

**Appendix 3**

**Test Cycle Report  
Ballast Water Treatment System**

Treatment system: OceanSaver®  
Ship name: Höegh Trooper

Date and time for ballast water uptake: November 14, 2007, 17:31-18:55  
Position of ship during ballast water uptake: 13°27,5'N 042°39,0'E - 13°15,2'N 042°58,0'E.  
Distance travelled during uptake was 22.3 nm. Water depth 54 to 224 m. Distance to nearest main land 16-20 nm.

Date and time for ballast water discharge: November 16, 2007, 09:19-10:31  
Position of ship during ballast water discharge: 16°00,4'N 053°36,4'E - 16°09,3'N 053°57,0'E. Distance travelled during discharge was 21.8 nm. Water depth 2425 to 2590 m. Distance to nearest main land 41.3-46.0 nm.

Holding time of ballast water between uptake and discharge (hours): approximately 41

Weather conditions during the test: Good

**Water quality and number of organisms in uptake water**

	Temp °C	Salinity PSU	TOC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml	E.coli cfu	Enteroc. cfu	V.cholera cfu
Control	28,0	37	1.9	114	1549	NIOZ	0	0	0
Treated	28,0	37	1.5	115	841	NIOZ	0	0	0

**Water quality and number of organisms in discharge water**

	Temp °C	Salinity PSU	TOC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml	E.coli cfu	Enteroc. cfu	V.cholera cfu
Control	29,5	37	1.3	115	332	NIOZ	0	0	0
Treated # 1	30,0	37	1.3	118	0	NIOZ	0	0	0
Treated # 2	30,0	37	1.4	115	0	NIOZ	0	0	0
Treated # 3	30,0	37	1.1	118	0	NIOZ	0	0	0

Remarks: The 10-50µm category organisms (phytoplankton) was analysed at the NIOZ laboratories and are reported upon separately.

Date and signature of the sampling crew leader

22. Dec. 2007



S. Gollasch

## Test Cycle Report Ballast Water Treatment System

Treatment system: OceanSaver®  
Ship name: Höegh Trooper

Date and time for ballast water uptake: November 16, 2007, 21:11-22:11.  
Position of ship during ballast water uptake: 17°42,3'N 056°53,6'E - 17°56,4'N 057°07,3'E.  
Distance travelled during uptake was 19.3 nm. Water depth 73 to 85 m. Distance to nearest main land 32.5-35.0 nm.  
Date and time for ballast water discharge: November 17, 2007, 19:12-20:25.  
Position of ship during ballast water discharge: 23°15,7'N 059°13,3'E - 23°30,5'N 058°53,3'E. Distance travelled during discharge was 23.7 nm. Water depth 225 to 1359 m. Distance to nearest main land 7-13 nm.

Holding time of ballast water between uptake and discharge (hours): approximately 24

Weather conditions during the test: Good

### Water quality and number of organisms in uptake water

	Temp °C	Salinity PSU	TOC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml	E.coli cfu	Enteroc. cfu	V.cholera cfu
Control	28,9	38	1.8	112	2208	NIOZ	0	0	0
Treated	28,9	38	1.6	116	365	NIOZ	0	0	0

### Water quality and number of organisms in discharge water

	Temp °C	Salinity PSU	TOC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml	E.coli cfu	Enteroc. cfu	V.cholera cfu
Control	29,2	38	1.3	112	361	NIOZ	0	0	0
Treated # 1	29,2	38	1.5	122	0	NIOZ	0	0	0
Treated # 2	29,2	38	1.4	117	0	NIOZ	0	0	0
Treated # 3	29,2	38	1.4	113	0	NIOZ	0	0	0

Remarks: The 10-50µm category organisms (phytoplankton) was analysed at the NIOZ laboratories and are reported upon separately.

