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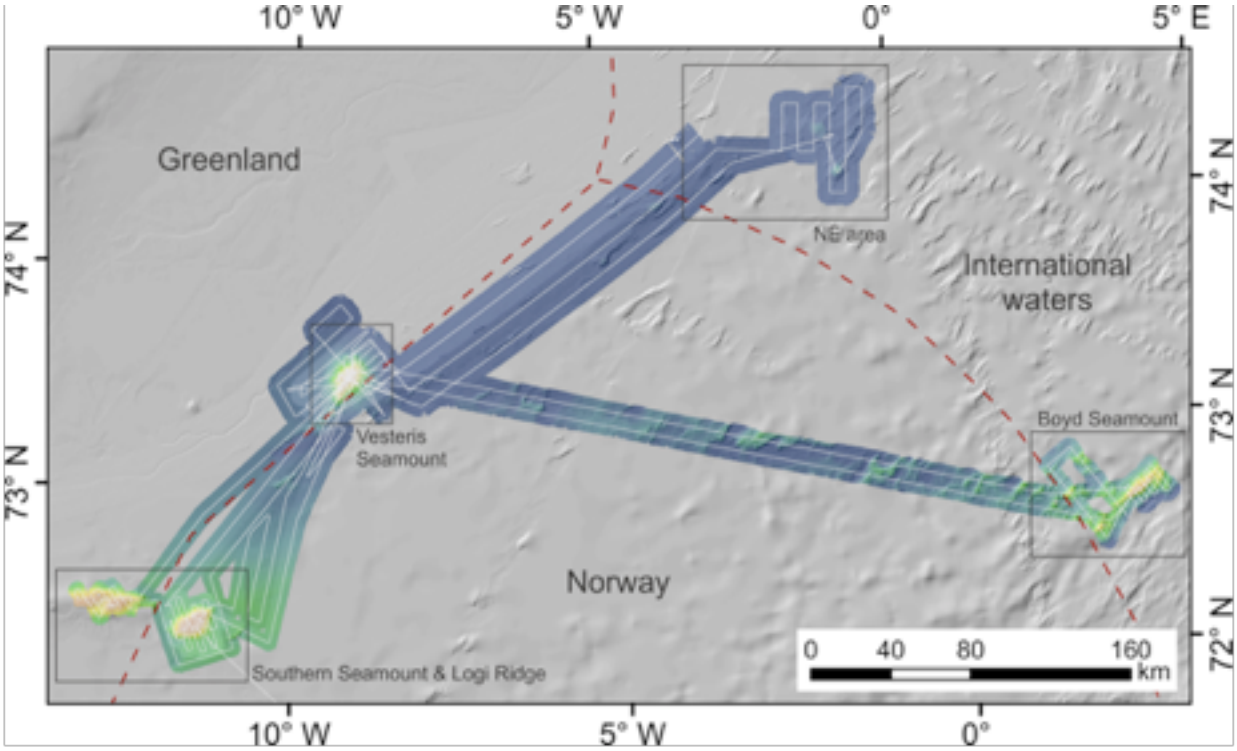
Short Cruise Report
MARIA S MERIAN

Longyearbyen - Emden
18.8.2019 – 16.9.2019
Chief Scientist: Wolfgang Bach
Captain: Ralf Schmidt



Objectives

The research program of RV MARIA S. MERIAN cruise MSM86 Vesteris Seamount was aimed at improving our understanding of the evolution of Vesteris Seamount, a large and lone intraplate volcano in the Greenland Sea. We had also planned to sample other basement highs in the region to determine their age and origin. Mapping and sampling several basement outcrops in the Greenland Basin, specifically Vesteris Seamount, Logi Ridge and Southern Seamount, as well as suspected volcanic edifices northeast of Vesteris Seamount were the main activites planned. We used the remotely operated vehicle MARUM SQUID 2000 and the TV-guided grab from GEOMAR for sampling rocks and biota. CTD casts were conducted to collect deep-sea water samples and sound velocity profiles for bathymetric mapping. The ship's EM122 and 712 echosounders were be used by bathymetry and backscatter surveys as well as for the collection of water column data, aimed at locating flares of CO_2 bubbles released from Vesteris seamount, which is a dormant volcano. Our research objectives include (1) resolving mantle melting dynamics and source composition and their bearing for the geodynamic evolution of the northern North Atlantic, (2) reconstructing the volcanic growth of Vesteris Seamount and its partial destruction by slope failures, (3) investigating the diversity of sponges and the microbiomes they host at Vesteris Seamount and other basement highs, and (4) examining the colonization of volcanic rocks by microorganisms, including fungi and bacteria, and determining the relation between rock alteration and endolithic life. Our work focused on four main areas (1) the main edifice of the Vesteris Seamount, (2) the volcanic edifices along the Logi Ridge and Southern Seamount, (3) the northeastern area, and (4) Luise Boyd Seamount on the northern flank of Mohns Ridge.

