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NORD STREAM 2 -PROJECT

Environmental Baseline Surveys in the Finnish Exclusive Economic Zone

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Environmental Baseline Surveys in the Finnish Exclusive Economic Zone

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Summary

Sediment and water samples were collected in order to provide reference data for the Environmental Baseline studies for the Nord Stream 2 –project, based on document “W-PE-EIA-PFI-SOW-800-151115EN-01 Scope of Work Environmental baseline survey in Finnish EEZ”. In addition fixed automatic monitoring stations were installed in three locations. Presented time-series of water quality, current and underwater noise were recorded from December 2015 to May 2016. Recorded values were typical for season. In addition a strong salt water pulse was recorded in the central part of study area. Results on sediments sampling showed contamination on organotin levels and random elevated levels of PCB, PAH and Dioxin concentrations. Underwater noise monitoring showed a clear effect of heavy shipping in the central study area. Current monitoring showed how wind generated current could penetrate to deeper layer due to weak stratification in the winter time conditions.

List of abbreviations

EEZ	Exclusive Economic Zone
TOC	Total Organic Carbon
CTD	Oceanography instrument for conductivity, temperature, depth etc.
ADCP	Acoustic Doppler Current Profiler
PCB	PolyChlorinated Biphenyl
PAH	Polycyclic Aromatic Hydrocarbons
FFT	Fast Fourier Transform
RMS	Root Mean Square
SPL	Sound Pressure Level
LEQ	Equivalent Continuous Noise Level
L5, L50, L95	Percentile Noise Levels
SEL	Sound Exposure Level
EIA	Environmental Impact Assessment

1. Introduction

This report includes the final results of measurements from ADCP1 – ADCP3 and NOISE1 – NOISE3 stations with fixed sensors from the beginning of the monitoring period in December 2015 to the end of baseline monitoring campaigns in May 2016. The monitoring is based on the document Environmental Baseline Surveys in the Finnish Exclusive Economic Zone, W-PE-EIA-PFI-SOW-800-151115EN-01. Fixed monitoring stations were used to provide long-term water quality, current and underwater noise reference data for environmental baseline studies to be used for EIA phase on Nord Stream 2 -pipeline project.

ADCP1-3 stations were equipped with automatic water quality instruments measuring temporal changes in salinity, temperature, turbidity and dissolved oxygen in three depths: 2, 5 and 15 metres above the sea floor. In addition to water quality instruments these stations were equipped with 3D acoustic doppler current profilers (ADCP) which monitor current velocity and direction from the bottom to the surface in several layers. ADCP3 was collected earlier than ADCP1 - 2.

The NOISE1-3 stations were equipped with two passive acoustic recorders which monitored underwater background noise levels. NOISE1 and NOISE3 locations were planned to be close to NSP pipeline to monitor potential noise due to pipeline operation. NOISE1 provides also good background monitoring location for eastern part of monitoring area. In February 2016 the system was recovered from NOISE1_1 and re-deployed to NOISE1_2 location, which is in the direct vicinity of NSP northern pipeline. NOISE1_2 is located some 50 metres south from NOISE1_1. In addition similar setup was installed at NOISE3 location in February 2016. Like NOISE1_2 station, NOISE3 is located next to NSP northern pipeline. NOISE2 was installed only for background noise monitoring. Coordinates, water depth and recorded parameters at each station are shown in the Table 1.

In addition to the results from fixed stations this report includes sediment, CTD and water quality sampling results from the FIN_EBS_LUO_1 – FIN_EBS_LUO_7 areal stations collected in December 2015. Measurements were performed in seven sampling locations in the Gulf of Finland and the Northern Baltic Sea. Each areal station consisted of 8 sampling points for a total of 7 x 8 = 56 sediment samples collected.

Additionally we collected benthos samples in four areal stations (FIN_EBS_LUO_1_1 to FIN_EBS_LUO_4_8). Three replicates were taken from the first sampling location on each areal stations FIN_EBS_LUO1_1, FIN_EBS_LUO2_1, FIN_EBS_LUO3_1 and FIN_EBS_LUO4_1 and one sample was taken from other seven sampling locations. Thus in total 4 x 3 + 4 x 7 = 40 benthos samples. Benthos sampling and CTD profiling on each benthos location were repeated in June 2016. Results from both sampling rounds are presented in this report.

2. Material and Methods

The coordinates of the fixed monitoring stations are shown on the Table 1 and locations are shown in the Figure 1, which represents the sampling areas in the Finnish EEZ.

Table 1. Locations, depths and recorded parameters on ADCP1 - 3 and NOISE1 - 3 stations.

Station name	Position and water depth	Parameters and monitoring depth	Monitoring period
ADCP1	60.0179°N; 026.3649°E 67 m	*Water quality*: salinity, temperature, turbidity, dissolved oxygen concentration. 2, 5 and 15 metres above bottom *Currents:* 3D current velocity and direction, all depths with 2 metre vertical resolution	12/2015 → 5/2016
ACDP2	59.6000°N; 023.5333°E 78 m	*Water quality*: salinity, temperature, turbidity, dissolved oxygen concentration. 2, 5 and 15 metres above bottom *Currents:* 3D current velocity and direction, all depths with 2 metre vertical resolution	12/2015 → 5/2016
ADCP3	59.7333°N; 023.4833°E 45 m	*Water quality*: salinity, temperature, turbidity, dissolved oxygen concentration. 2, 5 and 15 metres above bottom *Currents:* 3D current velocity and direction, all depths with 2 metre vertical resolution	12/2015 → 5/2016
NOISE1_1 and NOISE1_2	NOISE1_1 60.0179°N; 026.3649°E 67 m	*Underwater noise 12/2015-2/2016 (device moved to NOISE1_2 (closer to NSP northern pipeline) in 2/2016):* *Sound pressure levels from 10 Hz to 10 kHz and 1/3 octave bands. 10 meters* above bottom (only one hydrophone available). *Station ID is NOISE1_1 in data files.*	12/2015 - 2/2016
	NOISE1_2 60.0167°N; 026.3667°E 65 m	*Underwater noise:* *Sound pressure and exposure levels from 10 Hz to 10 kHz and 1/3 octave bands. 2 and 10 metres above bottom. Station ID is NOISE1_2 in data files.*	2/2016 → 4/2016
NOISE2	59.6000°N; 023.5333°E 78 m	*Underwater noise:* *Sound pressure and exposure levels from 10 Hz to 10 kHz and 1/3 octave bands.* 2 and 10 metres above bottom	12/2015 → 5/2016
NOISE3	59.4833°N; 022.7833°E 85 m	*Underwater noise:* *Sound pressure and exposure levels from 10 Hz to 10 kHz and 1/3 octave bands.* 2 and 10 metres above bottom	2/2016 → 4/2016

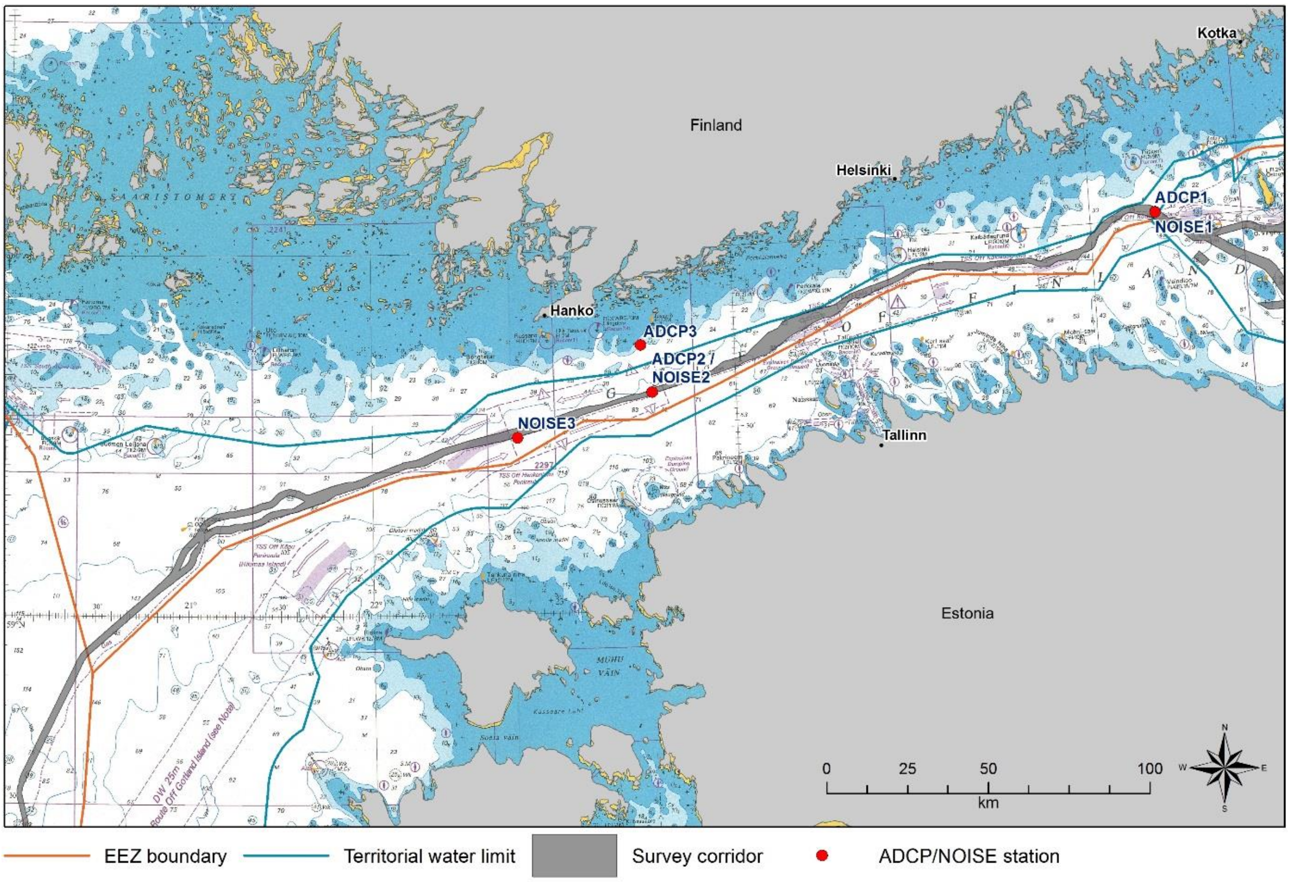


Figure 1. Location of the fixed monitoring stations ADCP1 – ADCP3 and NOISE1 – 3. (Map Ramboll Finland Oy).

The coordinates, water depth and recorded parameters for sediment, benthos and water sampling at each station are shown in Tables 2 and 3 and the sampling locations are shown on Figure 2.

Table 2. Locations, depths and recorded parameters for sediment and benthos sampling stations.

Station name	Position and water depth	Parameters & information
FIN_EBS_LUO_1_1	60.0156°N; 026.1557°E; 59 m	*Sediment samples:* heavy metals, physical properties, organotins, dioxins, furans, PAH-compounds and organic matter, nutrients and TOC Samples were sliced into 0-2 cm, 2-10 cm and 10-30 cm subsamples, if sediment quality and softness allowed *Benthos samples*: number of individual, wet biomass, total biomass, species and brackish water benthic index Three replicas were taken from stations: FIN_EBS_LUO_1_1 FIN_EBS_LUO_2_1 FIN_EBS_LUO_3_1 FIN_EBS_LUO_4_1
FIN_EBS_LUO_1_2	60.0204°N; 026.1831°E; 57 m	
FIN_EBS_LUO_1_3	60.0156°N; 026.1923°E; 50 m	
FIN_EBS_LUO_1_4	60.0345°N; 026.2197°E; 58 m	
FIN_EBS_LUO_1_5	60.0345°N; 026.2563°E; 61 m	
FIN_EBS_LUO_1_6	60.0204°N; 026.3112°E; 65 m	
FIN_EBS_LUO_1_7	60.0204°N; 026.3478°E; 66 m	
FIN_EBS_LUO_1_8	60.0298°N; 026.3661°E; 67 m	
FIN_EBS_LUO_2_1	59.9119°N; 025.6200°E; 69 m	
FIN_EBS_LUO_2_2	59.9072°N; 025.6379°E; 69 m	
FIN_EBS_LUO_2_3	59.9119°N; 025.6468°E; 66 m	
FIN_EBS_LUO_2_4	59.9072°N; 025.6826°E; 68 m	
FIN_EBS_LUO_2_5	59.9072°N; 025.7273°E; 44 m	
FIN_EBS_LUO_2_6	59.8978°N; 025.7362°E; 54 m	
FIN_EBS_LUO_2_7	59.8931°N; 025.7630°E; 60 m	
FIN_EBS_LUO_2_8	59.9025°N; 025.8077°E; 74 m	
FIN_EBS_LUO_3_1	59.9160°N; 025.1060°E; 55 m	
FIN_EBS_LUO_3_2	59.9117°N; 025.1417°E; 63 m	
FIN_EBS_LUO_3_3	59.9033°N; 025.1596°E; 48 m	
FIN_EBS_LUO_3_4	59.9033°N; 025.1864°E; 56 m	
FIN_EBS_LUO_3_5	59.9033°N; 025.2312°E; 63 m	
FIN_EBS_LUO_3_6	59.9160°N; 025.2401°E; 59 m	
FIN_EBS_LUO_3_7	59.9075°N; 025.2848°E; 48 m	

FIN_EBS_LUO_3_8	59.9117°N; 025.3295°E; 49 m	
FIN_EBS_LUO_4_1	59.7854°N; 024.3766°E; 60 m	
FIN_EBS_LUO_4_2	59.7900°N; 024.3857°E; 58 m	
FIN_EBS_LUO_4_3	59.7808°N; 024.4130°E; 67 m	
FIN_EBS_LUO_4_4	59.7993°N; 024.4403°E; 61 m	
FIN_EBS_LUO_4_5	59.7993°N; 024.4858°E; 60 m	
FIN_EBS_LUO_4_6	59.8132°N; 024.5313°E; 58 m	
FIN_EBS_LUO_4_7	59.7993°N; 024.5313°E; 60 m	
FIN_EBS_LUO_4_8	59.8228°N; 024.5455°E; 51 m	
FIN_EBS_LUO_5_1	59.6105°N; 023.6131°E; 83 m	*Sediment samples:* heavy metals, physical properties, organotins, dioxins, furans, PAH-compounds and organic matter, nutrients and TOC Samples were sliced into 0-2 cm, 2-10 cm and 10-30 cm subsamples, if sediment quality and softness allowed
FIN_EBS_LUO_5_2	59.6383°N; 023.8036°E; 76 m	
FIN_EBS_LUO_5_3	59.6383°N; 023.8398°E; 77 m	
FIN_EBS_LUO_5_4	59.6754°N; 023.8761°E; 71 m	
FIN_EBS_LUO_5_5	59.6662°N; 023.8761°E; 71 m	
FIN_EBS_LUO_5_6	59.6522°N; 023.9124°E; 70 m	
FIN_EBS_LUO_5_7	59.6476°N; 023.9214°E; 70 m	
FIN_EBS_LUO_5_8	59.6569°N; 023.9214°E; 70 m	
FIN_EBS_LUO_6_1	59.4802°N; 022.6275°E; 78 m	
FIN_EBS_LUO_6_2	59.4893°N; 022.6985°E; 77 m	
FIN_EBS_LUO_6_3	59.4847°N; 022.7695°E; 85 m	
FIN_EBS_LUO_6_4	59.4893°N; 022.7784°E; 82 m	
FIN_EBS_LUO_6_5	59.5074°N; 022.8583°E; 78 m	
FIN_EBS_LUO_6_6	59.5210°N; 022.9027°E; 77 m	
FIN_EBS_LUO_6_7	59.5119°N; 022.9027°E; 84 m	
FIN_EBS_LUO_6_8	59.5391°N; 023.0004°E; 84 m	
FIN_EBS_LUO_7_1	59.1869°N; 020.9642°E; 113 m	
FIN_EBS_LUO_7_2	59.1823°N; 021.0346°E; 121 m	
FIN_EBS_LUO_7_3	59.2054°N; 021.0434°E; 118 m	
FIN_EBS_LUO_7_4	59.1869°N; 021.0522°E; 111 m	
FIN_EBS_LUO_7_5	59.2562°N; 021.2460°E; 112 m	
FIN_EBS_LUO_7_6	59.2562°N; 021.2724°E; 114 m	
FIN_EBS_LUO_7_7	59.2654°N; 021.2812°E; 102 m	
FIN_EBS_LUO_7_8	59.2793°N; 021.3428°E; 99 m	

Table 3. Locations, depths and recorded parameters for CTD profiling and water sampling stations.

Station name	**Position and water depth**	**Parameters and monitoring depths**
FIN_EBS_LUO_1_1	60.0156°N; 026.1557°E; 59 m	*CTD profile*: salinity, temperature, turbidity, dissolved oxygen concentration, vertical profile *Water quality*: heavy metals, nutrients, organic matter and suspended solids. 1 metre above bottom
FIN_EBS_LUO_2_1	59.9119°N; 025.6200°E; 69 m	
FIN_EBS_LUO_3_1	59.9160°N; 025.1060°E; 55 m	
FIN_EBS_LUO_4_1	59.7854°N; 024.3766°E; 60 m	
FIN_EBS_LUO_5_1	59.6105°N; 023.6131°E; 83 m	
FIN_EBS_LUO_6_1	59.4802°N; 022.6275°E; 78 m	
CTD: FIN_EBS_LUO_7_1	59.1869°N; 020.9642°E; 113 m	
Water sample: FIN_EBS_LUO_7_7	59.2654°N; 021.2812°E; 102 m	

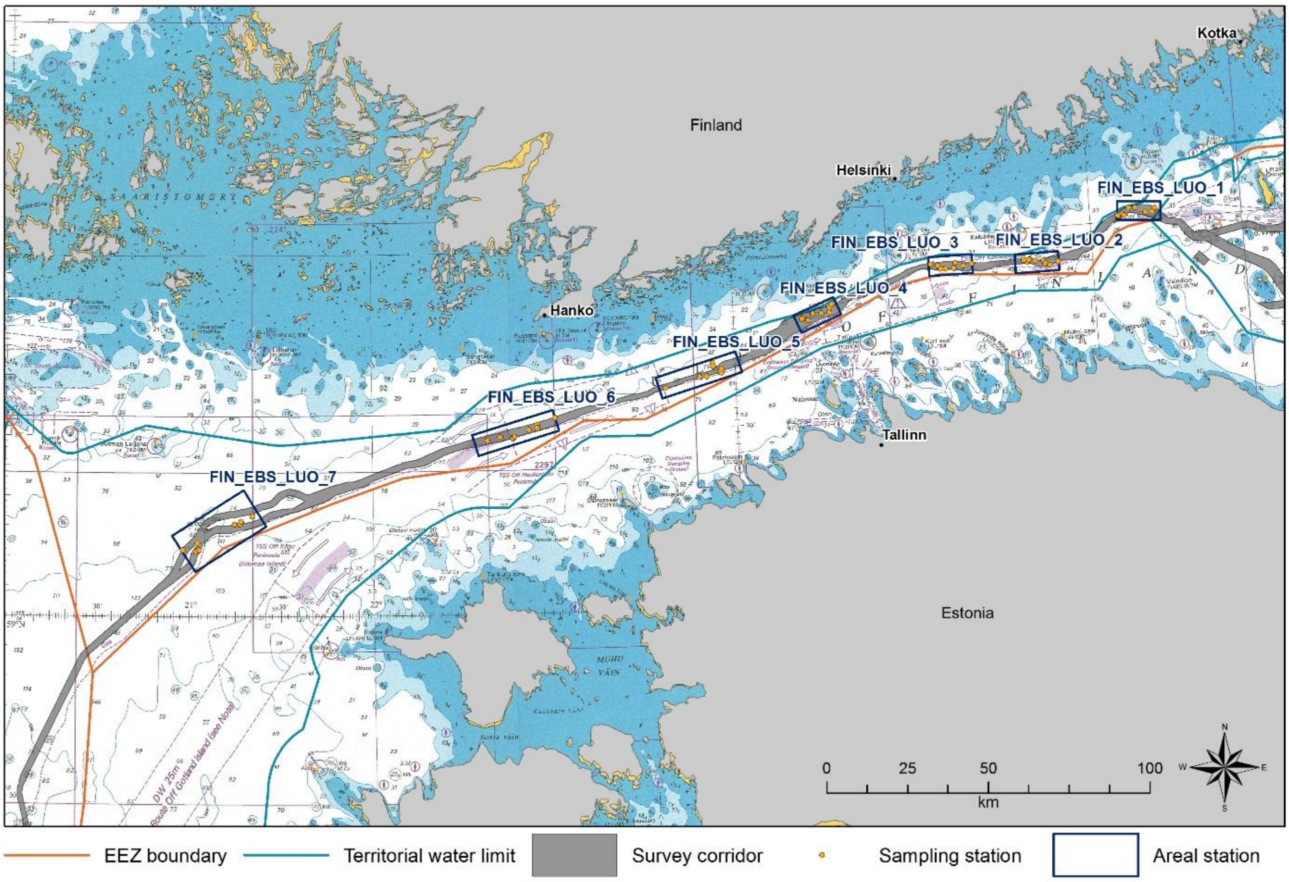


Figure 2. Location of the areal sediment, benthos, CTD and water sampling locations FIN_EBS_LUO_1 – FIN_EBS_LUO_7. (Map Ramboll Finland Oy).

2.1 Continuous monitoring with fixed stations

Continuous long-term water quality and current monitoring was done with moored instruments at locations ADCP1, ADCP2 and ADCP3. Water quality was recorded with self-logging Xylem EXO2 sondes (Fig.3). EXO2 sonde records salinity, temperature, oxygen and turbidity levels at each of the monitoring locations with a 60 minute interval. Turbidity and oxygen levels are measured with optical sensors. At the beginning of each hour the instrument makes a set of observations, calculates and stores an average value of these observations into internal memory, and then goes into resumes in order to save power. The cycle starts over at the beginning of the next hour. The sensors have an automatic cleaning system to prevent biofouling.

Figure 3. EXO2 multiparameter sonde for automatic salinity, temperature, turbidity and oxygen monitoring.

Current measurements were made with recording 3D ADCPs (Acoustic Doppler Current Profiler) at ADCP1, ADCP2 and ADCP3 stations. The ADCPs were of type 300 or 600 kHz RD-Instruments Workhorse Sentinel ADCPs that are equipped with pressure and temperature sensors (Fig. 4). These instruments measure currents from the bottom to the surface with a 2 metre vertical resolution at 60 minute intervals. The ADCP does not measure the lowermost 2 metre layer since the transmitted acoustic signal interferes with the incoming signal close to the instrument. These overlapping signals are deleted from the received information. One measurement is done in every 60 seconds and an averaged value is logged every 60 minutes, which allows the current velocity to be measured with an accuracy that is better than 1 cm/s. Ranges, resolution and accuracy of theEXO2 sonde and RD-Instrument Workhorse Sentinel ADCPs are listed in the Table 4.

Table 4. Parameters, ranges, resolution and accuracy of fixed water quality and current monitoring stations.

Parameter	Range	Resolution	Accuracy
Turbidity	0 – 1000 FNU	0.1 FNU	2% or 0.3 FNU
Salinity	0 – 70 ppt	0.01 ppt	2%
Conductivity	0 – 100 mS/cm	0.001 mS/cm – 0.1 mS/cm	0.5%
Temperature	-5 – +45°C	0.01°C	0.2°C
Oxygen	0 – 20 mg/l	0.01 mg/l	1%
Current velocity	0-500 cm/s	0.1 cm/s	better than 1 cm/s
Current direction	0-360°	0.1°	±5°

Figure 4. RD-Instruments Workhorse Sentinel ADCP for current measurements.

Current meters, automatic water quality instruments and passive acoustic monitoring devices were moored on the sea floor with concrete weights that are equipped with acoustic LRT releasers made by Sonardyne (Fig. 5). Acoustic releaser is an oceanographic device for the deployment and later recovery of instruments from the seabed where the recovery is triggered with an acoustic command. During the service visit systems are recovered to surface and data downloaded for analyses. After recovery, the instruments are checked and re-programmed for a new deployment.

Passive acoustic monitoring was done with a Loggerhead DSG Ocean Logger, which is a long-term autonomous acoustic recording unit (Fig. 5). DSG-Ocean autonomous hydrophone system stored 5 to 15 minutes of acoustic data in the beginning of each hour into SD card with 48/50 kHz sample rate with pre-amplification of 20 to 33dB. Newer model of the recording unit allow larger datasets to be collected with same power consumption, therefore datasets length vary from 5 to 15 minutes, depending on location. The frequency range of the selected hydrophone model, HTI-96-MIN, is 2 Hz to 30 kHz. Dataset length was set as long as system allowed in order to collect highest amount of data from each site.

Figure 5. Sonardyne acoustic releaser LRT with a distance transponder (Left) and Loggerhead DSG-ST acoustic logger (right) for passive acoustic monitoring.

Hydrophone-specific parameters, gain and sensitivity, were taken into account in data post processing. Before actual data processing the data was checked in case for unrealistic or false values caused by logger system or other high amplitude interference peaks. There erroneous interference peaks were removed. Interference was discovered during the post processing at NOISE1 and NOISE3 2 meters above the bottom. These results are not presented. Logger systems were calibrated against known sound source prior the deployment.

After pre-processing the data analysis was made with Matlab (version R2015a). Measured voltage values were transformed actual pressure (Pa). DC offset was removed from the signal and the data was corrected by the hydrophone sensitivity and gain used in the measurement.

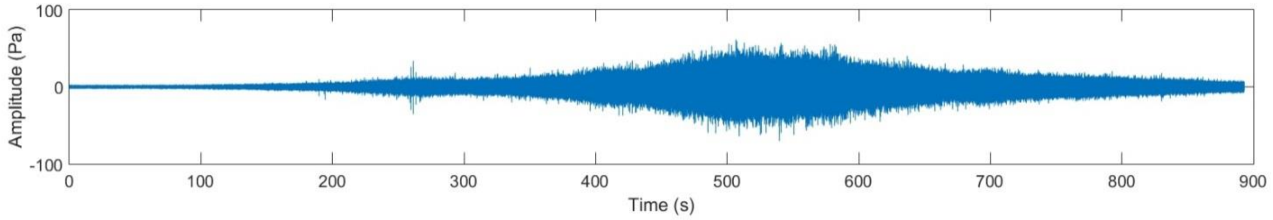


Figure 6. A single ship passing - pressure vs. time

Fast-Fourier-Tranform (FFT)-analysis was made over 1-second periods, giving 1 Hz resolution amplitude spectra. The sound pressure value p is compared to a reference pressure (pref). In water, the reference pressure is 1 µPa. RMS sound pressure levels (SPL) were calculated in the 10 Hz – 10 kHz 1/3-octave bands over 1 second. (Betke et al. 2015). An example in time domain of a ship passing by is shown in figure 6. Data example of 1-second SPL can be seen in Figure 7.

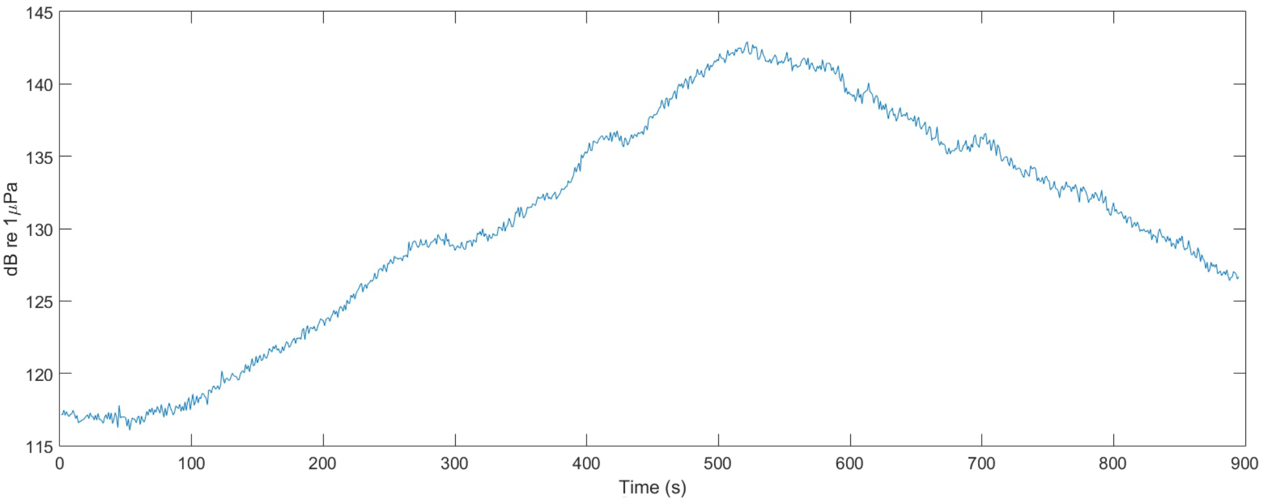


Figure 7. A single ship passing – 1s FFT SPL vs time

1-second results are not introduced but further processed to 5 minute and 1 hour equivalent continuous sound pressure levels (Leq5min and Leq1h), L95, L50 and L5 percent statistical levels. Leq (5min) is the average energy produced every 5 min over the whole measurement period. Leq (1h) is the average energy produced every 1 hour over the whole measurement period. Data processing steps are shown in Fig. 8-10. Each statistical Ln level indicates the percentage (5%, 50%, and 95%) of measurements for which the SPL has a higher value than the Ln level. In other words, L5 quantifies peaks of noise, L50 quantifies the average noise over the considered time and L95 quantifies the background noise.

All the further processed values are based on 1-second SPL values.

1) Leq (5min), L95, L50, L5: Broadband (10-10000 Hz) over a 5 min intervals for the whole measurement period
2) Leq (1h), L95, L50, L5: Broadband (10-10000 Hz) and 1/3 octave band frequency levels over a 1h min intervals for the whole measurement period
3) Leq (total), L95, L50, L5): Broadband (10-10000 Hz) and 1/3 octave band frequency levels over the whole measurement period

Sound Exposure Levels (SEL), another commonly used acoustic parameter, can be used if necessary to describe impulsive sound sources such as explosions and rock-placement operations during the actual construction phase. In this report sound pressure levels were used describe the results of the long-term monitoring.

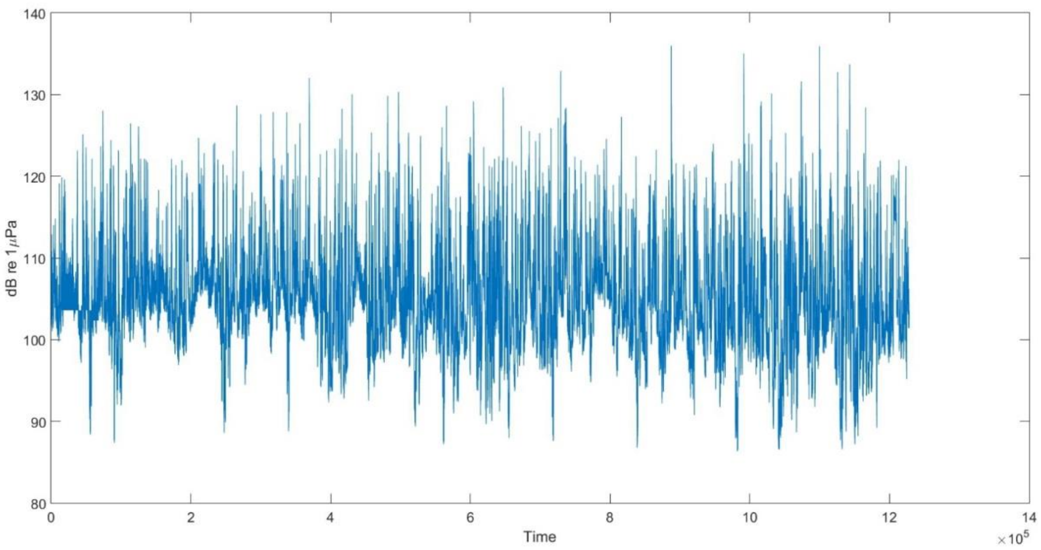


Figure 8. Data example at NOISE1_2 from February 2016 to May 2016 – 1s FFT vs time

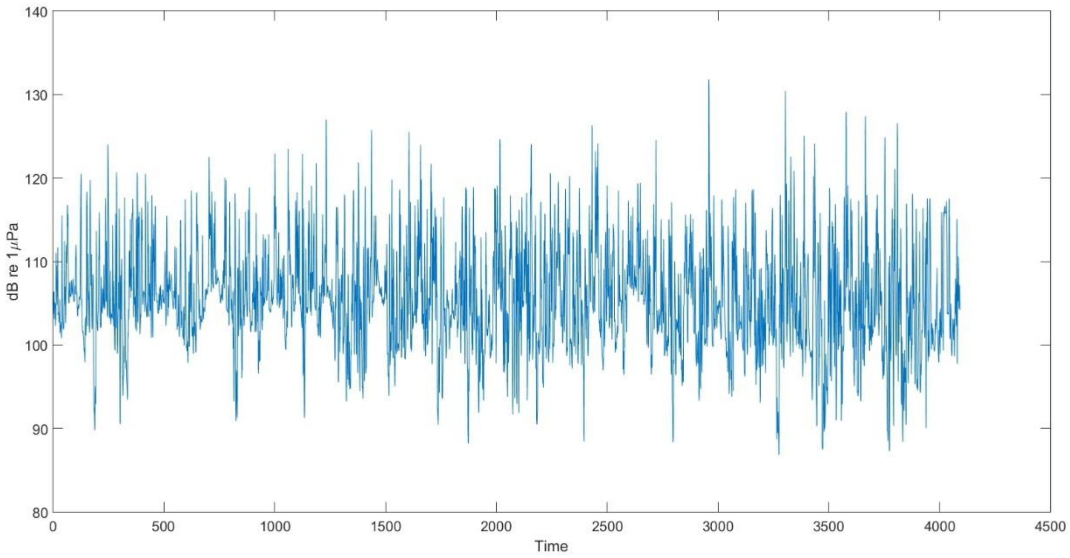


Figure 9. Data example at NOISE1_2 from February 2016 to May – 5min Leq vs time

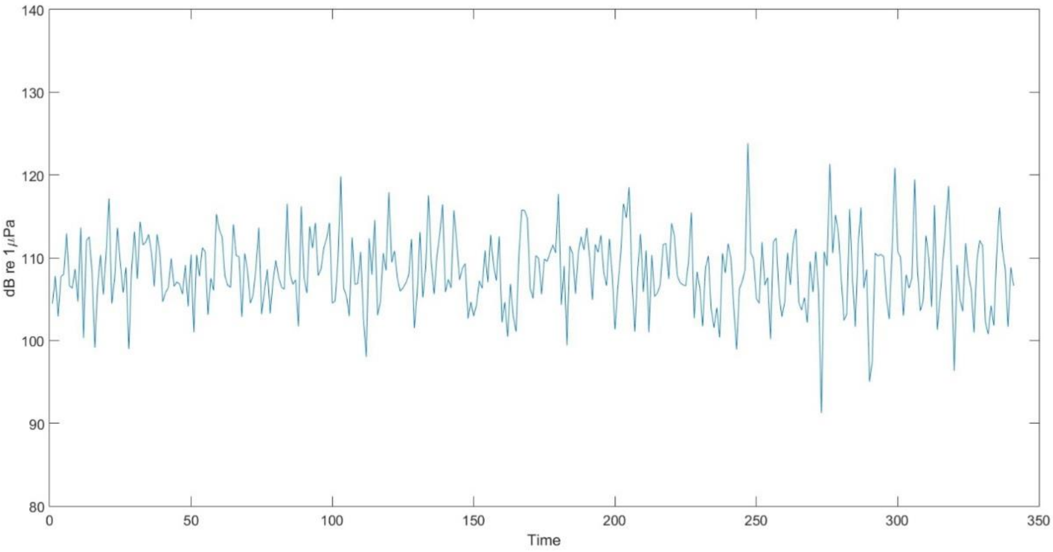


Figure 10. Data example at Noise 1_2 from February 2016 to May – 1h Leq vs time

Figure 11. shows an installation set-up of long-term monitoring stations including ADCP, acoustic transponder + releaser and EXO multiparameter sonde as well as acoustic monitoring devices. All instruments were calibrated before deployment according to instructions provided by the manufacturer.

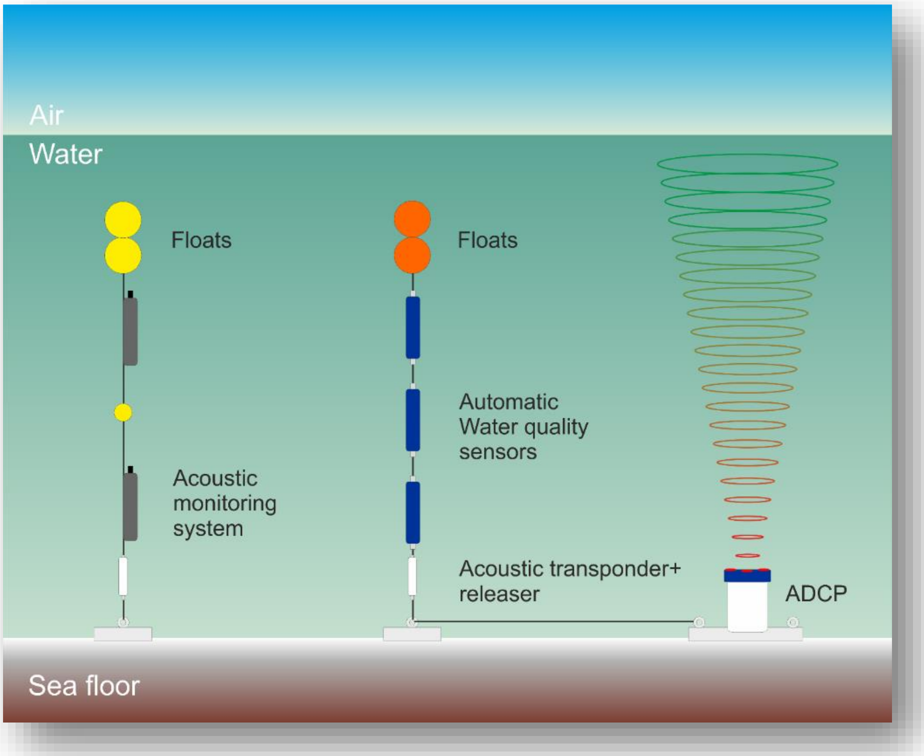


Figure 11. Example of measurement setup for long-term monitoring stations. Not in scale.

2.2 CTD –profiling and Water sampling

During the first monitoring and sampling cruise in December 2015, a set of CTD –profiles (Conductivity Temperature Depth) was collected. The dataset was collected in order to monitor vertical distribution of salinity, temperature, turbidity and dissolved oxygen values along the baseline survey corridor. The monitoring was made by lowering a self-recording JFE Advantech Rinko -profiler (Fig. 12) from the surface to the bottom in seven locations (See Table 3). The system records readings every 0.1 metres while lowered with a winch from the vessel.

One water sample was collected for laboratory analyses at each areal sampling locations FIN_EBS_LUO_1 to FIN_EBS_LUO_7 in addition to CTD profiling. In total seven samples were collected (see Table 3 and Fig. 2). Water samples were taken one metre above the seafloor with a 2.7 litre Limnos sampler. The samples were bottled, labelled and stored in +3°C until transportation to the laboratory. Laboratory analyses were carried out for total heavy metals and nutrients and for organic and suspended matter.

Figure 12. Rinko CTD -profiler for vertical profiling of salinity, temperature, depth, turbidity and dissolved oxygen concentration.

2.3 Sediment and benthos sampling

Sediment sampling was carried out with a GEMAX type sampler (Fig 13), which was lowered with a hydraulic winch to the sea floor. The sediment samples were sliced into sub-samples, stored in containers, labelled and stored in +3°C until transport to the laboratory. In locations where hard sand or gravel prevented GEMAX sampling a control sample was taken with a Van Veen sampler (Fig. 13).

Laboratory analyses were carried out for heavy metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dioxins and furans. In addition organotins, tributyltin and its decay compounds were analysed together with total nutrients and physical characteristics of sediment quality (auxiliary parameters).

Sediment sampling was done as areal sampling based on water depth and oxygen concentration as described in the Scope of Work document for Environmental Baseline surveys in the Finnish EEZ, W-PE-EIA-PFI-SOW-800-151115EN-01. Sampling areas started from the eastern Gulf of Finland and ended in the deeper parts of Northern Baltic Sea (See Figure 2 and Table 2). Eight individual sampling locations were visited in each seven areal sampling stations FIN_EBS_LUO_1 to 7. I.e. in total samples for baseline studies were collected from 56 sampling locations.

Sediment samples were collected from the uppermost 0 – 2 cm vertical sections in all locations. In addition 2 – 10 and 10 – 30 cm sections were sent for analyses depending on sediment quality and softness. Maximum sampling depth varied from 2-30 cm.

A set of benthos samples were collected from 32 locations. Benthos samples were taken with the Van Veen sampler. Benthos sampling results from the sampling campaign performed in December 2015 has been reported in the document "Monitoring of Benthic Infauna in the Gulf of Finland, 2015 - Environmental Baseline Survey in the Finnish EEZ", produced by Fish and Water Research Ltd. Report can be found as Attachment 2 in the end of this report. Monitoring was repeated in June 2016. Results from both monitoring campaigns are shown in the Attachment 2.

Figure 13. GEMAX sediment sampler (left) and Van Veen benthos sampler (right).

3. RESULTS

3.1 Water quality time series from stations ADCP1, ADCP2 and ADCP3

The water quality data is shown separately for stations ADCP1, ADCP2 and ADCP3 starting from December 2015 to May 2016 when stations were recovered from seabed. Plots are generated for temperature, salinity, turbidity and dissolved oxygen concentrations (Fig. 14-25).

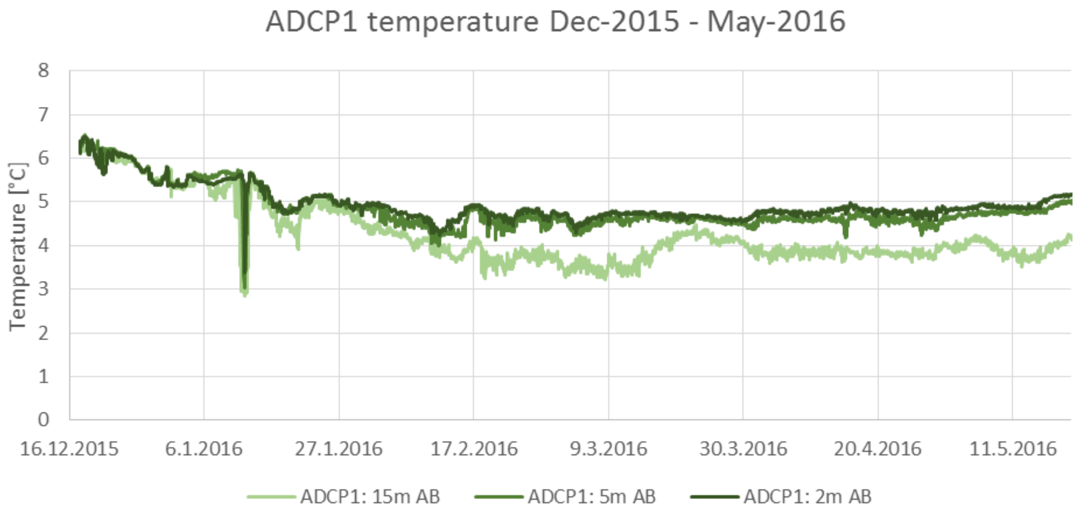


Figure 14. Temperature values from ADCP1 station from December 2015 to May 2016. AB stands for Above Bottom.

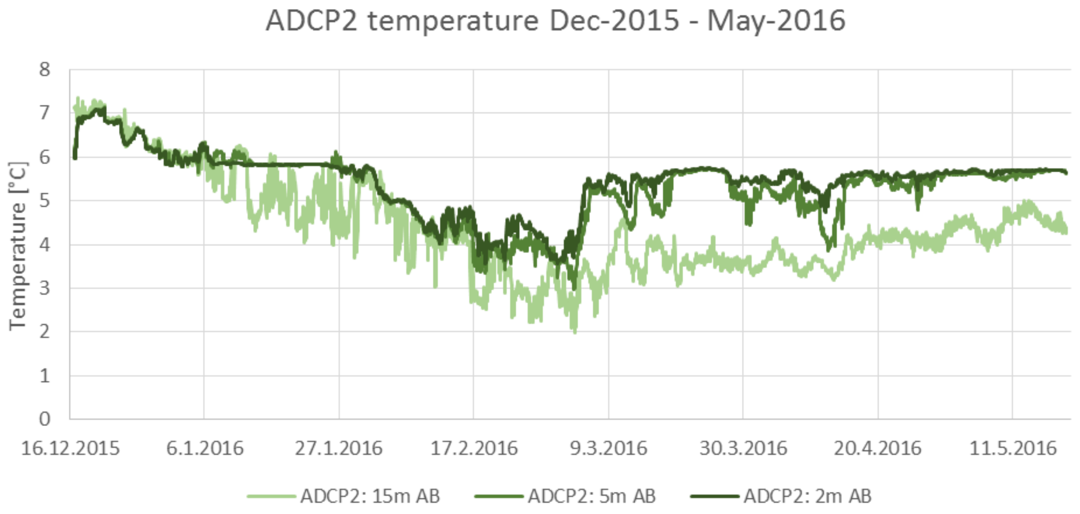


Figure 15. Temperature values from ADCP2 station from December 2015 to May 2016. AB stands for Above Bottom.

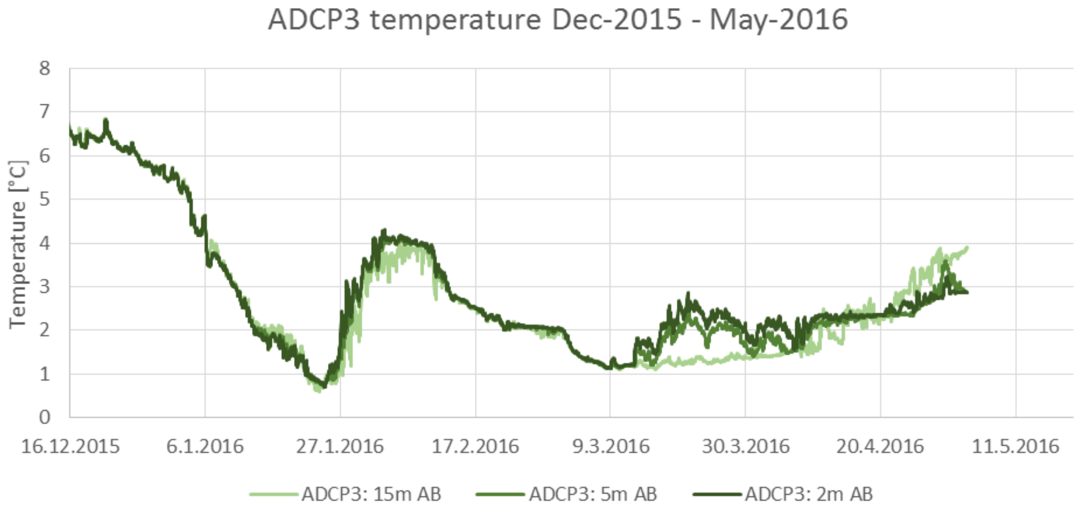


Figure 16. Temperature values from ADCP3 station from December 2015 to May 2016. AB stands for Above Bottom.

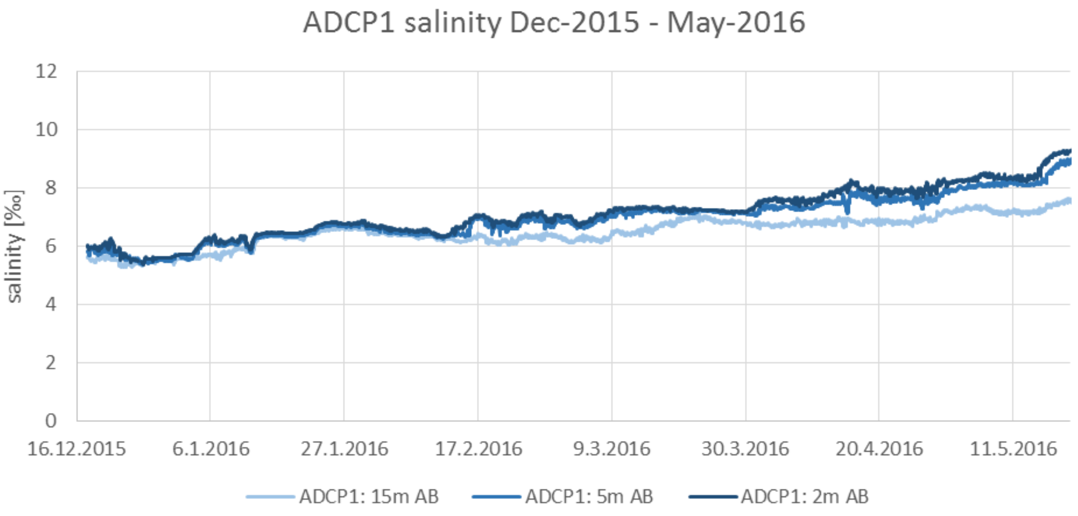


Figure 17. Salinity values from ADCP1 station from December 2015 to May 2016. AB stands for Above Bottom.

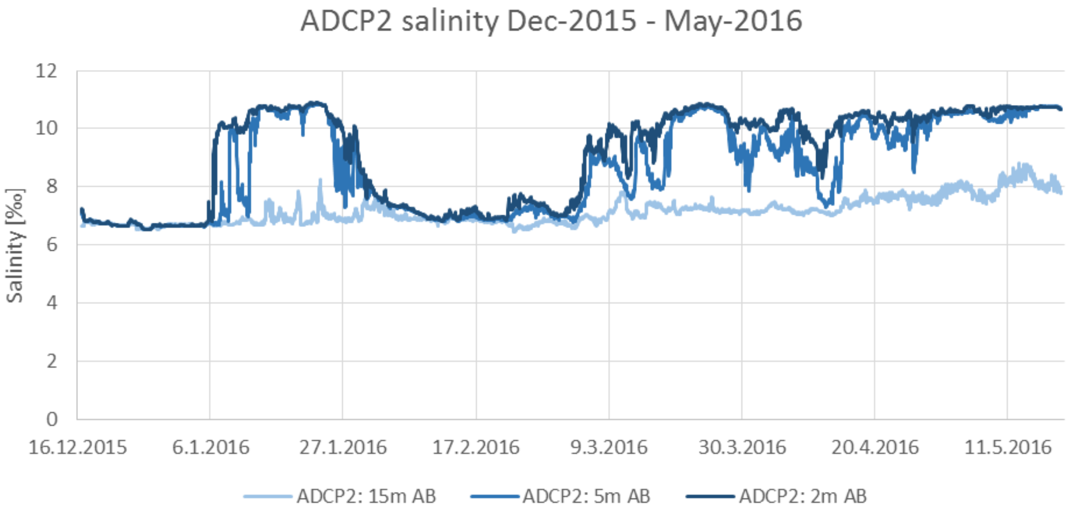


Figure 18. Salinity values from ADCP2 station from December 2015 to May 2016. AB stands for Above Bottom.

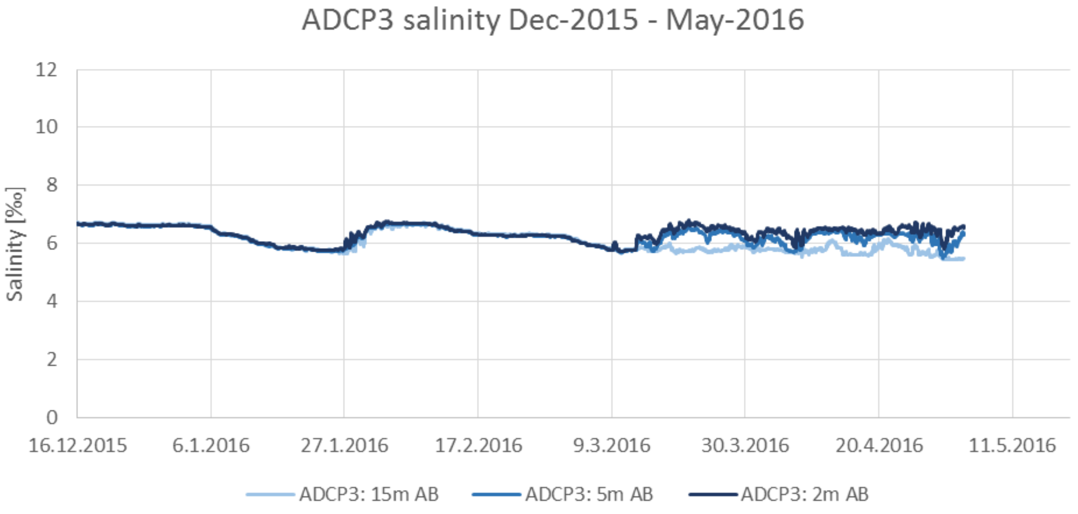


Figure 19. Salinity values from ADCP3 station from December 2015 to May 2016. AB stands for Above Bottom.

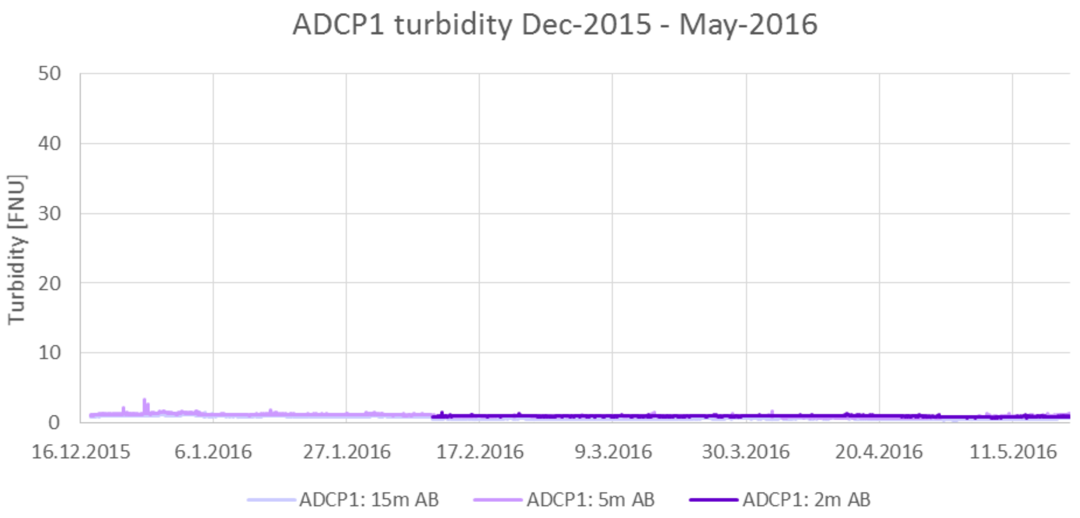


Figure 20. Turbidity values from ADCP1 station from December 2015 to May 2016. AB stands for Above Bottom.

