

## Report from SMHI's marine monitoring cruise with R/V Svea – September 2025



Photo: Amanda Nylund, SMHI

**Survey period:** 2025-09-24 to 2025-09-30

**Principals:** Swedish Meteorological and Hydrological Institute (SMHI),  
Swedish Agency for Marine and Water Management (SwAM)

**Cooperation partners:** Swedish University of Agricultural Sciences (SLU),  
Swedish Maritime Administration

## SUMMARY

During the expedition, which is part of the Swedish pelagic monitoring programme, the Skagerrak, the Kattegat, the Sound, and the Baltic Proper were surveyed.

Surface water temperatures ranged from 15–17 °C in the Skagerrak, 15–16 °C in the Kattegat and the Sound, and 13–17 °C in the Baltic Proper. The surface water salinity was 29–32 psu in the Skagerrak, 20–23 psu in the Kattegat, 12 psu in the Sound, and 6–8 psu in the Baltic Proper.

Concentrations of dissolved inorganic nutrients in the surface water showed nitrogen levels typical for the season, which were low or below the detection limit throughout the study area. Phosphate concentrations were also generally low across the area, although slightly higher than normal, particularly in the southern Baltic Proper. Silicate concentrations were seasonally low in the waters along the west coast but higher than normal throughout the Baltic Proper.

Oxygen levels in the bottom waters of the west coast were good (3.4–5.8 ml/l). In the Arkona Basin, oxygen levels have increased since August, with concentrations just at the threshold of severe oxygen deficiency (2.0 ml/l) at station BY2, but well above this level at station BY1. This indicates that an inflow of oxygen-rich bottom water through the Sound into the Arkona Basin has occurred since August. In the Bornholm Basin, severe oxygen deficiency still prevails from depths of 70–80 metres, including in the Hanö Bay, where oxygen concentrations have decreased since August. In the Eastern Gotland Basin, severe oxygen deficiency was observed from depths of 70–80 metres, and hydrogen sulphide was detected between 80–90 m in the northeastern part and 140–150 m in the southwestern part. In the Western Gotland Basin, severe oxygen deficiency was observed from 70 m, and hydrogen sulphide was present from 80 m.

The next expedition with R/V Svea is planned for 20–27 October, starting in Kalmar and ending in Lysekil.

## EXPEDITION OVERVIEW

The expedition was carried out aboard the research vessel R/V Svea between September 24<sup>th</sup> and 30<sup>th</sup>, starting in Lysekil and ending in Kalmar. During the expedition, weather conditions were mostly clear with light winds, and air temperatures ranging from 12–15 °C in the Skagerrak and the Kattegat, and between 10–14 °C in the Baltic Proper.

Water column profiles of salinity, temperature, oxygen, and fluorescence were measured using a CTD<sup>1</sup> mounted on a rosette with room for 24 water samplers. SMHI's 23 regular monitoring stations were sampled as planned, and in addition, both the Huvudskär buoy and Flinten 7 were visited for CTD reference measurements. At the Huvudskär buoy, a broken light on the Huvudskär beacon was replaced. Furthermore, the bottom-mounted system at station P22 and the wave buoy at Knolls Grund were recovered and replaced; on both occasions, CTD reference measurements were carried out. At ten stations, additional sampling at the chlorophyll maximum was performed for EAWAG, Switzerland.

Gelatinous zooplankton were sampled using a net at one station in the Skagerrak, one station in the Kattegat, and two stations in the Baltic Proper. The gelatinous zooplankton samples were photographed in a photo box, and the images will later be analysed by the University of Gothenburg. At seven stations in the Baltic Proper, Environmental DNA (eDNA) samples were collected within the SAMBAH II project, with the aim of mapping the occurrence of harbour porpoises in the Baltic Proper.

Svea's FerryBox system and the instrument used to measure underway profiles of oxygen, salinity, and temperature (the Moving Vessel Profiler (MVP)), were frequently operated during the voyage.