Narrative

On Sunday the 18th of August, RV Maria S. Merian left roadstead at Longyearbyen harbour at 06:50 at calm seas and no wind. The scientific program started at 07:45 with underway multibeam mapping. Our first mission was the recovery of a MeBo-plug and an autonomous monitoring platform installed during MSM57 on Vestnesa Ridge. Station MSM86_001 began at 07:30 on Monday the 19th. It was intended to recover both pieces of equipment with the ROV. The platform was eventually recovered using the TV-guided grab, which was equipped with hooks, lowered, and maneuvered over the platform with the ship's DP system until the hooks had engaged. In the evening hours of the 19th August, the ROV was successfully lowered to the ocean floor, where it found and unscrewed the MeBo-plug. At 11:30 am on 19th August we started transiting towards the main working area at calm seas. During the early morning hours of the 21st August a CTD cast was performed to record a sound velocity profile of the water column and collect deep-sea water. On August 21-22, we performed five TV grab stations and a first ROV

dive along the eastern flank of Vesteris Seamount in 500 to 600 m water depth. During the evening of the 22nd August and the early morning of the 23rd August, five more TV grab stations were completed along the northern slope of Vesteris Seamount, followed by a CTD station and a multibeam transect. At noon on the 24th of August, the ROV dive was abandoned and a TV grab was lowered at the eastern ridge of Vesteris seamount. A subsequent ROV test was done during the afternoon of the 23rd August followed by three TV grab stations at the western ridge of Vesteris seamount. That same day, we took six successful TV grabs in the vicinity of Vesteris Seamount prior to conducting a hydroacoustic survey of the shallow sections of Vesteris overnight using the Kongsberg EM712 multibeam system. We continued with four TV grabs on the south western flank of Vesteris seamount but operations had to be abandoned due to increasing swell and winds and we performed a hydroacoustic survey towards the southern working area, where a multibeam survey was conducted during the August 27th and the early morning of August 28th at map Southern Seamount for the first time. We subsequently performed five TV grab stations from west to east on the Southern Seamount and a CTD station prior to surveying (EM122) back from southern Seamount to Vesteris Seamount. Dive 042 of MARUM-SQUID took place during the daytime August 29, followed by two TV grab stations along the northern parasitic cones of Vesteris Seamount. Winds increasing to 7 Bft and rising seas forced us to abandon work at Vesteris Seamount again. We headed to the northeastern working area and mapped (EM122) two seamounts there. Based on the newly generated maps, we selected three locations for TV grab stations on the two seamounts in the northeastern area and conducted successful rock sampling there. During the night to the 1st September we transited back to Vesteris Seamount where fair weather allowed us to successfully conduct an ROV dive followed by five TV grab and a CTD station prior to leaving the area again due to adverse sea state. We headed ESE and performed a multibeam survey towards Luise Boyd seamount at 72°N, 3°E just north of the Mohns Ridge. In the late morning hours of the 3rd, we were able to start rock sampling did four successful TV-grab stations followed by CTD station just east of Luise Boyd seamount. We then continued a hydroacoustic survey NW of Luise Boyd seamount and lowered two more TV grabs at the seamount. At noon that day, we started steaming back towards Vesteris Seamount where we arrived at 06:00 on 5th of September and did two TV grab stations prior to ROV dive 044 in the central area of Vesteris Seamount. Four TV grab stations followed and during the night to the 6th September we continued our detailed hydroacoustic survey of Vesteris Seamount. During daytime, we performed ROV dive 45 at the northwestern flank of Vesteris Seamount followed by five TV grabs along the eastern and northern flanks of the volcano. On the 7th of September, another hydroacoustic survey and the final ROV dive on Vesteris Seamount were successfully completed. During the evening of the 7th we transited south to Logi Ridge with an initial hydroacoustic survey followed by 3 TV grabs along Logi Ridge in the morning of the 8th

September. The afternoon and evening we did another hydroacoustic survey at Logi Ridge, prior to a long hydroacoustic survey to Vesteris seamount and back due to heavy seas and storm during the 9th of September and two TV grabs and a CTD on Vesteris seamount during the afternoon of the 9th September. During the night we performed a hydroacoustic survey southeast of Vesteris. In the morning of the 10th of September we lowered two final TV grabs on Vesteris seamount prior to mapping the area towards the Southern Seamount where we performed three more TV grabs in the early morning. At 9:30 UTC we finished the working program at the southern Seamount and started transiting SE towards Jan Mayen. The scientific program ended at 9:05 am on the 11th September 2019 at 72°23.19'N, 11°22.57'W, the underway data collection was finalised at 13.09.2019 3:48 am at 64°48.40'N, 0°11.95'O. The vessel arrived in Emden on the 16th September 9:55 am UTC docking into the shipyard.

Acknowledgements

We gratefully acknowledge the help of the Foreign Office in Berlin and the German Research Fleet Coordination Centre at the University of Hamburg in achieving the research permission and scheduling the cruise. The cruise was financed by the German Research Foundation. We thank Captain Ralf Schmidt and his crew for their help in carrying out a successful cruise and for the pleasant and professional atmosphere on RV MARIA S. MERIAN. We acknowledge the help and support of the captain and crew of MSM86 also during the ROV, and TV-grab operations.

