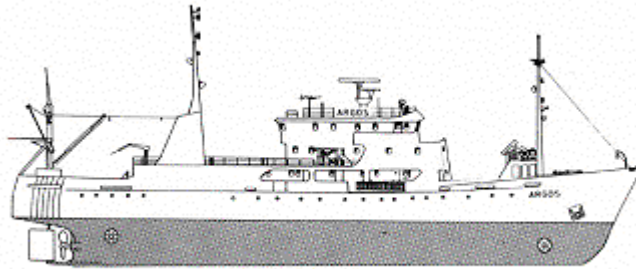


CRUISE REPORT FROM R/V ARGOS



Survey period: 2005-05-16 - 2005-05-21

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

Principal: SMHI

SUMMARY

The expedition was taken place within SMHI's regular marine monitoring programme and covered the Skagerrak, Kattegat, Sound and Baltic Proper.

Data presented in this report have been subject to preliminary quality control procedures only.

Phosphate concentrations in the south and western Baltic Proper remain much higher than normal. Silicate measurements also showed high levels, while nitrate levels were normal. Nutrient concentrations in the Skagerrak and Kattegat were normal.

In the Baltic Proper oxygen concentrations below 2 ml/l were found at depths exceeding 70 to 90 metres. Hydrogen sulphide was found in the bottom water in the Hanö Bight and the Bornholm Basin, and in a roughly 20 metre deep layer over the bottom around Gotland from about 110 metres.

*The CTD-curve revealed a relatively high peak on the chlorophyll measurements at Anholt at about 15 meters depth. Other than this there were no high peaks in Skagerrak, Kattegat, Sound or Baltic Proper. The potentially toxic dinoflagellate *Dinophysis acuta* was observed at Gotlandsjupet, Hanö Bight and BCSIII. The latter also showed some cyanobacteria in the form of *Aphanizomenon* sp.*

The next expedition is scheduled for June 13 to 18, 2005.

PRELIMINARY RESULTS

The cruise, part of SMHI's ordinary monitoring programme, began in Gothenburg on the 16th May and ended in the same port on the 21st May. The cruise was interrupted with a short stop in Visby on the 19th to pick up additional personnel. The weather was dominated by steadily increasing air pressure, from 1000 to 1024 hPa. Initial cloud broke up during the first day, leaving clear skies for the rest of the week. Apart from fresh north westerly winds in the Skagerrak, winds were weak to moderate (3 – 8 m/s), initially from the north, before becoming westerly and south westerly later in the week. In the Skagerrak, waves were up to 2.5 metres high, but rarely exceeded 1 metre for the remainder of the cruise.

The Skagerrak

Surface water temperatures were normal throughout the area. They varied from 10.3°C at Å17 to 11.8°C at the coast. Surface salinities were also normal, between 23 and 26 psu. Surface stratification was located at a depth of 10 metres or shallower.

All nutrients had the low surface concentrations that are typical for the time of year. Phosphate was ca. 0.05 µmol/l. Nitrate concentrations were between 0.1 and 0.8 µmol/l (highest at the coast, lowest furthest offshore). Silicate had concentrations of 0.4 – 0.7 µmol/l (also highest at the coast).

Relatively high peaks of chlorophyll fluorescence were recorded in the more nutrient rich water just below the halocline. Where the peaks were strongest, oxygen saturation was up to 117% at between 10 and 20 metres depth.

Secchi depth was 8 metres.

The Kattegat and the Sound

Surface water temperature in the Kattegat was between 10.8 and 11.3°C, which is very close to average for the time of year. In the Sound, surface temperature at W Landskrona was normal, around 10.8°C, while at Drogden E it was one degree colder. Surface salinity had recovered from the low values observed during March and April. At Fladen, surface salinity was 20.2 psu (which is greater than average) and at Anholt E was 16.8 psu. The halocline and thermocline were well defined at both Anholt E. and Fladen, and were found at between 8 and 12 metres. East of Läsö, they occurred from 4 to 8 metres depth. At W. Landskrona in the Sound, surface salinity was 10.7 psu, which is significantly higher than normal (though still within 1 standard deviation of the 1995 – 2004 mean). The halocline was very strong, with salinity changing from 18 to 34 psu between 10 and 15 metres depth. High salinity (34.55 psu) was observed below 15 metres at W. Landskrona. There was a 3.5 psu salinity difference between surface and bottom at Drogden E.

Surface nutrient concentrations in the Kattegat were normal for the season. Phosphate concentrations were 0.04-0.07 µmol/l and silicate varied between 0.3 to 1.5 µmol/l. In the Sound, phosphate concentrations remain elevated: surface concentration at W. Landskrona reached 0.31 µmol/l. This compares with typical May values of about 0.1 µmol/l (1995 – 2004 average, standard deviation: 0.03 µmol/l). Silicate concentrations in the Kattegat were marginally below average, while in the Sound they were back to normal after being elevated during the previous cruise. Nitrate concentrations were close to or below the limit of detection (0.10 µmol/l) throughout the whole region.

