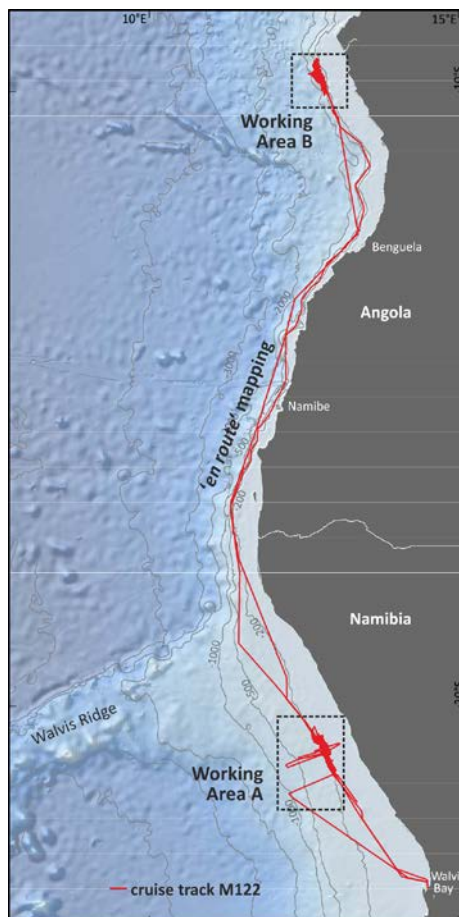


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Short Cruise Report RV METEOR Cruise M122

Walvis Bay – Walvis Bay
30.12.2015 – 31.1.2016

Chief Scientist: Dierk Hebbeln
Captain: Rainer Hammacher



Cruise track of RV METEOR expedition M122

Objectives

The research program of R/V METEOR cruise M122 focussed on a detailed study of cold-water corals (CWC) along the Namibian and Angolan continental margins. CWC are the architects of important bioconstructions and are the nuclei of unique biodiversity hotspots in the deep sea. Present knowledge about the distribution and ecology of CWC as well as their sensitivity to environmental change derived mainly from studies on coral sites in the North Atlantic Ocean. For other regions in the Atlantic, in particular in the low latitudes, only few scattered reports of CWC exist. Except for one site along the Angolan margin (at 7°S; see Le Guilloux et al. 2009), the knowledge about the occurrence of CWC along the Namibian and Angolan margins was rather sparse prior to M122. However, recent hydroacoustic campaigns (M76-3, MSM20-1) revealed extended areas showing numerous seabed structures which resemble coral mounds known from the NE Atlantic. Although this region is characterised by an extensive oxygen minimum zone, the few reports about the occurrence of CWC demonstrated the great potential to discover extensive and large occurrences along the Angolan and Namibian margins. RV METEOR cruise M122 intended to conduct an intense survey and sampling programme (i) to validate if the hydroacoustically detected mound-like seabed structures along the Namibian and Angolan margins are indeed formed by CWC, (ii) to investigate the spatial distribution and vitality of the CWC as well as the prevailing environmental setting steering their occurrence, and (iii) to reconstruct their temporal development across glacial-interglacial timescales.

CWC are of special interest for marine scientists because of (i) their capacity to act as ecosystem engineers and habitat providers creating highly diverse bathyal ecosystems, (ii) their intrinsic link to the regional hydrographic setting, and (iii) their ability to create 3-dimensional geological structures at the seafloor (coral mounds) that can serve as important palaeo-archives (incl. the CWC themselves). However, only recently the significance of CWC (also on a global scale) has been revealed triggered by the progress in deep-sea technologies. Beyond the exploration of hotspots along the European and North American Atlantic margins, our knowledge about CWC is still rather limited, if not absent at all. One example for a rather underexplored region was the SE Atlantic, for which our knowledge about CWC prior to the cruise can be summarised as:

- CWC (mainly *Lophelia pertusa* and possibly *Madrepora oculata*), forming substantial geological structures, exist off northern Angola (~7.3°S) at 350 - 450 m water depth, and probably off central Angola (~9.7°S) at 260 - 550 m water depth,
- geological structures most likely formed by CWC exist off northern Namibia (~20.8°S) at 160 - 260 m water depth, and
- CWC fragments (mostly alive) were found in dredge samples from the Valdivia seamount on Walvis Ridge and from the Congo Canyon (6.5°S).

With respect to this limited knowledge and to the high potential for the existence of extensive low latitude CWC ecosystems in the SE Atlantic in a peculiar setting (e.g., regarding the low dissolved oxygen concentrations along the Namibian and Angolan margins), this region was a prime target for CWC research. Thus, the main hypotheses to be tested during the expedition were as follows:

Hypothesis I: *Lophelia pertusa* can withstand very low oxygen concentrations, lower as shown in any field or laboratory studies.

Hypothesis II: Although vivid, the low-oxygen adopted SE Atlantic CWC ecosystems display a reduced diversity and population density with a different species composition compared to their NE Atlantic counterparts.

Hypothesis III: The prosperity of SE Atlantic CWC ecosystems varied on decadal to orbital timescales and this variability was directly controlled by changes in productivity and/or oxygen availability.

Hypothesis IV: CWC skeletons act as palaeo-archives which provide detailed information about past water mass characteristics.

Hypothesis V: While the initiation of the coral mounds in the SE Atlantic is favoured by an active tectonic regime, their long-term development is related to the changes in the oceanographic setting.

Narrative

In the morning of December 30, the RV METEOR left the port of Walvis Bay, Namibia, and steamed towards the first working area off northern Namibia at approximately 21°S. There the vessel worked from December 31, 2015, to January 11, 2016. During these days an extensive hydroacoustic and seismic mapping programme provide the base information to plan and to conduct seven dives with the Bremen ROV SQUID. These were complemented by a diverse sampling program applying CTD-water sampler, grab sampler, box corer, and gravity corer, as well as by three lander deployments. In this working area, numerous CWC mounds were found, however, with no living CWC ecosystems.

January 12 and 13 were spent steaming back to Walvis Bay to pick up some needed spare parts for the ROV. Back in the Namibian working area the last remaining lander was recovered and then RV METEOR began its transit to the Angolan working area at approximately 10°S.

