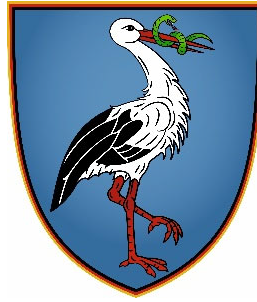


RV MARIA S. MERIAN

MSM126 “Jellyweb Madeira”

February 9 – March 4, 2024



3rd weekly report (February 19 – 25, 2024)

Background: The focus of cruise MSM126 “Jellyweb Madeira” lies on the pelagic deep sea, harboring the most extensive but also least explored habitats for life on earth. A particular knowledge gap in this system concerns the biodiversity and functional role of gelatinous zooplankton (the “jelly web”). With cruise MSM126, we aim to improve the understanding of deep sea biodiversity and of the structure and functioning of food webs, focusing on the marine systems surrounding Madeira Island in the Eastern Central Atlantic Ocean. To do so, we are conducting habitat and biodiversity exploration and dedicated food web sampling, using a wide range of established and novel in-situ observation (e.g., pelagic and benthic camera observation systems, remotely operated vehicle ROV PHOCA), remote sensing (multibeam mapping, ADCP), measurement (CTD and additional sensors) and sampling technology (various nets, ROV PHOCA samplers, water samplers). Samples are used for experimental approaches on board and for laboratory analyses including (meta)genomic and stable isotope analysis after the cruise. Our cruise consortium includes GEOMAR Helmholtz Centre for Ocean Research Kiel (lead), University of Southern Denmark, MARE Madeira/ARDITI Portugal, University of Hamburg, AWI Bremerhaven, Smithsonian Museum of National History, and the University of Western Australia.

Weekly report:

Overview: All cruise objectives for the period of February 19 – 25, 2024 were met, benefiting from continuous 24-hour operations without loss of working days, under continued good weather and sea state conditions and optimum working conditions on board.

Table 1 Gear deployments during cruise MSM126 between February 19 and 25, 2024, by priority working area (see Figure 1 for details).

Gear	Working area				Total	Purpose
	RID	CAN	PLA	EDD		
WS-CTD	15	19	5	5	44	Oceanographic profiles; water samples
BONGO	2	3	2		7	Shallow mesoplankton sampling (to 250 m)
IKMT	2	3	1		6	Meso- and macroplankton sampling (to 800 m)
MSN	7	5	4		16	Depth-resolved plankton sampling (to 1000 m)
PLA	8	6	1		15	(Gelatinous) plankton sampling (to 250 m)
WP3	1				1	(Gelatinous) plankton sampling (to 250 m)
WP2		1			1	Plankton sampling (to 250 m)
XOFOS	2	1	1		4	Optical Ocean Floor Observation System
PELAGIOS	2	1			3	Optical Pelagic Observation System
ROV	5	8			13	Optical observations; benthic & pelagic sampling
Total	44	47	14	5	110	

The spatial focus in the reporting period lay on the Ribeira Brava Canyon and the Plateau area on the central and western southern side of Madeira (Figure 1), which means that we have now extensively covered all three of our priority working areas of our cruise with mapping, optical observations, biodiversity and food web sampling, as well as the characterization of the physical conditions and current dynamics of these area (Table 1).

