RRS James Cook Cruise JC094, October 13 – November 30 2013

Tenerife - Trinidad

TROPICS

Tracing Oceanic Processes using Corals and Sediments

Reconstructing abrupt Changes in Chemistry and Circulation of the Equatorial Atlantic Ocean: Implications for global Climate and deep-water Habitats

Cruise Report

Laura F. Robinson (University of Bristol)

CONTENTS

This cruise report was written by members of the JC094 Science Team and NERC NMF staff.

Chapter 1. Personnel on board

1	LEASK	JOHN ALAN	Master
2	NEWTON	PETER WILLIAM	C/O
3	MACLEOD	IAIN	2/O
4	NORRISH	NICHOLAS	3/O
5	HINDS	MATTHEW	C/E
6	KEMP	CHRISTOPHER MARTIN	2/E
7	DAVITT	FRANCIS ROBERT	3/E
8	SLATER	GARY	3/E
9	DAMERELL	PAUL Darren	ETO
10	BULLIMORE	GRAHAM	PCO
11	CRIMMIN	SAMANTHA JANE	Doctor
12	MacDONALD	JOHN EWAN	CPOS
13	MACLEAN	ANDREW	CPOD
14	DAY	STEPHEN PAUL	POD
15	SIMS	KENNETH NEIL	SG1A
16	OSBORNE	ADAM VICTOR MURRAY	SG1A
17	RENNIE	AARON LEE	SG1A
18	PHILIPS	DAVID ALBERT	SG1A
19	SMYTH	JOHN GERARD	ERPO
20	HAUGHTON	JOHN	H/Chef
21	LINK	WALTER JOHN THOMAS	Chef
22	MINGAY	GRAHAM MALCOLM	Stwd
23	NOLAN	MELVIN PIUS	Stwd
24	BADGER	MARCUS PETER	Scientist
25	BATES	STEPHANIE LAUREN	Scientist
26	DOURAIN	MELANIE AMELIE LAETITIA	Scientist
27	FAIRBANK	VANESSA ELIZABETH	Scientist
28	HENDRY	KATHARINE ROSEMARY	Scientist
29	HOY	SHANNON KELSEY	Scientist
30	HUVENNE	VEERLE ANN IDA	Scientist
31	JACOBEL	ALLISON WOOD	Scientist
32	MARSH	LEIGH	Scientist
33	MOHAMED	KAIS JACOB	Scientist
34	MORRIS	PAUL JAMES	Scientist
35	NG	HONG CHIN	Scientist
36	ROBINSON	LAURA FRANCES	PI
37	SPOONER	PETER TIMOTHY	Scientist
38	STRUVE	TORBEN	Scientist
39	TAYLOR	MICHELLE LISA	Scientist
40	WILLIAMS	MARICEL CELILIA	Scientist
41	WOODHALL	LUCY CHERYL	Scientist
42	DER GRIENT	JESSE	Scientist
43	TURNER	DAVID RUSSELL	Technician
44	BRIDGER	MARTIN JOHN	SST
45	DAVIES	ALLAN	Technician
46	POOLE	BENJAMIN GEORGE	Technician
47	EDGE	DAVID	Technician
48	LOCKE	RUSSELL ANDREW	Technician
49	CHILDS	DAVID MATTHEW	Technician
50	MURDOCH	IAN CAMPBELL	Technician
51	COOPER	JAMES	Technician

Science Party

Principal Scientist: Dr Laura F Robinson University of Bristol

Shift 4am to 4pm

Watch Leader: Dr Veerle Huvenne National Oceanography Centre, Southampton

Dr Katharine Hendry University of Bristol
Dr Michelle Taylor University of Oxford*
Dr Marcus Badger University of Bristol
Allison Jacobel Columbia University
Torben Stuve Imperial College, London
Dr Melanie Dourain Laboratoire de Planétologie et Géodynamique de Nantes
Peter Spooner University of Bristol*
Vanessa Fairbank University of Bristol

* Move to 8am-8pm to allow better overlap with ROV recovery

Shift 4am to 4pm

Watch Leader: Dr Paul Morris University of Bristol

Leigh Marsh National Oceanography Centre, Southampton
Shannon Hoy University of Bristol
Dr Kais Mohamed Falcon University of Vigo
Dr Lucy Woodall Natural History Museum of London
Maricel Williams University of Bristol
Hong Chin Ng University of Bristol
Stephanie Bates Cardiff University
Jesse van der Grient University of Oxford

Chapter 2: Rationale, Objectives and Sampling Strategy

Ice-core records show that glacials had lower atmospheric pCO_2 and cooler temperatures than today. During the deglaciation there were a series of abrupt millennial scale changes to the global climate. Explaining the mechanism controlling these oscillations remains an outstanding puzzle. The ocean is a key player, and the Atlantic is particularly dynamic as it transports heat, carbon and nutrients across the equator. Despite decades of research there are distinct gaps in our knowledge of the history of the deep and intermediate ocean. Major hurdles include access to suitable archives, development of geochemical proxies and analyses that are sufficiently precise to test climate hypotheses. Through a combination of ship-board field work, modern calibrations and geochemical analyses this project will produce samples and data that address each of these gaps.

Cruise JC094 was the field work component of a focused study of present and past ocean chemistry in the Equatorial Atlantic including assessment the physical and chemical controls on deep-water coral ecosystems. A particular focus is on using the skeletons of deep-sea corals as climate archives.

The sampling objectives of the cruise can be grouped into a number of themes:

(a) Controls on coral habitats past and present

Studying what controls the distribution of corals today and in the past requires systematic mapping, imaging and collections from deep-water coral habitats. Shipboard swath bathymetry was used for an overview of each feature, and to select sampling sites. Systematic dives up the slopes of each feature allowed collection of video, stills, live and fossil corals and seawater. In addition microbathymetry of unusual habitats was to gin a wider overview. Coral associates were imaged and collected to add depth to our knowledge of the coral habitats.

(b) Development of geochemical proxies

Core top sediments, live calcified corals and sponges were collected across a range of depths with associated seawater with sampling focused on the greatest possible range of environmental parameters (e.g. temperature, nutrient status, water mass). These samples will be used to test geochemical proxies.

(c) Reconstruction of past climate

Sediment cores and fossil corals were collected across the basin and at a range of depth to allow a history of the Atlantic to be reconstructed.

(d) Ancillary Studies.

A number of other collections were also made including plastics (Lucy Woodall), rocks (Bramley Murton), sponges (Katharine Hendry) and genetics samples (Michelle Taylor).

Chapter 3: Cruise Overview

3.1 Cruise Timeline

Date			Location	Activity
October	13	TRANSIT		
October	14		Deep water	ROV wire stream, DP test
October	15	TRANSIT		CTD001 test
October	16	TRANSIT		
October	17	TRANSIT		
October	18	TRANSIT		
October	19	TRANSIT	CARTER	CTD002, survey, ROV221
October	20		CARTER	ROV 222
October	21		CARTER	ROV223, MGA001, ROV224
October	22		CARTER	MGA002, PTN001
October	23		CARTER	MGA003, ROV225
October	24		CARTER	MGA004
October	25		CARTER	ROV226
October	26		CARTER	MGA226, ROV227
October	27	TRANSIT	CARTER	
October	28	TRANSIT		MGA006, PTN002,GVY001, MGA007
October	29	TRANSIT		
October	30		KNIPOVICH	CTD003, survey, ROV228
October	31		KNIPOVICH	ROV229
November	1		KNIPOVICH	GVY002, GVY003, GVY004,ROV230
November	2		KNIPOVICH	
November	3	TRANSIT	KNIPOVICH	MGA008, PTN003
November	4	TRANSIT		MGA009
November	5	TRANSIT		GVY005, GVY006
November	6	TRANSIT		
November	7	TRANSIT		
November	8	TRANSIT	VEMA	CTD004, ROV230
November	9		VEMA	MGA010, GVY007
November	10		VEMA	MGA011, CTD005, DRG01
November	11		VEMA	ROV232
November	12		VEMA	ROV233
November	13		VEMA	ROV234(MB)
November	14	TRANSIT		
November	15	TRANSIT		core on the way
November	16	TRANSIT	VAYDA	survey, CTD006, ROV235
November	17		VAYDA	recover ROV and SBP survey
November	18		VAYDA	MGA013, GVY009, ROV236
November	19		VAYDA	rov stays in
November	20		VAYDA	recover ROV, MB survey, ROV237
November	21		VAYDA	recover ROV, MGA014
November	22		VAYDA	GVY010+ 011, BOX001, GVY012, ROV238
November	23	TRANSIT	VAYDA	recover ROV, transit
November	24	TRANSIT	Gamberg	transit, SPB + MB survey, ROV239
November	25		Gamberg	recover ROV, GRY013, ROV 240
November	26		Gamberg	recover ROV, GRY014, MGA015, MGA016
November	27	TRANSIT		MGA017, Transit
November	28	TRANSIT		
November	29	TRANSIT		ARRIVE Port of Spain

3.2 Cruise Narrative

Friday 11 October 2013: Most of science party arrive in Santa Cruz de Tenerife.
NOC staff call with news that Brazilian permissions not viable (permission to enter waters, but not to collect samples), so decision made to proceed with alternative cruise track.

Saturday 12 October 2013: Remainder of science party arrive in Santa Cruz.

Sunday 13 October 2013
1230 Safety briefing
1400 Depart Santa Cruz de Tenerife to steam to deep water for ROV wire streaming

Monday 14 October 2013
1615 Safety Drill

Tuesday 15 October
0030am ROV wire streaming test successful
Problems with Dynamic Positions (DP), captain stays on station to look for repeat of problem and to coordinate with NOC and manufacturer of the system
STN001 Test CTD001 at 0900 to 100m depth
Test ability to isolate engines when on DP
1011 depart for Carter Seamount

Wednesday 16th October: Reported problem with starboard propulsion
Continued training and planning for scientific sites including ROV tours

Thursday 17th October: All clear in morning meeting with no reported propulsion issues.

Friday 18th October : Continue transit, training activities.

Saturday 19th October
STN 002 0446 CTD002 cast in 4522m seawater. All bottles fire and sampling continues throughout the day. Minicorer evident on the pinger trace making it hard to see approach of bottom, so decide to leave off minicorer for future deployments.
Continue towardst Carter Seamount and commence partial Multibeam swathe bathymetry survey of Carter Seamount (North edifice). Use map from Peyve et al 2009 as a guideline. Seamount rises up to 215m flat plateau with a series of plateaus separated y steep sections.
STN 003 1530 ROV221 at 914m water depth. Dive aborted at 523m due to USBL malfunction. Test USBL beacon on wire and decide to use 'old' beacon which was working on last ISIS cruise. (problem appears to be with connections on board having been changed during prior cruises?)