List of Participants

1.	Prof. Dr. Wolfgang Bach	Chief Scientist	UB, MARUM
2.	Prof. Dr. Christoph Beier	Petrology	UH, GZN
3.	Prof. Dr. Jörn Peckmann	Geobiology	HH
4.	Julia Bauer	Petrology	GZN
5.	Aaron Röhler	Petrology	UB
6.	Anna Schaarschmidt	Petrology	GZN
7.	Katharina Unger-Moreno	Petrology	UB
8.	Dr. Daniel Birgel	Geobiology	HH
9.	Krisin Kampen	Geobiology	HH
10.	Jan Steger	Geobiology	UW
11.	Laura Kramer	Bathymetry	UB, MARUM
12.	Anne Strack	Bathymetry	UB, MARUM
13.	Dr. Beate Slaby	Biology	GEOMAR
14.	Ieva Caraite	Biology	GEOMAR
15.	Dr. Oona Snoeyenbos-West	Biology	NRM
16.	Francisca Carvalho	Biology	UBer
17.	Dr. Bianca Rincon Tomas	Biology	UGoe
18.	Eduard Fabrizius	TVG-Technician	GEOMAR
19.	Dr. Nico Nowald	ROV	MARUM
20.	Siefke Fröhlich	ROV	MARUM
21.	Tobias Schade	ROV	MARUM
22.	Vincent Vittori	ROV	MARUM

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MARUM	Zentrum für Marine Umweltwissenschaften, Bremen, Germany
GZN	GeoZentrum Nordbayern, Friedrich-Alexander Universität Erlangen-Nürnberg, Erlangen, Germany
GEOMAR	GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Kiel, Germany
UH	Department of Geosciences and Geography, Faculty of Science, University of Helsinki, Finland
HH	Fachbereich Geowissenschaften, Universität Hamburg, Germany
NRM	Museum of Natural History, Stockholm, Sweden
UW	University of Vienna, Vienna, Austria
UBer	University of Bergen, Bergen, Norway
UGoe	University of Göttingen, Göttingen, Germany

