Interlaboratory Comparison of Nutrient Seawater Samples in the German Bight

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Abstract

In 2007 and 2008, an intercomparison exercise for nutrient analysis of sea water samples was carried out by six independent German laboratories. Main objective was to compare different conservation techniques (deep freezing or poisoning with mercury chloride, $HgCl_2$) as well as the different analytical methods used by the investigators. The samples were analysed for dissolved nitrate+nitrite, nitrite, ortho-phosphate, silicate and ammonium.

The sea water samples were taken in the German Bight during two monitoring cruises in March 2007 and March 2008. The samples were divided into 250-ml-aliquots, of which one was directly measured onboard the research vessel with SFA (segmented flow analysis). The other aliquots were simultaneously distributed among the participating laboratories, half of them being conserved by deep-freezing at -18 °C, the other half being poisoned by $HgCl_2$ (stored at 4-8°C), respectively. All samples were processed within a fixed time-frame.

The analysed data were compared and evaluated according to Gofino et al. (2004). One laboratory failed at the analysis of phosphate and ammonium. Apart from that the interlaboratory variability was generally less than 10 % for nitrate+nitrite, nitrite, silicate and phosphate. For ammonium the variability ranged between 0.5 and 45 %. This clearly revealed methodic problems for the storage and/or analysis of ammonium samples.
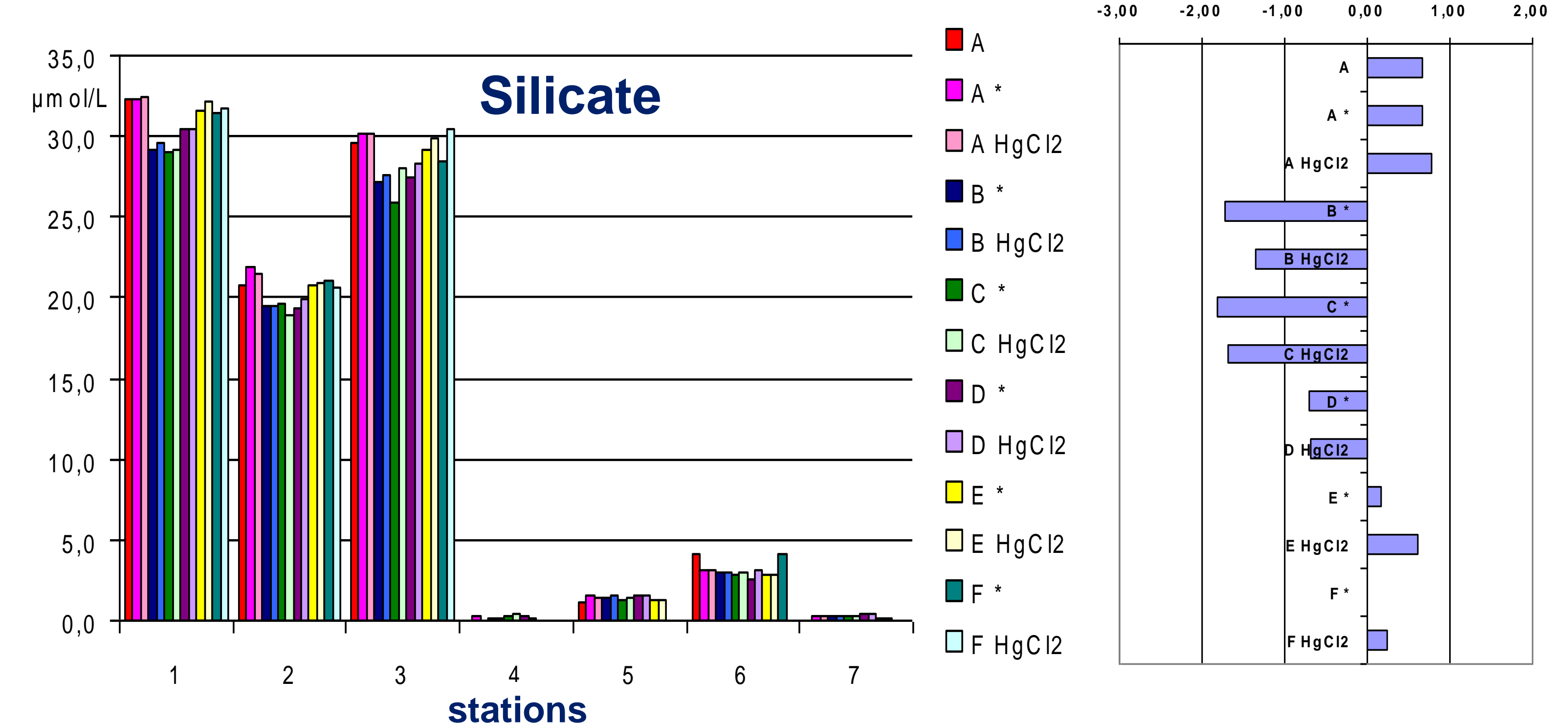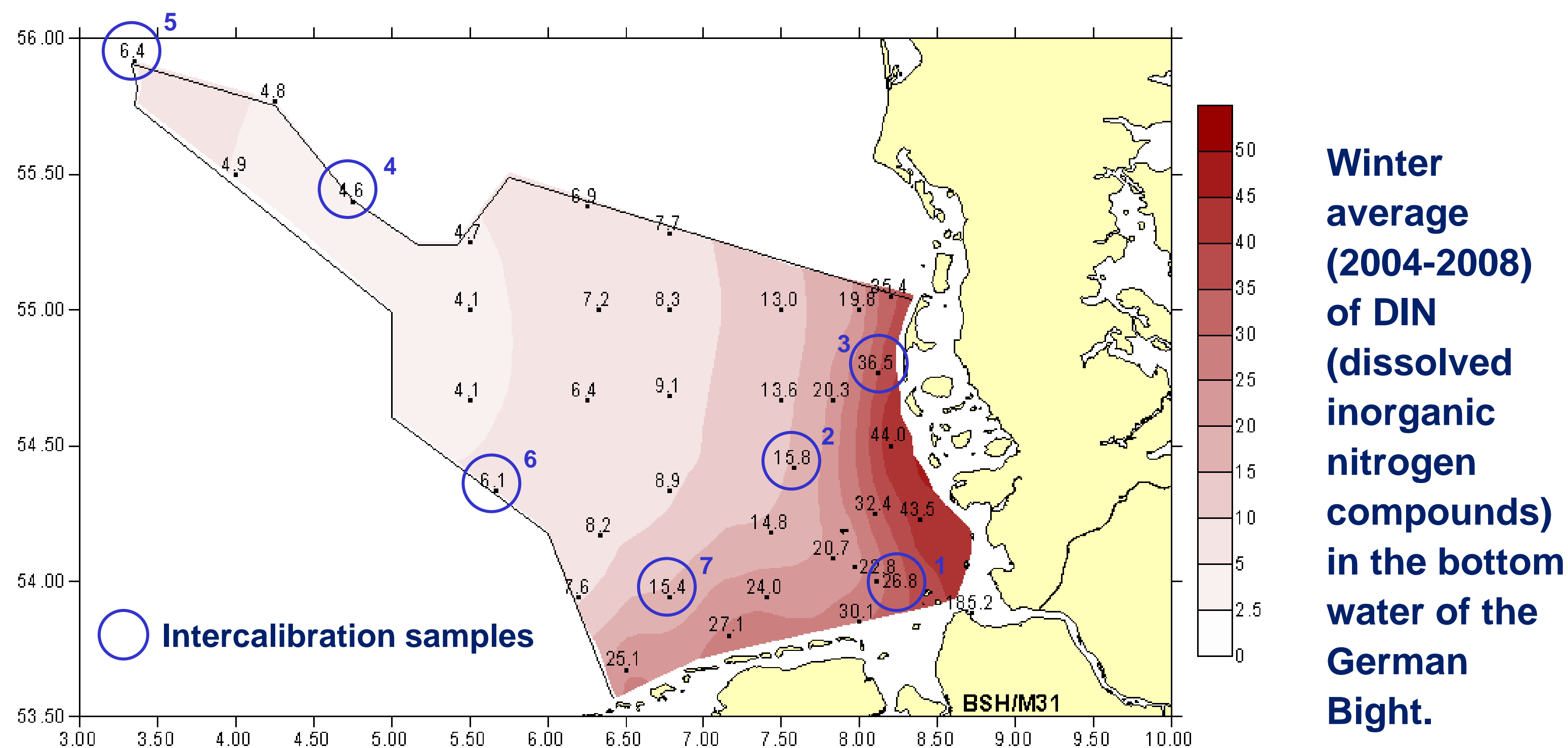
Distribution pattern of DIN in the German Bight

Winter average (2004-2008) of DIN (dissolved inorganic nitrogen compounds) in the bottom water of the German Bight.

