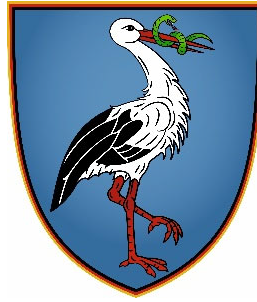


RV MARIA S. MERIAN

MSM126 “Jellyweb Madeira”

February 9 – March 4, 2024



2nd weekly report (February 12 – 18, 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: During the period of February 12 – 18, 2024, we have continued 24-hour operations, benefiting from near flawless performance of all gears, good weather and sea state conditions and the fantastic working conditions on board. This has allowed us to complete all planned gear deployments and objectives (Table 1, 2) in the first of our three priority working areas, the Madeira Desertas Ridge (Figure 1), on February 16 at 16:30 UTC, exactly on schedule.

Specific work has included the completion of the multibeam mapping of the topography of the entire Desertas Ridge working area, daytime and nighttime biodiversity and food web sampling with diverse nets and the water sampler on the deep 1500 m (RID_D1) and shallow 300 m (RID_S2) priority stations, pelagic (PELAGIOS) and sea floor (XOFOS) optical surveys, the latter from 70 down to 1200 m depth, as well as successful pelagic and benthic ROV deployments for optical biodiversity and habitat observations and the sampling of pelagic and benthic fauna. Moreover, the on-board respiration-, neurophysiology and behavioral experiments with pelagic gelatinous taxa and amphipods have continued successfully. The reporting period also included multiple water sampler-CTD profiles and ADCP long-term stationary and transect observations, including a 12-hour ADCP transect and repeated water sampler-CTD deployments across a developing oceanographic feature, as ground-truthing to the simultaneous overflights of the SWOT (Surface Water and Ocean Topography) satellite on Feb13, 2024.

We then relocated to our Canyon priority working area on the central southern side of Madeira (Figure 1), with a short stop outside Funchal harbor on Feb. 16 at 18:00 UTC to take on board a parcel with delayed equipment delivered to RV MARIA S. MERIAN by the local agent with the help of the expedition boat of cruise partner MARE Madeira /ARDITI. On Feb. 16 at 19:30 UTC, we started work in the Canyon working area, now repeating the same work program already completed in the Ridge area.

Table 1 Gear deployments during cruise MSM126 between February 9 and 18, 2024, by priority working area (see Figure 1 for details).

Gear	Working area			Total	Purpose
	RID	EDD	CAN		
WS-CTD	16	5	7	28	Oceanographic profiles; water samples
BONGO	3			3	Shallow mesoplankton sampling (to 250 m)
IKMT	2		1	3	Meso- and macroplankton sampling (to 800 m)
MSN	7		1	8	Depth-resolved plankton sampling (to 1000 m)
Ring net	8		3	11	(Gelatinous) plankton sampling (to 250 m)
WP3	1			1	(Gelatinous) plankton sampling (to 250 m)
XOFOS	9			9	Optical Ocean Floor Observation System
PELAGIOS	2			2	Optical Pelagic Observation System
ROV	5		3	8	Optical observations; benthic & pelagic sampling
Total	53	5	15	73	

Table 2 Summary of completed sampling and observations during cruise MSM126 until February 18, 2024, by priority working area and overarching work line.

Work line	Device	Parameters	Area			
			Ridge	Canyon	Plateau	Eddy
Food web	WS-CTD	nutrients, chl, pigments	x			x
Food web	WS-CTD	bacteria	x			
Food web	WS-CTD	pico and nano- plankton	x			
Food web	WS-CTD	microphytoplankton	x			
Food web	WS-CTD	microzooplankton	x			
Biodiversity	WS-CTD	eDNA	x			
Oceanography	WS-CTD	oxygen (Winkler titration)	x	x		x
Food web	Bongo net	mesozooplanton: SI	x			
Food web	Multinet	mesozooplankton: abundance	x			
Food web	Ring net	gelatinous plankton: SI, experiments	x			
Food web	Ring net	amphipods: SI, board experiments	x			
Food web	IKMT	ichthyoplankton: abundance, SI, exp.	x			
Food web	IKMT	fish: CNS SIA	x			
Food web	Angling, amphipod traps	fish, cephalopods, amphipods: CNS SI	x			
Food web	ROV benthic	urchins, other benthic fauna, kelp: CNS SI	x			
Food web	ROV pelagic	diverse gelatinous fauna: SI	x			
Biodiversity	all nets, ROV	biodiversity, voucher specimens, photos	x			
Experiments	ROV lander, cores	food fall DNA barcoding experiment		x		
In-situ observ.	PELAGIOS	pelagic optical observations, mapping	x			
In-situ observ.	XOFOS	sea floor optical observations, mapping	x			
In-situ observ.	ROV observations	pelagic/benthic optical observations	x	x		
Mapping	Multibeam echosounder	topographic and habitat mapping	x	x		
Oceanography	ADCP	water column current profiling	x	x		x
Oceanography	WS-CTD	vertical CTD profiles	x	x		x
In-situ observ.	PISCO (on CTD)	optical water column particle profiles	x	x		x
In-situ observ.	UVP6 (on CTD)	optical water column particle profiles	x	x		x
Experiments	Board setups	experimental: respiration	x	x		
Experiments	Board setups	experimental: work behaviour	x	x		
Experiments	Board setups	experimental: neurophysiology	x	x		

