



# CRUISE REPORT



*R/V Aranda*

Combine 3, leg 1 /2018  
*11 – 14 September 2018*



Photo: Maiju Lehtiniemi

*This report is based on preliminary data and is subject to changes.*

## Monitoring cruise COMBINE 3, 11 – 14 September 2018, first leg.

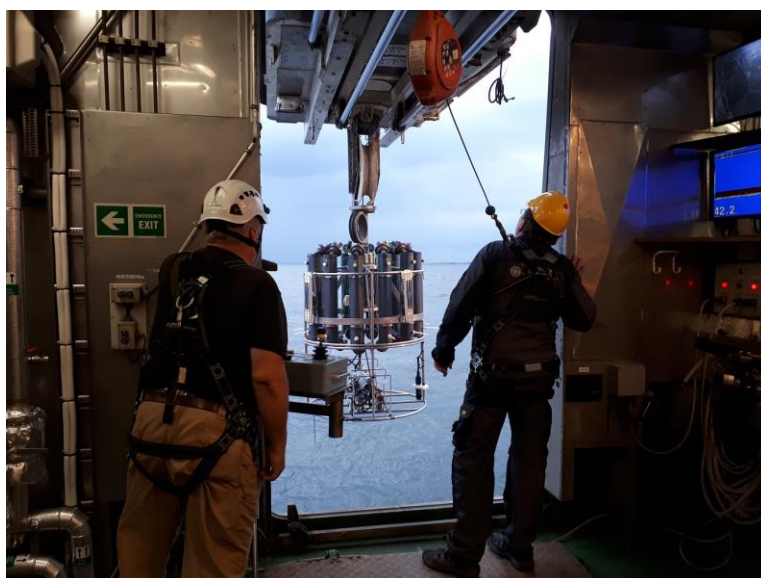
Table 1. Scientific crew on Combine 3 cruise, 1. leg.

Chief scientist:	Maiju Lehtiniemi	11.-14.9.2018	SYKE
Participants:	Janne Bruun	11.-14.9.2018	SYKE
	Pia Varmanen	11.-14.9.2018	SYKE
	Susanna Hyvärinen	11.-14.9.2018	SYKE
	Juha Flinkman	11.-14.9.2018	SYKE
	Outi Setälä	11.-14.9.2018	SYKE
	Henrik Hedberg	11.-14.9.2018	SYKE
	Panu Hänninen	11.-14.9.2018	SYKE
	Jere Riikonen	11.-14.9.2018	SYKE
	Pekka Kosloff	11.-14.9.2018	FMI
	Heini Jalli	11.-14.9.2018	FMI

SYKE MRC: Finnish Environment Institute, Marine Research Centre, FMI: Finnish Meteorological Institute

## Description of the cruise

This cruise was the first cruise after large renovation that was done on the vessel during the past year. The late timing of the cruise is also due to the renovation work, which was much delayed. Due to this the cruise was completed in a shorter time than usually and for that reason sampling stations were cut. Only the most important stations were sampled. Validation tests concerning sampling under accreditation were conducted during the cruise.



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The Combine 3 cruise is devoted to the monitoring of physical parameters (temperature, salinity, dissolved oxygen), nutrients and phyto- and zooplankton of the northern Baltic Sea according to HELCOM COMBINE program and sampling of phycotoxins. The first leg has special emphasis on the Gulf of Finland (Fig. 1). Also samples for microlitter monitoring were collected from the sediments with a Gemax twin corer by slicing the first 5 cm of the sediment surface. Microplastics will be extracted from the sediments in the laboratory and analysed.