Surface water oxygen saturation was up to 114%, indicating intense phytoplankton activity. Fluorescence peaks were found at 14 to 18 metres depth. These were particularly strong just below the pycnocline at Anholt E and W. Landskrona. The uncalibrated peak value was more than 10 (µg/l) at Anholt E, and 7.5 at W. Landskrona. This compares with a maximum value at Fladen of 1.5 at the same time. It should be noted that these are uncalibrated values, and only give a guide to

the chlorophyll concentration, which is accurately determined by a different method. Secchi depth was between 7 and 9 metres.

Oxygen concentration in the bottom water was equal to or just over what is normal for the time of year. The lowest concentration was 5.37 ml/l, corresponding to a saturation of 77%, observed at W. Landskrona.

Baltic Proper

Surface water temperature varied between 6.4 and 8.5°C, which is normal for the season. Highest surface temperatures were found in the Hanö Bight, lowest in the East Gotland Basin (Station BY15). The halocline in the Arkona Basin remained at 32-42 metres. Above this region, salinity was 7.9 psu, while below this it was 14.4 psu. These values are normal. In other regions, the halocline began at depths of 65 to 80 metres, though thermal stratification began at 10 metres at all stations. Secchi depth varied between 6 and 8 metres, which is about 2 metres less than during the April cruise.

Surface phosphate concentration remains very high, despite having decreased since April. In the Arkona Basin, concentrations are between 0.36 and 0.48 $\mu\text{mol/l}$, which are similar to normal winter values. In the Bornholm Basin, concentrations are now 0.57 – 0.60 $\mu\text{mol/l}$ and remain above winter normal values. For comparison, typical concentrations in the Arkona basin at this time of year should be about 0.15 $\mu\text{mol/l}$ (1995 – 2004 May mean. Standard deviation 0.08 $\mu\text{mol/l}$). In the Bornholm Basin, normal May concentrations are around 0.22 $\mu\text{mol/l}$ (standard deviation of 0.14 $\mu\text{mol/l}$). Elevated values were also observed in the Hanö Bight and the Karlsjö Deep. From the south eastern Baltic, through the East Gotland Basin up to the Fårö Deep, and over to the northern West Gotland Basin (the Norrköping Deep) concentrations were only slightly elevated or normal for the time of year, between 0.2 and 0.3 $\mu\text{mol/l}$.

Silicate concentrations are also above normal at many stations. Normal values were found at Station BY1 in the Arkona Basin, though elevated values were found 50 km east, in the same basin. Elevated values were found in the Bornholm Basin. At all other stations, concentrations were within one standard deviation of normal.

Nitrate and nitrite concentrations in surface water were at or below the detection limit, 0.10 $\mu\text{mol/l}$, at all stations, which is normal.

The fluorometer indicated peaks in fluorescence, and by implication, chlorophyll-a concentration, at all stations. Highest fluorescence was observed in the Arkona Basin, where the maxima extended from the surface down to 20 – 25 metres. At the other stations, the maxima were well defined peaks found at or just above the thermocline. Exceptions were at the Karlsjö Deep and also south east of Gotlan (Station BY10) where the peak occurred just below the thermocline. This plankton activity was reflected in the surface oxygen concentrations. All stations were supersaturated down to 20 - 40 metres. In the Arkona and Bornholm basins, the oxygen saturation is however slightly less than would be expected at this time of year (though within normal limits). The remaining stations were normal.

In the Arkona Basin, oxygen conditions were good. In the remainder of the Baltic Proper oxygen concentrations below 2 ml/l were found at depths exceeding 70 to 90 metres. In the Bornholm Basin, hydrogen sulphide was found in the 10 metres above the bottom, from 80 metres. These hydrogen sulphide concentrations are more than one standard deviation greater than normally found at this time of year, and as bad or worse than normally found during the autumn anoxic period. In the Hanö Bight, high concentrations of hydrogen sulphide were found in the bottom water sample (taken one metre above the bottom, at 79 metres). This was part of a thin layer, as there was still

oxygen left at 70 metres. Around Gotland, bottom oxygen (or hydrogen sulphide) concentrations remain within normal limits for the time of year.

A filtrated sample from BCSIII at 20 meters depth contained a relatively large amount of the potentially toxic dinoflagellate *Dinophysis acuta*. Some *Aphanizomenon* sp. (cyanobacteria) was observed, waiting for the right conditions to bloom. Samples from two more stations, Gotlandsdjupet and Hanö Bight, were filtrated and analysed for plankton. At all three stations dinoflagellates dominated the samples, in addition to zooplankton.

The next expedition is scheduled for June 13 to 18, 2005.

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