The expedition hosted an additional guest: Simona Saviano from the Stazione Zoologica Anton Dohrn in Naples, who joined the expedition for knowledge exchange regarding oceanographic sampling.

The results presented in this report are based on data that have undergone an initial quality control and have been compared with monthly averages for the period 1991–2020. After further quality assurance, some values may be subject to change. All values presented in the report are rounded to the nearest tenth and may therefore differ slightly from published values. Data are published as soon as possible on the data host's website, usually within about a week after the expedition. Some analyses are completed after the expedition and are therefore published later.

More information about our data hosting and to download data:

<https://www.smhi.se/data/oceanografi/datavardskap-oceanografi-och-marinbiologi>

For more information on the algal situation, see the AlgAware report:

<https://www.smhi.se/publikationer/publikationer/algrapporter>

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<sup>1</sup> CTD is a profiling instrument and is short for Conductivity, Temperature and Depth

## RESULTS

### Skagerrak

Surface water temperatures in the Skagerrak were normal for the month, ranging from 15 to 18 °C. Surface water salinity was 29–32 psu in coastal areas and 30–31 psu offshore. At station Å15, warm surface water had been mixed down to a depth of 100 m, which coincided with below normal concentrations of dissolved inorganic nutrients.

Concentrations of dissolved inorganic nutrients in the surface water remained low at all stations, with levels close to or below the detection limit, except at station Å17 where dissolved inorganic nitrogen (DIN) concentrations were elevated, and at station Släggö where phosphate concentrations were higher than normal. DIN concentrations were around 0.1 µmol/l, silicate ranged between 0.9 and 2.4 µmol/l, and phosphate between 0.03 and 0.15 µmol/l.

Bottom water oxygen concentrations were normal for the month, ranging from 3.4 to 5.8 ml/l, with the lowest values observed at station Släggö.

A distinct fluorescence peak was observed at depths of 40–50 m at station Å17, but the fluorescence maxima generally occurred at depths of 10–30 m, except at station Släggö where the fluorescence maximum was found in the surface layer (0–10 m).

### Kattegat and the Sound

In the Kattegat and the Sound, surface water temperature (15–16 °C) and salinity (20–22 psu in the Kattegat and 12 psu in the Sound) were normal for the season.

In the Kattegat, the halocline was observed at depths of 10–15 m, except at station P22 where it was located at 20 m. The halocline was sharper and deeper than normal at Anholt E. In the Sound, the halocline was weaker and deeper than normal, occurring at depths of 10–30 m. Below the pycnocline, the salinity was around 32–35 psu and the water temperature was 12–14 °C.

Throughout the area, the fluorescence maximum was found in the surface layer between 5 and 20 m, and at Anholt E a distinct peak was observed at 18 m depth.

Concentrations of dissolved inorganic nutrients in the surface water remained low throughout the area, with DIN and phosphate concentrations of around 0.1 µmol/l, except in the Sound where phosphate concentrations were higher than normal at 0.4 µmol/l. Silicate concentrations were normal or lower at all stations in the area, ranging from approximately 0.1–2.0 µmol/l in the Kattegat and 10.3 µmol/l in the Sound.

The oxygen conditions in the area were normal for the season, with a slightly deteriorated situation in the bottom waters of the Kattegat since August (oxygen concentrations of 3.5–3.9 ml/l) and a markedly deteriorated situation in the Sound (1.2 ml/l).

## **THE BALTIC SEA**

Surface water temperatures were normal for the month throughout the Baltic Proper, ranging from approximately 13 to 16 °C, while salinity was slightly above normal at a majority of the stations, with values between 6.2 and 8.2 psu.