Sunday 20 October
STN 004 0216 ROV222 in 918m water. Deployment successful and excellent biological and geological collections. USBL a little jumpy – later discovered that we should have been using the starboard USBL not the port.
STN 005 2323 ROV Dive 233 in 645m water

Monday 21 October
1639 Recover ROV after successful traverse up to top of plateau.
STN 006 1745 MGA001 To allow time for ROV turn around deploy Megacorer on 650m plateau. Gantry would not extend, so difficult recovery. Corer bounced against side of boat several times. Came up virtually empty with a few fossil corals in two cores. Had penetrated as evidence of mud up sides of corer. Niskin firing worked and LW sampled for plastics

STN 007 2055 ROV 224 Deployed at 1931m water depth. Successful fossil and bio collections. Evidence of some twisting in (brand new, already streamed) ROV wire, so decision to re-terminate the connection.
Move back out to deep water site for deep coring.

Tuesday 22 October
1540 recover ROV
STN 008 2118 MGA002 core in 4568m. Three cores 38—41cm long

Wednesday 23 October
STN 009 0448 Piston core PTN001 in 4567m. Recovered with 7.5m of sediment, dark grey with mottles in base section. Need to use MB depth as the echo sounder seems to be off.
STN 010 1452 MGA003in 2755m a few forams but otherwise no sediment. Too sandy?
STN 011 1858 ROV225 in 2749m water depth. Long sandy plains, sparse fossils of life until further up seamount. Dive traverses up to 2110m

Thursday 24 October
1835 Recover ROV
STN012 1929 MGA004 back on 650m plateau but closer to push core site. Recovered at 2030 with 7 damaged tubes, presumably we hit a rock.
ROV wire showing signs of torque, and the high tension wire very twisted
2139 Decision made to move to deep water and perform repeated streaming of the wire in 4600m of water to try and reduce any torque in the wire. Move to deep water site logging MB.

Friday 25 October
Continue wire streaming (three total) in 4300m of water.
NOC suggests using heavier weight. Switch to 1 ton weight and redeploy wire at 1649. Back on board at 2003 Steam back to ROV site.
STN013 2255 ROV 226 deployed in 540m water depth for swathe bathymetry. Problems with navigation during early parts of dive, but sorted out.

Saturday 26th October
1759 ROV 226 recovered.
STN014 1803 MGA005 deployed in 642m water depth. Came up with a few corals and forams but no real sediment.
STN015 2043 deploy ROV 227 dive from 1336m to 651m with extensive live and fossil coral collections. Lots of problems with slurp chambers with material stuck in the tubing and mixing of samples. Efforts made to unpick samples from video successful in many cases.

Sunday 27th October
1754 recover ROV then begin transit to Knipovich

Monday 28th October
SBP broken, making it hard to look for core sites. Seems that a board is faulty, and there are no spares on board. Sites chosen from prior core and from echo sounder which looked to have a sub surface layer.
STN016 0329 MGA006 in 3400m water depth. Recovered at 0655. Three cores came up, but two emptied on recovery due to broken core catcher units (snapped – hit hard clay layer at depth?) leaving one full core to extrude.
STN017 0805 PTN002 Deploy 12m piston core. 6Ton pull out, mud on exterior but piston empty. Hard clay layer again?
1210 test coring wire which had been ‘jumping’
Continue transit looking for core site in ~3500m basin
SBP fixed by switching boards around and subsurface layers become evident.
STN018 1613 GRY001 deploy 6m gravity core and recover 5.34cm of sediment (full core barrel)
2008 deploy Mega corer

STN019 2333 MGA007 recover megacores with 4 cores of 25-40cm long.

Tuesday 29th October
Steam to Knipovich with WP designed to go over some of Sierra Leone Rise Seamounts. Missed the top of Carter South as not accurate on the gravity data, but saw other seamounts on traverse.

Wednesday 30th October
Arrive deep water to NE of Knipovich
STN020 0642 CTD003 in 4054m water depth, recover at 1011.
STN021 1724 deploy ROV 228 in 1993m water depth. Traverse up to 1446m water depth collecting both fossil and live material

Thursday 31st October
1417 recover ROV
STN022 1927 deploy ROV229 at 1019m water depth with aim of sampling AAIW water masses. Pass fields of fossil corals but leave collections until shallower - although less samples found at top.

Friday 1st November
1459 recover ROV
STN023 1552 GVY002 Deploy gravity core on top of seamount at 552m in apparent sediment basin (>20m thick). Strange pull out and recovered empty – hit coral layer?
STN024 1723 GVY003 repeat gravity core, also empty.
STN025 1905 GVY004 move to another part of seamount top and try gravity core again – empty.
STN026 2146 deploy ROV 230 for final Knipovich dive at 2758m water depth. Long stretches of sediment, then steep rocky faces with scarce corals. At about 1400 moved ROV off bottom and moved to shallower depth range (~1100m) to fill up nets with fossils.

Saturday 2nd November
2251 recover ROV and start transit towards Vema and deep coring site

Sunday 3rd November.
STN027 0203 MGA008 deployed in 4405m water depth, 0619 Recover core with 4 tubes full (22-41cm recovery)
STN028 0713 Piston core PTN003 deployed in same place with 12m barrel. Recovered at 1144. Small amount of mud in trigger, but otherwise empty. Evidence that the core penetrated up to above the bomb. Liner shattered – maybe a vacuum inside? Mega core contained glacial material, so decided to leave site.
Transit toward Vema via coring site

Monday 4th November
STN029 2216 MGA009 in 4055m water depth. We were looking for a shallower site, but the shallower depths were all ridges. 0222 recover megacorer with four cores of soft mud and sand
STN030 0245 gravity core GVY005 with 6m barrel, and recover full core with ?1m over penetration(later discovered to be 88cm from colour measurements). Re-core to make sure that we get the glacial period represented.
STN031 0828 gravity core GVY006 using 9m with slow release and recover good core with no overpenetration.
Carry out CTD wire streaming down to 200m to try and remove opening in wire.

Tuesday 5th November to Thursday 7th November Continue transit

Friday 8th November
Arrive at Vema ridge via short survey along 3000m depth (no apparent sediment) and head towards CTD site monitoring bottom using SBP.

STN032 0717 water depth 4949m CTD004 recovered at 1153. Bottle 16 pouring out water, bottles 2 and 4 not sealed (T and O2 evidence)
STN033 ROV231 deployed at 1453 in 1546m water depth with site chosen from MB grid sent by Debbie Smith. Long ascent with high currents in places.

Saturday 9th November
1528 Swell increasing and stronger winds so decide to bring up ROV and core while assessing weather.
STN034 1734 deploy Megacore MGA010 at 4950m water depth south of ridge, 2 full cores out of four.
STN035 2238 deploy Gravity core GVY007 at same place. Double spike in tension (?double core in top section). Winch problems for ~1 hour during recovery.

Sunday 10th November
Weather still too rough to deploy ROV so traverse to north side of ridge.
STN036 Deploy Megacore MGA011 in 5160m water depth. None of the triggers fired, although Niskin worked.
STN037 1709 redeploy Megacore, MGA012 but same result – sediment too soft?
STN038 2259 deploy gravity core GVY008 with 9m barrel and get 7m recovery. Top consist of wet mud

Monday 11th November
STN039 05:00 deploy CTD005 in 5161m water depth on north side of ridge. Bottles 2 and 4 not sealed again. Wire appears unraveled and video footage shows it being damaged as it moves, so decision to re-terminate the wire during the transit.
Return to potential ROV site and check weather conditions, but still too rough to deploy.
STN040 1553 deploy rock dredge DRG001 with burlap lining at 873m water depth. Recover at 1753 with small collections of corals and small rocks in the dredge and in the bucket trailing behind.
STN041 2031 Weather calmer so deploy ROV232 in 1155m water depth to traverse to shallowest part of the seamount. Spectacular cliff at start with large (>ROV size) branching scleractinian. Up onto flatter slope and top of Vema with sand and fine coral rubble. One laser on the Scorpio not working so no scaling on that camera.

Tuesday 12th November
1536 Recover ROV. Lasers tested but work on deck.
STN042 2055 Deploy ROV233 in 3000m water depth for a traverse up a ridge on the north side of Vema of moderate steeepness. Large tracts of rocks with sand pockets, spectacular sponge covered ridges. Laser still not working underwater.

Wednesday 13th November
2032 recover ROV.
STN043 deploy ROV234 with vertically mounted Reson Multibeam system to map and video the cliffs around the area of Dive 232. Before dive HD science camera dome discovered to have a crack so removed and swapped for a low resolution camera. Wiring issues meant that it could not be move independently of the pilot camera. Lasers swapped for green lasers, but still only one working. Without laser and independent camera unable to do video mosaic, but steady flying allowed for video transects to be performed.

Thursday 14th November
2030 recover ROV
Transit to Researcher Seamounts continuing to collect MB bathymetry

Friday 15th November Transit to Researcher Seamounts.

Saturday 16th November
Arrive at first approach to Vayda Seamount at SE to start looking at SBP for future sediment sites. Some evidence of layering seen. Traverse across Vayda up ridge to the west of peak at 6knts and then

acorss the flat plain to CTD site in 4000m (looking for sediment). WP over small ridge so continue north to site with sediment layers.
STN044 deploy CTD006. Bottles 2 and 4 moved position so as to not compromise the bottom water sampling. Problems with switching between winch 'bellybox' and the winch room control on descent. Bottles 2 and 4 did not close at the bottom. Need new bottles for next CTD. Apparently already evidence for wire unraveling even on first deployment.
Steam back towards Vayda continuing to look at SBP. Then slow to 6knts to continue bathymetric survey. Vayda reaches 400m water depth with a small flat top.
STN045 deploy ROV235 at 1400m water depth towards west of seamount. Landed on fossil corals field. Strong currents during dive, so had to pull up ~200m to traverse across certain areas.

Sunday 17th November
1948 recover ROV.
Survey area to the north east of Vayda to look for shallower coring site. No apparent sediment on SBP so return to site of prior CTD for coring, decision made to core just south of small ridge.

