SYKE

ILMATIETEEN LAITOS

CRUISE REPORT

R/V Aranda

Cruise 7/2015

SL1/Nord Stream 2015

18. – 22. May 2015

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

SL1 / Nord Stream 2015

Cruise number 7 / 2015, date 18.-21.5.2015
Chief scientist Mika Raateoja

Description of the cruise

This cruise was part of HELCOM/COMBINE monitoring program, combined with enhanced environmental monitoring of Gulf of Finland. This leg of the Combine 2 cruise covers the Northern Baltic Proper, western and central Gulf of Finland, and Finnish territorial waters in the Gulf of Finland.

The other purpose of the cruise was to finish the monitoring campaign to clarify the possible impacts of the Nord Stream gas pipeline project on the benthic habitat in the middle Gulf of Finland. The results of this campaign will not be presented here.

Monitoring parameters include:

- the hydrographic description of the water column (density, temperature, salinity)
- water transparency
- water chemistry (nutrients, pH, dissolved O_2)
- the parameters of biogenic origin (Chl *a*, *in vivo* fluorescence of Chl *a* as well as the taxonomic distribution and biomass of mesozooplankton and macrozoobenthos)
- marine litter

Also

- water and sediment samples were taken for STUK at two stations
- sediment samples were taken for Harri Kankaanpää at two stations
- CDOM samples were taken for Pasi Ylöstalo at ten stations

Observations

For the whole study area, the pH level in the upper 20 m was the lowest observed during the LIMS database, that is, since 1997.

The western part of the Gulf of Finland

The salinity in the western part was at the lower end of the long-term variation; e.g. LL7S, LL9 and GF1 had deep water salinities at their lowest observed since 2002.

The temperature-driven stratification was about to develop in the offshore areas. Temperature decreased in the thermocline from 6 to 3°C but the gradient was broad, occurring at a depth interval of 20 to 40 m. The exception was the westernmost station LL12 where the thermocline

resembled the typical summertime situation; the temperature dropped at a depth interval of 10 to 20 m.

Phosphate concentration ranged from 0.3 µmol/l at the surface layer to 0.5-0.7 µmol/l at the deepest stretches of the thermocline. Nitrate was exhausted from the surface layer and started to increase drastically with depth from 20 m downwards up to 5-6 µmol/l.

Deep-water oxygen situation was the worst at LL12, JML, and GF1 where the concentration at 1 m above the bottom was ≤ 1 ml/l. There was no life at those stations in the zoobenthic samples. At JML, the sediment surface was actually inhabited by Beggiatoa mats (observed from a Gemax core), and the same was probably true for the two other stations. The areal variation in the deep oxygen condition was pronounced and related to bottom topography. There were five stations in an eastward cascade; LL12, LL11, JML, LL9, and GF1. From those, LL12 (83 m), JML (81 m), and GF1 (85 m) had oxygen deprivation near to the seafloor. To the opposite, LL9 (67 m) and LL11 (68 m) had the near-bottom oxygen concentration about 6 ml/l. It seems that the depth level for the occurrence of serious oxygen deprivation was 70-80 m.

The stationwise variation in the oxygen situation reflected to the deep-water phosphate levels; at the stations where there were oxygen problems the level was typical (3 to 4 µmol/l) and at the stations where there was a good situation the level was at the lower end recorded in the LIMS history.

The middle Gulf of Finland

The temperature-driven stratification was at its early developing stages in the middle part of the Gulf. In the offshore area, the temperature decreased steadily with depth down to 40 m while nearer to the coast some thermocline formation was observed in 10 m.Still, maximum temperatures were about 7 °C.

Like in the western part, the salinity was at the lower end of the long-term variation; in the deep waters of XIV3 and XV1 the salinities were the lowest observed in the time of the LIMS database.

Phosphate concentration ranged from 0.2-0.3 µmol/l at the surface layer to 0.8-1.0 µmol/l at the deepest stretches of the warmed water mass. Nitrate was exhausted in the surface layer and the nitricline occurred at 30 m.

The deep-water oxygen situation was good. No hypoxia was observed, and the deep-water oxygen level in the Finnish outer coastal area was the best observed since 1997. This may be partly due to the still relatively weak summertime stratification.