Intercalibration samples

Water sampling and sample processing

7 samples from the German Bight

monitoring cruises March 2007/2008

filtration

0.4µm Polycarbonate filter

SFA

onboard analysis

poisoning with $HgCl_2$ (4 - 8°C)

deep freezing at -18°C *

six independant laboratories

A   B   C   D   E   F

simultaneous analysis in July 2007/2008

Results and statistical evaluation

The results [µmol/L] of six independant laboratories (A-F) are exemplarily summed up for nitrite, slilicate and ammonium at seven stations in the German Bight (S = 28,3-35,0). The differences are evaluated statistically according to Cofino et al. (2004).
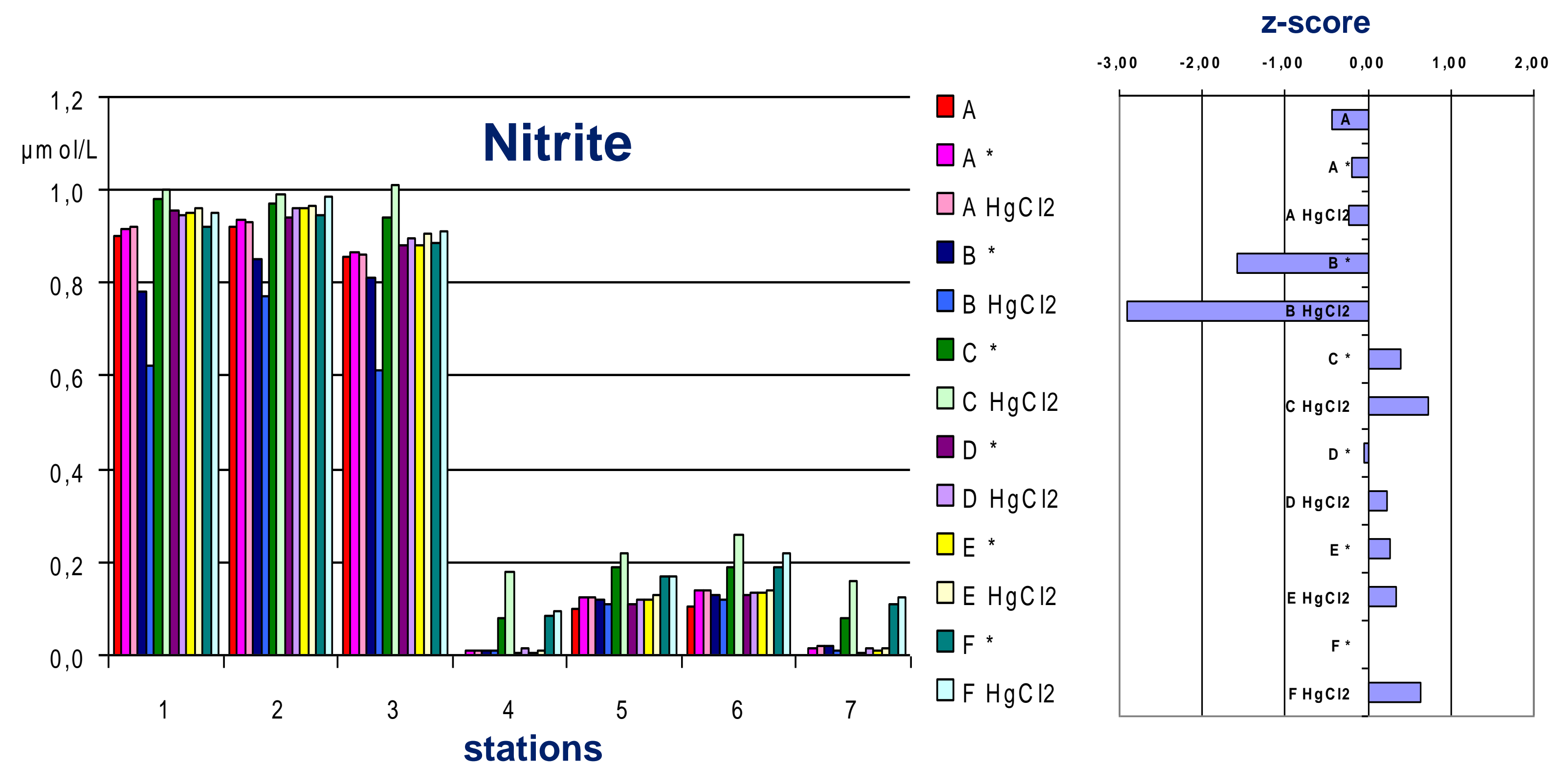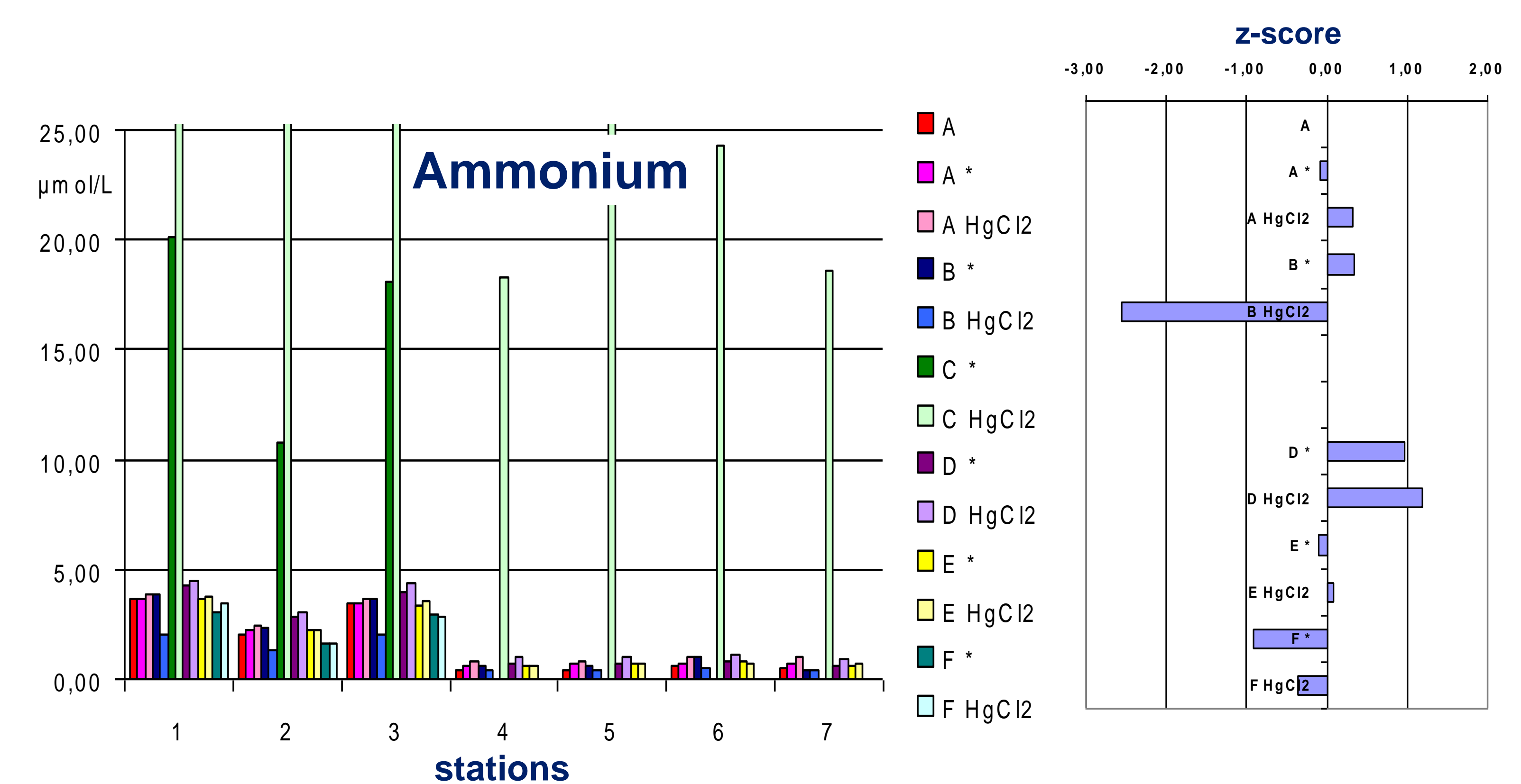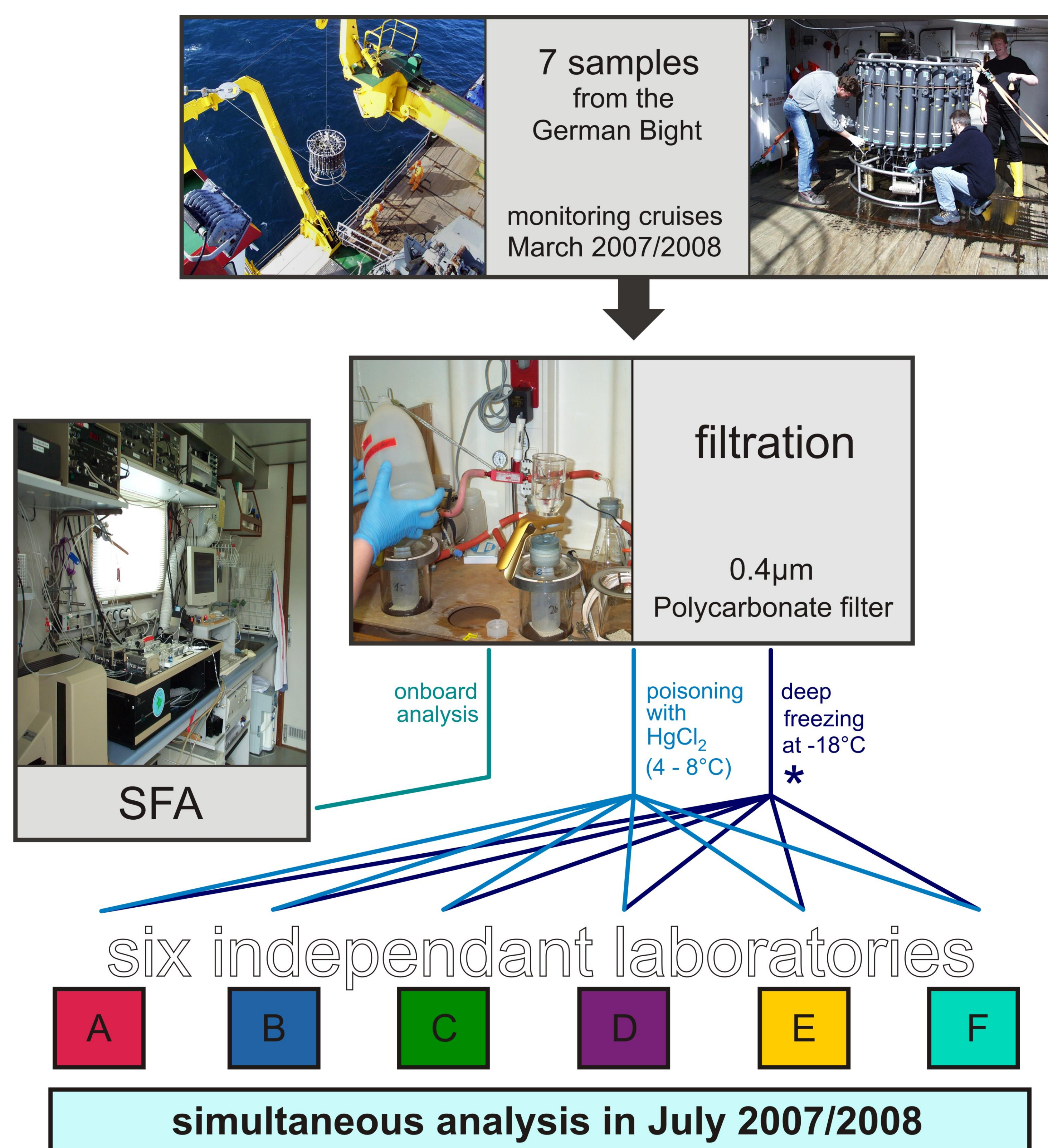
Nitrite

Z-score (nitrite) at station 3 referring to the assigned value (AV); AV = 0,88 µmol/L

Silicate

Z-score (silicate) at station 1 referring to the assigned value (AV); AV= 31,40 µmol/L

Ammonium

Z-score (ammonium) at station 1 referring to the assigned value (AV); AV= 3,68 µmol/L (without laboratory C)

Conclusions

- There are comparable results for onboard measurements as well as for analyses of deep frozen and $HgCl_2$ preserved samples.
- The z-scores for almost all institutes are between -2 and +2.
- The comparability of North Sea water analysis methods for dissolved nutrients is assured within the participating laboratories.

The results confirm that a common standard for nutrient analysis exists among German laboratories and thus, German monitoring tasks are fulfilled in an effectual way. However, some additional work on the storage and analysis of ammonium has to be done.

▶ One aim for the near future will be to extend this intercomparison project to the international community in order to ensure comparability of nutrient results within the whole OSPAR region.

Literature: D.E. Wells, W.P. Cofino and J.A. Scurfield (2004). The Application of the Cofino Model to evaluate Laboratory Performance Study Data using the Bandwith Estimator. Fisheries Research Services Collaborative Report No 04/04

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