Monday 18th November
STN 046 MGA013 deployed at 4125m water depth north of Vayda. Recovery of some sediment, longest core 8cm. Extensive scrolling problems on the way up (5 hours twenty minutes).
STN047 GVY009 in 4109m water depth. Recovered empty, although mud on the outside. Extenseive scrolling problems on the way up (4 hours 40 minutes). Hours of rest issue for CPO so no more coring possible (although ROV planned)
STN048 ROV236 at 850m water depth below Vayda summit. Early part of dive includes sediments and some fossil corals, but then becomes smooth rock with brittle stars.

Tuesday 19th November
Strong winds pick up during morning, with shipboard GPS drop outs so ROV held stationary on seafloor at 1424. Resume dive at 1637, but unable to recover. At top of plateau move to deeper site in blue water to allow another upward transect. Sharks and fishing gear seen on seamount plateau.

Wednesday 20th November
Recover ROV at 1401.
MB survey the southern side of Vayda
STN049 ROV237 deployed at 2165m below dive 235. Start with a sediment plain, then move up rocky slope Limited recovery of samples, and again very strong currents which required pull up by ~100m to make headway.

Thursday 21st November
Recover ROV
STN050 MGA014 deployed south of Vayda in 3700m water depth. Fitted USBL to allow monitoring of the precise position of the core at depth. USBL beacon visible on sonardyne screen allowing match to waypoint, although 100m+ scatter at depth.

Friday 22nd November
Megacore recovered, but USBL and bracket missing on recovery, with damage to MegaCorer. Appears as though cable wrapped underneath USBL pulling it off. No sediment recovered, although indications of penetration into the sediment. Niskin bottle fired, and also recovered empty.
STN051 GVY010 9m barrel deployed in same location. Recovered empty although indications of sediment on outside.
STN052 GVY011 9m barrel deployed in same location with small drift, again no sediment in corer and a small amount of sediment on outside up to ~50cm. Travel to south east past small ridge to revisit a potential site, but SBP looks worse than prior site. Return to site of STN50, 51, 52.
STN053 BOX001 deployed in same location as prior coring. Gantry stuck on recovery. Eventually recovered (2 hours 20 minutes from bottom to top) with about 10cm of sediment. Hard well mixed

foram sand layer at base. Sub cores taken using megacoring tubing for extruding as well as small diameter cores for LW and piston core tubing for storage.
STN054 GVY012 6m barrel deployed on the seamount on a 400m wide sediment plain close to where we recovered full ROV push cores. Core recovered with a small amount of sediment, around 30cm, but slumped down in corer. It had been difficult to disconnect the core barrel with lots of hammering, wobbling and pulling of the barrel which probably did not help the consistency of the core.
STN055 ROV238 deployed with Reson swath MB system in down facing position. Location close to dive 236. Conditions excellent and so able to swath a small knoll as well as the main habitat target.

Saturday 23rd November
ROV recovered and transit to Gramberg Seamount commences.

Sunday 24th November
Arrive Gramberg Seamount via SBP survey coming in from the NE. MB survey of seamount.
1544 deploy ROV239 in ~ 1564m water depth. Land on fossil coral covered knoll. Continue up seamount towards top and end dive at 900m

Monday 25th November
Recover ROV.
1800 deploy GRY013 in 1643m water depth but no sediment recovered.
2110 ROV240 deployed in water depth 2155m on deeper knoll. Mainly rocks and sediment. At 5am traverse back to start of Dive 239 to fill up nets with fossil corals.

Tuesday 26th November
Recover ROV240 for last time with no problems
Move to sediment core site looking at SBP, although acoustics not good. Return to site picked out during inward survey.
1943 deploy GRY014 in 2714m water depth. Recover 3.88m of sediment.
2238 deploy MGA015 at same site. Came up with small amount of sediment in one tube, so redeploy.

Wednesday 27th November
0148 deploy mega core MGA016 at same site as above and recover four tubes of sediment
Move to deep water sediment site.
0530 deploy MGA017 at 4128m water depth. Recover with 3 tubes partially full of muddy sediment
1000 core on deck, end of over the side operations, transit to Trinidad and Tobago commences.

Thursday 28th November
Transit
1328 Switch off MB and SBP as well as underway water sampling

Friday 29th November
Transit until arrival in Port of Spain.

Saturday 30th November
Disembark at 1400 local time.

3.3 NERC Cruise Assessment/ Debrief Agenda Form

Ship :	**R.R.S. James Cook**	**Cruise ID:**	**JC094**	**Dates:**	**13October-30November 2013**
PS name:	**LF Robinson**	**Institute & position:**	**University of Bristol**	**Email:**	**Laura.robinson@bristol.ac.uk**
Work type:	**ROV/CORE/MB/CTD**		**Area of operation:**	**Equatorial Atlantic**	
Master:	**John Leask**		**Tech Liaison Officer:**	**Dan Comben/Dave Turner**	

		Please tick the appropriate box and add comments if required						
	Supply Agreement Requirements	Exceeded	Met	Below	Greatly Below	Comments	Complaint filed (Y/N)	Internal Use Only: Logged
	Science Objectives Met		x	x		Despite the extensive efforts of all involved we were not able to secure permission to sample in Brazilian waters, thus we were unable to visit 2/3 of our target sites during the cruise. Instead we visited two alternative regions for sampling which allowed us to fulfil most of our overall science objectives, but not all. Agreement included flexible 24 hour ROV operations. Although 24 hour seafloor time was possible, the launch and recover windows were restricted due to late personnel changes, as discussed below	Discussed prior to cruise	
	Downtime		x			**Downtime** — **Reason** Overall there was limited downtime given the length of the cruise. Downtime documented below. **Ship** — 5.8 hours — Testing DP and propulsion during passage. Fortunately issues resolved and no further problems during cruise. 1 hour — Streaming CTD wire. It would appear that the CTD wire is not fit for purpose with evidence		

		of unravelling even after one deployment after retermination. This issue did not affect our cruise since we only carried out minimal CTD operations, but should be looked at for future cruises.
	Approx. 15 hours, hard to quantify since scrolling required repeated changes in pace etc.	Coring issues: (A) Gantry had problems being brought in. Observed for the first time on 21st October at STN006 (Megacore). This issue arose several times during coring operations taking up to an hour, or even more in some cases on recovery of cores. Engineers worked towards fixing the gantry during the cruise, but spare parts were not available on board. (b) Scrolling of coring wire problematic from 9th November adding up to 2 hours additional time to coring operations. It is worth noting that for future cruises it would be beneficial to have additional personnel expert in monitoring scrolling on the wire to prevent build up of scrolling problems and allow continuous coring programs. (c) some issues arising during transition from winch room control to 'belly box' which took up to an hour to resolve in exceptional cases.
Equipment	15 hours 24 hours	USBL problems during Dive221 and Dives 239 and 240. The first ROV dive ROV221 was aborted due to inability to connect to USBL beacon. The issue would appear to relate to changes having been made and not communicated between different cruises. Software issues arose during the latter dives. Second attempt at streaming ROV wire after evidence of twisting. It would have been helpful to have streamed with a heavy weight during the first wire streaming (during first passage).
Weather		In general conditions were very good, and we lost little time to weather during the

						| 24 hours. | cruise. We were unable to deploy the ROV during bad weather at Vema Fracture Zone, but carried out coring operations during that window. ROV dive had to be extended to >48 hours due to weather. Whilst we were able to look at other areas of the seamount after a blue water traverse, we were not able to visit the areas we had planned, losing a day. | **Other** | |		
	Safety If Accidents or Near misses have been filed refer to these.	x				**Accidents** **NONE** | None that I am aware of **Near Miss** **MAIB**		
	Programming & SME		x			Overall programming was well run. PI meeting cancelled at last minute.		
	Pre-Cruise Planning / Supply agreement		x			Pre cruise meeting was generally useful. It would be helpful to have a cruise manager who is a cruise participant.		
Pre-Cruise	Pre Cruise Planning & Communications			x		A late ROV personnel change (a team member critical to launch and recovery was moved to another cruise). This change was not communicated to me in a time efficient manner making it hard to propose alternative solutions. The change affected our cruise in a number of ways. The launch and recovery window was reduced to 12 hours, restricted further to daylight hours during marginal weather conditions and efforts to avoid mealtimes. Weather conditions were not problematic at our first two sites, but became so in our final three sites. As a result it became necessary to run long ROV dives with short turnaround times. Mostly this was a workable solution and we were able to maximise useful ROV bottom time. However it did have several impacts: - It was hard to make meaningful use of the intervening ~ four hour turn around window for coring or surveys thus reducing the time available for science - it placed additional pressure on the relevant ROV team and science team promoting tiredness on a long cruise - it was hard to plan sampling on the seafloor as we could not collect samples until we were full		

						but had to ‘pace’ sampling to allow for long dives. Overall this was only an issue in a couple of dives towards the end of the cruise. An area which would be of great benefit in planning would be to have a single, up to date pack of documentation required for embarkation. The dental forms are out of date and the information on medicals was initially incorrect. We were informed that a doctor’s letter was sufficient for overseas colleagues and only at late notice realised that this was not the case. One Brazilian collaborator was unable to join the cruise as he could not complete the ENG1 and PST courses. It is challenging to invite colleagues from other countries to participate in UK cruises as a result of these regulations, a fact that can only reduce the effectiveness of UK science.		
	Mobilisation Support					Excellent		
Onboard Support	Communications					Onboard generally good communications.		
	Staff					Across the board the crew and technical staff were helpful, courteous and knowledgeable making the cruise easy to run.		
	Scientific Facilities ▪ Functionality ▪ Performance ▪ Reliability ▪ Safety ▪ Cleanliness of labs					Overall excellent scientific facilities, well maintained and easy to use. A few issues below: Winch and gantries, see above. In addition failure of the main lab unit for running the winch and no spare parts meant that winching operations took place in the winch room. This made communications between science/technicians and winch operators challenging. The winch room does not have access to the information needed for deployments (e.g. MB depth) so that interested parties had to be separated. Winching either needs to be controlled from main lab, or winch room needs to be improved to contain better access to shipboard information. SBP120 essential to choosing coring sites had faulty boards and no spares. Systems technician worked towards a solution by switching boards, but unexpected failures at inopportune moments were problematic. Repeated failure of 2 niskin bottles on rosette (on 3 out of 6 occasions)		
	Domestic Facilities ▪ Hotel facilities ▪ Catering service ▪ Cleanliness of ship					Overall I was extremely impressed with the facilities. The galley staff did an outstanding job which was praised frequently by all science personnel. It would be of great benefit to have a midnight meal for 24 hour a day operations.		
	Demobilisation Support Please advise on any issues post completion					Demob has not yet happened. Agent not responsive to queries.		
	Any Other Business					Better internet access would improve ability to provide more insightful outreach material to the general public, as well as allow us to download scientific literature required during the course of the cruise.		