On January 17 station work in the Angolan working area commenced. Until January 26 a comparable working programme as it was done off Namibia was conducted. Again, the work with the ROV was in the focus and a total of 8 successful dives could be done. Here, extensive, thriving CWC ecosystems were encountered. In the morning of January 26, after three landers were recovered, RV METEOR started its return towards Walvis Bay. On January 27, the vessel stopped at a 2000 m station at 13°23'S to take a final deep CTD and to run a deep dive with the ROV. After both operations were finished successfully, the transit back to Walvis Bay was continued where the cruise ended in the morning of January 31, 2016.

Acknowledgements

The Shipboard Scientific Party aboard RV METEOR cruise M122 gratefully acknowledges the friendly and professional cooperation and very efficient technical assistance of Captain Rainer Hammacher, his officers, and crew who substantially contributed to the overall scientific success of this cruise. Greatly acknowledged are the efforts from the German Diplomatic Corps in the German Embassies in Windhoek and Luanda and in the Foreign Office in Berlin. Finally, we thank the German Science Foundation (DFG) for providing ship time on RV METEOR and for funding the ROV SQUID operations to investigate the cold-water coral ecosystems off Angola and Namibia. We also benefited from financial contributions by the research institutes involved. We gratefully acknowledge all this support.

Cruise participants

Name	Discipline	Institution
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<i>Seiter, Christian</i>	<i>ROV</i>	<i>MARUM</i>
<i>Vittori, Vincent</i>	<i>ROV</i>	<i>MARUM</i>
<i>Haberkern, Julia</i>	<i>Marine Geophysics</i>	<i>MTU-GeoB</i>
<i>Bergmann, Fenna</i>	<i>Marine Geophysics</i>	<i>MTU-GeoB</i>
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<i>Wilsenack, Maik</i>	<i>Geobiology</i>	<i>SAM</i>
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<i>Lavaleye, Marc, Dr.</i>	<i>Benthic Lander</i>	<i>NIOZ</i>
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<i>Gori, Andrea, Dr.</i>	<i>Ecophysiology</i>	<i>UB</i>
<i>Moçambique, Irene</i>	<i>Observer, Angola</i>	<i>INIP</i>
<i>João, Francisco</i>	<i>Observer, Angola</i>	<i>INIP</i>
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SAM	Senckenberg am Meer, Wilhelmshaven
GEOMAR	Helmholtz-Zentrum für Ozeanforschung, Kiel
IUPH	Institut für Umweltphysik, Universität Heidelberg
NIOZ	Royal Netherlands Institute for Sea Research, Texel, The Netherlands
IEO	Centro Oceanográfico de Baleares, Span. Institute of Oceanography, Palma de Mallorca, Spain
UB	Institute of Marine Sciences, CSIC, University of Barcelona, Spain
INIP	Instituto Nacional de Investigacao Pesqueira, Luanda, Angola
DWD	Deutscher Wetterdienst, Hamburg

Station list M122

Station-N°	Meteor	Gear	Latitude (S)		Longit. (E)		Date	Time	WD	REMARKS	Site
(GeoB)	(M1220)		°	min	°	min	ddmmyy	(UTC)	(m)		
Northern Namibian Margin											
20501-1	1347-1	V-CTD	20	47.190	12	47.390	30.12.15	23:00	271	failed	
20502-1	1348-1	MBES/PS	20	47.290	12	47.160	30.12.15	23:46	260	start survey	
			20	47.280	12	45.900	31.12.15	08:35	290	end survey	
20502-2	1349-1	XSV	20	53.360	12	20.780	31.12.15	05:26	512	sound velocity profile	
20503-1	1350-1	MCS	20	47.300	12	50.080	31.12.15	10:08	246	start survey	
			20	46.870	12	49.220	01.01.16	06:06	249	end survey	
20504-1	001-1	V-CTD	20	44.067	12	49.330	01.01.16	07:58	220	failed	Sylvester M.
20505-1	001-3	ROV	20	43.899	12	49.703	01.01.16	11:37	205	start dive #1	Sylvester M.
			20	43.991	12	49.041	01.01.16	16:54	233	end of dive	
20505-2	001-3	ROV	20	43.995	12	49.055	01.01.16	16:08	238	ROV S #1: hardground	
20505-3	001-3	ROV	20	43.989	12	49.041	01.01.16	16:50	232	ROV S #2: coral rubble, water	
20506-1	001-4	SML	20	43.929	12	49.107	01.01.16	18:07	222	deployment	Sylvester M.
			20	48.858	12	48.807	14.01.16	06:37	240	recovery	
20507-1	002-1	Albex	20	44.030	12	49.230	01.01.16	19:22	210	deployment	Sylvester M. (particle pump)
			20	44.030	12	49.230	09.01.16	14:14	210	recovery	
20508-1	003-1	Albex TROL	20	44.030	12	49.140	01.01.16	19:53	220	deployment	Sylvester M. (baited experiment)
			20	44.030	12	49.140	09.01.16	14:46	220	recovery	
20509-1	004-1	MBES/PS	20	40.810	12	50.270	01.01.16	20:47	222	start survey	
			20	36.230	12	51.720	02.01.16	05:35	153	end survey	
20510-1	005-1	GBC	20	43.962	12	49.119	02.01.16	06:44	230	REC: ~15cm; coral rubble	Sylvester M.
20511-1	006-1	GBC	20	43.981	12	49.069	02.01.16	07:23	232	REC: ~20cm; coral rubble	Sylvester M.
20512-1	007-1	ROV	20	44.071	12	48.841	02.01.16	09:18	246	start dive #2	Sylvester M.
			20	43.882	12	48.782	02.01.16	12:13	241	end of dive	
20512-2	007-1	ROV	20	43.981	12	48.876	02.01.16	10:22	242	ROV S #1: hardground, sponges	
20512-3	007-1	ROV	20	43.865	12	48.850	02.01.16	11:40	231	ROV S #2: sponge, coral rubble	
20513-1	008-1	ROV	20	45.829	12	49.944	02.01.16	14:35	221	start dive #3 (aborted)	New Year M.
			20	45.847	12	49.868	02.01.16	15:45	226	end of dive	
20513-2	008-1	ROV	20	45.828	12	49.880	02.01.16	15:26	220	ROV S #1: bryozoa, coral rubble	
20513-3	008-1	ROV	20	45.847	12	49.868	02.01.16	15:53	226	ROV S #2: water sample	
20514-1	009-1	MCS	20	45.720	12	50.140	02.01.16	16:29	162	start survey	
			20	44.350	12	50.830	03.01.16	05:36	175	end survey	
20515-1	010-1	GBC	20	45.828	12	49.976	03.01.16	06:33	226	REC: 23-25cm; sediment, worm tubes	New Year M.
20516-1	011-1	GBC	20	45.818	12	49.880	03.01.16	07:31	219	REC: 30-32cm; sediment, worm tubes	New Year M.
20516-2	011-2	GBC	20	45.834	12	49.887	03.01.16	08:10	223	REC: 40cm; coral rubble	New Year M.
20516-3	011-3	GC	20	45.834	12	49.887	03.01.16	08:54	225	REC: 5.74m; corals	New Year M.
20517-1	012-1	GC	20	43.980	12	49.076	03.01.16	10:05	235	REC: 0.52m; corals	Sylvester M. M#4
20518-1	013-1	GC	20	43.930	12	48.916	03.01.16	10:48	232	REC: 5.78m; corals, overpenetration	Sylvester M. M#8
20519-1	014-1	V-CTD	20	43.990	12	48.840	03.01.16	11:58	248	failed	Sylvester M.
20520-1	015-1	GS	20	43.476	12	49.866	03.01.16	12:51	234	coral and Pycnodonte rubble, sandy sediment	backscatter calibration
20521-1	016-1	GS	20	43.436	12	49.146	03.01.16	13:44	223	sand, shell hash, tubes	backscatter calibration
20522-1	017-1	GS	20	43.113	12	49.045	03.01.16	14:23	219	sand, shell hash, tubes	backscatter calibration
20523-1	018-1	GS	20	43.052	12	50.193	03.01.16	14:58	182	sand, shell hash, tubes	backscatter calibration
20524-1	019-1	GS	20	43.104	12	51.031	03.01.16	15:33	189	failed, not released	backscatter calibration
20524-2	019-2	GS	20	43.104	12	51.030	03.01.16	15:44	167	few sediment, corals, shell hash, hard rocks	backscatter calibration