Station List

Station	ROV-station (Marum)	Date (UTC)	Start (UTC)	Location	Start Position (Decimal Degrees)		Water depth [m]	Ende (UTC)	End Position (Decimal Degrees)		Water depth [m]	Sample time (UTC)	Sample Position (Decimal Degrees)		Waterdepth of sample [m]	comments	Size/number of samples
					Latitude	*Longitude*			*Latitude*	*Longitude*			*Latitude*	*Longitude*			
001-1_ROV		19.08.19	06:20	Vestnesa Ridge	79.005579	6.908392	1205	06:55	79.005587	6.908399	1206					Aborted due to technical problems	
001-2_TVG		19.08.19	11:36	Vestnesa Ridge	79.006137	6.905167	1213	13:34	79.006247	6.904281	1213					TV-Grab used with hooks to salvage Measuring platform of Cruise MSM57	
001-3_ROV		19.08.19	13:58	Vestnesa Ridge	79.006504	6.904711	1213	14:21	79.006497	6.90473	1213					Dive aborted due to technical problems	
002_ROV	**Dive_040**	19.08.19	19:24	Vestnesa Ridge	79.006571	6.905143	1212	23:30	79.006799	6.902717	1210					ROV used to salvage SonarCork	-
003_CTD		21.08.19	00:24	Vestnesa Ridge	74.541512	-3.244433	3601	02:37	74.541535	-3.244484	3601						Water Samples: 11 (4 Depths)
004_MBES		21.08.19	02:58	Transit to Vesteris	74.54078	-3.248016	3600	18:12	73.383006	-9.22604	2552						
005_TVG		21.08.19	18:49	Vesteris	73.367638	-9.393453	1884	20:39	73.369101	-9.39274	1887	19:55	73.368960	-9.392371	1882	black, fine basaltic lava	Biology: 6 Sediment: 2 Geology: 3
006_TVG		21.08.19	21:31	Vesteris	73.401157	-9.376564	2385	23:28	73.401307	-9.376083	2349	22:30	73.401130	-9.375700	2353	porphyritic basalt	Geology: 1
007_TVG		22.08.19	00:07	Vesteris	73.440673	-9.266039	977	01:23	73.441141	-9.266055	986	0:57	73.441030	-9.265800	989	fine grained sand, black vesicular lava	Biology: 4 Sediment: 2 Geology: 4
008_TVG		22.08.19	01:56	Vesteris	73.45152	-9.262659	979	02:58	73.451521	-9.261526	952	2:33	73.451480	-9.261330	958	black, glassy scoria	Biology: 19 Sediment: 1 Geology: 1
009_TVG		22.08.19	03:37	Vesteris	73.463998	-9.263547	738	04:23	73.463971	-9.263528	724	04:02	73.463880	-9.263230	731	pillow lava	Biology: 8 Sediment: 2 Geology: 1
010_ROV	**Dive_041**	22.08.19	05:24	Vesteris	73.509514	-9.144789	603	14:36	73.510674	-9.148868	529					sponges, pillow lava, lapilli	Biology: 5 Water: 1 Geology: 6
011_TVG		22.08.19	15:34	Vesteris	73.614061	-9.035181	1791	17:07	73.614071	-9.034969	1777	16:30	73.614160	-9.035220	1804	lava balloon, glassy pillow lava rim, fine-grained mud to silt	Biology: 9 Geology: 4
012_TVG		22.08.19	17:48	Vesteris	73.589353	-9.039541	1399	19:29	73.589199	-9.039521	1408	18:56	73.589310	-9.039710	1417	aphyritic lava, rarely small crystals	Biology: 3 Geology: 1
013_TVG		22.08.19	20:15	Vesteris	73.569114	-9.059061	857	21:22	73.568942	-9.059125	843	20:59	73.568880	-9.059360	844	black, vesicular fine-grained basalt, scoria, lapilli	Biology: 10 Sediment: 1 Geology: 4
014_TVG		22.08.19	22:21	Vesteris	73.557854	-9.080938	604	23:25	73.557677	-9.080931	606	23:08	73.557600	-9.081300	550	black, glassy basalt	Biology: 1 Sediment: 1 Geology: 1
015_TVG		22.08.19	23:52	Vesteris	73.546042	-9.072975	302	00:27	73.545942	-9.073231	297	00:14	73.545940	-9.073630	297	lapilli, black, glassy lava pieces	Biology: 5 Sediment: 1 Geology: 2
016_CTD		23.08.19	01:22	Vesteris	73.650012	-9.082526	2922	03:13	73.649997	-9.082608	2921						Water: 11 (4 depths)
017_MBES		23.08.19	04:02	Vesteris	73.730111	-8.890957	3084	11:15	73.632827	-9.075802	2707						
018_ROV		23.08.19	12:07	Vesteris	73.518116	-9.145943	295	12:20	73.518142	-9.146008	298					test run	
019_TVG		23.08.19	13:20	Vesteris	73.488948	-8.968776	1612	14:38	73.488987	-8.96889	1591	14:01	73.489110	-8.968920	1601	unconsolidated sediment, clasts of black vulcanite	Biology: 20 Sediment: 5
020_TVG		23.08.19	17:01	Vesteris	73.502974	-9.007341	1142	18:05	73.503017	-9.007612	1149	17:37	73.502977	-9.007844	1156	black, glasy lava flow	Biology: 2 Geology: 1
021_TVG		23.08.19	18:26	Vesteris	73.508447	-9.026851	962	19:46	73.508559	-9.027555	957	19:22	73.508700	-9.027630	953	black, vesicular and glassy lava flow	Biology: 2 Sediment: 2 Geology: 1
022_TVG		23.08.19	20:22	Vesteris	73.52166	-9.090314	359	21:18	73.521727	-9.09097	357	21:03	73.521850	-9.091070	359	black to brown sediment	Biology: 11 Sediment: 3
023_MBES		23.08.19	22:16	Vesteris	73.629732	-9.087991	2698	05:29	73.461323	-9.364351	1914					end 24.08.2019	
024_MBES		24.08.19	08:52	Vesteris	73.46498	-9.349588	1787	14:02	73.474707	-9.100214	1645						