Conclusion: Due to a change in the ships operational procedures, a decision was made by the engineer on duty to shift HFO (Heavy Fuel Oil) from starboard bunker fuel oil tank to port settling tank. Due to a consequential occurring heel to port, the ballasting of the port side tank (test tank), was abounded. The test cycle did however proceed as planned, however, the sampled volume of water was somewhat reduced (to approximately 700 l). The G8 guideline specifically notes that shipboard tests shall not interfere with normal shipboard ballasting routines. Thus, the test should be considered valid despite the reduced sampled volume of water.

Date and signature of the sampling crew leader

22. Dec. 2007



S. Gollasch

## Appendix 3

## Test Cycle Report Ballast Water Treatment System

Treatment system: OceanSaver®

Ship name: Höegh Trooper

- Date and time for **ballast water uptake**: April 12, 2008, 04:28-05:28
  - Position of ship during ballast water uptake ca. from 52°40,5'N, 003°40,0'E to 52°20.5'N, 003°30,5' E.
  - Distance travelled during uptake was ca. 21 nm. Water depth ca. 21 to 27 m.
  - Distance to nearest main land 33 nm.
- Date and time for **ballast water discharge**: April 14, 2008, 03:18-04:16
  - Position of ship during ballast water discharge: from ca. 50°37,3'N, 000°28,5' E to ca. 50°32,2' N, 000°17,5' W.
- Holding time of ballast water between uptake and discharge (hours): approximately 47.
- Weather conditions during the test: Very good.

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### Water quality and number of organisms in uptake water

	Vol sampled	Temp °C	Salinity PSU	POC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml*	E.coli cfu/100 ml	Enteroc. cfu/100 ml	V.cholera cfu/100 ml
Control	1713	9,5	35	1,6	42	4933	676,7	1	0	0
Treated	2028	9,5	35	0,0	43	3503	142,2	0	0	0

\* Analyzed at NIOZ.

### Water quality and number of organisms in discharge water

	Vol sampled	Temp °C	Salinity PSU	POC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml*	E.coli cfu/100 ml	Enteroc. cfu/100 ml	V.cholera cfu/100 ml
Control	1387	10,0	35	0,0	27	667	194,4	0	0	0
Treated # 1	2607	10,0	35	0,0	27	0	0,0	0	0	0
Treated # 2	2505	10,0	35	0,0	26	0	2,8	0	0	0
Treated # 3	2753	10,0	35	0,2	30	0	2,2	0	0	0
Treated, average						0	1,7	0	0	0

## Remarks:

The new sampling gear performed very well even in water with an extremely high sediment and organism load. It is assumed that the introduced mucus-forming plankton-algae *Coscinodiscus wailesii* bloomed in the water during the experiment as the inside of the nets was coated with a jelly-like layer. All filtering during sample processing, including filtering of organisms below 50 microns, was therefore also difficult.

## Conclusion:

The treated water met the D-2 standard at discharge and the organism concentration in the control tank at discharge. All water volumes were in line with the requirements for a valid test.

Date and signature of the sampling crew leader

2008-5-5 S. Gollasch

## Appendix 3

## Test Cycle Report

### Ballast Water Treatment System

Treatment system: OceanSaver®

Ship name: Höegh Trooper

- Date and time for **ballast water uptake**: April 14, 2008, 05:52-06:48
  - Position of ship during ballast water uptake ca. from ca. 50°33,3'N, 000°29,5'W to ca. 50°35,3'N, 000°47,8'W.
  - Distance travelled during uptake was ca. 12 nm. Water depth ca. 30 to 55 m.
  - Distance to nearest main land 8,3 nm.
- Date and time for **ballast water discharge**: April 15, 2008, 21:27-22:15
  - Position of ship during ballast water discharge: from ca. 49°35,4'N, 000°19,3'W to ca. 49°39,0'N, 000°32,4'W.
- Holding time of ballast water between uptake and discharge (hours): approximately 39.
- Weather conditions during the test: Very good.

#### Water quality and number of organisms in uptake water

	Vol sampled	Temp °C	Salinity PSU	POC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml*	E.coli cfu	Enteroc. cfu	V.cholera cfu
Control	3024	10,0	35	1,0	34	2756	469	0	0	0
Treated	3535	10,0	35	0,0	34	1696	322	1	0	0

\* Analyzed at NIVA in CFDA stained microscope preparations.

