2nd Global Test Facility Forum

Singapore, 28-29 October 2010

MINUTES OF THE MEETING

Summary

The organizations involved in testing and data generation for approval and certification of Ballast Water Management (BWM) Treatment Technologies met for a 2nd Global Test Facility Forum, 28-29 October 2010, in Singapore. The meeting was hosted by Tropical Marine Science Institute (TMSI) and DHI Singapore.

The group discussed, in detail, the formalization of the network, and agreed to work towards a Memorandum of Understanding between the test facility operators, which would set out the minimum quality standards that the members of the group would agree to adhere to. Furthermore, the group discussed the possibilities for a harmonized QA/QC protocol, as well as various issues related to the biology of testing, such as class sizes, viability assessments, and sampling.

The group established an Interim Steering Committee, comprising KORDI (representing Asia), MERC (representing North America) and NIVA (representing Europe). An Interim Chairman was selected, Dr. Sjur Tveite (NIVA), and GloBallast Partnerships PCU was appointed as the Interim Secretariat.

The next meeting will tentatively be held during the IMO-GloBallast R&D Forum on BWM in Istanbul, Turkey, October 2011.

For any questions regarding the Global Network of Ballast Water Test Facilities, please contact

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MINUTES OF THE MEETING

Welcome, opening of meeting and selection of chairman

The meeting was opened at 09:00 am at TMSI, Singapore. After welcoming remarks from the hosts, DHI Singapore and TMSI, the meeting selected Martin Anderson to act as the chair for the meeting, supported by Stephan Gollasch as facilitator. Fredrik Haag, IMO-GloBallast agreed to act as secretary.

Update from IMO

Dandu Pughiuc, Head of the Biosafety Section, IMO, provided an update on the latest development at IMO. He also presented his view that the main challenges ahead, and where the test facility forum can play a significant role, is the interpretation of guidelines by test facilities, and the interpretation of guidelines as well as test results by the end users and administrations.

Fredrik Haag provided a brief update on the progress in the GloBallast Partnerships project and the Global Industry Alliance.

The meeting agreed to the agenda, with the additions that NIVA suggested some more discussion on size groups, and Stephan Gollasch suggested a short update from recent discussions at NIOZ.

The meeting agreed that the objectives of this second meeting of the group would be to make progress on the following issues:

1) Formalization of the network of test facilities
2) Completing the issues started last time
3) Agreeing on what cannot be agreed on
4) Agreeing on a work plan
5) Discussing test protocols (suggestion from GESAMP) for G8 and G9, in particular the time between sample and testing
6) Make sure that other initiatives are also included to avoid overlap and duplication (e.g. BW), STEP, etc)
7) Discuss other harmonization issues (methodological), looking at the short term vs long term plans for harmonization.
8) Involving Class societies
9) Involving Administrations
10) Live/dead definition

Formalisation of the network of test facilities

The group discussed the formalisation of the network. Reference was made to other groups such as IACS, it was generally agreed that mutual recognition of each other and an agreement on minimum standards should be the main pillar of the cooperation. It was agreed to establish a working group during the meeting, which would discuss the formalisation in more detail and suggest a way forward to the meeting (see below).

Progress on joint activities

Compiling and Sharing QA/QC Protocols (GSI)

During the first Global Test Facility Forum (24-25 January 2010 in Malmo, Sweden), one of the conclusions was that quality assurance (QA) and quality control (QC) protocols were priorities for harmonization among land-based test facilities. As a result, the Great Ships Initiative (GSI) was tasked with collecting and imparting QA/QC information from the participating test facilities. GSI's approach to complete this task was to compile QA/QC methods and documentation, identify commonalities and discrepancies, and finally discuss meaningful discrepancies and work to harmonize quality systems across test facilities. Prior to the Second Global Test Facility Forum, GSI received very little response to requests for QA/QC methods and documentation from the test facilities participating in the forum. Therefore, GSI concluded that a new first step was needed to catalyze test facility harmonization.

Method

GSI's goal was to use the Second Global Test Facility Forum as a platform to reach a common understanding on the definition of QA/QC, the importance of QA/QC to land-based testing of ballast water treatment systems (BWTS), and the fundamental concepts and components of a quality system. As a follow-up to this exercise, each participating test facility was asked to complete a three-part survey that would allow GSI to compile QA/QC methods across facilities, in terms of quality system organization/structure, QA/QC protocols, and data quality objectives. The following test facilities were present at the Second Global Test Facility Forum and completed the survey: NIOZ (the Netherlands), NIVA (Norway), GSI (USA), MERC (USA), DHI (Denmark and Singapore), KOMERI (Korea), KORDI (Korea), IMARES (the Netherlands), and the University of Tokyo (Japan). In addition, the survey was sent via e-mail to the United States Coast Guard Naval Research Laboratory and the Golden Bear Facility (both located in the USA).