Cruise personnel

Mika Raateoja	SYKE	18.-22.05.2015
Jan-Erik Bruun	SYKE	18.-22.05.2015
Jalli Heini	IL	18.-22.05.2015
Hedberg Henrik	SYKE	18.-20.05.2015
Kirsi Hyvärinen	SYKE	18.-22.05.2015
Susanna Hyvärinen	SYKE	18.-22.05.2015
Marko Jaale	SYKE	18.-22.05.2015
Markku Jansson	IL	18.-22.05.2015
Jyrälä Jarkko	SYKE	18.-20.05.2015
Tanja Kinnunen	SYKE	18.-22.05.2015
Pekka Kosloff	IL	18.-22.05.2015
Setälä Outi	SYKE	18.-22.05.2015
Jere Riikonen	SYKE	18.-22.05.2015
Reinimäki Saara	SYKE	18.-22.05.2015
Pia Varmanen	SYKE	18.-22.05.2015
Mesiniemi Riku	HY	18.-22.05.2015
Jalo Mikko	SIVIILIPALVELUSMIES	18.-22.05.2015

Station List

Index	Station	LAT	LON	Depth	Time / date
251	39A	60°04.01'	24°58.81'	41	12:45 18.05.2015
252	LL7BEN_B	59°53.06'	24°48.22'	79	14:55 18.05.2015
253	LL7BEN-A	59°52.26'	24°50.02'	75	16:03 18.05.2015
254	LL7S	59°51.01'	24°49.81'	78	17:05 18.05.2015
255	LÄNGDEN	59°46.36'	23°15.59'	60	23:45 18.05.2015
256	AMN	59°41.43'	23°15.43'	56	01:59 19.05.2015
257	LL12	59°29.01'	22°53.81'	82	04:43 19.05.2015
258	LL11	59°35.01'	23°17.81'	68	08:27 19.05.2015
259	JML	59°34.91'	23°37.61'	80	11:25 19.05.2015
260	LL9	59°42.01'	24°01.81'	69	14:37 19.05.2015
261	GF1	59°42.30'	24°40.93'	84	18:10 19.05.2015
262	LL6A	59°55.01'	25°01.81'	75	22:19 19.05.2015
263	LL6ABEN-A	59°56.17'	25°03.51'	71	00:37 20.05.2015
264	LL6ABEN-B	59°57.67'	25°06.01'	71	01:43 20.05.2015
265	LL5	59°55.01'	25°35.82'	70	11:01 20.05.2015
266	LL5BEN-A	59°55.90'	25°34.91'	70	13:00 20.05.2015
267	LL5BEN-B	59°57.56'	25°35.16'	70	14:01 20.05.2015
268	XIV3	60°12.19'	26°11.57'	77	17:05 20.05.2015
269	XV1	60°15.00'	27°14.82'	64	21:01 20.05.2015
270	LL3A	60°04.03'	26°20.80'	68	02:17 21.05.2015
271	LL4A	60°01.01'	26°04.81'	60	06:38 21.05.2015
272	GF2	59°50.31'	25°51.41'	84	08:50 21.05.2015

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	CTD	Bottom sal + O2 / H2S	Secchi	O2 / H2S	pH	Nutrients	Chl a	Zooplankton	Zoobenthos	Litter	Sediment	CDOM
39A	x	x	x	x	x	x						x
LL7BEN-B	x	x	x						x			
LL7BEN-A	x	x	x						x			
LL7S	x	x	x	x	x	x	x	x	x	x		x
LÄNGDEN	x	x		x	x	x	x	x		x		x
AMN	x	x		x	x	x			x			
LL12	x	x		x	x	x	x	x	x	x		x
LL11	x	x	x	x	x	x						
JML	x	x	x	x	x	x			x		x	
LL9	x	x	x	x	x	x	x	x	x	x		x
GF1	x	x	x	x	x	x	x	x	x	x		x
LL6A	x	x		x	x	x			x			
LL6ABEN-A	x	x							x			
LL6ABEN-B	x	x							x			
LL5	x	x	x	x	x	x			x			
LL5BEN-A	x	x	x						x			
LL5BEN-B	x	x	x						x			
XIV3	x	x	x	x	x	x						x
XV1	x	x		x	x	x	x	x	x	x	x	x
LL3A	x	x		x	x	x	x	x	x	x	x	x
LL4A	x	x	x	x	x	x			x			
GF2	x	x	x	x	x	x			x			x