

## SO270 MASCARA

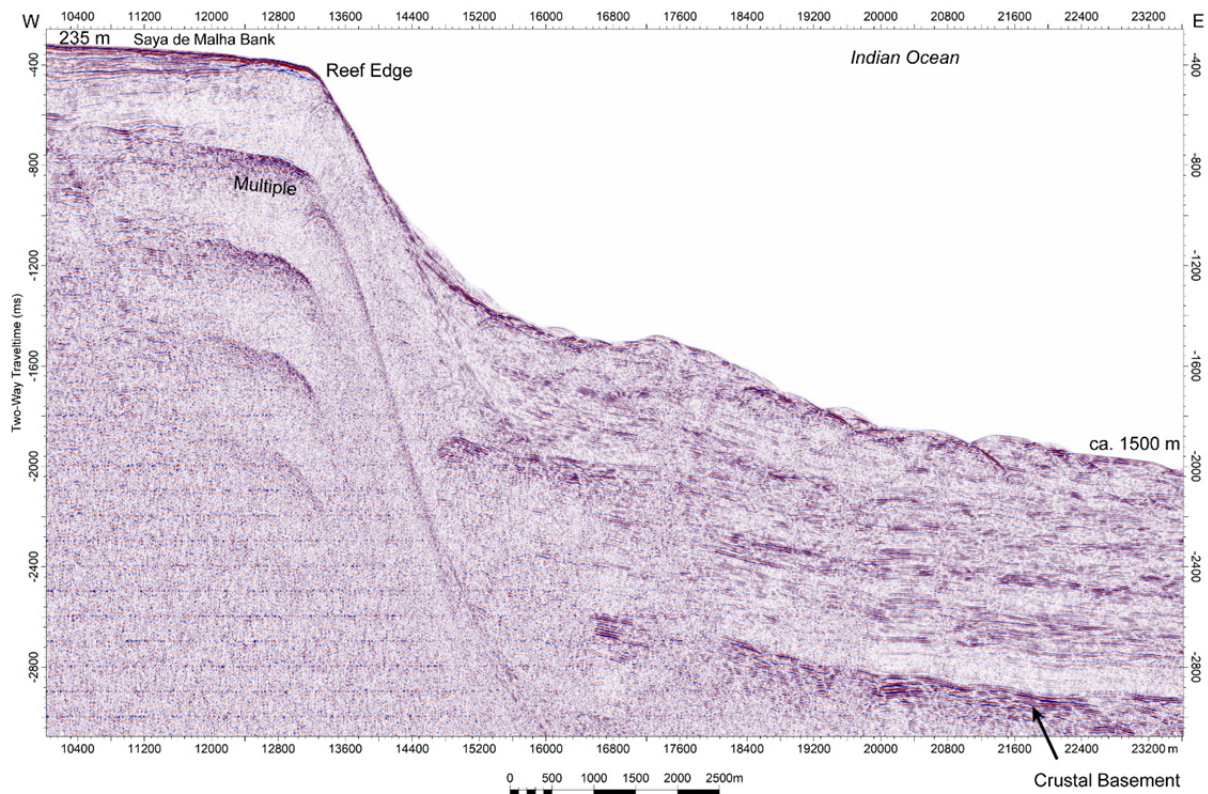
### Weekly Report 6 – 6<sup>th</sup> to 12<sup>th</sup> Oct. 2019

This report period started with the continuation of our work in the southern part of the Saya de Malha carbonate platform. At the end of the week, we have made our way through the entire platform and are now in the north-western working area WA-4.

After finishing hydroacoustic mapping of the south-eastern slope of the platform on October 6, we deployed the digital streamer and the acoustic sources and started a reflection seismic survey. This seismic survey aimed on linking the stratigraphy of ODP (Ocean Drilling Program) Sites 705/706, located south-east off the platform, with our seismic data from Saya the Malha Bank. However, already in reach of the sites, a technical problem emerged with the digital streamer, which finally needed to be recovered.