Results

A total of twelve land-based test facilities were surveyed, with eleven test facilities responding as of April 2011. The results of the survey indicate a very high level of QA/QC among the eleven responding test facilities. All of the test facilities have a Quality Management Plan in place, the majority of which (91%) are publically available (Table 1). In addition, all of the test facilities have a dedicated Quality Assurance Project Plan (also known as Test/Quality Assurance Plan or Test Plan); although in some cases (36%) a portion of the document is not publically available because of BWTS developer confidentiality (Table 1). All of the test facilities have dedicated (64%) or semi-dedicated (36%) internal or external quality management staff; and all test facilities have been subject to external audits on a regular (54%), irregular (36%), or unplanned/random (10%) basis (Table 1). Of the test facilities surveyed, all currently have (or intend to have) QA/QC protocols in place for test facility operation, equipment maintenance and calibration, test preparation, sample collection, sample analysis, data management, and reporting (Table 2). These protocols may either be in the form of standard operating procedures or may be incorporated into a Test Plan. In the majority of cases, these protocols are publically available but BWTS developer confidentiality may prohibit the public release of protocols relating to test preparation and reporting. Finally, the majority (75%) of test facilities surveyed have publically available objectives established for meeting quantitative (i.e., precision, test facility bias, experiment bias, analyst bias, accuracy, sensitivity, and completeness) and qualitative (i.e., representativeness and comparability) data quality criteria (Table 3). The remaining 27% have publically available objectives in place for most quantitative data quality criteria and are considering including additional criteria, or they either have objectives in place that are not public or do not have objectives in place (Table 3).

Table 1. GSI survey results of quality system components (organization, structure, and planning) in place at Land-Based Ballast Water Treatment Test Facilities.

	NIOZ	NIVA	GSI	MERC	DHI-Denmark	DHI-Singapore	Japan	KOMERI	KORDI	IMARES	NRL	GBF[g]
Quality Management Plan	**1**	**1**	**1**	**1**	**1**	**1**	**1[c,d]**	**2**	**1**	**2**	**3[f]**	**RP**
1= Dedicated document, publicly available; 2= Component of Test Plan; publically available; 3 = Not public or not in existence												
Test - Specific Quality Assurance Project Plan	**1**	**2[a]**	**1**	**1**	**2[b]**	**2**	**1[c]**	**2**	**2[b]**	**2**	**3[f]**	**RP**
1= Dedicated document, publicly available; 2= Component of Test Plan; publically available; 3 = Not public or not in existence												
Quality Management Staff	**1**	**1**	**1**	**1**	**1**	**1**	**1[e]**	**2**	**2**	**2**	**2**	**RP**
1= Dedicated staff (internal or external); 2 = Semi-dedicated internal staff; 3 = No staff												
Quality Management Audits	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**3**	**RP**
1= Regular, external; 2=Irregular, external; 3=Non planned												

COMMENTS:

[a]Specific parts related to technology can be confidential.

[b]Specific technical parts describing the technology may be confidential if required by the client.

[c]Only in Japanese language at this moment.

[d]There are no GLP bodies under G8.

[e]Particularly for biological testing, in almost all cases, there needs to be external staff.

[f]Not public.

[g]Requested, response pending (RP).

Table 2. GSI survey results of quality assurance/quality control protocols in place at Land-Based Ballast Water Treatment Test Facilities.

Test Facility	Test Facility Operation	Equipment Maintenance and Calibration	Test Preparation	Sample Collection	Sample Analysis	Data Management	Reporting
NIOZ	1	1	1	1	1	1	1
NIVA	1 to 2	1	2[a]	1	1	1	1
GSI	1	1	1	1	1	1	1
MERC	1 to 2	1	1	1	1	1	1
DHI-Denmark	1[b]	1[b]	1[b]	1[b]	1[b]	1[b]	1[b]
DHI-Singapore	1	1	1	1	1	1	1[c]
Japan	1[d]	1	1	1	1	1	1
KOMERI	1	1	1	1	1	1 or 2[e]	1
KORDI	2	1	1	1	1	1	1
IMARES	2	2	2	2	2	2	See Guidelines
NRL	2	2	2	2	2	2	2
GBF[f]	RP	RP	RP	RP	RP	RP	RP

1 = Protocols in Place and Public; 2 = Protocols in Place and Not Public; 3 = No Protocols in Place

COMMENTS:

[a]Protocol for test preparation is usually public, but parts describing specific details related to the clients technology can be confidential.