In the Arkona Basin, the water column was well mixed down to depths of 20–30 m, with a salinity of about 8 psu and temperatures of 14–16 °C. Between 30 and 40 m, a less well-mixed water mass with slightly colder water (8–10 °C) was observed, followed by a distinct halocline at around 40 m, below which both salinity and temperature increased (10–16 psu and 12–16 °C). In the Bornholm Basin and the Hanö Bay, a halocline was observed at around 38 m and an intermediate cold-water layer between 40 and 60 m. The Hanö Bay also exhibited a thermocline at 25 m. In the central parts of the Baltic Proper, the thermocline was located at approximately 20–30 m and the halocline at 60–80 m, with an intermediate cold-water layer observed between 30 and 60 m.

Dissolved inorganic nitrogen (DIN) concentrations in surface waters were at or below the detection limit (0.1 µmol/l), with some values lower than normal for the month in the Eastern Gotland Basin. Phosphate concentrations were above normal for the month across most of the Baltic Proper, with surface values of approximately 0.1–0.4 µmol/l. Surface silicate concentrations were above normal at all stations except at the station BY39 Ölands Södra Udde, with measured values between 13 and 17 µmol/l.

In the Arkona Basin, bottom-water oxygen concentrations had increased since August, with levels just at the threshold for severe oxygen deficiency (2.0 ml/l) at station BY2, but well above the threshold at station BY1.

In the Bornholm Basin, severe oxygen deficiency prevailed from depths of 70–80 m, including in the Hanö Bay where oxygen concentrations have decreased since August. Bottom-water oxygen concentrations were around 0.1 ml/l, but no hydrogen sulphide was detected in the area. In the Eastern Gotland Basin, severe oxygen deficiency was observed from depths of 70–80 m, and hydrogen sulphide was detected between 80–90 m in the northeastern part and 140–150 m in the southwestern part. In the Western Gotland Basin, severe oxygen deficiency was observed from 70 m, and hydrogen sulphide was present from 80 m. The highest hydrogen sulphide concentrations occurred in the Eastern Gotland Basin at station BY15 (Gotland Deep). Since 2023, extra samples for hydrogen sulphide analysis has been taken at this station for later dilution before analysis, as it is suspected that hydrogen sulphide levels are being underestimated.

Fluorescence measurements indicated a uniformly distributed plankton activity in the upper 20–30 m throughout the Baltic Proper, with no distinct fluorescence maxima.

