

## SO270 MASCARA

### Weekly Report 5 – 23<sup>rd</sup> Sept. to 5<sup>th</sup> Oct. 2019

During this report period, we continued the scientific data acquisition in the main working area, the Saya de Malha Bank. From September 29<sup>th</sup> to October 2<sup>nd</sup>, we conducted a seismic survey in the two working areas in the southern part of the Saya the Malha Bank (WA-2 and WA-3). WA-2 is of particular interest for the project as this is the area where internal waves approach the platform from the southwest. Understanding the sedimentary processes associated with these internal waves is one of the main aims of the expedition. WA-3 includes the passage that separates the Saya the Malha Bank from the Nazareth Bank in the south. Here, seismic data will help to understand the potential structural control on platform development.

The seismic- and hydroacoustic survey data were also instrumental to select a series of sediment sampling stations covering a deep- (basin) to shallow-water transect (platform edge to inner platform). The aim of this part of the project is to document the sediment distribution across the carbonate platform in order to understand why the present-day Saya de Malha platform does not show any reefal environment situated close to present-day sea level but instead shows carbonate sediment production in fairly deep water.

The following stations were selected to document the sediment distribution: (i) a deep-water station at slightly over 2,000 m water-depth, where we looked for the mix between sediment export of fines from the platform and the input of biota living in the open ocean like planktonic foraminifera and pteropods (aquatic snails); (ii) two stations covering the transition from the steep slope, angles up to 30 degrees, to the edge of the carbonate platform. This section starts at approx. 300 m and finishes at approx. 100 m of water-depth and was characterized by a gradual 1-degree slope. The sediment at the deepest station consists of fine-grained well-sorted bioclastic sands with abundant pteropods, planktonic and benthic foraminifera. The shallowest station displays medium grained, poorly-sorted bioclastic sand (grainstones) with pelagic components such as pteropods and planktonic foraminifera but also Halimeda and coral fragments; (iii) the following two stations covered the shallowest part of the platform with water-depths between 45 to 60 m. The sediments of these stations were dominated by coralline algae (Fig. 1) and large benthic foraminifers; (iv) the succeeding three stations disclosed the transition from the shallow section to the inner lagoon with a water-depth of around 110 to 130 m. Fine-grained wacke- to packstone with abundant planktonic foraminifera and some sponge spicules characterized this sedimentation area; (v) the final station along the E-W profile addressed a single shallow high of the otherwise fairly deep lagoon, water-depth approx. 75-80m. The recovered Sedi-