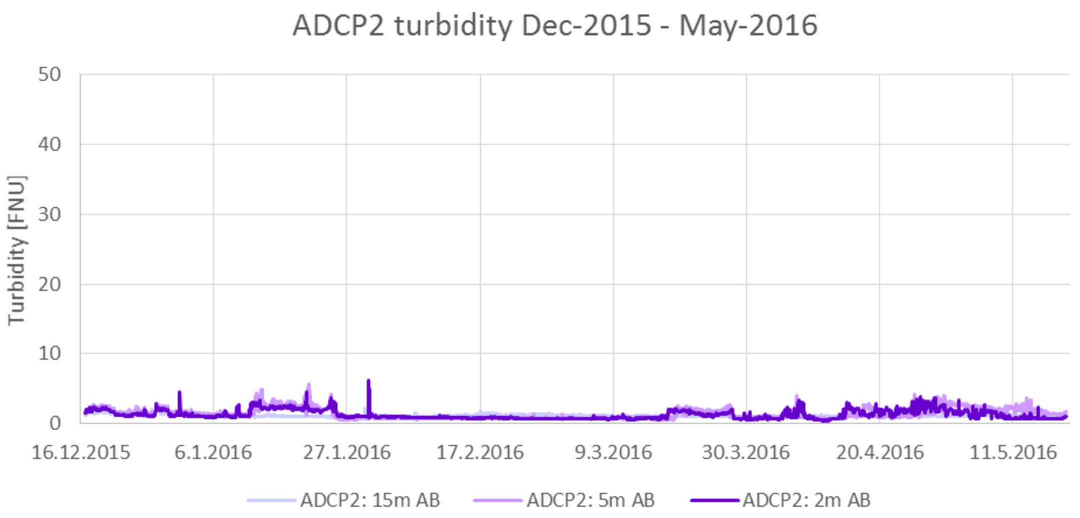


Figure 21. Turbidity values from ADCP2 station from December 2015 to May 2016. AB stands for Above Bottom.

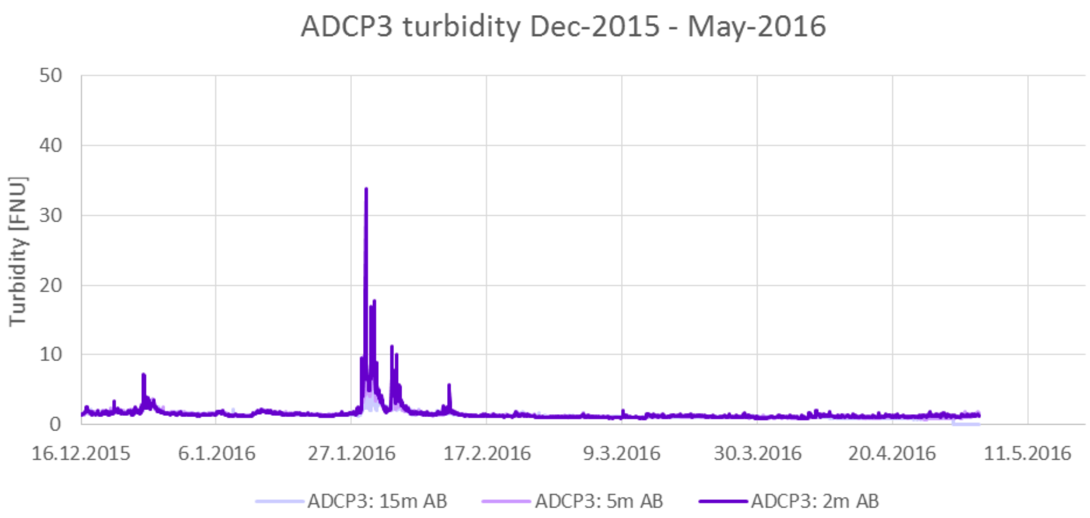


Figure 22. Turbidity values from ADCP3 station from December 2015 to May 2016. AB stands for Above Bottom.

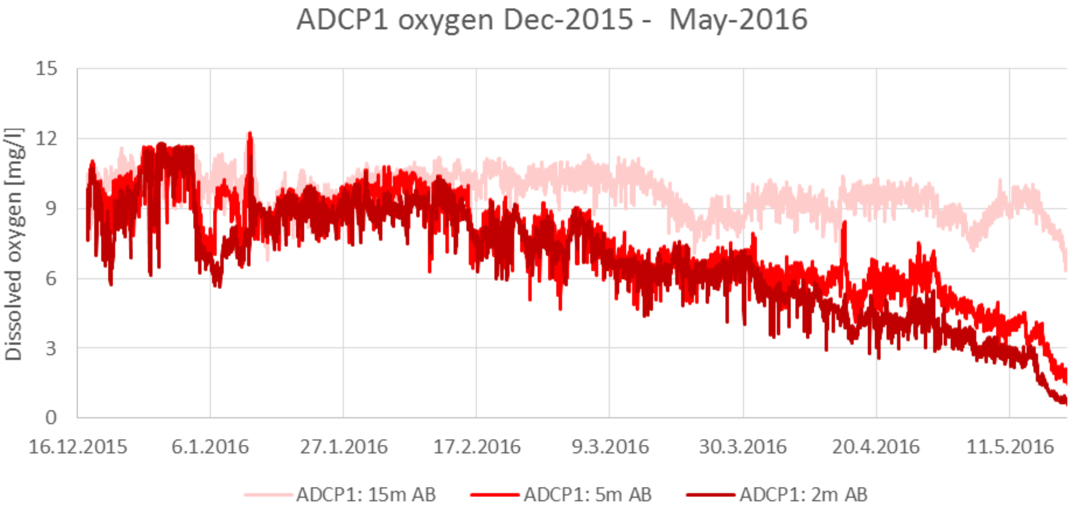


Figure 23. Dissolved oxygen values from ADCP1 station from December 2015 to May 2016. AB stands for Above Bottom.

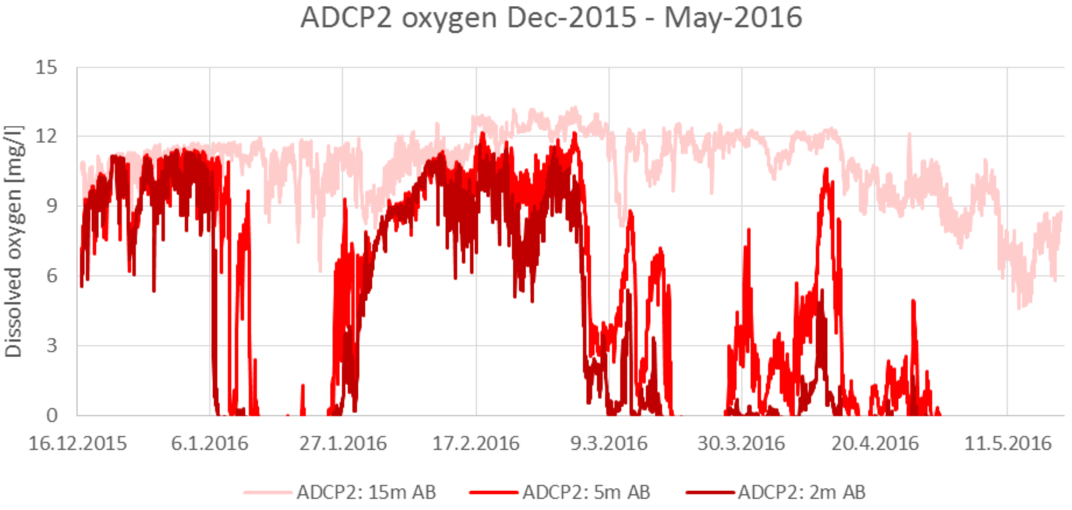


Figure 24. Dissolved oxygen values from ADCP2 station from December 2015 to May 2016. AB stands for Above Bottom.

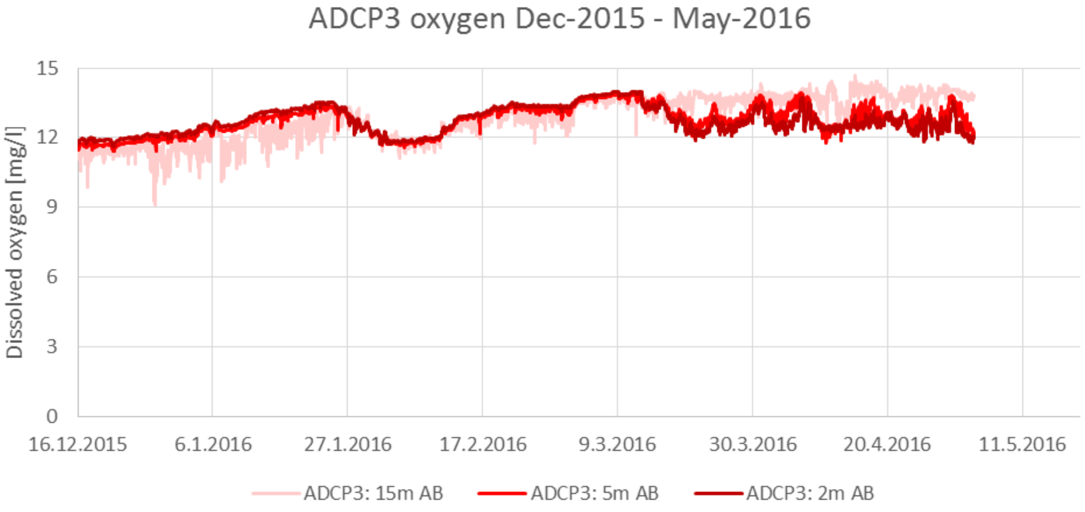


Figure 25. Dissolved oxygen values from ADCP3 station from December 2015 to May 2016. AB stands for Above Bottom.

3.2 Current monitoring time series from the stations ADCP1, ADCP2 and ADCP3

Current magnitude data is presented for stations ADCP1, ADCP2 and ADCP3 in this section. Time-series plots were generated for all three stations (Fig. 26-28). The uppermost layer of the sea is excluded from the figures since both current magnitude and direction are strongly influenced by wind and waves and thus are not representative. In addition, during the wintertime the lack of scatterers can prevent acoustic monitoring throughout whole water column. Current magnitude and direction histograms were generated for the lowermost ten meter layer for all three stations (Fig. 29-30), which is the most critical layer for EIA impacts as pipelines will be installed directly to the seafloor.

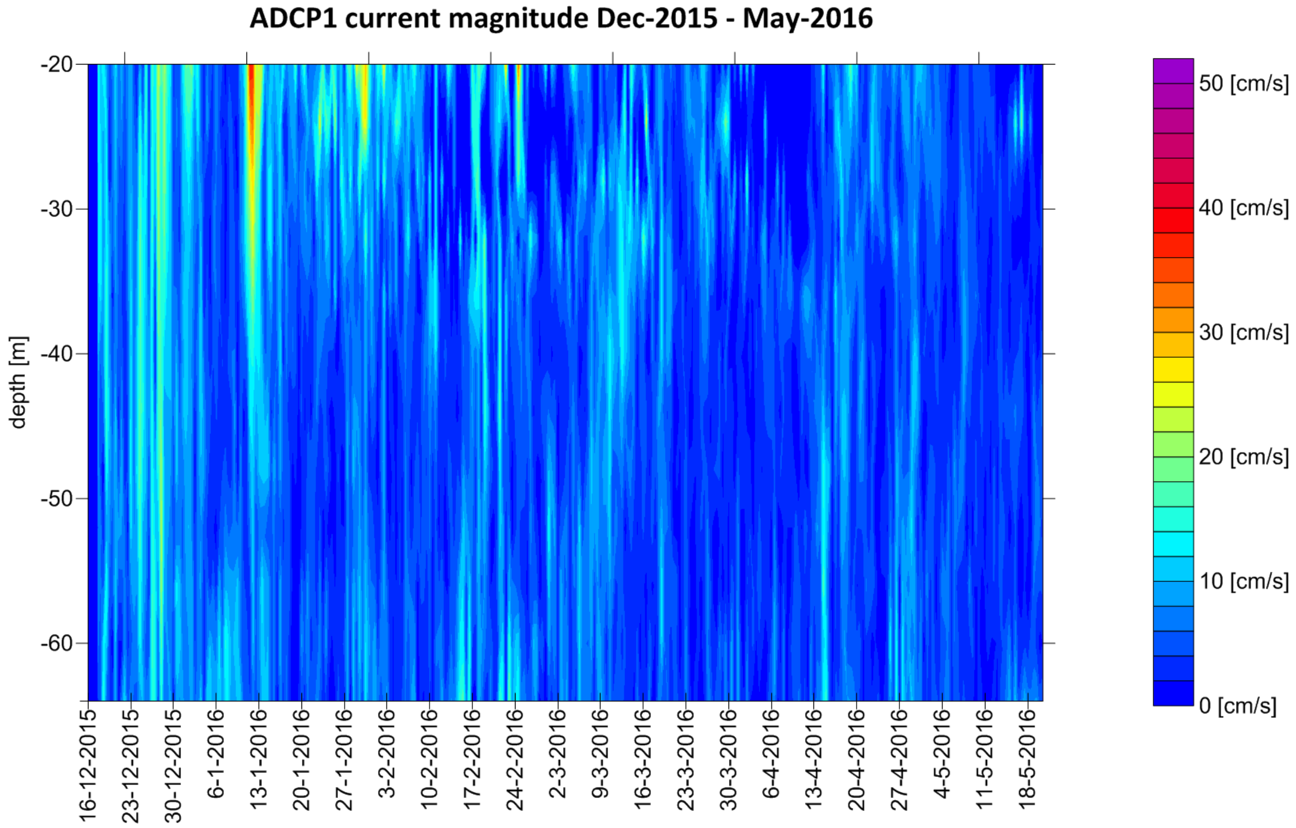


Figure 26. Current magnitude values from ADCP1 station from December 2015 to May 2016.

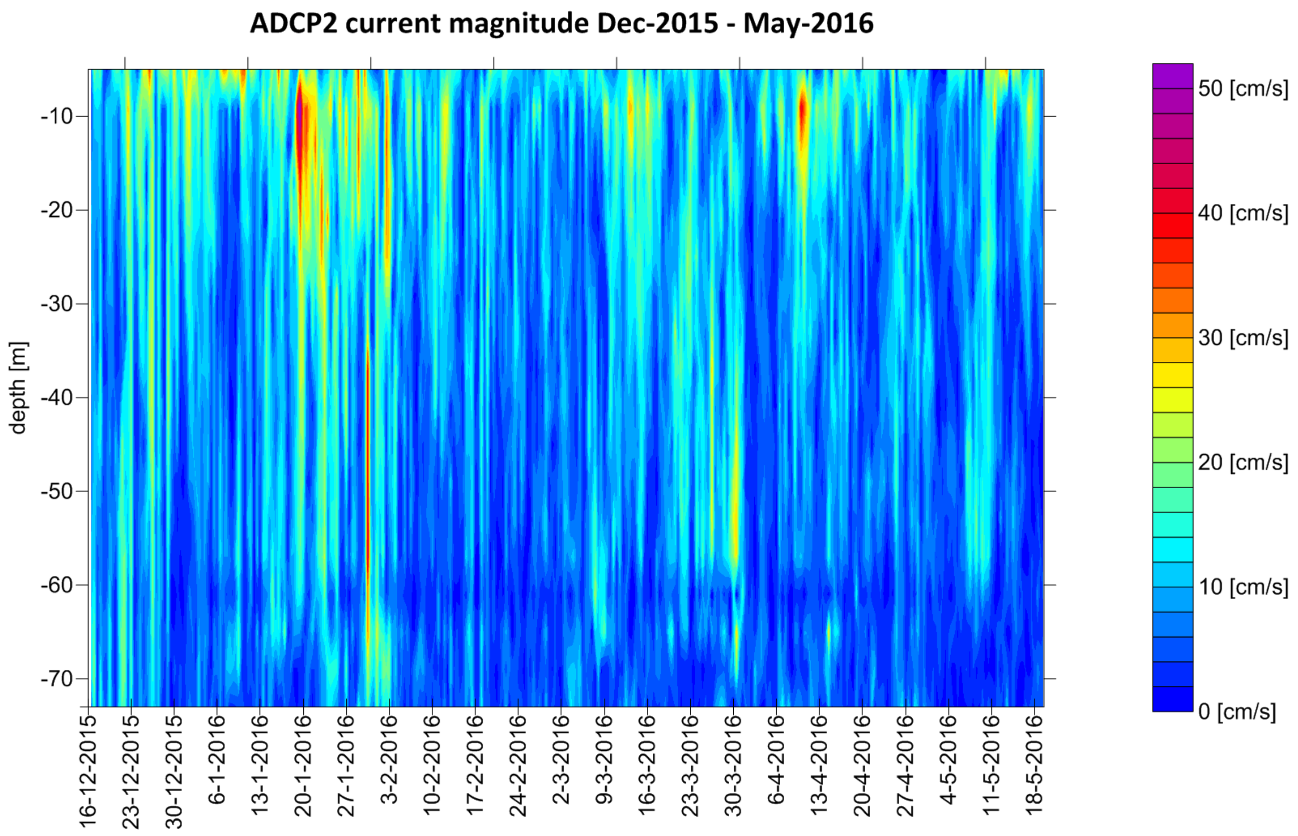


Figure 27. Current magnitude values from ADCP2 station from December 2015 to May 2016.

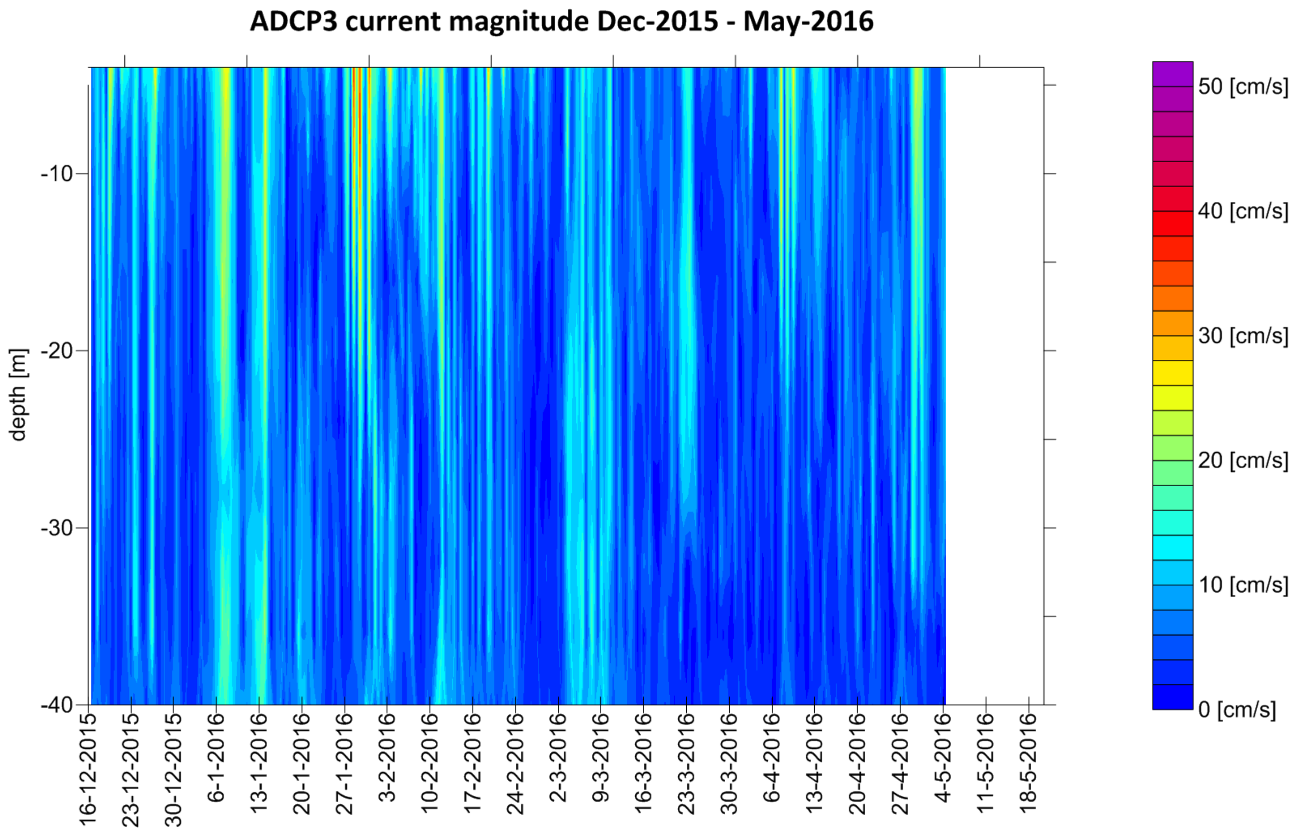


Figure 28. Current magnitude values from ADCP3 station from December 2015 to May 2016.

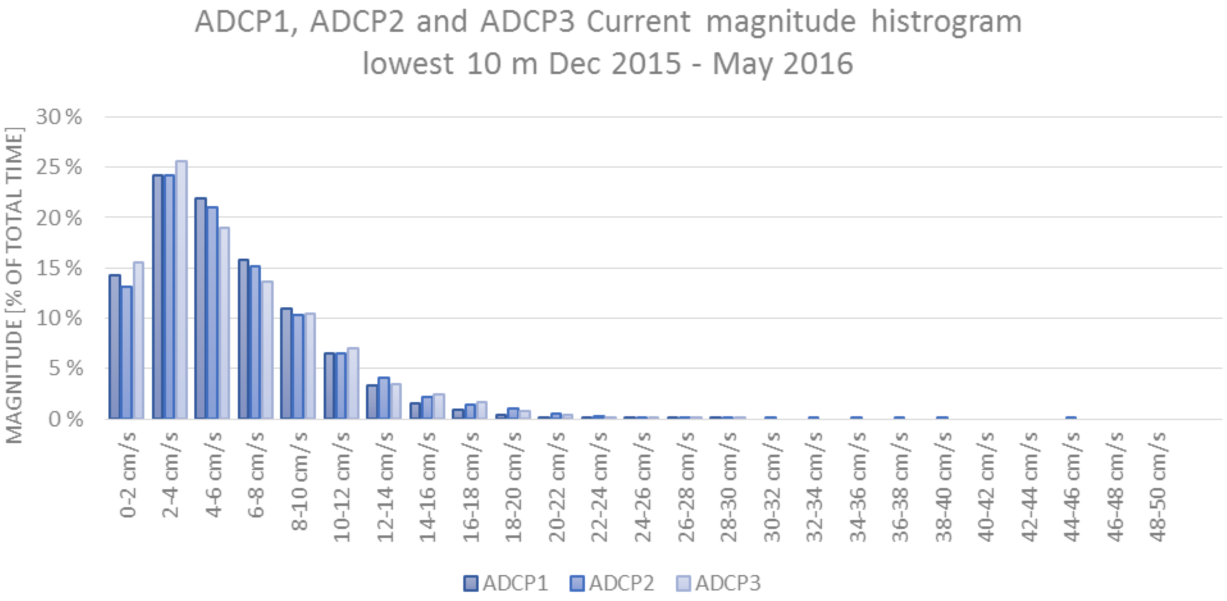


Figure 29. Current magnitude histogram from ADCP1, ADCP2 and ADCP3 stations from December 2015 to May 2016.

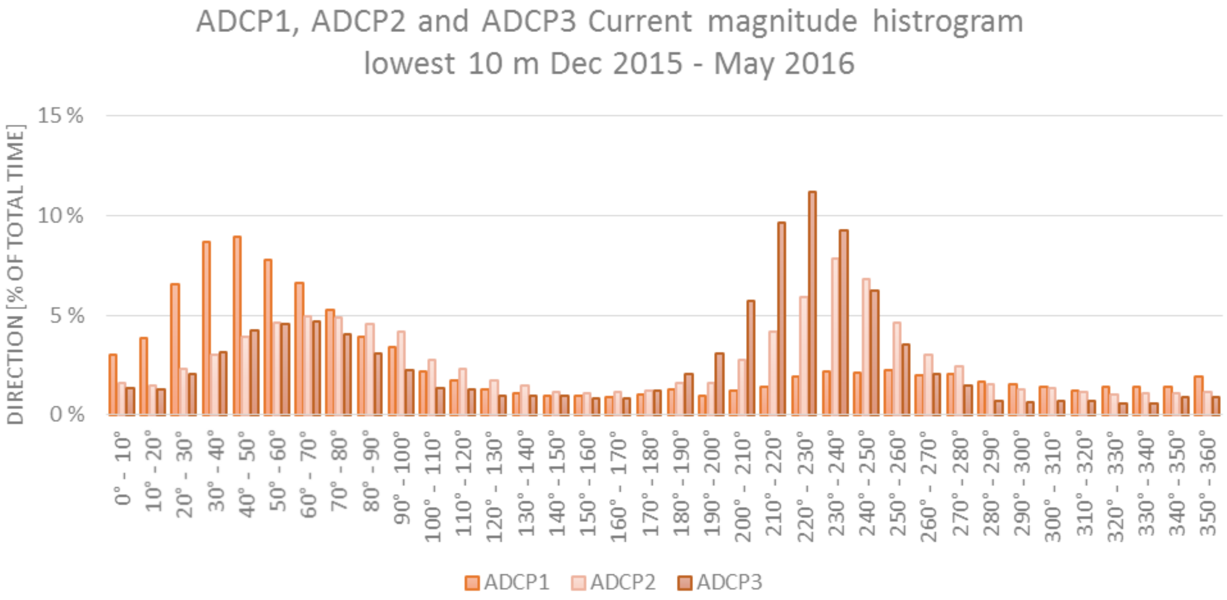


Figure 30. Current direction histogram from ADCP1, ADCP2 and ADCP3 stations from December 2015 to May 2016.

3.3 Underwater noise monitoring time series

Statistical analysis results from the different measurement locations are reported separately and also compared to each other in this section. In addition to time series analysis for recorded special events have been introduced. Only overall and 1h interval results are introduced in this report because of the long measurement period. Overall results are listed in the Table 5. All the results are reported in metadata-file. Times series plots for Sound pressure levels are shown for stations NOISE1, NOISE2 and NOISE3.

Table 5. Results, whole measurement period, broadband (10 Hz-10 kHz)

Location	Depth above bottom [m]	Monitoring Period	Leq (total) (10Hz-10kHz) [dB re 1 µPa]	L95 [dB re 1 µPa]	L50 [dB re 1 µPa]	L5 [dB re 1 µPa]
NOISE1_1	10	20151218 - 20160208	110.37	95.51	104.56	114.35
NOISE1_2	10	20160211 - 20160407	110.86	94.83	104.44	116.59
NOISE 2	2	20151218 - 20160208	114.83	98.26	106.09	118.65
NOISE 2	10	20151218 - 20160208	115.06	99.66	106.57	120.50
NOISE 2	2	20160211 - 20160408	112.17	94.61	102.80	111.89
NOISE 2	10	20160211 - 20160518	113.92	94.55	104.47	115.28
NOISE 3	10	20160211 - 20160407	115.36	98.67	105.61	116.58

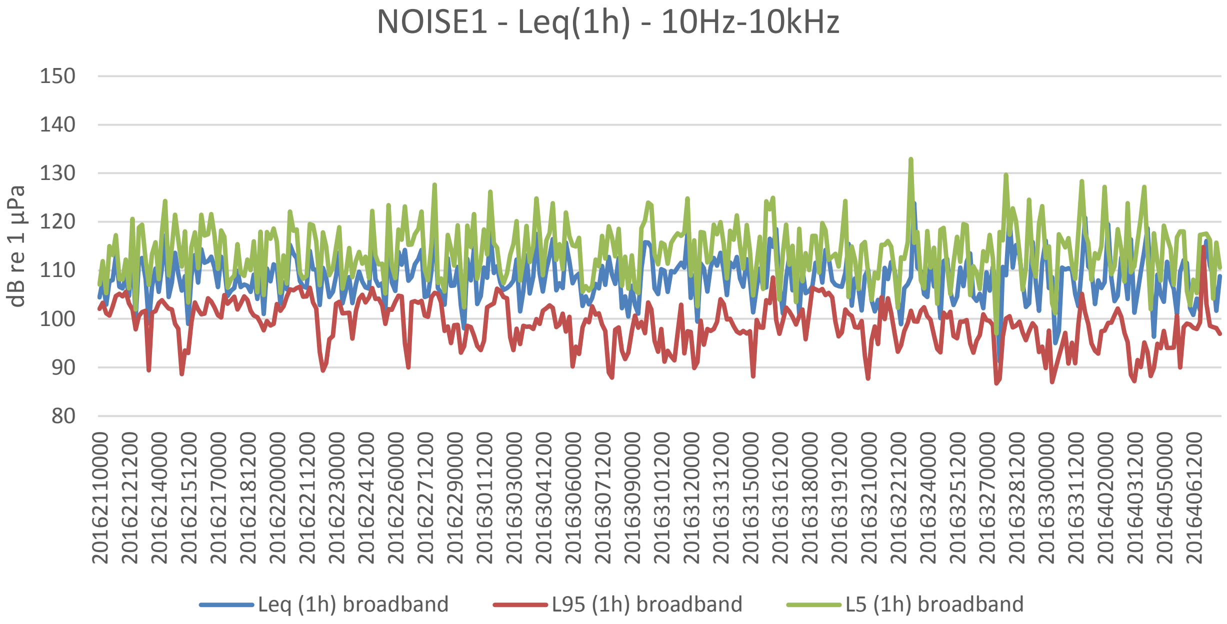


Figure 31. Leq(1h), L95(1h) and L5(1h) levels at NOISE1_2, 10m above the bottom, whole monitoring period

Total Leq at NOISE1 (Fig. 31) station during the second measurement period 20160211 – 20160407 was 110.86 dB. Leq(1h) was smoother compared to NOISE2 and NOISE3. L95 was 94.83 dB and L5 116.59 dB. Shipping density was lower at this location. The issue is discussed further when comparing the other locations.

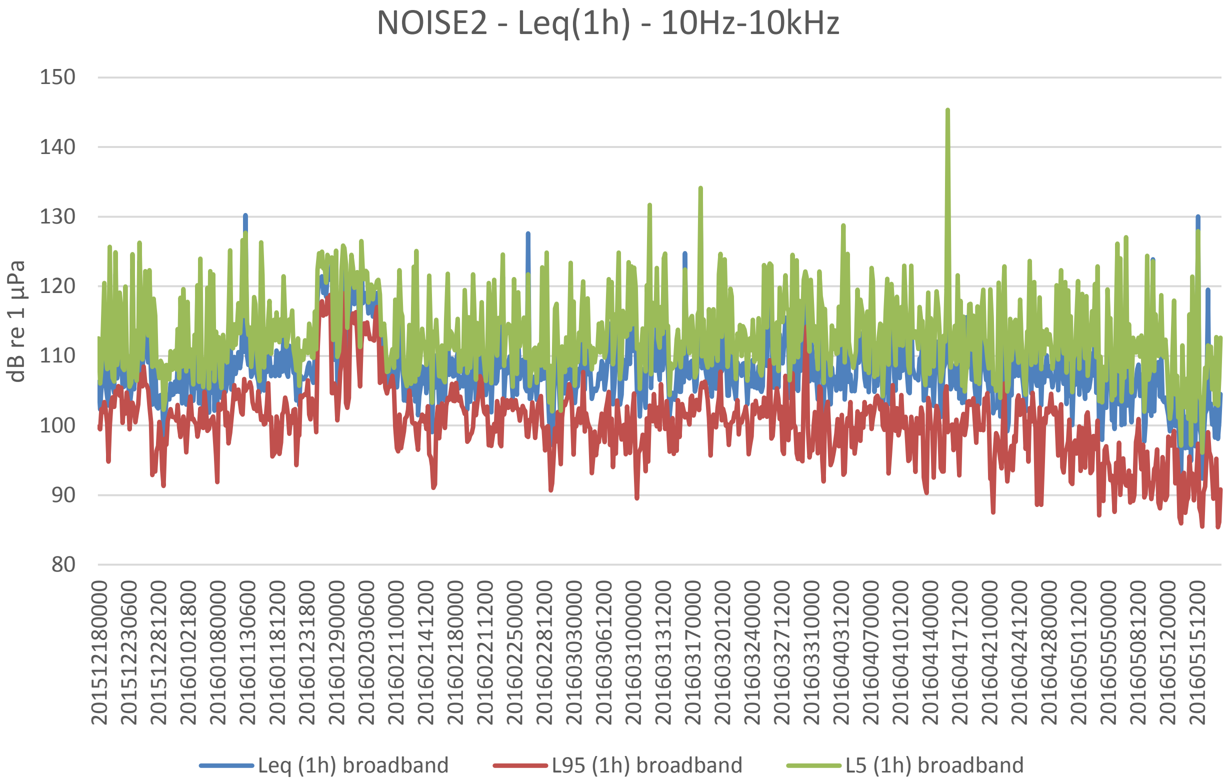


Figure 32. Leq(1h), L95(1h) and L5(1h) levels at NOISE2, 10m above the bottom, whole monitoring period

At NOISE2 station (Fig. 32) whole monitoring period Leq (total) was 113.99 dB, L95 96.77 dB and L5 116.58 dB. Shipping was active and occasionally very close to the measurement location causing high amplitude peaks. Unknown vessel was operating in the NOISE2 area during 27th of January and 5th of February 2016 and the measured noise level was constantly higher as can be seen from the Figure 32.

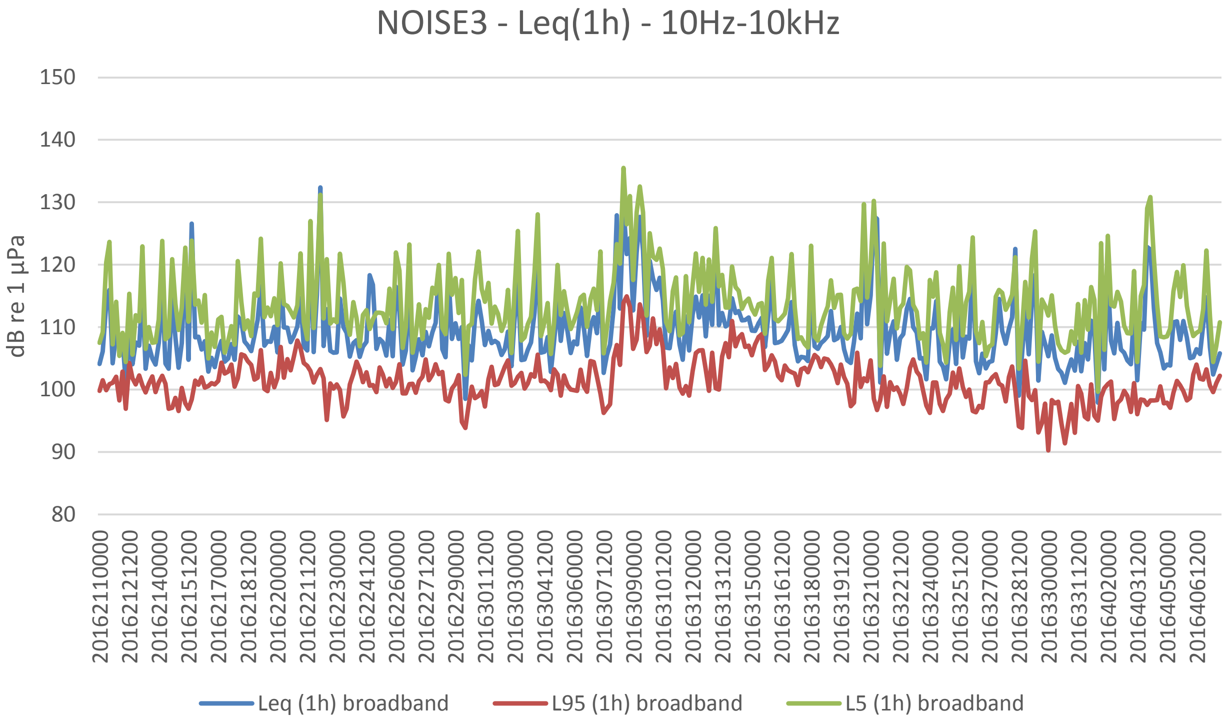


Figure 33. Leq(1h), L95(1h) and L5(1h) levels at NOISE3, 10m above the bottom, whole monitoring period

At NOISE3 (Fig. 33) Leq (total) was 115.36 dB, L95 98.67 dB and L5 116.58 dB. Noise levels were highest at this station. Especially Leq (total) and L5 were clearly higher and caused by near passing ships. An unknown vessel was operating on the area during the period 8-10th of March 2016 and increasing the continuous noise level.

The results at different locations are compared in Table 6 and Figures 34-37. The monitoring period is 20160211 – 20160407 in the comparison. The highest Leq (total) levels during the monitoring period were measured at NOISE3 station and the lowest Leq (total) levels at NOISE1. Background noise is lower at NOISE1 compared to NOISE2 and NOISE3.

Table 6. Measurement location related comparison, broadband (10 Hz-10 kHz)

Location	Depth above bottom	Monitoring Period	Leq (total) (10Hz-10kHz) [dB re 1 µPa]	L95 [dB re 1 µPa]	L50 [dB re 1 µPa]	L5 [dB re 1 µPa]
NOISE1	**10**	**20160211 - 20160407**	**110.86**	**94.83**	**104.44**	**116.59**
NOISE2	**10**	**20160211 - 20160407**	**112.42**	**97.96**	**105.22**	**115.70**
NOISE3	**10**	**20160211 - 20160407**	**115.36**	**98.67**	**105.61**	**116.58**

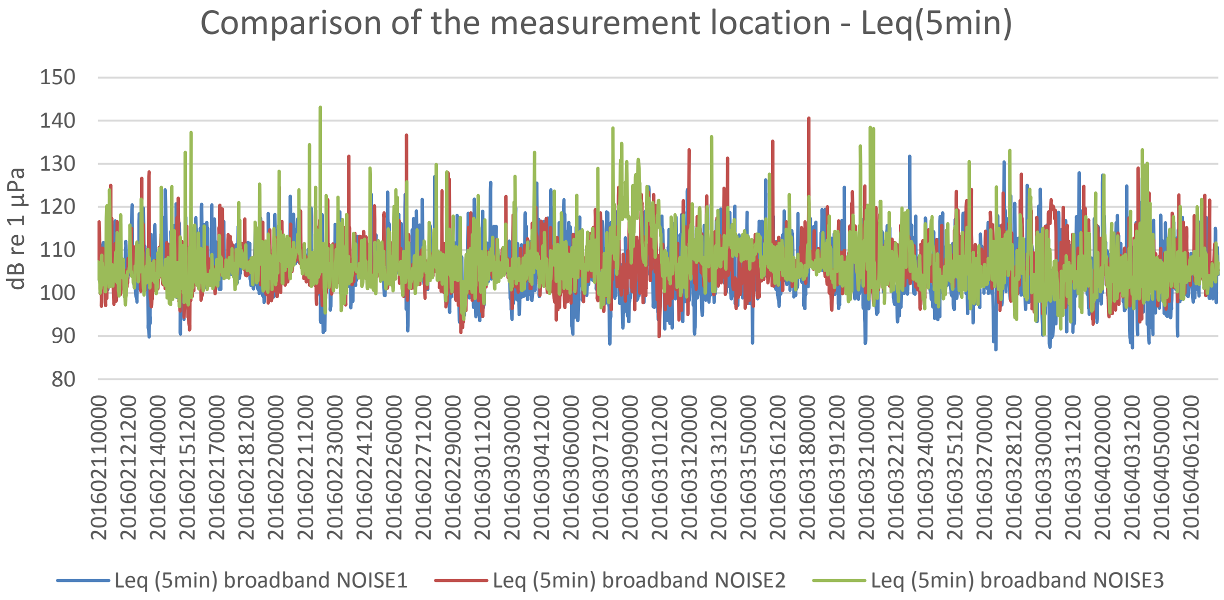


Figure 34. Leq (5min) broadband NOISE1, NOISE2 and NOISE3.

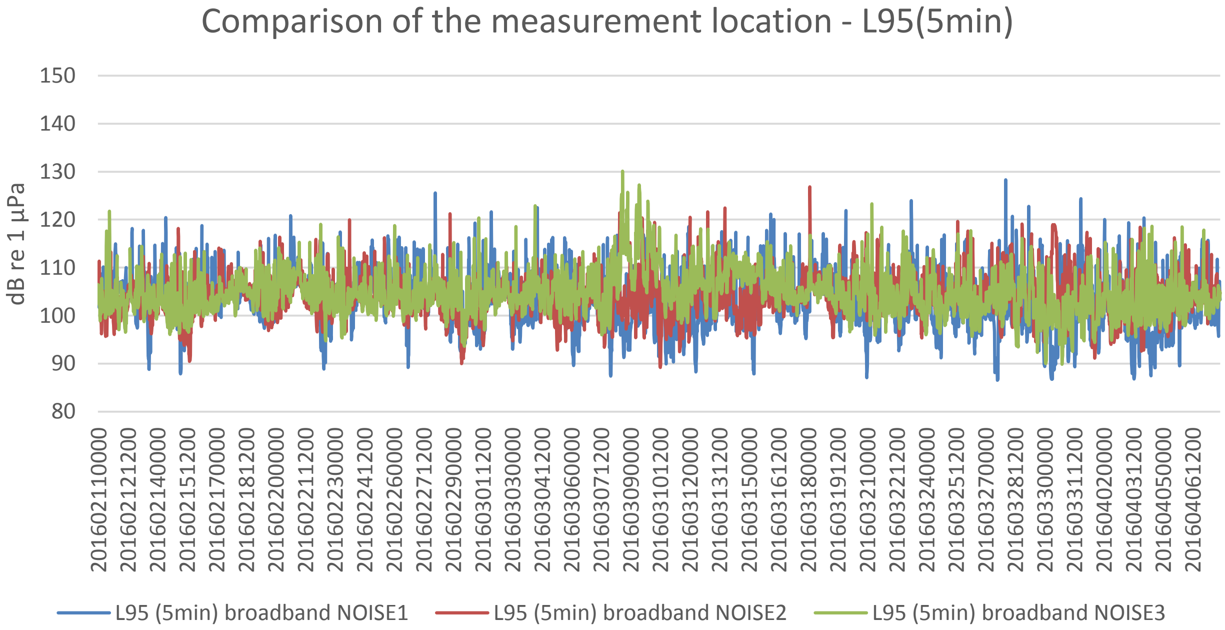


Figure 35. L95 (5min) broadband NOISE1, NOISE2 and NOISE3.

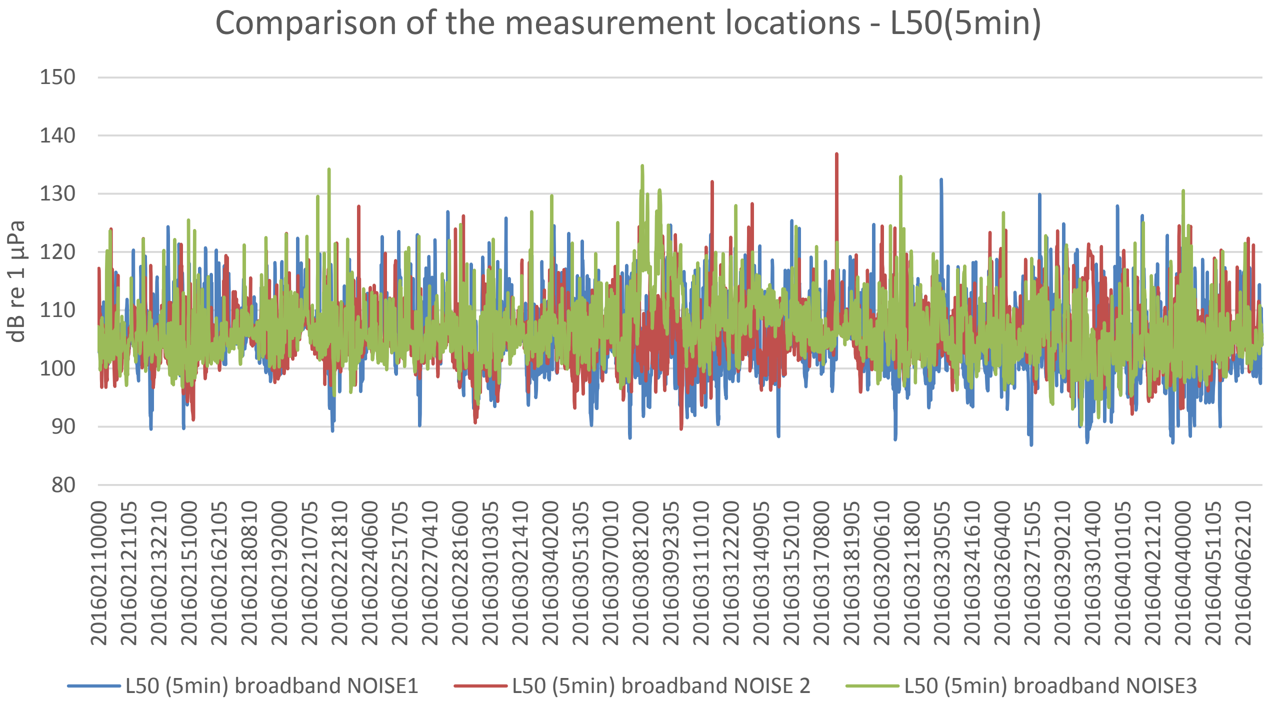


Figure 36. L50 (5min) broadband NOISE1, NOISE2 and NOISE3.

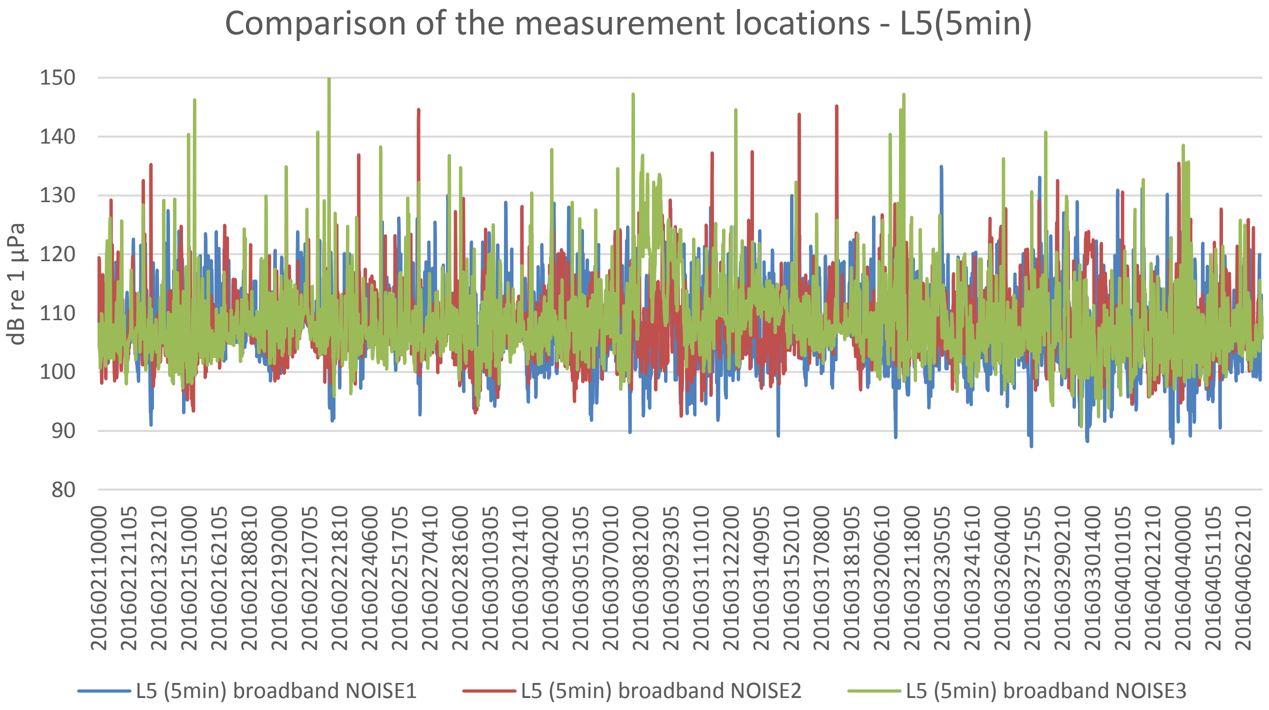


Figure 37. L5 (5min) broadband NOISE1, NOISE2 and NOISE3.

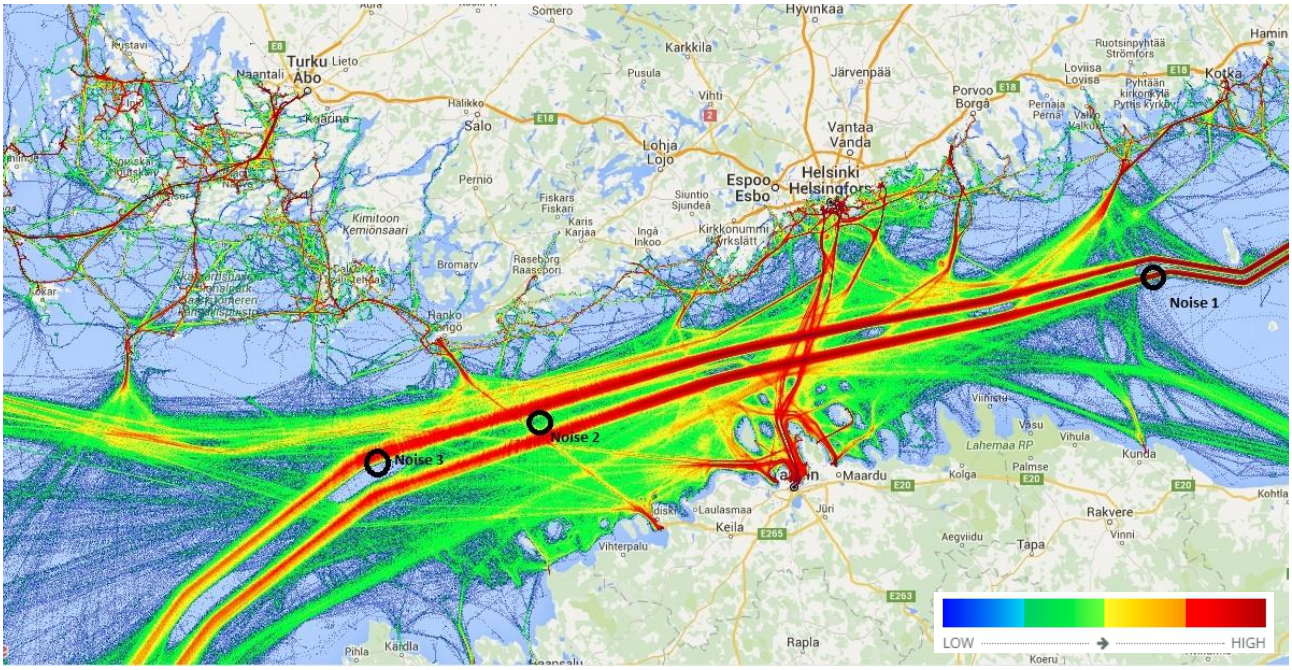


Figure 38: Locations of the NOISE1, NOISE2 and NOISE3 vs. shipping density. Shipping density refers to distinct vessels on a daily basis and count positions / km², blue <30, green 30-70, yellow 70-140 and red >140. (Marine Traffic 2014 statistics).

As commonly known, shipping noise is the largest anthropogenic noise source. At low frequencies the background noise level is dominated by the noise from the distant ships. When a large ship passes close to a measurement station, the noise level will temporarily increase substantially. Shipping density in 2014 can been seen in Figure 38. Figures 39 and 40 are an example of ship passing the hydrophone line at NOISE2. This was one of the highest measured sound pressure levels during the measurements and happened on 16th of April 2016 when a large ship passed the hydrophones at NOISE2 causing SPL of 149 dB.

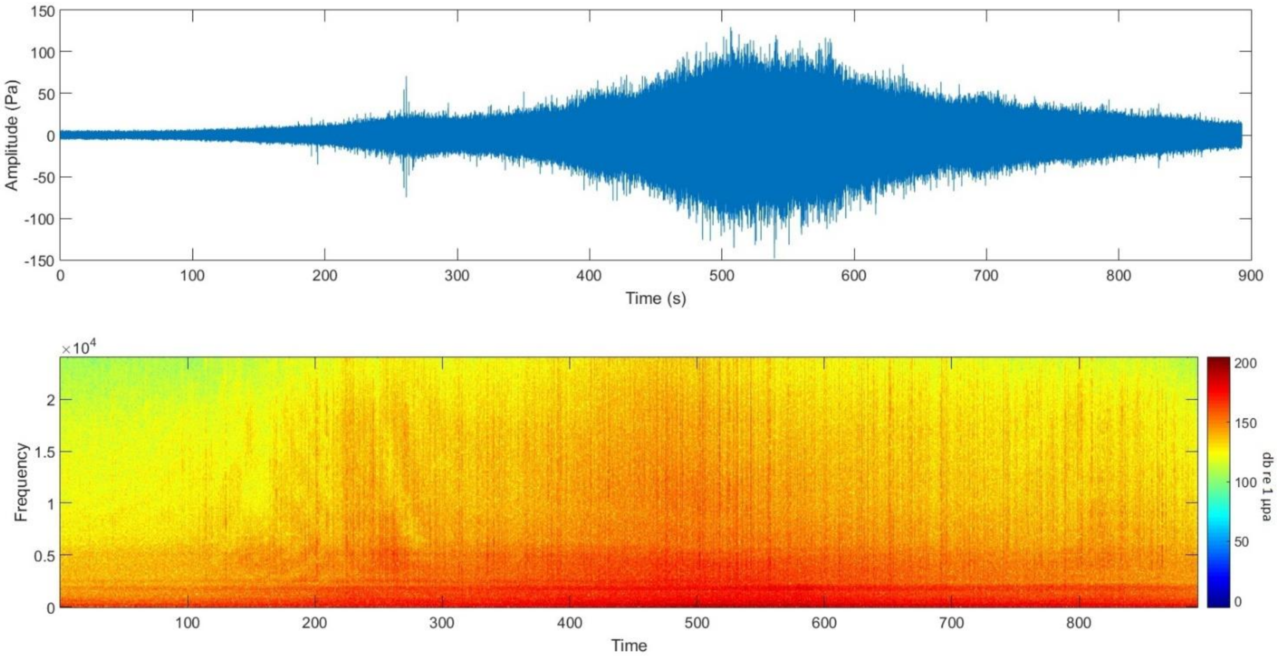


Figure 39. Acoustic signature of a single ship passing by at NOISE2 location 20160416 11:00 UTC.