Station-N°	Meteor	Gear	Latitude (S)		Longit. (E)		Date	Time	WD	REMARKS	Site
(GeoB)	(M1220)		°	min	°	min	ddmmyy	(UTC)	(m)		
20525-1	020-1	CTD+RO	20	43.990	12	48.830	03.01.16	17:31	247	water sampling	Sylvester M.
20526-1	021-1	MBES/PS	20	43.990	12	48.830	03.01.16	17:59	210	start survey	
			20	41.820	12	48.150	04.01.16	05:47	242	end survey	
20527-1	022-1	GC	20	41.410	12	51.194	04.01.16	06:39	182	REC: 2.08m; shell hash	E of Escarpment
20528-1	023-1	GC	20	42.330	12	52.610	04.01.16	07:45	187	REC: 5.21m; sediment, shell hash	E of Escarpment
20529-1	024-1	GC	20	43.467	12	50.736	04.01.16	08:56	165	REC: 2.26m; sand, shells	W of Escarpment
20530-1	025-1	GC	20	42.733	12	48.269	04.01.16	10:20	242	REC: 1.30m; sediment, shell hash	N of Sylvester M.
20531-1	026-1	GC	20	43.933	12	48.919	04.01.16	11:22	232	REC: 10.21m; 0-8m: corals; below: shell hash & sediment	Sylvester M. M#8
20532-1	027-1	GS	20	43.024	12	52.009	04.01.16	12:18	178	sand, shell hash	backscatter calibration
20533-1	028-1	GS	20	43.390	12	53.107	04.01.16	13:04	183	silty sediment	backscatter calibration
20534-1	029-1	GS	20	42.706	12	53.036	04.01.16	13:55	176	hardground	backscatter calibration
20535-1	030-1	GS	20	42.432	12	53.090	04.01.16	14:28	168	clayey rocks, bivalves	backscatter calibration
20536-1	031-1	CTD+RO	20	46.470	12	49.450	04.01.16	15:32	250	water sampling	New Year M.
20537-1	032-1	MBES/PS	20	38.050	12	49.010	04.01.16	16:37	204	start survey	
			20	32.720	12	46.630	04.01.16	17:16	154	end survey	
20538-1	033-1	MCS	20	32.290	12	47.630	04.01.16	17:49	166	start survey	
			20	41.820	12	49.430	05.01.16	05:03	191	end survey	
20539-1	034-1	GBC	20	45.018	12	51.733	05.01.16	06:03	166	large hardground boulder; box damaged	Escarpment M.
20540-1	035-1	GC	20	45.024	12	51.704	05.01.16	07:15	159	REC: 0.24m; few coral fragments and shells	Escarpment M.
20541-1	036-1	GS	20	40.521	12	47.106	05.01.16	08:55	242	sand, shell hash, tubes	backscatter calibration
20542-1	037-1	GS	20	37.349	12	50.544	05.01.16	10:15	165	hardground	backscatter calibration
20543-1	038-1	CTD+RO	20	30.180	12	40.060	05.01.16	12:03	224	water sampling	Squid M.
20543-2	038-2	GC	20	30.187	12	40.066	05.01.16	12:33	224	REC: 4.85m; top: corals, oysters, fine sediment	Squid M.
20544-1	039-1	GC	20	22.267	12	38.468	05.01.16	13:59	162	REC: 0.76m; pipe bent, corals	Pickel Mound
20544-2	039-2	GS	20	22.265	12	38.468	05.01.16	14:38	160	coral rubble	Pickel Mound
20545-1	040-1	GBC	20	30.184	12	40.067	05.01.16	16:07	224	REC: 22-32cm; <i>Pycnodonte</i> -coral rubble	Squid M.
20546-1	041-1	MBES/PS	20	29.880	12	39.460	05.01.16	16:41	256	start survey	
			20	41.660	12	50.950	06.01.16	05:48	187	end survey	
20547-1	042-1	ROV	20	45.006	12	51.964	06.01.16	08:18	192	start dive #4	
			20	45.004	12	51.659	06.01.16	12:23	162	end of dive	
20547-2	042-1	ROV	20	45.011	12	51.757	06.01.16	10:49	178	ROV S #1: sponge	
20547-3	042-1	ROV	20	45.015	12	51.757	06.01.16	11:12	168	ROV S #2: bryozoa	
20547-4	042-1	ROV	20	45.005	12	51.676	06.01.16	11:53	160	ROV S #3: water sample	
20547-5	042-1	ROV	20	45.003	12	51.667	06.01.16	12:11	163	ROV S #4: <i>Cellaria</i> (bryozoa)	
20547-6	042-1	ROV	20	45.003	12	51.667	06.01.16	12:15	163	ROV S #5: <i>Cellaria</i> (bryozoa)	
20547-7	042-1	ROV	20	45.003	12	51.667	06.01.16	12:17	163	ROV S #6: <i>Cellaria</i> (bryozoa)	
20548-1	043-1	GS	20	45.025	12	51.715	06.01.16	13:10	162	coral rubble, shell hash	Escarpment M.
20549-1	044-1	GS	20	45.014	12	51.778	06.01.16	13:44	175	coral rubble, bivalves	Escarpment M.
20550-1	045-1	GC	20	51.029	12	28.103	06.01.16	16:27	367	REC: 5.54m	deep off-mound site
20551-1	046-1	CTD+RO	20	50.000	12	25.000	06.01.16	17:51	391	water sampling	CTD transect
20552-1	047-1	CTD+RO	20	47.792	12	33.110	06.01.16	19:25	333	water sampling	CTD transect
20553-1	048-1	CTD+RO	20	45.588	12	41.383	06.01.16	20:55	310	water sampling	CTD transect
20554-1	049-1	CTD+RO	20	43.681	12	43.639	06.01.16	21:55	286	water sampling	CTD transect