Station	ROV-station (Marum)	Date (UTC)	Start (UTC)	Location	Start Position (Decimal Degrees)		Water depth [m]	Ende (UTC)	End Position (Decimal Degrees)		Water depth [m]	Sample time (UTC)	Sample Position (Decimal Degrees)		Waterdepth of sample [m]	comments	Size/number of samples
					Latitude	*Longitude*			*Latitude*	*Longitude*			*Latitude*	*Longitude*			
025_TVG		24.08.19	14:37	Vesteris	73.514028	-9.326488	1049	15:51	73.514093	-9.325904	1062	15:21	73.514180	-9.326290	1057	rounded dropstones (gneiss?), black fine-grained to glassy volcanic pieces, muddy brown sediment	Biology: 2 Sediment: 3 Geology: 4
026_TVG		24.08.19	16:28	Vesteris	73.543402	-9.278268	1092	17:49	73.54332	-9.278713	1076	17:21	73.543300	-9.278600	1076	porphyritic lava with diverse matrix	Biology: 4 Geology: 1
027_TVG		24.08.19	18:22	Vesteris	73.545006	-9.233896	955	19:32	73.544585	-9.237455	951	19:07	73.544600	-9.237460	960	mafic, vesicular rock	Biology: 6 Sediment: 2 Geology: 1
028_TVG		24.08.19	20:02	Vesteris	73.532556	-9.220978	555	20:56	73.532189	-9.221033	575	20:38	73.532270	-9.221360	575	black, porphyritic/glassy, vesicular lava. Volcanoclastic, layered rock	Biology: 15 Sediment: 2 Geology: 2
029_TVG		24.08.19	21:38	Vesteris	73.518227	-9.146169	306	22:20	73.518319	-9.146123	304	22:01	73.518320	-9.014610	302	porphyritic lava with glassy matrix, lapilli	Biology: 1 Geology: 2
030_MBES		24.08.19	22:50	Vesteris	73.476158	-9.097284	1603	07:14	73.452091	-8.782904	2856					end 25.08.2019	
031_TVG		25.08.19	08:05	Vesteris	73.527214	-9.116766	163	09:09	73.527229	-9.116817	162	08:57	73.527200	-9.117300	161	Sediment with biomass	Biology: 16 Sediment: 3
032_TVG		25.08.19	09:47	Vesteris	73.51945	-9.160004	139	10:15	73.519199	-9.159344	148	10:03	73.519210	-9.159700	145	volcanoclastic breccia. Black, fine-grained, vesicular, porphyritic lava with altered phenocrysts	Biology: 17 Sediment: 2 Geology: 3
033_TVG		25.08.19	11:00	Vesteris	73.536033	-9.255824	944	12:26	73.535859	-9.254819	937	12:01	73.535800	-9.255300	923	Glassy & porphyritic, vesicular lava. Fine layered sedimentary rock.	Biology: 2 Sediment: 1 Geology: 3
034_TVG		25.08.19	12:56	Vesteris	73.51732	-9.258675	765	13:53	73.51708	-9.258448	751	13:33	73.517000	-9.258800	747	dark, grey, fine-grained lava	Biology: 3 Sediment: 2 Geology: 2
035_TVG		25.08.19	14:28	Vesteris	73.518461	-9.217871	352	15:02	73.518461	-9.217566	352	14:48	73.518460	-9.217580	352	very mafic lava	Biology: 8 Sediment: 2 Geology: 1
036_TVG		25.08.19	15:31	Vesteris	73.524668	-9.193775	255	16:31	73.524442	-9.193452	257	16:19	73.524400	-9.193880	257	black to grey sediment	Biology: 3 Sediment: 3
037_MBES		25.08.19	17:52	Vesteris	73.59033	-8.98336	1730	08:26	73.517637	-9.20658	343						
038_TVG		26.08.19	08:59	Vesteris	73.511811	-9.171353	226	09:38	73.511754	-9.171337	222	09:24	73.511620	-9.171420	221	hydroclastic sediment. Dropstone	Biology: 12 Sediment: 3 Geology: 1
039_TVG		26.08.19	10:37	Vesteris	73.505675	-9.194656	279	11:22	73.50563	-9.193701	279	11:10	73.505490	-9.193830	277	black, fine-grained basalt. Black to brown sediment with shells and lapilli	Biology: 1 Sediment: 3 Geology: 1
040_TVG		26.08.19	12:03	Vesteris	73.492042	-9.267309	993	13:05	73.492042	-9.266392	983	12:38	73.491910	-9.266600	972	black, glassy and fine-grained, vesicular basalt and scoria. Porphyritic and glassy lava. Lapilli	Biology: 4 Sediment: 2 Geology: 5
041_TVG		26.08.19	13:33	Vesteris	73.490564	-9.239644	517	14:36	73.490418	-9.239583	517	14:18	73.490270	-9.239730	517	fresh lava with vesicle bands and glassy crust. Few phenocrysts, pipe vesicles, scoria	Biology: 7 Sediment: 2 Geology: 3
042_MBES		26.08.19	15:34	Transit from vesteris to Southern Seamount	73.490138	-9.239444	523	01:05	72.488327	-11.857303	2308					End 27.08.2019	
043_CTD		27.08.19	01:14	Southern Seamount	72.484486	-11.862027	2316	02:44	72.484487	-11.862065	2312						Water: 10 (3 depths)
044_MBES		27.08.19	03:12	Southern Seamount	72.484183	-11.773902	2218	07:41	72.343001	-11.695047	1927						
045_TVG		28.08.19	08:10	Southern Seamount	72.373805	-11.653801	740	09:35	72.373605	-11.652335	704	09:10	72.373620	-11.652780	704	dark grey, reddish lava, manganese crusts, sediment	Biology: 22 Sediment:3 Geology: 4