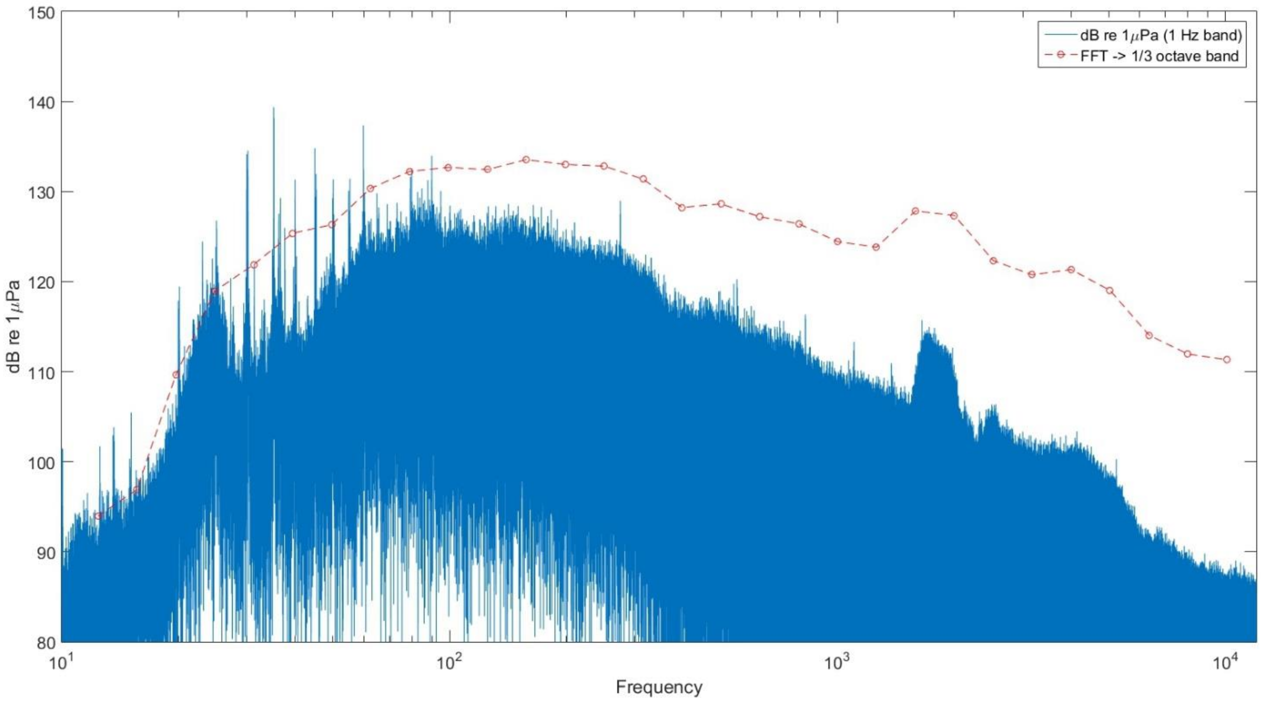


Figure 40. Frequency response (1hz resolution and 1/3 octave) of single ship passing by the monitoring location.

As seen in Figures 39 and 40 a lot of the energy is at lower frequency bands. The Commission Decision 2010 prescribes to measure 1/3 octave bands around 63 and 125 Hz (Commission Decision 2010/477/EU). These 1/3 octave bands include distant shipping noise. An example of octave bands at NOISE2 are presented in Figure 41. Average noise level in these octave bands over a measurement period at Noise 2 are 102.7 dB (63 Hz band) and 99.23 dB (125 Hz band).

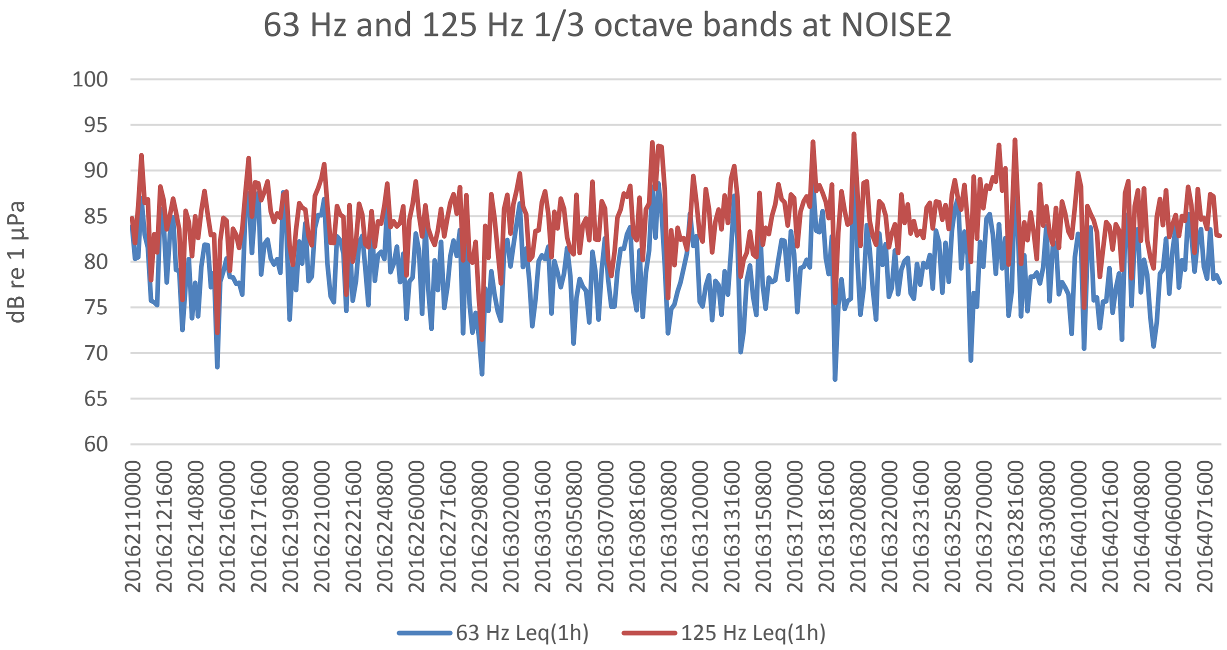


Figure 41. Leq (1h) at 63 Hz and 125 Hz 1/3 octave bands at NOISE2

We compared the measured noise of two acoustic data loggers placed at two different depths (2m and 10 m above seabed) in same location, NOISE2 (Fig. 42). The average Leq (5min) difference between the hydrophones was 2.78 dB. Overall Leq, L5, L95 and L50 levels were higher at the hydrophone nearer to the surface (Table 5). However Leq (5min) is higher at 2 meters from the bottom during the single high amplitude events like ship passing the hydrophone. This is because of the bottom reflection.

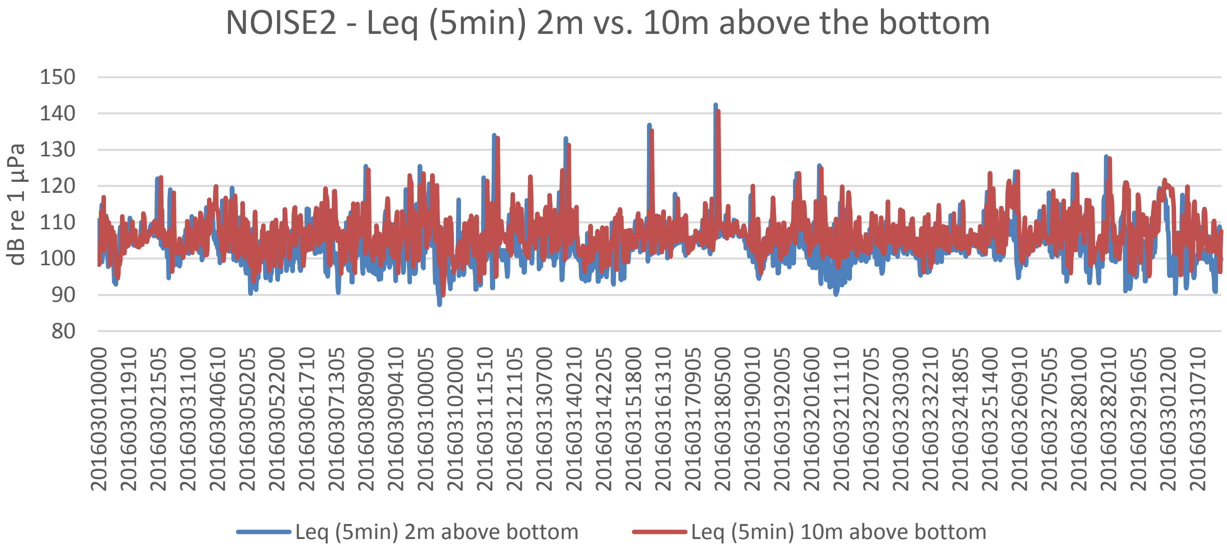


Figure 42. Depth comparison at NOISE2, where two identical hydrophones were installed at two different depths.

Impulsive noise signature was discovered on 18th of Feburary 2016 at both NOISE2 and NOISE3 stations. Origin of the sound remained unknown but it is assumed that Finnish Defence Forces were using coastal artillery weapons on that area and that might be the noise source. Example of the event is in the Figure 43.

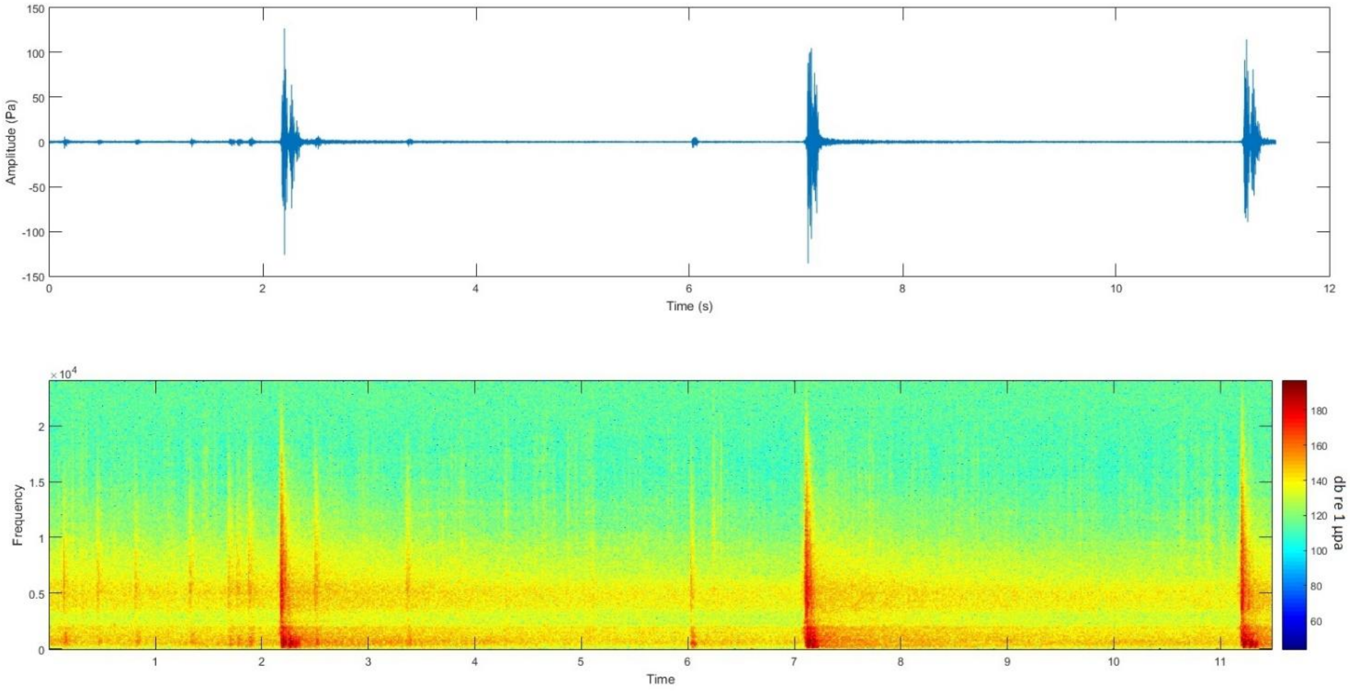


Figure 43. Acoustic signature of an impulsive sound source.

An unknown vessel was operating on the area during the period 8-10th of March 2016 and causing extremely high noise level at 10 Hz 1/3 octave band. Figure 44 shows the 10 Hz 1/3 octave level at NOISE3 in time domain and Figure 45 frequency response of the ship passing by.

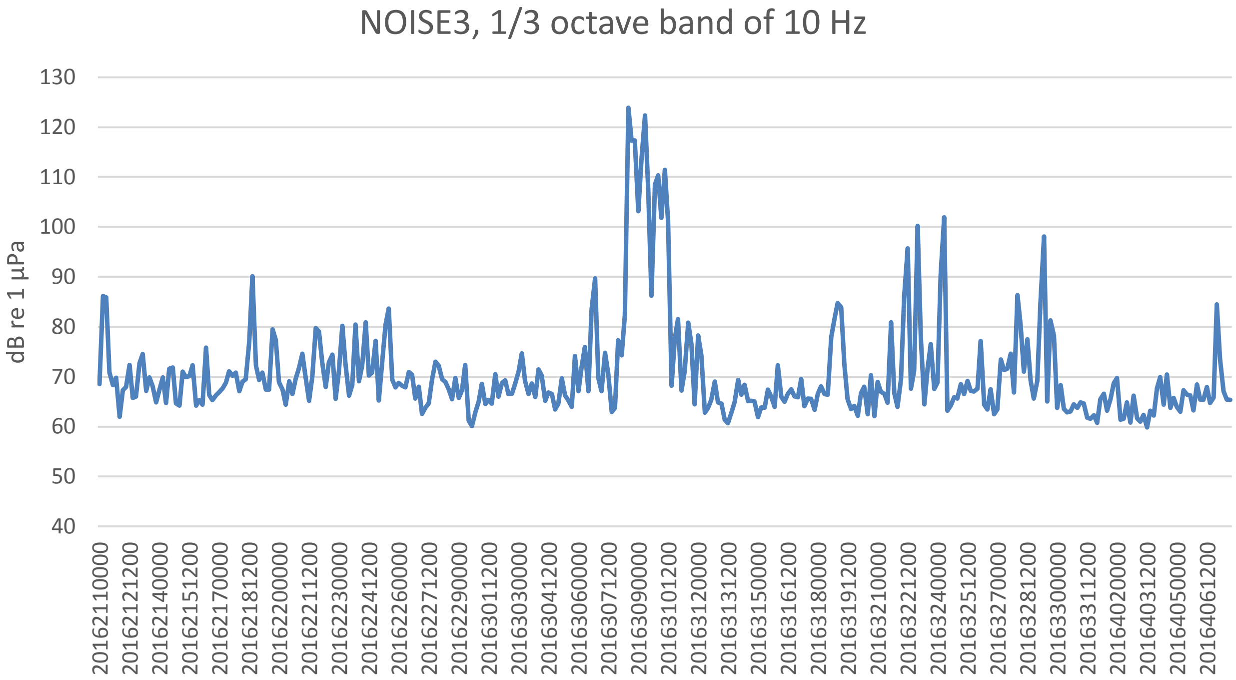


Figure 44. 10 Hz 1/3 octave band at NOISE3 (Note: different scale on y-axis)

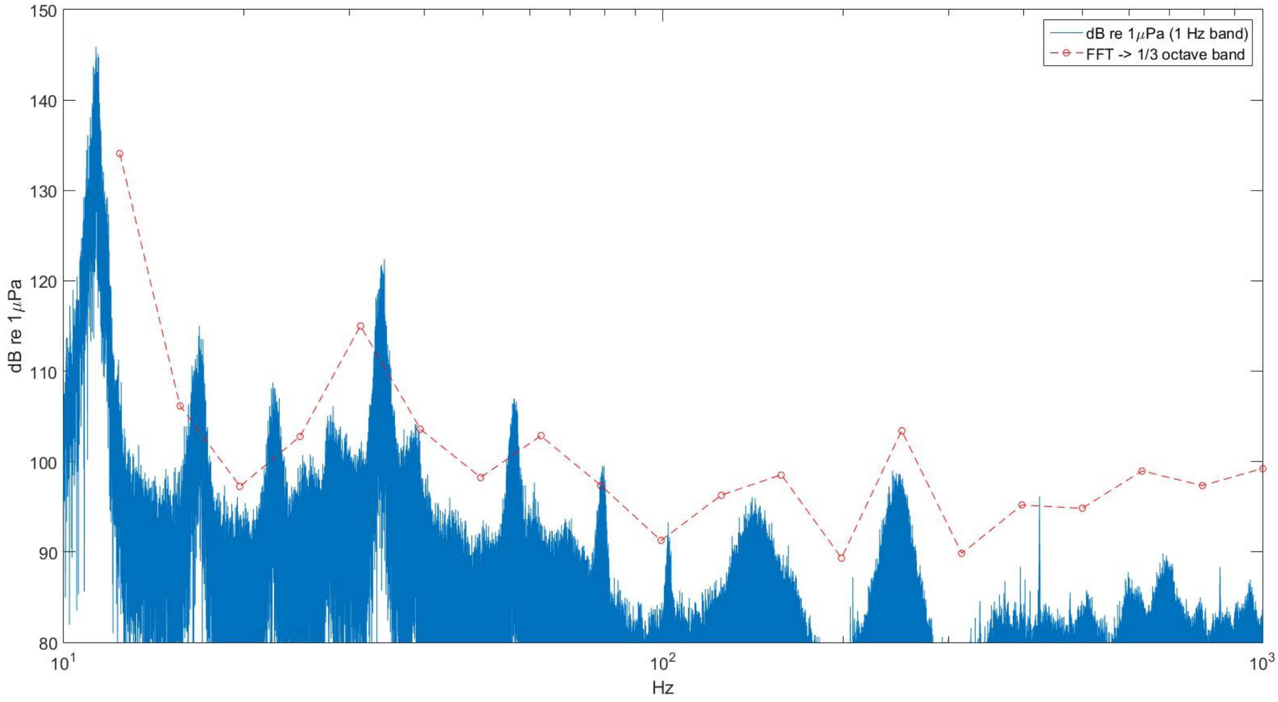


Figure 45. Narrow band and 1/3 octave band frequency response of single ship passing by the NOISE 3 station 20160803 15:00 UTC

3.4 CTD profiling and Water samples

CTD profiling results from FIN_EBS_LUO_1 – FIN_EBS_LUO_7 stations is shown in Figure 46 and laboratory results of collected water samples are shown in Table 7.

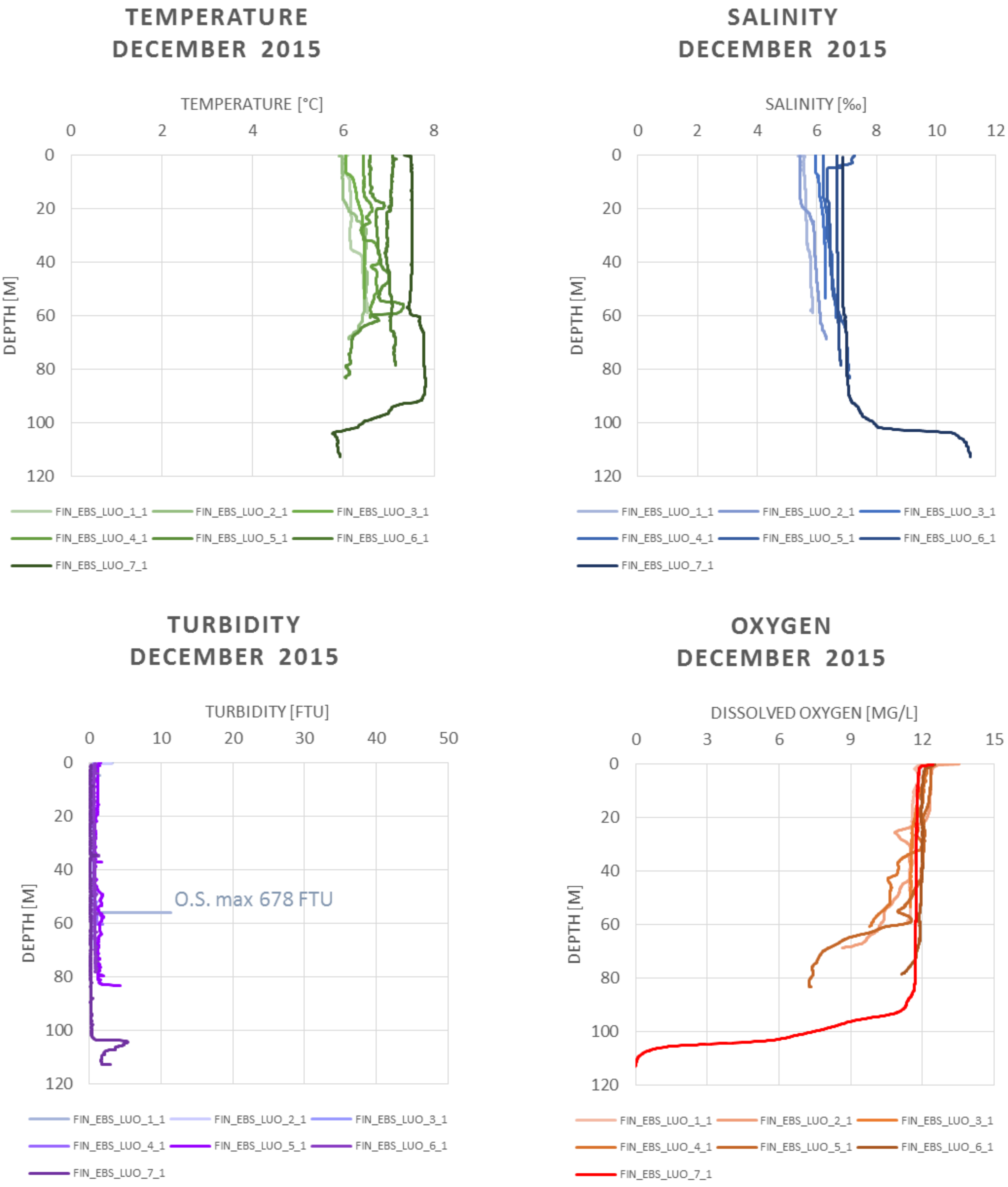


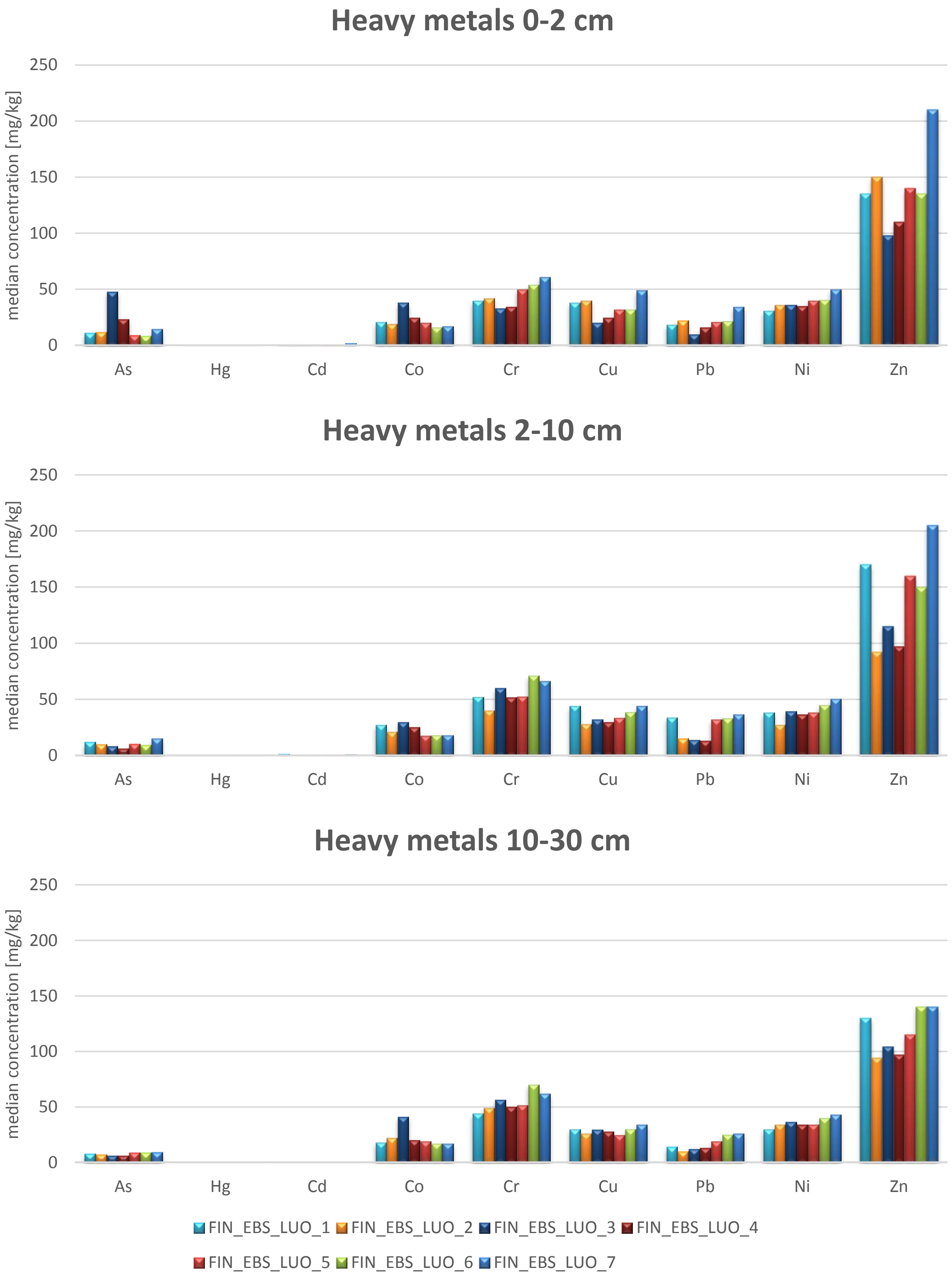
Figure 46. Vertical distribution of temperature, salinity, turbidity and dissolved oxygen concentrations for stations FIN_EBS_LUO_1 – FIN_EBS_LUO_7. (O.S. = outside figure scale)

Table 7. Laboratory results from the water samples from stations FIN_EBS_LUO_1 to FIN_EBS_LUO_7. MetropoliLab, samples were taken 1 metre above bottom in December 2015. Results are shown for total concentrations.

Station	Arsenic, As [µg/l]	Cadmium, Cd [µg/l]	Chromium, Cr [µg/l]	Cobalt, Co [µg/l]	Copper, Cu [µg/l]	Mercury, Hg [µg/l]	Nickel, Ni [µg/l]	Lead, Pb [µg/l]	Vanadium, V [µg/l]	Zinc, Zn [µg/l]	Nitrite nitrogen, NO2-N [µg/l]	Nitrate nitrogen, NO3-N [µg/l]	Nitrite-Nitrate, NO23-N [µg/l]	Total nitrogen; N-tot [µg/l]	Ammonium nitrogen, NH4-N [µg/l]	Phosphate Phosphorus, PO4-P [µg/l]	Total phosporus, P-tot [µg/l]	Solid matter [mg/l]	Turbidity [FNU]	Total organic carbon [mg/l]
FIN_EBS_LUO_1_1	1.2	0.04	0.57	0.06	1.5	<0.03	0.8	0.2	0.6	10	2	81	84	410	<4	29	35	1.5	1.2	5.4
FIN_EBS_LUO_2_1	1.6	0.03	0.23	0.08	2.9	<0.03	0.5	<0.1	0.6	7	<2	97	99	430	<4	40	43	1	1.3	5.2
FIN_EBS_LUO_3_1	1.2	0.03	0.39	0.05	1.0	<0.03	0.6	0.2	0.8	7	<2	81	83	390	<4	29	33	1.7	1.2	5.1
FIN_EBS_LUO_4_1	1.5	0.02	0.22	0.08	0.7	<0.03	0.5	<0.1	0.8	8	<2	82	84	400	<4	35	38	1.8	1.4	4.7
FIN_EBS_LUO_5_1	1.9	0.03	0.63	0.14	2.6	<0.03	0.9	2.5	0.8	7	3	93	96	430	<4	49	51	1.9	2.0	4.7
FIN_EBS_LUO_6_1	1.2	0.02	0.39	0.06	12	<0.03	0.5	<0.1	0.9	6	<2	60	62	370	<4	22	27	1.1	1.2	4.4
FIN_EBS_LUO_7_7	1.5	0.03	0.76	0.06	1.6	<0.03	1.1	<0.1	0.8	8	<2	78	79	390	<4	43	44	<1	0.7	4.1

3.5 Sediment samples

Results in the Figures 47-51 are shown as median values, representing typical concentrations of harmful substances for each site. Individual sample results together with nutrient, TOC and auxiliary parameter results are listed in the Attachment 1. Values are expressed as concentrations of the dry weight. Due to hard bottom in FIN_EBS_LUO_3 area only two deeper samples could be collected. In other areas amount of deeper sediment samples varied from five to eight for each depth class.



Heavy metals 0-2 cm

Heavy metals 2-10 cm

Heavy metals 10-30 cm

Figure 47. Median heavy metal concentrations from FIN_EBS_LUO_1 to 7 areal stations. Values are shown for 0-2 cm, 2-10 cm and 10-30 cm layer. Actual depth depends on sediment softness and quality.

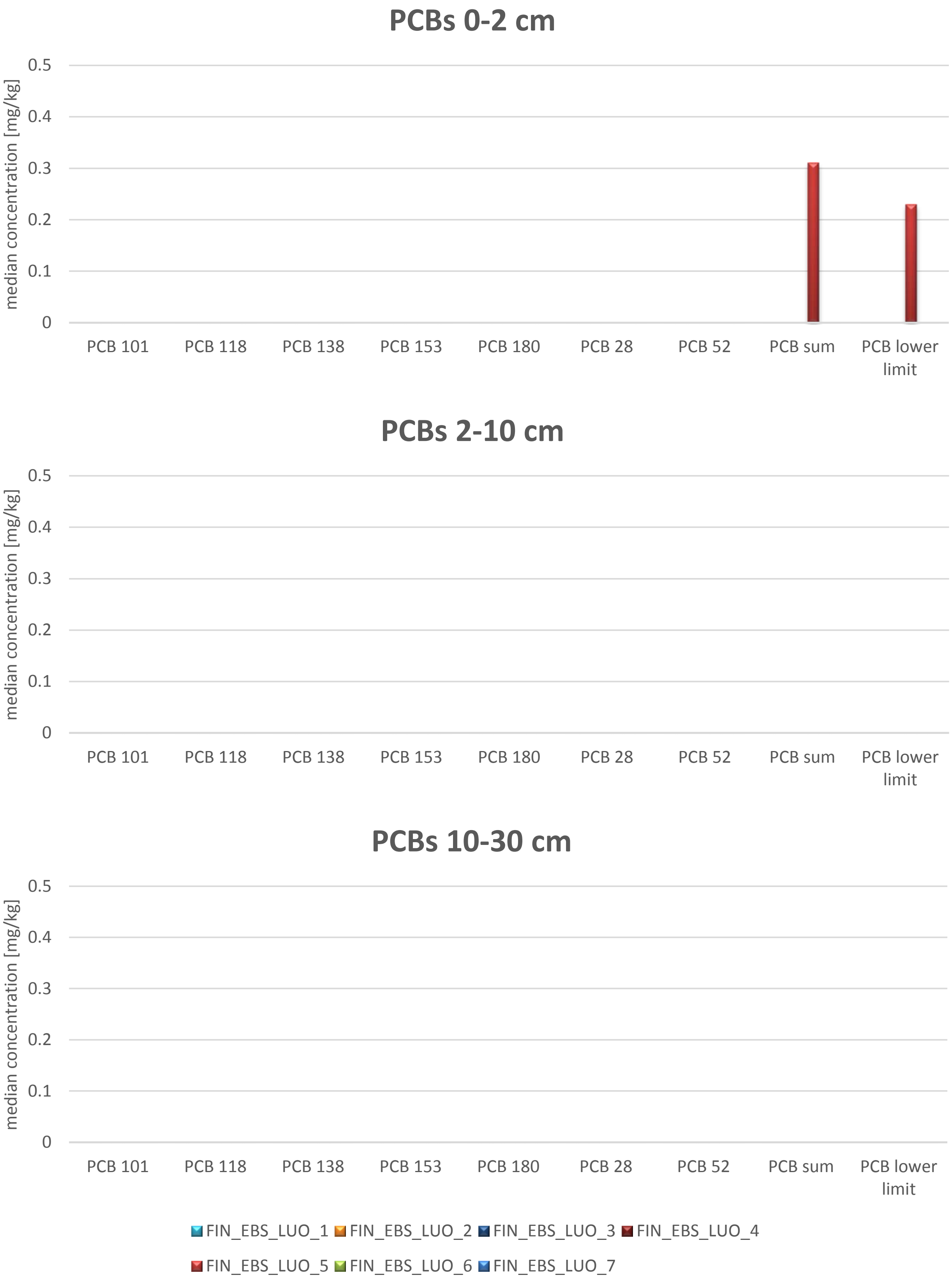


Figure 48. Median polychlorinated biphenyls (PCBs) concentrations from FIN_EBS_LUO_1 to 7 areal stations. Values are shown for 0-2 cm, 2-10 cm and 10-30 cm layer. Actual depth depends on sediment softness and quality.

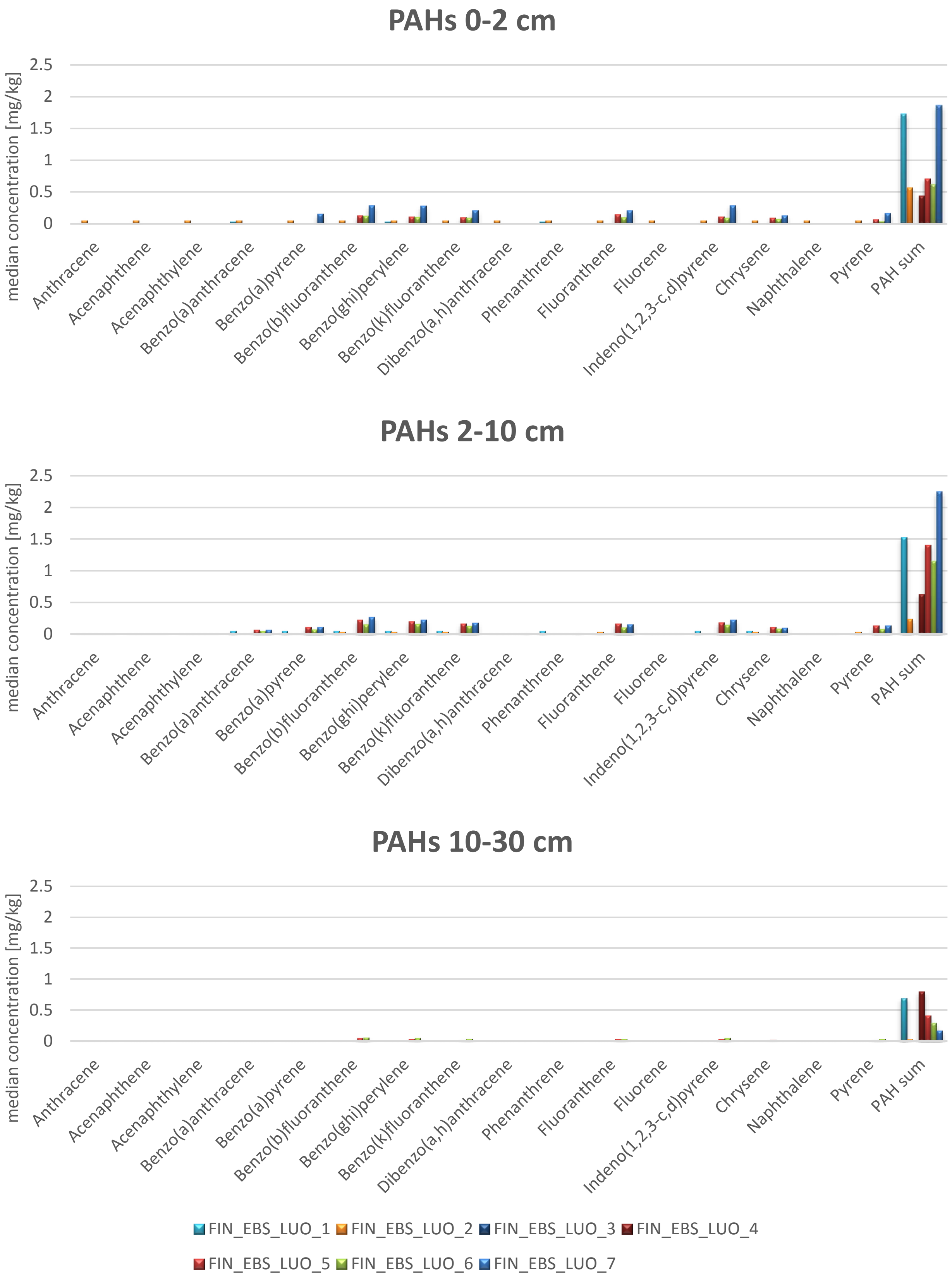
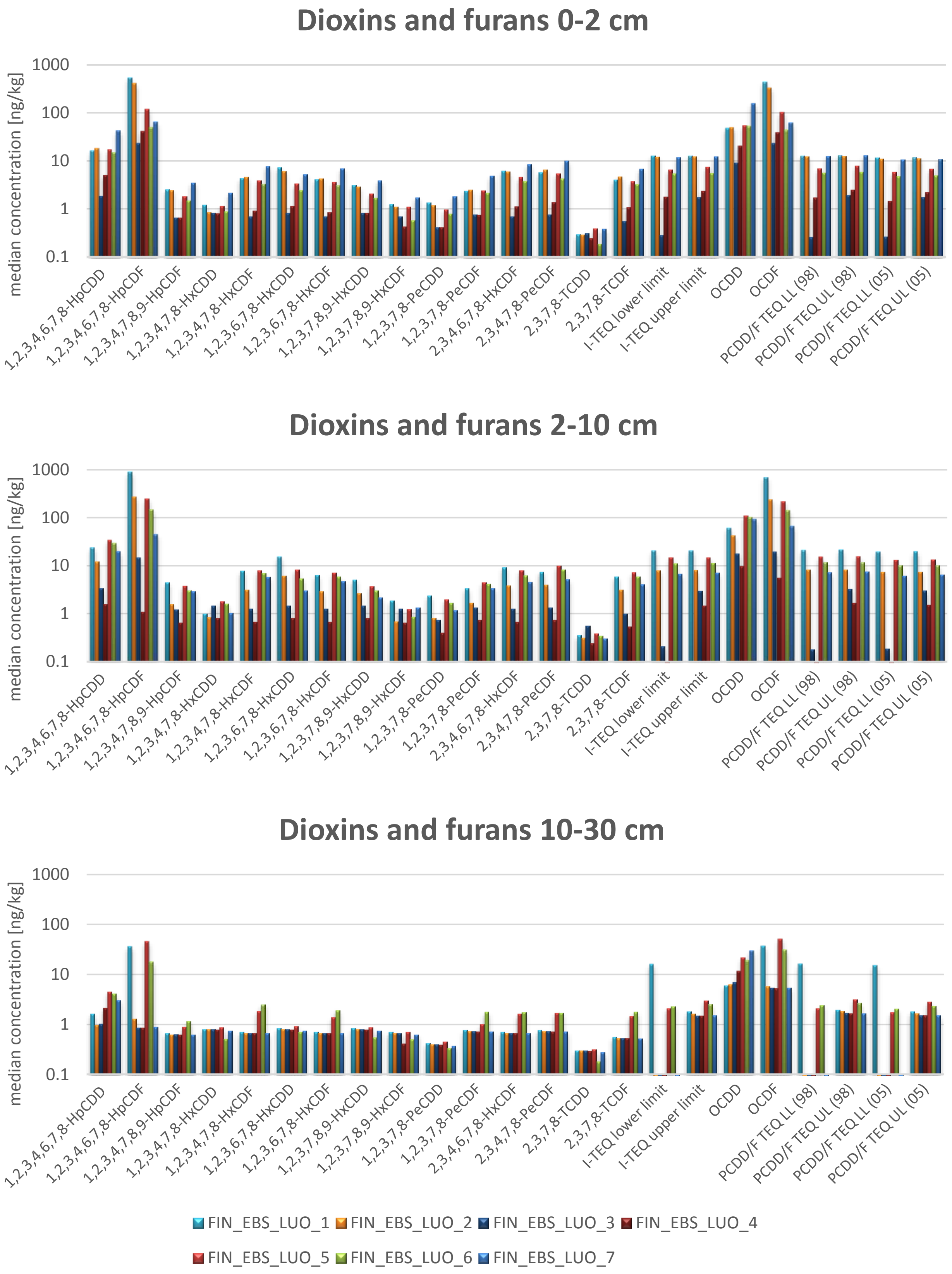


Figure 49. Median Polycyclic aromatic hydrocarbons (PAHs) concentrations from FIN_EBS_LUO_1 to 7 areal stations. Values are shown for 0-2 cm, 2-10 cm and 10-30 cm layer. Actual depth depends on sediment softness and quality.


Dioxins and furans 0-2 cm

Dioxins and furans 2-10 cm

Dioxins and furans 10-30 cm

Figure 50. Median dioxins and furan concentrations from FIN_EBS_LUO_1 to 7 areal stations. Values are shown for 0-2 cm, 2-10 cm and 10-30 cm layer. Actual depth depends on sediment softness and quality. Note the logarithmic scale.

Figure 51. Median organotin concentrations from FIN_EBS_LUO_1 to 7 areal stations. Values are shown for 0-2 cm, 2-10 cm and 10-30 cm layer. Actual depth depends on sediment softness and quality.

4. Discussion and conclusions

4.1 Temperature

Collected temperature data from the bottom layer showed typical seasonal cooling towards winter when the heat of the sea water is released slowly to the atmosphere (Fig. 14, 15 and 16). The initial temperature level was 6-7 °C right after the deployment in mid-December reaching the 4-5 °C level by the time of the first sensor recovery in mid-February. Due to the location of ADCP2 standing next to the Northern Gotland Basin and a larger sea water volume, initial temperatures were higher and cooling of bottom layer slower compared to ADCP1.

A significant short-term temperature fall was recorded at ADCP1 in January when temperatures decreased over 2 °C in all layers. The rapid cooling was caused by vertical mixing throughout the entire water column in a storm event which was also recorded with the profiling current metre (Fig. 26).

The ADCP2 is also located deeper with a depth of 78 m whilst the depth at ADCP1 is 67 m. Temperatures at 2m and 5m above the bottom followed the same curve while the 15m layer seems to be more exposed to vertical mixing which is seen as a higher periodical temperature fluctuation and generally lower temperatures.

The ADCP3 which is the located closer to coastal areas of Finland mainland showed faster cooling period in the beginning of monitoring campaign. A highly dynamic warming period was recorded in the end of January when temperatures in all monitoring depths rose from 1 to 4°C.

4.2 Salinity

General salinity levels at ADCP1, ADCP2 and ADCP3 (Fig. 17-19) followed the typical salinity levels recorded in the Gulf of Finland. A significant Baltic Sea revitalizing phenomenon that hasn’t shown for a decade was recorded at the ADCP2, which was the deepest monitoring locations. Impacts of saline pulses originated from the North Sea flowing into the Baltic Sea were clearly seen in the Gulf of Finland datasets. Oxygen-rich and salty North Sea water travels further into the Baltic Sea along the sea bottom forcing the often stagnant and anoxic bottom water from the Gotland Basin to flow northward towards the Gulf of Finland. This saline pulse driven flow condition was recorded at ADCP2 in the beginning of January and it lasted for almost a month, then vanished from area and returned in the beginning of March. Salinity levels at layers 2m and 5m above the bottom increased from 7 ‰, which is typical for the area, to almost a level of 11 ‰, which is extreme at this location. A strong halocline was formed between the layers 5m and 15m above the bottom during the saline water inflow, but the stratification was lost when the inflow ended. ADCP1 was further inside the Gulf of Finland, and so a major saline water inflow was not recorded, but values showed an increasing trend towards the end of monitoring period. Bottom layer salinity varied on both sides of 6 ‰ showing a slight increasing trend during the winter when fresh water discharge from rivers was lower. A weak halocline was formed between the layers 5m and 15m above the sea floor when more saline rich water was flowing into the area near the bottom. This weak stratification was lost in mid-January when storm induced currents (Fig. 26-28) mixed the entire water column. As expected salinity readings 15 meters above the seafloor were generally lower in all places when the stratification started to re-develop after deep vertical mixing in the beginning of winter season. Salinity values increased up to 9‰ during the mid-May, which indicated that salt water pulse was entering the area with a delay. Shallowest locations ADPC3 showed only seasonal variability without track of salt water pulse.

4.3 Turbidity

Recorded turbidity values remained low at ADCP1 apart from a few individual peaks in December (Fig. 20) taking place during the period of strong currents. At ADCP2, more turbidity fluctuation was recorded but the magnitude of the fluctuation was small with a few individual peaks (Fig. 21). Sediment resuspension were induced by increased flow velocities near the bottom layer (Fig. 27). The saline pulse flowing into the Gulf of Finland caused increased turbidity levels due to resuspension. Elevated turbidity levels in the lowermost water layer were often seen in the area during the Nord Stream -project. Shallowest monitoring location ADPC3 showed clear peak during the stormy period in the end January - early February (Fig 22). Turbidity levels increased from 1-2 FNU up to 35 FNU, even the highest sensor located at 15 metres above seafloor indicated strong resuspension in the area.

4.4 Dissolved oxygen

Oxygen levels at ADCP1 (Fig. 23) remained at a relatively good level until the new-year when vertical mixing reached also the bottom layer and broke the stratification. After sudden oxygen drop in January 13th, oxygen concentration was back to the good level during the storm event in January. After that values decreased gradually towards 2 mg/l, which is typical winter-time behaviour when organic material decomposes in the bottom. Values recorded at 15 metres above the bottom remained in good or moderate level.

At ADCP2, oxygen concentration (Fig. 24) remained relatively good until the saline pulse flowed into the area from the Gotland Basin. Intense oxygen loss was recorded immediately at 2 metres and later also at 5 metres above the bottom when saline and anoxic bottom water entered the area. Bottom layer anoxia lasted about a month corresponding well with the saline pulse duration (Fig. 18). After the anoxic saline pulse, values retuned back to the relatively good level when anoxic water was replaced with oxygen rich water and then concentrations dropped to zero when pulse returned into area.

At ADCP3 oxygen concentrations remained good during the winter and spring period (Fig. 25).

4.5 Currents

Current directions in the bottom layer were driven by the bottom topography, which forces the general current field close to the bottom. At ADCP1 the dominating current direction in the bottom layer was in the N-E direction and secondarily in the SW-W direction (Fig. 30). At ADCP2 and ADCP3 the dominating current direction in bottom layer was in the SW-W and secondarily in the NE-E direction (Fig. 30). The average current speed for ADCP1 was 7.3 cm/s and the maximum speed was 49.8 cm/s. For ADCP2 the average speed was 10.6 cm/s and the maximum speed was 79.5 cm/s and for ADCP3 the average speed was 5.9 cm/s and the maximum speed was 29.6 cm/s in the lowermost 10 meter water layer. Current magnitude profiles (Fig. 26 - 28) shows that vertical mixing covers the entire water column regularly during the winter period in circumstances when ice cover is not formed. Vertical mixing periods increase flow velocities from surface to bottom and simultaneously cause deterioration of stratification that is shown as rapid changes in temperature, salinity and oxygen concentrations, as well as turbidity changes due to resuspension forces.

4.6 Underwater noise monitoring

The highest Leq (total) levels during the monitoring period were measured at NOISE3 station. Results at NOISE2 station were very close to NOISE3 station values. At both measurement locations the vessel traffic is so high and active that at least a distant shipping noise can be heard in time-series virtually at any time.

L95 values at NOISE3 are over 3 dB higher compared to NOISE1. In other words background noise is lower at NOISE1. Vessels are passing closer at NOISE2 and NOISE3 and thus causing higher amplitude peaks compared to NOISE1. However L50 and L5 at NOISE1 are closer to values at NOISE2 and NOISE3 (Tables 5 and 6).

Single vessel can affect considerably the full period noise values if it operates for a longer time in the same area. At NOISE2 total noise level was higher during the first monitoring compared to second monitoring period. This was partly because of the unknown vessel which was operating in the area between 27th of January and 5th of February 2016.

Noise 1_2 and Noise 3 locations were chosen to detect potential noise from operation of NSP pipelines. However noise caused due to pipeline operation couldn't be identified. The correlation between shipping density and background noise is noticeable. The amplitude of lower 1/3 octave frequency bands is higher at NOISE2 and NOISE3 where the shipping density is higher. Background noise was generated by the ships and not by the pipeline.

4.7 CTD profiles and water samples

The CTD-profiles (Fig. 46) show that sea water in the Gulf of Finland was well mixed in December. No clear thermocline or halocline was observed with the exception of the westernmost sampling location in the Gotland Basin (FIN_EBS_LUO_7). There the thermocline was detected at a depth of 90 m and the halocline at 100 m depth. Oxygen profiles follow the same stratification structure at the westernmost sampling location, with the concentration decreasing rapidly below the thermocline and anoxic conditions prevailing below the halocline. Despite the well mixed water mass further inside the Gulf of Finland, lower, but well above 6 mg/l, oxygen levels were detected in the bottom water layer due to oxygen consumption in the decomposing process.

Turbidity profiles represent relatively clear water at all sampling locations. The only increased values were detected just above the bottom at the two westernmost sampling locations (FIN_EBS_LUO_6 and FIN_EBS_LUO_7). In the easternmost sampling location (FIN_EBS_LUO_1), the lowest three metres of the water mass showed high levels of turbidity, with maximum values exceeding over 650 turbidity units. Laboratory results for collected water samples showed typical values for the sampling season. No significant spatial variations could be seen. Water masses were well mixed as seen in CTD profiles. Amounts of heavy metals were low.

4.8 Sediment samples

Collected sediment sample datasets showed that vertical distribution of heavy metals was relatively constant in all sampled depths (Fig. 47). In general, surface sediment was slightly more contaminated in the westernmost part of area FIN_EBS_LUO_7, and in the deeper layer no clear spatial difference could be seen. A clear pattern in the vertical distribution of organotins and especially TBT levels was recorded (Fig. 51). Elevated values were practically visible in all samples taken from the uppermost 10 cm layer of sediment. The deepest samples from 10-30 cm showed that concentrations diminished significantly.

Dioxin and furan levels showed that areas 1, 2, 5 and 6 were slightly more contaminated than other sample sites (Fig. 50). The main pattern showed similar vertical behaviour than organotins. Deeper samples contained less dioxins and furans that the uppermost 10 cm layer. PAH levels were higher in the uppermost 0-10 cm layer than in the deepest samples (Fig. 49). In general, the westernmost areas FIN_EBS_LUO_5-7 showed higher concentrations than other sampled areas. PCB results showed elevated readings in only one surface layer subsample taken from the FIN_EBS_LUO_5 area (Fig. 48). Normalised values are shown in Attachment 1.

5. Attachment 1. Laboratory analysis results of the sediment samples.

Sediment data normalization

Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Equation 1 was used to normalize the concentration of metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn):

$$C\ normalized = C\ \times \frac{a+b\times 25+c\times 10}{a+b\times clay+c\times organic\ matter} \qquad \text{(Eq. 1)}$$

where: C normalized = concentration of substance in the standard sediment
C = measured concentration of the substance before normalization
clay = measured percentage of clay (<2 µm) of dry weight
organic matter = measured percentage of organic matter of dry weight (TOCx2; if higher than 30%, value 30% is used)
a, b and c = substance specific normalization factors

Constants a, b and c are defined in the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015) for different metals.

Other harmful substances (polycyclic aromatic hydrocarbons, dioxins and furans, polychlorinated biphenyls and organotins) were normalized using the equation 2:

$$C\ normalized = C \times \frac{10}{organic\ matter} \qquad \text{(Eq. 2)}$$

where: C normalized = concentration of substance in the standard sediment
C = measured concentration of substance before normalization
organic matter = measured percentage of organic matter of dry weight (TOCx2; if lower than 2%, value 2% is used; if higher than 30%, value 30% is used. For PAH-compounds, if lower than 10%, value 10% is used).

Normalized values falling into certain guideline concentration levels (Ministry of the Environment, 2015) have been highlighted in the tables 8-14. Yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2. These levels are given in Table 7 for sampled substances. For depositing the dredged materials, levels higher than 1B are considered (Ministry of the Environment, 2015).

Table 7. The guideline concentration levels (Ministry of the Environment, 2015) for sampled substances. Only limits for >1 or >2 are given.