Station-N°	Meteor	Gear	Latitude (S)		Longit. (E)		Date	Time	WD	REMARKS	Site
(GeoB)	(M1220)		°	min	°	min	ddmmyy	(UTC)	(m)		
20555-1	050-1	CTD+RO	20	43.118	12	50.985	06.01.16	23:10	163	water sampling	CTD transect
20556-1	051-1	CTD+RO	20	42.802	12	52.079	06.01.16	23:55	178	water sampling	CTD transect
20557-1	052-1	CTD+RO	20	41.979	12	55.303	07.01.16	00:51	150	water sampling	CTD transect
20558-1	053-1	MBES/PS	20	41.980	12	55.300	07.01.16	01:05	149	start survey	
			20	54.110	12	53.860	07.01.16	07:11	214	end survey	
20559-1	054-1	ROV	20	54.318	12	53.922	07.01.16	08:44	221	start dive#5	Merluza M.
			20	54.473	12	53.475	07.01.16	13:57	235	end of dive	
20559-2	054-1	ROV	20	54.335	12	53.838	07.01.16	10:27	220	ROV S #1: sponge	
20559-3	054-1	ROV	20	54.336	12	53.812	07.01.16	10:41	219	ROV S #2: white bryozoan	
20559-4	054-1	ROV	20	54.336	12	53.813	07.01.16	10:47	218	ROV S #3: water sample	
20559-5	054-1	ROV	20	54.345	12	53.755	07.01.16	11:15	220	ROV S #4a-d: 4 white bryozoans (partly lost)	
20560-1	055-1	CTD+RO	20	54.341	12	53.818	07.01.16	15:12	217	water sampling	Merluza M.
20560-2	055-2	GS	20	54.337	12	53.819	07.01.16	15:43	217	off-mound: sediment, worm tubes	Merluza M.
20561-1	056-1	GS	20	54.417	12	53.538	07.01.16	16:12	224	off-mound: sediment, worm tubes	Merluza M.
20562-1	057-1	MBES/PS	20	55.060	12	51.970	07.01.16	16:46	252.5	start survey	
			20	57.590	12	55.260	08.01.16	08:08	218.7	end survey	
20563-1	058-1	GS	20	59.040	12	55.096	08.01.16	09:01	232	coral rubble	Priska M.
20564-1	059-1	GS	20	59.006	12	55.045	08.01.16	09:30	234	coral rubble	Priska M.
20565-1	060-1	CTD+RO	20	58.913	12	55.002	08.01.16	11:05	233	water sampling	Priska M.
20565-2	060-2	GS	20	58.918	12	55.003	08.01.16	11:40	232	coral rubble	Priska M.
20566-1	061-1	GBC	20	54.346	12	53.829	08.01.16	12:57	223	REC: 12cm; coral rubble, bivalves	Merluza M.
20567-1	062-1	GBC	20	54.412	12	53.609	08.01.16	13:44	225	failed, toppled over	Merluza M.
20567-2	062-2	GBC	20	54.412	12	53.609	08.01.16	14:09	226	failed, toppled over	Merluza M.
20568-1	063-1	GC	20	59.006	12	55.044	08.01.16	15:21	236	REC: 2.90m; corals, strong H ₂ S smell	Priska M.
20569-1	064-1	GS	20	58.892	12	54.586	08.01.16	16:10	243	coral rubble	Priska M.
20570-1	065-1	MBES/PS	20	59.09	12	53.92	08.01.16	16:29	247.7	start survey	
			20	28.260	12	40.120	09.01.16	06:17	221.4	end survey	
20571-1	066-1	GBC	20	30.194	12	40.122	09.01.16	06:55	225	REC: 30cm; coral rubble	Squid M.
20571-2	066-2	GC	20	30.193	12	40.122	09.01.16	07:55	225	REC: 5.48m; corals	Squid M.
20572-1	067-1	CTD+RO	20	35.249	12	43.97	09.01.16	09:04	233	water sampling	Sea star M.
20572-2	067-2	GC	20	35.248	12	43.966	09.01.16	09:26	218	REC: 5.87m; overpenetration, corals	Sea star M.
20572-3	067-3	GC	20	35.248	12	43.969	09.01.16	10:48	218.7	REC: 9.87m; corals	Sea star M.
20572-4	067-4	GBC	20	35.249	12	43.968	09.01.16	12:05	221	REC: 30cm; coral rubble	Sea star M.
20575-1	070-1	MCS	20	28.020	12	43.760	09.01.16	17:20	138.7	start survey	
			20	28.630	12	39.340	10.01.16	05:22	235.9	end survey	
20576-1	071-1	ROV	20	30.196	12	40.180	10.01.16	09:23	235	start dive#6	Squid M.
			20	30.034	12	39.983	10.01.16	13:03	230	end of dive	
20576-2	071-1	ROV	20	30.143	12	39.926	10.01.16	11:23	238	ROV S #1: yellow sponge	
20576-3	071-1	ROV	20	30.131	12	39.903	10.01.16	11:43	225	ROV S #2: bryozoans	
20576-4	071-1	ROV	20	30.034	12	39.981	10.01.16	12:49	230	ROV S #3: water (lost during recovery)	
20577-1	072-1	CTD+RO	20	30.049	12	39.948	10.01.16	14:21	221	water sampling	Squid M.
20577-2	072-2	GS	20	30.048	12	39.947	10.01.16	14:50	221	coral rubble	Squid M.
20578-1	073-1	GS	20	30.080	12	39.894	10.01.16	15:21	230	coral rubble	Squid M.
20579-1	074-1	GS	20	30.128	12	39.901	10.01.16	15:48	223	coral rubble	Squid M.
20580-1	075-1	MBES/PS	20	30.190	12	43.350	10.01.16	16:35	194.1	start survey	
			20	58.940	12	55.250	11.01.16	05:45	225.1	end survey	