Station	ROV-station (Marum)	Date (UTC)	Start (UTC)	Location	Start Position (Decimal Degrees)		Water depth [m]	Ende (UTC)	End Position (Decimal Degrees)		Water depth [m]	Sample time (UTC)	Sample Position (Decimal Degrees)		Waterdepth of sample [m]	comments	Size/number of samples
					Latitude	*Longitude*			*Latitude*	*Longitude*			*Latitude*	*Longitude*			
046_TVG		28.08.19	10:35	Southern Seamount	72.379852	-11.555534	551	11:27	72.380153	-11.554702	533	11:53	72.380150	-11.554700	536	black, fine-grained lava, dropstones	Biology: 17 Sediment: 2 Geology: 3
047_TVG		28.08.19	12:16	Southern Seamount	72.43404	-11.53653	1202	14:45	72.432871	-11.53544	1060	14:18	72.432865	-11.535887	1057	breccia	Geology: 2
048_TVG		28.08.19	15:25	Southern Seamount	72.384204	-11.434809	475	16:07	72.384004	-11.43475	497	15:52	72.384000	-11.435100	491	black, fine-grained lava, dropstones	Biology: 2 Sediment: 1 Geology: 2
049_TVG		28.08.19	17:01	Southern Seamount	72.460929	-11.250906	739	17:49	72.460694	-11.251557	730	17:47	72.460697	-11.252000	733	fresh alkali basalt, dropstones	Biology: 2 Sediment: 1 Geology: 2
050_MBES		28.08.19	18:29	Vesteris	72.454985	-11.208706	1262	06:10	73.511178	-9.15204	446						
051_MBES		29.08.19	07:44	Vesteris	73.526524	-9.104157	226	08:31	73.513875	-9.178108	180						
052_ROV	**Dive_042**	29.08.19	08:48	Vesteris	73.517712	-9.149006	295	13:50	73.520596	-9.145332	188					black, fine-grained lava, glassy crusts, lapilli	Biology: 4 Sediment: 2 Geology: 2
053_TVG		29.08.19	14:48	Vesteris	73.610838	-9.175571	1759	16:52	73.610691	-9.177337	1787	16:14	73.610600	-9.176770	1778	dropstones	Biology: 1 Sediment: 3 Geology: 1
054_TVG		29.08.19	17:52	Vesteris	73.678143	-8.785591	2676	19:56	73.678259	-8.785946	2648	18:57	73.678000	-8.784840	2687	manganese crust	Biology: 6 Sediment: 2 Geology: 1
055_MBES		29.08.19	20:20	Transit Vesteris to NE area	73.680207	-8.74235	3007	10:03	74.430135	-2.023042	3651						
056_MBES		30.08.19	10:13	Transit Vesteris to NE area	74.42639	-1.927422	3648	06:42	74.473175	-0.529609	3755						
057_TVG		31.08.19	08:00	NE area	74.301139	-1.010206	2598	10:08	74.301718	-1.009478	2548	09:13	74.301760	-1.010020	2550	mantle complex, altered peridotites, gabbro, dunite & basalt with Manganese crusts	Biology: 8 Sediment: 2 Geology: 12
058_TVG		31.08.19	11:00	NE area	74.310327	-1.060363	2462	13:13	74.31037	-1.060325	2466	12:19	74.310200	-1.060020	2462	manganese crust	Biology: 2 Geology: 1
059_TVG		31.08.19	14:17	NE area	74.470181	-1.160346	3109	17:05	74.470317	-1.159962	3106	16:02	74.470100	-1.159400	3094	serpentinized olivine gabbro	Biology: 2 Geology: 1
060_MBES		31.08.19	19:36	Vesteris	74.400553	-2.746831	3873	05:45	73.529119	-9.196616	518						
061_ROV	**Dive_043**	01.09.19	05:59	Vesteris	73.528698	-9.193821	505	14:16	73.527348	-9.192554	407					porphyritic & fine-grained lava, lapilli	Biology: 5 Geology: 6
062_TVG		01.09.19	14:29	Vesteris	73.52731	-9.191366	370	15:33	73.527196	-9.191285	367	15:18	73.527070	-9.191387	363	lava with layered vesicles, black glassy scoria	Biology: 5 Sediment: 3 Geology: 4
063_TVG		01.09.19	16:11	Vesteris	73.530905	-9.196907	542	16:58	73.530732	-9.196907	535	16:42	73.530635	-9.196630	538	black, porphyritic and vesicular lavas	Biology: 11 Sediment: 2 Geology: 5
064_TVG		01.09.19	17:41	Vesteris	73.553914	-9.154596	808	18:39	73.554109	-9.156735	843	18:15	73.554000	-9.156398	849	empty	-
065_TVG		01.09.19	19:08	Vesteris	73.537112	-9.212699	751	20:26	73.537527	-9.212986	744	19:59	73.537381	-9.212626	793	grey, porphyritic volcanic rock	Biology: 1 Sediment: 2 Geology: 1
066_TVG		01.09.19	21:11	Vesteris	73.526334	-9.003532	1175	22:16	73.526428	-9.002018	1180	21:44	73.526338	-9.001729	1132	finde-grained aphanitic lava	Geology: 1
067_CTD		01.09.19	22:45	Vesteris	73.511625	-8.884488	2104	00:06	73.5115	-8.885144	2100					SVP	Water: 24 (7 depths)
068_MBES		02.09.19	00:14	Boyd Seamount	73.510688	-8.860786	2236	21:47	72.569547	2.345133	1804						
069_MBES		02.09.19	21:47	Boyd Seamount	72.569523	2.345017	1804	07:24	72.775248	3.089199	2093					End 03.09.2019	