Substance	Concentration level	
	>1 (1A-1C)	**2**
Metals (mg/kg)		
Arsenic, As	>15	>70
Cadmium, Cd	>0.5	>2.5
Chromium, Cr	>65	>270
Copper, Cu	>35	>90
Mercury, Hg	>0.1	>1
Nickel, Ni	>45	>60
Lead, Pb	>40	>200
Zinc, Zn	>170	>500
Polycyclic aromatic hydrocarbons, PAHs (µg/kg)		
Anthracene	>20	>500
Benzo(a)anthracene	>20	>1000
Benzo(a)pyrene	>20	>4500
Benzo(ghi)perylene	>20	>1000
Benzo(k)fluoranthene	>20	>2500
Phenanthrene	>20	>5000
Fluoranthene	>20	>2000
Indeno(1,2,3-c,d)pyrene	>20	>1000
Chrysene	>20	>3000
Naphthalene	>20	>2500
Pyrene	>20	>2800
Dioxins and Furans (ng WHO-TEQ/kg)		
WHO PCDD/F TEQ	>5	>60
Polychlorinated biphenyls, PCBs (µg/kg)		
PCB 28 - 180	>2	>30
Organotins (µg/kg)		
Tributyltin, TBT	>5	>150
Triphenyltin, TPhT	>2	>30

Constants a, b and c have not been defined in the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015) for cobalt, and the cobalt concentration was not normalized. Also guideline concentration levels have not been defined for all observed substances; the concentrations of these substances were therefore not normalized. Sometimes the normalization procedure produced value N/A; this is because TOC value, or in case of metals, TOC or clay value could not be observed for the sample in question.

Table 8. Sediment sample analyses at locations FIN_EBS_LUO_1_1 – FIN_EBS_LUO_1_8. Laboratory Eurofins Finland Oy. Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Normalized values falling into certain guideline concentration levels have been highlighted: yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2.

FIN_EBS_LUO_1	sample (cm)	1-1 (0-2cm)	1-1 (2-10cm)	1-1 (10-26cm)	1-2 (0-2cm)	1-3 (0-2cm)	1-4 (0-2cm)	1-5 (0-2cm)	1-5 (2-10cm)	1-5 (10-30cm)	1-6 (0-2cm)	1-6 (2-10cm)	1-6 (10-15cm)	1-7 (0-2cm)	1-7 (2-10cm)	1-7 (10-30cm)	1-8 (0-2cm)	1-8 (2-10cm)	1-8 (10-30cm)
Parameter	Unit	CONCENTRATIONS																	
Metals																			
Arsenic, As	mg/kg	11	16	16	5.3	2.1	3.5	16	9.4	7.4	43	6.4	4.5	11	12	8.1	13	12	14
Cadmium, Cd	mg/kg	1.1	0.8	< 0.2	< 0.2	< 0.2	0.4	1.2	1.6	0.9	0.9	0.2	< 0.2	1.7	1.6	0.3	1.7	1.8	0.9
Chromium, Cr	mg/kg	36	22	32	77	7	9	44	52	32	25	77	73	49	43	46	52	57	44
Cobalt, Co	mg/kg	44	27	18	20	5	6	25	24	24	32	27	22	18	59	17	22	21	17
Copper, Cu	mg/kg	35	19	21	42	5	8	41	53	28	21	44	41	47	39	30	49	50	33
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	0.07	< 0.07
Nickel, Ni	mg/kg	27	19	29	50	5	7	36	38	22	26	47	45	35	30	32	39	39	30
Lead, Pb	mg/kg	20	14	9	17	2	5	23	40	27	13	14	14	33	34	13	34	45	28
Zinc, Zn	mg/kg	130	97	61	140	23	34	170	200	130	120	150	140	180	170	99	190	210	140
Metals, normalized concentrations																			
Arsenic, As	mg/kg	N/A	21.2	15.8	9.3	3.8	5.7	N/A	N/A	6.4	N/A	4.9	3.0	N/A	9.5	7.0	N/A	9.2	13.0
Cadmium, Cd	mg/kg	N/A	1.1	N/A	N/A	N/A	0.7	N/A	N/A	0.9	N/A	0.2	N/A	N/A	1.5	0.3	N/A	1.5	0.9
Chromium, Cr	mg/kg	N/A	27.9	26.6	135.6	13.0	14.7	N/A	N/A	23.9	N/A	47.0	38.1	N/A	29.6	33.9	N/A	39.6	36.6
Copper, Cu	mg/kg	N/A	27.0	20.6	86.9	10.9	15.1	N/A	N/A	23.6	N/A	31.9	25.6	N/A	29.8	25.1	N/A	36.7	30.3
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	0.07	< 0.07
Nickel, Ni	mg/kg	N/A	27.3	22.5	130.6	14.6	15.7	N/A	N/A	14.8	N/A	24.6	19.5	N/A	18.2	21.2	N/A	24.0	23.3
Lead, Pb	mg/kg	N/A	17.7	8.9	26.8	3.2	7.5	N/A	N/A	23.9	N/A	11.0	9.8	N/A	27.9	11.4	N/A	35.8	26.4
Zinc, Zn	mg/kg	N/A	139.4	54.5	320.8	56.6	69.4	N/A	N/A	99.8	N/A	94.5	74.6	N/A	117.9	75.2	N/A	143.1	120.2
Dioxins and Furans																			
1,2,3,4,6,7,8-HeptaCDD	ng/kg	217	7.87	< 0.90	1.59	3.36	2	24.6	35.2	36.9	8.14	2.28	< 0.95	32.9	23.6	1.64	30.4	48.6	17.1
1,2,3,4,6,7,8-HeptaCDF	ng/kg	6590	247	< 0.87	< 0.81	25.1	61.9	876	962	1140	200	10	< 0.91	1000	890	36.6	948	1350	729
1,2,3,4,7,8,9-HeptaCDF	ng/kg	32.1	1.18	< 0.63	< 0.59	< 1.6	< 0.39	3.47	5.05	5.61	1.13	< 0.44	< 0.67	4.56	4.47	< 0.60	4.49	5.58	3.25
1,2,3,4,7,8-HexaCDD	ng/kg	< 11	< 0.50	< 0.80	< 0.75	< 2.0	< 0.49	0.987	1.68	< 1.9	< 0.48	< 0.56	< 0.84	1.45	0.996	< 0.75	1.46	1.85	0.645
1,2,3,4,7,8-HexaCDF	ng/kg	53.3	2.14	< 0.67	< 0.62	< 1.6	0.629	6.8	9.49	10.2	1.93	< 0.46	< 0.70	8.05	7.83	< 0.63	7.62	11.5	5.56
1,2,3,6,7,8-HexaCDD	ng/kg	103	4.15	< 0.80	< 0.75	< 2.0	1.06	10.8	20.5	22.4	3.88	< 0.56	< 0.84	18.1	15.2	< 0.75	16	28.6	10.8
1,2,3,6,7,8-HexaCDF	ng/kg	51.7	2	< 0.67	< 0.62	< 1.6	0.6	6.34	7.91	9.35	1.93	< 0.46	< 0.70	7.12	6.4	< 0.63	6.87	10.5	5.01
1,2,3,7,8,9-HexaCDD	ng/kg	45.5	1.45	< 0.80	< 0.75	< 2.0	< 0.49	4.27	7.78	8.24	1.51	< 0.56	< 0.84	7.23	5.08	< 0.75	6.72	10.4	4.14
1,2,3,7,8,9-HexaCDF	ng/kg	< 14.6	0.549	< 0.67	< 0.62	< 1.6	< 0.41	< 1.69	< 1.86	< 1.93	< 0.591	< 0.46	< 0.70	< 2.17	< 1.87	< 0.63	< 0.899	< 2.85	< 1.42
1,2,3,7,8-PentaCDD	ng/kg	15.2	0.584	< 0.40	< 0.37	< 0.98	< 0.25	1.71	3.08	3.2	0.616	< 0.28	< 0.42	2.72	2.37	< 0.38	2.39	3.6	1.67
1,2,3,7,8-PentaCDF	ng/kg	25.7	0.897	< 0.73	< 0.68	< 1.8	< 0.45	2.95	4.57	4.86	0.968	< 0.51	< 0.77	3.89	3.36	< 0.69	3.6	5.38	2.26
2,3,4,6,7,8-HeksaCDF	ng/kg	72	3.46	< 0.67	< 0.62	< 1.6	0.943	9.18	12.7	12	3.29	< 0.46	< 0.70	10.8	9.27	< 0.63	9.47	15.6	6.22
2,3,4,7,8-PentaCDF	ng/kg	71.1	2.23	< 0.73	< 0.68	< 1.8	0.688	8.68	12	10.9	2.79	< 0.51	< 0.77	10.9	7.49	< 0.69	10	14.3	5.74
2,3,7,8-TetraCDD	ng/kg	< 4.0	< 0.19	< 0.30	< 0.28	< 0.74	< 0.19	0.291	0.365	< 0.70	< 0.18	< 0.21	< 0.32	< 0.39	0.357	< 0.28	0.304	0.616	0.295
2,3,7,8-TetraCDF	ng/kg	51.1	1.8	< 0.53	< 0.50	< 1.3	0.557	6.1	9.03	9.39	1.92	< 0.37	< 0.56	8.32	5.93	< 0.50	7.52	9.78	4.14
OktaCDD	ng/kg	613	20.2	< 3.7	12.5	19.6	5.53	74.3	105	94	22.8	13.4	< 3.9	94.8	60.4	6.04	85	143	49.3
OktaCDF	ng/kg	6400	200	< 3.2	< 5.0	34.9	58.7	808	890	1100	144	11.3	< 5.6	771	697	36.8	737	1170	654
I-TEQ (NATO/CCMS) lower	ng/kg	158	5.79	N/D	0.0284	0.339	1.43	20	26.1	27.5	5.45	0.148	N/D	24.4	20.5	0.425	22.9	34	16
I-TEQ (NATO/CCMS) upper	ng/kg	164	6.02	1.49	1.41	3.94	1.9	20.2	26.3	28.6	5.74	1.17	1.58	25	20.6	1.81	23	34.3	16.1
WHO (1998) PCDD/F TEQ lower	ng/kg	159	5.88	N/D	0.0171	0.29	1.37	20.1	26.7	28	5.61	0.126	N/D	24.9	21	0.387	23.4	34.7	16.2
WHO (1998) PCDD/F TEQ upper	ng/kg	165	6.12	1.69	1.58	4.39	1.97	20.2	26.9	29.1	5.9	1.29	1.78	25.6	21.2	1.96	23.5	34.9	16.3
WHO (2005) PCDD/F TEQ lower	ng/kg	145	5.46	N/D	0.0196	0.301	1.24	18.5	24.4	26	5.07	0.13	N/D	22.9	19.5	0.395	21.5	31.9	15.1
WHO (2005) PCDD/F TEQ upper	ng/kg	152	5.7	1.53	1.44	4	1.83	18.6	24.6	27.1	5.36	1.18	1.61	23.5	19.7	1.81	21.5	32.2	15.3
Dioxins and Furans, normalized concentrations																			
WHO (1998) PCDD/F TEQ lower	ng/kg	150	21.00	N/D	0.09	1.45	6.85	14.15	23.84	66.67	10.79	0.63	N/D	22.23	35.00	0.97	18.28	35.41	31.15
WHO (1998) PCDD/F TEQ upper	ng/kg	156	21.86	8.45	7.90	21.95	9.85	14.23	24.02	69.29	11.35	6.45	8.90	22.86	35.33	4.90	18.36	35.61	31.35

WHO (2005) PCDD/F TEQ lower	ng/kg	137	19.50	N/D	0.10	1.51	6.20	13.03	21.79	61.90	9.75	0.65	N/D	20.45	32.50	0.99	16.80	32.55	29.04
WHO (2005) PCDD/F TEQ upper	ng/kg	143	20.36	7.65	7.20	20.00	9.15	13.10	21.96	64.52	10.31	5.90	8.05	20.98	32.83	4.53	16.80	32.86	29.42
Polycyclic aromatic hydrocarbons (PAHs)																			
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.72	0.49	0.18	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	0.28
Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene,	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	0.09	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.14	0.18	0.11	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	0.07	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Dibenzo(a,h)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.87	0.22	0.3	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.08	0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	0.2
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
PAH sum	mg/kg	N/D	N/D	N/D	N/D	N/D	N/D	1.73	1.53	0.91	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.48
Polycyclic aromatic hydrocarbons (PAHs) , normalized concentrations																			
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.51	0.44	0.18	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	0.28
Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.10	0.16	0.11	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.10	0.07	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.61	0.20	0.30	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.07	0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.15	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	0.20
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
Polychlorinated biphenyls (PCBs)																			
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Polychlorinated biphenyls (PCBs) , normalized concentrations																			
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organotins																			
Monobutyltin, MBT	µg/kg	6.33	< 1.1	< 0.85	< 1.04	< 0.59	< 1.41	< 5.80	< 3.3	< 1.5	2.07	< 1.1	< 0.90	3.78	< 3.52	< 1.3	< 4.9	< 2.7	< 3.76
Dibutyltin, DBT	µg/kg	12.3	2.4	< 0.85	2.3	< 0.59	< 0.71	8.73	14.1	1.62	2.7	< 1.1	< 0.90	14.9	5.91	< 1.3	11.5	6.9	< 1.8
Tributyltin, TBT	µg/kg	79.2	15.2	< 0.85	< 0.89	1.24	1.99	41.6	121	15.7	11.1	< 1.1	< 0.90	88.1	29.6	< 1.3	75.4	46.1	3.22
Tetrabutyltin, TTBT	µg/kg	< 5.0	< 1.1	< 0.85	< 0.89	< 0.59	< 0.71	< 5.4	< 3.3	< 1.5	< 1.4	< 1.1	< 0.90	< 3.4	< 2.1	< 1.3	< 4.9	< 2.7	< 1.8
Mono-octyltin, MOT	µg/kg	< 5.0	< 1.1	< 0.85	< 0.89	< 0.59	< 0.71	< 5.4	< 3.3	< 1.5	< 1.4	< 1.1	< 0.90	< 3.4	< 2.1	< 1.3	< 4.9	< 2.7	< 1.8

Dioctylintin, DOT	µg/kg	< 5.0	< 1.1	< 0.85	< 0.89	< 0.59	< 0.71	< 7.10	< 3.3	< 1.5	< 1.4	< 1.1	< 0.90	< 3.4	< 2.1	< 1.3	< 4.9	< 2.7	< 1.8
Tricyclohexyltin, TCHT	µg/kg	< 9.9	< 2.3	< 1.7	< 1.8	< 1.2	< 1.4	< 11	< 6.7	< 3.1	< 2.8	< 2.1	< 1.8	< 6.7	< 4.2	< 2.7	< 9.9	< 5.4	< 3.6
Triphenyltin, TPhT	µg/kg	< 5.0	< 1.1	< 0.85	< 0.89	< 0.59	< 0.71	< 5.4	< 3.3	< 1.5	< 1.4	< 1.1	< 0.90	< 3.4	< 2.1	< 1.3	< 4.9	< 2.7	< 1.8
Organotins, normalized concentrations																			
TBT	µg/kg	74.72	54.29	< 0.85	< 0.89	6.20	9.95	29.30	108.04	37.38	21.35	< 1.1	< 0.90	78.66	49.33	< 1.3	58.91	47.04	6.19
Triphenyltin, TPhT		< 5.0	< 1.1	< 0.85	< 0.89	< 0.59	< 0.71	< 5.4	< 3.3	< 1.5	< 1.4	< 1.1	< 0.90	< 3.4	< 2.1	< 1.3	< 4.9	< 2.7	< 1.8
Nutrients																			
Total organic carbon	%	5.3	1.4	0.5	0.3	0.3	0.6	7.1	5.6	2.1	2.6	0.4	0.2	5.6	3	2	6.4	4.9	2.6
Total nitrogen	%	0.63	0.12	< 0.05	< 0.05	< 0.05	< 0.05	0.86	0.65	0.23	0.18	< 0.05	< 0.05	0.64	0.44	0.28	0.88	0.69	0.37
Total phosporus	mg/kg	2000	850	450	637	420	543	1500	940	490	3400	780	600	1100	718	610	1098	985	710
Auxiliary parameters																			
Fraction < 2000 µm	%	N/A	86	85.6	98.9	95.5	93.7	N/A	N/A	83	N/A	95	96.8	N/A	79.6	88.1	N/A	59.9	73.1
Fraction < 1000 µm	%	N/A	85.7	85.4	98.6	93.3	89.5	N/A	N/A	82.8	N/A	80.4	93.8	N/A	79.4	83.6	N/A	59.7	71
Fraction < 500 µm	%	N/A	83.5	85	98.4	86.8	87.2	N/A	N/A	82.5	N/A	77.2	92.4	N/A	79.7	80.2	N/A	59.6	68.4
Fraction < 250 µm	%	N/A	80.8	84.2	98.3	72	84.4	N/A	N/A	82.3	N/A	75.7	91.8	N/A	79.8	78.9	N/A	59.6	65.9
Fraction < 125 µm	%	N/A	72	80	98.1	25.5	55.5	N/A	N/A	81	N/A	74.6	91.5	N/A	79.8	77.2	N/A	59.4	59.3
Fraction < 63 µm	%	N/A	41.8	55	98	4.8	14.1	N/A	N/A	75	N/A	73.6	91.1	N/A	77.9	74.7	N/A	59	55.4
Fraction < 45 µm	%	N/A	33.4	46	97.8	3.4	9.9	N/A	N/A	71	N/A	73.4	91	N/A	75.7	73.7	N/A	58.5	52.3
Fraction < 16 µm	%	N/A	26.6	43.7	97.4	3	8.5	N/A	N/A	64.5	N/A	71.2	88.6	N/A	71.2	68.6	N/A	58.2	48.6
Fraction < 2 µm	%	N/A	14.4	35.1	3.4	2	5.6	N/A	N/A	42	N/A	57	70.7	N/A	47.6	42.8	N/A	46.9	35.1
Loss on ignition	%	15.3	3.9	2.1	3.7	1	1.7	18	14.6	8	7.2	3.4	3.2	14.9	9.8	6.8	15.6	12.6	7.4
Dry matter (1)	%	9.48	40.9	52.1	49.1	75.1	65	8.18	13.2	27.4	31.7	46.8	47.6	12.9	22.5	34.5	12	17.8	27.4
Dry matter (2)	%	16.6	47.9	54.2	50.3	73.7	70	6.1	13.6	26.5	33.9	46.3	46.3	16.8	25.5	33.7	17.6	18	30.3
Dry matter (3)	%	N/A	43.5	51.9	49.4	75.3	66.6	N/A	N/A	25.2	N/A	46.2	46.4	N/A	26	33.3	N/A	18	28

N/A = Not Analysed; N/D = Not detected; With the sample number also information is given of the sample depth (cm below the sediment surface).

Table 9. Sediment sample analyses at locations FIN_EBS_LUO_2_1 – FIN_EBS_LUO_2_8. Laboratory Eurofins Finland Oy. Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Normalized values falling into certain guideline concentration levels have been highlighted: yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2.

FIN_EBS-LUO_2	**sample (cm)**	**2-1 (0-2cm)**	**2-1 (2-10cm)**	**2-1 (10-30cm)**	**2-2 (0-2cm)**	**2-2 (2-10cm)**	**2-2 (10-30cm)**	**2-3 (0-2cm)**	**2-3 (2-10cm)**	**2-3 (10-30cm)**	**2-4 (0-2cm)**	**2-4 (2-10cm)**	**2-4 (10-30cm)**	**2-6 (0-2cm)**	**2-7 (0-2cm)**	**2-8 (0-2cm)**	**2-8 (2-10cm)**	**2-8 (10-30cm)**
Parameter	Unit	CONCENTRATIONS																
Metals																		
Arsenic, As	mg/kg	12	8.5	13	11	11	7.1	10	8.9	6.8	12	10	11	2.1	12	12	10	6.9
Cadmium, Cd	mg/kg	1.2	1.3	2.1	1.2	0.4	< 0.2	1.1	0.4	< 0.2	1.2	1.5	0.2	< 0.2	0.4	1.3	0.6	< 0.2
Chromium, Cr	mg/kg	42	52	58	42	40	51	38	36	49	44	47	33	5	8	42	27	42
Cobalt, Co	mg/kg	90	21	17	21	40	22	16	18	36	47	20	13	5	17	19	23	27
Copper, Cu	mg/kg	40	44	51	40	28	27	35	23	26	40	41	20	3	10	41	21	23
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	36	38	40	36	27	34	31	25	34	36	34	23	4	34	37	19	29
Lead, Pb	mg/kg	22	37	47	23	15	11	22	13	10	21	37	10	< 2	3	22	14	10
Zinc, Zn	mg/kg	150	180	230	160	92	96	140	83	94	160	180	71	17	43	160	82	84
Metals, normalized concentrations																		
Arsenic, As	mg/kg	N/A	7.1	10.6	N/A	11.2	6.0	8.7	8.3	5.5	N/A	8.5	13.0	3.9	21.4	N/A	10.6	5.8
Cadmium, Cd	mg/kg	N/A	1.1	1.9	N/A	0.5	N/A	1.0	0.4	N/A	N/A	1.4	0.3	N/A	0.7	N/A	0.7	N/A
Chromium, Cr	mg/kg	N/A	40.5	42.8	N/A	36.5	36.7	32.1	29.5	33.5	N/A	36.6	35.7	9.4	14.4	N/A	25.7	30.3
Copper, Cu	mg/kg	N/A	35.4	40.3	N/A	28.7	22.3	29.7	21.3	20.4	N/A	34.0	24.6	6.7	21.4	N/A	22.4	18.9
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	N/A	27.0	26.5	N/A	23.7	21.9	24.5	19.0	20.4	N/A	24.2	25.8	12.2	93.7	N/A	17.7	18.7
Lead, Pb	mg/kg	N/A	31.6	39.6	N/A	15.3	9.6	19.6	12.3	8.4	N/A	32.3	11.5	N/A	4.8	N/A	14.7	8.7

Zinc, Zn	mg/kg	N/A	137.6	168.9	N/A	88.8	71.4	115.5	71.0	65.9	N/A	140.1	84.6	43.2	102.6	N/A	83.1	62.4
Dioxins and Furans																		
1,2,3,4,6,7,8-HeptaCDD	ng/kg	18.7	30.3	41.3	19	6.49	0.982	17.3	4.43	0.854	18.3	25.7	1.47	< 0.87	< 0.96	18.2	12.1	< 0.98
1,2,3,4,6,7,8-HeptaCDF	ng/kg	460	562	1170	409	110	0.543	384	67.7	< 0.53	426	717	18.8	9	10.8	521	271	1.28
1,2,3,4,7,8,9-HeptaCDF	ng/kg	2.53	3.3	5.53	2.61	0.862	< 0.40	2.24	0.667	< 0.38	2.47	3.71	< 0.63	< 0.61	< 0.67	2.56	1.59	< 0.69
1,2,3,4,7,8-HexaCDD	ng/kg	0.792	1.15	1.75	0.973	< 0.83	< 0.50	0.86	< 0.47	< 0.49	< 2.4	1.11	< 0.80	< 0.78	< 0.85	0.966	0.58	< 0.87
1,2,3,4,7,8-HexaCDF	ng/kg	4.88	6.65	10.3	4.58	1.64	< 0.42	4.24	1.01	< 0.40	5.56	8.21	< 0.67	< 0.65	< 0.71	5.22	3.11	< 0.72
1,2,3,6,7,8-HexaCDD	ng/kg	6.92	10.9	20.3	6.38	3.31	< 0.50	6.02	1.84	< 0.49	6.56	13.1	< 0.80	< 0.78	< 0.85	6.12	6.14	< 0.87
1,2,3,6,7,8-HexaCDF	ng/kg	4.4	5.93	9.35	4.56	1.46	< 0.42	3.91	0.963	< 0.40	4.25	7.49	< 0.67	< 0.65	< 0.71	5.08	2.91	< 0.72
1,2,3,7,8,9-HexaCDD	ng/kg	3.44	4.32	7.21	3.03	1.48	< 0.50	2.89	0.855	< 0.49	2.8	5.2	< 0.80	< 0.78	< 0.85	3.23	2.64	< 0.87
1,2,3,7,8,9-HexaCDF	ng/kg	< 1.57	< 1.75	< 2.57	< 1.37	< 0.69	< 0.42	< 1.10	< 0.39	< 0.40	< 2.0	< 1.89	< 0.67	< 0.65	< 0.71	< 0.842	< 0.44	< 0.72
1,2,3,7,8-PentaCDD	ng/kg	1.19	2.03	3.19	1.35	0.605	< 0.25	1.02	0.346	< 0.24	1.25	2.53	< 0.40	< 0.39	< 0.42	1.27	0.806	< 0.43
1,2,3,7,8-PentaCDF	ng/kg	2.53	3.31	5.07	2.58	1.01	< 0.46	2.2	0.586	< 0.45	2.5	3.83	< 0.73	< 0.71	< 0.78	2.65	1.69	< 0.80
2,3,4,6,7,8-HeksaCDF	ng/kg	6.32	7.8	13.8	6.1	2.36	< 0.42	5.21	1.37	< 0.40	6.31	9.09	< 0.67	< 0.65	< 0.71	5.93	3.86	< 0.72
2,3,4,7,8-PentaCDF	ng/kg	6.68	8.56	11.3	6.8	2.36	< 0.46	5.66	1.37	< 0.45	6.66	9.33	< 0.73	< 0.71	< 0.78	7.85	3.96	< 0.80
2,3,7,8-TetraCDD	ng/kg	< 0.28	< 0.31	0.639	0.215	< 0.31	< 0.19	< 0.19	< 0.18	< 0.18	< 0.90	0.372	< 0.30	< 0.29	< 0.32	< 0.36	0.219	< 0.33
2,3,7,8-TetraCDF	ng/kg	4.77	6.52	9.73	5	1.66	< 0.33	4.18	1.3	< 0.32	5.48	7.2	< 0.53	< 0.52	< 0.57	5.03	3.14	< 0.58
OktaCDD	ng/kg	49.7	78.9	115	52	20.8	6.34	52.9	13.8	6.33	47.5	73.2	6.18	< 3.6	< 3.9	56.5	42.5	7.48
OktaCDF	ng/kg	317	453	1040	383	83.1	< 3.3	333	67.1	< 3.2	383	685	19.4	11.6	13.2	431	238	< 5.8
I-TEQ (NATO/CCMS) lower	ng/kg	12.4	16.3	28.7	12.2	4	0.0216	10.6	2.43	0.0149	12.1	19.9	0.228	0.102	0.121	13.8	8.05	0.0203
I-TEQ (NATO/CCMS) upper	ng/kg	12.8	16.8	29	12.4	4.46	0.945	10.9	2.69	0.916	13.4	20	1.7	1.54	1.69	14.2	8.09	1.63
WHO (1998) PCDD/F TEQ lower	ng/kg	12.7	16.8	29.3	12.5	4.21	0.0159	10.8	2.53	0.00917	12.3	20.4	0.205	0.0912	0.11	14	8.2	0.0136
WHO (1998) PCDD/F TEQ upper	ng/kg	13.1	17.3	29.5	12.6	4.67	1.06	11.1	2.79	1.03	13.6	20.6	1.87	1.72	1.89	14.4	8.24	1.84
WHO (2005) PCDD/F TEQ lower	ng/kg	11.4	15.1	27.2	11.2	3.74	0.0172	9.67	2.26	0.0104	11	18.7	0.21	0.0935	0.112	12.4	7.43	0.0151
WHO (2005) PCDD/F TEQ upper	ng/kg	11.8	15.6	27.4	11.3	4.2	0.962	9.97	2.52	0.932	12.4	18.8	1.72	1.57	1.72	12.9	7.47	1.67
Dioxins and Furans, normalized concentrations																		
WHO (1998) PCDD/F TEQ lower	ng/kg	7.84	16.15	35.73	9.77	11.08	0.05	9.47	6.66	0.03	8.66	24.88	0.79	0.46	0.55	10.94	22.78	0.04
WHO (1998) PCDD/F TEQ upper	ng/kg	8.09	16.63	35.98	9.84	12.29	3.12	9.74	7.34	3.03	9.58	25.12	7.19	8.60	9.45	11.25	22.89	4.84
WHO (2005) PCDD/F TEQ lower	ng/kg	7.04	14.52	33.17	8.75	9.84	0.05	8.48	5.95	0.03	7.75	22.80	0.81	0.47	0.56	9.69	20.64	0.04
WHO (2005) PCDD/F TEQ upper	ng/kg	7.28	15.00	33.41	8.83	11.05	2.83	8.75	6.63	2.74	8.73	22.93	6.62	7.85	8.60	10.08	20.75	4.39
Polycyclic aromatic hydrocarbons (PAHs)																		
Anthracene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene,	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.11	0.04	< 0.01
Benzo(ghi)perylene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.13	0.04	< 0.01
Benzo(k)fluoranthene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Dibenzo(a,h)anthracene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.12	0.04	< 0.01
Fluorene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.13	< 0.01	< 0.01
Chrysene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Naphthalene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.08	0.04	< 0.01
PAH sum	mg/kg	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.03	N/D	N/D	0.57	0.24	N/D
Polycyclic aromatic hydrocarbons (PAHs) , normalized concentrations																		
Anthracene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.10	0.04	< 0.01
Benzo(k)fluoranthene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01

Phenanthrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.09	0.04	< 0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.10	< 0.01	< 0.01
Chrysene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Naphthalene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	< 0.01	0.06	0.04	< 0.01
Polychlorinated biphenyls (PCBs)																		
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Polychlorinated biphenyls (PCBs) , normalized concentrations																		
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organotins																		
Monobutyltin, MBT	µg/kg	< 6.3	< 3.8	< 2.2	< 4.8	3.71	< 1.4	< 5.6	< 1.4	< 1.5	< 6.9	< 2.4	< 1.1	< 0.57	< 0.67	< 4.0	< 1.4	< 1.3
Dibutyltin, DBT	µg/kg	< 6.3	10.3	3.11	11.1	7.42	< 1.4	11.9	1.94	< 1.5	10.5	6.74	< 1.1	< 0.57	< 0.67	8.43	3.23	< 1.3
Tributyltin, TBT	µg/kg	24.8	91.3	19.5	106	25.7	< 1.4	70.5	11	< 1.5	66.6	64.1	< 1.1	< 0.642	2.02	73.5	33.2	< 1.3
Tetrabutyltin, TTBT	µg/kg	< 6.3	< 3.8	< 2.2	< 4.8	1.89	< 1.4	< 5.6	< 1.4	< 1.5	< 6.9	< 2.4	< 1.1	< 0.57	< 0.67	< 4.0	< 1.4	< 1.3
Mono-octyltin, MOT	µg/kg	6.53	< 3.8	< 2.2	< 4.8	< 1.3	< 1.4	< 5.6	< 1.4	< 1.5	< 6.9	< 2.4	< 1.1	< 0.57	< 0.67	< 4.0	< 1.4	< 1.3
Dioctylintin, DOT	µg/kg	< 12.8	< 3.8	< 2.2	8.79	< 1.3	< 1.4	5.74	< 1.4	< 1.5	< 6.9	< 2.4	< 1.1	< 0.57	< 0.67	< 4.0	< 1.4	< 1.3
Tricyclohexyltin, TCHT	µg/kg	< 13	< 7.6	< 4.3	< 9.5	< 2.6	< 2.8	< 11	< 2.8	< 2.9	< 14	< 4.9	< 2.3	< 1.1	< 1.3	< 7.9	< 2.8	< 2.6
Triphenyltin, TPhT	µg/kg	< 6.3	< 3.8	< 2.2	< 4.8	< 1.3	< 1.4	< 5.6	< 1.4	< 1.5	< 6.9	< 2.4	< 1.1	< 0.57	< 0.67	< 4.0	< 1.4	< 1.3
Organotins, normalized concentrations																		
Tributyltin, TBT	µg/kg	15.31	87.79	23.78	82.81	67.63	< 1.4	61.84	28.95	< 1.5	46.90	78.17	< 1.1	< 0.642	10.10	57.42	92.22	< 1.3
Triphenyltin, TPhT		< 6.3	< 3.8	< 2.2	< 4.8	< 1.3	< 1.4	< 5.6	< 1.4	< 1.5	< 6.9	< 2.4	< 1.1	< 0.57	< 0.67	< 4.0	< 1.4	< 1.3
Nutrients																		
Total organic carbon	%	8.1	5.2	4.1	6.4	1.9	1.7	5.7	1.9	1.7	7.1	4.1	1.3	0.2	0.2	6.4	1.8	1.9
Total nitrogen	%	1.1	0.67	0.58	0.85	0.28	0.16	0.66	0.22	0.16	0.87	0.49	0.15	< 0.05	< 0.05	0.78	0.23	0.23
Total phosporus	mg/kg	1472	915	851	1100	603	590	1052	573	490	1071	769	452	310	1500	990	457	569
Auxiliary parameters																		
Fraction < 2000 µm	%	N/A	48.9	51.2	N/A	71.1	87	72.7	84.8	59.4	N/A	62.7	63.5	97.6	93.9	N/A	69.5	84.6
Fraction < 1000 µm	%	N/A	48.8	51.2	N/A	70.2	79.8	71.3	83.4	59.4	N/A	62.7	62.4	96.8	74.3	N/A	64.2	84.5
Fraction < 500 µm	%	N/A	48.7	51	N/A	68.1	71.5	70	81.3	59.2	N/A	62.7	60	88.3	61.5	N/A	63.2	84.3
Fraction < 250 µm	%	N/A	48.5	50.9	N/A	66	66.7	68.6	79.2	59	N/A	62.7	59	71.5	34.3	N/A	62.5	84
Fraction < 125 µm	%	N/A	48.2	50.5	N/A	61.5	64.5	64.6	73.3	58.7	N/A	62.3	56.2	15.9	16.6	N/A	59.6	83.5
Fraction < 63 µm	%	N/A	47.5	49.7	N/A	45.8	63.6	55	61.3	58	N/A	56.5	39.9	3.6	10.9	N/A	41.1	80.3
Fraction < 45 µm	%	N/A	46.4	48.3	N/A	41.9	63.4	51	58.9	57.4	N/A	53.5	35.1	2.4	9.2	N/A	36.1	77.3
Fraction < 16 µm	%	N/A	45.4	47.8	N/A	39.2	60.7	48.1	55	51.4	N/A	51.5	32.1	2	7.5	N/A	35.5	69.8
Fraction < 2 µm	%	N/A	39.2	42.8	N/A	29.8	44.4	34.2	36	48.2	N/A	39.2	21.2	1.5	2.7	N/A	27.6	44.3
Loss on ignition	%	18.8	13.6	11	15.4	5.5	5.8	13.1	5.5	6.7	17.3	10.6	4.7	0.9	1.9	15.2	5.8	6.3
Dry matter (1)	%	7.62	12.7	21.7	10.1	36.7	34.7	8.51	35.8	35.3	6.82	20	39.5	82.4	62.3	10.7	30.3	33.3
Dry matter (2)	%	10.7	13.6	19.1	14	41.7	35.4	13	34.9	34.5	12.9	19.7	41.2	76.1	67.2	13.5	30.6	33.5
Dry matter (3)	%	N/A	14.4	21.1	N/A	34.8	33.8	8.9	34.7	35	N/A	18.7	41.7	76	69.2	N/A	29.6	32.7

N/A = Not Analysed; N/D = Not detected; With the sample number also information is given of the sample depth (cm below the sediment surface).

Table 10. Sediment sample analyses at locations FIN_EBS_LUO_3_1 – FIN_EBS_LUO_3_7. Laboratory Eurofins Finland Oy. Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Normalized values falling into certain guideline concentration levels have been highlighted: yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2.

FIN_EBS-LUO_3	**sample (cm)**	**3-1 (0-2cm)**	**3-2 (0-2cm)**	**3-4 (0-2cm)**	**3-5 (0-2cm)**	**3-5 (2-10cm)**	**3-5 (10-30cm)**	**3-6 (0-2cm)**	**3-6 (2-10cm)**	**3-6 (10-18cm)**	**3-7 (0-2cm)**
Parameter	Unit	**CONCENTRATIONS**									
Metals											
Arsenic, As	mg/kg	54	63	2.2	6	11	7.5	48	4.9	4.8	N/A
Cadmium, Cd	mg/kg	1	1.1	< 0.2	0.4	< 0.2	< 0.2	0.5	0.3	< 0.2	N/A
Chromium, Cr	mg/kg	33	52	11	26	56	54	34	64	59	N/A
Cobalt, Co	mg/kg	38	55	6	12	32	66	41	27	16	N/A
Copper, Cu	mg/kg	21	35	6	20	29	26	20	35	33	N/A
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	N/A
Nickel, Ni	mg/kg	61	79	6	19	37	34	36	42	39	N/A
Lead, Pb	mg/kg	10	12	3	15	13	12	10	14	12	N/A
Zinc, Zn	mg/kg	120	170	30	78	110	98	98	120	110	N/A
Metals, normalized concentrations											
Arsenic, As	mg/kg	61.4	61.3	3.8	6.9	8.4	5.2	49.4	3.4	3.0	N/A
Cadmium, Cd	mg/kg	1.3	1.3	N/A	0.5	N/A	N/A	0.6	0.3	N/A	N/A
Chromium, Cr	mg/kg	32.9	42.8	N/A	27.8	35.3	30.0	30.0	34.4	N/A	N/A
Copper, Cu	mg/kg	24.6	33.9	N/A	23.6	21.0	16.8	20.7	22.5	N/A	N/A
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	N/A
Nickel, Ni	mg/kg	60.8	60.4	N/A	21.0	20.1	15.9	30.3	18.8	N/A	N/A
Lead, Pb	mg/kg	11.1	11.7	N/A	16.8	10.2	8.7	10.2	10.1	N/A	N/A
Zinc, Zn	mg/kg	132.2	149.5	N/A	90.0	70.4	55.1	93.4	66.0	N/A	N/A
Dioxins and Furans											
1,2,3,4,6,7,8-HeptaCDD	ng/kg	1.49	< 0.93	N/A	9.3	5.51	0.993	2.2	1.3	N/A	N/A
1,2,3,4,6,7,8-HeptaCDF	ng/kg	10	3.51	55.4	147	28.5	< 0.87	23.1	< 0.82	< 0.86	N/A
1,2,3,4,7,8,9-HeptaCDF	ng/kg	< 0.65	< 0.65	< 0.69	1.27	< 1.8	< 0.64	< 0.63	< 0.60	< 0.63	N/A
1,2,3,4,7,8-HexaCDD	ng/kg	< 0.82	< 0.83	< 0.87	< 0.79	< 2.2	< 0.81	< 0.80	< 0.76	< 0.79	N/A
1,2,3,4,7,8-HexaCDF	ng/kg	< 0.69	< 0.69	< 0.73	2.63	< 1.9	< 0.67	< 0.67	< 0.63	< 0.66	N/A
1,2,3,6,7,8-HexaCDD	ng/kg	< 0.82	< 0.83	< 0.87	3.49	< 2.2	< 0.81	< 0.80	< 0.76	< 0.79	N/A
1,2,3,6,7,8-HexaCDF	ng/kg	< 0.69	< 0.69	< 0.73	2.3	< 1.9	< 0.67	< 0.67	< 0.63	< 0.66	N/A
1,2,3,7,8,9-HexaCDD	ng/kg	< 0.82	< 0.83	< 0.87	1.54	< 2.2	< 0.81	< 0.80	< 0.76	< 0.79	N/A
1,2,3,7,8,9-HexaCDF	ng/kg	< 0.69	< 0.69	< 0.73	< 0.66	< 1.9	< 0.67	< 0.67	< 0.63	< 0.66	N/A
1,2,3,7,8-PentaCDD	ng/kg	< 0.41	< 0.41	< 0.44	0.447	< 1.1	< 0.40	< 0.40	< 0.38	< 0.40	N/A
1,2,3,7,8-PentaCDF	ng/kg	< 0.75	< 0.76	< 0.80	1.12	< 2.0	< 0.74	< 0.73	< 0.69	< 0.73	N/A
2,3,4,6,7,8-HeksaCDF	ng/kg	< 0.69	< 0.69	1.02	2.67	< 1.9	< 0.67	< 0.67	< 0.63	< 0.66	N/A
2,3,4,7,8-PentaCDF	ng/kg	< 0.75	< 0.76	< 0.80	2.89	< 2.0	< 0.74	< 0.73	< 0.69	< 0.73	N/A
2,3,7,8-TetraCDD	ng/kg	< 0.31	< 0.31	< 0.33	< 0.30	< 0.83	< 0.30	< 0.30	< 0.28	< 0.30	N/A
2,3,7,8-TetraCDF	ng/kg	< 0.55	< 0.55	0.588	2.66	< 1.5	< 0.54	< 0.53	< 0.50	< 0.53	N/A
OktaCDD	ng/kg	58.6	< 3.8	5.27	29.3	25.1	7.29	9.2	9.88	6.77	N/A
OktaCDF	ng/kg	12.8	< 5.5	63.8	148	34.2	< 5.4	23.4	< 5.0	< 5.3	N/A
I-TEQ (NATO/CCMS) lower	ng/kg	0.187	0.0351	0.802	5.01	0.399	0.0172	0.286	0.0228	0.0173	N/A
I-TEQ (NATO/CCMS) upper	ng/kg	1.7	1.57	2.27	5.45	4.48	1.51	1.75	1.42	1.49	N/A
WHO (1998) PCDD/F TEQ lower	ng/kg	0.122	0.0351	0.74	5.07	0.346	0.0107	0.256	0.014	0.0112	N/A
WHO (1998) PCDD/F TEQ upper	ng/kg	1.84	1.77	2.43	5.52	4.98	1.7	1.92	1.6	1.68	N/A
WHO (2005) PCDD/F TEQ lower	ng/kg	0.137	0.0351	0.754	4.51	0.358	0.0121	0.263	0.0159	0.0125	N/A
WHO (2005) PCDD/F TEQ upper	ng/kg	1.69	1.61	2.27	4.95	4.55	1.54	1.77	1.45	1.52	N/A

Dioxins and Furans, normalized concentrations											
WHO (1998) PCDD/F TEQ lower	ng/kg	0.61	0.18	3.70	12.07	0.96	0.04	1.28	0.07	0.06	N/A
WHO (1998) PCDD/F TEQ upper	ng/kg	9.20	8.85	12.15	13.14	13.83	5.67	9.60	8.00	8.40	N/A
WHO (2005) PCDD/F TEQ lower	ng/kg	0.69	0.18	3.77	10.74	0.99	0.04	1.32	0.08	0.06	N/A
WHO (2005) PCDD/F TEQ upper	ng/kg	8.45	8.05	11.35	11.79	12.64	5.13	8.85	7.25	7.60	N/A
Polycyclic aromatic hydrocarbons (PAHs)											
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Acenaphthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Acenaphthylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(a)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(b)fluoranthene,	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(ghi)perylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Dibenzo(a,h)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Fluorene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Chrysene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
PAH sum	mg/kg	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/A
Polycyclic aromatic hydrocarbons (PAHs) , normalized concentrations											
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(a)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(ghi)perylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Benzo(k)fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Fluoranthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Indeno(1,2,3-c,d)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Chrysene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	N/A
Polychlorinated biphenyls (PCBs)											
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
Polychlorinated biphenyls (PCBs) , normalized concentrations											
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	N/A
Organotins											
Monobutyltin, MBT	µg/kg	< 0.80	< 0.86	< 0.57	3.29	< 1.2	< 1.3	< 0.78	< 0.86	< 0.99	N/A
Dibutyltin, DBT	µg/kg	< 0.80	< 0.86	0.636	3.06	< 1.2	< 1.3	< 0.78	< 0.86	< 0.99	N/A

Tributyltin, TBT	µg/kg	< 1.18	< 0.86	1.51	10.1	2.31	< 1.3	1.64	< 0.86	< 0.99	N/A
Tetrabutyltin, TTBT	µg/kg	< 0.80	< 0.86	< 0.57	< 1.4	< 1.2	< 1.3	< 0.78	< 0.86	< 0.99	N/A
Mono-octyltin, MOT	µg/kg	< 0.80	< 0.86	< 0.57	< 1.4	< 1.2	< 1.3	< 0.78	< 0.86	< 0.99	N/A
Dioctylintin, DOT	µg/kg	< 0.80	< 0.86	< 0.57	< 1.4	< 1.2	2.11	< 0.78	< 0.86	< 0.99	N/A
Tricyclohexyltin, TCHT	µg/kg	< 1.6	< 1.7	< 1.1	< 2.8	< 2.4	< 2.5	< 1.6	< 1.7	< 2.0	N/A
Triphenyltin, TPhT	µg/kg	< 0.80	< 0.86	< 0.57	< 1.4	< 1.2	< 1.3	< 0.78	< 0.86	< 0.99	N/A
Organotins, normalized concentrations, normalized concentrations											
Tributyltin, TBT	µg/kg	< 1.18	< 0.86	7.55	24.05	6.42	< 1.3	8.20	< 0.86	< 0.99	N/A
Triphenyltin, TPhT	µg/kg	< 0.80	< 0.86	< 0.57	< 1.4	< 1.2	< 1.3	< 0.78	< 0.86	< 0.99	N/A
Nutrients											
Total organic carbon	%	0.6	0.6	0.4	2.1	1.8	1.5	0.7	0.2	0.2	N/A
Total nitrogen	%	0.074	0.061	0.07	0.29	0.22	0.19	0.076	< 0.05	< 0.05	N/A
Total phosporus	mg/kg	4468	6218	336	650	600	520	4200	570	490	N/A
Auxiliary parameters											
Fraction < 2000 µm	%	93.4	76.3	93.9	72.3	84.4	94.1	86.5	82	90.3	44.2
Fraction < 1000 µm	%	86.9	66.5	70.2	72	84.3	94	84.5	76.9	90.3	43.8
Fraction < 500 µm	%	79.7	57.6	50.5	71.6	84.2	93.9	81.6	75.3	90.2	42.9
Fraction < 250 µm	%	69.8	51.7	32.5	70.8	84	93.8	75.3	74.7	90	42.1
Fraction < 125 µm	%	50	47.2	20.7	68.5	83.5	93.7	47.2	74.2	89.9	41.4
Fraction < 63 µm	%	37.6	44.6	14.1	47.8	80.5	93.5	38.5	74	89.9	40.9
Fraction < 45 µm	%	34.3	43.8	12	31.1	78.1	93.3	36.5	73.9	89.9	40.7
Fraction < 16 µm	%	32.1	43.6	8.3	28.1	76.7	88.8	36.4	72.5	89.3	37.3
Fraction < 2 µm	%	25.1	35.8	3.7	21.7	54.4	64.9	31.6	68	77.9	28
Loss on ignition	%	4.4	6	1.2	5.4	5.6	5.8	4.4	3.4	3.5	N/A
Dry matter (1)	%	57.8	53.5	79.3	36.2	36.2	37.1	56.7	49.2	47.8	N/A
Dry matter (2)	%	58.7	52.2	78.7	35.5	38.7	36.4	55.4	49.2	48.3	N/A
Dry matter (3)	%	57.4	49.9	77.2	33.6	35.8	37	54.4	48.6	47.9	82

N/A = Not Analysed; N/D = Not detected; With the sample number also information is given of the sample depth (cm below the sediment surface).

Table 11. Sediment sample analyses at locations FIN_EBS_LUO_4_1 – FIN_EBS_LUO_4_8. Laboratory Eurofins Finland Oy. Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Normalized values falling into certain guideline concentration levels have been highlighted: yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2.