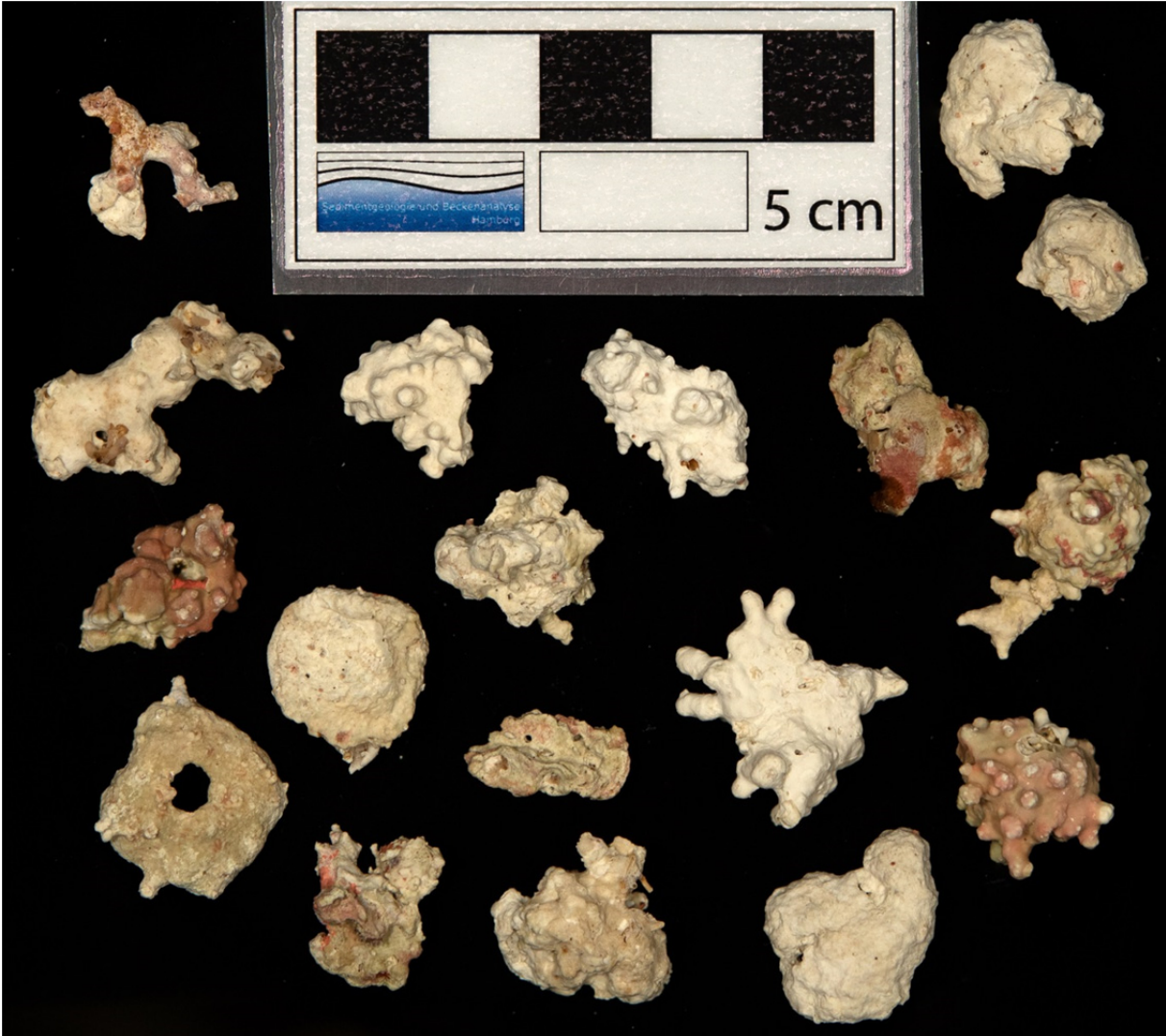


Fig. 1: Variety of coralline algae nodules from the shallower parts of Saya de Malha Bank.



Fig. 2: Sea floor on the Saya de Malha Bank at a water depth of 75-80 m as recovered by the box corer.

ment classifies as a grainstone following the Dunham classification of carbonates and contained large benthic foraminifera and some coralline algae (Fig. 2).

The shallower stations show a clear dominance of coralline algae and large benthic foraminifera in contrast to the deeper stations. This might be related to the reduced light at the sea floor as the result of comparable great water depths and turbidity within the water column in this area, and probably represent mesophotic conditions (low light) favouring the large benthic foraminifers and coralline algae production.

During October 3rd we have sampled the sea floor at two stations located in the southwest of the platform at water depths of 1400 and 800 m. At the first station, we recovered a 4.5 m long sediment core. At the second station, the gravity corer remained empty, most likely as the result of the more coarse grained sediment in the proximity of the platform slope.

In the early morning of October 4<sup>th</sup> we reached a station scheduled for 24 hrs of continuous ADCP (Acoustic Doppler Current Profiler) and CTD measurements as well as recording of the water column using the multibeam echosounder. These measurements aimed on a better understanding of the internal waves. These waves propagate along discontinuity layers in the water column and are expected to move sediment if they break along the shoaling margins of the Saya de Malha Bank. We remained at this station until midnight and were able to observe the passage of internal waves with amplitudes of up to 35 m.

At the moment we are performing hydroacoustics along the southeaster slope of the bank. This data should clarify the local transport paths for sediment from the platform to the basin. During the following days we plan to obtain additional seismic data in the south of the Saya the Malha Bank to connect our seismic survey with the two ODP sites 705 and 706 located south of the bank. Afterwards we will return to working area WA-2 and the interior of the platform to complete our sampling transects and to connect them. Doing so, we will also deploy the OFOS (Ocean Floor Observation System) to allow for a visual inspection of fauna and sediments at the sea floor. We are pretty confident that the dataset that will be obtained will reveal the main cause for the present-day mesophotic status of the Saya de Malha Bank.

All onboard are fine.

In the name of all cruise participants

Sebastian Lindhorst, Chief Scientist

Institute for Geology, University of Hamburg