Chapter 4: Site summaries and maps

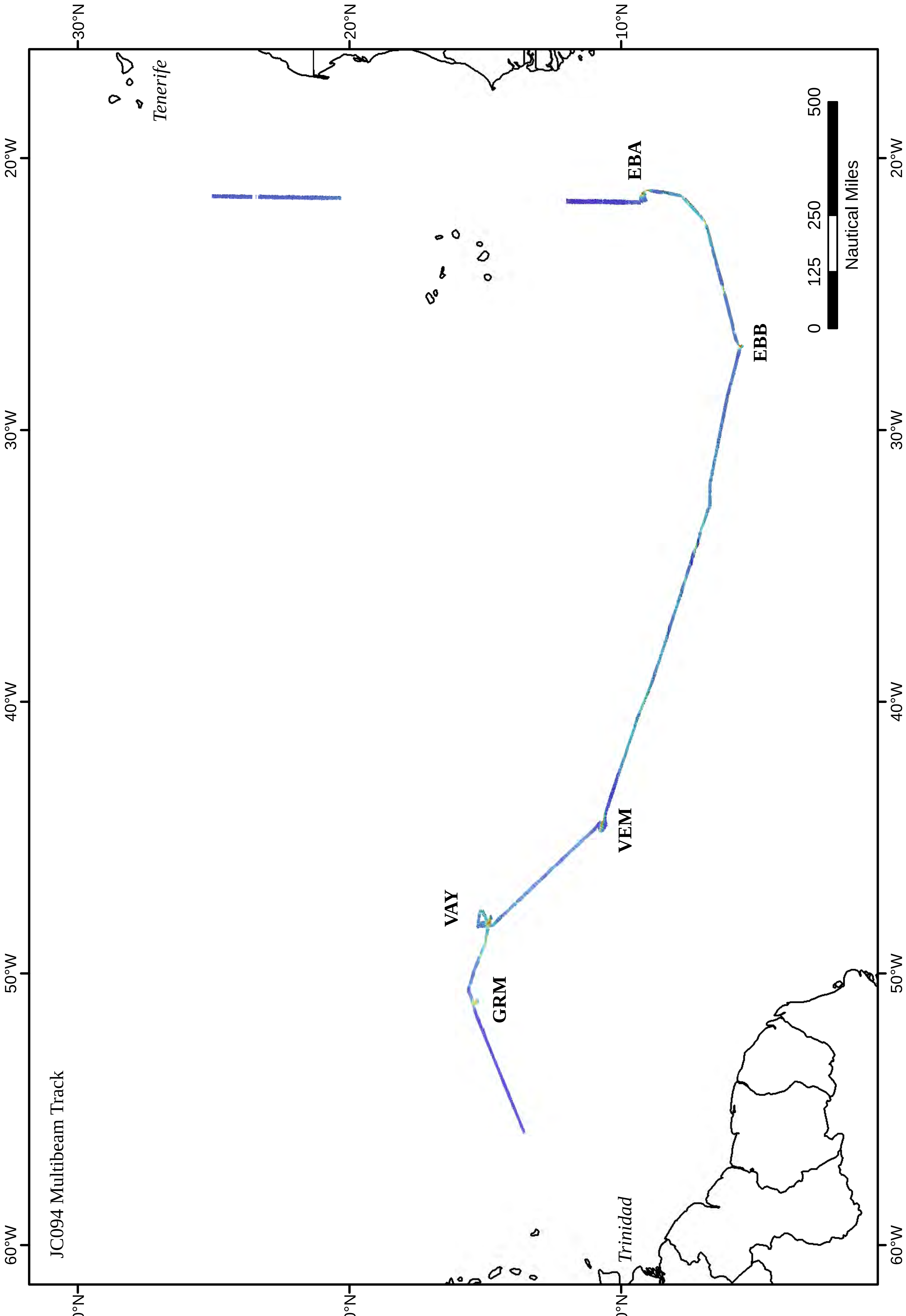
The following pages are full page maps and site summaries for the five main sites as well as overview maps.

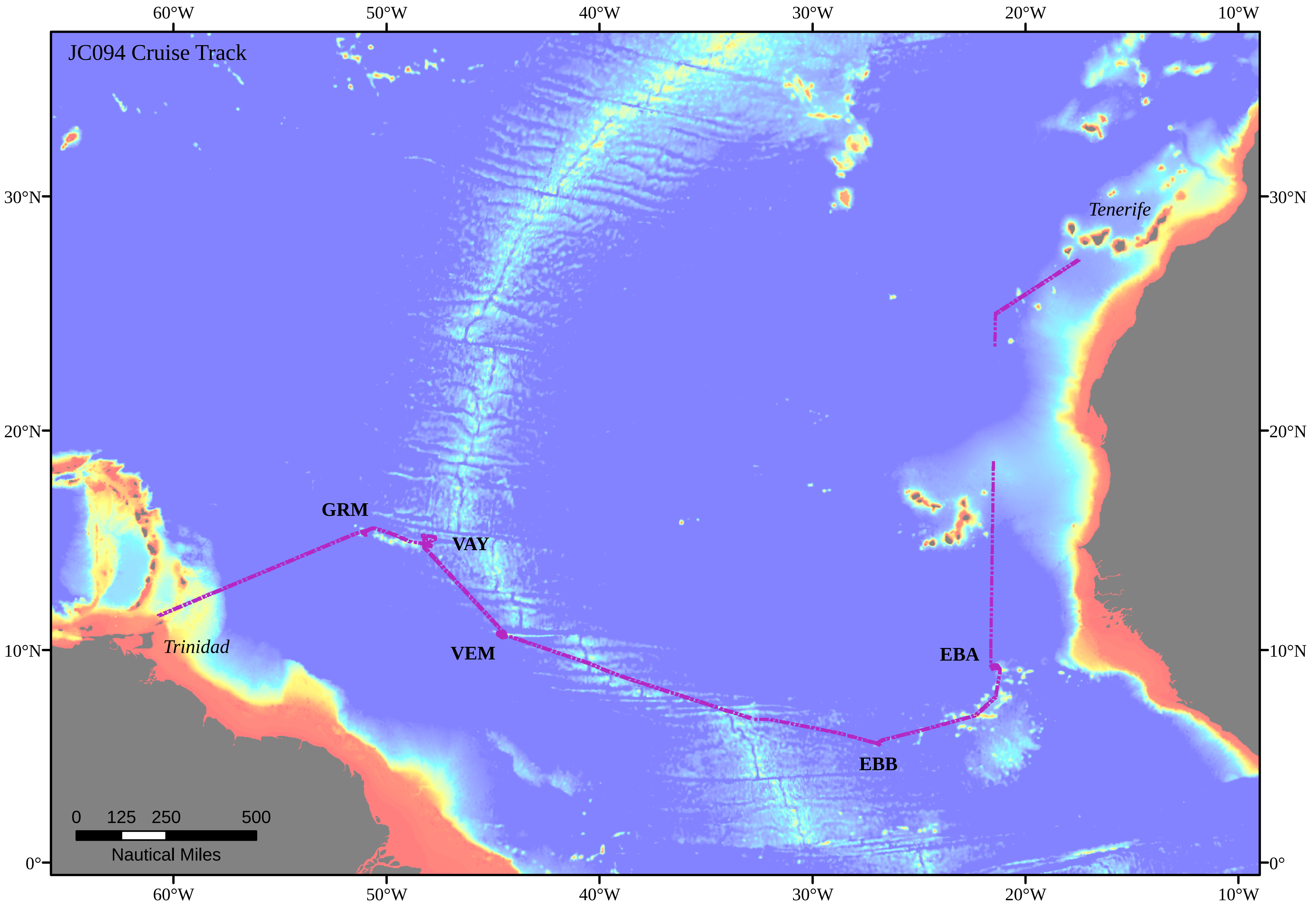
4.1 Overview Maps

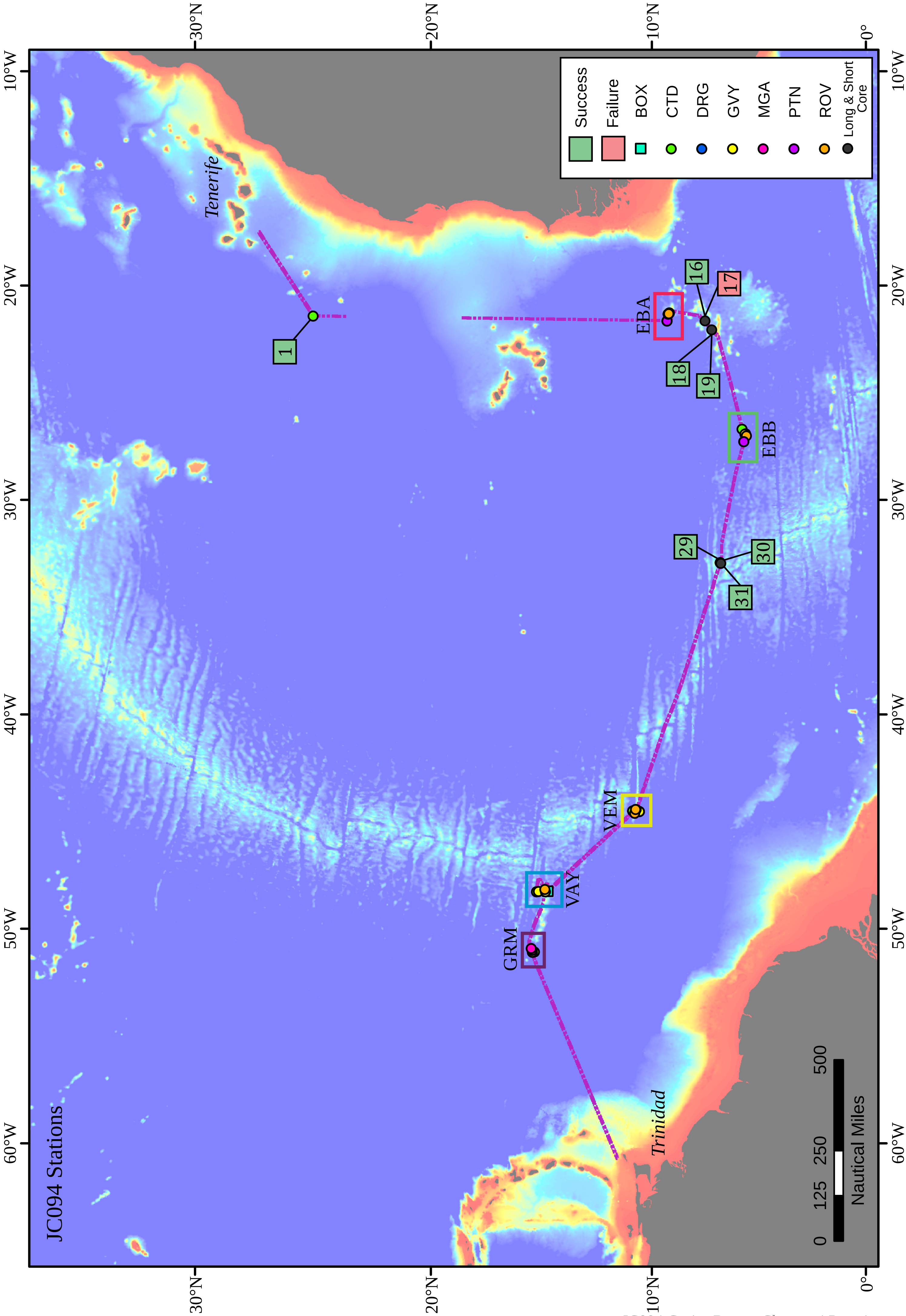
JC094 Multibeam Track ***(Page 2):*** This is the JC094 track of the hull-mounted EM-120 multibeam sonar data. Gaps in the data are where the sonar was not being logged while transiting through Economic Exclusive Zones. This map was created in a Mercator projection with a standard parallel of 10.0 degrees north. (EBA= Carter Seamount, EBB= Knipovich Seamount, VEM= Vema Fracture Zone, VAY= Vayda Seamount, and GRM= Gramberg Seamount).