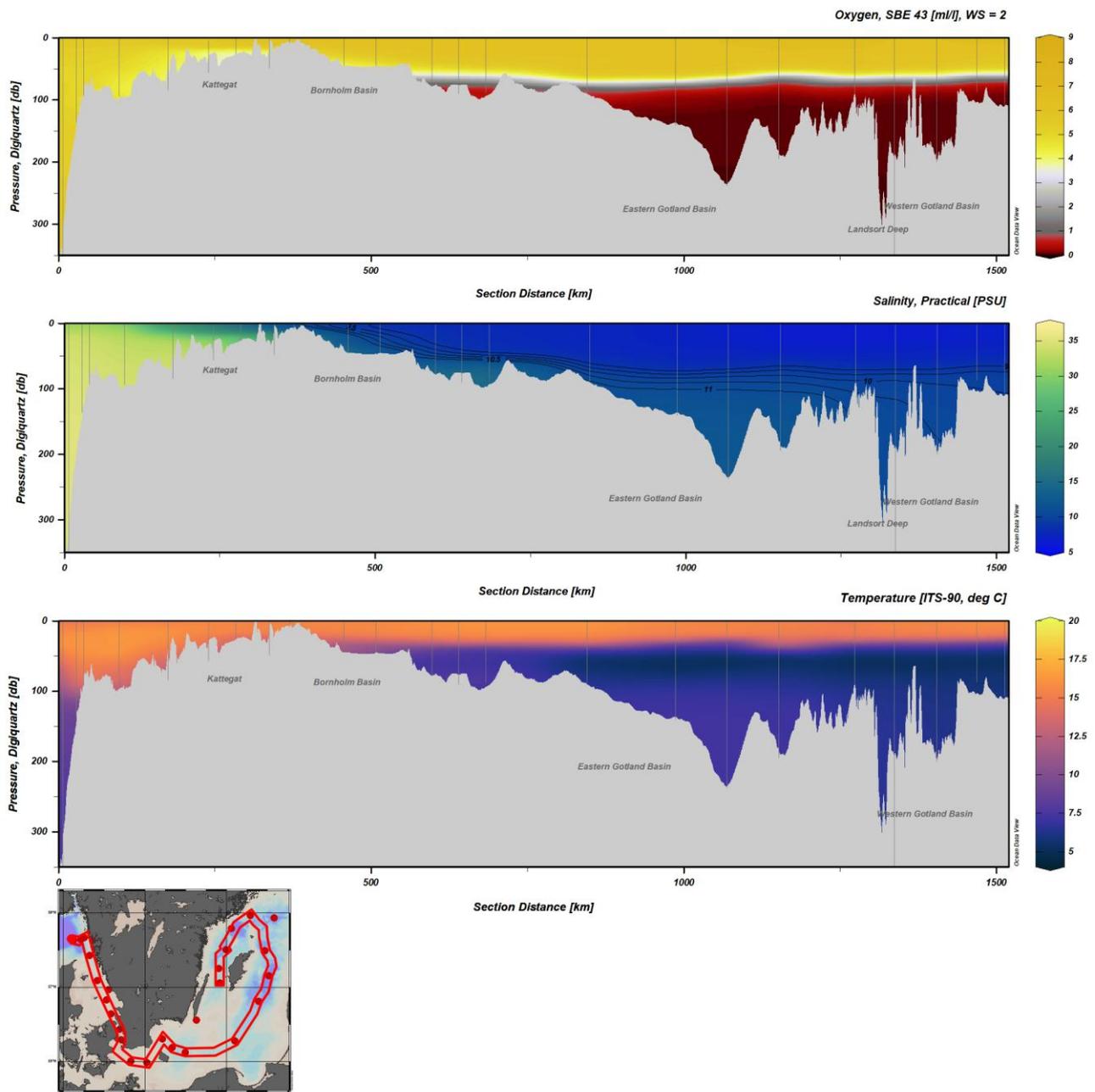


Figure 1. Section showing oxygen concentration, salinity, and temperature from CTD and measurements, from the Skagerrak through the Kattegat and into the Baltic Sea according to the map (bottom).