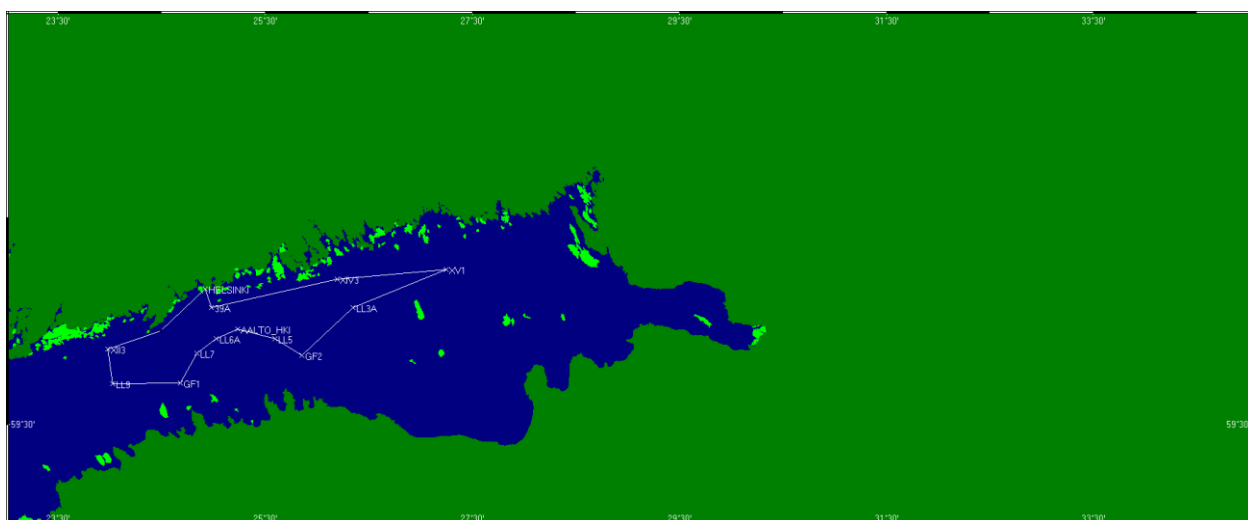


Figure 1. Route and sampling stations during COMBINE 3 leg 1 2018 cruise.

Combine 3, leg 1 sailed from Helsinki on Tuesday 11th September 2018 at 16.30. During the cruise the HELCOM Combine pelagic monitoring stations were sampled (Fig. 1, Table 2 and 3).

Table 2. Station information for the COMBINE 3, leg 1, 11-14.9.2018.

Index	Station	Lat.	Lon.	Depth	Date and time
0001	39A	N60.0401	E024.5881	42.00	20180911 1538
0002	XIV3	N60.1219	E026.1158	78.00	20180911 2312
0003	XV1	N60.1498	E027.1485	66.00	20180912 0400
0004	LL3A	N60.0401	E026.2083	70.00	20180912 1132
0005	GF2	N59.5028	E025.5147	85.00	20180912 1730
0006	LL5	N59.5498	E025.3583	71.00	20180912 2145
0007	LL6A	N59.5503	E025.0190	72.00	20180913 0125
0008	LL7	N59.5079	E024.5026	102.00	20180913 0500
0009	LL7S	N59.5101	E024.4981	78.00	20180913 0700

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0010	GF1	N59.4231 E024.4094	84.00	20180913 0940
0011	LL9	N59.4202 E024.0182	65.00	20180913 1614
0012	F62	N59.2001 E023.1581	97.00	20180913 1933
0013	LL11	N59.3501 E023.1782	67.00	20180913 2244
0014	UUS-23	N59.4680 E023.1580	55.00	20180914 0058

## Observations

The large salt water intrusions of 2014, 2015 and 2016 brought saline deep old nutrient rich waters towards the north to the entrance to the Gulf of Finland and due to the 2018 summer weather conditions saline nutrient rich waters were observed even in the eastern Gulf of Finland during the cruise (Figure 2).