Station	ROV-station (Marum)	Date (UTC)	Start (UTC)	Location	Start Position (Decimal Degrees)		Water depth [m]	Ende (UTC)	End Position (Decimal Degrees)		Water depth [m]	Sample time (UTC)	Sample Position (Decimal Degrees)		Waterdepth of sample [m]	comments	Size/number of samples
					Latitude	*Longitude*			*Latitude*	*Longitude*			*Latitude*	*Longitude*			
070_TVG		03.09.19	08:10	Boyd Seamount	72.711731	2.971778	845	09:10	72.711754	2.971774	846	08:45	72.711590	2.971340	851	dropstones	Biology: 8 Sediment: 3 Geology: 1
071_TVG		03.09.19	09:55	Boyd Seamount	72.690723	2.968985	1367	12:06	72.689872	2.971592	1403	11:34	72.689750	2.971120	1448	empty	-
072_TVG		03.09.19	12:37	Boyd Seamount	72.681101	2.862356	718	13:31	72.681141	2.862181	717	13:10	72.681100	2.861690	716	dropstones	Biology: 10 Sediment: 3 Geology: 1
073_TVG		03.09.19	14:31	Boyd Seamount	72.665156	2.665257	868	15:34	72.665188	2.665063	866	15:08	72.665161	2.664586	827	porphyritic pillow lava, dropstones	Biology: 5 Sediment: 2 Geology: 2
074_CTD		03.09.19	16:38	Boyd Seamount	72.628311	2.73499	2628	18:18	72.628353	2.735047	2626					SVP	Water 12 (5 depths)
075_MBES		03.09.19	18:56	Boyd Seamount	72.573651	2.587361	2863	03:02	72.49862	2.21312	1843					End 04.09.2019	
076_TVG		04.09.19	06:01	Boyd Seamount	72.711329	3.044053	1286	08:05	72.712235	3.039617	1207	07:33	72.712100	3.040020	1209	fine-grained aphanitic & tholeiitic basalt	Sediment: 2 Geology: 5
077_TVG		04.09.19	09:03	Boyd Seamount	72.678473	2.816087	621	10:43	72.678156	2.825324	666	10:18	72.678050	2.825730	665	smal piece ov lava	Biology: 5 Sediment: 3 Geology: 1
078_MBES		04.09.19	11:05	Vesteris	72.693701	2.724383	1503	06:00	73.541298	-9.088185	1744					End 05.06.2019	
079_TVG		05.09.19	06:15	Vesteris	73.540547	-9.158116	752	07:25	73.540544	-9.158573	751	07:01	73.540470	-9.158290	756	deeper equivalent of basaltic lava	Biology: 2 Geology: 1
080_TVG		05.09.19	07:56	Vesteris	73.537318	-9.13196	187	09:08	73.537052	-9.131266	171	08:57	73.536960	-9.130860	172		Biology: 21 Sediment: 2
081_ROV	**Dive_044**	05.09.19	09:40	Vesteris	73.528979	-9.115199	163	15:34	73.528845	-9.112582	208					lava	Biology: 5 Sediment: 1 Geology: 1
081-2_TVG		05.09.19	16:04	Vesteris	73.528787	-9.111307	212	16:38	73.528835	-9.111235	210	16:38	73.528830	-9.111200	210	hyaloclastite	Biology: 1 Geology: 2
082_TVG		05.09.19	17:04	Vesteris	73.516859	-9.098935	502	17:43	73.516845	-9.098866	500	17:23	73.516750	-9.098610	498	altered vesicular lava, fresh lava with round vesicles, olivine phenocrysts	Biology: Sediment: 2 Geology: 4
083_TVG		05.09.19	18:19	Vesteris	73.51768	-9.058541	786	19:07	73.51802	-9.058524	787	18:48	73.517920	-9.058190	785	fresh, vesicular alkaline lava, aphyritic pillow lava	Biology: 9 Sediment: 3 Geology: 2
084_TVG		05.09.19	19:44	Vesteris	73.557201	-9.009679	833	21:00	73.557202	-9.009656	831	20:31	73.557070	-9.009356	836	pillow lava with big pyroxenes	Geology: 1
085_MBES		05.09.19	21:16	Vesteris	73.559778	-8.957303	1469	04:19	73.481467	-8.974373	1901					End 06.09.2019	
086_ROV	**Dive_045**	06.09.19	06:01	Vesteris	73.540712	-9.276288	1171	14:31	73.542648	-9.279805	1095					porphyritic trachyte, basanite, lava with altered phenocrysts	Biology: 6 Geology: 8
087_TVG		06.09.19	14:54	Vesteris	73.523987	-9.312573	1450	16:06	73.523824	-9.312929	1429	15:34	73.523817	-9.312943	1399	vesicular lava	Biology: 5 Geology: 3
088_TVG		06.09.19	16:40	Vesteris	73.490476	-9.224829	576	17:57	73.490625	-9.224644	563	17:41	73.490540	-9.225080	574	porphyritic lava with olivine phenocrysts	Biology: 4 Geology: 1
089_TVG		06.09.19	18:30	Vesteris	73.501076	-9.14731	676	19:21	73.501078	-9.147209	668	19:01	73.501100	-9.146720	665	lapilli, scoria	Biology: 2 Geology: 2
090_TVG		06.09.19	20:13	Vesteris	73.533325	-9.089258	262	20:56	73.533283	-9.086738	299	20:43	73.533320	-9.086375	299	lapilli, hyaloclastite, porphyritic lava	Biology: 3 Sediment: 2 Geology: 3
091_TVG		06.09.19	21:34	Vesteris	73.567371	-9.05068	890	22:26	73.567381	-9.050349	899	21:59	73.567450	-9.050023	887	vesicular, porphyritic lava	Biology: 7 Sediment: Geology: 2
092_MBES		06.09.19	22:29	Vesteris	73.567507	-9.050381	928	00:20	73.469091	-10.09493	2943					End 07.09.2019	
093_PS		07.09.19	00:29	Vesteris	73.466151	-10.069373	2944	03:59	73.492253	-9.259722	897						