JC094 Cruise Track ***(Page 3):*** This is the RRS James Cook navigation data at 1 minute intervals overlaying an ETOPO1 base map. The ETOPO seafloor is represented by depth with the dark blues representing deeper depths and the red being the shallowest. This map was created in a Mercator projection with a standard parallel of 10.0 degrees north. *(Amante, C. and B. W. Eakins. ETOPO1 1 Arc-Minute Global Relief Model: Procedures, Data Sources and Analysis. NOAA technical Memorandum NESDIS NGDC-24, 19 pp, March 2009.)*

JC094 Stations ***(Page 4):*** This figure is the JC094 Cruise Track map with the locations of each main site and transit stations. The five main sites (EBA= Carter Seamount, EBB= Knipovich Seamount, VEM= Vema Fracture Zone, VAY= Vayda Seamount, and GRM= Gramberg Seamount) are shown by coloured square outlines that correlate to zoomed imasp of each site with stations (see following pages). The transit stations are depicted by their number in either a red (successful) or green (failed).


JC094 Multibeam Track
Tenerife
Trinidad
EBA
EBB
VEM
VAY
GRM
0
125
250
500
Nautical Miles
20°W
30°W
40°W
50°W
60°W
30°N
20°N
10°N


JC094 Cruise Track
Tenerife
GRM
VAY
VEM
EBA
EBB
Trinidad
0 125 250 500
Nautical Miles
60°W
50°W
40°W
30°W
20°W
10°W
30°N
20°N
10°N
0°

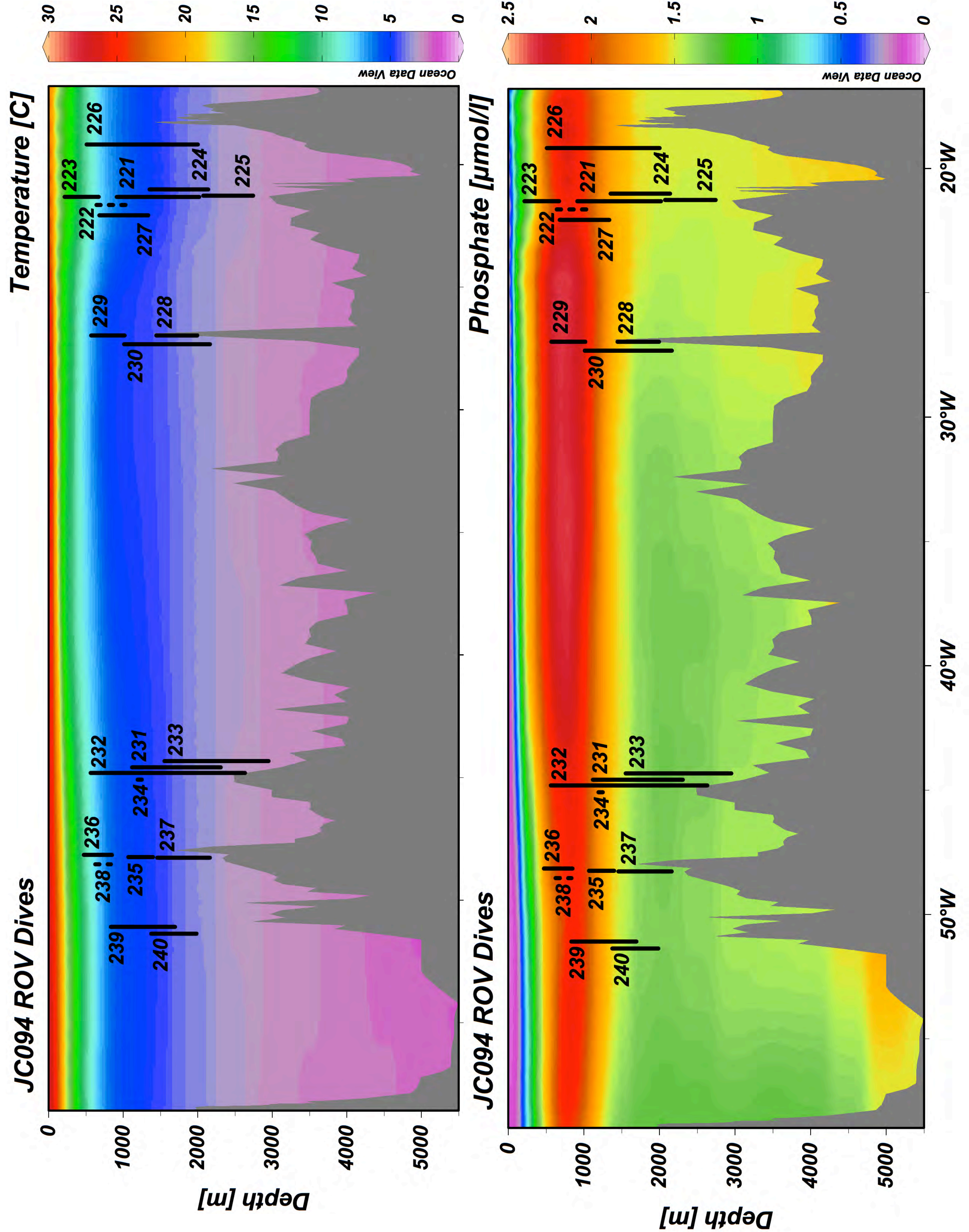

JC094 Stations
Success
Failure
BOX
CTD
DRG
GVY
MGA
PTN
ROV
Long & Short Core
Tenerife
Trinidad
EBA
EBB
VEM
VAY
GRM
1
16
17
18
19
29
30
31
0
125
250
500
Nautical Miles
10°W
20°W
30°W
40°W
50°W
60°W
0°
10°N
20°N
30°N

4.2 Overview of Sampling shown on vertical sections

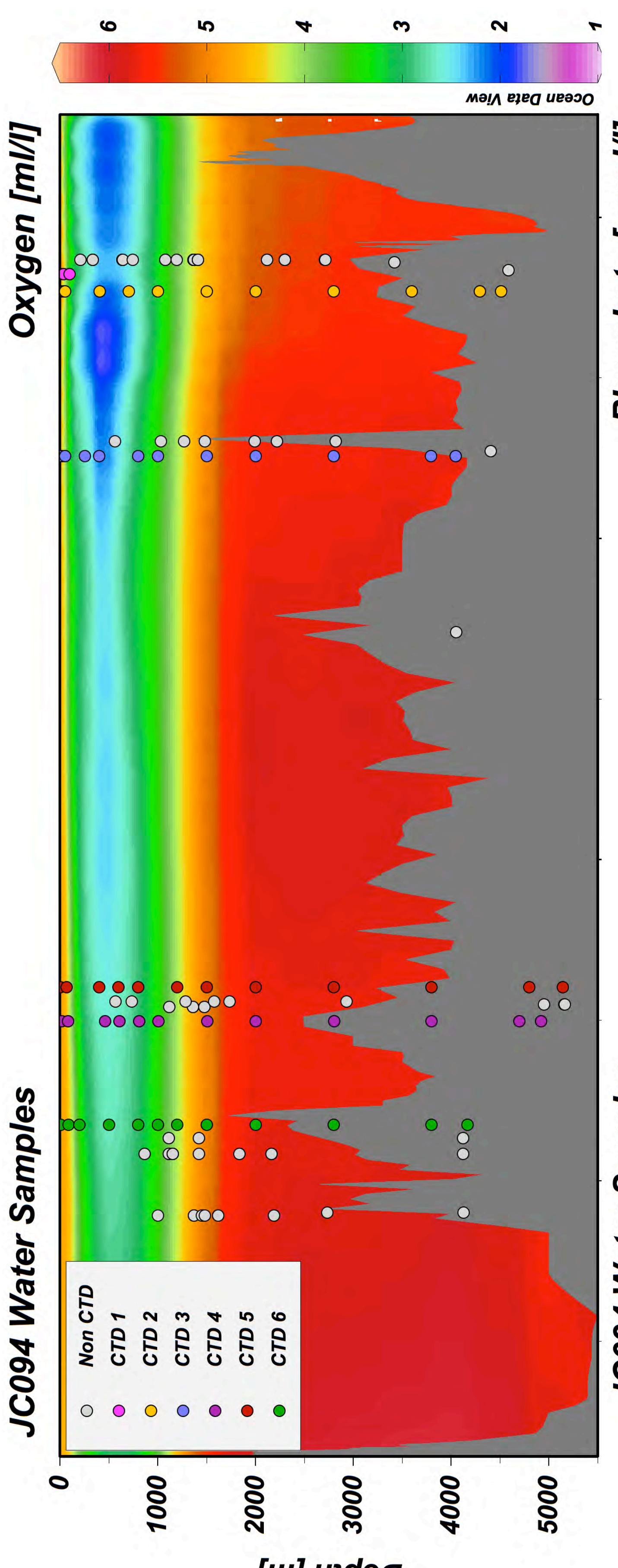
ROV DIVES (Page 6): ROV dive locations and depth ranges superimposed on Ocean Data view longitudinal sections. The top graph shows the temperature (degree Celsius) at depth (m) by location (Degree) for each ROV dive. The bottom graph represents the phosphate levels (µmol/l) at depth (m) by location (Degree) for each ROV dive.

