Palaeo-environmental variability in Holocene cold-water coral reefs in Stjernsund, northern Norway

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Fig. 1: Map of northern Norwegian fjordsystems with the Stjernsund highlighted. This 30 km long and 3.5 km wide glacial trough, comprises a prominent Late Glacial terminal moraine (~13 ka BP), colonized today by cold-water corals linked to bathyal North Atlantic water inflow.

Overview and aims

During RV Poseidon cruise POS-325 in 2005 the world's northernmost cold-water coral province has been explored in great detail. One of the key-sites was the Stjernsund-Fjord at 70°N in the West Finnmark District, northern Norway (Fig. 1). There coral mounds of *Lophelia pertusa* are situated at 260 to 235 m depth ontop of a Late Glacial terminal moraine, which forms a 350 m high sill. Its crest comprises a current-swept environment, influenced by tides and ambient water temperatures of 5 to 6°C. The currents provide a steady nutrient flux and inhibit sedimentation. A series of gravity cores has been taken in an E-W transect (Fig. 2) across the sill, to investigate the geological and climatic history of the Holocene coral mounds and the deglacial ice-stream retreat. Palaeoceanographic and facies changes are currently reconstructed using benthic foraminiferal assemblages in the coral mound core POS-325-472 and the fjordbasin core POS-325-482.

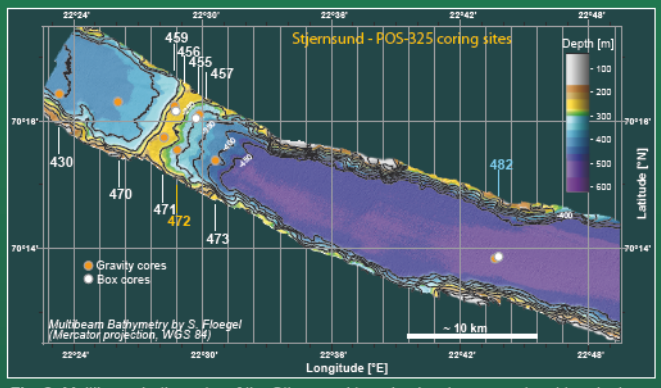
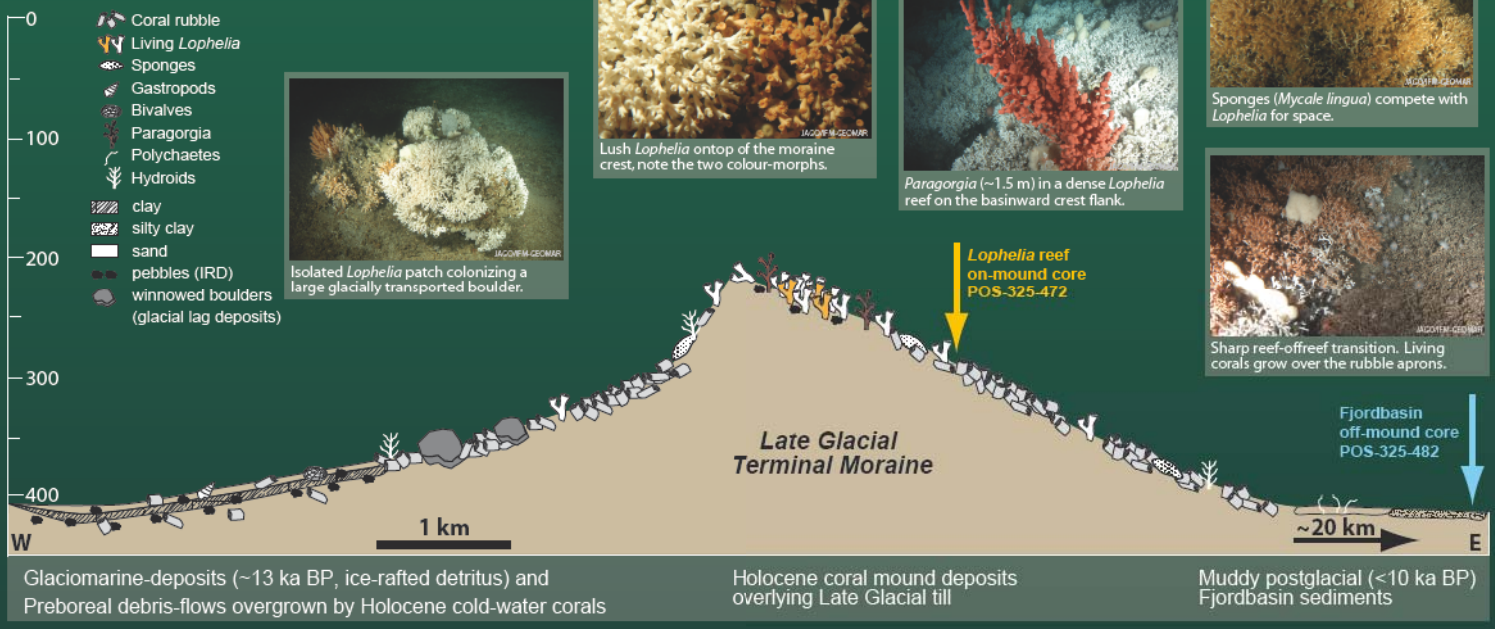