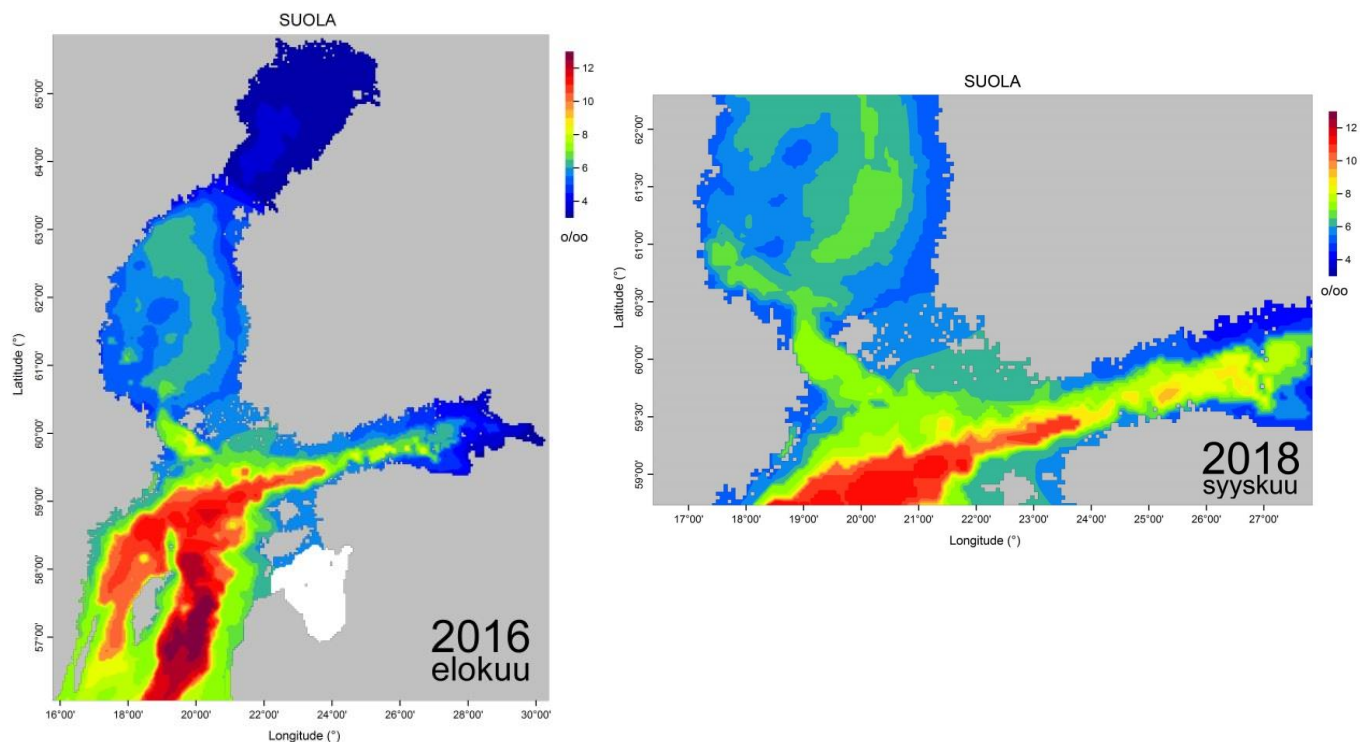


Figure 2. Salinity close to the bottom during the 2016 (left) and 2018 Gulf of Finland (right) Combine 3 cruises.

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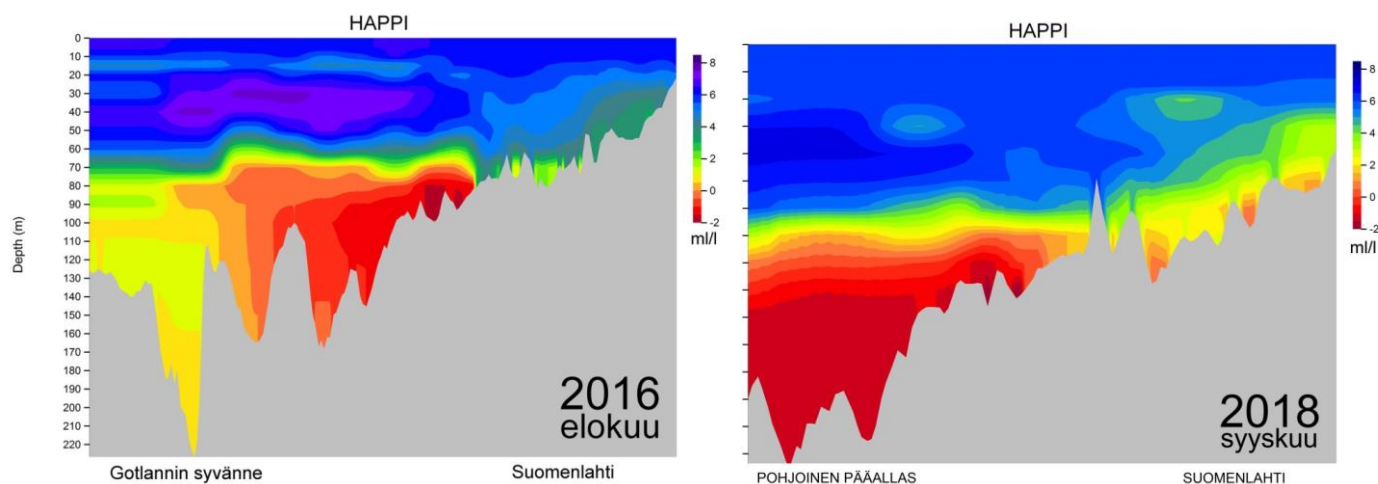


Figure 3. Oxygen conditions on the bottom shown as a cross-section plot from the Gotland Deep to the eastern Gulf of Finland (x-axis) in August 2016 (left) and in September 2018 (right). Depth (m) on y-axis. Blue indicates good oxygen conditions, yellow depleted oxygen and red anoxia.

Deep water oxygen conditions of the Gulf of Finland depend on the water exchange between the northern Baltic Proper and the Gulf and thus annual fluctuations in the oxygen conditions in the entrance to the Gulf of Finland can be large (Fig 3.). The deep water oxygen conditions were similar to the ones in 2014 but worse than during the past couple of years. In September 2018 oxygen was depleted also in the eastern Gulf of Finland.

In the whole Gulf of Finland including the eastern areas depleted oxygen close to the bottom reflects to the higher phosphorus concentrations as well (Fig. 4).