Station-N°	Meteor	Gear	Latitude (S)		Longit. (E)		Date	Time	WD	REMARKS	Site
(GeoB)	(M1220)		°	min	°	min	ddmmyy	(UTC)	(m)		
20581-1	076-1	ROV	20	59.063	12	55.082	11.01.16	07:47	235	start dive#7	Priska M.
			20	58.878	12	55.032	11.01.16	12:07	233	end of dive	
20581-2	076-1	ROV	20	59.033	12	55.088	11.01.16	08:17	230	ROV S #1: sponge, coral rubble	
20581-3	076-1	ROV	20	59.033	12	55.088	11.01.16	08:27	230	ROV S #2: white bryozoa	
20581-4	076-1	ROV	20	59.000	12	55.061	11.01.16	09:06	235	ROV S #3: yellow sponge	
20581-5	076-1	ROV	20	59.010	12	55.061	11.01.16	09:10	235	ROV S #4: yellow tree-like sponge	
20581-6	076-1	ROV	20	58.994	12	55.004	11.01.16	10:06	232	ROV S #5: white bryozoa	
20581-7	076-1	ROV	20	58.886	12	55.022	11.01.16	11:07	225	ROV S #6: water sample	
20582-1	077-1	GC	20	58.896	12	55.081	11.01.16	12:03	231	REC: 3.04m; corals	Priska M.
20583-1	078-1	CTD+RO	21	5.565	12	59.083	11.01.16	14:08	212	water sampling	S of Priska M.
20583-2	078-2	GC	21	5.563	12	59.082	11.01.16	14:32	211	REC: 5.59m	S of Priska M.
20584-1	079-1	GS	21	6.112	12	59.415	11.01.16	15:21	206	sand, shell hash, tubes	pancake-like structure
20585-1	080-1	CTD+RO	21	25.371	12	15.291	11.01.16	20:44	1042	water sampling	deep station
20586-1	081-1	MBES/PS	21	9.840	13	0.930	13.01.16	22:42	147	start survey	
			20	43.970	12	49.160	14.01.16	05:46	228	end survey	
20588-1	083-1	GC	20	37.868	12	46.244	14.01.16	07:59	238	REC: 4.79m	S of Sea star M.
Angolan Margin											
20901-1	084-1	CTD+RO	16	8.938	11	30.786	15.01.16	11:33	1053	water sampling	1000 m
20902-1	085-1	CTD+RO	12	47.374	12	52.433	16.01.16	07:42	611	water sampling	600 m
20903-1	086-1	MBES/PS	9	52.770	12	49.810	17.01.16	02:54	252	start survey	
			9	44.190	12	42.450	17.01.16	08:10	527	end survey	
20904-1	087-1	ROV	9	43.769	12	42.851	17.01.16	10:36	502	start dive#8	Valentin Mounds
			9	43.661	12	42.887	17.01.16	15:25	483	end of dive	
20904-2	087-1	ROV	9	43.700	12	42.876	17.01.16	12:37	501	ROV S #1: live <i>Lophelia</i>	
20904-3	087-1	ROV	9	43.700	12	42.876	17.01.16	13:30	501	ROV S #2: live <i>Madrepora</i>	
20904-4	087-1	ROV	9	43.688	12	42.881	17.01.16	14:09	486	ROV S #3: water sample	
20904-5	087-1	ROV	9	43.688	12	42.881	17.01.16	14:25	486	ROV S #4: live <i>Lophelia</i> (thick theca)	
20904-6	087-1	ROV	9	43.661	12	42.887	17.01.16	14:56	483	ROV S #5: sea urchins, live & dead <i>Lophelia</i>	
20904-7	087-1	ROV	9	43.661	12	42.887	17.01.16	15:18	483	ROV S #6: <i>Aphrocallistes</i> , yellow anemones	
20905-1	088-1	CTD+RO	9	43.747	12	42.875	17.01.16	17:01	501	water sampling	
20906-1	089-1	MCS	9	39.460	12	44.690	17.01.16	18:43	293	start survey	
			9	39.900	12	39.830	18.01.16	8:00	553	end survey	
20907-1	090-1	GS	9	44.092	12	42.410	18.01.16	9:46	517	coral rubble	Valentine M.
20908-1	091-1	GS	9	43.601	12	42.896	18.01.16	10:49	442	coral	Valentine M.
20908-2	091-2	GC	9	43.605	12	42.893	18.01.16	11:22	439	REC: 4.51m; corals	Valentine M.
20909-1	092-1	GS	9	42.871	12	42.997	18.01.16	12:40	396	coral rubble	Valentine M.
20910-1	093-1	GS	9	43.573	12	44.664	18.01.16	13:36	334	coral framework	Twin M.
20910-2	093-2	GC	9	43.573	12	44.665	18.01.16	14:01	334	REC: 6.75m, corals	Twin M.
20911-1	094-1	GC	9	47.238	12	45.533	18.01.16	15:11	386	REC: 5.59m	off-mound
20912-1	095-1	GC	9	44.903	12	46.663	18.01.16	16:04	247	REC: 4.88m, corals	Anna Ridge
20912-2	095-2	GS	9	44.903	12	46.663	18.01.16	16:30	247	coral rubble	Anna Ridge
20913-1	096-1	GS	9	47.296	12	46.401	18.01.16	17:20	307	coral rubble	Anna Ridge
20913-2	096-2	V-CTD	9	47.296	12	46.403	18.01.16	18:10	304	failed	Anna Ridge
20913-3	096-3	CTD+RO	9	47.296	12	46.403	18.01.16	18:39	303	water sampling	Anna Ridge
20914-1	097-1	MBES/PS	9	47.220	12	46.570	18.01.16	10:00	413	start survey	
			9	43.800	12	46.880	19.01.16	05:26	254	end survey	
20915-1	098-1	CTD+RO	9	43.572	12	43.863	19.01.16	06:28	433	water sampling	Valentine M
20915-2	098-2	SML	9	43.574	12	43.868	19.01.16	08:28	430	deployment	Valentine M.
			9	43.574	12	43.868	26.01.16	05:05	430	recovery	