WATER SAMPLES (Page 7): Water sample locations (grey dots are samples collected by ROV or by Mega core, coloured dots are CTD samples, as labelled) superimposed on Ocean Data view longitudinal sections. The top graph depicts the amount of oxygen (ml/l) at depth (m) by location (Degree) for each water sample taken. The bottom graph represents the phosphate levels (µmol/l) at depth (m) by location (Degree) for each water sample.

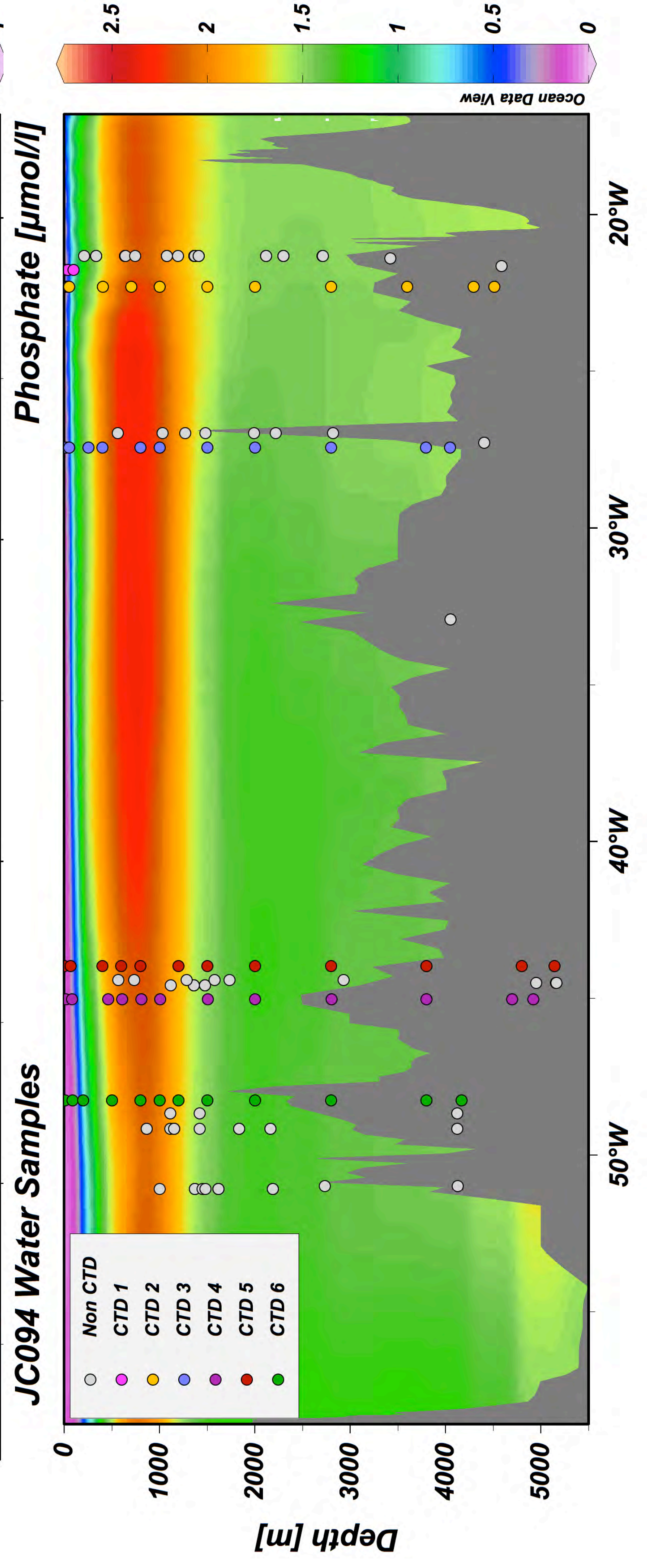
SEDIMENT CORES (Page 8): Sediment core locations for short (mega and box corers) and long (piston and gravity corers) cores superimposed on Ocean Data view longitudinal sections. The top graph depicts the temperature (degree Celsius) at depth (m) by location (Degree) for each sediment sample by attempted or successful core. The bottom graph represents the phosphate levels (µmol/l) at depth (m) by location (Degree) for attempted or successful core.



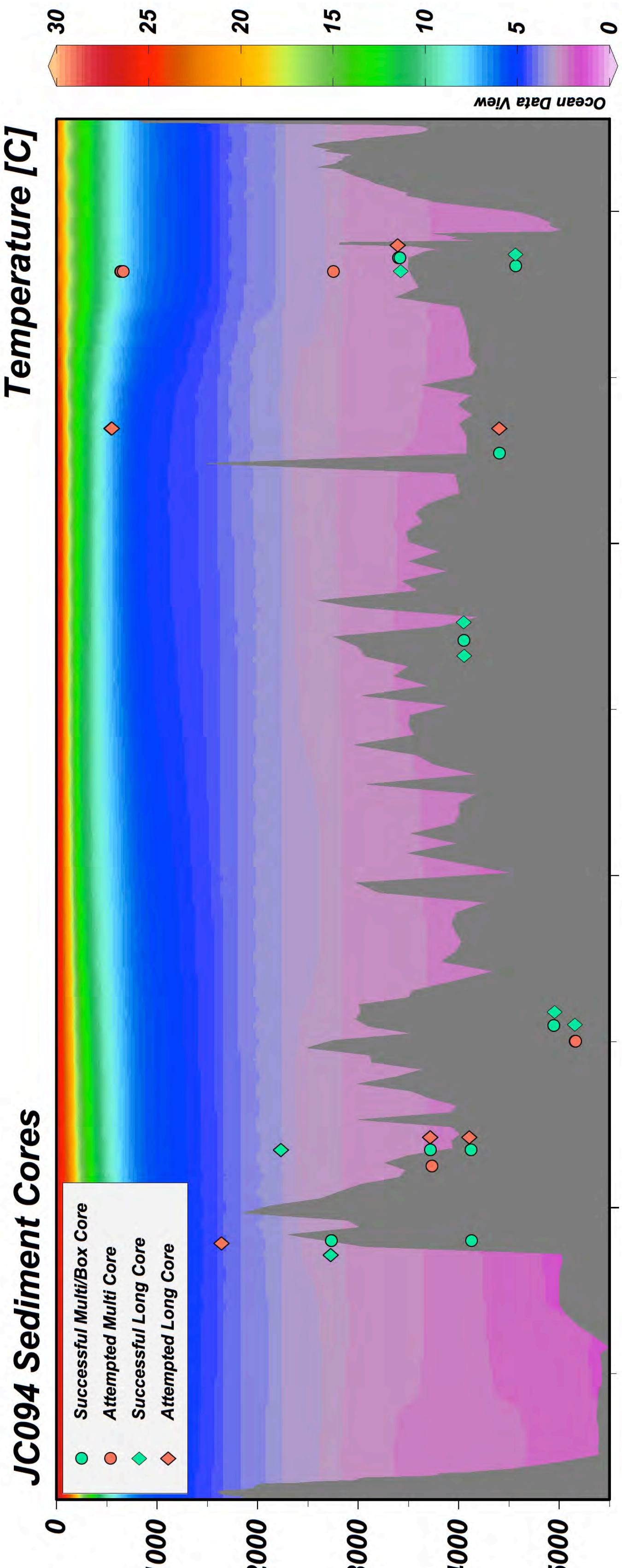
JC094 ROV Dives
Temperature [C]
Depth [m]
Ocean Data View
JC094 ROV Dives
Phosphate [µmol/l]
Depth [m]
Ocean Data View
20°W
30°W
40°W
50°W
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240

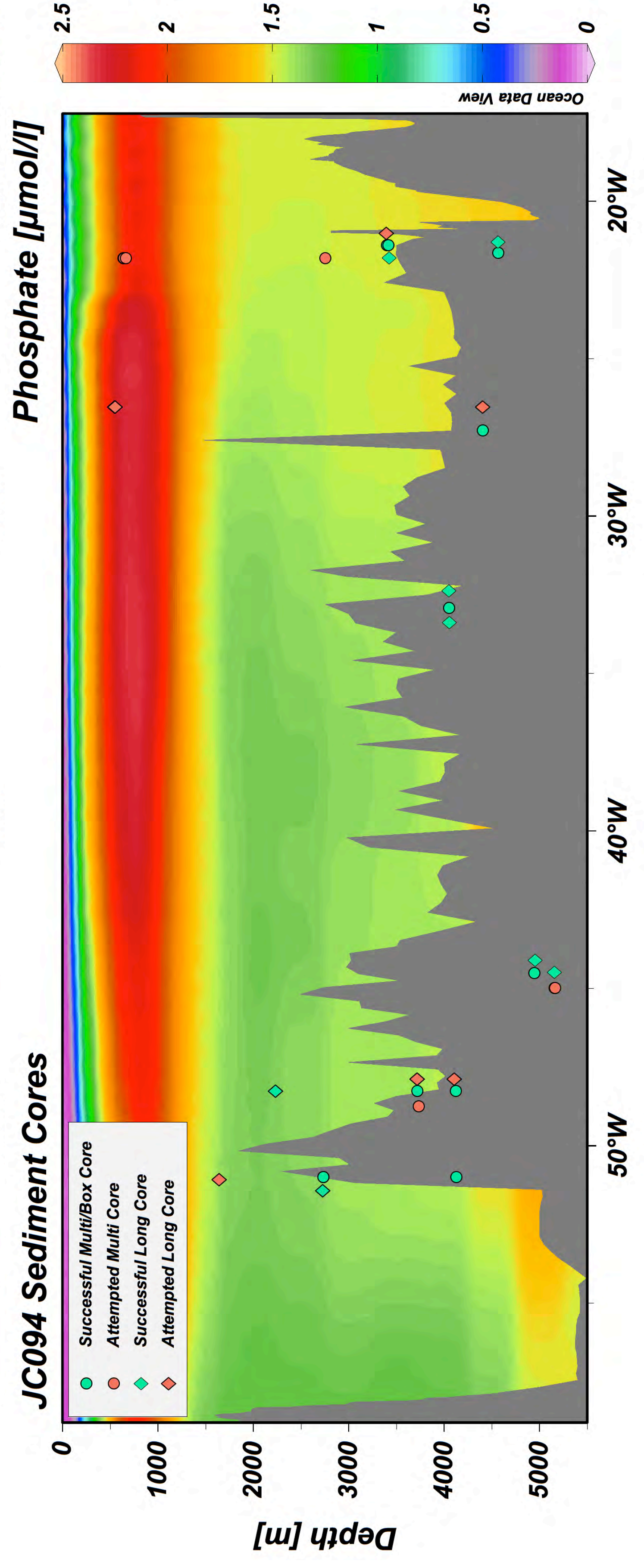


JC094 Water Samples
Oxygen [ml/l]
Non CTD
CTD 1
CTD 2
CTD 3
CTD 4
CTD 5
CTD 6
Depth [m]
0
1000
2000
3000
4000
5000
6
5
4
3
2
1
Ocean Data View