[b]It is the intention to publish as much as possible. All SOPs will be available to inspection from clients and external auditors. Report can only be published after agreement with client.

[c]Report may contain confidential information relating to clients technology. This information will be removed from any public disclosure.

[d]Public but only in Japanese.

[e]Raw data is not public, but client has access. Report data is public.

[f]Requested, response pending.

Table 3. GSI survey results of qualitative and quantitative data quality objectives in place at Land-Based Ballast Water Treatment Test Facilities.

	NIOZ	NIVA	GSI	MERC	DHI-Denmark	DHI-Singapore	Japan	KOMERI	KORDI	IMARES	NRL	GBF[f]
Precision	1	1	1	1	1	1	2	1	1	2	1	RP
Test Facility Bias	1	1	1	1	1	1	3	1	1	2	2	RP
Experiment Bias	1	1	1	1	1	1	3	1	1	2	2	RP
Analyst/Operator Bias	1	1	1	1	1	1	3	1	1	2 or 3	2	RP
Accuracy	1	1	1	1	1	1	2	1	1	2	1	RP
Sensitivity	1	1	1	1	1	1	2	1	1	2	2	RP
Completeness	1	1	1	1	0[a]	0[c]	1	1	1	2	1	RP
Representativeness	1	1	1	1	No response	1	2	1	1	2	1	RP
Comparability	1	1	1	1	0[b]	1[d]	2[e]	1	1	2	1	RP
	1 = Objectives in Place and Public; 2 = Objectives in Place and Not Public; 3 = No Objectives in Place											

COMMENTS:

[a]We will probably include it.

[b]We do not have a specific goal of comparability between test cycles.

[c]Possible inclusion.

[d]Comparability within test cycles but not comparability between test cycles.

[e]Comparability meaning proficiency.

[f]Requested, response pending (RP).

Status report on challenge water manipulation (NIVA)

Helge Litved (NIVA) gave a presentation on the topic of challenge water manipulation.

(HELGE, please expand on this)

Model results and test run report for Administrations

Due to time constraints, it has not yet been possible to accomplish this, but it will remain as a priority item on the agenda for the next meeting.

Size class issues (NIVA)

NIVA referred to THE G8 Guidelines (MEPC 174 (58)), Part 2, section 2.3.32, where it is stated that:

> *For the evaluation of organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension, at least 1 litre of influent water and at least 10 litres of treated water should be collected. If samples are concentrated for enumeration, the samples should be concentrated using a sieve no greater than 10 micrometres mesh in the diagonal dimension.*

DNV then argued that the counting of organisms within the 10-50 micrometer range then leaves two options:

1. With proper flushing of the sampling net during sampling, to avoid clogging, the sampling procedure basically defines the size range of the collected organism and all sampled organisms will be counted.

2. Organisms which have been collected will be measured individually and all individuals with a size larger than 10 micrometers are to be included in the assessment.

NIVA supports option 1, because it would solve some problems encountered when assessing the 10-50 µm group, e.g.:

- Many algal species are flexible with respect to size and size of a natural population may be dependent on environmental factors such as light, temperature and grazing pressure. DNV argues that it is the size of individuals at the time of sampling which should be determined.

- Using the MPN method species may be of different size at the time when analysing MPN cultures, than when samples were inoculated.

- Concentration an algal sample will to some degree kill the most fragile species.

- Concentrating a sample will in practice include all species with a minimum diameter of >7 µm.

- Because of the problems indicated above there may be quite large variations with respect to which species are represented in the test depending on the methods used by the Test Facilities.

NIVA also presented advantages and disadvantages with the approach using option 1:

Advantages:

1. It is easy to standardise as the method requires low degree of technical equipment (filter with 10 µm in diagonal diameter)
2. Increases the number of alga in test with respect to both land based and shipboard testing.

3. The need for surrogate organisms will be reduced and testing will to a larger degree be performed on natural populations.
4. This common ”pre-treatment” of the sample does not exclude use of other techniques used to estimate number of viable organisms

Disadvantages:

1. Some mortality may occur because of the physical manipulation of the sample.
2. Increases the challenge of the BWMS system

The group were presented with this interpretation of the IMO guideline and the group was asked to give comments on option 1.

Stephan Gollasch indicated two possible objections using option 1. First of all, the procedure would deviate from the explicit IMO guideline specifying that organisms should be 10-50 µm in minimum dimension. Secondly, he made reference to his own experience were a comparison had been made on for a sample of treated ballast water that indicated a reduction in viable cells after concentrating the sample using a net.

Several test facilities supported using option 1, however, there was agreement that they would like to be presented with results using the two options in parallel in order to better understand how option 1 would differ from the usual practice.