Nevertheless, seismic data acquisition during this expedition was very successful with 1750 km of multi-channel reflection seismic lines measured until now. This data provides insight into the sedimentological and structural architecture and the stratigraphic framework of the Saya de Malha carbonate platform. Figure 1 shows a seismic cross section from the distal to the proximal part of the eastern margin of the Saya de Malha Bank. The slope is characterized by a very steep upper segment, with slope angles exceeding 20°. In its middle part, the cemented slope is buried under an 850 m thick wedge of peri-platform sediments. They overlay the crustal basement which could be identified in the seismic data due to its rough relief and the strong impedance contrast marked by high amplitude reflections. At ODP Site 706 this basement is composed of basaltic volcanics. The sediment wedge at the eastern slope of Saya de Malha is characterized by the alternation of well stratified sediment packages with intercalated mass transport deposits, especially in the uppermost part where slump deposits dominate. The edge of the platform is located at a water depth of ca. 240 m and is marked by a drowned fringing reef. Towards the interior of the platform, this old platform is overlain by a truncated sediment wedge. Data show that the platform margin stepped back with time; and that the producing areas constantly decreased as a result.

In the course of October 7, we started hydroacoustic mapping in the southwestern part of Saya de Malha Bank. This survey continued through October 8 and covered the platform slope as well as parts of the marine channel between Saya the Malha and Nazareth Bank. The data allow estimating the impact of the strong ocean currents onto the slope architecture of the bank. Data further show that old drift sediment bodies are located at the toe of slope. These drifts, however, are not active at the moment and are incised by numerous deep canyons. We recovered two gravity cores from these drifts, which will help us to determine the age of these deposits.



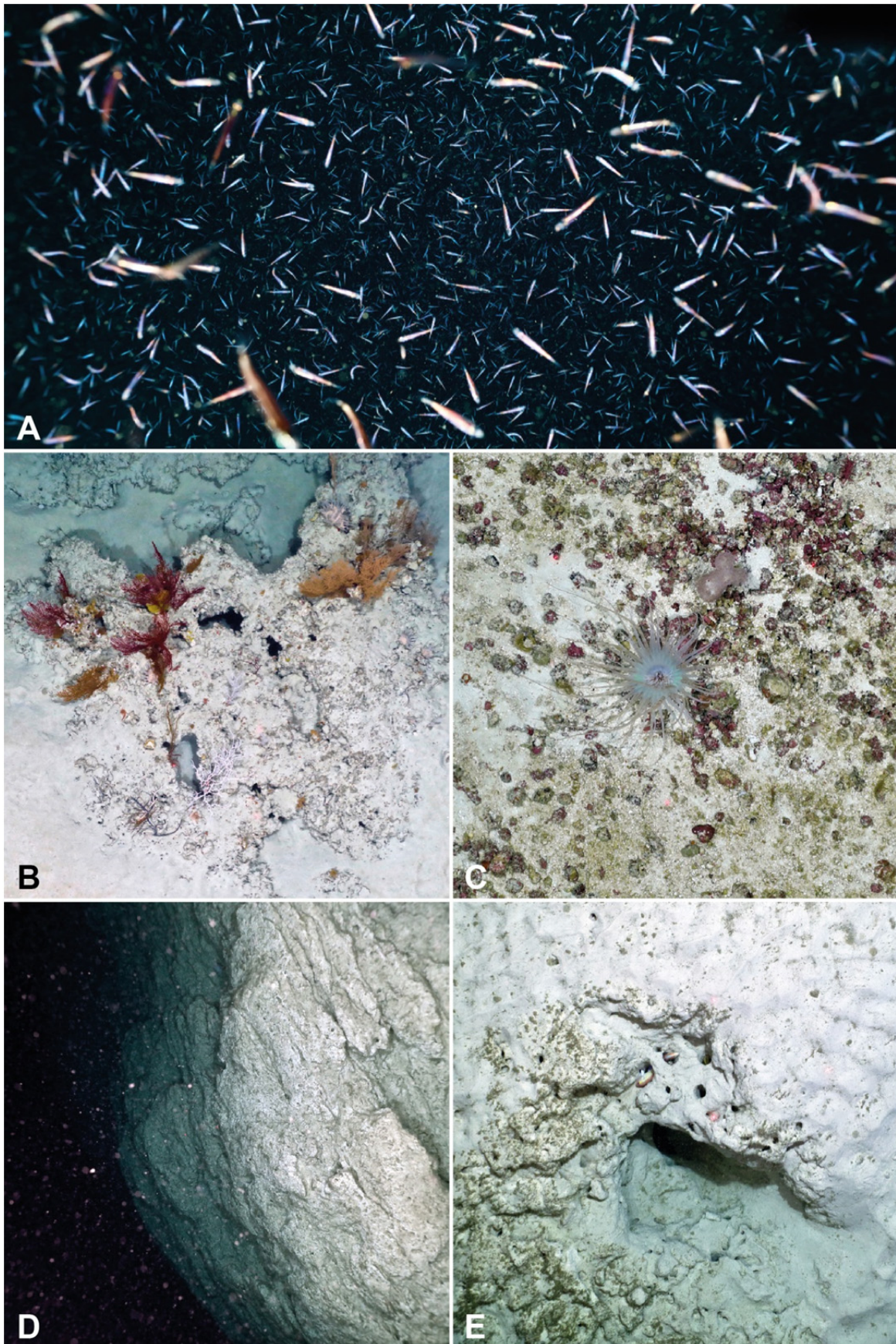
**Fig. 1:** W-E striking seismic profile over the eastern margin of the Saya de Malha carbonate platform. Vertical axes are in two-way-traveltime (TWT).

