

MSM 16-3, PHAETON

2. Weekly report

1.11.-8.11.2010

Mon 1.11.2010

During the second week the research activities continued in the Golfe d'Arguin area. After the day of zodiac work in the Baie du Lévrier on Sun 31.10.2010, Maria S. Merian passed a quiet night in the bay just opposite the port of Nouadhibou. On Mon morning, the Zodiac was deployed for a second excursion to the shoals of the bay with water depths of about 8 m. This second excursion took place some miles further south. The Innomar-data again clearly showed the Holocene sediment cover overlying the assumed land surface of the last glacial. The Holocene sediment forms large-scale dunes. The reworked character of the sediment was confirmed by sediment sampling. The material on the shoals is moderately sorted bioclastic sand of a yellowish color. Live specimens of carbonate producing organisms were not recovered. The sediment in the adjacent deeper areas (<20m) is fine-grained and organic-rich. At the same time, from the Maria S. Merian sediment was sampled in water depths of some 30 m. In the fine-grained organic-rich sediment, chemosynthetic bivalves were found that are typical of reducing H₂S-rich environments. These include live *Solemya* and lucinids. The ship left the Baie du Lévrier before dusk.

During the night, the wind slightly caught up. A parasound profile was measured roughly along the 40 m isobath of the Golfe d'Arguin to complete and connect the grids measured during the first week.

Tue 2.11.2010

During daylight time, vibrocoring and gravity coring took place off the central Banc d'Arguin. Cores were taken in water depth of 23-85 m in order to obtain archives of the Holocene evolution of the shelf, i.e. the post-glacial flooding and the climate evolution during the Holocene. At the shallow positions, coarse carbonate sediment was recovered. At the base of the cores, cemented quartz sand occurred, tentatively interpreted as shoreline or beach related to the Holocene flooding of the gulf. Outer shelf cores recovered finer-grained, dominantly silty material redeposited in mudbelts.

The northernmost major submarine canyon off the Golfe d'Arguin, the Tandouret Canyon, was mapped during the night in order to prepare the ROV dive of the next day. Mound structures were detected as well as ridges on the canyon flank that appear promising targets for the study of deep-water corals. Two CTDs were run for gaining a better understanding of the current regime and the water masses in the canyon.

Wed 3.11.2010

The ROV was deployed in the Tandouret Canyon on one of the mound structures mapped the night before. The ROV encountered abundant live *Lophelia*, large numbers of crabs and fish. The healthy state of the coral bioherms reminded of the ROV dives of the first week and again demonstrated that the notion that the reefs off Northern

Mauritania are just the remains of glacially flourishing reefs has to be revised. Samples of the *Lophelia* bioherms were taken with the ROV.

During the evening and the early night, the bioherms were further sampled by means of box coring. The bioherms appear strongly cemented so that the recovery was moderate. Stiff muddy sediment adjacent to the coral mounds provided an interesting chemosynthetic macrofaunal taphocoenosis dominated by *Lucinoma* (possibly *L. myriamae*) and thyasirid and vesicomid (*Isorropodon*) bivalves. After a shallow CTD, the parasound profiling along the 40mwd isotbath of the Banc d'Arguin was continued. It visualizes the internal structures of the mudbelt depocenter – a complicated succession of prograding sediment bodies and erosive surfaces that reflect the complex glacial-interglacial story of the northern Mauritanian shelf.

Thu 4.11.2010

The zodiac was deployed on the southern Banc d'Arguin just west of the positions of the first week in order to study the shoals of this part of the bank. The pattern of a roughly 10 m thick Holocene sediment unit overlying an erosive surface was repeated. Sampling recovered coarse carbonate sediment with abundant entire tiny sand dollars and barnacle colonies on bivalve shells. The shoals here thus act as active carbonate factory. However, even in the shallowest positions of as little as 4.5 mwd, no indication of photic carbonate production was encountered. The only photic organism in this depositional system appears to be the seagrass whose presence in shallower landward positions is indicated by floating leaves and stems. The absence of photic carbonate production seems to be a direct effect of the low water transparency and thus low light penetration – the secchi disk visibility is as little as 1.5 mwd. For comparison: oligotrophic waters tropical waters show secchi disk visibilities of up to some 60 mwd. At the same time, grab sampling from the Maria S. Merian recovered carbonate-richer and coarser sediment than at previous comparable sites.