Station-N°	Meteor	Gear	Latitude (S)		Longit. (E)		Date	Time	WD	REMARKS	Site
(GeoB)	(M1220)		°	min	°	min	ddmmyy	(UTC)	(m)		
20916-1	099-1	Albex TROL	9	43.660	12	42.090	19.01.16	09:54	526	deployment	Valentine M. (baited experiment)
			9	43.660	12	42.09	26.01.16	05:49	526	recovery	
20917-1	100-1	ROV	9	43.665	12	42.891	19.01.16	11:46	473	start dive #9	Valentine M.
			9	43.009	12	43.009	19.01.16	16:21	426	end of dive	
20917-2	100-1	ROV	9	43.664	12	42.889	19.01.16	12:22	473	ROV S #1: <i>Sympagella</i> sponges on rubble	
20917-3	100-1	ROV	9	43.626	12	42.898	19.01.16	13:13	446	ROV S #2: live <i>Lophelia</i> (white & red)	
20917-4	100-1	ROV	9	43.626	12	42.898	19.01.16	13:56	446	ROV S #3: water sample	
20918-1	101-1	MCS	9	42.990	12	46.670	19.01.16	18:05	254	start survey	
			9	50.610	12	44.160	20.01.16	05:18	624	end survey	
20919-1	102-1	CTD+RO	9	42.709	12	34.651	20.01.16	07:20	886	water sampling	
20920-1	103-1	ROV	9	44.763	12	46.929	20.01.16	10:51	336	start dive#10	Anna Ridge
			9	44.606	12	46.882	20.01.16	15:42	251	end of dive	
20920-2	103-1	ROV	9	44.756	12	46.922	20.01.16	11:16	336	ROV S #1: <i>Neopgynodonte</i> oysters (6x)	
20920-3	103-1	ROV	9	44.753	12	46.921	20.01.16	11:59	336	ROV S #2: white sponge, <i>Eunice</i> tube	
20920-4	103-1	ROV	9	44.753	12	46.920	20.01.16	12:21	336	ROV S #3: sea urchin	
20920-5	103-1	ROV	9	44.686	12	46.900	20.01.16	13:15	307	ROV S #4: sea urchin	
20920-6	103-1	ROV	9	44.686	12	46.900	20.01.16	13:27	307	ROV S #5: <i>Neopgynodonte</i> oyster (2x)	
20920-7	103-1	ROV	9	44.663	12	46.894	20.01.16	14:01	296	ROV S #6: rock	
20920-8	103-1	ROV	9	44.659	12	46.893	20.01.16	14:20	294	ROV S #7: sea urchin	
20920-9	103-1	ROV	9	44.615	12	46.876	20.01.16	15:04	252	ROV S #8: sponge	
20920-10	103-1	ROV	9	44.615	12	46.876	20.01.16	15:10	252	ROV S #9: water sample	
20920-11	103-1	ROV	9	44.606	12	46.881	20.01.16	15:38	251	ROV S #10: live <i>Lophelia</i>	
20921-1	104-1	Albex	9	46.160	12	45.960	20.01.16	16:52	342	deployment	W of Anna Ridge (particle pump)
			9	46.160	12	45.96	23.01.16	05:44	342	recovery	
20922-1	105-1	GS	9	46.123	12	45.650	20.01.16	17:23	357	sand (phosphoritic)	
20923-1	106-1	GS	9	44.907	12	45.105	20.01.16	18:07	359	sand (phosphoritic), clay	
20924-1	107-1	GS	9	44.913	12	44.092	20.01.16	19:07	431	sand (phosphoritic)	
20925-1	108-1	MBES/PS	9	44.430	12	39.330	20.01.16	19:40	499	start survey	
			9	39.330	12	45.300	21.01.16	04:53	239	end survey	
20926-1	109-1	CTD+RO	9	43.268	12	43.034	21.01.16	05:48	432	water sampling	
20927-1	110-1	ROV	9	42.270	12	43.858	21.01.16	08:14	402	start dive#11	Buffalo Mounds
			9	41.998	12	43.883	21.01.16	13:31	356	end of dive	
20927-2	110-1	ROV	9	42.239	12	43.838	21.01.16	08:40	387	ROV S #1: live <i>Madrepora</i> , live <i>Lophelia</i>	
20927-3	110-1	ROV	9	42.239	12	43.838	21.01.16	08:59	379	ROV S #2: water sample	
20927-4	110-1	ROV	9	42.228	12	43.829	21.01.16	09:30	371	ROV S #3: live <i>Lophelia</i> (one branch)	
20927-5	110-1	ROV	9	42.171	12	43.803	21.01.16	10:11	359	ROV S #4: octocorals & antipatharians	
20927-6	110-1	ROV	9	42.116	12	43.781	21.01.16	11:25	385	ROV S #5: live <i>Acesta</i> (!)	
20927-7	110-1	ROV	9	42.102	12	43.774	21.01.16	11:42	372	ROV S #6: white sponge, bryozoans	
20927-8	110-1	ROV	9	42.019	12	43.820	21.01.16	12:56	349	ROV S #7: live <i>Aphrocallistes</i> & anemones	
20927-9	110-1	ROV	9	42.019	12	43.820	21.01.16	13:02	349	ROV S #8: live <i>Lophelia</i>	
20927-10	110-1	ROV	9	41.998	12	43.883	21.01.16	13:50	356	ROV S #9: dead framework, sea star, live	
20928-1	111-1	GC	9	43.388	12	42.899	21.01.16	15:34	457	REC: 7.57m, corals	Valentine M.
20929-1	112-1	MCS	9	42.780	12	43.550	21.01.16	16:23	422	start survey	
			9	46.710	12	42.920	22.01.16	04:58	504	end survey	
20930-1	113-1	ROV	9	49.364	12	46.405	22.01.16	07:22	412	start dive#12	Scary M.
			9	49.239	12	46.685	22.01.16	12:10	425	end of dive	
20930-2	113-1	ROV	9	49.372	12	46.429	22.01.16	07:51	374	ROV S #1: live <i>Lophelia</i> with yellow bryozoa	
20930-3	113-1	ROV	9	49.372	12	46.429	22.01.16	07:54	374	ROV S #2: water sample	
20930-4	113-1	ROV	9	49.372	12	46.436	22.01.16	08:08	374	ROV S #3: octocorals, <i>Aphrocallistes</i> , yellow	
20930-5	113-1	ROV	9	49.381	12	46.514	22.01.16	09:03	412	ROV S #4: live gastropod	