It was agreed that a similar approach was not feasible for the >50 µm group as this in many cases would include i.e. chain-forming algae that belong to the lower size group.

NIVA volunteered to present the group with comparable analysis using the two options in parallel at a later opportunity.

<u>How to measure minimum dimension? (presentation by Stephan Gollasch)</u>

For organisms above 10 micron the minimum dimension measurement should be based upon an investigation of the organism "body", thereby ignoring sizes of thin spines, antenna etc (Fig. 1). In e.g. flat worms or diatoms the minimum dimension should be the smallest part of their "body", i.e. the dimension between the body surfaces when looked at the individual from the side. In ball shaped organisms the minimum dimension should be the spherical diameter. This approach is in-line with the views expressed at the relevant IMO discussions.

Further, the summary of discussions at a recent meeting in the framework of the Interreg IVB funded project *Ballast Water Opportunity*, at NIOZ, Texel, The Netherlands, is that the smallest visible axis of an organism should be identified and the widest point on this axis should be measured as minimum dimension. For examples see Figure 1. This group concluded that this view is also in-line with the relevant IMO documents.

In chain forming organisms the individual cells should be measured for categorizing the organisms into the IMO D-2 size groups.

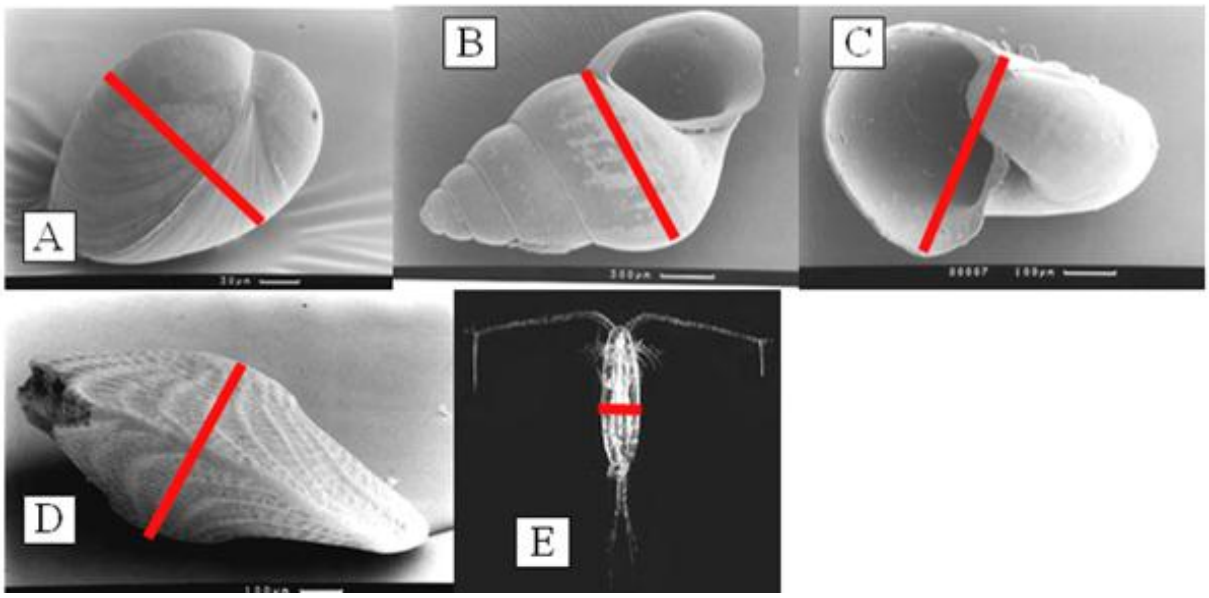

Fig.1. Minimum dimension measurements (red line) for selected organism types: A = mussel larvae, B and C = gastropod larvae, D = foraminifera (phytoplankton) and E = copepod. (Photos A - D: Stephan Gollasch, E: www.wikipedia.org).

Break-out groups

Formalization Group

The group consisted of Torben Madsen (DHI), Sjur Tveite (NIVA), Fredrik Haag (IMO-GloBallast), Ross A. Kanzleiter (MERC), Shinichi Hanayama (Japan), Yuongsoo Kim (KOMERI), Kyoungsoon Shin (KORDI).

The following discussion points were given to the Formalization Group:

- How to formalise the group
- What areas can/should we not agree on?
- Now can administrations be involved
- Cross-verification/inspections

After extensive discussion (see Annex 3), the following group made the following recommendations to the test facility forum members:

1) To establish a **Interim Steering Group** with representatives of test facilities on all continents
2) To establish an **Interim Secretariat**
3) To elect an **Interim Chairman,** who will, supported the Interim Steering Group and the Interim Secretariat, further the work on establishing a permanent network.
4) To develop an MOU between the test facilities, with the specific aim of formalising the cooperation. The Interim Steering Groups should aim a circulating a draft MOU by February 2011.