A longer sampling program started in the afternoon of October 8 and leads us from the south-western tip of the platform through the inner platform towards working area WA-4, located at the northwestern margin of Saya de Malha. Sedimentological sampling continued until October 11, two times interrupted by longer OFOS (Ocean Floor Observation System) transects. OFOS data will help us to interpret the sediment samples in a larger context, and to obtain a better image of sediment- and faunal distribution on the modern carbonate platform (Fig. 2). Photos and videos of the sea floor are furthermore valuable for the interpretation of bottom current strength and direction, which could not be measured with the shipboard ADCPs.

After finishing the sedimentological program in the early morning of October 11, we started hydroacoustic mapping of the western slope of Saya the Malha. The data obtained so far show an impressive system of deep canyons and we are curious how the upper courses of these channels are connected to the platform.

The MBES and Parasound survey is scheduled until the late evening of October 12. We will then approach a station off the platform, where we plan to sample the sediments of a submarine fan, located in front of one of the canyons, at a water depth of 2500 m. The expected samples will help us to understand the current-controlled sediment export of the Saya the Malha carbonate platform. Subsequently, we will perform a seismic survey over the western margin of the platform to better understand the present sedimentary architecture.





**Fig. 2:** Views of the sea floor of Saya de Malha bank. **A)** Shoal in a paleo-sinkhole 120 m beneath the sea floor (water depth 400 m); **B)** hard ground with corals (280 m); **C)** coralline algae and sea anemone (80 m); **D)** view down the wall of a paleo-sinkhole (280 m); **E)** burrow in partly lithified sediments (280 m).

We will use the remaining days to further complete our data set and to refine information on selected topics. We are very satisfied with the course of the expedition and believe that the data obtained will bear the potential not only to test all of the hypotheses raised in the project proposal, but also to address scientific questions beyond. These achievements, however, were not possible without the outstanding support provided by the entire crew of RV SONNE.

All onboard are fine.

In the name of all cruise participants

Sebastian Lindhorst, Chief Scientist

Institute for Geology, University of Hamburg