FIN_EBS-LUO_4	**sample (cm)**	**4-1 (0-2cm)**	**4-1 (2-10cm)**	**4-1 (10-17cm)**	**4-2 (0-2cm)**	**4-2 (2-10cm)**	**4-2 (10-18cm)**	**4-3 (0-2cm)**	**4-3 (2-10cm)**	**4-3 (10-30cm)**	**4-4 (0-2cm)**	**4-4 (2-10cm)**	**4-5 (0-2cm)**	**4-5 (2-10cm)**	**4-5 (10-20cm)**	**4-6 (0-2cm)**	**4-6 (2-10cm)**	**4-7 (0-2cm)**	**4-7 (2-10cm)**	**4-8 (0-2cm)**	**4-8 (2-10cm)**	**4-8 (10-15cm)**
Parameter	Unit	**CONCENTRATIONS**																				
Metals																						
Arsenic, As	mg/kg	14	9.3	7.8	61	4.6	5.4	10	8.3	13	61	4.2	32	5.4	6.3	15	6.8	55	9	2.5	4.3	2.7
Cadmium, Cd	mg/kg	0.3	< 0.2	< 0.2	0.4	0.2	< 0.2	0.5	0.8	0.6	0.8	< 0.2	< 0.2	0.2	< 0.2	0.2	< 0.2	0.7	< 0.2	< 0.2	< 0.2	< 0.2
Chromium, Cr	mg/kg	36	52	54	34	52	55	54	50	44	32	51	35	55	50	33	48	56	49	16	57	16
Cobalt, Co	mg/kg	26	26	14	61	20	21	20	43	20	72	26	18	24	28	23	18	53	32	10	22	8
Copper, Cu	mg/kg	23	24	23	26	33	33	33	37	27	28	28	21	30	28	18	23	32	29	9	31	49
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	26	33	34	51	39	41	38	37	28	68	37	32	39	36	24	32	66	32	10	36	12
Lead, Pb	mg/kg	19	13	14	17	15	13	22	23	26	15	13	18	14	12	10	11	14	10	5	12	9
Zinc, Zn	mg/kg	100	90	93	120	96	97	140	150	120	120	97	99	120	93	77	86	150	97	36	100	120
Metals, normalized concentrations																						
Arsenic, As	mg/kg	13.4	7.2	5.9	59.6	3.0	3.8	N/A	6.3	12.6	57.5	2.9	30.9	4.0	4.8	16.7	5.0	48.3	6.7	3.7	3.2	4.5

Cadmium, Cd	mg/kg	0.3	< 0.2	< 0.2	0.5	0.2	< 0.2	N/A	0.7	0.7	0.9	< 0.2	< 0.2	0.2	< 0.2	0.2	< 0.2	0.7	< 0.2	< 0.2	< 0.2	< 0.2
Chromium, Cr	mg/kg	30.8	33.0	33.8	28.9	26.9	30.9	N/A	34.5	38.1	26.2	28.1	28.9	33.2	30.9	32.9	28.6	41.1	29.1	22.1	33.6	26.8
Copper, Cu	mg/kg	21.7	17.8	16.7	25.3	20.3	22.0	N/A	27.0	26.0	26.1	18.4	20.1	21.3	20.5	20.5	16.0	27.4	20.4	14.8	21.8	95.5
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	20.9	18.1	18.4	40.7	16.7	19.4	N/A	22.5	22.9	51.7	17.1	24.6	20.1	19.1	23.9	16.3	43.5	16.2	16.5	18.0	28.4
Lead, Pb	mg/kg	18.2	10.4	11.0	16.7	10.4	9.6	N/A	18.2	25.3	14.3	9.5	17.5	10.9	9.5	10.9	8.4	12.5	7.7	6.9	9.2	13.7
Zinc, Zn	mg/kg	88.6	58.6	59.5	107.8	50.5	55.7	N/A	101.4	108.4	103.0	54.8	86.7	74.3	59.3	83.4	52.3	115.2	59.3	59.9	60.8	254.9
Dioxins and Furans																						
1,2,3,4,6,7,8-HeptaCDD	ng/kg	10.2	1.85	1.34	5.51	2.65	2.12	16.9	21.6	22.2	122	2.09	4.53	1.32	1.23	2.53	< 1.04	2.41	0.821	< 0.94	< 1.16	3.1
1,2,3,4,6,7,8-HeptaCDF	ng/kg	90.1	6.2	< 0.86	35.2	< 0.89	< 0.49	193	181	270	116	1.28	47.6	< 0.52	< 0.49	23.7	< 0.90	19.1	2.94	5.03	< 0.89	96
1,2,3,4,7,8,9-HeptaCDF	ng/kg	1.22	< 0.62	< 0.63	< 0.64	< 0.65	< 0.36	2.17	1.95	2.61	2.2	< 0.59	0.46	< 0.38	< 0.36	< 0.38	< 0.66	< 0.39	< 0.68	< 0.66	< 0.65	< 0.62
1,2,3,4,7,8-HexaCDD	ng/kg	< 0.80	< 0.79	< 0.79	< 0.81	< 0.83	< 0.45	0.814	1.05	1.04	1.91	< 0.74	< 0.51	< 0.48	< 0.45	< 0.48	< 0.83	< 0.49	< 0.51	< 0.83	< 0.82	< 0.78
1,2,3,4,7,8-HexaCDF	ng/kg	2.21	< 0.66	< 0.66	0.846	< 0.69	< 0.38	4.13	4.65	5.78	3.34	< 0.62	0.999	< 0.40	< 0.37	0.494	< 0.69	0.6	< 0.43	< 0.69	< 0.69	0.901
1,2,3,6,7,8-HexaCDD	ng/kg	2.75	< 0.79	< 0.79	1.14	< 0.83	< 0.45	4.34	4.88	7.17	12	< 0.74	1.16	< 0.48	< 0.45	0.649	< 0.83	0.587	< 0.51	< 0.83	< 0.82	1.56
1,2,3,6,7,8-HexaCDF	ng/kg	2	< 0.66	< 0.66	0.88	< 0.69	< 0.38	3.86	4.19	4.54	13.2	< 0.62	0.83	< 0.40	< 0.37	0.463	< 0.69	0.499	< 0.43	< 0.69	< 0.69	0.874
1,2,3,7,8,9-HexaCDD	ng/kg	1.32	< 0.79	< 0.79	< 0.81	< 0.83	< 0.45	2.26	2.43	2.99	11.8	< 0.74	0.762	< 0.48	< 0.45	< 0.48	< 0.83	< 0.49	< 0.51	< 0.83	< 0.82	< 0.78
1,2,3,7,8,9-HexaCDF	ng/kg	< 0.67	< 0.66	< 0.66	< 0.68	< 0.69	< 0.38	< 0.42	< 0.612	< 0.41	< 0.41	< 0.62	< 0.43	< 0.40	< 0.37	< 0.40	< 0.69	< 0.41	< 0.43	< 0.69	< 0.69	< 0.65
1,2,3,7,8-PentaCDD	ng/kg	< 0.607	< 0.39	< 0.40	< 0.41	< 0.41	< 0.23	0.93	1.2	1.44	8.49	< 0.37	< 0.26	< 0.24	< 0.22	< 0.24	< 0.41	< 0.24	< 0.26	< 0.42	< 0.41	< 0.39
1,2,3,7,8-PentaCDF	ng/kg	1.23	< 0.72	< 0.73	< 0.74	< 0.76	< 0.42	2.38	2.7	2.91	1.71	< 0.68	0.636	< 0.44	< 0.41	< 0.44	< 0.76	< 0.45	< 0.47	< 0.76	< 0.75	< 0.72
2,3,4,6,7,8-HeksaCDF	ng/kg	2.92	< 0.66	< 0.66	1.1	< 0.69	< 0.38	5.08	5.2	5.72	3.98	< 0.62	1.16	< 0.40	< 0.37	0.603	< 0.69	0.668	< 0.43	< 0.69	< 0.69	1.14
2,3,4,7,8-PentaCDF	ng/kg	3.46	< 0.72	< 0.73	1.35	< 0.76	< 0.42	5.4	6.3	6.33	3.58	< 0.68	1.39	< 0.44	< 0.41	0.684	< 0.76	0.712	< 0.47	< 0.76	< 0.75	< 0.72
2,3,7,8-TetraCDD	ng/kg	< 0.30	< 0.29	< 0.30	< 0.30	< 0.31	< 0.17	< 0.19	0.203	0.314	1.75	< 0.28	< 0.19	< 0.18	< 0.17	< 0.18	< 0.31	< 0.18	< 0.19	< 0.31	< 0.19	< 0.29
2,3,7,8-TetraCDF	ng/kg	2.28	< 0.52	< 0.53	1.03	< 0.55	< 0.30	4.33	5.04	4.84	2.9	< 0.49	1.14	< 0.32	< 0.30	0.545	< 0.55	0.678	< 0.34	< 0.56	< 0.55	0.767
OktaCDD	ng/kg	34.1	9.97	11.5	23.4	22.2	14.8	46.3	60.1	77.2	1600	15.7	17.6	8.32	9.19	11.2	9.52	9.1	4.78	< 3.8	7.18	9.18
OktaCDF	ng/kg	92.3	7.18	< 5.3	35.6	< 5.5	< 3.0	183	145	238	127	7.05	42.1	< 3.2	< 3.0	< 20.4	< 5.5	16.4	< 5.7	< 5.6	< 5.5	87.1
I-TEQ (NATO/CCMS) lower	ng/kg	4.28	0.0977	0.0249	1.64	0.0487	0.0359	8.12	9.08	10.8	16.9	0.0565	1.92	0.0215	0.0215	0.891	0.00952	0.9	0.0424	0.0503	0.00718	1.61
I-TEQ (NATO/CCMS) upper	ng/kg	5.03	1.54	1.5	2.42	1.58	0.878	8.35	9.14	10.9	17	1.42	2.33	0.915	0.856	1.38	1.56	1.37	0.995	1.6	1.42	2.72
WHO (-98) PCDD/F TEQ lower	ng/kg	4.17	0.0822	0.0145	1.59	0.0287	0.0226	8.37	9.49	11.3	19.6	0.036	1.86	0.014	0.0132	0.881	0.000952	0.877	0.0381	0.0503	0.000718	1.53
WHO (-98) PCDD/F TEQ upper	ng/kg	5.22	1.72	1.68	2.57	1.76	0.975	8.61	9.55	11.3	19.6	1.58	2.41	1.02	0.957	1.47	1.75	1.47	1.11	1.8	1.61	2.83
WHO (-05) PCDD/F TEQ lower	ng/kg	3.48	0.0857	0.0168	1.33	0.0332	0.0256	7.29	8.22	10	19.2	0.0406	1.59	0.0157	0.015	0.746	0.00286	0.74	0.039	0.0503	0.00216	1.54
WHO (-05) PCDD/F TEQ upper	ng/kg	4.53	1.57	1.52	2.3	1.6	0.887	7.53	8.28	10	19.2	1.44	2.13	0.93	0.869	1.33	1.59	1.32	1.01	1.63	1.45	2.69
Dioxins and Furans, normalized concentrations																						
WHO (-98) PCDD/F TEQ lower	ng/kg	8.34	0.37	0.048	5.68	0.14	0.11	8.21	9.68	25.68	57.65	0.18	9.30	0.070	0.066	3.39	0.0037	4.39	0.19	0.25	0.0036	7.65
WHO (-98) PCDD/F TEQ upper	ng/kg	10.44	7.82	5.60	9.18	8.80	4.88	8.44	9.74	25.68	57.65	7.90	12.05	5.10	4.79	5.65	6.73	7.35	5.55	9.00	8.05	14.15
WHO (-05) PCDD/F TEQ lower	ng/kg	6.96	0.39	0.056	4.75	0.17	0.13	7.15	8.39	22.73	56.47	0.20	7.95	0.079	0.075	2.87	0.011	3.70	0.20	0.25	0.011	7.70
WHO (-05) PCDD/F TEQ upper	ng/kg	9.06	7.14	5.07	8.21	8.00	4.44	7.38	8.45	22.73	56.47	7.20	10.65	4.65	4.35	5.12	6.12	6.60	5.05	8.15	7.25	13.45
Polycyclic aromatic hydrocarbons (PAHs)																						
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Acenaphthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Acenaphthylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(a)anthracene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.19	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	0.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(b)fluoranthene,	mg/kg	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	0.1	0.1	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	0.08	0.11	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(k)fluoranthene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.09	0.08	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Dibenzo(a,h)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Fluoranthene	mg/kg	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.12	0.15	0.05	0.2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Fluorene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Chrysene	mg/kg	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	0.04	0.21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Pyrene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	0.08	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
PAH sum	mg/kg	0.4	N/D	N/D	N/D	N/D	N/D	0.44	0.63	0.8	2.23	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D

Polycyclic aromatic hydrocarbons (PAHs), normalized concentrations																						
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(a)anthracene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.19	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(a)pyrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	0.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	0.08	0.11	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Benzo(k)fluoranthene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.09	0.08	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Fluoranthene	mg/kg	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.12	0.15	0.05	0.20	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.10	< 0.01	0.06	0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Chrysene	mg/kg	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	0.04	0.21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Pyrene	mg/kg	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.10	0.08	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Polychlorinated biphenyls (PCBs)																						
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Polychlorinated biphenyls (PCBs) , normalized concentrations																						
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organotins																						
Monobutyltin, MBT	µg/kg	5.99	< 1.2	< 1.1	1.93	< 0.93	< 1.1	< 6.66	< 3.3	< 3.09	3.18	< 1.0	1.35	< 1.1	< 1.2	1.32	< 1.2	2	< 1.0	< 0.66	< 0.98	1.37
Dibutyltin, DBT	µg/kg	5.15	< 1.2	< 1.1	3.18	< 0.93	< 1.1	4.67	8.95	11	3.93	< 1.0	1.89	< 1.1	< 1.2	1.79	< 1.2	1.58	1.21	< 0.66	< 0.98	1.02
Tributyltin, TBT	µg/kg	16.1	1.98	< 1.1	15.6	< 0.93	< 1.1	18.5	67.3	16.8	12.8	< 1.0	9.39	< 1.1	< 1.2	6.9	< 1.2	4.96	< 1.0	< 0.66	< 0.98	6.67
Tetrabutyltin, TTBT	µg/kg	< 1.8	< 1.2	< 1.1	< 1.1	< 0.93	< 1.1	< 4.1	< 3.3	< 1.8	< 1.4	< 1.0	< 1.2	< 1.1	< 1.2	< 1.0	< 1.2	< 1.1	< 1.0	< 0.66	< 0.98	< 0.57
Mono-octyltin, MOT	µg/kg	< 1.8	< 1.2	< 1.1	< 1.1	< 0.93	< 1.1	< 4.1	< 3.3	< 1.8	< 1.4	< 1.0	< 1.2	< 1.1	< 1.2	< 1.0	< 1.2	< 1.1	< 1.0	< 0.66	< 0.98	< 0.57
Dioctylintin, DOT	µg/kg	2.53	< 1.2	< 1.1	< 1.1	< 0.93	< 1.1	< 4.1	< 3.3	< 1.8	< 1.4	< 1.0	< 1.2	< 1.1	< 1.2	< 1.0	< 1.2	< 1.25	< 1.0	< 0.66	< 0.98	< 0.57
Tricyclohexyltin, TCHT	µg/kg	< 3.6	< 2.3	< 2.3	< 2.2	< 1.9	< 2.2	< 8.3	< 6.6	< 3.7	< 2.8	< 2.1	< 2.5	< 2.3	< 2.4	< 2.1	< 2.3	< 2.1	< 2.0	< 1.3	< 2.0	< 1.1
Triphenyltin, TPhT	µg/kg	< 1.8	< 1.2	< 1.1	< 1.1	< 0.93	< 1.1	< 4.1	< 3.3	< 1.8	< 1.4	< 1.0	< 1.2	< 1.1	< 1.2	< 1.0	< 1.2	< 1.1	< 1.0	< 0.66	< 0.98	< 0.57
Organotins, normalized concentrations																						
Tributyltin, TBT	µg/kg	32.20	9.00	< 1.1	55.71	< 0.93	< 1.1	18.14	68.67	38.18	37.65	< 1.0	46.95	< 1.1	< 1.2	26.54	< 1.2	24.80	< 1.0	< 0.66	< 0.98	33.35
Triphenyltin, TPhT	µg/kg	< 1.8	< 1.2	< 1.1	< 1.1	< 0.93	< 1.1	< 4.1	< 3.3	< 1.8	< 1.4	< 1.0	< 1.2	< 1.1	< 1.2	< 1.0	< 1.2	< 1.1	< 1.0	< 0.66	< 0.98	< 0.57
Nutrients																						
Total organic carbon	%	2.5	1.1	1.5	1.4	0.5	0.6	5.1	4.9	2.2	1.7	0.4	1	0.8	0.6	1.3	1.3	1	0.4	0.2	0.2	0.5
Total nitrogen	%	0.32	0.14	0.17	0.17	< 0.05	0.051	0.7	0.64	0.28	0.2	< 0.05	0.13	< 0.05	< 0.05	0.14	0.13	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total phosporus	mg/kg	1600	530	670	5100	510	460	1500	940	590	4900	470	1500	480	410	1100	470	4000	1000	380	460	584
Auxiliary parameters																						
Fraction < 2000 µm	%	75.3	68.9	95.6	92.5	90.7	74.5	N/A	73.4	87.4	80.5	96.5	82.6	84.7	66.3	84.8	72.9	91.9	75.2	94.8	76.9	94.7
Fraction < 1000 µm	%	74.9	68.7	87.3	83.2	90.2	74.3	N/A	73.4	80.7	76	88	79.9	84.6	66.3	83.6	72.8	83.7	75	91.7	76.7	56.9
Fraction < 500 µm	%	73.9	68.2	85.5	74.2	89.8	74.2	N/A	73.4	72.1	72.7	86.8	76.1	84.5	66.2	81.8	72.6	75.7	74.6	85.8	76.2	37.7
Fraction < 250 µm	%	72.2	67.2	84.5	67.9	89.5	74	N/A	73.4	67.3	68	85.7	72	84.4	66.2	79.4	72.4	69.9	73.8	76.1	75.1	25.4
Fraction < 125 µm	%	67.9	65.7	83.7	61.7	89.2	74	N/A	73.4	63.1	61.7	85.1	64	84.1	66	69.4	72.2	64.7	73.4	32.8	70	17.6
Fraction < 63 µm	%	53.3	63.5	83.1	55.9	89	73.8	N/A	72.9	60.5	53.5	84.7	56.9	83.9	66	39.2	71.8	61.9	73.2	15.9	68.2	13
Fraction < 45 µm	%	48.8	62.9	82.9	54.9	88.9	73.7	N/A	72.4	59.6	49.6	84.4	55.3	83.8	65.9	34.1	71.5	61.1	73.1	14.5	67.9	11.9
Fraction < 16 µm	%	45.5	62.2	80.3	51.2	88.7	71.9	N/A	68.3	53.7	46.6	82.6	52.1	82.8	65.7	32.1	69.5	54.1	72.3	13.6	67.7	9.4
Fraction < 2 µm	%	33.5	53.9	54.8	33.9	71.5	64	N/A	47.5	32.8	36	65.6	35.6	57.9	55.9	25.1	58.8	43.1	59.3	11.2	59.9	4.8

Loss on ignition	%	7.1	5.1	5.4	6.5	4.2	4.4	13.8	13.5	7.2	7.2	4.3	6.1	4.6	4.5	4.4	5.7	5.9	3.2	1.3	3.3	2
Dry matter (1)	%	27.6	40	38.9	42.3	48.4	46.5	12	14.8	26.4	33.2	46	35	40.8	40.8	47.7	38.6	42.5	48.9	69.8	50.2	76.8
Dry matter (2)	%	28.8	41.3	39.7	45.2	48.2	47.1	10.5	14.3	26.8	36.6	46.6	41.6	40.6	41	49.8	39.1	43.4	48.7	73.6	50.9	75.5
Dry matter (3)	%	30.1	39.8	39.6	36.4	47.9	46.9	N/A	14.1	27.2	31.1	46.5	35.4	41.3	41.6	43.5	39.5	37.4	49	73.9	51.2	69.9

N/A = Not Analysed; N/D = Not detected; With the sample number also information is given of the sample depth (cm below the sediment surface).

Table 12. Sediment sample analyses at locations FIN_EBS_LUO_5_1 – FIN_EBS_LUO_5_8. Laboratory Eurofins Finland Oy. Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Normalized values falling into certain guideline concentration levels have been highlighted: yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2.

FIN_EBS-LUO_5	**sample (cm)**	**5-1 (0-2cm)**	**5-1 (2-10cm)**	**5-1 (10-30cm)**	**5-2 (0-2cm)**	**5-2 (2-10cm)**	**5-2 (10-30cm)**	**5-3 (0-2cm)**	**5-3 (2-10cm)**	**5-3 (10-30cm)**	**5-4 (0-2cm)**	**5-4 (2-10cm)**	**5-4 (10-30cm)**	**5-5 (0-2cm)**	**5-5 (2-10cm)**	**5-5 (10-30cm)**	**5-6 (0-2cm)**	**5-6 (2-10cm)**	**5-6 (10-30cm)**	**5-7 (0-2cm)**	**5-7 (2-10cm)**	**5-7 (10-30cm)**	**5-8 (0-2cm)**	**5-8 (2-10cm)**	**5-8 (10-30cm)**
Parameter	Unit	**CONCENTRATIONS**																							
Metals																									
Arsenic, As	mg/kg	9.8	8.5	14	N/A	9.5	11	7	6.8	10	7.6	11	10	10	13	7	9	12	7.4	8.3	12	5.7	9.1	1.2	7.9
Cadmium, Cd	mg/kg	0.7	0.7	0.2	N/A	0.8	< 0.2	0.6	0.9	0.7	0.4	0.6	0.7	0.6	0.9	0.2	0.5	0.9	0.2	0.6	0.7	< 0.2	0.5	< 0.2	< 0.2
Chromium, Cr	mg/kg	54	45	52	N/A	46	43	48	52	52	41	61	54	58	63	53	50	56	48	50	53	47	53	3	51
Cobalt, Co	mg/kg	21	17	20	N/A	100	21	16	16	12	12	24	33	17	18	17	20	17	31	29	29	14	26	5	18
Copper, Cu	mg/kg	37	26	27	N/A	28	22	30	35	37	23	34	32	34	39	25	32	37	23	32	33	23	33	< 1	24
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	N/A	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	41	30	34	N/A	31	27	36	38	34	28	38	34	41	42	35	40	39	32	39	38	35	42	3	33
Lead, Pb	mg/kg	22	30	21	N/A	33	20	21	29	35	18	36	24	24	44	18	21	36	16	21	31	9	21	< 2	14
Zinc, Zn	mg/kg	150	130	120	N/A	140	94	130	160	180	100	160	160	150	180	110	140	180	120	140	160	90	140	6	96
Metals, normalized concentrations																									
Arsenic, As	mg/kg	N/A	6.7	N/A	N/A	7.2	9.4	N/A	5.0	7.7	N/A	7.9	8.1	N/A	10.5	5.6	N/A	8.6	5.6	N/A	8.7	4.1	N/A	0.9	6.6
Cadmium, Cd	mg/kg	N/A	0.6	N/A	N/A	0.7	< 0.2	N/A	0.7	0.6	N/A	0.5	0.7	N/A	0.8	0.2	N/A	0.7	0.2	N/A	0.6	< 0.2	N/A	< 0.2	< 0.2
Chromium, Cr	mg/kg	N/A	30.2	N/A	N/A	29.4	31.1	N/A	33.6	34.4	N/A	37.4	37.7	N/A	44.8	36.6	N/A	34.2	30.3	N/A	32.4	28.2	N/A	1.9	36.3
Copper, Cu	mg/kg	N/A	19.6	N/A	N/A	20.1	18.2	N/A	24.2	27.1	N/A	23.1	25.0	N/A	30.2	19.3	N/A	24.9	16.4	N/A	22.5	15.8	N/A	< 1	19.3
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	N/A	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	N/A	17.7	N/A	N/A	17.2	17.4	N/A	21.3	19.7	N/A	20.0	21.0	N/A	26.6	21.3	N/A	20.4	17.4	N/A	19.9	18.0	N/A	1.6	20.9
Lead, Pb	mg/kg	N/A	24.4	N/A	N/A	25.8	17.4	N/A	22.1	27.8	N/A	27.0	20.0	N/A	36.5	14.9	N/A	26.8	12.5	N/A	23.3	6.8	N/A	< 2	11.9
Zinc, Zn	mg/kg	N/A	88.5	N/A	N/A	90.0	70.1	N/A	101.4	119.4	N/A	97.4	113.4	N/A	128.1	77.0	N/A	108.9	76.4	N/A	97.5	54.6	N/A	3.9	69.9
Dioxins and Furans																									
1,2,3,4,6,7,8-HeptaCDD	ng/kg	16.9	34.5	5.39	N/A	40.7	3.17	16.2	25.3	25	15.7	26.4	16.4	18.1	33.9	4.28	20.2	34.3	4.76	17.5	24	1.83	17.2	34.9	2.07
1,2,3,4,6,7,8-HeptaCDF	ng/kg	79.5	228	52.8	N/A	310	22.3	99.8	159	216	120	192	150	119	264	47	144	293	44.3	118	206	< 0.89	136	300	6.51
1,2,3,4,7,8,9-HeptaCDF	ng/kg	1.67	3.64	1.36	N/A	4.47	0.768	1.77	2.29	3.69	1.76	2.13	3	1.89	3.92	0.952	2.16	4.41	0.804	1.91	3.09	< 0.65	1.81	4.58	< 0.69
1,2,3,4,7,8-HexaCDD	ng/kg	1	1.93	< 0.46	N/A	2.18	< 0.43	< 1.8	1.52	1.24	< 0.97	1.29	1.02	1.03	1.72	< 0.94	1.14	1.84	< 0.87	< 2.1	1.24	< 0.82	< 1.3	1.85	< 0.87
1,2,3,4,7,8-HexaCDF	ng/kg	3.72	7.87	3.06	N/A	9.82	1.74	3.65	5.39	6.7	3.56	5.96	6.09	4.15	8.78	1.97	4.25	7.96	1.68	3.96	6.01	< 0.68	3.86	9.37	< 0.72
1,2,3,6,7,8-HexaCDD	ng/kg	2.79	8.02	1.28	N/A	9.6	0.726	3.19	5.56	5.4	3.37	6.81	4.61	3.8	9.49	0.988	3.53	8.64	< 0.87	3.35	6.06	< 0.82	3.57	9.04	< 0.87
1,2,3,6,7,8-HexaCDF	ng/kg	3.45	7.09	2.36	N/A	7.49	1.35	3.38	4.72	5.73	3.59	5.25	4.64	3.9	7.44	1.42	4.14	7.11	1.28	3.42	4.93	< 0.68	3.85	7.22	< 0.72
1,2,3,7,8,9-HexaCDD	ng/kg	1.73	3.96	0.748	N/A	4.64	0.475	2.09	2.76	2.67	2.22	3.07	2.11	2.09	4.32	< 0.94	2.02	4.03	< 0.87	< 2.1	2.84	< 0.82	1.93	3.55	< 0.87
1,2,3,7,8,9-HexaCDF	ng/kg	< 1.08	< 2.11	< 0.668	N/A	< 2.59	< 0.485	< 1.5	< 0.82	< 1.93	< 0.81	< 1.64	< 0.67	< 1.24	< 2.40	< 0.78	< 0.88	< 0.75	< 0.72	< 1.8	< 0.67	< 0.68	< 1.1	< 0.66	< 0.72
1,2,3,7,8-PentaCDD	ng/kg	0.952	1.94	0.496	N/A	2.37	0.245	0.968	1.53	1.61	< 0.49	1.88	1.38	0.927	2.2	< 0.47	1.01	2.31	< 0.43	< 1.1	1.58	< 0.41	1.07	2.02	< 0.43
1,2,3,7,8-PentaCDF	ng/kg	2.29	4.38	1.8	N/A	5.36	1.04	2.4	3.4	4.41	2.3	3.51	3.56	2.23	4.78	< 0.966	2.6	4.83	< 0.79	2.52	3.3	< 0.75	2.4	4.6	< 0.79
2,3,4,6,7,8-HeksaCDF	ng/kg	3.83	7.83	2.2	N/A	9.11	1.18	4.27	5.68	6.72	4.57	6.37	4.9	4.66	9.01	1.8	4.77	8.23	1.47	4.79	5.99	< 0.68	4.53	9.05	< 0.72
2,3,4,7,8-PentaCDF	ng/kg	4.93	9.74	2.54	N/A	10.9	1.34	5.12	7.08	7.76	5.21	7.78	5.96	5.42	10.7	1.85	5.8	10.8	1.53	5.67	7.31	< 0.75	5.48	10.1	< 0.79
2,3,7,8-TetraCDD	ng/kg	0.208	0.513	0.189	N/A	0.507	< 0.16	< 0.68	< 0.37	0.392	< 0.36	0.28	< 0.30	0.226	0.583	< 0.35	< 0.39	< 0.34	< 0.33	< 0.79	< 0.30	< 0.31	< 0.47	0.403	< 0.32

2,3,7,8-TetraCDF	ng/kg	3.69	7.19	2.15	N/A	8.53	1.44	4.19	5.38	6.29	3.5	5.8	4.84	3.69	7.9	1.51	4.68	7.45	0.995	4.13	5.38	< 0.55	3.77	7.14	< 0.58
OktaCDD	ng/kg	48.9	115	23.8	N/A	149	11.7	47.2	88	83.4	51.3	82.3	52.5	54.5	105	22.9	58.7	114	20.1	56.4	90.1	15.6	55.4	132	14.6
OktaCDF	ng/kg	61.6	218	49.1	N/A	288	27.8	91.1	146	207	111	29.2	165	89.2	150	56	114	420	53.2	103	219	< 5.5	103	298	< 10.5
I-TEQ (NATO/CCMS) lower	ng/kg	6.38	14	3.65	N/A	16.5	1.84	6.56	9.68	11.5	6.34	11.1	8.58	7.38	15.4	2.3	7.82	15.2	1.88	6.46	10.5	0.0339	7.25	15.3	0.1
I-TEQ (NATO/CCMS) upper	ng/kg	6.49	14.2	3.76	N/A	16.8	2.09	7.58	10.1	11.7	7.12	11.2	8.94	7.5	15.7	3.2	8.3	15.6	2.79	8.37	10.9	1.55	7.95	15.3	1.7
WHO (-98) PCDD/F TEQ lower	ng/kg	6.76	14.6	3.83	N/A	17.3	1.92	6.92	10.2	12.1	6.19	11.9	9.07	7.71	16.3	2.22	8.17	15.8	1.81	6.31	11	0.0198	7.64	15.9	0.0873
WHO (-98) PCDD/F TEQ upper	ng/kg	6.87	14.8	3.94	N/A	17.6	2.18	7.94	10.7	12.3	7.22	12.1	9.44	7.84	16.5	3.36	8.65	16.3	2.94	8.76	11.4	1.74	8.35	16	1.89
WHO (-05) PCDD/F TEQ lower	ng/kg	5.75	12.7	3.3	N/A	15.1	1.64	5.87	8.79	10.5	5.14	10.3	7.85	6.61	14.1	1.87	6.99	13.7	1.52	5.16	9.55	0.023	6.53	13.8	0.0902
WHO (-05) PCDD/F TEQ upper	ng/kg	5.85	12.9	3.41	N/A	15.4	1.9	6.89	9.24	10.7	6.16	10.5	8.22	6.74	14.3	2.99	7.47	14.1	2.64	7.61	9.92	1.58	7.23	13.9	1.72
Dioxins and Furans, normalized concentrations																									
WHO (-98) PCDD/F TEQ lower	ng/kg	6.76	29.20	9.12	N/A	32.04	5.65	6.41	10.85	18.91	6.19	17.50	17.44	7.41	22.64	4.27	7.04	21.94	3.93	5.63	17.74	0.05	6.70	79.50	0.20
WHO (-98) PCDD/F TEQ upper	ng/kg	6.87	29.60	9.38	N/A	32.59	6.41	7.35	11.38	19.22	7.22	17.79	18.15	7.54	22.92	6.46	7.46	22.64	6.39	7.82	18.39	4.35	7.32	80.00	4.30
WHO (-05) PCDD/F TEQ lower	ng/kg	5.75	25.40	7.86	N/A	27.96	4.82	5.44	9.35	16.41	5.14	15.15	15.10	6.36	19.58	3.60	6.03	19.03	3.30	4.61	15.40	0.06	5.73	69.00	0.21
WHO (-05) PCDD/F TEQ upper	ng/kg	5.85	25.80	8.12	N/A	28.52	5.59	6.38	9.83	16.72	6.16	15.44	15.81	6.48	19.86	5.75	6.44	19.58	5.74	6.79	16.00	3.95	6.34	69.50	3.91
Polycyclic aromatic hydrocarbons (PAHs)																									
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.01	0.07	< 0.01	N/A	0.08	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.06	0.05	< 0.01	0.07	< 0.01	0.09	0.12	< 0.01	0.12	< 0.01	< 0.01	0.08	0.12	< 0.01
Benzo(a)pyrene	mg/kg	< 0.01	0.12	< 0.01	N/A	0.13	< 0.01	< 0.01	0.09	0.17	< 0.01	0.09	0.06	< 0.01	0.11	< 0.01	0.08	0.13	< 0.01	0.12	0.04	< 0.01	0.08	0.13	< 0.01
Benzo(b)fluoranthene,	mg/kg	0.13	0.24	0.08	N/A	0.26	0.06	0.12	0.17	0.36	0.12	0.18	0.15	0.13	0.22	< 0.01	0.13	0.23	0.04	0.14	0.08	< 0.01	0.12	0.23	< 0.01
Benzo(ghi)perylene	mg/kg	0.1	0.22	0.06	N/A	0.26	0.05	0.11	0.17	0.29	0.1	0.16	0.12	0.12	0.2	< 0.01	0.1	0.23	< 0.01	0.14	0.07	< 0.01	0.11	0.21	< 0.01
Benzo(k)fluoranthene	mg/kg	0.13	0.18	0.06	N/A	0.2	0.04	< 0.01	0.13	0.27	< 0.01	0.12	0.1	0.1	0.16	< 0.01	0.11	0.17	< 0.01	0.12	0.05	< 0.01	0.09	0.19	< 0.01
Dibenzo(a,h)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01
Fluoranthene	mg/kg	0.11	0.16	0.06	N/A	0.18	0.05	0.15	0.17	0.22	0.1	0.13	0.12	0.13	0.15	< 0.01	0.15	0.21	< 0.01	0.19	0.07	< 0.01	0.16	0.2	< 0.01
Fluorene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.09	0.21	0.06	N/A	0.23	0.05	0.12	0.17	0.26	0.1	0.15	0.12	0.12	0.2	< 0.01	0.09	0.22	< 0.01	0.13	0.06	< 0.01	0.11	0.16	< 0.01
Chrysene	mg/kg	0.08	0.12	0.04	N/A	0.14	0.03	0.14	0.1	0.21	< 0.01	0.1	0.08	0.08	0.11	< 0.01	0.13	0.16	< 0.01	0.14	0.04	< 0.01	0.09	0.2	< 0.01
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	0.07	0.14	0.05	N/A	0.14	0.04	< 0.01	0.12	0.18	< 0.01	0.09	0.1	< 0.01	0.13	< 0.01	0.1	0.17	< 0.01	0.13	0.05	< 0.01	0.1	0.16	< 0.01
PAH sum	mg/kg	0.71	1.46	0.41	N/A	1.62	0.32	0.64	1.12	2.17	0.42	1.08	0.9	0.68	1.35	N/D	0.98	1.71	0.04	1.23	0.46	N/D	0.94	1.66	N/D
Polycyclic aromatic hydrocarbons (PAHs) , normalized concentrations																									
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.01	0.07	< 0.01	N/A	0.08	< 0.01	< 0.01	< 0.01	0.10	< 0.01	0.06	0.05	< 0.01	0.07	< 0.01	0.08	0.12	< 0.01	0.11	< 0.01	< 0.01	0.07	0.12	< 0.01
Benzo(a)pyrene	mg/kg	< 0.01	0.12	< 0.01	N/A	0.13	< 0.01	< 0.01	0.09	0.17	< 0.01	0.09	0.06	< 0.01	0.11	< 0.01	0.07	0.13	< 0.01	0.11	0.04	< 0.01	0.07	0.13	< 0.01
Benzo(ghi)perylene	mg/kg	0.10	0.22	0.06	N/A	0.26	0.05	0.10	0.17	0.29	0.10	0.16	0.12	0.12	0.20	< 0.01	0.09	0.23	< 0.01	0.13	0.07	< 0.01	0.10	0.21	< 0.01
Benzo(k)fluoranthene	mg/kg	0.13	0.18	0.06	N/A	0.20	0.04	< 0.01	0.13	0.27	< 0.01	0.12	0.10	0.10	0.16	< 0.01	0.09	0.17	< 0.01	0.11	0.05	< 0.01	0.08	0.19	< 0.01
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01
Fluoranthene	mg/kg	0.11	0.16	0.06	N/A	0.18	0.05	0.14	0.17	0.22	0.10	0.13	0.12	0.13	0.15	< 0.01	0.13	0.21	< 0.01	0.17	0.07	< 0.01	0.14	0.20	< 0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.09	0.21	0.06	N/A	0.23	0.05	0.11	0.17	0.26	0.10	0.15	0.12	0.12	0.20	< 0.01	0.08	0.22	< 0.01	0.12	0.06	< 0.01	0.10	0.16	< 0.01
Chrysene	mg/kg	0.08	0.12	0.04	N/A	0.14	0.03	0.13	0.10	0.21	< 0.01	0.10	0.08	0.08	0.11	< 0.01	0.11	0.16	< 0.01	0.13	0.04	< 0.01	0.08	0.20	< 0.01
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	N/A	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	0.07	0.14	0.05	N/A	0.14	0.04	< 0.01	0.12	0.18	< 0.01	0.09	0.10	< 0.01	0.13	< 0.01	0.09	0.17	< 0.01	0.12	0.05	< 0.01	0.09	0.16	< 0.01
Polychlorinated biphenyls (PCBs)																									
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.066	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.08	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.16	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Polychlorinated biphenyls (PCBs), normalized concentrations																									
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.066	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.08	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.16	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	N/A	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organotins																									
Monobutyltin, MBT	µg/kg	< 3.1	8	< 1.4	N/A	4.07	< 1.4	< 5.6	< 3.5	< 2.1	< 4.7	2.42	< 2.1	6.52	8.23	< 1.7	8.31	7.86	< 1.5	8.25	5.04	< 1.2	6	6.72	< 1.6
Dibutyltin, DBT	µg/kg	3.71	10.7	< 1.4	N/A	6.67	< 1.4	< 5.6	10.4	< 2.1	< 4.7	< 2.3	< 2.1	5.76	8.37	< 1.7	4.83	8.83	< 1.5	5.21	4.47	< 1.2	8.64	7.55	< 1.6
Tributyltin, TBT	µg/kg	21.4	95.9	< 1.4	N/A	53	< 1.4	20.6	113	9.38	13.5	28.9	4.59	20.8	30.9	< 1.7	39.5	49.5	< 1.5	18.6	27.5	< 1.2	58.5	29.7	< 1.6
Tetrabutyltin, TTBT	µg/kg	< 3.1	< 2.3	< 1.4	N/A	< 2.3	< 1.4	< 5.6	< 3.5	< 2.1	< 4.7	< 2.3	< 2.1	< 3.5	< 2.4	< 1.7	< 3.9	< 2.3	< 1.5	< 4.4	< 1.9	< 1.2	< 4.3	< 2.2	< 1.6
Mono-octyltin, MOT	µg/kg	< 3.1	< 2.3	< 1.4	N/A	< 2.3	< 1.4	< 5.6	< 3.5	< 2.1	< 4.7	< 2.3	< 2.1	< 3.5	< 2.4	< 1.7	< 3.9	< 2.3	< 1.5	< 4.4	< 1.9	< 1.2	< 4.3	< 2.2	< 1.6
Dioctylintin, DOT	µg/kg	< 3.1	< 2.3	< 1.4	N/A	< 2.3	< 1.4	< 5.6	< 3.5	< 2.1	< 4.7	< 2.3	< 2.1	< 3.5	< 2.4	< 1.7	< 3.9	< 2.3	< 1.5	< 4.4	< 1.9	< 1.2	< 4.3	< 2.2	< 1.6
Tricyclohexyltin, TCHT	µg/kg	< 6.3	< 4.6	< 2.9	N/A	< 4.6	< 2.8	< 11	< 7.1	< 4.2	< 9.5	< 4.6	< 4.1	< 6.9	< 4.9	< 3.4	< 7.7	< 4.7	< 3.1	< 8.8	< 3.7	< 2.3	< 8.6	< 4.5	< 3.1
Triphenyltin, TPhT	µg/kg	< 3.1	< 2.3	< 1.4	N/A	< 2.3	< 1.4	< 5.6	< 3.5	< 2.1	< 4.7	< 2.3	< 2.1	< 3.5	< 2.4	< 1.7	< 3.9	< 2.3	< 1.5	< 4.4	< 1.9	< 1.2	< 4.3	< 2.2	< 1.6
Organotins, normalized concentrations																									
Tributyltin, TBT	µg/kg	21.40	191.80	< 1.4	N/A	98.15	< 1.4	19.07	120.21	14.66	13.50	42.50	8.83	20.00	42.92	< 1.7	34.05	68.75	< 1.5	16.61	44.35	< 1.2	51.32	148.50	< 1.6
Triphenyltin, TPhT	µg/kg	< 3.1	< 2.3	< 1.4	N/A	< 2.3	< 1.4	< 5.6	< 3.5	< 2.1	< 4.7	< 2.3	< 2.1	< 3.5	< 2.4	< 1.7	< 3.9	< 2.3	< 1.5	< 4.4	< 1.9	< 1.2	< 4.3	< 2.2	< 1.6
Nutrients																									
Total organic carbon	%	5	2.5	2.1	N/A	2.7	1.7	5.4	4.7	3.2	5	3.4	2.6	5.2	3.6	2.6	5.8	3.6	2.3	5.6	3.1	2	5.7	0.3	2.2
Total nitrogen	%	0.67	0.31	0.73	0.73	0.34	0.22	0.7	0.61	0.38	0.7	0.45	0.34	0.7	0.47	0.35	0.75	0.44	0.29	0.74	0.39	0.24	0.78	< 0.05	0.27
Total phosporus	mg/kg	850	560	570	N/A	580	530	900	790	650	850	770	620	1000	800	660	1100	770	630	1100	740	500	1200	47	620
Auxiliary parameters																									
Fraction < 2000 µm	%	N/A	64.2	N/A	N/A	59	61.7	N/A	75.2	70.3	N/A	82.6	64.7	N/A	50.3	80.1	N/A	83.1	85.4	N/A	84.1	81.2	N/A	67.9	89.1
Fraction < 1000 µm	%	N/A	63	N/A	N/A	58.9	60.5	N/A	75.1	68.2	N/A	82.6	64.5	N/A	50.2	74.5	N/A	83	84.8	N/A	84	81.2	N/A	67.8	81.3
Fraction < 500 µm	%	N/A	61.5	N/A	N/A	58.9	58.1	N/A	75	64.2	N/A	82.5	64.2	N/A	49.9	69	N/A	83	83.7	N/A	83.3	81.2	N/A	67.8	78.2
Fraction < 250 µm	%	N/A	60.4	N/A	N/A	58.7	57	N/A	74.7	62.6	N/A	82.5	64	N/A	49.7	67	N/A	83	82.5	N/A	82.5	81.1	N/A	67.8	77.1
Fraction < 125 µm	%	N/A	59.5	N/A	N/A	58.7	56.4	N/A	74.7	61.7	N/A	82.5	63.9	N/A	49.7	65.9	N/A	83	81.6	N/A	81.6	80.9	N/A	67.5	76.3
Fraction < 63 µm	%	N/A	59.4	N/A	N/A	58.7	56	N/A	74.7	61.4	N/A	82.4	63.8	N/A	49.6	65.3	N/A	82.8	80.8	N/A	81.3	80.8	N/A	67.4	75.7
Fraction < 45 µm	%	N/A	59.4	N/A	N/A	58.7	55.9	N/A	74.7	61.3	N/A	82.4	63.6	N/A	49.6	65	N/A	82.7	80.6	N/A	81.2	80.8	N/A	67.2	75.4
Fraction < 16 µm	%	N/A	59.1	N/A	N/A	58.1	55.3	N/A	73.3	58.1	N/A	79.9	63.4	N/A	49	59.8	N/A	80	77.1	N/A	78.1	78.4	N/A	63.9	72.3
Fraction < 2 µm	%	N/A	49.4	N/A	N/A	53.2	44.2	N/A	52.3	50.5	N/A	56.6	46.6	N/A	45.3	47.4	N/A	56.9	54.3	N/A	56.8	58.2	N/A	55.3	45.2
Loss on ignition	%	14	10.4	7.1	N/A	10.9	7.1	15.1	14	10	14.4	11	8.6	14.6	10.9	8.5	15	10.4	8.2	14.8	9.3	6.8	15	0.8	7.5
Dry matter (1)	%	13.5	19.4	30.1	N/A	19.1	31.5	8.61	12.8	22.3	10.1	18.7	24.2	14.3	20.4	29.5	12.8	20.7	31.7	10.8	24.8	37.8	9.94	20.9	32
Dry matter (2)	%	15.7	19.4	31	N/A	19.1	31.1	9.1	12.9	22.1	10.8	18.1	25.4	13.6	20.1	27.1	12.7	21.9	27.7	11.9	27.2	37.6	13.5	21.5	31.7
Dry matter (3)	%	N/A	19.2	N/A	N/A	19	30.8	N/A	12.7	21.2	N/A	18.5	26.2	N/A	20.1	26.8	N/A	20.3	27.9	N/A	23.5	37.8	N/A	21.5	31.5

N/A = Not Analysed; N/D = Not detected; With the sample number also information is given of the sample depth (cm below the sediment surface).

Table 13. Sediment sample analyses at locations FIN_EBS_LUO_6_1 – FIN_EBS_LUO_6_8. Laboratory Eurofins Finland Oy. Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Normalized values falling into certain guideline concentration levels have been highlighted: yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2.

FIN_EBS-LUO_6	sample (cm)	6-1 (0-2cm)	6-1 (2-10cm)	6-1 (10-30cm)	6-2 (0-2cm)	6-2 (2-10cm)	6-2 (10-30cm)	6-3 (0-2cm)	6-3 (2-10cm)	6-3 (10-30cm)	6-4 (0-2cm)	6-4 (2-10cm)	6-4 (10-30cm)	6-5 0-2cm)	6-5 (2-10cm)	6-5 (10-17cm)	6-6 (0-2cm)	6-6 (2-10cm)	6-7 (0-2cm)	6-7 (2-10cm)	6-7 (10-30cm)	6-8 (0-2cm)	6-8 (2-10cm)	6-8 (10-30cm)
Parameter	Unit	CONCENTRATIONS																						
Metals																								
Arsenic, As	mg/kg	7.4	9	9.4	7.4	12	9	9.2	14	8.1	9.6	11	9.5	8.4	4.7	5.4	6.8	5.7	8.2	9.7	7.1	8.4	7.9	10
Cadmium, Cd	mg/kg	0.4	0.4	0.5	0.5	0.6	< 0.2	0.7	1.1	0.2	0.7	0.8	< 0.2	0.6	< 0.2	< 0.2	0.3	0.3	0.6	0.7	0.2	0.6	0.5	0.4
Chromium, Cr	mg/kg	55	57	72	52	81	70	53	64	71	55	78	60	51	84	80	58	78	49	48	52	58	57	54
Cobalt, Co	mg/kg	18	15	16	15	18	17	16	18	16	16	17	16	15	20	20	16	21	18	30	25	16	16	25
Copper, Cu	mg/kg	31	31	33	32	37	28	36	40	32	38	40	29	32	40	43	37	44	30	28	30	32	30	30
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	39	38	40	40	45	39	43	47	40	44	45	41	41	51	50	43	52	36	30	29	38	36	34
Lead, Pb	mg/kg	21	32	36	23	40	20	21	42	31	24	42	19	22	19	17	22	21	20	34	25	21	29	31
Zinc, Zn	mg/kg	130	150	150	140	180	120	140	210	140	150	190	120	130	150	150	130	130	130	150	110	140	140	140
Metals, normalized concentrations																								
Arsenic, As	mg/kg	N/A	7.4	7.2	N/A	9.7	7.0	N/A	N/A	6.2	7.3	7.9	7.5	N/A	3.3	3.7	4.9	3.8	N/A	7.5	5.6	N/A	6.0	7.8
Cadmium, Cd	mg/kg	N/A	0.4	0.5	N/A	0.6	< 0.2	N/A	N/A	0.2	0.6	0.7	< 0.2	N/A	< 0.2	< 0.2	0.3	0.3	N/A	0.6	0.2	N/A	0.4	0.4
Chromium, Cr	mg/kg	N/A	40.5	46.5	N/A	57.3	45.5	N/A	N/A	45.8	37.3	46.9	40.0	N/A	47.4	43.7	35.4	41.0	N/A	31.4	33.8	N/A	36.7	35.1
Copper, Cu	mg/kg	N/A	24.5	24.2	N/A	28.9	20.7	N/A	N/A	23.6	27.3	27.0	21.8	N/A	26.7	28.0	25.2	27.2	N/A	20.6	22.5	N/A	21.6	22.3
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	N/A	24.0	22.4	N/A	28.3	22.1	N/A	N/A	22.4	26.2	23.1	23.9	N/A	24.3	22.9	22.5	22.7	N/A	17.1	16.4	N/A	20.1	19.2
Lead, Pb	mg/kg	N/A	27.0	28.7	N/A	33.4	16.0	N/A	N/A	24.7	18.8	31.3	15.4	N/A	14.0	12.3	16.5	14.6	N/A	27.1	20.2	N/A	22.7	24.9
Zinc, Zn	mg/kg	N/A	108.1	98.2	N/A	128.3	79.2	N/A	N/A	91.8	99.6	114.0	81.1	N/A	86.5	83.9	79.1	69.1	N/A	99.1	73.2	N/A	90.5	92.7
Dioxins and Furans																								
1,2,3,4,6,7,8-HeptaCDD	ng/kg	13.5	24.5	13.4	14.7	37.3	3.58	16.4	43.5	4.12	17.5	31.5	1.74	17.6	5.08	0.903	13.2	4.41	15.2	37.4	15.1	3.43	27.1	14.4
1,2,3,4,6,7,8-HeptaCDF	ng/kg	47.7	104	59.7	45.4	171	17.8	51	171	16	51.8	159	2.03	68.9	16.4	< 0.51	45.6	4.35	56.5	195	56.7	13.5	133	86.5
1,2,3,4,7,8,9-HeptaCDF	ng/kg	1.36	2.42	2.18	1.54	3.69	0.789	1.47	4.54	1.35	1.79	4.66	< 0.40	1.64	0.52	< 0.37	1.3	< 0.37	1.48	4.6	1.16	0.944	2.45	2.62
1,2,3,4,7,8-HexaCDD	ng/kg	0.807	1.39	< 0.81	0.896	1.86	< 0.48	0.951	2.24	< 0.46	1.04	1.67	< 0.51	0.88	< 0.47	< 0.47	0.748	< 0.46	0.89	2.19	0.852	< 0.47	1.53	0.927
1,2,3,4,7,8-HexaCDF	ng/kg	2.83	5.63	4.93	3.35	9.3	1.39	3.82	9.05	2.5	3.33	8.41	< 0.42	3.62	1	< 0.39	2.62	< 0.39	3.3	9.76	3.26	1.95	5.67	5.61
1,2,3,6,7,8-HexaCDD	ng/kg	2.06	4.52	2.53	2.44	7.06	0.573	2.53	8.09	0.704	2.73	5.77	< 0.51	2.69	1.06	< 0.47	1.85	0.555	2.48	7.82	2.39	0.592	4.88	2.97
1,2,3,6,7,8-HexaCDF	ng/kg	3.08	4.36	3.75	3.16	6.87	1.04	3.41	7.76	1.93	3.19	6.69	< 0.42	3.08	0.825	< 0.39	2.4	< 0.39	3.18	8.65	3.38	1.52	5.25	4.63
1,2,3,7,8,9-HexaCDD	ng/kg	1.58	2.63	1.44	1.67	4.15	< 0.48	2.03	4.43	0.555	1.7	3.36	< 0.51	1.72	0.668	< 0.47	1.4	< 0.46	1.69	4.1	1.65	0.482	2.65	1.67
1,2,3,7,8,9-HexaCDF	ng/kg	< 0.59	< 0.738	< 0.67	< 0.56	< 0.497	< 0.40	< 0.35	< 1.58	< 0.496	< 0.616	< 1.50	< 0.42	< 0.688	< 0.39	< 0.39	< 0.571	< 0.39	< 0.643	< 1.48	< 0.600	< 0.39	< 0.969	< 1.41
1,2,3,7,8-PentaCDD	ng/kg	0.779	1.36	0.874	0.758	1.77	< 0.24	0.911	2.38	0.333	0.902	1.92	< 0.25	0.857	0.321	< 0.23	0.754	< 0.23	0.8	2.22	0.853	0.286	1.54	1.1
1,2,3,7,8-PentaCDF	ng/kg	1.88	3.42	2.84	2.19	4.75	0.804	2.3	5.66	1.77	2.34	4.95	< 0.47	2.12	0.64	< 0.43	1.79	< 0.43	2.14	5.62	2.11	1.14	3.53	3.3
2,3,4,6,7,8-HeksaCDF	ng/kg	3.09	5.25	3.73	3.83	7.27	0.976	4.01	8.61	1.75	3.79	7.53	< 0.42	3.98	1.1	< 0.39	2.82	0.415	3.67	8.89	3.54	1.31	5.25	4.08
2,3,4,7,8-PentaCDF	ng/kg	3.93	6.71	4.49	4.34	8.89	1.05	4.7	10.5	1.69	4.88	9.24	< 0.47	4.47	1.18	< 0.43	3.4	0.523	4.24	10.4	4.13	1.31	7.42	5.31
2,3,7,8-TetraCDD	ng/kg	< 0.27	0.337	< 0.30	< 0.25	< 0.22	< 0.18	0.183	0.624	< 0.17	< 0.18	0.394	< 0.19	< 0.19	< 0.18	< 0.17	< 0.18	< 0.17	0.275	0.495	< 0.17	< 0.18	0.349	0.274
2,3,7,8-TetraCDF	ng/kg	2.65	5.13	3.49	3.26	6.2	0.906	3.3	8.26	1.8	3.32	6.75	< 0.34	3.2	0.989	< 0.31	2.61	0.523	3.26	8.45	3.08	1.29	5.71	4.4
OktaCDD	ng/kg	41	86.8	48.1	51.7	117	15.9	58.6	146	19.3	61	122	15.3	53.1	20.7	5.55	48.5	34.9	54.5	128	45.9	17.6	86.9	52
OktaCDF	ng/kg	43.3	96.2	69.3	43.1	165	26.2	40.5	183	30.7	47.7	193	4.34	67.5	18.5	< 3.1	42.5	5.16	45	223	51.1	23	119	96.3
I-TEQ (NATO/CCMS) lower	ng/kg	4.77	8.93	5.68	5.23	12.2	1.32	5.9	14.7	2.29	5.73	12.5	0.0574	5.69	1.61	0.0146	4.31	0.538	5.58	14.8	5.24	1.79	9.93	7.26
I-TEQ (NATO/CCMS) upper	ng/kg	5.09	9	6.13	5.53	12.5	1.75	5.93	14.9	2.56	5.98	12.7	0.991	5.95	1.87	0.88	4.54	1.06	5.64	15	5.47	2.05	10	7.4
WHO (-98) PCDD/F TEQ lower	ng/kg	5.08	9.44	6.01	5.52	12.9	1.28	6.26	15.6	2.41	6.09	13.2	0.0397	6.01	1.73	0.00959	4.6	0.502	5.89	15.6	5.58	1.9	10.5	7.67
WHO (-98) PCDD/F TEQ upper	ng/kg	5.41	9.51	6.46	5.83	13.1	1.83	6.3	15.8	2.68	6.33	13.3	1.1	6.27	1.99	0.988	4.84	1.14	5.95	15.7	5.81	2.16	10.6	7.81
WHO (-05) PCDD/F TEQ lower	ng/kg	4.27	8.07	5.08	4.63	11	1.06	5.3	13.5	2.05	5.09	11.3	0.0436	5.1	1.49	0.0107	3.9	0.406	5.02	13.5	4.73	1.62	9	6.57
WHO (-05) PCDD/F TEQ upper	ng/kg	4.6	8.14	5.53	4.93	11.3	1.61	5.33	13.6	2.32	5.33	11.4	1	5.35	1.75	0.896	4.14	1.04	5.08	13.6	4.96	1.88	9.1	6.71
Dioxins and Furans, normalized concentrations																								
WHO (-98) PCDD/F TEQ lower	ng/kg	6.68	17.48	14.31	6.00	20.81	3.05	6.39	22.94	6.03	6.34	22.76	0.08	5.46	8.65	0.05	7.42	2.51	5.89	30.00	17.44	1.94	18.10	20.18

WHO (-98) PCDD/F TEQ upper	ng/kg	7.12	17.61	15.38	6.34	21.13	4.36	6.43	23.24	6.70	6.59	22.93	2.29	5.70	9.95	4.94	7.81	5.70	5.95	30.19	18.16	2.20	18.28	20.55
WHO (-05) PCDD/F TEQ lower	ng/kg	5.62	14.94	12.10	5.03	17.74	2.52	5.41	19.85	5.13	5.30	19.48	0.09	4.64	7.45	0.05	6.29	2.03	5.02	25.96	14.78	1.65	15.52	17.29
WHO (-05) PCDD/F TEQ upper	ng/kg	6.05	15.07	13.17	5.36	18.23	3.83	5.44	20.00	5.80	5.55	19.66	2.08	4.86	8.75	4.48	6.68	5.20	5.08	26.15	15.50	1.92	15.69	17.66
Polycyclic aromatic hydrocarbons (PAHs)																								
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.18	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.09	< 0.01	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	< 0.01	0.05	0.06
Benzo(a)pyrene	mg/kg	< 0.01	0.07	< 0.01	< 0.01	0.05	< 0.01	0.08	0.15	< 0.01	0.06	0.1	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	< 0.01	0.08	0.1
Benzo(b)fluoranthene,	mg/kg	0.11	0.15	0.06	0.11	0.11	< 0.01	0.14	0.34	0.06	0.13	0.21	< 0.01	0.14	< 0.01	< 0.01	0.1	< 0.01	0.14	0.34	0.06	0.12	0.16	0.24
Benzo(ghi)perylene	mg/kg	0.1	0.17	0.05	0.09	0.1	< 0.01	0.15	0.25	0.05	0.13	0.2	< 0.01	0.11	< 0.01	< 0.01	0.08	< 0.01	0.11	0.28	0.05	0.09	0.15	0.19
Benzo(k)fluoranthene	mg/kg	0.07	0.1	0.04	0.08	0.07	< 0.01	0.11	0.23	0.04	0.1	0.16	< 0.01	0.13	< 0.01	< 0.01	0.06	< 0.01	0.1	0.25	0.05	0.09	0.17	0.16
Dibenzo(a,h)anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	0.03
Fluoranthene	mg/kg	0.09	0.1	0.04	0.1	0.09	< 0.01	0.12	0.19	0.03	0.1	0.14	< 0.01	0.11	< 0.01	< 0.01	0.06	< 0.01	0.11	0.24	0.04	0.1	0.11	0.14
Fluorene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.18	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.09	0.16	0.05	0.09	0.1	< 0.01	0.14	0.23	0.05	0.13	0.2	< 0.01	0.09	< 0.01	< 0.01	0.07	< 0.01	0.1	0.27	0.05	0.09	0.13	0.17
Chrysene	mg/kg	< 0.01	0.09	< 0.01	0.06	0.06	< 0.01	0.1	0.16	< 0.01	0.1	0.11	< 0.01	0.09	< 0.01	< 0.01	< 0.01	< 0.01	0.09	0.19	0.03	< 0.01	0.08	0.12
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	< 0.01	0.08	0.03	0.06	0.07	< 0.01	0.08	0.15	0.03	0.07	0.12	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.18	0.03	< 0.01	0.08	0.12
PAH sum	mg/kg	0.46	0.97	0.27	0.59	0.65	N/D	0.92	1.84	0.26	0.82	1.3	N/D	0.81	N/D	N/D	0.37	N/D	0.65	2.43	0.31	0.49	1.01	1.33
Polycyclic aromatic hydrocarbons (PAHs) , normalized concentrations																								
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.18	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.09	< 0.01	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.10	< 0.01	< 0.01	0.05	0.06
Benzo(a)pyrene	mg/kg	< 0.01	0.07	< 0.01	< 0.01	0.05	< 0.01	0.08	0.15	< 0.01	0.06	0.10	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	< 0.01	< 0.01	0.08	0.10
Benzo(ghi)perylene	mg/kg	0.10	0.17	0.05	0.09	0.10	< 0.01	0.15	0.25	0.05	0.13	0.20	< 0.01	0.10	< 0.01	< 0.01	0.08	< 0.01	0.11	0.28	0.05	0.09	0.15	0.19
Benzo(k)fluoranthene	mg/kg	0.07	0.10	0.04	0.08	0.07	< 0.01	0.11	0.23	0.04	0.10	0.16	< 0.01	0.12	< 0.01	< 0.01	0.06	< 0.01	0.10	0.25	0.05	0.09	0.17	0.16
Phenanthrene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	0.03
Fluoranthene	mg/kg	0.09	0.10	0.04	0.10	0.09	< 0.01	0.12	0.19	0.03	0.10	0.14	< 0.01	0.10	< 0.01	< 0.01	0.06	< 0.01	0.11	0.24	0.04	0.10	0.11	0.14
Indeno(1,2,3-c,d)pyrene	mg/kg	0.09	0.16	0.05	0.09	0.10	< 0.01	0.14	0.23	0.05	0.13	0.20	< 0.01	0.08	< 0.01	< 0.01	0.07	< 0.01	0.10	0.27	0.05	0.09	0.13	0.17
Chrysene	mg/kg	< 0.01	0.09	< 0.01	0.06	0.06	< 0.01	0.10	0.16	< 0.01	0.10	0.11	< 0.01	0.08	< 0.01	< 0.01	< 0.01	< 0.01	0.09	0.19	0.03	< 0.01	0.08	0.12
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	< 0.01	0.08	0.03	0.06	0.07	< 0.01	0.08	0.15	0.03	0.07	0.12	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.18	0.03	< 0.01	0.08	0.12
Polychlorinated biphenyls (PCBs)																								
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Polychlorinated biphenyls (PCBs) , normalized concentrations																								
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organotins																								
Monobutyltin, MBT	µg/kg	3.34	< 1.9	< 1.4	5.92	< 1.8	< 1.3	5.74	< 2.3	< 1.4	< 2.8	< 1.9	< 1.5	3.98	< 0.94	< 0.90	3.85	< 1.0	< 3.9	2.94	< 4.4	< 1.4	< 2.4	< 1.7
Dibutyltin, DBT	µg/kg	< 2.9	2.94	< 1.4	< 2.8	4.38	< 1.3	< 3.7	5.42	< 1.4	4.49	4.38	< 1.5	< 3.1	< 0.94	< 0.90	< 2.8	< 1.0	< 3.9	3.6	< 4.4	< 1.4	3.73	< 1.7
Tributyltin, TBT	µg/kg	7.44	10.9	< 1.4	11	16.2	< 1.3	18.4	25.5	< 1.4	34.6	9.15	< 1.5	13.2	2.83	< 0.90	11.5	2.47	14.7	16.1	10.9	< 1.4	28.6	2
Tetrabutyltin, TTBT	µg/kg	< 2.9	< 1.9	< 1.4	< 2.8	< 1.8	< 1.3	< 3.7	< 2.3	< 1.4	< 2.8	< 1.9	< 1.5	< 3.1	< 0.94	< 0.90	< 2.8	< 1.0	< 3.9	< 2.3	< 4.4	< 1.4	< 2.4	< 1.7

