

Second weekly Report on the RV SONNE expedition 256 (TACTEAC)

Monday, April 24th to Sunday, April 30th

We started with a systematic EM710 multibeam and Parasound survey over the One Tree shelf lying to the east of the Capricorn-Bunker Group of islands in the southern Great Barrier Reef (GBR). The surveyed area was ~109 km² with depths ranging from 50 to 200 m revealing the shelf break together with multiple terraces and numerous low pinnacles. On Monday morning, we continued with the video telemetry in the southern part of the third working area (GeoB22209, 152° 11' E, 23° 25' S). We traversed southeast for about 300 m over the top of a ridge (paleo-reef) structure at 90 m water depth. The substrate was mainly covered by soft sediments with isolate patches of limestone outcrop covered by attached biota (e.g. sponges, red coralline algae). More complex pinnacle structures occurred towards the end of the traverse with their sides and tops characterised by rough substrates and abundant attached biota. We continued the survey of the 90 m deep ridge towards the east over the front of the seaward facing, 10 m high cliff. Both the top and the cliff edge were covered by abundant attached biota similar in composition to the preceding transect.

We sampled the northern part of the study area with a giant box corer (GBC) at 90 m water depth and recovered rather homogenous medium to coarse carbonate sand with few pebbles on top and abundant benthic foraminifera. Sediments were recovered with a gravity corer (GC) deployed at 120 m water depth followed by two GC deployments at 200 and 240 m water depth (recovery between 5 and 6 m) on the way to the Capricorn Channel further east. The broad Capricorn Channel separates the outer-shelf Swain Reefs from the inner-shelf. The overnight survey along a scarp rimming the channel in ~200 m revealed drift deposit-like sediments on the downslope side and low pinnacles on the upslope platform. We sampled the southern part of the channel at 340 m water depth with a GC recovering more than 5 m of sandy to clayey mud, and the northern part of the channel with a GBC and two GC at 120 m water depth and recovered clayey sand with patches of ooids.



Gravity core GeoB22218-1 being recovered (left) and described/sampled (right) on deck.

On Tuesday 25th April, we transited around the eastern side of the Swain Reefs over the South Marion Plateau, stopping briefly for a camera survey over a previously mapped patch of low pinnacles lying in 100 m. We rounded Elusive Reef at the northeast tip of the Swain Reefs on Wednesday 26th April and crossed onto the North Marion Plateau in about 350 m. There, we recovered the top ~9 m of sediment at the ODP site 194 (GeoB22218-1, 152°48' E, 20°54' S). We crossed the tail of a large submarine landslide, sourced from the GBR shelf, to the west of Elusive Reef. We continued along the plateau for Hydrographers Passage and the Southern Queensland Trough and deployed one GC in each area before arriving at the Gloria Knolls, which are the remains of large submarine landslide from the GBR margin. The knolls appear as a cluster of eight large debris blocks up to 179 m high lying in depths of ~1200 m. The Parasound revealed lens-like chaotic internal strata within the largest knoll that could be a bioherm and now buried with hemipelagic sediments. We deployed a CTD-rosette water sampler followed by a multiple corer (MUC) with the video-telemetry for surveying and recording this sampling technique. With a GC, we recovered the top 6 m of sediments before heading to the Ribbon Reefs. Underway in the Central Queensland Trough, we deployed two GCs in order to collect mass wasting deposits and hemipelagic sediments in close vicinity.



Deployment of the multiple corer with the video telemetry system (left) and a snapshot of the sampling technique on Gloria Knolls (GeoB22222-2).

From Friday 28th to Sunday 30th April, we conducted extensive swath mapping near the Ribbon Reefs on the northern GBR margin. Depths ranged from 400 m on the upper slope to depths over 2000 m, heavily incised with a submarine canyon system, and draining into the relatively flat Queensland Trough. An unusual finding were trains of small debris blocks stretching across the floor of the trough, presumably sourced from mass wasting at the foot of the canyons. These block trains have moved over 20 km in places from their source. We sampled the Ribbon Reef working area with CTD-rosette, several MUCs and GCs in a depth transect from 800 m to 2200 m.

After a busy week, we are now commencing a long transit to our final working area in the far northern GBR opposite Cape York.

With warm regards from the crew and the scientific party of SO256,

Mahyar Mohtadi