lunch + Group Picture**
13:00 – 14:30	Practical sample analysis for D-1 and D-2 in the TUBITAK-MRC laboratory *IMO-GloBallast Consultants Dr Stephan Gollasch Dr Matej David with Dr Arzu Olgun*
14:30 – 15:00	**Summary and conclusions of the training, Closing ceremony with certificates and USB sticks, End of the Workshop.**

Annex 2 List of Participants

Train-the-Trainer workshop on sampling and analysis of ballast water
Gebze, Republic of Turkey, 2-4 June 2015

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Annex 3 IMO-GloBallast Opening Remarks

Train-the-Trainer workshop on sampling and analysis of ballast water
Gebze, Republic of Turkey, 2-4 June 2015

Ladies and Gentlemen,

Dear Participants,

It is such a pleasure being here in Gebze for this train-the-trainer workshop on Port State Control under the BWM Convention with an emphasis on sampling and analysis of ballast water, representing the International Maritime Organization and the GloBallast Partnerships Programme.

It is now widely anticipated that the BWM Convention may enter into force in the very near future. We have 44 signatories to the Convention, representing 32.86 percent of the world tonnage. We are now about 2 percent away from meeting the entry into force criteria. Therefore, it is very important that the IMO Member States, and in particular the Lead Partnering Countries of the GloBallast Project, are being trained on the practical aspects of the implementation of the Convention.

This is why we organized this hands-on training on sampling and analysis of ballast water following a specific request from our Lead Partnering Countries to be trained on this topic. This is the first training involving several GloBallast countries with a ship-board sampling of ballast water followed by its analysis in a marine laboratory. It is expected that, at the end of this training, every one of you will be able to replicate such training in your country at the national level to ensure that all Port State Control Officers and marine biologists will know the possible procedures for sampling and analysis of ballast water.

I would like to take this opportunity to thank the Government of the Republic of Turkey and especially Mr Turgay Buyuran, Maritime Expert from the Ministry of Transport, Maritime Affairs and Communications; as well as Dr Ipek Erzi, Coordinator of the European Project at the Tubitak Marmara Research Centre for hosting this activity. Thanks also to the lecturers, Dr Gollasch and Dr Matej as well as Mr Helavuori from IMO, to the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (or REMPEC) and to the Regional Organization for the Conservation of the Environment of the Red Sea and the Gulf of Aden (or PERSGA) for supporting GloBallast with all the logistics, and to all of you for attending this event.

I wish you all a very productive workshop for the next three days.

Thank you very much.

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