Mono-octyltin, MOT	µg/kg	< 2.9	< 1.9	< 1.4	< 2.8	< 1.8	< 1.3	< 3.7	< 2.3	< 1.4	< 2.8	< 1.9	< 1.5	< 3.1	< 0.94	< 0.90	< 2.8	< 1.0	< 3.9	< 2.3	< 4.4	< 1.4	< 2.4	< 1.7
Dioctylintin, DOT	µg/kg	< 2.9	< 1.9	< 1.4	< 2.8	< 1.8	< 1.3	< 3.7	< 2.3	< 1.4	< 2.8	< 1.9	< 1.5	< 3.1	< 0.94	< 0.90	< 2.8	< 1.0	< 3.9	< 2.3	< 4.4	< 1.4	< 2.4	< 1.7
Tricyclohexyltin, TCHT	µg/kg	< 5.9	< 3.7	< 2.8	< 5.6	< 3.6	< 2.6	< 7.4	< 4.7	< 2.9	< 5.6	< 3.8	< 3.0	< 6.1	< 1.9	< 1.8	< 5.6	< 2.1	< 7.9	< 4.6	< 8.9	< 2.7	< 4.8	< 4.10
Triphenyltin, TPhT	µg/kg	< 2.9	< 1.9	< 1.4	< 2.8	< 1.8	< 1.3	< 3.7	< 2.3	< 1.4	< 2.8	< 1.9	< 1.5	< 3.1	< 0.94	< 0.90	< 2.8	< 1.0	< 3.9	< 2.3	< 4.4	< 1.4	< 2.4	< 1.7
Organotins, normalized concentrations																								
Tributyltin, TBT	µg/kg	9.79	20.19	< 1.4	11.96	26.13	< 1.3	18.78	37.50	< 1.4	36.04	15.78	< 1.5	12.00	14.15	< 0.90	18.55	12.35	14.70	30.96	34.06	< 1.4	49.31	5.26
Triphenyltin, TPhT	µg/kg	< 2.9	< 1.9	< 1.4	< 2.8	< 1.8	< 1.3	< 3.7	< 2.3	< 1.4	< 2.8	< 1.9	< 1.5	< 3.1	< 0.94	< 0.90	< 2.8	< 1.0	< 3.9	< 2.3	< 4.4	< 1.4	< 2.4	< 1.7
Nutrients																								
Total organic carbon	%	3.8	2.7	2.1	4.6	3.1	2.1	4.9	3.4	2	4.8	2.9	2.4	5.5	0.7	0.3	3.1	0.9	5	2.6	1.6	4.9	2.9	1.9
Total nitrogen	%	0.49	0.37	0.24	0.57	0.4	0.26	0.62	0.43	0.24	0.59	0.36	0.29	0.69	0.11	< 0.05	0.43	0.12	0.64	0.33	0.18	0.62	0.41	0.3
Total phosporus	mg/kg	880	750	750	940	810	730	940	760	710	920	770	610	990	580	610	820	620	920	570	570	920	650	580
Auxiliary parameters																								
Fraction < 2000 µm	%	N/A	50.5	76.2	N/A	60.6	68.7	N/A	N/A	60.5	61.8	86.7	70.6	N/A	94.6	74.9	78.7	92.3	N/A	66.6	62.8	N/A	62.4	58.8
Fraction < 1000 µm	%	N/A	50.2	76.1	N/A	59.8	68.7	N/A	N/A	60.4	61.5	84.3	68.1	N/A	94.6	74.9	78.6	90.3	N/A	66.5	62.6	N/A	62.3	58.7
Fraction < 500 µm	%	N/A	49.7	76.1	N/A	57.9	68.6	N/A	N/A	60.6	61.4	83.7	65.2	N/A	94.4	74.9	78.4	89.2	N/A	65.2	62.1	N/A	61.9	58.5
Fraction < 250 µm	%	N/A	49.2	76	N/A	56.3	68.3	N/A	N/A	60.6	61.3	83.5	63.7	N/A	94.3	74.8	78.2	88.8	N/A	64.4	61.6	N/A	61.6	58.3
Fraction < 125 µm	%	N/A	48.6	75.8	N/A	55.5	67.7	N/A	N/A	60.5	60.9	83.5	62.5	N/A	94.2	74.8	77.8	88.5	N/A	63.7	60.9	N/A	61.4	58.1
Fraction < 63 µm	%	N/A	48.5	75.8	N/A	54.9	67.2	N/A	N/A	60.5	60.4	83.4	62	N/A	94.1	74.8	77.6	88.3	N/A	63.5	60.7	N/A	61.3	57.8
Fraction < 45 µm	%	N/A	48.4	75.5	N/A	54.6	66.7	N/A	N/A	60.6	60.1	83.2	61.5	N/A	94.1	74.7	77.5	88	N/A	63.3	60.5	N/A	61.1	57.8
Fraction < 16 µm	%	N/A	46.7	74.4	N/A	47.8	62.7	N/A	N/A	59.8	57.9	80.7	55.6	N/A	85.2	74.6	66	87.1	N/A	59.7	60	N/A	56.5	56.5
Fraction < 2 µm	%	N/A	45.4	52.5	N/A	45.7	51.9	N/A	N/A	52.5	48.8	58.2	50	N/A	63.6	66.5	56.9	70.2	N/A	51.4	51.9	N/A	52.6	51.9
Loss on ignition	%	10.5	8.6	6.9	12.3	6.9	9.1	13	10	7.2	12.6	8.9	7.5	14.2	3.9	3	9.4	4.9	13.5	9.6	6.5	13.9	9.8	7.4
Dry matter (1)	%	15.5	23.2	31.7	16.4	24.2	32.3	12.5	20.7	33	15	23.3	30	13.8	44.3	51.4	18	44.2	12.6	21.3	10.2	33.5	19.8	28.2
Dry matter (2)	%	15.8	22	31.7	16.7	24.6	31.9	14.5	20.4	32.2	14.9	23.1	29.2	14.4	42.8	50.8	17	42.6	13.4	23.5	33.7	12.4	21	29.5
Dry matter (3)	%	N/A	22.3	30.8	N/A	23.7	31.6	N/A	N/A	32.6	14.5	23.4	29.8	N/A	43.6	51.1	16.8	44.3	N/A	21.3	32.7	N/A	19.5	27.7

N/A = Not Analysed; N/D = Not detected; With the sample number also information is given of the sample depth (cm below the sediment surface).

Table 14. Sediment sample analyses at locations FIN_EBS_LUO_7_1 – FIN_EBS_LUO_7_8. Laboratory Eurofins Finland Oy. Concentrations of harmful substances in sediment samples were normalized according to the Instructions for Dredging and Depositing Dredged Materials by the Ministry of the Environment (2015). Normalized values falling into certain guideline concentration levels have been highlighted: yellow color means that the value is higher than concentration level 1 (within the concentration levels 1A-1C), and red that the value is within the concentration level 2.

FIN_EBS-LUO_7	**sample**	**7-1 (0-2cm)**	**7-1 (2-10cm)**	**7-1 (10-30cm)**	**7-2 (0-2cm)**	**7-2 (2-10cm)**	**7-2 (10-20cm)**	**7-3 (0-2cm)**	**7-3 (2-10cm)**	**7-3 (10-30cm)**	**7-4 (0-2cm)**	**7-4 (2-10cm)**	**7-5 (0-2cm)**	**7-5 (2-10cm)**	**7-5 (10-30cm)**	**7-6 (0-2cm)**	**7-6 (2-10cm)**	**7-6 (10-30cm)**	**7-7 (0-2cm)**	**7-7 (2-10cm)**	**7-7 (10-30cm)**	**7-8 (0-2cm)**	**7-8 (2-10cm)**	**7-8 (10-20cm)**
Parameter	Unit	**CONCENTRATIONS**																						
Metals																								
Arsenic, As	mg/kg	17	16	10	18	17	4.2	15	14	11	4.6	4.7	15	18	9.7	14	16	9.3	13	11	4.7	13	6.1	6.1
Cadmium, Cd	mg/kg	2.3	1.8	0.3	2.1	1.2	< 0.2	1.9	1.1	0.2	0.2	0.2	1.6	1.8	0.4	1.9	2.1	0.4	1.4	0.8	< 0.2	1.6	0.3	0.2
Chromium, Cr	mg/kg	48	79	62	70	64	71	73	110	62	69	69	63	60	61	59	55	58	53	58	57	54	70	77
Cobalt, Co	mg/kg	17	18	17	17	21	19	19	18	17	18	18	16	18	17	20	18	16	16	19	16	16	21	23
Copper, Cu	mg/kg	58	48	37	58	46	49	48	42	34	35	33	50	46	34	55	49	34	42	38	32	47	39	41
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	57	54	44	59	51	52	58	49	42	42	43	49	52	41	50	51	40	50	44	43	49	50	53
Lead, Pb	mg/kg	35	47	28	34	34	26	40	39	24	14	14	28	49	30	24	50	33	37	30	15	47	21	20
Zinc, Zn	mg/kg	240	270	140	240	210	140	250	200	130	120	120	190	260	140	190	260	140	200	160	110	220	140	140
Metals, normalized concentrations																								
Arsenic, As	mg/kg	N/A	12.5	7.8	N/A	13.3	2.9	N/A	10.9	8.7	4.3	3.8	N/A	13.7	7.0	N/A	13.0	7.0	N/A	8.5	3.7	N/A	4.3	4.6

Cadmium, Cd	mg/kg	N/A	1.6	0.3	N/A	1.1	< 0.2	N/A	1.0	0.2	0.2	0.2	N/A	1.6	0.4	N/A	1.9	0.4	N/A	0.7	< 0.2	N/A	0.3	0.2
Chromium, Cr	mg/kg	N/A	53.4	40.5	N/A	41.7	38.0	N/A	72.8	41.0	53.2	44.9	N/A	39.6	36.3	N/A	40.3	36.2	N/A	37.4	36.3	N/A	39.5	46.3
Copper, Cu	mg/kg	N/A	35.9	27.8	N/A	34.5	31.2	N/A	31.3	25.7	32.1	25.5	N/A	33.4	23.3	N/A	38.4	24.3	N/A	28.2	24.0	N/A	26.0	29.2
Mercury, Hg	mg/kg	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Nickel, Ni	mg/kg	N/A	32.0	25.0	N/A	28.9	23.2	N/A	28.3	24.2	29.5	24.3	N/A	29.9	20.8	N/A	33.5	21.5	N/A	24.6	23.7	N/A	23.7	27.2
Lead, Pb	mg/kg	N/A	38.0	22.7	N/A	27.6	18.6	N/A	31.4	19.6	13.1	11.6	N/A	38.7	22.6	N/A	41.9	25.8	N/A	24.1	12.1	N/A	15.5	15.6
Zinc, Zn	mg/kg	N/A	183.2	93.4	N/A	140.1	76.5	N/A	133.8	87.7	98.5	81.3	N/A	171.2	84.2	N/A	189.4	88.7	N/A	105.4	72.3	N/A	80.7	86.7
Dioxins and Furans																								
1,2,3,4,6,7,8-HeptaCDD	ng/kg	47.3	37.1	3.28	41.7	19.6	2.87	45.7	19.8	3.06	< 0.83	< 0.83	29.2	49.1	4.64	23	57.2	5.59	43.8	18.3	2.99	49.8	2.51	< 0.54
1,2,3,4,6,7,8-HeptaCDF	ng/kg	69.5	85	2.53	58.3	40.8	< 0.52	95.9	49	< 0.85	< 0.80	< 0.80	36.4	195	8.19	34.9	140	14.7	90.7	39.1	< 0.89	100	4.79	< 0.52
1,2,3,4,7,8,9-HeptaCDF	ng/kg	3.87	4.75	< 0.38	3.82	2.16	< 0.38	4.01	3.58	< 0.62	< 0.59	< 0.59	2.83	6.03	1.04	2.16	6.29	1.54	3.25	2.27	< 0.65	4.83	< 0.63	< 0.38
1,2,3,4,7,8-HexaCDD	ng/kg	2.29	1.86	< 0.48	2.27	0.959	< 0.48	2.36	1.08	< 0.79	< 0.74	< 0.74	1.45	2.43	< 0.74	1.36	2.78	< 0.79	2.07	0.891	< 0.82	2.69	< 0.79	< 0.48
1,2,3,4,7,8-HexaCDF	ng/kg	9.18	10.7	0.591	7.83	4.66	< 0.40	8.67	6.89	< 0.66	< 0.62	< 0.62	5.98	13.1	1.79	5.1	14.8	3	7.74	4.69	< 0.69	12	< 0.66	< 0.40
1,2,3,6,7,8-HexaCDD	ng/kg	5.52	5.34	< 0.48	5.37	2.49	< 0.48	5.91	3.44	< 0.79	< 0.74	< 0.74	3.69	7.13	< 0.74	3.44	7.88	< 0.79	5.14	2.57	< 0.82	7.48	< 0.79	< 0.48
1,2,3,6,7,8-HexaCDF	ng/kg	8.35	8.49	0.482	7.19	3.59	< 0.40	8.12	5.79	< 0.66	< 0.62	< 0.62	5.43	10.3	1.72	5.06	10.8	2.16	6.75	3.66	< 0.69	9.46	< 0.66	< 0.40
1,2,3,7,8,9-HexaCDD	ng/kg	4.3	3.68	< 0.48	4.13	1.74	< 0.48	4.33	2.58	< 0.79	< 0.74	< 0.74	3.31	4.47	< 0.74	2.11	4.96	< 0.79	3.64	1.75	< 0.82	4.53	< 0.79	< 0.48
1,2,3,7,8,9-HexaCDF	ng/kg	< 2.52	< 2.57	< 0.40	< 2.54	< 1.29	< 0.40	< 2.75	< 2.17	< 0.66	< 0.62	< 0.62	< 2.09	< 3.25	< 0.62	< 1.38	< 1.36	< 0.66	< 0.957	< 0.70	< 0.69	< 0.80	< 0.66	< 0.40
1,2,3,7,8-PentaCDD	ng/kg	2.12	1.87	< 0.24	1.88	0.959	< 0.24	2.22	1.33	< 0.39	< 0.37	< 0.37	1.33	2.3	< 0.37	1.22	2.58	0.411	1.77	0.993	< 0.41	2.21	< 0.40	< 0.24
1,2,3,7,8-PentaCDF	ng/kg	5.59	5.94	< 0.44	4.79	2.61	< 0.44	6.33	3.99	< 0.72	< 0.68	< 0.68	4.06	7.22	1.07	3.36	7.57	1.78	4.93	2.83	< 0.75	7.28	< 0.73	< 0.44
2,3,4,6,7,8-HeksaCDF	ng/kg	9.13	8.86	0.443	8.68	4.13	< 0.40	9.08	5.05	< 0.66	< 0.62	< 0.62	5.67	11.4	1.15	5.45	11.2	1.76	8.24	3.79	< 0.69	10.2	< 0.66	< 0.40
2,3,4,7,8-PentaCDF	ng/kg	10.4	9.52	0.436	10.2	4.42	< 0.44	10.4	5.65	< 0.72	< 0.68	< 0.68	7.11	11.8	1.19	5.59	13.1	1.81	9.8	4.65	< 0.75	11.3	< 0.73	< 0.44
2,3,7,8-TetraCDD	ng/kg	0.488	0.455	< 0.18	< 0.38	0.223	< 0.18	0.378	< 0.30	< 0.30	< 0.28	< 0.28	< 0.39	0.552	< 0.28	< 0.40	0.559	< 0.30	0.404	< 0.31	< 0.31	< 0.36	< 0.30	< 0.18
2,3,7,8-TetraCDF	ng/kg	7.61	7.57	0.392	6.72	3.45	< 0.32	7.67	4.5	< 0.52	< 0.49	< 0.49	5.02	9.13	0.969	4.85	9.82	1.72	7.08	3.59	< 0.55	8.48	< 0.53	< 0.32
OktaCDD	ng/kg	172	138	29.8	153	92.1	24	186	94.7	31.8	3.64	3.87	117	189	37.5	101	202	32.9	164	74.6	23.2	228	12.6	3.29
OktaCDF	ng/kg	62	121	5.42	61.8	52.5	< 3.2	93.4	81.3	< 5.2	< 4.9	< 4.9	28.1	201	17.6	29.4	143	28.9	86.6	49.3	< 5.5	101	5.72	< 3.2
I-TEQ (NATO/CCMS) lower	ng/kg	13.1	12.6	0.502	11.8	5.92	0.0527	13.4	7.52	0.0624	0.00364	0.0039	8.31	16.7	1.4	7.04	17.4	2.34	12.1	5.78	0.0531	14.5	0.0913	0.00329
I-TEQ (NATO/CCMS) upper	ng/kg	13.4	12.9	1.01	12.4	6.05	0.942	13.6	8.04	1.52	1.39	1.39	8.91	17	2.15	7.58	17.5	2.94	12.2	6.16	1.58	14.9	1.55	0.903
WHO (-98) PCDD/F TEQ lower	ng/kg	14	13.3	0.471	12.5	6.27	0.0311	14.2	8.03	0.0338	0.00036	0.0004	8.84	17.5	1.35	7.54	18.4	2.49	12.8	6.16	0.0322	15.3	0.0748	0.00033
WHO (-98) PCDD/F TEQ upper	ng/kg	14.2	13.6	1.09	13.1	6.39	1.04	14.5	8.55	1.68	1.56	1.56	9.44	17.8	2.29	8.07	18.5	3.09	12.9	6.55	1.76	15.7	1.73	1.02
WHO (-05) PCDD/F TEQ lower	ng/kg	11.8	11.4	0.39	10.4	5.36	0.0359	12.1	6.86	0.0401	0.00109	0.0012	7.37	15	1.11	6.38	15.7	2.11	10.8	5.2	0.0369	13	0.0785	0.00099
WHO (-05) PCDD/F TEQ upper	ng/kg	12.1	11.6	1.01	11	5.49	0.947	12.3	7.38	1.53	1.42	1.42	7.97	15.4	2.04	6.91	15.8	2.71	10.9	5.58	1.6	13.4	1.57	0.922
Dioxins and Furans, normalized concentrations																								
WHO (-98) PCDD/F TEQ lower	ng/kg	11.29	21.45	1.39	11.16	19.59	0.16	14.49	16.06	0.094	0.002	0.002	7.62	25.74	3.75	5.71	22.44	6.55	13.33	18.12	0.16	16.28	0.37	0.002
WHO (-98) PCDD/F TEQ upper	ng/kg	11.45	21.94	3.21	11.70	19.97	5.20	14.80	17.10	4.67	7.80	7.80	8.14	26.18	6.36	6.11	22.56	8.13	13.44	19.26	8.80	16.70	8.65	5.10
WHO (-05) PCDD/F TEQ lower	ng/kg	9.52	18.39	1.15	9.29	16.75	0.18	12.35	13.72	0.11	0.055	0.060	6.35	22.06	3.08	4.83	19.15	5.55	11.25	15.29	0.18	13.83	0.39	0.005
WHO (-05) PCDD/F TEQ upper	ng/kg	9.76	18.71	2.97	9.82	17.16	4.74	12.55	14.76	4.25	7.10	7.10	6.87	22.65	5.67	5.23	19.27	7.13	11.35	16.41	8.00	14.26	7.85	4.61
Polycyclic aromatic hydrocarbons (PAHs)																								
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.01	0.12	< 0.01	< 0.01	0.04	< 0.01	0.09	0.07	< 0.01	< 0.01	< 0.01	< 0.01	0.12	< 0.01	< 0.01	0.15	< 0.01	0.09	0.06	< 0.01	0.1	< 0.01	< 0.01
Benzo(a)pyrene	mg/kg	0.18	0.28	< 0.01	0.17	0.09	< 0.01	0.17	0.14	< 0.01	< 0.01	< 0.01	0.11	0.21	< 0.01	< 0.01	0.24	0.03	0.14	0.09	< 0.01	0.2	< 0.01	< 0.01
Benzo(b)fluoranthene,	mg/kg	0.33	0.52	0.03	0.3	0.17	< 0.01	0.31	0.32	< 0.01	< 0.01	< 0.01	0.21	0.43	0.05	0.16	0.53	0.1	0.28	0.22	< 0.01	0.41	< 0.01	< 0.01
Benzo(ghi)perylene	mg/kg	0.34	0.55	< 0.01	0.31	0.15	< 0.01	0.3	0.26	< 0.01	< 0.01	< 0.01	0.2	0.4	0.04	0.15	0.47	0.08	0.26	0.19	< 0.01	0.36	< 0.01	< 0.01
Benzo(k)fluoranthene	mg/kg	0.25	0.34	< 0.01	0.22	0.11	< 0.01	0.22	0.21	< 0.01	< 0.01	< 0.01	0.15	0.29	0.04	< 0.01	0.36	0.06	0.2	0.15	< 0.01	0.29	< 0.01	< 0.01
Dibenzo(a,h)anthracene	mg/kg	< 0.01	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	mg/kg	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	< 0.01	0.07	< 0.01	< 0.01	0.08	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	mg/kg	0.28	0.31	< 0.01	0.22	0.12	< 0.01	0.24	0.18	< 0.01	< 0.01	< 0.01	0.17	0.29	< 0.01	0.16	0.35	0.05	0.21	0.13	< 0.01	0.21	< 0.01	< 0.01
Fluorene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.38	0.64	0.03	0.35	0.16	< 0.01	0.31	0.27	< 0.01	< 0.01	< 0.01	0.21	0.42	0.04	0.16	0.47	0.07	0.26	0.18	< 0.01	0.34	< 0.01	< 0.01
Chrysene	mg/kg	0.16	0.17	< 0.01	0.12	0.07	< 0.01	0.14	0.11	< 0.01	< 0.01	< 0.01	0.1	0.17	< 0.01	< 0.01	0.21	0.04	0.14	0.09	< 0.01	0.19	< 0.01	< 0.01
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	0.21	0.26	< 0.01	0.17	0.1	< 0.01	0.19	0.16	< 0.01	< 0.01	< 0.01	0.12	0.24	< 0.01	< 0.01	0.29	0.05	0.16	0.11	< 0.01	0.17	< 0.01	< 0.01
PAH sum	mg/kg	2.13	3.36	0.06	1.86	1.01	N/D	1.97	1.8	N/D	N/D	N/D	1.27	2.7	0.17	0.63	3.22	0.48	1.74	1.22	N/D	2.27	N/D	N/D

Polycyclic aromatic hydrocarbons (PAHs) , normalized concentrations																								
Anthracene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	mg/kg	< 0.01	0.12	< 0.01	< 0.01	0.04	< 0.01	0.09	0.07	< 0.01	< 0.01	< 0.01	< 0.01	0.12	< 0.01	< 0.01	0.15	< 0.01	0.09	0.06	< 0.01	0.10	< 0.01	< 0.01
Benzo(a)pyrene	mg/kg	0.15	0.28	< 0.01	0.15	0.09	< 0.01	0.17	0.14	< 0.01	< 0.01	< 0.01	0.09	0.21	< 0.01	< 0.01	0.24	0.03	0.14	0.09	< 0.01	0.20	< 0.01	< 0.01
Benzo(ghi)perylene	mg/kg	0.27	0.55	< 0.01	0.28	0.15	< 0.01	0.30	0.26	< 0.01	< 0.01	< 0.01	0.17	0.40	0.04	0.11	0.47	0.08	0.26	0.19	< 0.01	0.36	< 0.01	< 0.01
Benzo(k)fluoranthene	mg/kg	0.20	0.34	< 0.01	0.20	0.11	< 0.01	0.22	0.21	< 0.01	< 0.01	< 0.01	0.13	0.29	0.04	< 0.01	0.36	0.06	0.20	0.15	< 0.01	0.29	< 0.01	< 0.01
Phenanthrene	mg/kg	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	< 0.01	0.07	< 0.01	< 0.01	0.08	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	mg/kg	0.23	0.31	< 0.01	0.20	0.12	< 0.01	0.24	0.18	< 0.01	< 0.01	< 0.01	0.15	0.29	< 0.01	0.12	0.35	0.05	0.21	0.13	< 0.01	0.21	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.31	0.64	0.03	0.31	0.16	< 0.01	0.31	0.27	< 0.01	< 0.01	< 0.01	0.18	0.42	0.04	0.12	0.47	0.07	0.26	0.18	< 0.01	0.34	< 0.01	< 0.01
Chrysene	mg/kg	0.13	0.17	< 0.01	0.11	0.07	< 0.01	0.14	0.11	< 0.01	< 0.01	< 0.01	0.09	0.17	< 0.01	< 0.01	0.21	0.04	0.14	0.09	< 0.01	0.19	< 0.01	< 0.01
Naphthalene	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	mg/kg	0.17	0.26	< 0.01	0.15	0.10	< 0.01	0.19	0.16	< 0.01	< 0.01	< 0.01	0.10	0.24	< 0.01	< 0.01	0.29	0.05	0.16	0.11	< 0.01	0.17	< 0.01	< 0.01
Polychlorinated biphenyls (PCBs)																								
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Polychlorinated biphenyls (PCBs) , normalized concentrations																								
PCB 101	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 118	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 138	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 153	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 180	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 28	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 52	mg/kg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organotins																								
Monobutyltin, MBT	µg/kg	< 8.32	< 2.0	< 1.4	8.44	< 1.6	< 1.1	< 9.88	< 1.9	< 1.4	< 1.1	< 0.85	< 11.3	< 3.77	< 1.5	< 7.0	< 3.2	< 1.5	< 4.2	< 1.6	< 1.1	< 4.0	< 1.0	< 0.91
Dibutyltin, DBT	µg/kg	5.78	< 2.0	< 1.4	< 6.0	< 1.6	< 1.1	4.58	< 1.9	< 1.4	< 1.1	< 0.85	< 7.0	< 2.7	< 1.5	< 7.0	3.37	< 1.5	7.14	< 1.6	< 1.1	4.76	< 1.0	< 0.91
Tributyltin, TBT	µg/kg	25.8	3.89	< 1.4	22	< 1.96	< 1.1	13	< 1.9	< 1.4	< 1.1	< 0.85	25.4	5.06	< 1.5	11.3	11.2	< 1.5	31.9	< 1.6	< 1.1	11.8	< 1.0	< 0.91
Tetrabutyltin, TTBT	µg/kg	< 5.6	< 2.0	< 1.4	< 6.0	< 1.6	< 1.1	< 4.3	< 1.9	< 1.4	< 1.1	< 0.85	< 7.0	< 2.7	< 1.5	< 7.0	< 3.2	< 1.5	< 4.2	< 1.6	< 1.1	< 4.0	< 1.0	< 0.91
Mono-octyltin, MOT	µg/kg	< 5.6	< 2.0	< 1.4	< 6.0	< 1.6	< 1.1	< 4.3	< 1.9	3.43	< 1.1	< 0.85	< 7.0	15.8	< 1.5	< 7.0	< 3.2	< 1.5	< 4.2	< 1.6	< 1.1	< 4.0	< 1.0	< 0.91
Dioctylintin, DOT	µg/kg	7.33	< 2.0	< 1.4	< 6.0	< 1.6	< 1.1	< 4.3	< 1.9	< 1.4	< 1.1	< 0.85	< 7.0	< 2.7	< 1.5	< 7.0	< 3.2	< 1.5	< 4.2	< 1.6	< 1.1	< 4.0	< 1.0	< 0.91
Tricyclohexyltin, TCHT	µg/kg	< 11	< 4.1	< 2.9	< 12	< 3.2	< 2.1	< 8.6	< 3.7	< 2.7	< 2.1	< 1.7	< 14	< 5.5	< 3.0	< 14	< 6.5	< 2.9	< 8.5	< 3.2	< 2.2	< 8.1	< 2.0	< 1.8
Triphenyltin, TPhT	µg/kg	< 5.6	< 2.0	< 1.4	< 6.0	< 1.6	< 1.1	< 4.3	< 1.9	< 1.4	< 1.1	< 0.85	< 7.0	< 2.7	< 1.5	< 7.0	< 3.2	< 1.5	< 4.2	< 1.6	< 1.1	< 4.0	< 1.0	< 0.91
Organotins, normalized concentrations																								
Tributyltin, TBT	µg/kg	20.81	6.27	< 1.4	19.64	< 1.96	< 1.1	13.27	< 1.9	< 1.4	< 1.1	< 0.85	21.90	7.44	< 1.5	8.56	13.66	< 1.5	33.23	< 1.6	< 1.1	12.55	< 1.0	< 0.91
Triphenyltin, TPhT	µg/kg	< 5.6	< 2.0	< 1.4	< 6.0	< 1.6	< 1.1	< 4.3	< 1.9	< 1.4	< 1.1	< 0.85	< 7.0	< 2.7	< 1.5	< 7.0	< 3.2	< 1.5	< 4.2	< 1.6	< 1.1	< 4.0	< 1.0	< 0.91
Nutrients																								
Total organic carbon	%	6.2	3.1	1.7	5.6	1.6	0.4	4.9	2.5	1.8	0.3	0.3	5.8	3.4	1.8	6.6	4.1	1.9	4.8	1.7	0.7	4.7	0.6	0.5
Total nitrogen	%	0.78	0.45	0.29	0.68	0.21	< 0.05	0.59	0.26	0.19	< 0.05	< 0.05	0.64	0.42	0.23	0.79	0.48	0.21	0.53	0.18	< 0.05	0.56	< 0.05	< 0.05
Total phosporus	mg/kg	820	730	650	860	610	430	860	650	660	560	550	830	700	650	980	750	650	790	550	470	860	570	570
Auxiliary parameters																								
Fraction < 2000 µm	%	N/A	57	57.2	N/A	79.7	82.4	N/A	56.4	67.1	50.9	61.7	N/A	59.2	89.9	N/A	74.1	93.9	N/A	71.9	60.4	N/A	75.1	73.2
Fraction < 1000 µm	%	N/A	56.6	57.1	N/A	79	82.4	N/A	56.4	66.1	50.7	61.6	N/A	59.2	89.9	N/A	71.8	90.7	N/A	71.2	60.4	N/A	75.1	72.9
Fraction < 500 µm	%	N/A	56.2	57	N/A	73.8	82.2	N/A	56.1	62.6	48.9	60.9	N/A	59.2	86.4	N/A	68.5	89	N/A	67.5	60.4	N/A	74.3	70.8
Fraction < 250 µm	%	N/A	55.9	56.9	N/A	69.6	82	N/A	55.8	60.7	47.8	60.5	N/A	59.1	85.9	N/A	66.7	88	N/A	64.6	60.4	N/A	73.8	69.6
Fraction < 125 µm	%	N/A	55.6	56.9	N/A	65.8	81.9	N/A	55.4	59.4	46.7	60.2	N/A	59	85.6	N/A	65.4	87.3	N/A	62.8	60.4	N/A	73.6	68.8
Fraction < 63 µm	%	N/A	55.3	57	N/A	63.4	81.8	N/A	55	58.9	46	60.1	N/A	58.9	85.6	N/A	64.4	86.9	N/A	61.8	60.4	N/A	73.5	68.3
Fraction < 45 µm	%	N/A	55.3	56.9	N/A	62.7	81.8	N/A	54.8	58.7	45.5	59.9	N/A	58.9	85.6	N/A	63.9	86.4	N/A	61.4	60.4	N/A	73.4	67.7
Fraction < 16 µm	%	N/A	53.6	53.8	N/A	59.7	80.8	N/A	52.7	58.5	43.1	59.1	N/A	54.6	83.3	N/A	57.8	83.4	N/A	60.9	59.6	N/A	66.8	63
Fraction < 2 µm	%	N/A	49	51.6	N/A	51.7	68.3	N/A	50.6	50.7	39.9	51.9	N/A	50.8	59.1	N/A	43.3	55.1	N/A	52.5	53.6	N/A	63.7	58.2

Loss on ignition	%	16.4	10.1	6.6	15	6.2	4.6	13.8	8.1	6.5	2.8	3.2	15.8	10.4	6.6	17.7	12.1	6.8	13.1	6.3	4.8	13.1	4.6	4.5
Dry matter (1)	%	8.23	25	32.5	8.07	29.6	44.4	11.6	26.7	35	44.3	56.2	7.04	17.9	33.4	6.69	15.6	33	10.1	31.5	39.8	11.8	48.4	51.4
Dry matter (2)	%	7.3	19.8	33.5	9.1	29.5	43.8	13.5	26.2	34	46.5	56.7	10.1	18.7	32.7	7.2	15.2	32.1	11.3	26.9	39.1	12.1	47.4	51.1
Dry matter (3)	%	N/A	19.1	34	N/A	29.4	43.8	N/A	25.4	33.5	45.6	57	N/A	18	33.1	N/A	15.3	39.4	N/A	28.1	39.1	N/A	47.6	50.8

N/A = Not Analysed; N/D = Not detected; With the sample number also information is given of the sample depth (cm below the sediment surface).

6. Attachment 2. Monitoring of Benthic Infauna in the Gulf of Finland, 2015 and 2016 - Environmental Baseline Survey in the Finnish EEZ

NORD STREAM 2 -PROJECT

	Document Title **Monitoring of Benthic Infauna in the Gulf of Finland, 2015 and 2016 - Environmental Baseline Survey in the Finnish EEZ**
Company: Fish and Water Research Ltd Company representative: Ari Haikonen	Document-No. FIN_EBS_LUO_BEN_Analysis_v03_20160912

Revision	Date	Description	Made by	Checked by
01	20.7.2016	Version for comments	Ari Haikonen and Saara Olsen	Sauli Vatanen
02	26.7.2016	Amended version	Ari Haikonen and Saara Olsen	Antti Lindfors
03	12.9.2016	Amended version	Ari Haikonen and Saara Olsen	Antti Lindfors
04	21.10.2016	Amended version	Ari Haikonen and Saara Olsen	Antti Lindfors

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Appendix 1: Coordinates of the sampling locations, sample depth, water and sediment quality.

Appendix 2: Combined results of the Nord Stream 2 benthos monitoring.

Appendix 3: Detailed results of benthic infauna.

Appendices 4–7: CTD profiles at stations FIN_EBS_ LUO_1– FIN_EBS_ LUO_4

Appendices 8–11: Detailed maps of sampling locations 1–8 for each station.

1 Summary

Benthic infauna samples were collected and analysed in order to provide reference data for environmental baseline studies for the Nord Stream 2 project.

Monitoring was performed during two seasons; in winter from 16.12 to 18.12.2015 and in summer from 1.6 to 2.6.2016 in cooperation with Luode Consulting Oy. Van Veen grab samples were taken at four areal stations and each station had eight sampling locations.

Oxygen conditions were good, between 9–11 mg/l, in every areal station during winter 2015, compared to summer 2016, when oxygen levels were between 0.2–11 mg/l. During both sampling times a total of seven taxa were found and the number of taxa as well as the state of benthic invertebrate communities were strongly depth-dependent. The results show that at depths of 60–75 meters the benthic communities are scarce or absent at sampling locations. This may result from deep offshore waters suffering more or less permanent oxygen deficiency near the seabed.

In general, there was little or no differences in benthic infauna biomass or taxa between seasons. The sampling locations have good or moderate seabed conditions for benthic infauna at depths less than 60 meters. In deeper waters periodic extinction of the benthic fauna occurs, which indicates occasional poor oxygen conditions.

2 Introduction

This document provides the results of the monitoring of benthic infauna communities at selected sampling locations related to the environmental impact assessment process of the Nord Stream 2 project.

The deep-sea benthic communities are usually dominated by only a few species (Andersin et al. 1978). In addition, benthic biomass generally decreases from the North Sea to the Bothnian Bay (Furman et. al. 2014). The deep-sea benthic communities are mainly structured by salinity, oxygen concentration, sediment quality and depth, showing particularly strong responses to bottom oxygen deficiency. During autumn and winter the water column temperature becomes more uniform due to increased wind mixing and convections, thus improving also bottom oxygen conditions (Møller & Hansen 1994). During stratification, the oxygen content corresponds to near equilibrium with the atmosphere between the surface and thermocline, but decreases rapidly in the layer below thermocline.

The benthic infauna represents well community responses to environmental disturbances (Perus et al. 2007). The benthic community of the Baltic Sea consists of both limnic and marine species. Consequently, they are living close to their physiological limits in the brackish water and response to even small changes in their environment.

Sampling was performed during two seasons: in winter 2015 and summer 2016. Samples of benthic fauna were collected and analysed in order to provide reference data for environmental baseline studies. The monitoring is based on the document Environmental Baseline Surveys in the Finnish Exclusive Economic Zone, W-PE-EIA-PFI-SOW-800-151115EN-01.

3 Material and methods

3.1 Collecting the data

Winter monitoring was performed from 16.12 to 18.12.2015 in cooperation with Luode Consulting Oy, using research vessel Aranda and summer monitoring from 1.6 to 2.6.2016 using research vessel Monitor. During each sampling, the vessel was kept stationary by engine. Benthic invertebrate sampling was performed at four areal stations and each station has eight sampling locations (Fig. 1 and Table 1).

Sampling was carried out with a van Veen grab sampler (0.1 m^2). The grab was lowered and lifted up with a winch. One van Veen grab sample per each randomly selected point was taken from each sampling location (4 x 8). Additionally, three replicate van Veen grab samples were taken at one intensive site per areal station (LUO1_1, LUO2_1, LUO3_1 and LUO4_1, 4 x 3 replicates) for further analysis to calculate variation within a sample. Sub-samples were kept separately through the whole process.

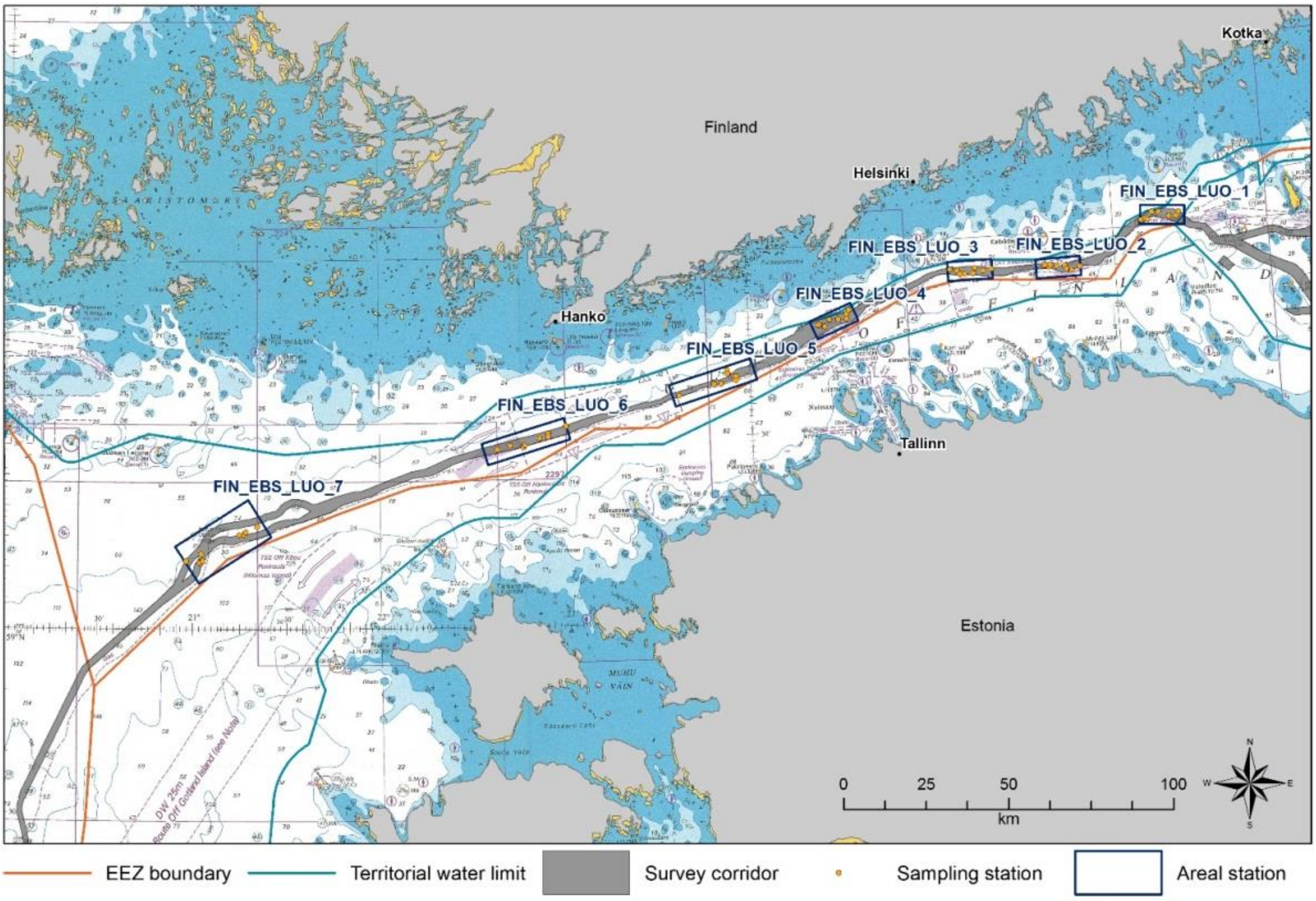


Figure 1. Locations of the benthos monitoring areal stations FIN_EBS_LUO1–4 in the Nord Stream 2 benthic invertebrate monitoring in 2016. Map Ramboll Finland Oy.

Table 1. Project summary including sampling locations, date, parameters taken, units and methods.

Project activity	Station/Location	Sampling dates	Parameter	Unit	Method
Monitoring of Benthic Infauna in Finnish waters	FIN_EBS_LUO_1_1	16.12.–18.12.2015 and 1.6.– 2.6.2016	Abundance and biomass of species and individuals	ind./m^2, g/m^2	van Veen grab
	FIN_EBS_LUO_1_2				
	FIN_EBS_LUO_1_3				
	FIN_EBS_LUO_1_4				
	FIN_EBS_LUO_1_5				
	FIN_EBS_LUO_1_6				
	FIN_EBS_LUO_1_7				
	FIN_EBS_LUO_1_8				
	FIN_EBS_LUO_2_1				
	FIN_EBS_LUO_2_2		Oxygen concentration and CTD-profile	mg/l (oxygen), psu (salinity), ºC (temperature) and m (depth)	Water sampler and CTD-profile
	FIN_EBS_LUO_2_3				
	FIN_EBS_LUO_2_4				
	FIN_EBS_LUO_2_5				
	FIN_EBS_LUO_2_6				
	FIN_EBS_LUO_2_7				
	FIN_EBS_LUO_2_8				
	FIN_EBS_LUO_3_1				
	FIN_EBS_LUO_3_2				
	FIN_EBS_LUO_3_3				
	FIN_EBS_LUO_3_4				
	FIN_EBS_LUO_3_5				
	FIN_EBS_LUO_3_6				
	FIN_EBS_LUO_3_7				
	FIN_EBS_LUO_3_8				
	FIN_EBS_LUO_4_1				
	FIN_EBS_LUO_4_2				
	FIN_EBS_LUO_4_3				
	FIN_EBS_LUO_4_4				
	FIN_EBS_LUO_4_5				
	FIN_EBS_LUO_4_6				
	FIN_EBS_LUO_4_7				
	FIN_EBS_LUO_4_8				

Samples were sieved onboard through 1.0 and 0.5 mm metal gauze sieves. Visible animals were hand-picked during the sieving. Each sample was stored and documented separately. The 0.5 and 1.0 mm sieve fractions were kept separate throughout the process. Sieved samples were preserved in 70% -ethanol and stored in plastic containers for further analysis.

At each sampling location salinity, temperature and depth (CTD) profiles from surface to near-seabed were measured with a JFE Advantech Rinko datalogger with a fast response optical dissolved oxygen (DO) sensor. The benthic species were identified in the laboratory. The number of individuals and biomass were calculated per square meter. The total biomass of each species in each sample was determined as wet weight (ww g), dry weight (dw g) and ash free dry weight (aw g) with 0.1 mg accuracy. The lengths of the bivalve *Macoma baltica* shells were measured and divided into groups of > 4 mm, 4–10 mm, 11–15 mm and 16–20 mm according to length. The dry and ash dry weighting was carried out according to HELCOM's COMBINE guidelines (HELCOM 2007).

BBI index (multimetric brackish water benthic index) (Perus et al. 2007) was calculated for classification of the benthic invertebrate assemblages at each sampling locations. The BBI value was calculated using ecologically relevant parameters (species richness, abundance, biodiversity, and proportion of sensitive and tolerant species) for determination of the ecological status of the seabed at the sampling locations. BBI takes into consideration the naturally low diversity in the Baltic Sea (Perus et. al. 2007).

4 Macrozoobenthic results in 2015 and 2016

More detailed information of sampling locations, conditions and results is presented in the appendices 1–7. Results of benthic community shown in sections 4.3–4.6 are based on 3 replicates at sampling location 1 in each areal station and in other sampling locations (2–8) the results are based on an individual sample.

4.1 Environmental conditions

Oxygen conditions did not vary between areal stations during winter (sampling period 16.12.–18.12.2015) or summer (sampling period 1.6.–2.6.2016) (Fig. 2), except for station FIN_EBS_LUO_2, where the lowest oxygen levels and highest salinity levels were observed at sampling locations 2 and 8 (Figs. 2 and 3). The CTD curves showed no clear vertical temperature nor salinity stratification at any of the sampling locations in winter, whereas in summer a clear formation of both was observed in all sampling locations 2016 (Appendices 4–7).

In winter the oxygen concentrations decreased with increasing depth (Linear regression: $F_{1,30} = 16.69$, $p < 0.001$) but not significantly with salinity ($F_{1,30} = 3.299$, $p = 0.08$), which is due to autumnal circulation. In summer 2016 the oxygen concentrations decreased significantly with increasing depth (Linear regression: $F_{1,30} = 249.5$, $p < 0.001$) and also salinity (Linear regression: $F_{1,30} = 206.2$, $p < 0.001$) (Fig. 4 and 5). Clear correlation between oxygen concentration and depth and salinity was observed during summer due to developed thermal stratification.

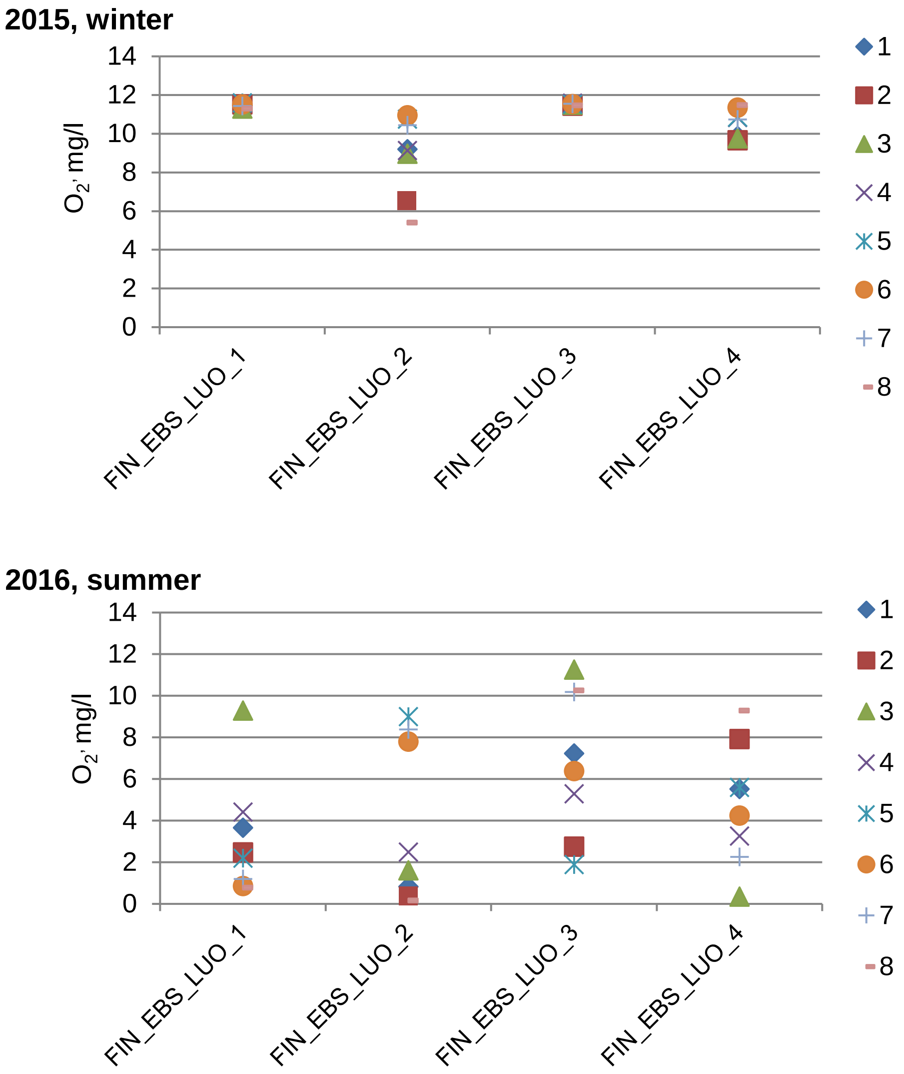


Figure 2. Near-bottom oxygen concentrations (mg/l) at the areal stations in 2015 (above) and 2016 (below). Numbers 1–8 refers to sampling locations within the areal stations.

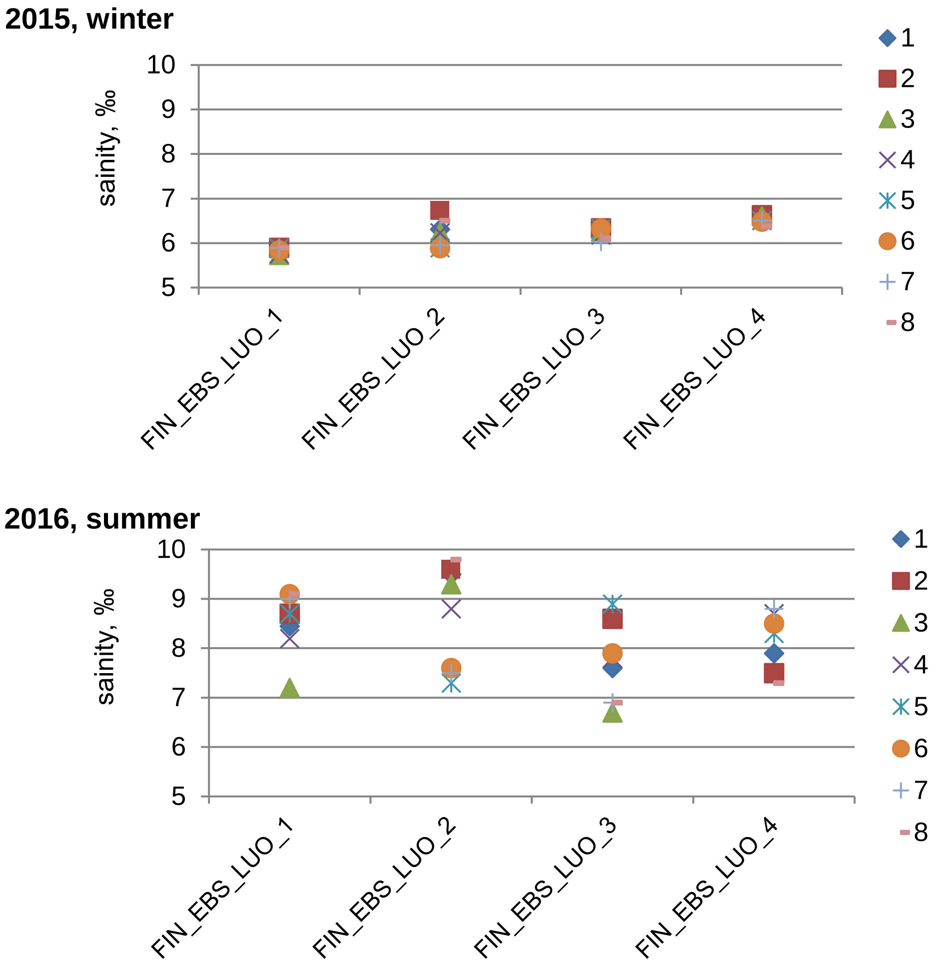
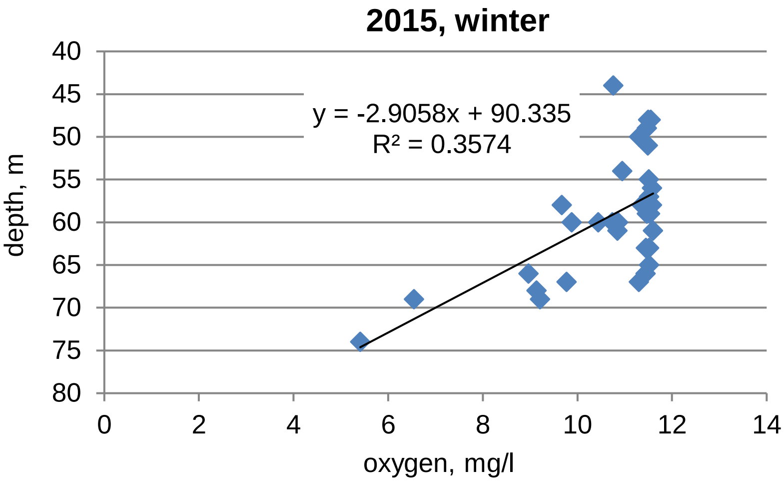


Figure 3. Near-bottom salinity (‰) at the areal stations in 2015 (above) and 2016 (below). Numbers 1–8 refers to sampling locations within the areal stations.