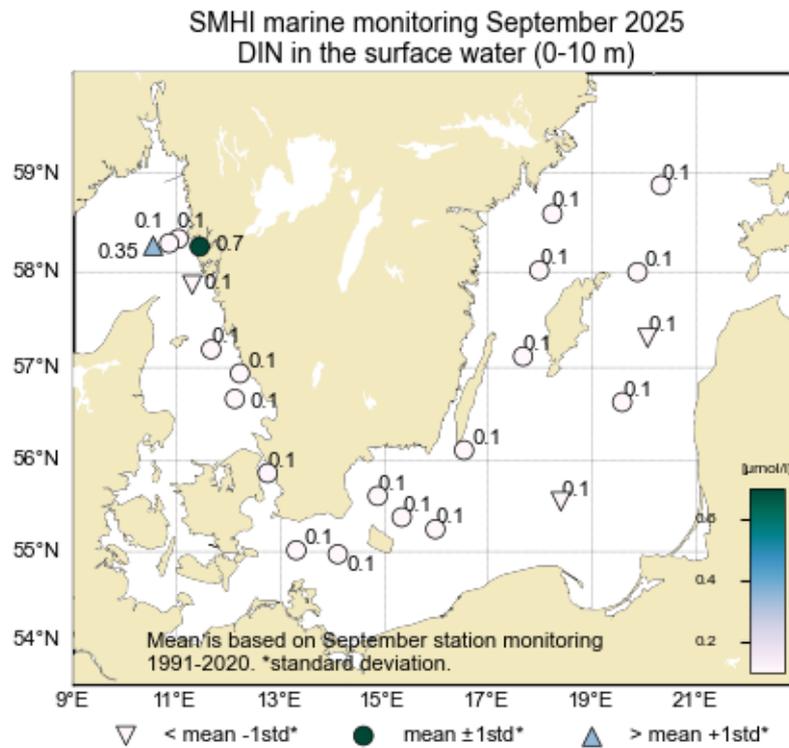


Figure 2. The concentration ( $\mu\text{mol/l}$ ) of inorganic nitrogen (DIN) in the surface water (0–10 m). The mean value is based on data for the month at each station during the years 1991–2020.

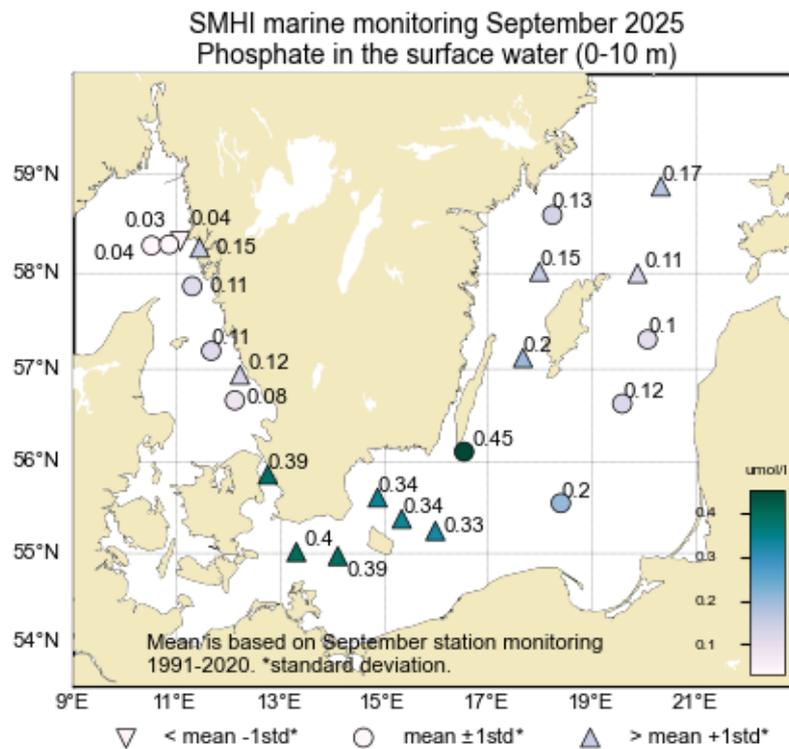


Figure 3. The concentration ( $\mu\text{mol/l}$ ) of phosphate in the surface water (0–10 m). The mean value is based on data for the month at each station during the years 1991–2020.