The meeting endorsed all points above. The Interim Steering Committee (until next meeting) will consist of:

- **Sjur Tveite** (NIVA), representing the European test facilities
- **Kyoungsoon Shin** (KORDI), representing the Asian test facilities
- **Ross Kanzleiter** (MERC), representing the North America test facilities

- One representative of the Interim Secretariat

The meeting also elected **Sjur Tveite** as the Interim Chairman, and the GloBallast PCU agreed to act as the Interim Secretariat. The Interim Steering Group was tasked to work on the issues identified by the Formalization Group (see annex 3), and report back to the group as appropriate.

QA/QC Group

The following discussion points were given to the Group:

- Agree on a template for questionnaire
- Identify minimum guidelines for quality assurance and quality control at Land-Based Ballast Water Treatment Test Facilities
    a. The objective of this document is an agreement among the test facilities in the test facilities forum to commit to a minimum level of quality.
- The minimum guidelines for QA/QC were drafted by the breakout group and presented to the attendees of the Second Global Test Facility Forum. These guidelines will be circulated to the members of the forum for review and approval as an annex to the Memorandum of Understanding.
- The *Minimum Guidelines for Quality Assurance/Quality Control at Land-Based Test Facilities* are presented in Annex 5 of this document.

Biology Group

The following discussion points were given to the Group:

1) Class sizes
2) Viability assessment
3) Sampling

A summary of the discussions can be found in Annex 4.

Summary of the ETV and STEP

Ross Kanzleiter provided an overview of the US ETV and STEP programmes.

Any other business

A number of other issues where raised at the meeting.

Dissemination of findings to IMO

The finding and discussions in the Test Facility Forum meetings should be communicated to IMO and its relevant meetings/sub-committees. How can that be accomplished? Fredrik Haag confirmed that the GloBallast Project Coordination Unit, acting as the Interim Secretariat, will be able to submit information about the establishment of the test facility network to the IMO meetings, and will also use its time-slot allocated for information to the delegates of MEPC 62 (July 2011) to make a presentation on this topic.

Proposing G8/G9 modifications

It was discussed whether the findings of the Group can be used to propose amendments to e.g. the G8/G9 Guidelines. The IMO representatives assured the meeting that IMO and its relevant sub-committees will be most interested in receiving inputs from the expertise in the Test Facility Group, and that there are many ways, either through the IMO Secretariat or the national administrations, to pass information on to the IMO meetings. It was also stressed that the Interim Secretariat (GloBallast PCU) is ideally situated within the IMO for this purpose.

Reports from Test Facility Meetings

It was agreed that from now on, all reports of the test facility meetings should include an Executive Summary that can be disseminated outside the Group. The rest of the reports and all annexes should be kept internal unless otherwise specifically agreed.

Work plan and next meeting

It was agreed that the highest priority at the moment is for the Interim Steering Committee to make progress on the issues related to the MOU and formalisation of the network. The ISC will suggest a suitable time and venue for the next meeting, tentatively back to back with MEPC 62 or the next IMO-GloBallast R&D Forum (October 2011).

In the interim, the issues identified by the other break-out groups should be addressed by the lead organisations.

The meeting was closed at 16:00 on 1 November 2010.

Annex 1

2nd GLOBAL TEST FACILITY FORUM

Tropical Marine Science Institute, National University of Singapore
S2S, 18 Kent Ridge Road
Singapore 119227

Singapore, 31 October – 1 November 2010

AGENDA

Saturday, 30 October

Arrival of participants

Day 1: Sunday, 31 October

09:00	Bus departure from Grand Copthorne Waterfront Hotel to TMSI	
09.30	Welcoming remarks from the hosts	DHI and TMSI, Singapore
	Selection of a chairman	All
	Update from the test facilities and introduction of new members	All
	Update from IMO	IMO-GloBallast
10:30	*Coffee break*	
11:00	Formalisation of the test facility network • Name, membership and modus operandi • Website	
12:30	*Lunch*	
13:30	**Progress with joint activities** Compile and share QA \ QC protocols	GSI
15:30	*Coffee break*	
	Status report on challenge water manipulation	NIVA
17:00	End of day 1 – bus departure to Grand Copthorne Waterfront Hotel	