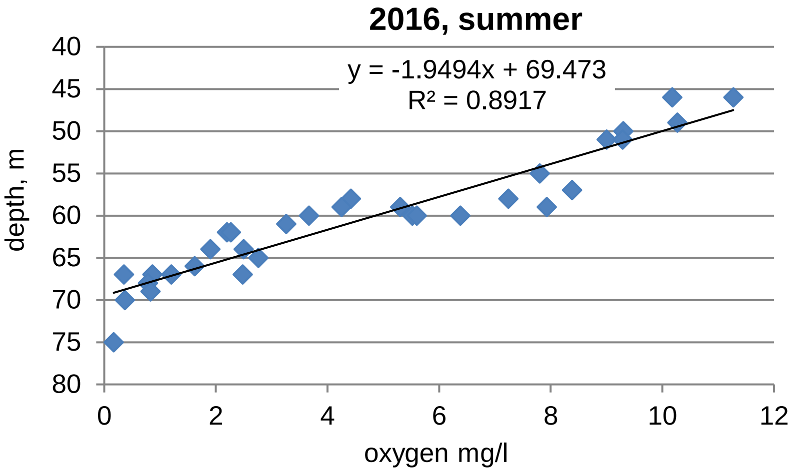


Figure 4. Correlation between depth and oxygen content in eight sampling locations within four areal stations in 2015 and 2016.

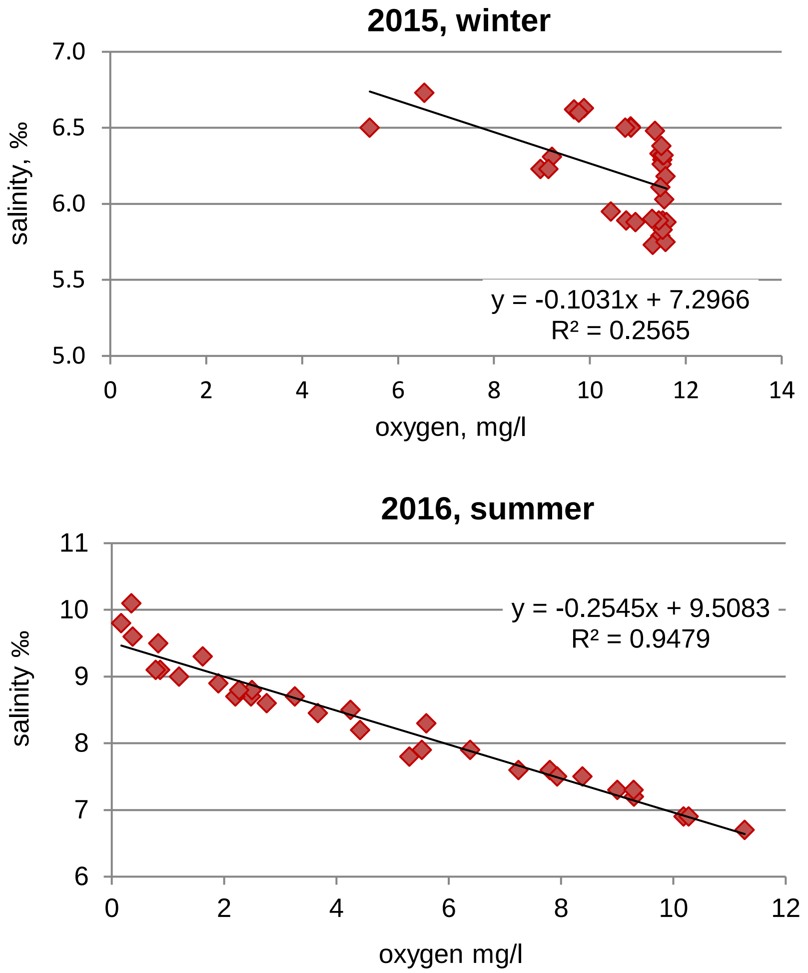


Figure 5. Correlation between salinity and oxygen content in eight sampling locations within four areal stations in 2015 and 2016.

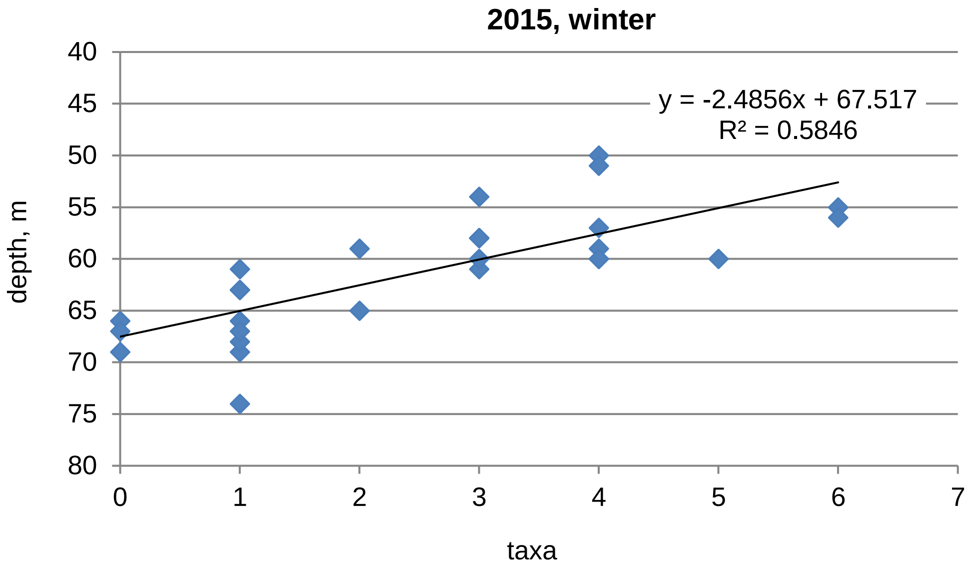
4.2 General description of taxa, spatial distribution and BBI index

Total of seven taxa were found during both winter and summer sampling (Table 2). The number of taxa increased with decreasing sampling depth (Fig. 6) and the diversity of species was highest at areal station LUO_3, although the total abundance was lower compared to other sampled areas (Fig. 7). Highest densities in winter were at areal station FIN_EBS_LUO_1 where *Marenzelleria* was the most abundant species. Highest densities in summer were at FIN_EBS_LUO_4. Sample variation among the three replicates was high in areal station FIN_EBS_LUO_1, compared to the other three areal stations. In areal stations FIN_EBS_LUO_3 and 4 the dominant taxa was *M. baltica*, and majority of the individuals were between size classes 4–16 mm (Appendix 3). Benthic species show great variation in sensitivity to seabed oxygen conditions. For example *Marenzelleria* can tolerate more variation in bottom oxygen concentrations than species like *Macoma baltica* or *Halicryptus spinulosus*.

Table 2. Benthic infauna taxa found (x) at the areal stations in winter 2015 (above) and summer 2016 (below).

Taxa 2015	**FIN_EBS_LUO_1**	**FIN_EBS_LUO_2**	**FIN_EBS_LUO_3**	**FIN_EBS_LUO_4**
Halicryptus spinulosus		x	x	x
Bylgides sarsi	x	x	x	x
Marenzelleria sp.	x	x	x	x
Macoma baltica	x	x	x	x
Saduria entomon	x	x	x	
Monoporeia affinis	x	x	x	x
Gammarus salinus			x	
Total	**5**	**6**	**7**	**5**

Taxa 2016	**FIN_EBS_LUO_1**	**FIN_EBS_LUO_2**	**FIN_EBS_LUO_3**	**FIN_EBS_LUO_4**
Halicryptus spinulosus	x	x	x	x
Bylgides sarsi			x	
Marenzelleria sp.	x	x	x	x
Macoma baltica	x	x	x	x
Saduria entomon	x	x	x	x
Monoporeia affinis	x	x	x	x
Gammarus salinus			x	
Total	**5**	**5**	**7**	**5**



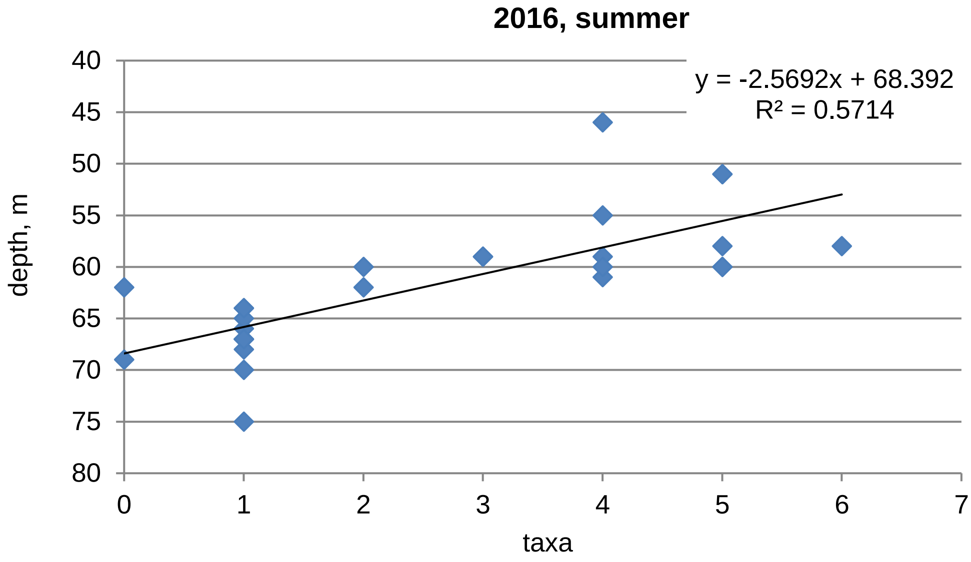


Figure 6. The sample depth and the number of taxa in winter 2015 (above) and summer 2016 (below).

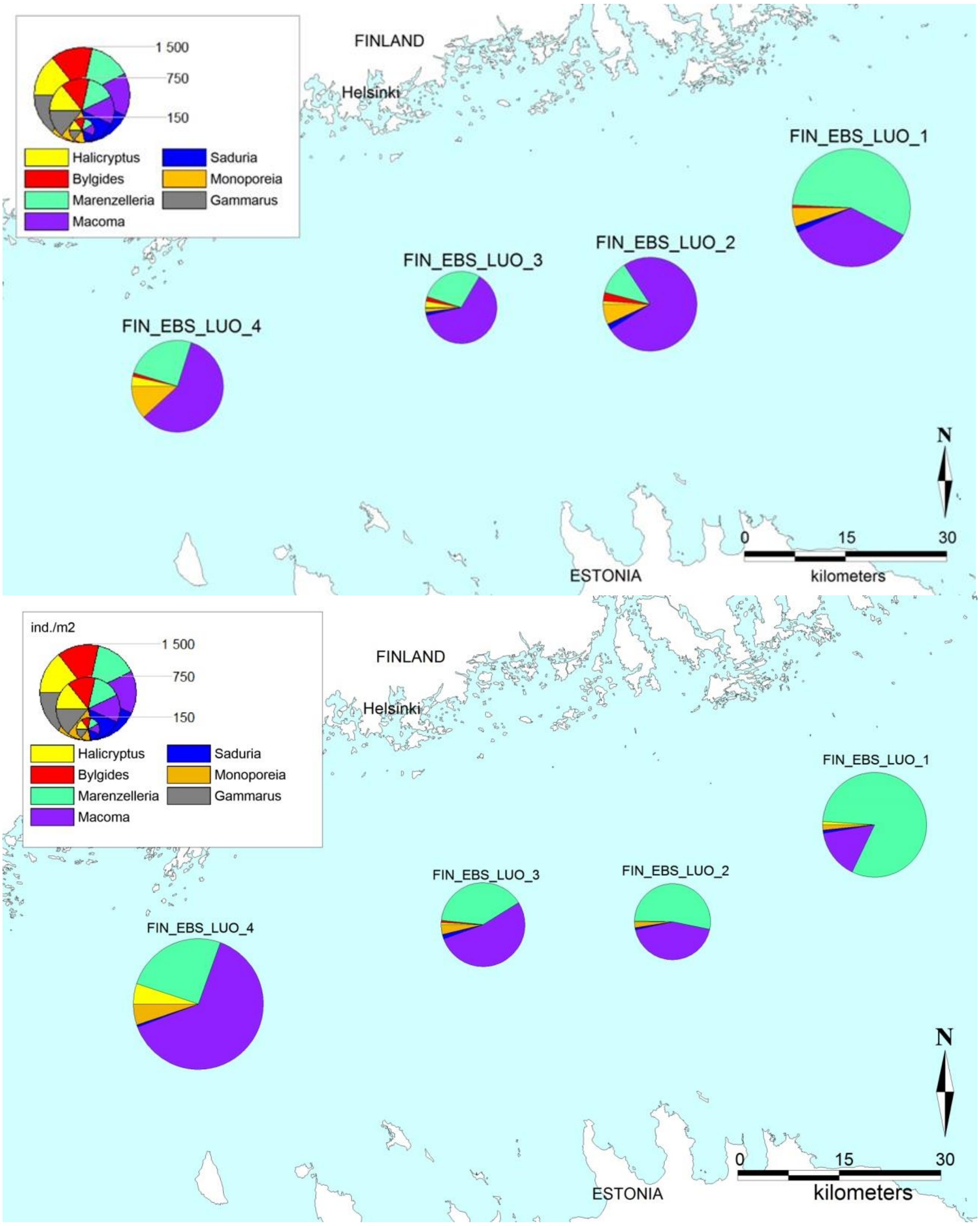
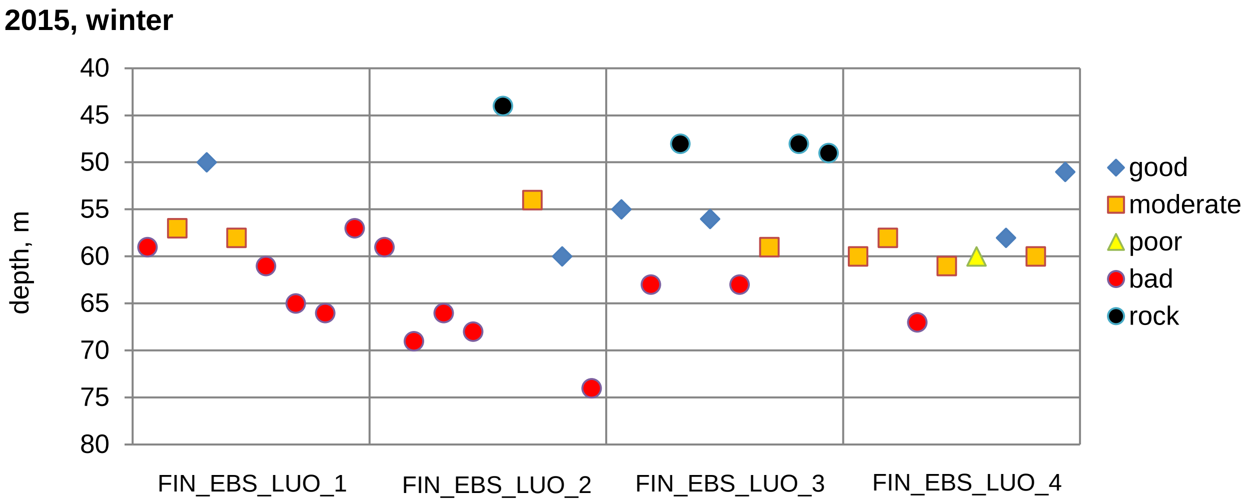


Figure 7. Species-specific abundances (ind./m^2) at the areal stations in winter 2015 (above) and summer 2016 (below).

The sampling locations generally have good or moderate seabed conditions for benthos at the depths lower than 60 meters (Fig. 8).



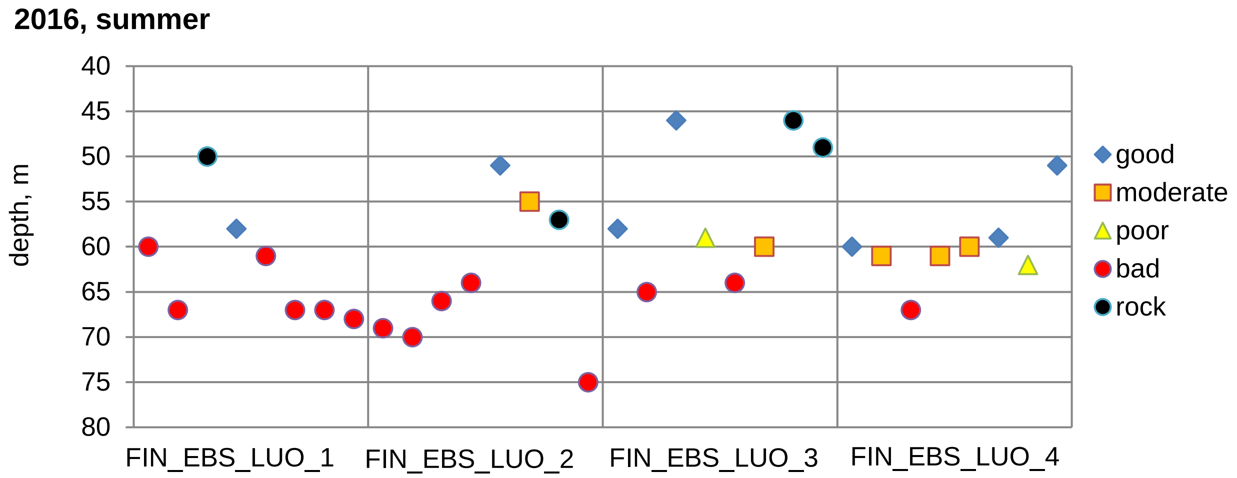


Figure 8. The environmental status based on the benthic macroinvertebrate index (BBI) at the sampling locations in winter 2015 (above) and summer 2016 (below). The seabed was lifeless at sampling locations LUO_1_5 and LUO_2_1 so BBI could not be calculated at these sampling locations.

4.3 Areal station FIN_EBS_LUO_1

The samples were collected at depths of 50–67 m. Sampling location LUO_1_2 situated in a steep slope, which is why there is a 10 meter depth difference between winter and summer samplings and thus also marked difference in observed biomass and oxygen concentrations. The seabed was lifeless at sampling location 5 during summer and at sampling locations 7 and 8 during winter. Hydrogen sulfide was present at sampling locations 5, 7 and 8 during both samplings (Table 3).The seabed showed good or moderate status at sampling locations 2, 3 and 4 in winter 2015, but in summer 2016 bad environmental status in nearly all sampling locations except for sampling location 4 which had good environmental status (Table 3).

Altogether five taxa were observed at areal station FIN_EBS_LUO_1 during both samplings. The polychaete *Marenzelleria* sp. was the dominant taxa in approximately half of the sampling locations (Fig. 9). In winter, highest biomasses were observed at sampling locations 2 and 4 and in summer at sampling location 4, where also *Macoma baltica* was present in high densities.

Table 3. Details and results of the benthos sampling at the sampling locations of the areal station FIN_EBS_LUO_1 in winter 2015 (above) and summer 2016 (below). 1-2 meter changes in sampling depth between seasons are due to fine variation in seabed topography and exact sampling location. *Sampling location LUO_1_2 has steep depth gradient.

2015								
Sample location	**FIN_EBS_LUO_1_1_BEN_1**	**FIN_EBS_LUO_1_2_BEN_1**	**FIN_EBS_LUO_1_3_BEN_1**	**FIN_EBS_LUO_1_4_BEN_1**	**FIN_EBS_LUO_1_5_BEN_1**	**FIN_EBS_LUO_1_6_BEN_1**	**FIN_EBS_LUO_1_7_BEN_1**	**FIN_EBS_LUO_1_8_BEN_1**
Water depth, m	59	57	50	58	61	65	66	67
Sample	yes	yes	yes	yes	yes	yes	yes	yes
O_2, mg/l	11.5	11.5	11.3	11.6	11.6	11.5	11.4	11.3
H_2S smell	no	no	no	no	yes	no	yes	yes
Taxa	2	4	4	3	1	2	0	0
Density, ind./m^2	1 527	1 880	1 210	2 120	20	710	0	0
Biomass, ww g/m^2	33	451	126	320	0.1	3.9	0	0
BBI	0.07	0.30	0.39	0.27	0.03	0.08		
BBI status	bad	moderate	good	moderate	bad	bad	bad	bad
2016								
Water depth, m	60	67*	50	58	62	67	67	68
Sample	yes	yes	no	yes	yes	yes	yes	yes
O_2, mg/l	3.7	2.5	9.3	4.4	2.2	0.9	1.2	0.8
H_2S smell	no	no	n/a	no	yes	no	yes	yes
Taxa	2	1	n/a	5	0	1	1	1
Density, ind./m^2	870	1 060	n/a	3 080	0	770	50	280
Biomass, ww g/m^2	22	16	n/a	595	0	12	0.35	3.86
BBI	0.08	0.03	n/a	0.37		0.03	0.03	0.03
BBI status	bad	bad	n/a	good	bad	bad	bad	bad

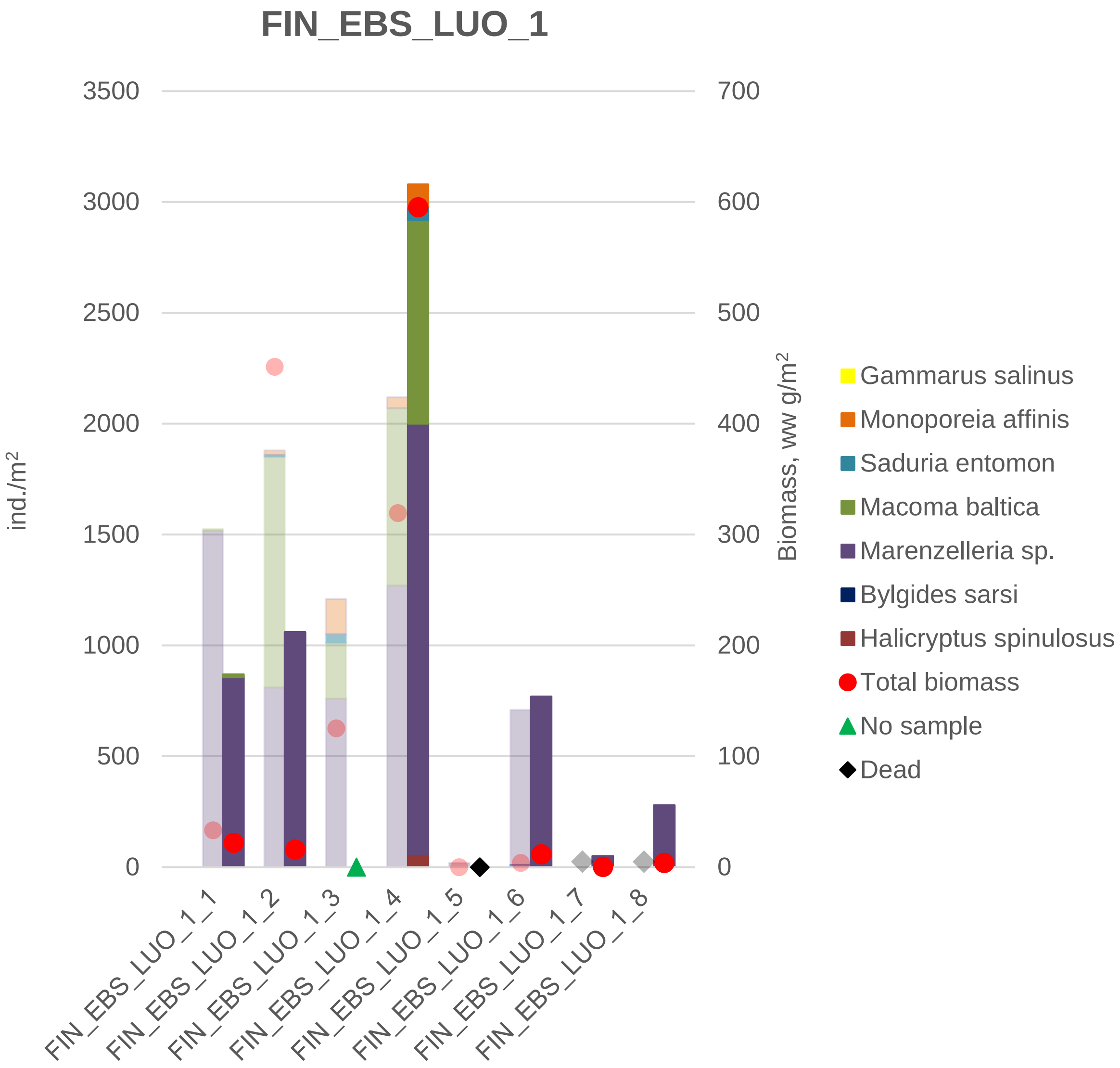


Figure 9. Species-specific abundances and total biomass at areal station FIN_EBS_LUO_1 in winter 2015 (transparent) and summer 2016 (colored).

4.4 Areal station FIN_EBS_LUO_2

The samples were collected at depths of 44–75 m. No samples were obtained from sampling location 5 in winter and from sampling location 7 in summer. The seabed was lifeless during both samplings at sampling location 1 and hydrogen sulfide smell was present at four sampling locations (winter 1, 3, 4 and 8 and summer 1, 2, 3, and 8; Table 4). During both samplings the bottom showed bad environmental status at five sampling locations (1, 2, 3, 4 and 8).

Altogether five taxa were found during winter and six taxa during summer. During both samplings, *M. baltica* was the dominant taxa at two sampling locations and *Marenzelleria* sp. at four sampling locations (Fig. 10). Most of the *Marenzelleria*s were small (0.5 mm sieve). A good environmental status indicator amphipod *Monoporeia affinis* was present in winter at one sampling location and in summer at two sampling locations. Highest biomasses were observed in sampling locations 5, 6 and 7, where *M. baltica* was also present at high densities.

Table 4. Details and results of the benthos sampling at the sampling locations of the areal station FIN_EBS_LUO_2 in winter 2015 (above) and summer 2016 (below). *Sampling location LUO_2_5 has steep depth gradient.

2015								
Sample location	**FIN_EBS_LUO_2_1_BEN_1**	**FIN_EBS_LUO_2_2_BEN_1**	**FIN_EBS_LUO_2_3_BEN_1**	**FIN_EBS_LUO_2_4_BEN_1**	**FIN_EBS_LUO_2_5_BEN_1**	**FIN_EBS_LUO_2_6_BEN_1**	**FIN_EBS_LUO_2_7_BEN_1**	**FIN_EBS_LUO_2_8_BEN_1**
Water depth, m	69	69	66	68	44	54	60	74
Sample	yes	yes	yes	yes	no	yes	yes	yes
O_2, mg/l	9.2	6.6	9.0	9.1	10.8	11.0	10.4	5.4
H_2S smell	yes	no	yes	yes	n/a	no	no	yes
Taxa	0	1	1	1	n/a	3	5	1
Density, ind./m^2	0	10	20	20	n/a	940	1 330	10
Biomass, ww g/m^2	0	0.03	0.1	0.1	n/a	203	277	0.1
BBI		0.02	0.03	0.03	n/a	0.3	0.34	0.02
BBI status	bad	bad	bad	bad	n/a	moderate	good	bad
2016								
Water depth, m	69	70	66	64	*51	55	57	75
Sample	yes	yes	yes	yes	yes	yes	no	yes
O_2, mg/l	0.8	0.4	1.6	2.5	9.0	7.8	8.4	0.2
H_2S smell	yes	yes	yes	no	no	no	n/a	yes
Taxa	0	1	1	1	5	4	n/a	1
Density, ind./m^2	0	10	140	940	1 280	1 000	n/a	50
Biomass, ww g/m^2	0	0.05	2.1	15	301	232	n/a	0.12
BBI		0.02	0.03	0.03	0.37	0.27	n/a	0.03
BBI status	bad	bad	bad	bad	good	moderate	n/a	bad

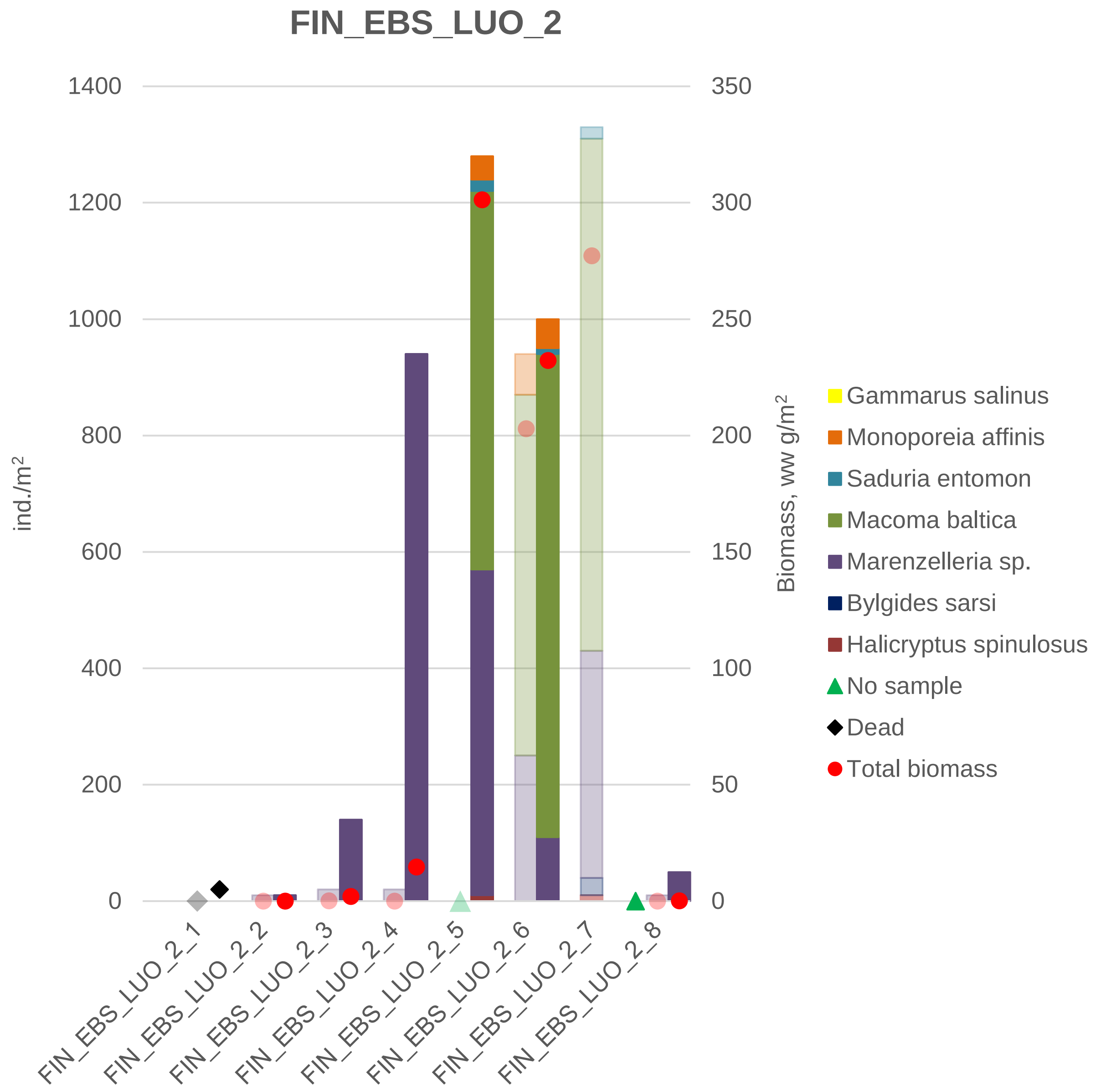


Figure 10. Species-specific abundances and total biomass at areal station FIN_EBS_LUO_2 in winter 2015 (transparent) and summer 2016 (colored).

4.5 Areal station FIN_EBS_LUO_3

Samples were collected at depths of 46–65 m (Table 5). No samples were obtained from sampling locations 3 (in winter), 7 and 8 (winter and summer). In summer hydrogen sulfide smell was present at sampling location 5. In general, the bottom showed bad or poor environmental status in half of the sampling locations and in half good or moderate status.

Altogether seven taxa were found during both samplings. *M. baltica* was the dominant taxa at two sampling locations (4 and 6) and *Marenzelleria* sp. at four sampling locations (1, 2, 3 and 5; Fig. 11). *Monoporeia affinis* was present in winter only at one sampling location and in summer at two sampling locations. Highest biomasses were observed at sampling locations 4 and 6 where high densities of *M. baltica* were present.

Table 5. Details and results of the benthos sampling at the sampling locations of the areal station FIN_EBS_LUO_3 in winter 2015 (above) and summer 2016 (below).

2015								
Sample location	**FIN_EBS_LUO_3_1_BEN_1**	**FIN_EBS_LUO_3_2_BEN_1**	**FIN_EBS_LUO_3_3_BEN_1**	**FIN_EBS_LUO_3_4_BEN_1**	**FIN_EBS_LUO_3_5_BEN_1**	**FIN_EBS_LUO_3_6_BEN_1**	**FIN_EBS_LUO_3_7_BEN_1**	**FIN_EBS_LUO_3_8_BEN_1**
Water depth, m	55	63	48	56	63	59	48	49
Sample	yes	yes	no	yes	yes	yes	no	no
O_2, mg/l	11.5	11.5	11.5	11.6	11.5	11.5	11.6	11.5
H_2S smell	no	no	n/a	no	no	no	n/a	n/a
Taxa	6	1	n/a	6	1	4	n/a	n/a
Density, ind./m^2	210	60	n/a	1 180	90	660	n/a	n/a
Biomass, ww g/m^2	27	0.3	n/a	374	0.9	292	n/a	n/a
BBI	0.45	0.03	n/a	0.38	0.03	0.28	n/a	n/a
BBI status	good	bad	n/a	good	bad	moderate	n/a	n/a
2016								
Water depth, m	58	65	46	59	64	60	46	49
Sample	yes	yes	yes	yes	yes	yes	no	no
O_2, mg/l	7.2	2.8	11.3	5.3	1.9	6.4	10.2	10.3
H_2S smell	no	no	no	no	yes	no	n/a	n/a
Taxa	6	1	4	3	1	5	n/a	n/a
Density, ind./m^2	723	80	880	1 560	250	650	n/a	n/a
Biomass, ww g/m^2	64.8	1.2	98	473	2.4	247	n/a	n/a
BBI	0.43	0.03	0.35	0.18	0.03	0.33	n/a	n/a
BBI status	good	bad	good	poor	bad	moderate	n/a	n/a

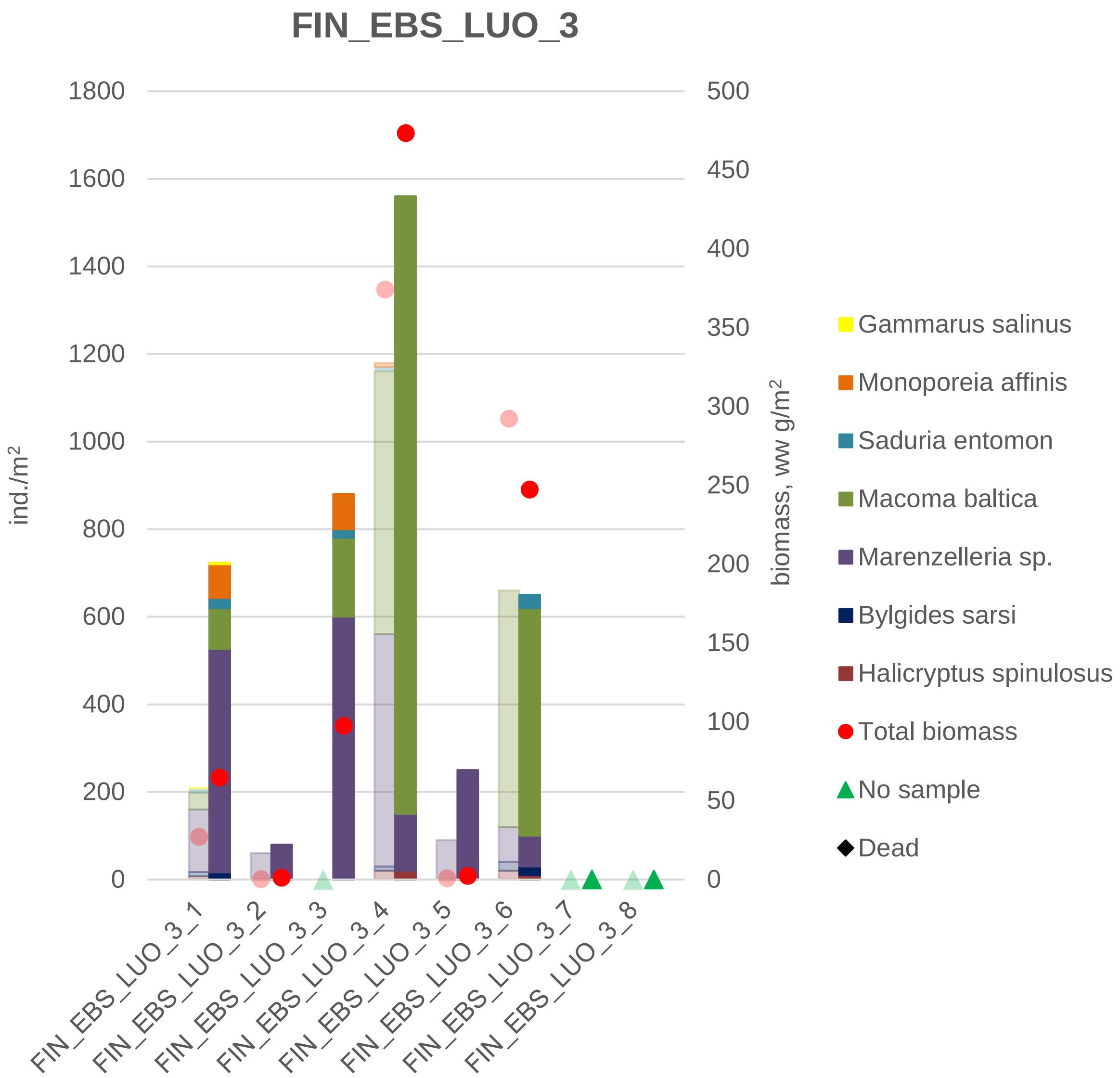


Figure 11. Species-specific abundances and total biomass at areal station FIN_EBS_LUO_3 in winter 2015 (transparent) and summer 2016 (colored).

4.6 Areal station FIN_EBS_LUO_4

Samples were collected at depths of 51–67 m (Table 6). In winter and summer sampling hydrogen sulfide smell was present at sampling location 3. The bottom showed good or moderate environmental status at six sampling locations and poor or bad environmental status only at two sampling locations.

Altogether five taxa were observed during both samplings. In winter and summer *M. baltica* was the dominant taxa at five and six sampling locations, respectively, when *Marenzelleria* sp. was dominant only in two sampling locations (Fig. 12). In addition, *Monoporeia affinis* was present at three sampling locations during winter (5, 6 and 8) and five sampling locations during summer (1, 4, 5, 6 and 8). Highest biomasses were observed at sampling locations 2, 5 and 8. All locations but LUO_4_3, where there was H2S present, total abundance increased from winter to summer.

Table 6. Details and results of the benthos sampling at the sampling locations of the areal station FIN_EBS_LUO_4 in winter 2015 (above) and summer 2016 (below).

2015								
Sample location	**FIN_EBS_LUO_4_1_BEN_1**	**FIN_EBS_LUO_4_2_BEN_1**	**FIN_EBS_LUO_4_3_BEN_1**	**FIN_EBS_LUO_4_4_BEN_1**	**FIN_EBS_LUO_4_5_BEN_1**	**FIN_EBS_LUO_4_6_BEN_1**	**FIN_EBS_LUO_4_7_BEN_1**	**FIN_EBS_LUO_4_8_BEN_1**
Water depth, m	60	58	67	61	60	58	60	51
Sample	yes	yes	yes	yes	yes	yes	yes	yes
O_2, mg/l	9.9	9.7	9.8	10.9	10.9	11.4	10.7	11.5
H_2S smell	no	no	yes	no	no	no	no	no
Taxa	4	3	1	3	4	3	3	4
Density, ind./m^2	660	1 810	20	540	890	840	240	1 350
Biomass, ww g/m^2	198	316	0.1	122	330	161	6.0	384
BBI	0.31	0.28	0.03	0.27	0.22	0.4	0.24	0.34
BBI status	moderate	moderate	bad	moderate	poor	good	moderate	good
2016								
Water depth, m	60	59	67	61	60	59	62	51
Sample	yes	yes	yes	yes	yes	yes	yes	yes
O_2, mg/l	5.5	7.9	0.4	3.3	5.6	4.3	2.3	9.3
H_2S smell	no	no	yes	no	no	no	no	no
Taxa	5	4	1	4	4	3	2	5
Density, ind./m^2	853	1 940	30	1 080	1 180	860	680	2170
Biomass, ww g/m^2	273	436	0,26	249	447	236	51	415
BBI	0.35	0.29	0.03	0.32	0.26	0.37	0.12	0.46
BBI status	good	moderate	bad	moderate	moderate	good	poor	good

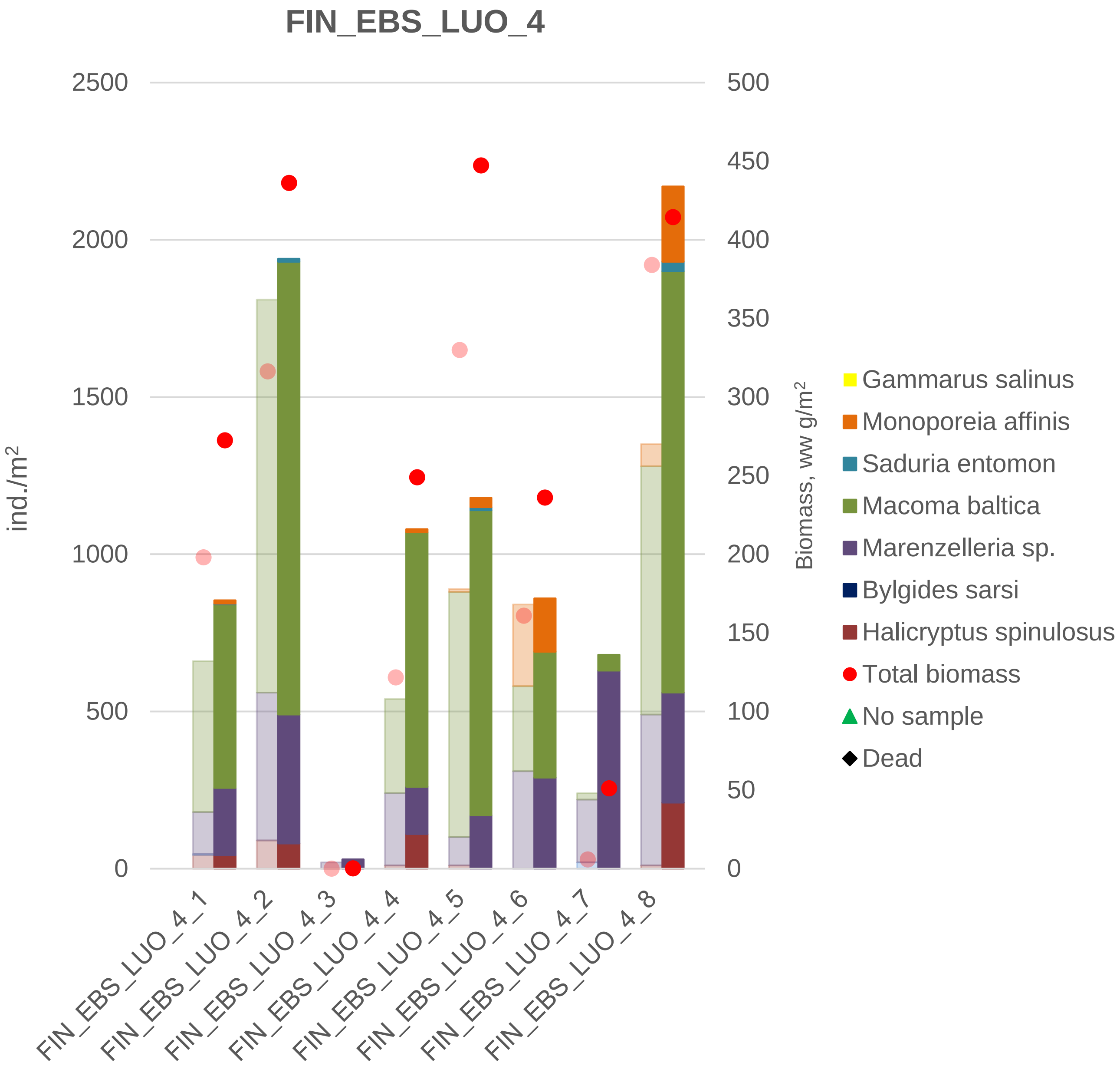


Figure 12. Species-specific abundances and total biomass at areal station FIN_EBS_LUO_4 in winter 2015 (transparent) and summer 2016 (colored).

5 Conclusions

Many physicochemical factors, such as salinity, oxygen concentration and sediment quality have a strong impact on the benthic invertebrate communities. Benthic invertebrate status in the Gulf of Finland is more or less entirely controlled by the presence or absence of hypoxia/anoxia and the oxygen conditions can vary largely within a year and between years (Conley et al. 2009; Maximov 2003).

The CTD curves showed no thermocline or halocline during winter, but during summer a clear formation of both was observed (Appendices 4–7). In 2016, two saline pulses were recorded close to the areal station FIN_EBS_LUO_2 (Lindfors et al. 2016). Anoxic bottom water from the Gotland basin flowed southwards to Gulf of Finland in the beginning of January and stayed in the area for a few weeks before disappearing. Another saline pulse arrived in March and increased the bottom salinity from ca. 7 ‰ to 11 ‰. Decreased oxygen concentrations from ca. 11 mg/l to 0 mg/l were also observed during the saline pulse. Anoxia (lack of oxygen, 0 mg/l O_2) was not observed at any of the sampling locations during in winter 2015 or anymore in summer 2016, but hypoxia (low oxygen, ca. < 2 mg/l O_2) was still observed in several sampling locations during sampling in summer 2016. Moreover, the oxygen levels decreased with increasing depth and salinity. Mean oxygen levels were lowest at the easternmost areal station FIN_EBS_LUO_1 and increased towards west, along the depth gradient of the sampling stations.

The spatial distribution of benthic invertebrates varied markedly within areal stations and it seems that there has been periodic extinction of the benthic infauna at sampling locations deeper than 60 meters, further indicating periodic hypoxia or anoxia. At these sampling locations there was also hydrogen sulfide smell in the sediment. As the seabed becomes dead, burrowing organisms no longer oxygenate the sediment, which allows sulfide to move up towards the sediment-water interface. In sampling locations where the hydrogen sulfide smell was observed *Marenzelleria* sp. was the only species present and majority of the individuals were small (0.5 mm sieve), which indicates that the colonization had just begun in the area after the improved oxygen conditions in 2015. In two sampling locations, FIN_EBS_LUO1_5 and FIN_EBS_LUO2_1, the seabed was dead and without benthic invertebrates.

During both sampling seasons, total of seven taxa were found and the number of taxa reduced with increasing depth. Moreover, the proportion of *Marenzelleria* sp. in total macrofauna increases towards east, while the proportion of *Macoma baltica* decreases. This may be due to deeper seabed profile and lower oxygen concentration towards east, as *M. balthicas* burrowing depth decreases during hypoxic conditions and makes them more vulnerable to predators, such as crustacean *Saduria entomon* (Tallqvist 2001; Long et. al. 2008). The living conditions in deep sea areas can change rapidly and only most competitive, opportunistic taxa, like *Marenzelleria*, can survive in unstable conditions, yet in low abundances (Stigzelius et al. 1997, Viitasalo 2007). The presence of other species, for instance *M. balthica,* indicates more stable conditions on the seabed. Living in a stressful environment of low salinity causes energetic constraints that result in weakened reproduction, slower growth rates, thinner and weaker shells and smaller size, which shows as smaller portion of *M. balthica* juveniles (size class < 4 mm) and large adults (> 15 mm).

As indicated previously, in the Gulf of Finland the state of the benthic communities depends largely on the depth zone in question. A classification for environmental status using benthic macroinvertebrate index (BBI), shows that at depths of 60–75 meters the benthic invertebrate communities are scarce or absent at sampling locations as deep offshore waters suffer more or less permanent oxygen deficiency near the seabed. However, sampling location FIN_EBS_LUO_2_7 situated at 60 meters depth, showed good status. At this sampling location the seabed was composed of quite rough material (silt and sand), which may indicate near-seabed currents which in turn may oxygenate the seabed. The BBI index improved east–west direction (from FIN_EBS_LUO1 to FIN_EBS_LUO4) and was predominantly good at depths above 60 meters.

There was no marked difference in benthos infauna taxa between the two sampling seasons. Mean biomass at areal stations LUO_3 and LUO_4 was slightly higher during summer 2016 than in winter 2015 and some differences were observed in the BBI index, which was possibly a result of different oxygen conditions in the bottom between winter and summer. In general the benthic infauna community seems to be more versatile, include more species that are sensitive to environmental change and have increasingly better habitat towards western parts of the Gulf of Finland.

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Appendix 1. Coordinates of the sampling locations, sample depth, water and sediment quality for the Nord Stream 2 benthos monitoring in 2015 and 2016. All samples were taken with a van Veen sampler (0,1 m^2).