JC094 Water Samples
Phosphate [µmol/l]
Non CTD
CTD 1
CTD 2
CTD 3
CTD 4
CTD 5
CTD 6
Depth [m]
0
1000
2000
3000
4000
5000
2.5
2
1.5
1
0.5
0
Ocean Data View
50°W
40°W
30°W
20°W


JC094 Sediment Cores
Temperature [C]
Successful Multi/Box Core
Attempted Multi Core
Successful Long Core
Attempted Long Core
Depth [m]
0
1000
2000
3000
4000
5000
30
25
20
15
10
5
0
Ocean Data View


JC094 Sediment Cores
Phosphate [µmol/l]
Successful Multi/Box Core
Attempted Multi Core
Successful Long Core
Attempted Long Core
Depth [m]
0
1000
2000
3000
4000
5000
50°W
40°W
30°W
20°W
2.5
2
1.5
1
0.5
0
Ocean Data View

4.3 Site Maps

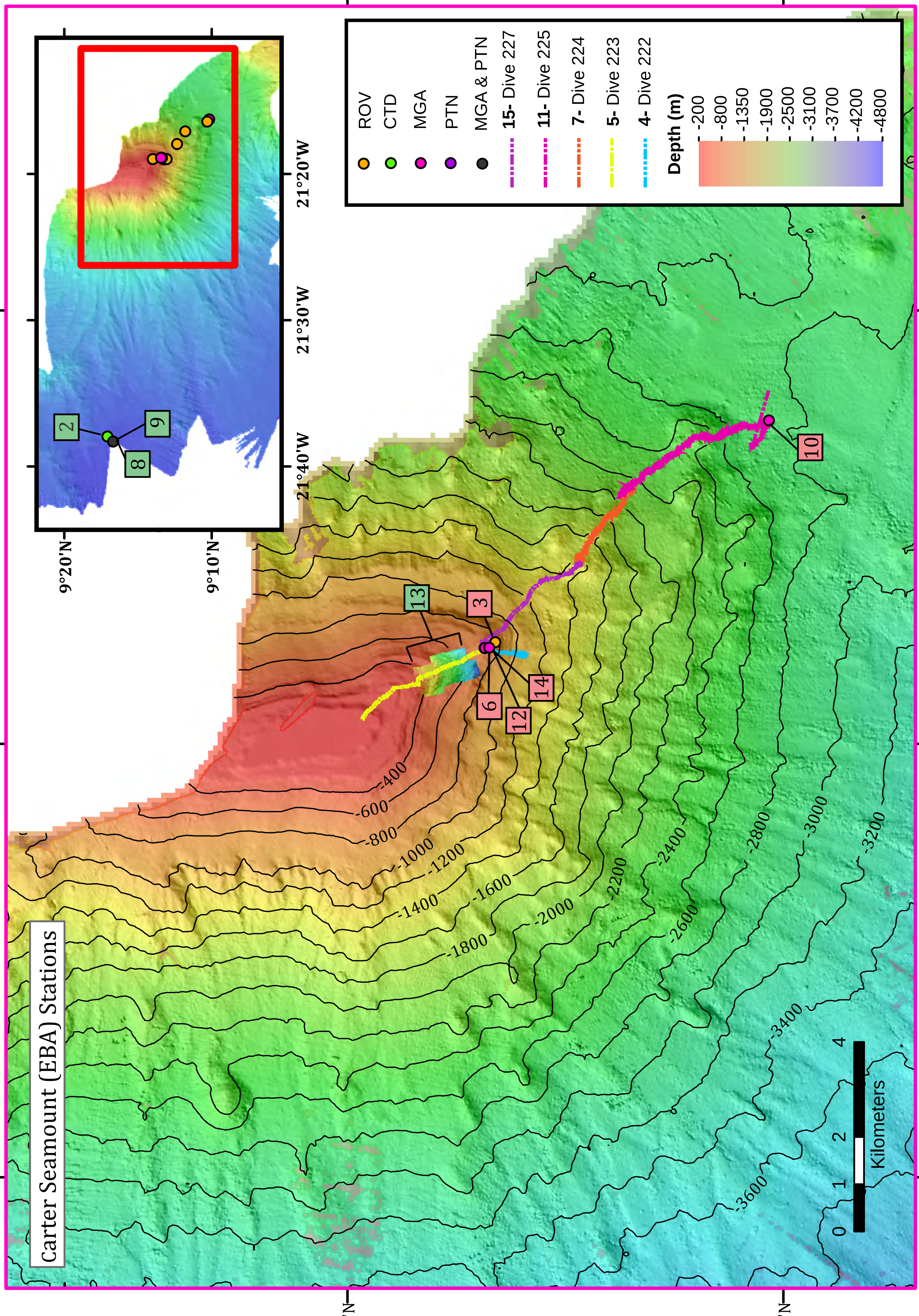
Carter Seamount (EBA) Stations ***(Page 10):*** This figure shows all of the stations by gear type that occurred on Carter Seamount. The base map is from EM-120 data collected and processed during JC094. This base map is a 50 m resolution grid overlaying a 100 m resolution grid in a UTM projection, Zone 27N. The contours are at 200 m intervals. Stations are represented by coloured circles, except for ROV dives which are represented by coloured navigation lines created from USBL data. Station 13 is shown as the high-resolution ROV multibeam data. The stations are shown in as red (failed) or green (successful).

Knipovich Seamount (EBB) Stations ***(Page 11):*** This figure shows all of the stations by gear type that occurred on Knipovich Seamount. The base map was produced by EM-120 data collected and processed during JC094. This base map is a 100 m resolution grid in a UTM projection, Zone 26N. The contours are created at 100 m intervals. Stations are represented by coloured circles, except for ROV dives which are represented by coloured navigation lines created from USBL data. The stations are shown in as red (failed) or green (successful).

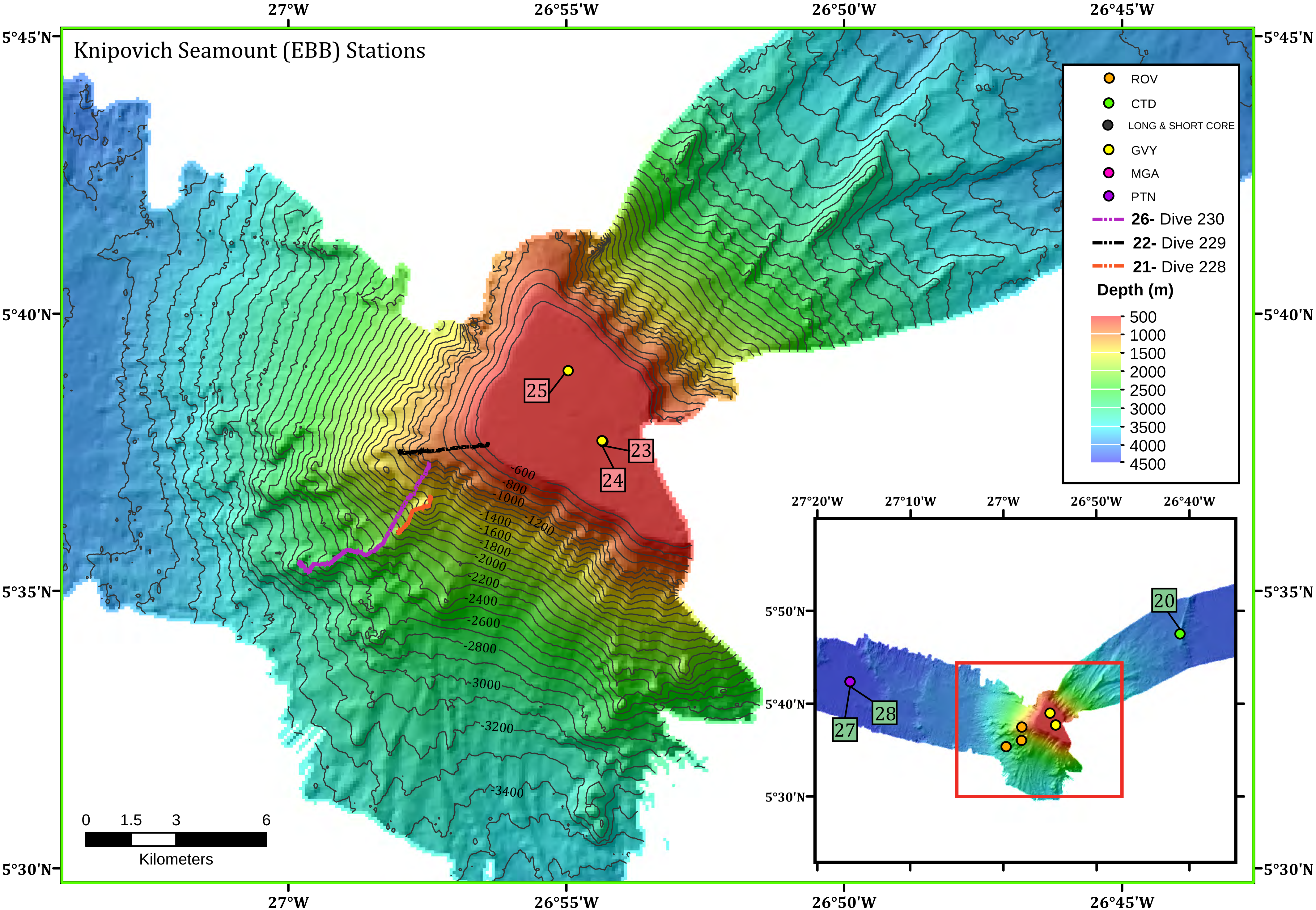
Vema Fracture Zone (VEM) Stations ***(Page 12):*** This figure shows all of the stations by gear type that occurred on the Vema Fracture Zone. The base map was produced by EM-120 data collected and processed during JC094. This base map is a 100 m resolution grid in a UTM projection, Zone 23N. The contours are created at 200 m intervals. Stations are represented by coloured circles, except for ROV dives which are represented by coloured navigation lines created from USBL data. Station 14 is not represented by the ROV navigation line, but by the orange coloured circle because it was the vertical-high resolution mapping dive. The stations are shown in as red (failed) or green (successful).

