



**SO258 Leg 1**  
**INGON**  
**Weekly Report No. 2**  
**(12.06. – 18.06.2017)**



**R/V SONNE**  
15°54'S / 87°01'E

The second week of R/V SONNE cruise SO258 leg 1 was characterized by different biological experiments and the long transit to the first working area of the geologists. On the one hand, the series of trawls was continued with nine further deployments in order to study adaptations of sensory systems in the mesopelagic fauna with special focus on the visual systems and their perception of bioluminescence. Catches were brought on board during darkness so damage to the eyes or bleaching of visual pigments was avoided. All trawls contained numerous and diverse species of fish (lanternfish, viperfish, hatchetfish, anglerfish, barreled dragonfish), and also an unexpected richness in squids, octopuses, and shrimp.

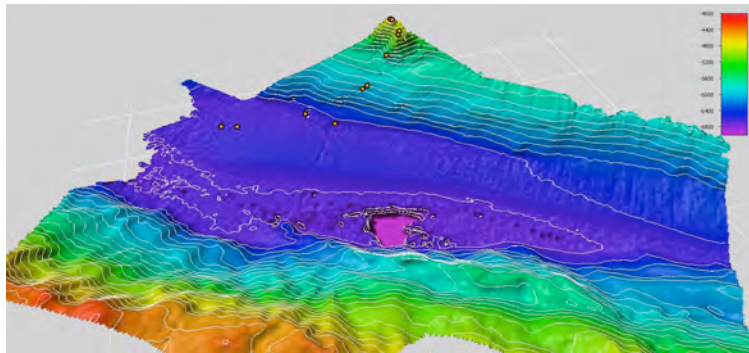


Catches of the trawls:  
Top: Barbled dragonfish  
*Foliacanthus* sp.;  
detail: luminous organ at the tip of the barbel; head with photophores. Bottom left: Hatchetfish  
*Sternoptyx* sp.; right: Anglerfish (photo: Wensung Chung)

Most animals were dead on recovery and were used for molecular biological and histological sampling. However, in general, some animals were still alive, allowing for several types of physiological and physiochemical experiments. Preliminary results indicate that regeneration of rhodopsin does in fact occur in deep-sea rods, although with dynamics different from surface fish. Another type of study explores the auditory abilities of mesopelagic fish - a study never attempted before. Our first electroaudiograms indicate a shift from high frequency sensitivity breaks in e.g. reef fish to middle to low frequency sensitivity maxima in mesopelagic fish.

From Sunday to Wednesday, the Newcastle University fleet of 5 benthic landers were deployed 11 times between 4,700 and 6,500 m in the vicinity of a deep seafloor depression at 22°S by 110°E. The landers are a combination of baited video and still camera landers and baited traps. The team successfully collected specimens of amphipods from all baited trap stations including two sets of samples from as deep as 6,500 m. Some highlights from the baited traps included the recovery of a large natant decapod from 6,000 m, the recovery of a perfect specimen of the very rare ophidiid (cusk eel) *Bassozetus* sp. and the discovery of two hadal (<6,000 m) amphipod species from the deepest parts of the depression (*Hirondellea* spp.). The significance of the *Hirondellea* spp. relates to one of the main objectives of this study to disentangle the effects of pressure alone and the effects of topography. The West Australian Basin is hadal, in that it exceeds 6,000 m, but it does not represent the large subduction trenches more typical of the West Pacific, therefore this cruise provided the opportunity to examine diversity and life history in a hadal setting that is not a trench. The

main result is that there are hadal species (likely to be new species) occupying the very limited space in the deep depression greater than 6,000 m even though the morphology of the area is vastly different to conventional hadal trenches. The landers were also used to characterize the benthic scavenging fauna and revealed a complete absence of the typical scavenging macrourids, but rather a community dominated by the cusk eel *Bassozetus* sp. and large natant decapods. Interestingly, on the video systems second deployment, the footage revealed that the seafloor was in fact a manganese nodule field. The physical samples will, on return to the UK, also be used to examine piezophilic pressure adaptation in the deep species and large-scale speciation in the more abyssal specimens, notably *Euthythenese gryllus* that we recovered from 4,700 to 6,000 m.



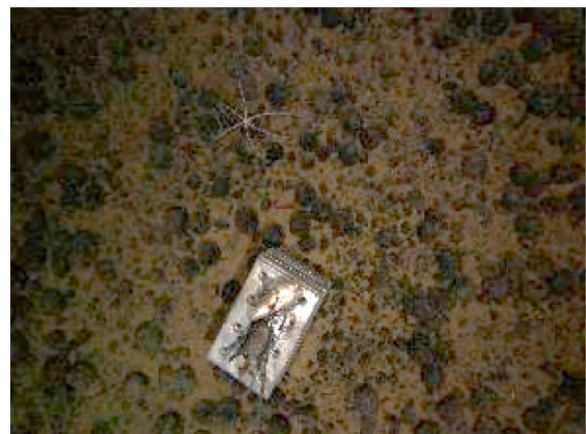
3D-map showing the multi-beam bathymetric of a part of a ~6,500 m deep depression in the West Australian Basin. The benthic landers have been deployed on the bottom of the depression and across its northern flank. Their positions are marked by small orange dots (color pattern: red = shallow, purple = deep).



The fish samples of the Ophiidid *Bassozetus* sp. (photo: Newcastle University)



A still image showing the cusk eels *in situ*. (photo: Newcastle University)



A manganese nodule field filmed by the camera-lander. (photo: Newcastle University)

During the night from Sunday of Monday, we will arrive at a seamount which will be first mapped and then sampled by dredging. In the upcoming week, we will focus on bathymetric mapping and hard rock sampling in different areas, some of which are completely unexplored to date. This week the weather was unsettled and occasionally rainy and windy. However, not least thanks to the efforts of the master and the crew of R/V SONNE, we were able to conduct almost all deployments as scheduled despite wind and waves. All cruise participants are doing well and send greetings to everybody at home.

Reinhard Werner, Jochen Wagner and the scientific party of SO258/1