2015														
Sampling location ID	**latitude (WGS84)**	**longitude (WGS84)**	**date**	**time (UTC+2)**	**nr of replicates**	**water depth, m**	**sediment type**	**sediment surface color**	**oxygenated surface layer**	**samples middle part thickness, cm**	**H_2S smell**	**O_2, mg/l**	**T, °C**	**salinity, psu**
FIN_EBS_LUO_1_1	26.15569	60.01565	2015-12-17	7:55	3	59	sulfide mud, clay	brown, grey	yes	15	no	11.5	6.5	5.8
FIN_EBS_LUO_1_2	26.18313	60.02036	2015-12-17	8:45	1	57	clay, gravel	brown, grey	yes	5	no	11.5	6.5	5.9
FIN_EBS_LUO_1_3	26.19228	60.01565	2015-12-17	9:41	1	50	silt, clay, sand	brown, grey	yes	3	no	11.3	6.4	5.7
FIN_EBS_LUO_1_4	26.21972	60.03449	2015-12-17	10:33	1	58	gravel, clay	brown, grey	yes	10	no	11.6	6.4	5.8
FIN_EBS_LUO_1_5	26.25631	60.03449	2015-12-17	10:54	1	61	sulfide mud	brown, grey	yes	15	yes	11.6	6.5	5.9
FIN_EBS_LUO_1_6	26.31119	60.02036	2015-12-17	14:57	1	65	mud, clay, concretions	brown, grey	n/a	10	no	11.5	6.5	5.8
FIN_EBS_LUO_1_7	26.34778	60.02036	2015-12-17	14:28	1	66	sulfide mud	black	no	15	yes	11.4	6.5	5.9
FIN_EBS_LUO_1_8	26.36607	60.02978	2015-12-17	14:00	1	67	sulfide mud	black	no	15	yes	11.3	6.5	5.9
FIN_EBS_LUO_2_1	25.61999	59.91189	2015-12-17	22:12	3	69	sulfide mud	black	no	15	yes	9.2	6.2	6.3
FIN_EBS_LUO_2_2	25.63787	59.90720	2015-12-17	21:33	1	69	mud, clay	brown, grey	n/a	15	no	6.6	5.6	6.7
FIN_EBS_LUO_2_3	25.64681	59.91189	2015-12-17	20:52	1	66	sulfide mud, mud, clay	brown, black	yes	15	yes	9.0	6.1	6.2
FIN_EBS_LUO_2_4	25.68257	59.90720	2015-12-17	19:57	1	68	sulfide mud, clay	brown, black	yes	15	yes	9.1	6.1	6.2
FIN_EBS_LUO_2_5	25.72728	59.90720	2015-12-17	19:22	1	44	rock	no sample	n/a	n/a	n/a	10.8	6.4	5.9
FIN_EBS_LUO_2_6	25.73622	59.89781	2015-12-17	18:44	1	54	clay, silt	brown, grey	n/a	5	no	11.0	6.4	5.9
FIN_EBS_LUO_2_7	25.76304	59.89312	2015-12-17	18:15	1	60	sand, silt, concretions	grey	n/a	5	no	10.4	6.3	6.0
FIN_EBS_LUO_2_8	25.80774	59.90251	2015-12-17	17:06	1	74	sulfide mud, clay	black	no	15	yes	5.4	5.5	6.5
FIN_EBS_LUO_3_1	25.10596	59.91595	2015-12-18	3:30	3	55	clay, concretions	grey	n/a	15	no	11.5	6.5	6.3
FIN_EBS_LUO_3_2	25.14173	59.91173	2015-12-18	2:56	1	63	clay, concretions	grey	n/a	15	no	11.5	6.5	6.3
FIN_EBS_LUO_3_3	25.15962	59.90328	2015-12-18	2:20	1	48	rock	no sample	n/a	n/a	n/a	11.5	6.5	6.3
FIN_EBS_LUO_3_4	25.18645	59.90328	2015-12-18	1:39	1	56	gravel, sand, clay	brown, grey	yes	5	no	11.6	6.4	6.2
FIN_EBS_LUO_3_5	25.23116	59.90328	2015-12-18	1:05	1	63	clay	brown, grey	yes	15	no	11.5	6.5	6.3
FIN_EBS_LUO_3_6	25.24011	59.91595	2015-12-18	0:36	1	59	clay, concretions	brown, grey	yes	15	no	11.5	6.5	6.3
FIN_EBS_LUO_3_7	25.28482	59.90750	2015-12-18	0:11	1	48	rock	no sample	n/a	n/a	n/a	11.6	6.6	6.0
FIN_EBS_LUO_3_8	25.32954	59.91173	2015-12-17	23:40	1	49	rock	no sample	n/a	n/a	n/a	11.5	6.6	6.1
FIN_EBS_LUO_4_1	24.37662	59.78539	2015-12-16	21:44	3	60	clay	brown, grey	yes	10	no	9.9	6.6	6.6
FIN_EBS_LUO_4_2	24.38572	59.79002	2015-12-16	22:46	1	58	clay, concretions	brown, grey	yes	10	no	9.7	6.5	6.6
FIN_EBS_LUO_4_3	24.41303	59.78077	2015-12-16	23:25	1	67	sulfide mud	brown	yes	15	yes	9.8	6.5	6.6
FIN_EBS_LUO_4_4	24.44033	59.79928	2015-12-17	0:04	1	61	clay	brown, grey	yes	10	no	10.9	6.8	6.5
FIN_EBS_LUO_4_5	24.48584	59.79928	2015-12-17	0:45	1	60	clay	brown, grey	yes	15	no	10.9	6.8	6.5
FIN_EBS_LUO_4_6	24.53134	59.81317	2015-12-17	1:35	1	58	clay	brown, grey	yes	15	no	11.4	6.8	6.5
FIN_EBS_LUO_4_7	24.53134	59.79928	2015-12-17	2:00	1	60	clay, concretions	brown, grey	yes	5	no	10.7	6.7	6.5
FIN_EBS_LUO_4_8	24.54550	59.82283	2015-12-17	3:10	1	51	clay, sand	brown, grey	yes	15	no	11.5	6.7	6.4

2016

Sampling location ID	latitude (WGS84)	longitude (WGS84)	date	time (UTC+2)	nr of replicates	water depth, m	sediment type	sediment surface color	oxygenated surface layer	samples middle part thickness, cm	H_2S smell	O_2, mg/l	T, °C	salinity, psu
FIN_EBS_LUO_1_1	26.15569	60.01565	2016-06-02	5:35	3	60	sulfide mud, clay, concretions	brown	yes	15	no	3.7	4.7	8.5
FIN_EBS_LUO_1_2	26.18313	60.02036	2016-06-02	5:15	1	67	clay, concretions	brown	yes	15	no	2.5	4.8	8.7
FIN_EBS_LUO_1_3	26.19228	60.01565	2016-06-02	4:50	1	50	rock, concretions	brown	yes	n/a	n/a	9.3	3.8	7.2
FIN_EBS_LUO_1_4	26.21972	60.03449	2016-06-02	4:22	1	58	clay	brown	yes	15	no	4.4	4.5	8.2
FIN_EBS_LUO_1_5	26.25631	60.03449	2016-06-02	4:10	1	62	sulfide mud	black	no	15	yes	2.2	4.9	8.7
FIN_EBS_LUO_1_6	26.31119	60.02036	2016-06-02	3:25	1	67	clay, concretions	brown	yes	15	no	0.9	5.1	9.1
FIN_EBS_LUO_1_7	26.34778	60.02036	2016-06-02	3:13	1	67	sulfide mud	brown	yes	15	yes	1.2	5.1	9.0
FIN_EBS_LUO_1_8	26.36607	60.02978	2016-06-02	2:45	1	68	sulfide mud	black	no	15	yes	0.8	5.1	9.1
FIN_EBS_LUO_2_1	25.61999	59.91189	2016-06-01	22:23	3	69	sulfide mud	black	no	15	yes	0.8	5.3	9.5
FIN_EBS_LUO_2_2	25.63787	59.90720	2016-06-01	23:05	1	70	clay, mud	dark gray	no	15	yes	0.4	5.3	9.6
FIN_EBS_LUO_2_3	25.64681	59.91189	2016-06-01	23:36	1	66	clay, mud	black	no	15	yes	1.6	5.2	9.3
FIN_EBS_LUO_2_4	25.68257	59.90720	2016-06-01	23:48	1	64	clay	brown	yes	15	no	2.5	4.9	8.8
FIN_EBS_LUO_2_5	25.72728	59.90720	2016-06-02	0:18	1	51	sand, clay	brown	yes	5	no	9.0	3.8	7.3
FIN_EBS_LUO_2_6	25.73622	59.89781	2016-06-02	0:25	1	55	sand, silt	brown	yes	5	no	7.8	4.1	7.6
FIN_EBS_LUO_2_7	25.76304	59.89312	2016-06-02	1:00	1	57	rock	n/a	n/a	n/a	n/a	8.4	4.0	7.5
FIN_EBS_LUO_2_8	25.80774	59.90251	2016-06-02	1:15	1	75	mud, clay	black	no	15	yes	0.2	5.4	9.8
FIN_EBS_LUO_3_1	25.10596	59.91595	2016-06-02	15:40	3	58	clay, concretions	brown	yes	10	no	7.2	4.0	7.6
FIN_EBS_LUO_3_2	25.14173	59.91173	2016-06-02	16:00	1	65	clay	brown	yes	10	no	2.8	4.7	8.6
FIN_EBS_LUO_3_3	25.15962	59.90328	2016-06-02	16:20	1	46	sand, rock	brown	yes	5	no	11.3	3.0	6.7
FIN_EBS_LUO_3_4	25.18645	59.90328	2016-06-02	16:35	1	59	sand	brown	yes	10	no	5.3	4.2	7.8
FIN_EBS_LUO_3_5	25.23116	59.90328	2016-06-02	16:55	1	64	mud, silt	brown	yes	15	yes	1.9	4.9	8.9
FIN_EBS_LUO_3_6	25.24011	59.91595	2016-06-02	17:05	1	60	clay, concretions	brown	yes	15	no	6.4	4.2	7.9
FIN_EBS_LUO_3_7	25.28482	59.90750	2016-06-02	17:25	1	46	rock	n/a	n/a	n/a	n/a	10.2	3.3	6.9
FIN_EBS_LUO_3_8	25.32954	59.91173	2016-06-02	17:40	1	49	rock	n/a	n/a	n/a	n/a	10.3	3.3	6.9
FIN_EBS_LUO_4_1	24.37662	59.78539	2016-06-02	12:10	3	60	clay, concretions	brown	yes	15	no	5.5	4.2	7.9
FIN_EBS_LUO_4_2	24.38572	59.79002	2016-06-02	11:50	1	59	clay, concretions	brown	yes	15	no	7.9	4.0	7.5
FIN_EBS_LUO_4_3	24.41303	59.78077	2016-06-02	12:55	1	67	sulfide mud	black	no	15	yes	0.4	5.5	10.1
FIN_EBS_LUO_4_4	24.44033	59.79928	2016-06-02	13:10	1	61	clay, concretions, rock	brown	yes	10	no	3.3	4.8	8.7
FIN_EBS_LUO_4_5	24.48584	59.79928	2016-06-02	13:35	1	60	clay	brown	yes	10	no	5.6	4.5	8.3
FIN_EBS_LUO_4_6	24.53134	59.81317	2016-06-02	14:10	1	59	clay, concretions	brown	yes	15	no	4.3	4.7	8.5
FIN_EBS_LUO_4_7	24.53134	59.79928	2016-06-02	13:50	1	62	clay	brown	yes	15	no	2.3	4.9	8.8
FIN_EBS_LUO_4_8	24.54550	59.82283	2016-06-02	14:20	1	51	clay, sand	brown	yes	5	no	9.3	3.6	7.3

Appendix 2. Combined results of the Nord Stream 2 benthos monitoring in 2015 and 2016. The benthos results are based on 3 replicates for location 1 at each areal station. Standard deviation (SD) was calculated for ind./m^2. If the target species was not present in any of the 3 grabs, SD is marked as n/a.

2015																				
	Halicryptus spinulosus					*Bylgides sarsi*					*Marenzelleria sp.*					*Macoma baltica*				
Sampling location ID	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**
FIN_EBS_LUO_1_1		n/a					n/a				1 517	±114	24.0	3.24	2.61	10	±3.3	9.4	1.6	1.32
FIN_EBS_LUO_1_2											810		10.2	0.89	0.81	1 040		440.7	19	16.4
FIN_EBS_LUO_1_3											760		2.4	0.57	0.19	250		121.5	0.82	0.44
FIN_EBS_LUO_1_4											1 270		8.6	0.99	0.85	800		310.5	13.4	10.3
FIN_EBS_LUO_1_5											20		0.1	0.02	>0.0001					
FIN_EBS_LUO_1_6						10		0.03	0.002	>0.0001	700		3.9	0.56	0.49					
FIN_EBS_LUO_1_7																				
FIN_EBS_LUO_1_8																				
FIN_EBS_LUO_2_1		n/a					n/a					n/a					n/a			
FIN_EBS_LUO_2_2											10		0.03	0.002	>0.0001					
FIN_EBS_LUO_2_3											20		0.1	0.03	0.027					
FIN_EBS_LUO_2_4											20		0.1	0.011	0.003					
FIN_EBS_LUO_2_5																				
FIN_EBS_LUO_2_6											250		0.9	0.18	0.107	620		201.8	6.57	5.3
FIN_EBS_LUO_2_7	10		0.2	0.04	0.023	30		5.6	0.66	0.6	390		1.9	0.38	0.22	880		266.8	8.44	6.73
FIN_EBS_LUO_2_8											10		0.1	0.016	0.015					
FIN_EBS_LUO_3_1	7	0	0.5	0.08	0.06	10	±3.3	0.2	0.03	0.03	143	±42	1.8	0.3	0.23	37	±16	20.0	0.87	0.61
FIN_EBS_LUO_3_2											60		0.3	0.068	0.058					
FIN_EBS_LUO_3_3																				
FIN_EBS_LUO_3_4	20		1.9	0.05	0.048	10		0.48	0.01	0.01	530		2.7	0.08	0.07	600		368.8	9.8	8.8
FIN_EBS_LUO_3_5											90		0.9	0.156	0.138					
FIN_EBS_LUO_3_6	20		3.4	0.28	0.28	20		3.2	0.4	0.36	80		1.3	0.49	0.22	540		284.5	10	8.6
FIN_EBS_LUO_3_7																				
FIN_EBS_LUO_3_8																				
FIN_EBS_LUO_4_1	43	±5.1	10.2	0.96	0.88	3.33	±1.9	0.08	0.009	0.008	133.3	±7.7	0.4	0.04	0.04	480	±32	187.5	5.54	5.64
FIN_EBS_LUO_4_2	90		16.4	1.25	1.15						470		2.7	0.51	0.3	1 250		297.2	10.8	8.2
FIN_EBS_LUO_4_3											20		0.1	0.022	0.016					
FIN_EBS_LUO_4_4	10		3.4	0.54	0.31						230		1.7	0.27	0.16	300		116.8	7.26	4.77
FIN_EBS_LUO_4_5	10		0.3	0.038	0.038						90		0.6	0.76	0.76	780		328.7	12.1	10.5
FIN_EBS_LUO_4_6											310		2.4	0.28	0.2	270		157.1	7.89	6.14
FIN_EBS_LUO_4_7						20		1.22	0.15	0.11	200		1.52	0.18	0.14	20		3.23	0.16	0.13
FIN_EBS_LUO_4_8	10		0.6	0.067	0.056						480		3.6	0.4	0.33	790		379.0	13.4	11.5

2015															
	Saduria entomon					*Monoporeia affinis*					*Gammarus salinus*				
Sampling location ID	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**
FIN_EBS_LUO_1_1		n/a					n/a					n/a			
FIN_EBS_LUO_1_2	10		0.3	0.07	0.06	20		0.1	0.02	>0.0001					
FIN_EBS_LUO_1_3	40		0.6	0.15	0.15	160		1.0	0.2	0.1					
FIN_EBS_LUO_1_4						50		0.6	0.004	>0.0001					
FIN_EBS_LUO_1_5															
FIN_EBS_LUO_1_6															
FIN_EBS_LUO_1_7															
FIN_EBS_LUO_1_8															
FIN_EBS_LUO_2_1		n/a					n/a					n/a			
FIN_EBS_LUO_2_2															
FIN_EBS_LUO_2_3															
FIN_EBS_LUO_2_4															
FIN_EBS_LUO_2_5															
FIN_EBS_LUO_2_6						70		0.2	0.048	0.027					
FIN_EBS_LUO_2_7	20		2.8	0.74	0.45										
FIN_EBS_LUO_2_8															
FIN_EBS_LUO_3_1	10	±1.9	4.7	1.16	0.68		n/a				3	±1.9	0.1	0.02	0.01
FIN_EBS_LUO_3_2															
FIN_EBS_LUO_3_3															
FIN_EBS_LUO_3_4	10		0.4	0.01	0.01	10		0.02	0.001	>0.0001					
FIN_EBS_LUO_3_5															
FIN_EBS_LUO_3_6															
FIN_EBS_LUO_3_7															
FIN_EBS_LUO_3_8															
FIN_EBS_LUO_4_1		n/a					n/a					n/a			
FIN_EBS_LUO_4_2															
FIN_EBS_LUO_4_3															
FIN_EBS_LUO_4_4															
FIN_EBS_LUO_4_5						10		0.3	0.038	0.038					
FIN_EBS_LUO_4_6						260		1.4	0.16	0.12					
FIN_EBS_LUO_4_7															
FIN_EBS_LUO_4_8						70		0.4	0.51	0.04					

	2016																			
	Halicryptus spinulosus					*Bylgides sarsi*					*Marenzelleria sp.*					*Macoma baltica*				
Sampling location ID	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**
FIN_EBS_LUO_1_1		n/a					n/a				857	±91	12.23	1.51	1.37	13	n/a	9.68	0.42	0.40
FIN_EBS_LUO_1_2											1060		16.01	2.28	2.06					
FIN_EBS_LUO_1_3																				
FIN_EBS_LUO_1_4	60		1.78	0.17	0.17						1940		13.49	1.77	1.45	920		499.33	21.06	18.22
FIN_EBS_LUO_1_5																				
FIN_EBS_LUO_1_6											770		11.80	1.78	1.49					
FIN_EBS_LUO_1_7											50		0.35	0.06	0.04					
FIN_EBS_LUO_1_8											280		3.86	0.61	0.59					
FIN_EBS_LUO_2_1		n/a					n/a					n/a					n/a			
FIN_EBS_LUO_2_2											10		0.05	0.006	0.004					
FIN_EBS_LUO_2_3											140		2.11	0.29	0.25					
FIN_EBS_LUO_2_4											940		14.68	2.13	1.98					
FIN_EBS_LUO_2_5	10		0.20	0.06	0.03						560		2.01	0.58	0.34	650		290.82	9.07	7.97
FIN_EBS_LUO_2_6											110		0.48	0.09	0.06	830		220.20	7.22	6.32
FIN_EBS_LUO_2_7																				
FIN_EBS_LUO_2_8											50		0.12	0.10	0.07					
FIN_EBS_LUO_3_1		n/a				17	n/a	0.42	0.06	0.04	510	±36	5.14	0.64	0.56	93	±15	52.70	2.24	2.04
FIN_EBS_LUO_3_2											80		1.15	0.18	0.15					
FIN_EBS_LUO_3_3											600		1.99	0.27	0.20	180		81.14	2.95	2.63
FIN_EBS_LUO_3_4	20		1.66	0.30	0.20						130		0.35	0.06	0.04	1410		471.37	16.43	14.03
FIN_EBS_LUO_3_5											250		2.35	0.33	0.28					
FIN_EBS_LUO_3_6	10		0.55	0.12	0.06	20		0.23	0.05	0.02	70		0.33	0.07	0.03	520		244.80	10.45	8.76
FIN_EBS_LUO_3_7																				
FIN_EBS_LUO_3_8																				
FIN_EBS_LUO_4_1	43	±5	4.41	0.71	0.63		n/a				213	±56	1.10	0.09	0.09	583	±14	259.03	11.28	9.65
FIN_EBS_LUO_4_2	80		7.74	1.00	0.90						410		1.95	0.24	0.19	1440		394.18	15.07	12.81
FIN_EBS_LUO_4_3											30		0.26	0.09	0.06					
FIN_EBS_LUO_4_4	110		9.25	0.67	0.61						150		0.91	0.01	0.01	810		238.78	8.81	7.50
FIN_EBS_LUO_4_5											170		1.70	0.21	0.14	970		445.10	16.78	14.87
FIN_EBS_LUO_4_6											290		0.61	0.16	0.13	400		234.12	10.65	9.49
FIN_EBS_LUO_4_7											630		7.62	0.78	0.75	50		43.58	2.71	2.43
FIN_EBS_LUO_4_8	210		14.51	1.15	1.04						350		1.17	0.21	0.17	1340		398.10	13.90	12.36

2016															
	Saduria entomon					*Monoporeia affinis*					*Gammarus salinus*				
Sampling location ID	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**	**ind/m^2**	**SD**	**ww g/m^2**	**dw g/m^2**	**adw g/m^2**
FIN_EBS_LUO_1_1		n/a					n/a					n/a			
FIN_EBS_LUO_1_2															
FIN_EBS_LUO_1_3															
FIN_EBS_LUO_1_4	60		79.33	19.18	12.55	100		1.28	0.13	0.12					
FIN_EBS_LUO_1_5															
FIN_EBS_LUO_1_6															
FIN_EBS_LUO_1_7															
FIN_EBS_LUO_1_8															
FIN_EBS_LUO_2_1		n/a					n/a					n/a			
FIN_EBS_LUO_2_2															
FIN_EBS_LUO_2_3															
FIN_EBS_LUO_2_4															
FIN_EBS_LUO_2_5	20		7.98	1.73	0.97	40		0.31	0.09	0.05					
FIN_EBS_LUO_2_6	10		11.29	2.65	1.75	50		0.30	0.06	0.04					
FIN_EBS_LUO_2_7															
FIN_EBS_LUO_2_8															
FIN_EBS_LUO_3_1	23	±2	6.19	1.53	0.95	77	±8	0.17	0.02	0.01	3	n/a	0.13	0.02	0.02
FIN_EBS_LUO_3_2															
FIN_EBS_LUO_3_3	20		14.06	2.53	1.59	80		0.36	0.05	0.04					
FIN_EBS_LUO_3_4															
FIN_EBS_LUO_3_5															
FIN_EBS_LUO_3_6	30		1.50	0.32	0.15										
FIN_EBS_LUO_3_7															
FIN_EBS_LUO_3_8															
FIN_EBS_LUO_4_1	3	n/a	7.98	1.58	0.99	10	n/a	0.01	>0.0001	>0.0001		n/a			
FIN_EBS_LUO_4_2	10		32.32	8.99	6.44										
FIN_EBS_LUO_4_3															
FIN_EBS_LUO_4_4						10		0.11	0.001	0.001					
FIN_EBS_LUO_4_5	10		0.31	0.04	0.03	30		0.28	0.03	0.02					
FIN_EBS_LUO_4_6						170		1.36	0.69	0.29					
FIN_EBS_LUO_4_7															
FIN_EBS_LUO_4_8	30		0.26	0.04	0.03	240		0.48	0.11	0.06					

Appendix 3. Detailed results of benthic infauna of the Nord Stream 2 benthos monitoring in 2015 and 2016. The units are per sample. The number of *M. baltica* is given per size class.

2015

Sampling location ID	FIN_EBS_LUO_1_1							FIN_EBS_LUO_1_2			FIN_EBS_LUO_1_3			FIN_EBS_LUO_1_4			FIN_EBS_LUO_1_5			FIN_EBS_LUO_1_6			FIN_EBS_LUO_1_7			FIN_EBS_LUO_1_8		
sub-sample	1		2		3			1						1			1			1			1			1		
sieve, mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Polychaeta																												
Bylgides sarsi																				1		0.003						
Marenzelleria sp.	103	25	145	46	108	28	7.19	42	39	1.02	32	44	0.24	31	96	0.86	1	1	0.01	14	56	0.39						
Bivalvia																												
Macoma baltica							2.81			44			12.15			31												
< 4 mm											1																	
4 - 10 mm								8			4			14														
11 - 15 mm								95			18			65														
16 - 20 mm			2		1			1			2			1														
Isopoda																												
Saduria entomon								1		0.03	4		0.06															
Amphipoda																												
Monoporeia affinis								2		0.01	16		0.10	5		0.06												

Sampling location ID	FIN_EBS_LUO_2_1							FIN_EBS_LUO_2_2			FIN_EBS_LUO_2_3			FIN_EBS_LUO_2_4			FIN_EBS_LUO_2_5			FIN_EBS_LUO_2_6			FIN_EBS_LUO_2_7			FIN_EBS_LUO_2_8		
sub-sample	1		2		3			1						1			1			1			1			1		
sieve, mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Priapulida																												
Halicryptus spinulosus																							1		0.02			
Polychaeta																												
Bylgides sarsi																							3		0.56			
Marenzelleria sp.									1	0.003	1	2	0.01		2	0.01				10	15	0.09	3	36	0.19	1		0.01
Bivalvia																												
Macoma baltica																						20			27			
< 4 mm																				6			3					
4 - 10 mm																				15			15					
11 - 15 mm																				38			70					
16 - 20 mm																				3								
Isopoda																												
Saduria entomon																							2		0.28			
Amphipoda																												
Monoporeia affinis																										6	1	0.02

Sampling location ID	**FIN_EBS_LUO_3_1**							**FIN_EBS_LUO_3_2**			**FIN_EBS_LUO_3_3**			**FIN_EBS_LUO_3_4**			**FIN_EBS_LUO_3_5**			**FIN_EBS_LUO_3_6**			**FIN_EBS_LUO_3_7**			**FIN_EBS_LUO_3_8**		
sub-sample	**1**		**2**		**3**			**1**						**1**			**1**			**1**			**1**			**1**		
sieve, mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Priapulida																												
Halicryptus spinulosus	1			1			0.05							2		0.19				2		0.34						
Polychaeta																												
Bylgides sarsi	2				1		0.05							1		0.05				2		0.32						
Marenzelleria sp.	3	3	4	4	10	19	0.53	1	5	0.03				2	51	0.27	7	2	0.094	5	3	0.13						
Bivalvia																												
Macoma baltica							5.99									37						28						
< 4 mm																												
4 - 10 mm					2									1						3								
11 - 15 mm	1				4									50						45								
16 - 20 mm	1				3									9						6								
Isopoda																												
Saduria entomon	2		1				1.42							1		0.04												
Amphipoda																												
Monoporeia affinis														1		0.002												
Gammarus salinus	1						0.02																					

Sampling location ID	**FIN_EBS_LUO_4_1**							**FIN_EBS_LUO_4_2**			**FIN_EBS_LUO_4_3**			**FIN_EBS_LUO_4_4**			**FIN_EBS_LUO_4_5**			**FIN_EBS_LUO_4_6**			**FIN_EBS_LUO_4_7**			**FIN_EBS_LUO_4_8**		
sub-sample	**1**		**2**		**3**			**1**						**1**			**1**			**1**			**1**			**1**		
sieve. mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Priapulida																												
Halicryptus spinulosus	6		3		4		3.05	9		1.64				1		0.335	1		0.03							1		0.06
Polychaeta																												
Bylgides sarsi			1				0.03																2		0.12			
Marenzelleria sp.	3	13		12	1	11	0.12	10	37	0.27	1	1	0.01	6	17	0.17	4	5	0.06	14	17	0.244	8	12	0.15	7	41	0.36
Bivalvia																												
Macoma baltica							56			30						12			33			16			0.32			38
< 4 mm	1							5												1								
4 - 10 mm	12		8		8			74						3			20			5			1			15		
11 - 15 mm	40		27		41			43						27			52			17			1			63		
16 - 20 mm	2		2		3			3									6			4						1		
Amphipoda																												
Monoporeia affinis																	1		0.03	25	1	0.14				7		0.04

2016

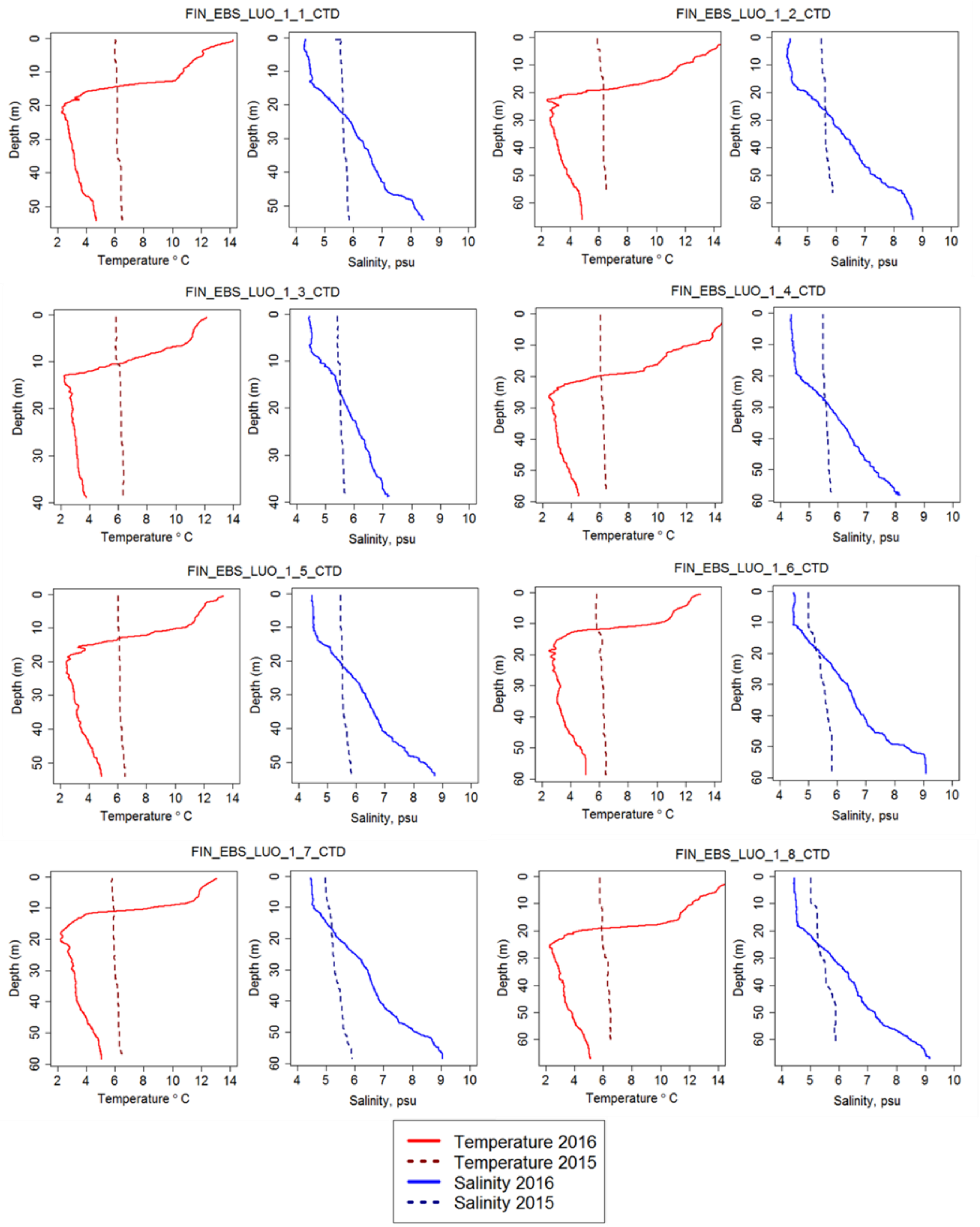
Sampling location ID	**FIN_EBS_LUO_1_1**							**FIN_EBS_LUO_1_2**			**FIN_EBS_LUO_1_3**			**FIN_EBS_LUO_1_4**			**FIN_EBS_LUO_1_5**			**FIN_EBS_LUO_1_6**			**FIN_EBS_LUO_1_7**			**FIN_EBS_LUO_1_8**		
sub-sample	**1**		**2**		**3**			**1**						**1**			**1**			**1**			**1**			**1**		
sieve, mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Priapulida																												
Halicryptus spinulosus														6		0.18												
Polychaeta																												
Bylgides sarsi																												
Marenzelleria sp.	38	57	31	24	54	53	3.67	62	44	1.60				81	113	1.35				32	45	1.18	1	4	0.04	23	5	0.39
Bivalvia																												
Macoma baltica							2.91									49.93												
< 4 mm																												
4 - 10 mm														9														
11 - 15 mm														75														
16 - 20 mm	3		1											8														
Isopoda																												
Saduria entomon														6		7.93												
Amphipoda																												
Monoporeia affinis														10		0.13												
Gammarus salinus																												

Sampling location ID	**FIN_EBS_LUO_2_1**							**FIN_EBS_LUO_2_2**			**FIN_EBS_LUO_2_3**			**FIN_EBS_LUO_2_4**			**FIN_EBS_LUO_2_5**			**FIN_EBS_LUO_2_6**			**FIN_EBS_LUO_2_7**			**FIN_EBS_LUO_2_8**		
sub-sample	**1**		**2**		**3**			**1**						**1**			**1**			**1**			**1**			**1**		
sieve, mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Priapulida																												
Halicryptus spinulosus																	1		0.02									
Polychaeta																												
Bylgides sarsi																												
Marenzelleria sp.									1	0.01	4	10	0.21	86	8	1.47		56	0.20		11	0.05					5	0.01
Bivalvia																												
Macoma baltica																			29.08			22.02						
< 4 mm																				13								
4 - 10 mm																	14			24								
11 - 15 mm																	48			43								
16 - 20 mm																	3			3								
Isopoda																												
Saduria entomon																	2		0.80	1		1.13						
Amphipoda																												
Monoporeia affinis																	4		0.03	4	1	0.03						
Gammarus salinus																												

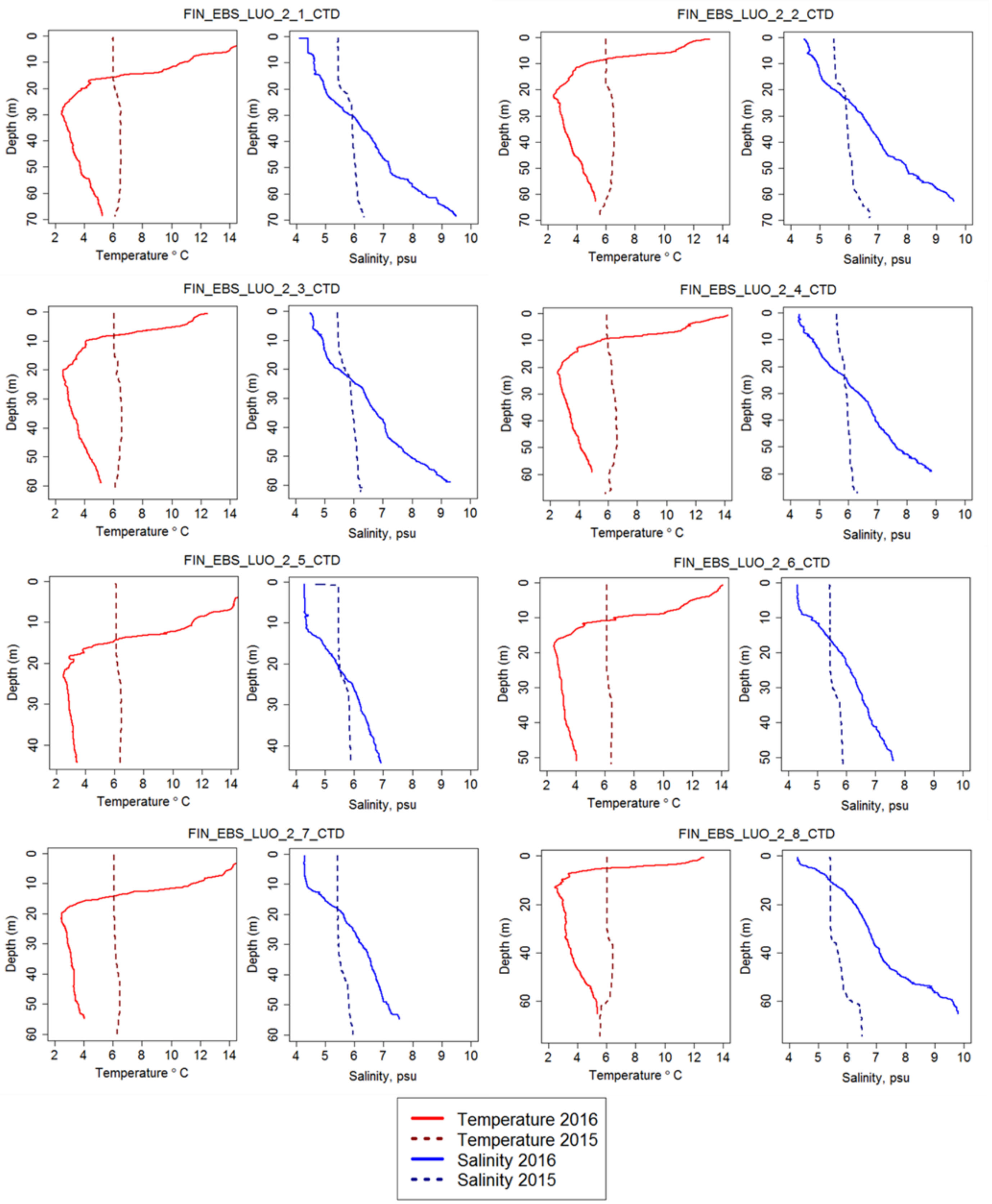
Sampling location ID	FIN_EBS_LUO_3_1							FIN_EBS_LUO_3_2			FIN_EBS_LUO_3_3			FIN_EBS_LUO_3_4			FIN_EBS_LUO_3_5			FIN_EBS_LUO_3_6			FIN_EBS_LUO_3_7			FIN_EBS_LUO_3_8		
sub-sample	**1**		**2**		**3**			**1**						**1**			**1**			**1**			**1**			**1**		
sieve, mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Priapulida																												
Halicryptus spinulosus														2		0.17				1		0.06						
Polychaeta																												
Bylgides sarsi	3		2				0.13													2		0.02						
Marenzelleria sp.	16	47	40	8	3	39	1.54	3	5	0.12	2	58	0.20		13	0.04	11	14	0.24	1	6	0.03						
Bivalvia																												
Macoma baltica							15.81						8.11			47.14						24.48						
< 4 mm																												
4 - 10 mm	3		1								2			29						2								
11 - 15 mm	10		5		5						15			110						49								
16 - 20 mm	1		3								1			2						1								
Isopoda																												
Saduria entomon	3		2		2		1.86				2		1.41							3		0.15						
Amphipoda																												
Monoporeia affinis	2	6	2	3		10	0.05				4	4	0.04															
Gammarus salinus					1		0.04																					

Sampling location ID	FIN_EBS_LUO_4_1							FIN_EBS_LUO_4_2			FIN_EBS_LUO_4_3			FIN_EBS_LUO_4_4			FIN_EBS_LUO_4_5			FIN_EBS_LUO_4_6			FIN_EBS_LUO_4_7			FIN_EBS_LUO_4_8		
sub-sample	**1**		**2**		**3**			**1**						**1**			**1**			**1**			**1**			**1**		
sieve. mm / ww g per sample	1	0.5	1	0.5	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g	1	0.5	ww g
Priapulida																												
Halicryptus spinulosus	4		2	1	6		1.32	7	1	0.77				10	1	0.93										17	4	1.45
Polychaeta																												
Bylgides sarsi																												
Marenzelleria sp.	4	12	4	4	7	33	0.33		41	0.20	3		0.026	2	13	0.09	1	16	0.17	16	13	0.06	32	31	0.76	24	11	0.12
Bivalvia																												
Macoma baltica							77.71			39.42						23.88			44.51			23.41			4.36			39.81
< 4 mm								3						1			2											
4 - 10 mm	4		5		4			55						41			14			1						54		
11 - 15 mm	53		47		47			79						36			75			30						80		
16 - 20 mm	6		5		4			7						3			6			9			5					
Isopoda																												
Saduria entomon	1						2.39	1		3.23							1		0.03							3		0.03
Amphipoda																												
Monoporeia affinis		1		2			0.002							1		0.01	3		0.03	15	2	0.14				6	18	0.05
Gammarus salinus																												

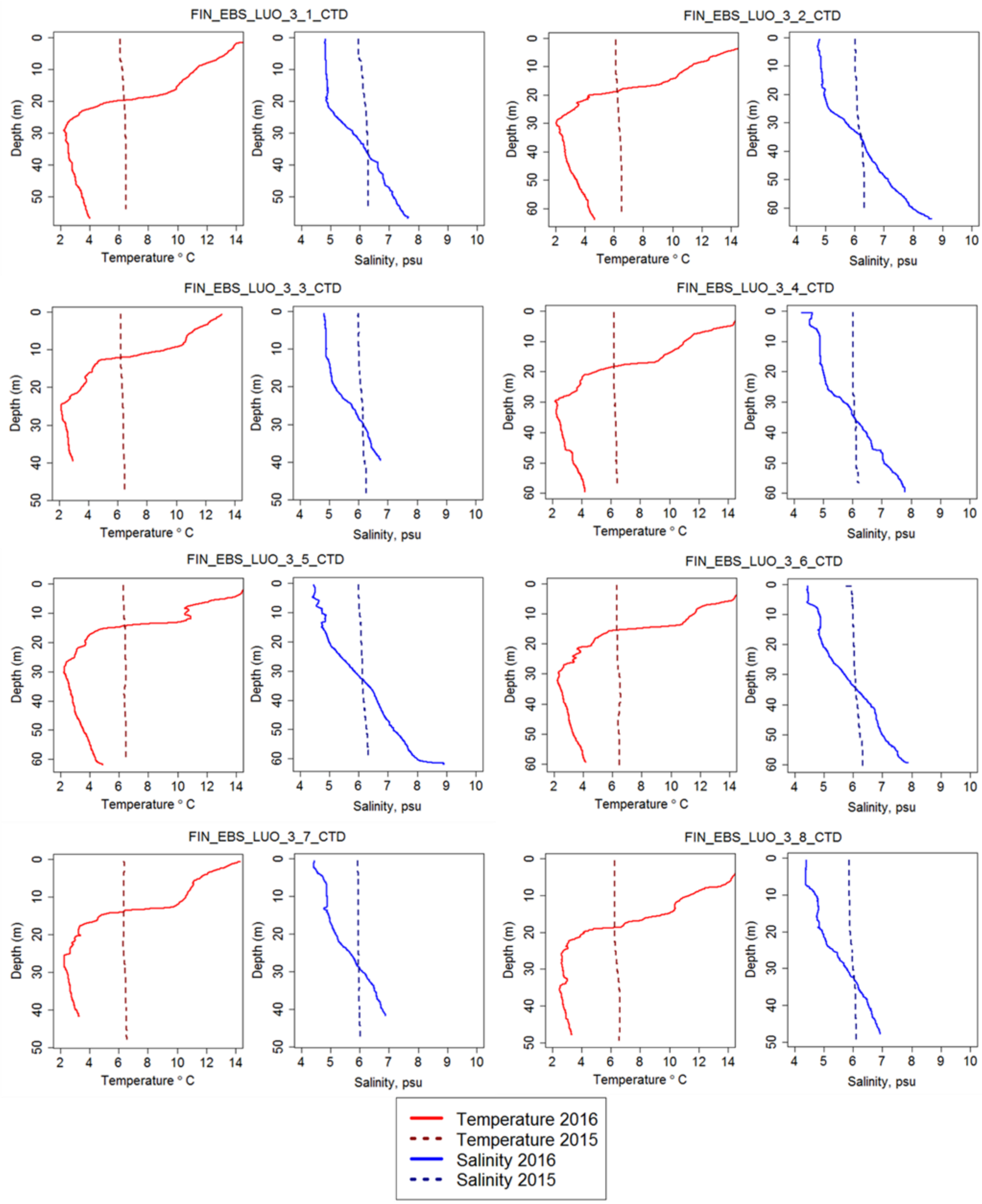
Appendix 4. CTD profiles at areal station FIN_EBS_ LUO_1 in 2015 and 2016.



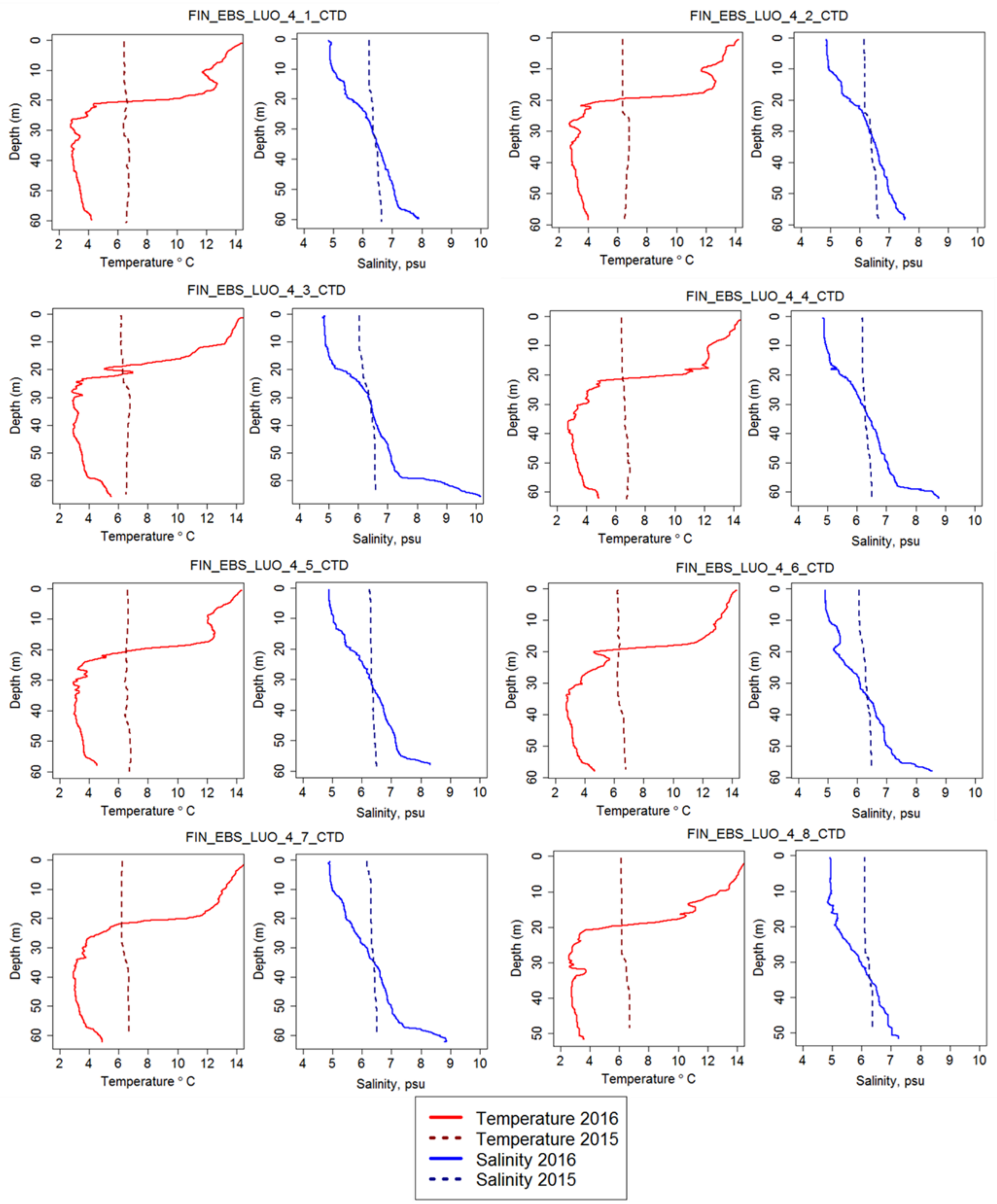
Appendix 5. CTD profiles at areal station FIN_EBS_LUO_2 in 2015 and 2016.



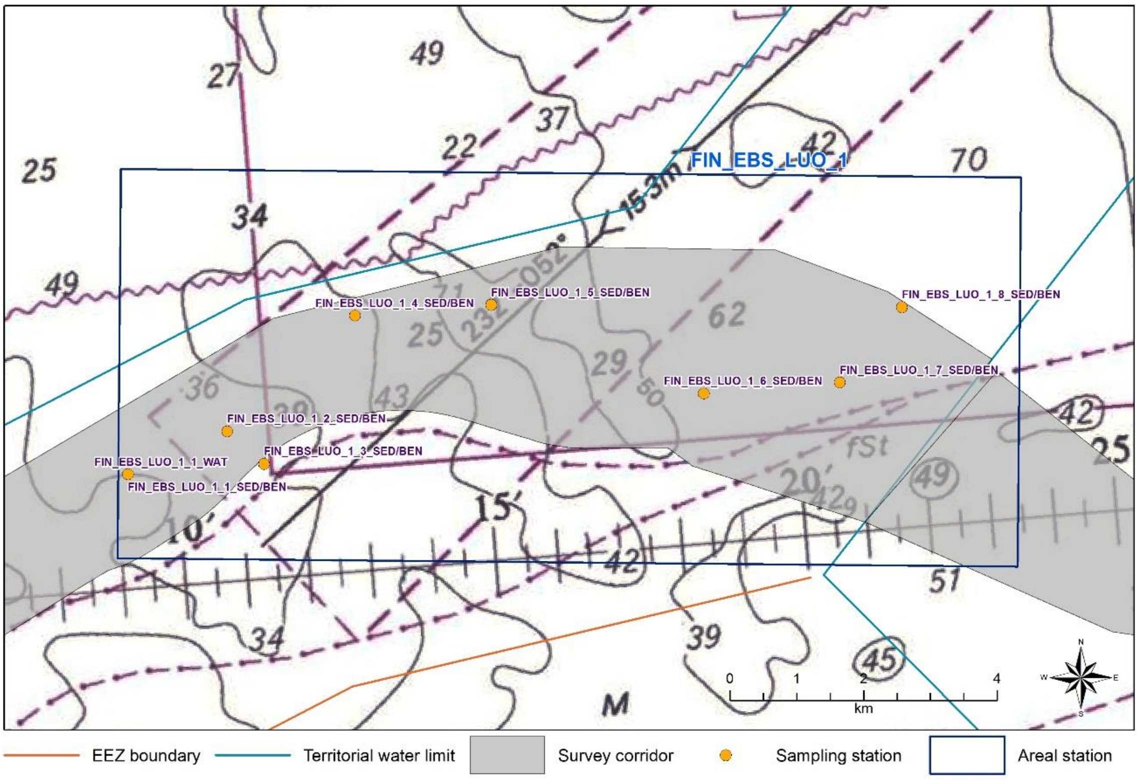
Appendix 6. CTD profiles at areal station FIN_EBS_LUO_3 in 2015 and 2016.



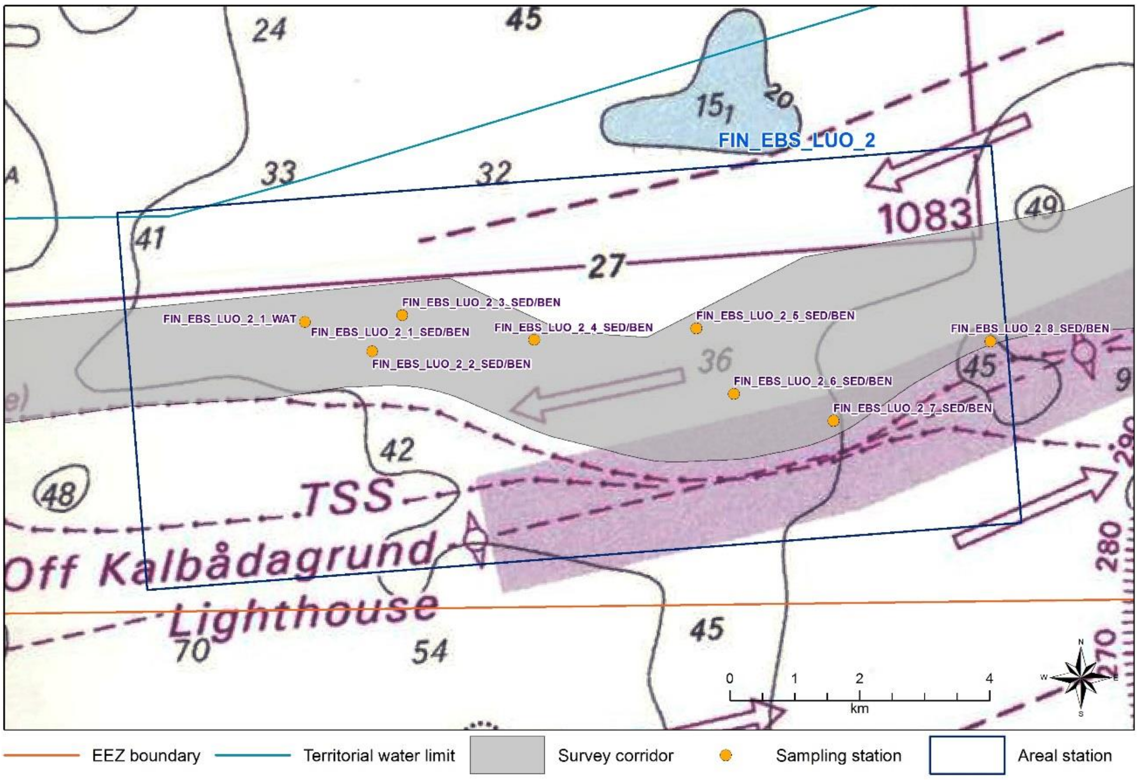
Appendix 7. CTD profiles at areal station FIN_EBS_ LUO_4 in 2015 and 2016.



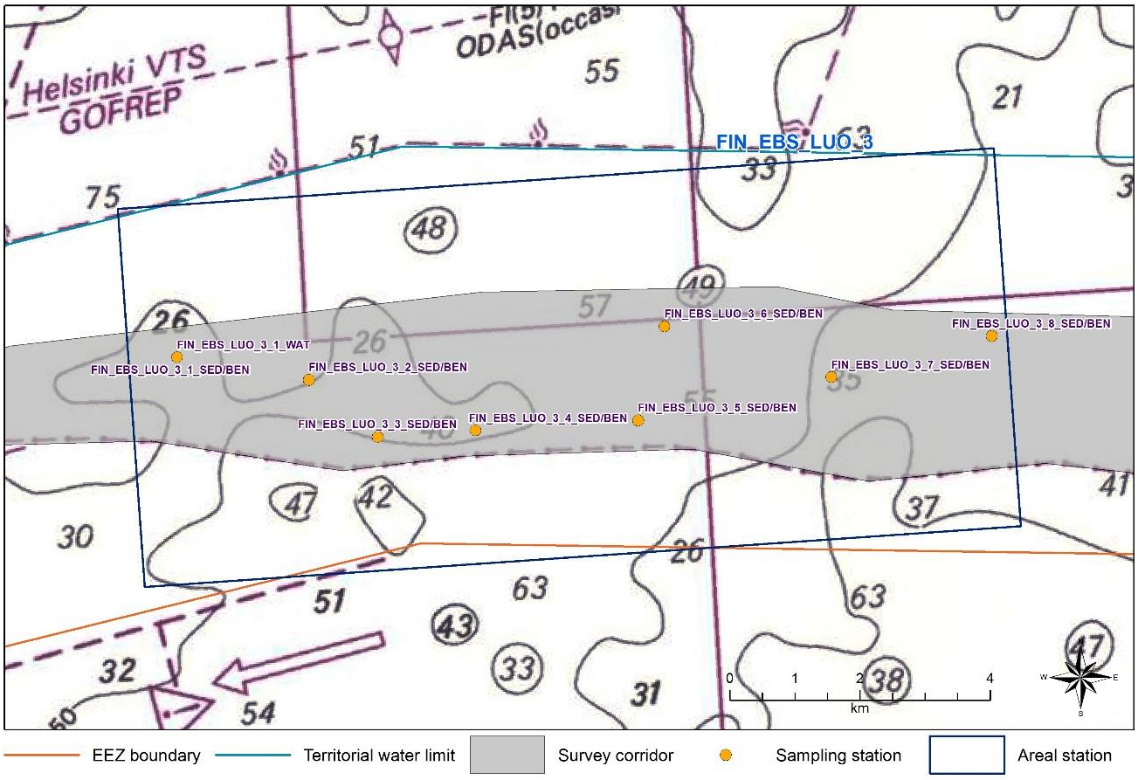
Appendix 8. Detailed map of sampling locations FIN_EBS_LUO1_1 – FIN_EBS_LUO1_8 (Map from Lindfors et al. 2016).



Appendix 9. Detailed map of sampling locations FIN_EBS_LUO2_1 – FIN_EBS_LUO2_8 (Map from Lindfors et al. 2016).



Appendix 10. Detailed map of sampling locations FIN_EBS_LUO3_1 – FIN_EBS_LUO3_8 (Map from Lindfors et al. 2016).



Appendix 11. Detailed map of sampling locations FIN_EBS_LUO4_1 – FIN_EBS_LUO4_8 (Map from Lindfors et al. 2016).