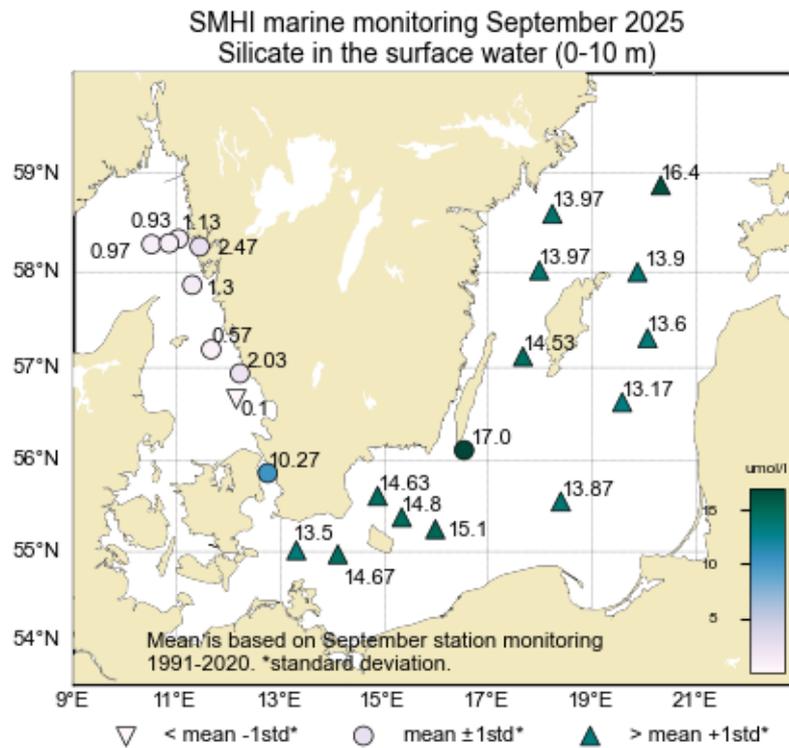


Figure 4. The concentration ( $\mu\text{mol/l}$ ) of silicate in the surface water (0–10 m). The mean value is based on data for the month at each station during the years 1991–2020.

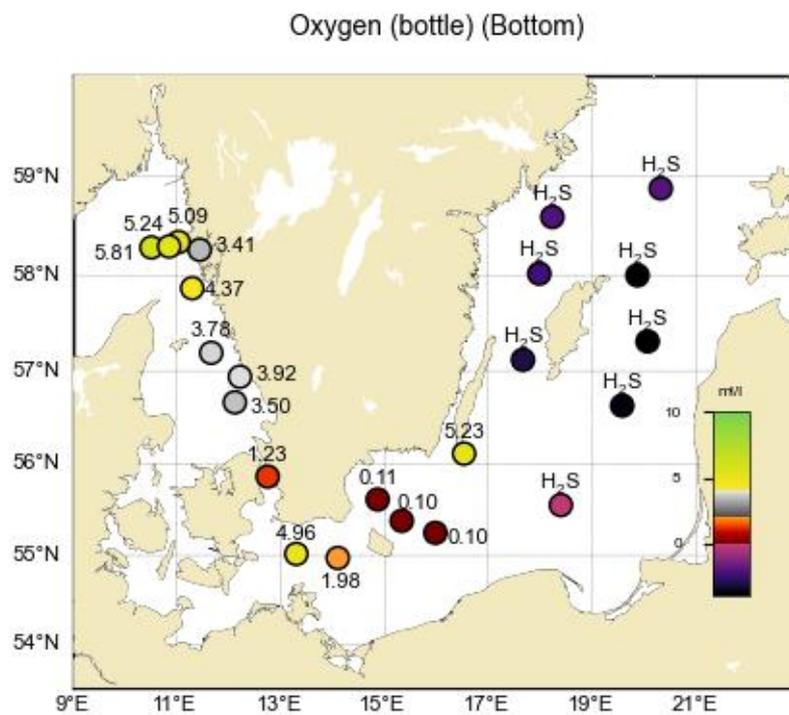


Figure 5. Dissolved oxygen concentration ( $\text{ml/l}$ ) in the bottom water, approx. one meter above the seafloor. Presence of hydrogen sulphide is shown as  $\text{H}_2\text{S}$ . Note that the values have not been compared to statistics as in similar figures and only circles are shown



## PARTICIPANTS

Name	Role	Organisation
Sari Sipilä	Cruise leader and water analysis	SMHI
Ola Kalén	CTD-operations and water analysis	SMHI
Johan Kronsell	CTD-operations and water analysis	SMHI
Madeleine Nilsson	Water sampling and analysis	SMHI
Amanda Nylund	Water sampling and analysis	SMHI
Johan Håkansson	Nutrient analysis, quality assurance	SMHI
Simona Saviano	Guest	Stazione Zoologica Anton Dohrn

## APPENDICES

- Track chart
- Table with stations, analysed parameters and number of sampling depths
- Monthly average plots for surface water
- Vertical profiles