#### Water quality and number of organisms in discharge water

	Vol sampled	Temp °C	Salinity PSU	POC mg/l	TSS mg/l	<50µm organisms/m <sup>3</sup>	10-50µm organisms/ml*	E.coli cfu	Enteroc. cfu	V.cholera cfu
Control	2558	11,2	35	0,0	34	1295	58	0	0	0
Treated # 1	2174	11,2	35	0,0	38	0	0	0	0	0
Treated # 2	2300	11,2	35	0,6	31	0	1	0	0	0
Treated # 3	2344	11,2	35	0,3	32	1,28 *	0	0	0	0
Treated average						0,43	0,33	0	0	0

\* Analyzed at NIVA in CFDA stained microscope preparations.

#### Remarks:

In replicate 3 at the discharge of the treated tank 1 living organism <50 µm was found in the sample, applying the dilution factor this results in 1,28 ind./m<sup>3</sup>.

#### Conclusion:

The treated water met the D-2 standard at discharge and the organism concentration in the control tank at discharge as well as all water volumes were in line with the requirements for a valid test.

Date and signature of the sampling crew leader



May 8th 2008,

S. Gollasch

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## Appendix 3

## Test Cycle Report

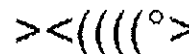
### Ballast Water Treatment System

Treatment system: OceanSaver®

Ship name: Høegh Trooper

- Date and time for **ballast water uptake**: September 5, 2008, 03:55-04:25
  - Position of ship during ballast water uptake from ca. 31°05,3'S, 017°07,0'E to 31°11,1'S, 017°16,8'E.
  - Distance travelled during uptake was ca. 10.5 nm. Water depth ca. 184 to 197 m.
  - Distance to nearest main land ca. 23 nm.
- Date and time for **ballast water discharge**: September 6, 2008, 05:20-05:51
  - Position of ship during ballast water discharge: from ca. 34°33,2'S, 022°59,1'E to 34°31,5'S, 023°11,2'E.
- Holding time of ballast water between uptake and discharge (hours): approximately 25.
- Weather conditions during the test: Good with swell in the range of 4-5 m.

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#### Water quality and number of organisms in uptake and discharge water

Parameter	Unit	Uptake water		Discharge water			Average #1-#3	
		Control	Treated	Control	Treated #1	Treated #2		Treated #3
Temperature	°C	16	16	17	17	17	17	
Salinity	PSU	35	35	35	35	35	35	
POC	mg/l	0,4	0,7	0,4	0,4	0,9	0,2	
TSS	mg/l	27,9	26,1	39,9	32,1	34,4	30,5	
Sample volume <50 µm	Litres	2029	2111	1673	1064	1161	1040	
Organisms <50µm	organisms/m <sup>3</sup>	1163	299	406	0	5	0	1,7
Sample volume 50-10 µm	Litres	10	10	10	10	10	10	
Organisms 10-50µm	organisms/ml*	5704	6420	888	0**	0**	0**	0
Sample volume bacteria	Litres	0,6	0,6	0,5	0,5	0,5	0,5	
<i>Escherichia coli</i>	cfu/100 ml	0	0	0	0	0	0	0,0
Intestinale <i>Enterococci</i>	cfu/100 ml	5	1	>1600	9	2	1	4,0
<i>Vibrio cholerae</i>	cfu/100 ml	0	0	0	0	0	0	0,0

\* Analyzed at: NIOZ. \*\* As per results of photosynthetic efficiency measurements at NIOZ no viable cells were found.

**Remarks:** One living individual was found in the discharge of the treated water (replicate 2). The high number of bacteriae in the discharge of the control water may be due to contamination during the inspection of the tank.

**Conclusion:** All sample volume requirements were met. The organism concentrations at uptake and discharge are in line with the IMO requirements, i.e. the D-2 standard was met.

Date and signature of the sampling crew leader

A handwritten signature in black ink, appearing to read 'S. Gollasch'.

2008-10-5 S. Gollasch