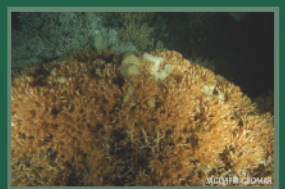
Fig. 2: Multibeam bathymetry of the Stjernsund trough, showing a prominent terminal moraine ridge at ~250 m, forming a sill across the up to 600 m deep fjordbasin. Glacier flow during the Last Glacial was oriented east-west. Gravity cores and box cores yielded a facies transect. The postglacial sediments of the coral-mound core (472) and the fjordbasin-core (482) are investigated in detail for paleoceanographic reconstructions.

Sedimentary facies, habitats and benthic fauna



Lush *Lophelia* ontop of the moraine crest, note the two colour-morphs.

Paragorgia (~1.5 m) in a dense *Lophelia* reef on the basinward crest flank.


Sponges (*Mycale lingua*) compete with *Lophelia* for space.

Sharp reef-offreef transition. Living corals grow over the rubble aprons.

Isolated *Lophelia* patch colonizing a large glacially transported boulder.

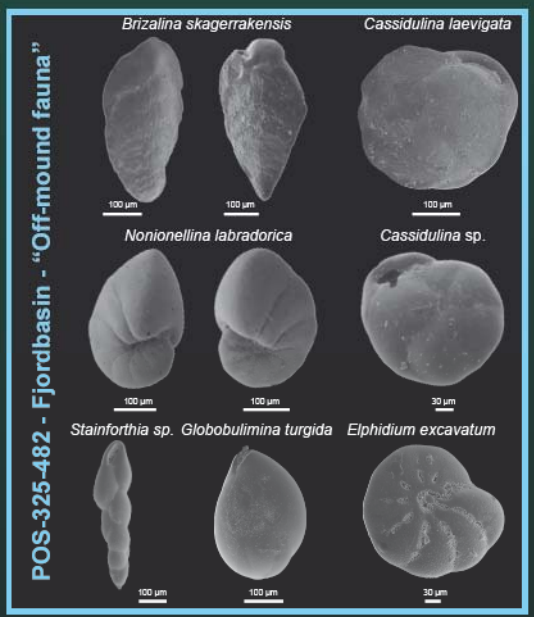
Glaciomarine-deposits (~13 ka BP, ice-rafted detritus) and Preboreal debris-flows overgrown by Holocene cold-water corals

Holocene coral mound deposits overlying Late Glacial till

Muddy postglacial (<10 ka BP) Fjordbasin sediments

First conclusions and outlook

- Cores and Jago-submersible transects revealed a complex facies zonation with life reefs, eroded coral rubble, basin-muds and glaciomarine deposits.
- Several on-mound cores show the contact with the underlying till of the Late Glacial terminal moraine, suggesting a Holocene coral growth.
- Planktonic foraminifera are scarce in basin and on-mound cores, reflecting low primary production in the low saline upper water column.
- Benthic foraminiferal assemblages in the on-mound core (POS-325-472) are dominated by epifaunal attached species like *D. coronata* and *Cibicides* spp. Basin communities (POS-325-482) instead are dominated by (shallow) infaunal species like *B. skagerrakensis*, *C. laevigata* and *N. labradorica*.
- The coral mound core comprises several hiati, reflecting the current dominated setting.
- The postglacial record instead comprises a homogenous and continuous high-resolution sequence (60 cm/ka) in the fjordbasin, which is currently under investigation for stable isotopes.



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