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The Expedition of the Research Vessel "Polarstern"  
to the Arctic in 2007 (ARK-XXII/1a-c)

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Edited by  
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## 5. DEEP-WATER CORALS ALONG THE NORWEGIAN CONTINENTAL MARGIN: MULTIDISCIPLINARY STUDIES ON SULA RIDGE, TRÆNA REEF, RØST REEF, FLOHOLMEN AND SOTBAKKEN

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### Objectives and work at sea

Despite our knowledge of the existence of cold-water corals since the times of Linnaeus, it is only in recent years that we have begun to unravel the geological and ecological complexities of the astonishing biogenic reefs formed by deep-water corals (Hovland & Mortensen, 1999; Freiwald et al., 2002; Hall-Spencer et al., 2002; Roberts et al., 2006; Lindberg et al., 2007). The present cruise surveyed cold-water coral reefs along the Norwegian coast, starting with a sidescan survey of Sula Ridge to examine backscatter data in detail on what is perhaps the best described cold-water reef complex (Freiwald et al., 2002). The expedition then continued north as a major target of the cruise was to study a system of *Lophelia pertusa* reefs which lie within the Arctic Circle off Røst in Lofoten. These reefs were discovered by the Norwegian Institute of Marine Research (IMR) in 2002 (Fosså et al., 2004; 2005) and comprise a complex of reefs that are 35 - 40 km long, up to 3 km wide and live at 300 - 400 m depth along the back wall of a giant submarine slide which took place on a steep and rugged part of the continental shelf break 4,000 years ago (Laberg et al. 2002). In the area mapped by IMR about 1500 potential *Lophelia* mounds were counted on the upper slope and around ice berg scars on the shelf. The IMR inspected selected parts of the reef with a tethered video camera and a ROV. They found no signs of coral damage due to fishing and on 4 January 2003 the Norwegian Government gave Røst Reef special protection against bottom trawling in an area 53 km long and 17 km wide. In July 2005 the Røst Reef was a target study area for a RV "Poseidon" cruise but poor weather conditions meant that only six grab stations and 10 CTDs were completed in the main reef area (Freiwald et al., 2005). On this trip we were blessed with good weather and so were able to extend our knowledge of the ecology and geology of Røst Reef considerably.

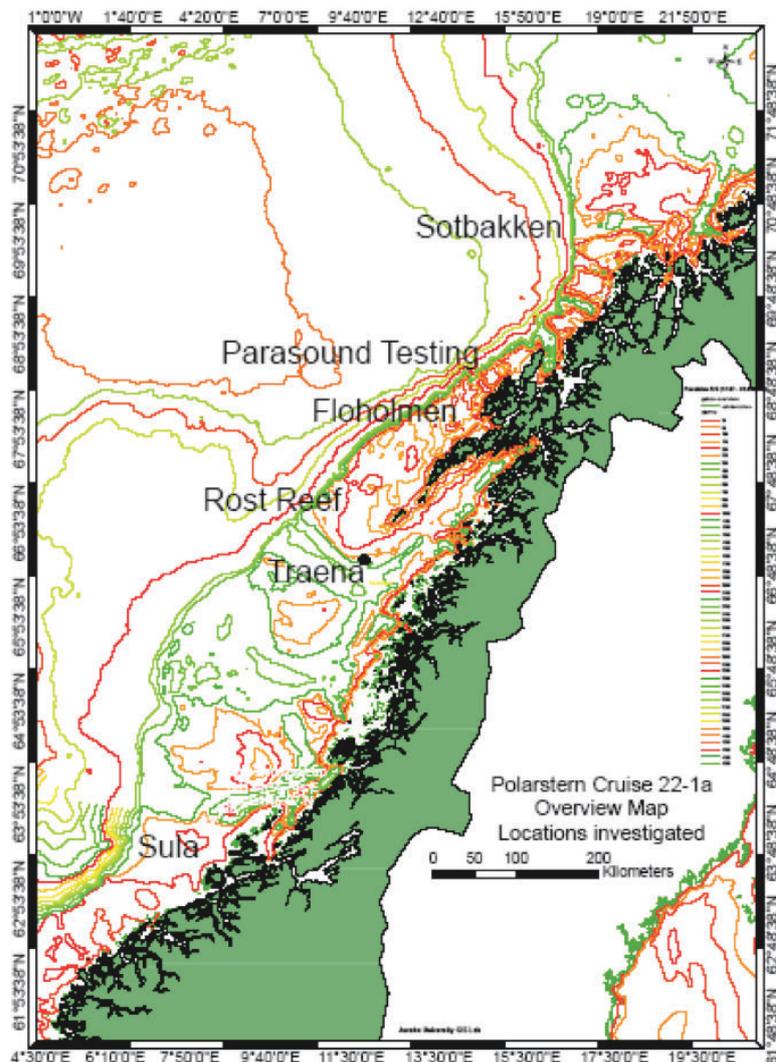


Fig. 5.1: Overview map of the areas investigated during ARK-XXII/1a

Our objectives were to:

1. Map the reef architecture and geometry using a multibeam system
2. Measure physical watermass properties with CTD and water sampler
3. Investigate particle dynamics and organic carbon cycling using ADCPs, particle sizers, sediment traps and water samples
4. Document sedimentary facies, biological habitats and species distributions within and adjacent to reef complexes using submersible, drop-down TV, scientific fish-finder, Van Veen grab and Box Core sampling
5. Thoroughly survey the Porifera and their associated microbiota
6. Characterise the microbial ecology of the living reef system
7. Analyse the postglacial geological evolution of the reefs by obtaining long sediment cores, with special emphasis on degradation and methanogenesis within the sediment

Concern has often been expressed that increased levels of turbidity and sedimentation could have negative effects on cold water coral habitats. To improve environmental risk assessment tools lab-experiments with different particle classes and corals were also carried out onboard. As HERMES deals with sustainable management of marine ecosystems the data from this cruise will be fed into the HERMES ecosystem modeling approach. This will provide means to predict and analyze potentially deleterious effects on coral ecosystems and moreover provide a platform to analyze scenarios to mitigate them. As will be seen in the remainder of this report, many of our ambitious targets were met, thanks in no small part to good weather which allowed us to make maximum use of the JAGO submersible, a first class research tool. In addition to the comprehensive surveys of Røst Reef, we also carried out similar surveys of poorly described coral reefs areas at Traeno and Sotbakken and looked for (but didn't find) reef systems at Floholmen.

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