Station-N°	Meteor	Gear	Latitude (S)		Longit. (E)		Date	Time	WD	REMARKS	Site
(GeoB)	(M1220)		°	min	°	min	ddmmyy	(UTC)	(m)		
20930-6	113-1	ROV	9	49.354	12	46.540	22.01.16	09:35	361	ROV S #5: coral rubble, red actinians (net)	
20930-7	113-1	ROV	9	49.318	12	46.582	22.01.16	10:19	335	ROV S #6: live <i>Madrepora</i> (2x net)	
20930-8	113-1	ROV	9	49.250	12	46.669	22.01.16	11:59	425	ROV S #7: anemone	
20931-1	114-1	GC	9	49.239	12	46.669	22.01.16	13:37	424	REC: 5.67m, corals	Scary M.
20932-1	115-1	GC	9	49.277	12	46.624	22.01.16	14:29	369	REC: 7.32m, corals	Scary M.
20933-1	116-1	GC	9	49.331	12	46.565	22.01.16	15:23	338	REC: 9.83m, corals	Scary M.
20933-2	116-2	GS	9	49.336	12	46.565	22.01.16	16:16	345	failed, not closed	Scary M.
20933-3	116-3	GS	9	49.337	12	46.564	22.01.16	16:33	346	coral rubble	Scary M.
20934-1	117-1	GS	9	49.362	12	46.544	22.01.16	17:03	384	not closed, few corals	Scary M.
20934-2	117-2	GS	9	49.362	12	46.543	22.01.16	17:25	382	coral rubble	Scary M.
20935-1	118-1	GS	9	49.384	12	46.514	22.01.16	17:54	412	fine coral rubble	Scary M.
20936-1	119-1	CTD+RO	9	49.358	12	46.366	22.01.16	18:47	424	water sampling	Scary M.
20937-1	120-1	MBES/PS	9	44.300	12	45.820	22.01.16	19:45	306	start survey	
			9	43.510	12	46.110	23.01.16	05:20	177	end survey	
20938-1	122-1	ROV	9	43.049	12	45.862	23.01.16	09:17	320	start dive#13	Snake M.
			9	43.033	12	46.100	23.01.16	11:57	256	end of dive	
20938-2	122-1	ROV	9	43.032	12	46.033	23.01.16	10:35	271	ROV S #1: long piece of wood, overgrown	
20938-3	122-1	ROV	9	43.033	12	46.100	23.01.16	11:56	256	ROV S #2: water sample	
20939-1	123-1	MBES/PS	9	43.080	12	46.050	23.01.16	13:58	267	start survey	
			9	44.950	12	42.430	23.01.16	14:49	532	end survey	
20940-1	124-1	Albex	9	43.840	12	42.150	23.01.16	15:05	532	deployment	W of Valentine M. (particle pump)
			9	43.840	12	42.150	26.01.16	06:22	532	recovery	
20941-1	125-1	MBES/PS	9	43.960	12	42.120	23.01.16	15:20	538	start survey	
			9	36.520	12	40.710	23.01.16	17:24	459	end survey	
20942-1	126-1	CTD+RO	9	35.223	12	40.172	23.01.16	17:52	463	water sampling	CTD transect
20943-1	127-1	CTD+RO	9	37.378	12	40.874	23.01.16	18:59	465	water sampling	CTD transect
20944-1	128-1	CTD+RO	9	39.505	12	41.522	23.01.16	20:13	489	water sampling	CTD transect
20945-1	129-1	CTD+RO	9	41.667	12	42.110	23.01.16	22:41	490	water sampling	CTD transect
20946-1	130-1	CTD+RO	9	43.812	12	42.885	23.01.16	23:39	500	water sampling	CTD transect
20947-1	131-1	CTD+RO	9	46.045	12	43.868	24.01.16	01:12	459	water sampling	CTD transect
20948-1	132-1	CTD+RO	9	48.330	12	44.844	24.01.16	02:13	430	water sampling	CTD transect
20949-1	133-1	CTD+RO	9	50.522	12	45.818	24.01.16	03:26	544	water sampling	CTD transect
20950-1	134-1	CTD+RO	9	52.758	12	46.792	24.01.16	04:44	391	water sampling	CTD transect
20951-1	135-1	ROV	9	42.096	12	43.746	24.01.16	08:22	357	start dive#14	Buffalo M.
			9	42.086	12	43.758	24.01.16	10:41	348	end of dive	
20951-2	135-1	ROV	9	42.090	12	43.762	24.01.16	08:54	351	start mosaicking (4m x 10m)	
			9	42.085	12	43.761	24.01.16	09:50	351	end mosaicking	
20952-1	136-1	GC12	9	48.663	12	46.266	24.01.16	14:05	389	REC: 5.39m	off-mound
20953-1	137-1	GBC	9	43.022	12	45.996	24.01.16	14:48	259	empty, toppled over	Snake M.
20953-2	137-2	GBC	9	43.026	12	46.005	24.01.16	15:48	259	REC: 20cm, coral rubble	Snake M.
20954-1	138-1	GS	9	44.901	12	46.663	24.01.16	16:41	248	coral rubble	Anna Ridge
20954-2	138-2	GS	9	44.901	12	46.661	24.01.16	16:58	248	coral rubble	Anna Ridge
20954-3	138-3	GS	9	44.901	12	46.661	24.01.16	17:17	248	coral rubble	Anna Ridge
20955-1	139-1	GS	9	44.680	12	46.896	24.01.16	17:45	299	coral rubble	Anna Ridge
20956-1	140-1	MBES/PS	9	46.520	12	48.380	24.01.16	18:18	288	start survey	
			9	40.140	12	40.200	25.01.16	05:23	551	end survey	
20957-1	141-1	ROV	9	39.901	12	42.945	25.01.16	07:05	447	start dive#15	Castle Mounds
			9	39.742	12	43.152	25.01.16	12:00	331	end of dive	
20957-2	141-1	ROV	9	39.902	12	42.945	25.01.16	07:12	447	ROV S #1: bivalve shells	
20957-3	141-1	ROV	9	39.913	12	42.993	25.01.16	08:09	414	ROV S #2: live <i>Lophelia/Acesta</i> rock, gorgonian	