Day 2: Monday, 1 November

09:00	**Progress with joint activities, cont'd**	
	Model results and test run report for Administrations	NIOZ
10:00	*Coffee break*	
10:30	Standardization of the sampling approach (not discussed in full in 1st meeting)	All
12:00	*Lunch*	
13:30	Discussion on further items for harmonization - The US ETV protocol as a basis for harmonization?	All US Representative
15:30	*Coffee break*	
16:00	Agreement on the work plan and date and place for next meeting	All
17:00	End of day 2 – bus departure to Grand Copthorne Waterfront Hotel	
19:00	ICBWM 2010 - Cocktail Reception and opening of exhibition at Grand Copthorne Waterfront Hotel, Level 2	ICBWM2010 delegates

Annex 2

LIST OF PARTICIPANTS

2nd Global Test Facility Forum
Singapore, 31 October – 1 November 2010

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Annex 3

SUMMARY FROM THE DISCUSSIONS IN THE FORMALISATION BREAK-OUT GROUP

The group suggested that the overall aim of the network should be **to set minimum testing standards by means of mutual recognition.**

The group should be guided by the following key principles:

Regardless of the various national guidelines applicable in each country/region, we group will aim to ensure comparable results for replicable testing of environmental efficacy, and, if possible, the evaluation of how the systems are to be implemented in the long run.

A fundamental principle for the group is the **sharing of information,** although it is recognized that some information and data will be bound by confidentiality agreements with vendors. However, for membership in the group, the sharing of generic issues (principles) of QA/QC is crucial. In particular, this should include:

- QMPs
- generic QAPP
- principles of the understanding of G8/G9 is also important.

The members of should commit to implementing the minimum standards agreed by the group.

Membership:
Membership is open to **organizations taking part in the generation of data for the certification (land-based and ship-board) for BWM system approvals.**

In addition, the **GESAMP- BWWG** and **GloBallast PCU** are invited as permanent observers. GESAMP has a clear and central mandate in relation to G9, but has extensive experience in G8 reporting and QA/QC. They are also the end recipient of testing reports. GloBallast PCU will provide initial administrative back-stopping and support.

Inclusion of other observers will be dynamic, on a case by case decision by the group.

Modus operandi:

- Interim Steering Group: **Asia** (KOMERI)**, Europe** (Sjur, NIVA), **North America** (Ross, MERC), plus Secretariat (Fredrik, GloBallast)
- It is also proposed to have a Chairmanship, which could rotate between the test facilities each year. It could be suggested that the chairing organization should, where possible and suitable, host the annual meeting of the Group.
- Interim Secretariat– GloBallast PCU
- It could be suitable to meet once per year. For the next meeting, Fredrik will check possibilities (possibly MEPC 62 or next R&D Forum). The group also suggests to arrange a half-day event and invite everyone (admin/vendors/industry) at the earliest opportunity.
- MOU – to be drafted by the ISG by February
- The issue of a **membership fee** needs to be addressed in the MOU.
- Principles for exclusion must also be proposed in the MOU

Proposed name, to be discussed
International Association of BW Test Facilities

Confidentiality and sharing of data
Some issues of confidentiality and sharing of data may need to be addressed, possibly regulated by the MOU?
Is it possible to share anonymous data? Before or after type approval? Should this be up to the vendor?

Is it feasible to have internal “soft” audits within the network? Neutral audits? Cross-verification? (GESAMP?)

Funding:
The issue of funding must be addressed, both in the short term and long term. For the time being, the GloBallast PCU has agreed to act as the Interim Secretariat, which removes the immediate need for funding.

Strategy of implementation:

- Step by step
- Land-based and ship-board testing have different “lives”
- The long-term goal is to be established as a “Recognized Organization”

The role of GESAMP
The group suggested that it would be beneficial if we could ask GESAMP to provide *their* question to the group,

Facilitating contacts and communications
All Test Facilities should appoint a main contact/focal point.

ANNEX 4

SUMMARY FROM THE DISCUSSIONS IN THE BIOLOGY BREAK-OUT GROUP

Focus of these notes was laid on phytoplankton, i.e. organisms less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension.

Test facility	Use of stains	Sample concentrated	Sample unconcentrated	Count
Korea	+	+	+	Microscope
Japan	+	+		Microscope
DHI (SG, DK)	+	+	+	Microscope
NIOZ	+		+	Machine
NIVA	+		+	Microscope
IMARES	+	+ (for treated water)	+	Microscope
GSI	+	+		Microscope
MERC	+	+	+	Microscope

Filtration

Disadvantage with filtration is potential damage of organisms which is suspected for all organisms. Trials have shown that phytoplankton is affected and more tests are expected to validate this result.

