

## CRUISE REPORT FROM R/V ARGOS

**Survey period:** 990802-990809

**Survey area:** The Skagerrak, the Kattegat,  
the Sound, and the Baltic Proper

**Principal:** SMHI

### SUMMARY

*The expedition was performed within SMHI's regular marine monitoring programme and covered the Skagerrak, the Kattegat, the Sound, and the Baltic Proper. Nutrient conditions were normal for the season. Hydrogen sulphide was found in the deep water in large areas of the Baltic and oxygen concentrations below 2 ml/l were generally found at depths exceeding 60 to 80 metres in the whole Baltic Proper. In the whole Baltic proper there was a considerable bloom of blue-green algae, dominated by *Nodularia spumigena*.*

*A detailed algal situation report is available on <http://www.smhi.se/sgn0102/nodc/reports/>.*

## **PRELIMINARY RESULTS**

The expedition, which was a part of the SMHI ordinary monitoring programme, began in Göteborg on the 2<sup>nd</sup> of August and ended in the same place on the 8<sup>th</sup> of August. The weather was dominated by weak winds.

A detailed algal situation report is available on <http://www.smhi.se/sgn0102/nodc/reports/>.

### **The Skagerrak**

Both the halocline and the thermocline were located at a depth of 5-10 meters. Surface water temperatures varied between 19 and 21.5°C. Concentrations of nitrate and silicate were all below detection limits (0.10 and 0.2 µmol/l respectively) in the surface layer, whereas the nitrite concentrations were in the range of 0.04-0.07 µmol/l. Phosphate concentrations varied between 0.04 and 0.25 µmol/l and ammonia concentrations between 0.19 and 0.66 µmol/l.

Chlorophyll concentrations down to 20 meters depth were in general between 0.2 and 0.8 µg/l. At station M6 there was a chlorophyll maximum of 4 µg/l at 20 meters depth. The oxygen saturation in the surface layer was between 106 and 117%. Net samples of phytoplankton were dominated by dinoflagellates.

### **The Kattegat and the Sound**

Surface water temperatures varied between 20.1 and 21.4°. Surface salinity was 17.0-17.5 PSU in the whole Kattegat. In the Sound it was considerably lower, about 7.7 PSU. Thermo- and halocline were at the same depth, 5-15 meters, whereas the nutricline in general was found at 10-20 meters depth. Nitrate concentrations above the nutricline were below the detection limit in the whole area. This was true also for silica in the Kattegat. In the Sound, however, there was silica present left in the surface water. Also phosphate, nitrite and ammonia was left in the surface layer (0.04-0.15, 0.02-0.15, 0.06-0.40 µmol/l respectively).

Chlorophyll concentrations down to 20 meters depth were in general between 0.8 and 3.1 µg/l. At station Läsö Ränna there was a subsurface chlorophyll maximum of 8.2 µg/l at 10 meters depth and by the end of the week (7/8) there was a maximum of 5.2 µg/l at 10 meters depth at Anholt E. The oxygen saturation in the surface layer was in the range of 106-117 %. Dinoflagellates and the diatom *Proboscia alata* dominated net samples of phytoplankton. The lowest oxygen concentration in the deep water was measured at Läsö Ränna with 2.63 ml/l corresponding to a saturation of less than 50%. At Anholt E the oxygen close to the bottom at 52 meters depth was 3.55 ml/l, corresponding to a saturation of about 50%. In the central Sound a concentration of 3.73 ml/l (<55%) was measured near the bottom at 47 meters depth.

### **The Baltic Sea**

Surface water mean temperature in the entire Baltic proper was 21.3°C, with a maximum of 21.9-22.2°C east of Gotland. The primary thermocline was located at about 10 meters depth in large parts of the Baltic. In the area west of Gotland, however, it was found closer to the surface. The secondary thermocline was found in the layer 15-25 meters depth. In the Arkona basin the halocline was at 35-40 meters depth and in the central and northern parts of the Baltic at about 90 meters depth.

In general the surface water was emptied of nitrite and nitrate down to 45-55 meters depth, except for the Arkona basin, where the

concentrations started to increase at 25-35 meter. Ammonia varied between 0.25 and 0.50  $\mu\text{mol/l}$  down to 25-45 meters depth in the southern parts and to 45-55 meters in the other parts of the Baltic proper. Phosphate concentrations in the surface layer varied between 0.05 and 0.14  $\mu\text{mol/l}$ . In the Arkona basin the phosphate cline as located at 10-15 meters, in the Bornholm basin and the eastern Gotland basin at 25-30 meters and in the northern Baltic and western Gotland at 30-55 meters depth. Silicate concentrations varied between 5 and 9  $\mu\text{mol/l}$  down to 15-25 meters in the southern Baltic and down to 60-80 meters in the other parts.

Oxygen conditions in the deep water were bad. In the Arkona basin and the Hanö Bight the oxygen concentrations were below 2 ml/l at depths over 45 and 60 meters respectively. In the Hanö Bight there was no oxygen left between 70 meters and the bottom. In the Bornholm basin oxygen concentrations were below 2 ml/l were found deeper than 70 meters and from 80 meters and down there was hydrogen sulphide. In the other parts of the Baltic proper oxygen concentrations below 2 ml/l were measured from 80-90 meters depth and down. The area with hydrogen sulphide had increased since last monitoring a month ago. Hydrogen sulphide was now found at the stations BY10 (from 140 meters depth), BY15 (from 150 meters depth), BY20 (from 150 meters depth), BY29 (from 125 meters depth), BY32 (from 200 meters depth) and BY38 (from 105 meters depth).

In the entire Baltic proper there was a considerable bloom of blue-green algae. Very obvious surface accumulations of algae were seen mainly east of Gotland. In other areas the algae were visible by the naked eye from the boat. In the Gotland basins there was also considerable amounts of the dinoflagellate genus *Dinophysis* at 15 and 20 meters depth. Chlorophyll concentrations varied between 1 and 5  $\mu\text{g/l}$ , with lowest values near the surface. At stations BY20 and BY29 chlorophyll maxima of about 7.3  $\mu\text{g/l}$  were found at 10 meters depth.

## **PARTICIPANTS**

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## **APPENDICES**

- Track chart
- Table over stations, parameters and sampling depths
- Map showing bottom oxygen concentrations
- Monthly average plots for selected stations
- Profiles for selected stations