Station-N°	Meteor	Gear	Latitude (S)		Longit. (E)		Date	Time	WD	REMARKS	Site
(GeoB)	(M1220)		°	min	°	min	ddmmyy	(UTC)	(m)		
20957-4	141-1	ROV	9	39.910	12	43.006	25.01.16	09:06	399	ROV S #3: white gorgonian, ophiuroid	
20957-5	141-1	ROV	9	39.879	12	43.031	25.01.16	09:36	363	ROV S #4: sea stars, yellow sponge	
20957-6	141-1	ROV	9	39.858	12	43.058	25.01.16	10:12	348	ROV sample #5: water sample	
20957-7	141-1	ROV	9	39.858	12	43.058	25.01.16	10:18	348	ROV S #6: red live <i>Lophelia</i> (?)	
20957-8	141-1	ROV	9	39.774	12	43.162	25.01.16	11:45	362	ROV S #7: dead coral framework, bryozoa	
20958-1	142-1	GS	9	39.898	12	42.937	25.01.16	13:18	453	sand	Castle M.
20959-1	143-1	GC12	9	43.027	12	45.961	25.01.16	14:24	279	REC: 7.55m, corals	Snake M. (flank)
20960-1	144-1	GC12	9	43.017	12	45.997	25.01.16	15:16	264	REC: 10.44m, corals	Snake M.(top)
20961-1	145-1	GBC	9	47.062	12	47.428	25.01.16	16:27	332	REC: 55cm, biot. silt	off-mound
20962-1	146-1	MBES/PS	9	47.060	12	47.430	25.01.16	16:48	332	start survey (continued between CTD casts)	
			9	42.870	12	47.670	26.01.16	03:03	332	end survey	
20963-1	147-1	CTD+RO	9	43.379	12	36.673	25.01.16	19:05	803	water sampling	CTD transect
20964-1	148-1	CTD+RO	9	43.445	12	39.300	25.01.16	20:44	703	water sampling	CTD transect
20965-1	149-1	CTD+RO	9	43.674	12	42.093	25.01.16	22:39	527	water sampling	CTD transect
20966-1	150-1	CTD+RO	9	43.570	12	43.852	26.01.16	00:27	431	water sampling	CTD transect
20967-1	151-1	CTD+RO	9	43.225	12	45.765	26.01.16	01:53	323	water sampling	CTD transect
20968-1	152-1	CTD+RO	9	42.872	12	47.665	26.01.16	03:12	236	water sampling	CTD transect
20969-1	153-1	MBES/PS	9	44.640	12	47.900	26.01.16	07:38	259	start survey	
			12	15.380	13	23.020	27.01.16	00:54	298	end survey	
20970-1	154-1	MBES/PS	12	15.620	13	23.230	27.01.16	00:56	236	start survey	
			12	19.220	13	21.890	27.01.16	01:37	353	end survey	
20971-1	155-1	ROV	13	22.842	12	20.745	27.01.16	12:26	1997	start dive#16	2000-m-site
			13	22.848	12	20.745	27.01.16	13:35	1997	end dive	
20971-3	155-2	CTD+RO	13	22.863	12	20.758	27.01.16	16:41	2005	water sampling	2000-m-site
20972-1	156-1	MBES/PS	17	7.890	11	11.940	28.01.16	15:07	233	start survey	
			17	11.940	11	22.580	28.01.16	16:33	238	end survey	
20973-1	157-1	MBES/PS	17	20.990	11	23.700	28.01.16	17:25	270	start survey	
			17	25.290	11	25.070	28.01.16	19:04	235	end survey	
20973-2	158-1	XSV	17	22.110	11	24.220	28.01.16	18:19	262	sound velocity profile	
20974-1	159-1	MBES/PS	19	53.250	12	13.220	29.01.16	10:10	237	start survey	
			21	7.080	13	2.150	30.01.16	12:21	135	end survey	

Abbreviations:

WD, water depth; REC, recovery; ROV S: ROV sample, M: Mounds

V-CTD: video-guided CTD, CTD+RO: CTD plus water sampler, SML: satellite mini lander (GEOMAR), ALBEX: Lander (NIOZ),

MCS: multichannel seismic, MBES/PS: surveys with multibeam echosounder and PARASOUND sub-bottom profiler, XSV: eXpendable Sound Velocity probes, GC: gravity corr, GBC: giant box corer, GS: grab sampler