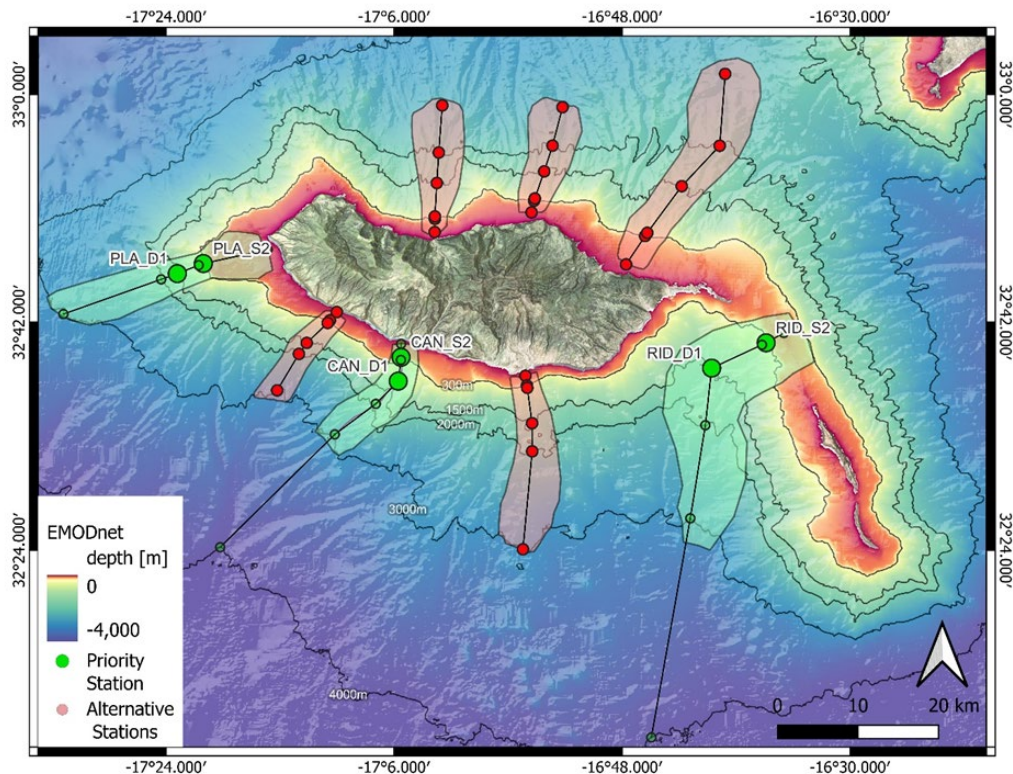


Figure 1 Working areas and stations of cruise MSM126. We have now covered all three priority working areas, the Madeira Desertas Ridge area (“RID”), the central Canyon (“CAN”) and the western Plateau (“PLA”). During the remaining days of the cruise, we will expand on mapping, observations and sampling on the central southern part of Madeira, with the CAN area and adjacent habitats.

Midwater observations and collections (report provided by Henk-Jan Hoving)

With this weekly report, we want to give insights on the deep sea observations and collections of fragile pelagic fauna with the remotely operated vehicle (ROV) PHOCA, one of the key work lines taking place during cruise MSM126.

ROV PHOCA allows us to descend and immerse in the deep sea and use the cameras on the vehicle to observe living deep-sea organisms in their natural habitat. During MSM126 we make use of this tool to document biodiversity in the midwater off Madeira. So far we have observed a wide variety of organisms including midwater fishes e.g. lanternfishes, dragonfishes, squids and crustaceans such as amphipods and shrimps. In particular we have been using the ROV to observe gelatinous fauna that are too fragile to capture with nets. This fauna includes the ctenophores, hydromedusae, siphonophores and pelagic tunicates. On MSM126 we are making use of specifically designed tools to collect gelatinous organisms. We have four so called detritus samplers, which are cylindrical chambers that can be opened and closed with a hydraulic arm on the ROV. The ROV positions the chamber around the target organism, and then closes the lid, capturing the living organisms and its surrounding water. Another midwater ROV tool is the suction sampler, which was designed by GEOMAR ROV pilots

and uses suction from a pump to slurp up an organism. Once captured the animal is carefully blown into one of the six chambers that are positioned on the front of the vehicle. The capture of pelagic animals is challenging due to the orientation in a three-dimensional space with two dimensional cameras. Also, the gelatinous animals are often very delicate and light as a feather. Therefore, the collection of midwater organisms requires patience as well as extensive maneuvering and operational skills by the ROV pilots. Using the midwater collecting tools, we have been collecting animals that we would have never captured in the nets. We observed and captured organisms mostly at depth from 400 to 1000 m, in the mesopelagic zone (Figure 2, 3). During MSM126 we have also seen amphipods on jellies, in a symbiotic relationship. These kind of deep-sea biological associations can only be revealed by studying animals in their natural environment. At the end of the dive and back on board, all of the animals are first photographed or filmed, some are used to measure oxygen consumption, others are used for experiments to study their vision and many are used for food web analysis. The use of ROV PHOCA on MSM126 (Figure 4) is providing us with unique biological insights and samples and we look forward to explore the deep water column of the Madeira deep-sea ecosystem in the remaining days.