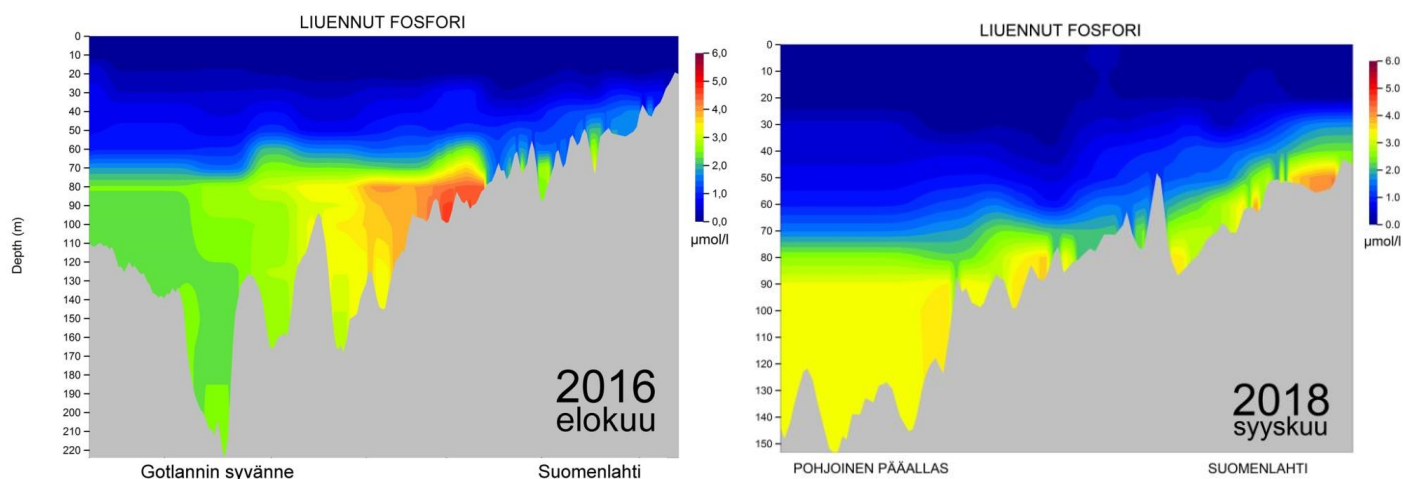


Figure 4. Phosphate levels ( $\mu\text{mol}^{-1}$ ) in the whole water column in the northern Baltic Sea shown as a cross-section plot from the Gotland Deep to

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the eastern Gulf of Finland (x-axis) in August 2016 (left) and in September 2018 (right). Depth (m) on y-axis.'

The newer monitoring parameters include phycotoxins. Phycotoxins are concentrated from water samples collected with a 30L water sampler (Fig. 5) from 10, 7.5, 5, 2.5 m and surface water. Phycotoxins were sampled from 3 stations in the Gulf of Finland (Table 3).



Figure 5. 30 L water sampler was used for monitoring of phycotoxins from different water layers (between 0-10m). Photo: Maiju Lehtiniemi.

Phytoplankton, zooplankton, phycotoxins and microliter samples were transported to the laboratory of the Marine Research Center and will be analysed during autumn and the next year.

Table 3. Summary of parameters collected at sampling stations during Combine 3, leg 1, 11<sup>th</sup>-14<sup>th</sup> September 2018.

Index	0001	0002	0003	0004	0005	0006	0007	0008	00010	00011	00012	00013	00014
Parametres/ Station	39A	XIV3	XV1	LL3A	GF2	LL5	LL6A	LL7	GF1	LL9	F62	LL11	LÄNGDEN/ UUS23
CTD-Salinity	x	x	x	x	x	x	x	x	x	x	x	x	x
CTD-Temperature	x	x	x	x	x	x	x	x	x	x	x	x	x
CTD-Oxygen	x	x	x	x	x	x	x	x	x	x	x	x	x
CTD-Fluorescence	x	x	x	x	x	x	x	x	x	x	x	x	x
Bottom salinity	x	x	x	x	x	x	x	x	x	x	x	x	x
Secchi depth								x	x	x			
Bottom oxygen	x	x	x	x	x	x	x	x	x	x	x	x	x
H <sub>2</sub> S											x	x	
pH	x	x	x	x	x	x	x	x	x	x	x	x	x
PO <sub>4</sub> -P	x	x	x	x	x	x	x	x	x	x	x	x	x
NO <sub>3</sub> -N	x	x	x	x	x	x	x	x	x	x	x	x	x
NO <sub>2</sub> -N	x	x	x	x	x	x	x	x	x	x	x	x	x
SiO <sub>4</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x
TN	x	x	x	x	x	x	x	x	x	x	x	x	x
TP	x	x	x	x	x	x	x	x	x	x	x	x	x
a-Chlorophyll	x	x	x	x	x	x	x	x	x	x	x	x	x
Phytopl. Integr.			x	x				x	x				x
Phycotoxins			x					x					
Zoopl.- net	x									x			x
Microlitter			x		x			x		x			