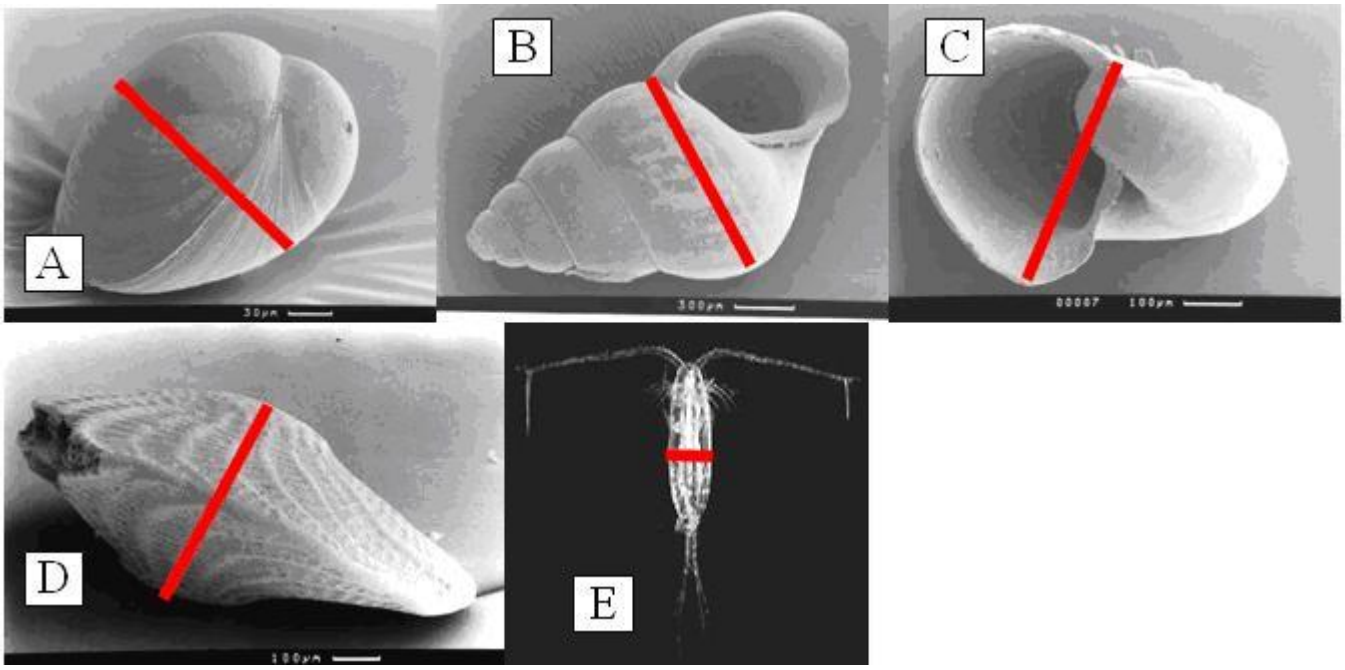
Debate but no agreement whether or not to assume all organisms retained on a 50 µm filter are to be sorted into the size class greater than or equal to 50 micrometres in minimum dimension.

Chain forming organisms

In chain forming organisms the individual cells should be measured for categorizing the organisms into the IMO D-2 size groups.

Minimum dimension

For all organisms choose smallest visible axis and measure the widest point on this axis.



Minimum dimension measurements (red line) for selected organism types: A = mussel larvae, B and C = gastropod larvae, D = foraminifera (phytoplankton) and E = copepod. (Photos A - D: Stephan Gollasch, H: www.wikipedia.org).

Viability

Test facility	Greater than 50	50 – 10	Resting stages	Inspection time
Korea	Organism intergrity, stain (Neutral Red), poking	Growth experiments, FDA-stain, organism movement	Not looked at	No second look at sample
Japan	Organism movement, organism intergrity, poking	Organism movement, organism intergrity	Incubation (not used yet)	No second look at sample
DHI (SG, DK)	Neutral red, movement, poking	DNA/FDA-Stain, epifluorescence, Lugol preserved samples	Counted including eggs etc, viability assessment not always possible	Considers second sample inspection
NIOZ	Neutral red, chloroplast, integrity of cell, poking	Stain (live/dead stains, i.e. Sytox Green), photosynthetic activity, minimum theoretical number (20 day experiment)	Incubation	Immediately after discharge, incubation for 5 to 20 days, recount
NIVA	Movement, no poking	Organism integrity	(Not seen any)	Immediately after discharge, recount after 24 hours for all test cycles, especially for UV-BWTS
IMARES	Movement, cell integrity, stain,	cell integrity, stain,	Incubation with light for a few	Immediately after discharge, if less

	poking		days	than 10 organisms run incubation and recount
GSI	Response to stimulus (poking, light), Lugol preserved samples	FDA stain, Lugol preserved samples	No viability assessment, counted	Immediately after discharge
MERC	Movement with poking	CMFDA stain, fixed (Lugol) samples for archiving samples, QA/QC	Regrowth assays, dilution series	Immediately after discharge