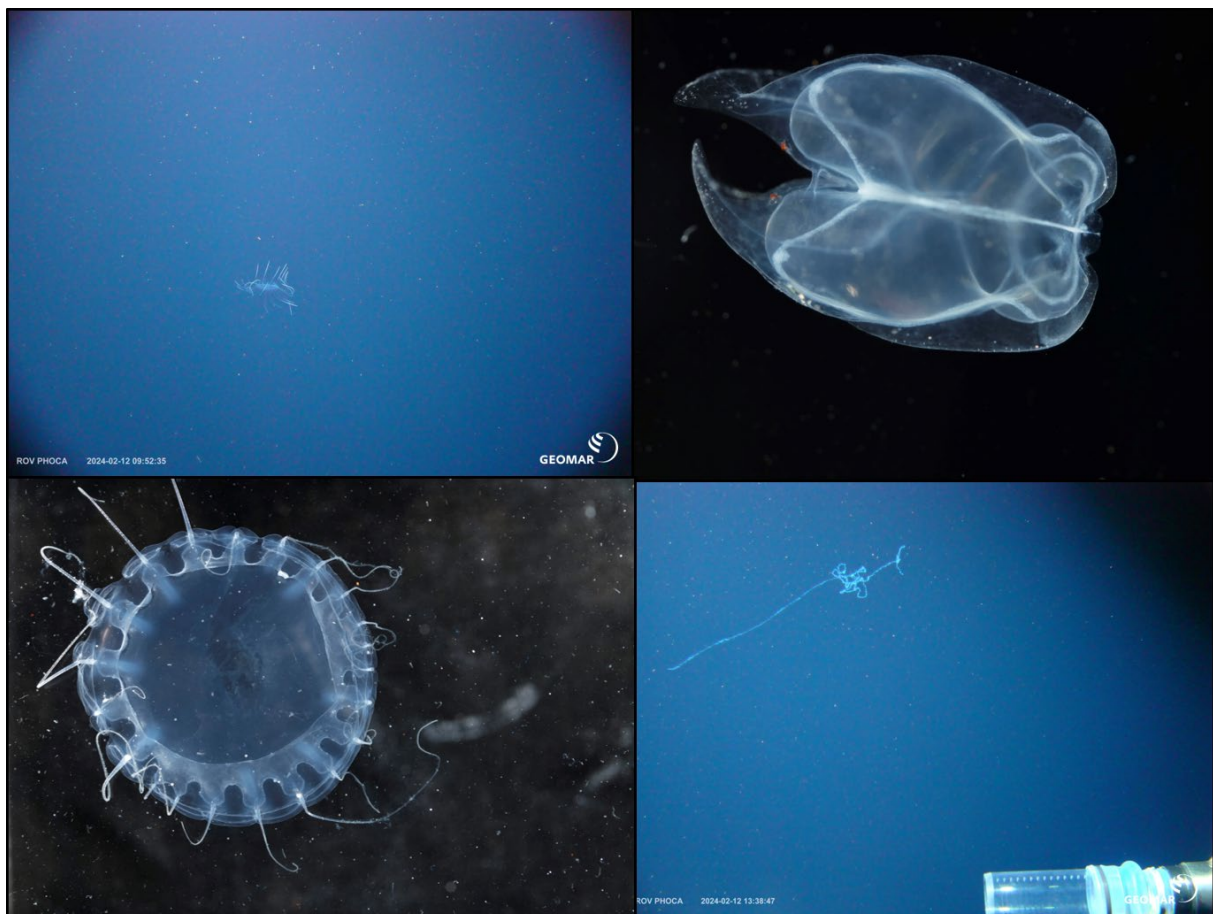


Figure 2 Midwater organisms photographed in-situ in their natural habitat during the capture with ROV PHOCA (top left, bottom right) and in the laboratory on board (bottom left, top right). Left side: the diner plate jellyfish *Solmissus*; right side: a siphonophore, with the top panel also showing the suction sampler of the ROV, bottom panel providing close up of part of the animal. Photos in situ: GEOMAR ROV team; laboratory: Karen Osborn

Outlook: In the remaining five full working days of our cruise, due to strong northerly winds and swell, we will focus on the protected Ribeira Brava Canyon working area. Here, we will extend multibeam mapping to deeper areas up to 3000 m, expand optical observations with ROV PHOCA and the XOFOS system, expand the extensive biodiversity and food web sample set of midwater organisms compiled over the duration of the cruise with additional ROV PHOCA and net deployments, and retrieve the benthic food fall experiment set out in week two of the cruise with ROV PHOCA.

Greetings from on board RV MARIA S. MERIAN on behalf of all participants,

Jan Dierking (Chief scientist MSM126)
GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany



Figure 3 ROV PHOCA deployment during cruise MSM126. Photo: Dierking



Figure 4 Midwater visitor: a squid above the detritus sampler of the Remotely Operated Vehicle (ROV) PHOCA. Photo: GEOMAR ROV team.