Experiencing the diversity of the underwater habitats and of the deep water fauna around Madeira has been a privilege and a continuous source of wonder to all of us cruise participants. Among the cruise highlights are (1) the mapping of deep water kelp forests at 70 -100 m depth on the Desertas Ridge area (discovered only a few years ago and the deepest kelp found to date worldwide), (2) ROV pelagic sampling during cruise MSM126, which resulted in a unique sample set of rare fauna, including fragile gelatinous organisms like salps, hydromedusae and chaetognaths, with multiple first records for Madeira waters (Figure 3) and (3) the successful implementation of the in-depth food web sampling strategy envisioned prior to the cruise, which now provides a unique foundation for food web studies integrating the “jelly web” with traditional non-gelatinous food web players. An operational conclusion of the cruise has been the confirmation of the value of oceanic islands as “protected” working areas under most weather and wind conditions, as the lee protection of Madeira has sheltered us from currently prevailing large swells and strong winds in the operations area (Figure 2). This has been an essential factor that has enabled the continuous 24-operations without loss of working days until now.

In the coming days, we will continue the exploration, habitat mapping and biodiversity and food web sampling of the Canyon working area with the diverse tool set at our disposal.

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

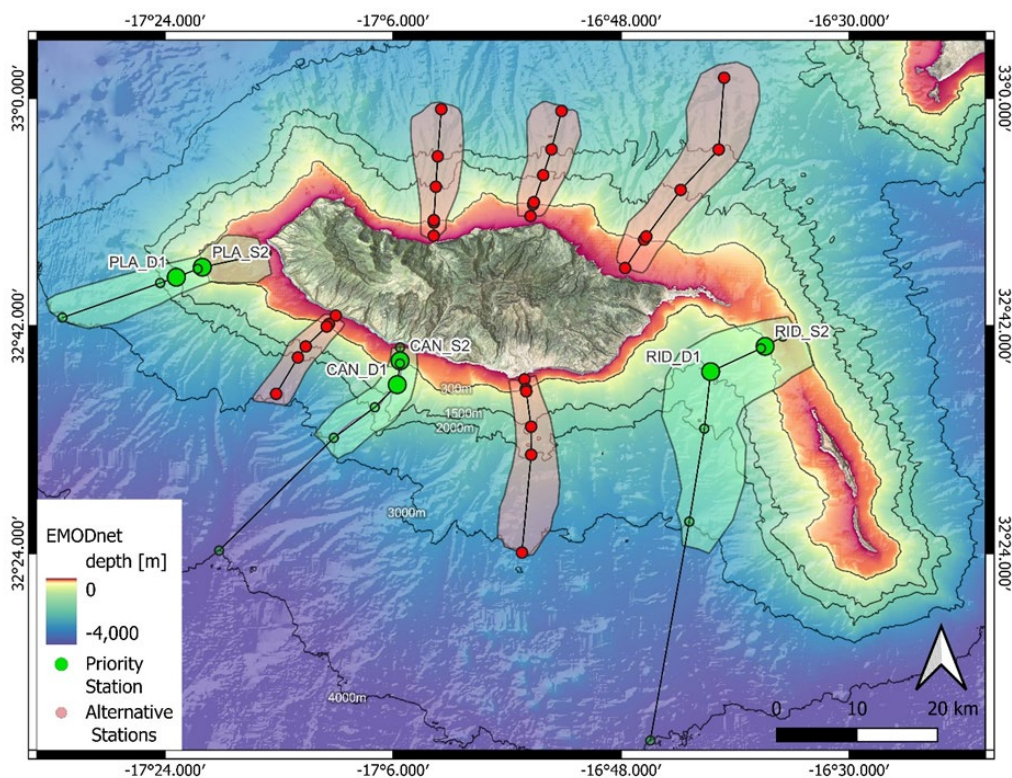


Figure 1 Working areas and stations of cruise MSM126. After completing work in the Madeira Desertas Ridge area (“RID”) on Feb. 16 16:30 UTC, operations are now concentrating on the central Canyon (“CAN”) working area, including the continuation of topographic mapping, optical survey, food web sampling, ROV and water sampler-CTD deployments, with particular focus on the priority stations “CAN_S2” (300 m) and “CAN_D1” (1500 m).



Figure 2 Operating in the leeward protection of Madeira has been an essential factor in the success of MSM126 operations in the reporting period. The picture was taken on Feb. 18, 2024, with winds of 7 Bft and 3 m groundswell plus windswell on the exposed island sides, but ideal conditions on the protected South side of the island.



Figure 3 Four members of the “midwater world” around Madeira caught during plankton sampling with the IKMT plankton net and the ROV pelagic samplers on stations RID_D1 and CAN_D1. Clockwise from top left: pteropod Diacavolinia, Hatchet fish, juvenile squid Histioteuthis, leptocephalus eel larva.. Photos: K. Osborn