Test soup preparation

Test facility	Manipulation of water parameters	Manipulation of organisms numbers	Mixing	Test soup application
Korea	Carbon	+	+	230 m³ and/or 430 m³, i.e. used directly for test (runs tests sequentially)
Japan	+	+	+	500 l, 1 x zoos, 1 x phyto
DHI (DK)	+	+ (added to big test tank)	+	1000 l and injected
DHI (SG)	+ (inline injection)	+ (as per test results)	+	1000 l and injected
NIOZ	+ (only TSS)	-	+	500 l, injection prior treatment system
NIVA	+	+	+	500 m³, i.e. used directly for test
IMARES	+	+	+	20 m³
GSI	+	+	+	Injection separate per organisms and water parameters
MERC	+	-	+	1000 l injected

Surrogates

“Use of non-native surrogate” needs to be defined, possibly Artemia in use is considered as non-native. Labcultures vs enrichment of species occurring in the wild at the test site.

Test facility	Use of native surrogate	“Use of non-native surrogate”	% of surrogates	
Korea	+ Artemia, Tetraselmis		50 – 90 %	
Japan	+ Artemia, Tetraselmis		Up to 100 %	
DHI (SG)	+		Up to 90 %	
DHI (DK)	+ Artemia,		Up to 90 %	

	Tetraselmis, enrichment of native ambient species as preferred option			
NIOZ	-	-		
NIVA	+ Artemia, Tetraselmis, enrichment of native ambient species as preferred option		Up to 90 %	
IMARES	+ various species of different groups	-	Up to 100 %	
GSI	+	-	Up to 90 %	
MERC	-	-	-	

Reporting of results

For most test facilities the results are reported to Administration and the Administration decide upon test validity. IMARES sends the test results to the vendor and it is the vendors responsibility to send the data and reports to the Administration.

Results of all test runs are reported, including unsuccessful tests.

Closing remarks

The session was closed with a discussion about the temperature effect (high and low) on the use and efficiency of active substances.

Provided agreements can be reached on methods the technicians to apply the methods may be trained jointly.

A ring test may further be undertaken, i.e. send standardized samples to different facilities and compare the counting results. However, a test of viability methods with this approach is impossible.

ANNEX 5

Draft Minimum Guidelines for Quality Assurance/Quality Control at Land-Based Test Facilities

Objective: All members of the Global Test Facility Network will agree to maintain the level of quality assurance (QA) and quality control (QC) described in this guidance document. In addition, all new members will commit to the establishment of these minimum guidelines upon joining the network.

1. **Quality Management Plan (QMP), Publically Available**
    - Quality Management Plan should contain the following information (this list is not complete):
        1. Organization's commitment to quality in terms of staff and resources.
        2. Description of roles and responsibilities of test facility staff.
        3. Communication with ballast water treatment system (BWTS) developer (i.e., process for maintaining separation between developer and test facility staff, how to address complaints from developer, etc.)
        4. How to handle deviations.
        5. How to archive data and length of archive time.
        6. Corrective actions in response to deviations (i.e., process for quality improvement).

2. **A Quality Assurance Project Plan (QAPP), Publically Available Whenever Possible**

3. **Independent Internal Audits**

4. **External Audits (either from administration, government agency, classification society, consultant, or another test facility)**

5. **Peer Review Process (review of quality system documentation and standard operating procedures)**
    - Set up a list of experts within the Global Test Facility Network (e.g., quality assurance, test facility operation/engineering, sample collection, zooplankton analysis, phytoplankton analysis, microbial analysis, toxicity testing, chemistry, etc.) to facilitate review of SOPs and quality system documentation.

6. **Standard Operating Procedures (SOPs) for routine procedures related to certification/verification testing (e.g., preparation of test water, sample collection, sample analysis, etc.)**

7. **Data Quality Criteria and Objectives**
    1. Analyst (Operator) Bias: Conduct a second count of zooplankton, phytoplankton sample during certification/verification testing.
    2. Facility Bias: Identify sources of error that are attributed to the test facility, such as, dirty pipes, cross contamination, etc. Validate that facility bias is minimized to the greatest extent possible.

3. Experiment Bias: Identify sources of error are attributed to sample handling, sampling methods, time from sample to analysis, preparation of source water, etc.. Validate that experiment bias is minimized to the greatest extent possible.
4. Precision: Quantify variability among replicate samples (i.e., taken in triplicate) to ensure homogeneity of control and treatment water.
5. Completeness: Quantify the number of samples that are valid versus the number of samples that were collected (recommend greater than 90%).

8. Continual Improvement (e.g., based on feedback and results of internal and external audits and data quality objectives)