During the late afternoon, a safety exercise of the crew took place. In the evening, the observer Abdoul Dia of IMROP gave a presentation on the geology and society of Mauritania. At night, a relict landscape below the Holocene cover off the central Banc d'Arguin was mapped with parasound. Small scale relic structures appear to represent an erosive land surface, assumably of last glacial age.

Fri 5.11.2010

The last zodiac expedition of this cruise took place on the central Banc d'Arguin in comparably deep water depths of up to 25 mwd. The target of the acoustic mapping was the possible early Holocene beach ridge or foreshore structure apparent as spit on the bathymetric chart. This feature that has possibly formed during early Holocene sea-level rise was previously encountered as cemented quartz sand during coring on Tuesday this week. The acoustic data confirm the presence of a indurated ridge, but further study of the data is required before definite interpretation. Sediment sampling recovered reddish reworked coarse-grained carbonate. Live fauna included abundant large hermit crabs inhabiting eroded gastropod shells with bryozoan encrustation. The water is more transparent here than in the Baie du Lévrier and on the southern Banc d'Arguin, and secchi disk visibility here reaches 5-7 mwd. The samples taken from Maria S. Merian are

coarser-grained than elsewhere near the Banc d'Arguin and contain abundant biogenic carbonate.

In the evening, vibrocoreing was planned for sampling the outer Arguin mud wedge, however because of technical problems with the vibrocorer the station had to be aborted. The remaining night, a parasound survey and multibeam mapping took place that led to the discovery of a chain of mounds in some 1000 mwd that are reminiscent of coral mounds. The night work was completed with a 1000 mwd CTD.

Sat 6.11.2010

During Saturday, positions on the small mud wedge between the Arguin and Timiris mud wedges were sampled by means of box coring, gravity coring and vibrocoreing. Cores of up to 11.5 m length were recovered that are expected to cover the entire Holocene sediment succession continuously and in high resolution. A highlight of this week was the recovery of the first live specimens ever of the large deep-water chemosynthetic bivalve *Lucinoma myriamae*.

During the night, the deep mound chain was mapped in detail in order to assess the probability that these structures are composed of coral buildups.

Sun 7.11.2010

As the multibeam map of the deep mound chain showed promising structures it was decided to ground truth the assumption by taking sediment samples from 1300 to 1300 mwd from within the outer canyon systems. However, all positive seabed reliefs encountered with the giant box corer showed consolidated clays, some sprinkled with deep-sea barnacle plates – but no corals. In the evening we steamed towards an inner canyon head to complete grab sampling on a fossil mound that was surveyed on the occasion of the first ROV dive.

The work proceeds well, the scientists are by now familiar with the sedimentary system explored and thus new questions arise, curiosity is high, scientists and crew collaborate very well, and the atmosphere on board the ship is continuously good.

Prof. Dr. Hildegard Westphal
Chief Scientist on Maria S. Merian



Cap Blanc, Mauritania.



Claudia Wienberg collects the live fauna from the surface of a box core.



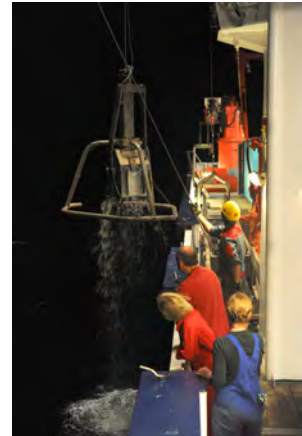
Live *Lophelia* specimens in the sample box of the ROV.



After a long working day: Guillem Mateu, Hendrik Lantzsch, Oliver Mund, Brit Kockisch, Tomas Lundälv, Stephen Schilling, Hildegard Westphal, André Klicpera, bosun Norbert Bosselmann, Philipp Meyer, Stefan Braun, Corinna Schollenberger.



Happy Birthday to André Klicpera, Manfred Boy, and Hendrik Schmidt!



Night box core

All above photographs: Nereo Preto



Congratulations to the Mauretanian observer Abdoul Dia to the birth of his first son

Sileye Abdoul Dia (*3.11.2010)