Station	ROV-station (Marum)	Date (UTC)	Start (UTC)	Location	Start Position (Decimal Degrees)		Water depth [m]	Ende (UTC)	End Position (Decimal Degrees)		Water depth [m]	Sample time (UTC)	Sample Position (Decimal Degrees)		Waterdepth of sample [m]	comments	Size/number of samples
					Latitude	*Longitude*			*Latitude*	*Longitude*			*Latitude*	*Longitude*			
094_ROV	**Dive_046**	07.09.19	04:52	Vesteris	73.552726	-9.009494	864	13:51	73.553287	-9.007346	836					vesicular lava, scoria with flow structure, lapilli	Biology: 7 Sediment: 2 Geology: 8
095_MBES		07.09.19	13:57	Logi Ridge	73.552106	-9.015927	774	22:00:54	72.518042	-12.246825	1555						
096_MBES		07.09.19	22:03	Logi Ridge	72.514406	-12.258215	1467	03:47	72.466309	-12.643454	513					End 08.09.2019	
097_TVG		08.09.19	04:28	Logi Ridge	72.476184	-12.842027	823	05:38	72.47638	-12.839692	822	05:14	72.476360	-12.840200	821	sediment with black ash layers, dropstones	Biology: 1 Sediment: 3 Geology: 1
098_TVG		08.09.19	06:22	Logi Ridge	72.501503	-12.802346	716	07:17	72.501853	-12.801774	703	06:57	72.501780	-12.802255	696		Biology: 25 Sediment: 3
099_TVG		08.09.19	08:49	Logi Ridge	72.518632	-12.398391	1124	10:35	72.519113	-12.395582	1117	10:09	72.5109	-12.3959	1104	dropstones	Geology: 1
100_MBES		08.09.19	12:02	Logi Ridge, Southern Seamount and area N of it	72.461112	-12.392197	1495	11:17	73.0843	-9.747897	2943					End 09.09.2019	
101_TVG		09.09.19	14:21	Vesteris	73.526792	-9.012498	1014	15:12	73.526792	-9.012455	1014	14:46	73.5267	-9.0121	1016	vesicular, aphyritic lava	Biology: 3 Geology: 1
102_TVG		09.09.19	15:51	Vesteris	73.555614	-9.153057	769	17:30	73.556029	-9.153125	795	17:08	73.5560	-9.1526	787	sediment with glassy ash layers, FeOOH crusts	Biology: 1 Sediment: 3 Geology: 1
103_CTD		09.09.19	18:54	Vesteris	73.435397	-9.559522	2814	20:38	73.435563	-9.559367	2826					SVP	-
104_MBES		09.09.19	20:54	Vesteris	73.437305	-9.603071	2851	04:13	73.741672	-9.705325	3021					End 10.09.2019	
105_TVG		10.09.19	06:04	Vesteris	73.563673	-9.189877	1362	07:15	73.56362	-9.189588	1334	06:45	73.5636	-9.1892	1351	porphyritic basalt	Geology: 1
106_TVG		10.09.19	08:29	Vesteris	73.475626	-9.233636	686	09:41	73.474812	-9.235807	737	09:23	73.4749	-9.2354	719	porphyritic lava	Biology: 1 Geology: 1
107_MBES		10.09.19	10:26	Vesteris	73.390762	-9.384726	2477	01:51	72.50441	-11.081374	2149					End 11.09.2019	
108_TVG		11.09.19	03:02	Southern Seamount	72.442817	-11.441587	577	04:32	72.442867	-11.443809	611	04:14	72.4428	-11.4434	601	Brecciated basalt with limestone matrix	Biology: 1 Geology: 1
109_TVG		11.09.19	05:18	Southern Seamount	72.41943	-11.288033	561	06:44	72.419123	-11.288815	572	06:28	72.4190	-11.2885	569	lapilli	Biology: 1 Sediment: 2 Geology: 1
110_TVG		11.09.19	07:23	Southern Seamount	72.385992	-11.386681	476	08:57	72.385522	-11.386512	515	08:41	72.3854	-11.3862	517		Biology: 1