Vayda Seamount (VAY) Stations ***(Page 13):*** This figure shows all of the stations by gear type that occurred on Vayda Seamount. The base map was produced by EM-120 data collected and processed during JC094. This base map is a 100 m resolution grid in a UTM projection, Zone 22N. The contours are created at 200 m intervals. Stations are represented by coloured circles, except for ROV dives which are represented by coloured navigation lines created from USBL data. Station 55 is not represented by the ROV navigation line, but by the high-resolution multibeam base map. The stations are shown in as red (failed) or green (successful).

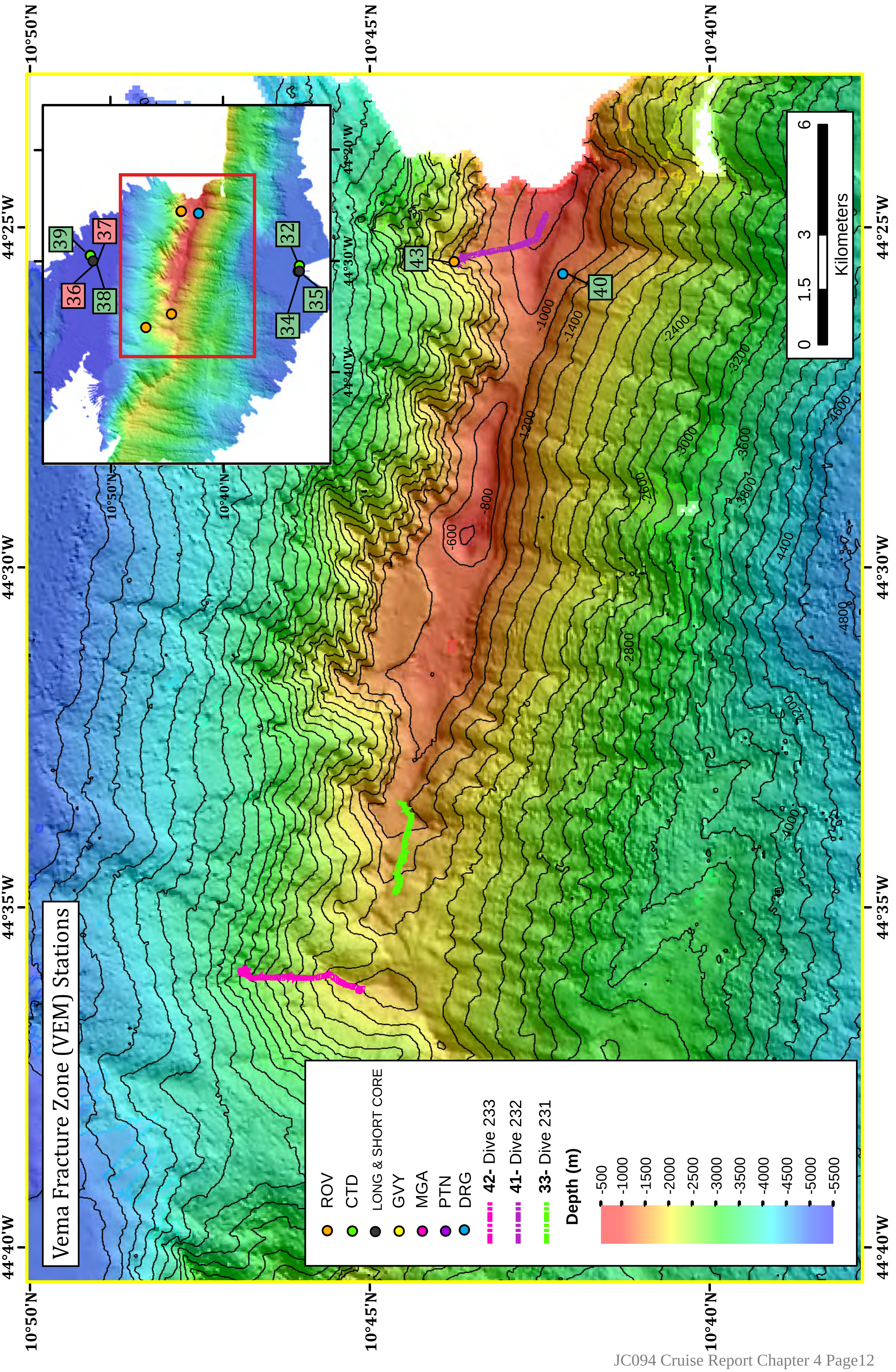
Gramberg Seamount (GRM) Stations ***(Page 14):*** This figure shows all of the stations by gear type that occurred on Gramberg Seamount. The base map was produced by EM-120 data collected and processed during JC094. This base map is a 100 m resolution grid in a UTM projection, Zone 22N. The contours are created at 200 m intervals. Stations are represented by coloured circles, except for ROV dives which are represented by coloured navigation lines created from USBL data. The stations are shown in as red (failed) or green (successful).



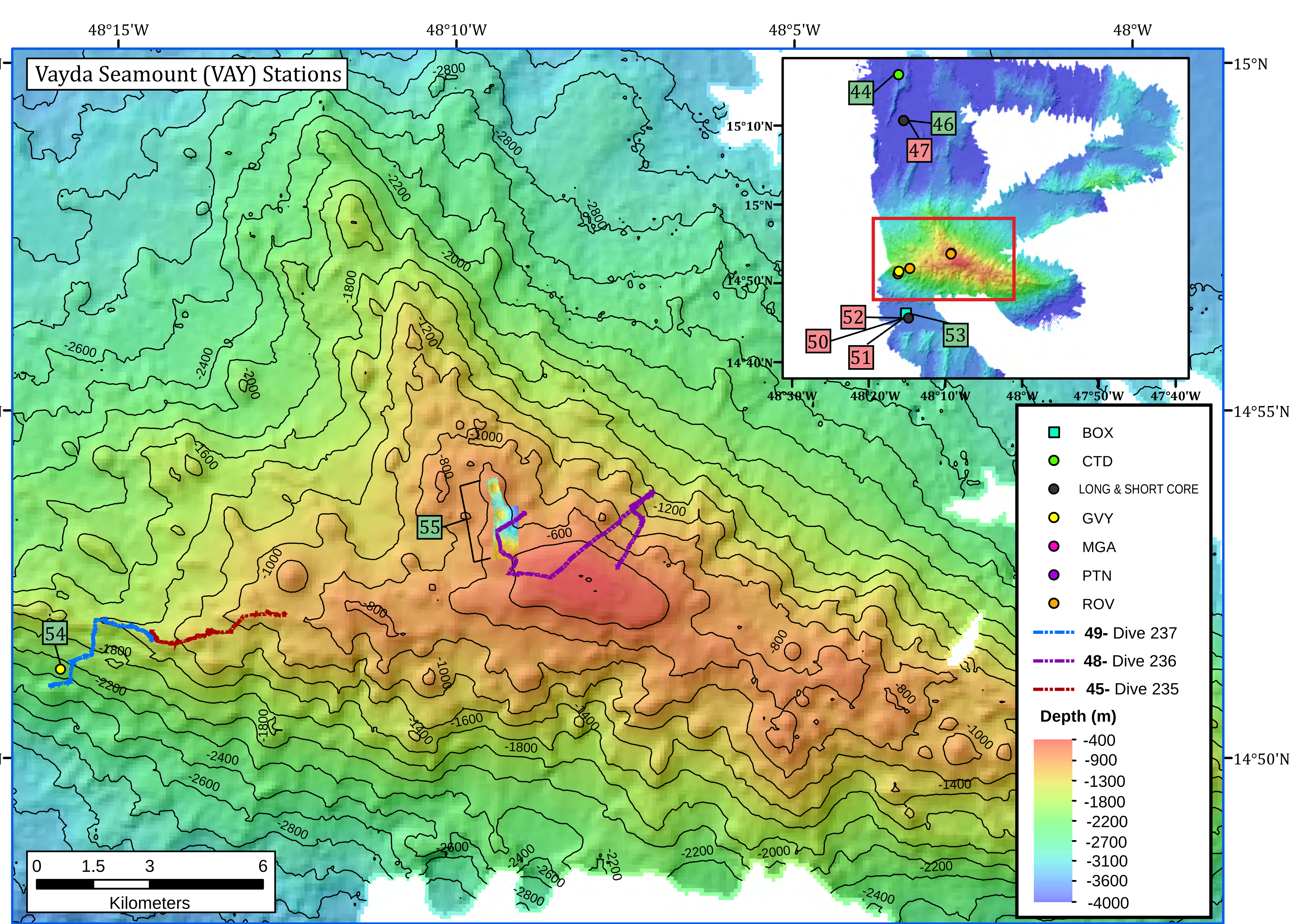
Carter Seamount (EBA) Stations
ROV
CTD
MGA
PTN
MGA & PTN
15- Dive 227
11- Dive 225
7- Dive 224
5- Dive 223
4- Dive 222
Depth (m)
-200
-800
-1350
-1900
-2500
-3100
-3700
-4200
-4800
Kilometers
0 1 2 4
9°15'N
9°10'N
21°15'W
21°20'W
21°25'W
9°20'N
21°20'W
21°30'W
21°40'W
2
6
8
9
3
6
10
12
13
14
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
-2000
-2200
-2400
-2600
-2800
-3000
-3200
-3400
-3600



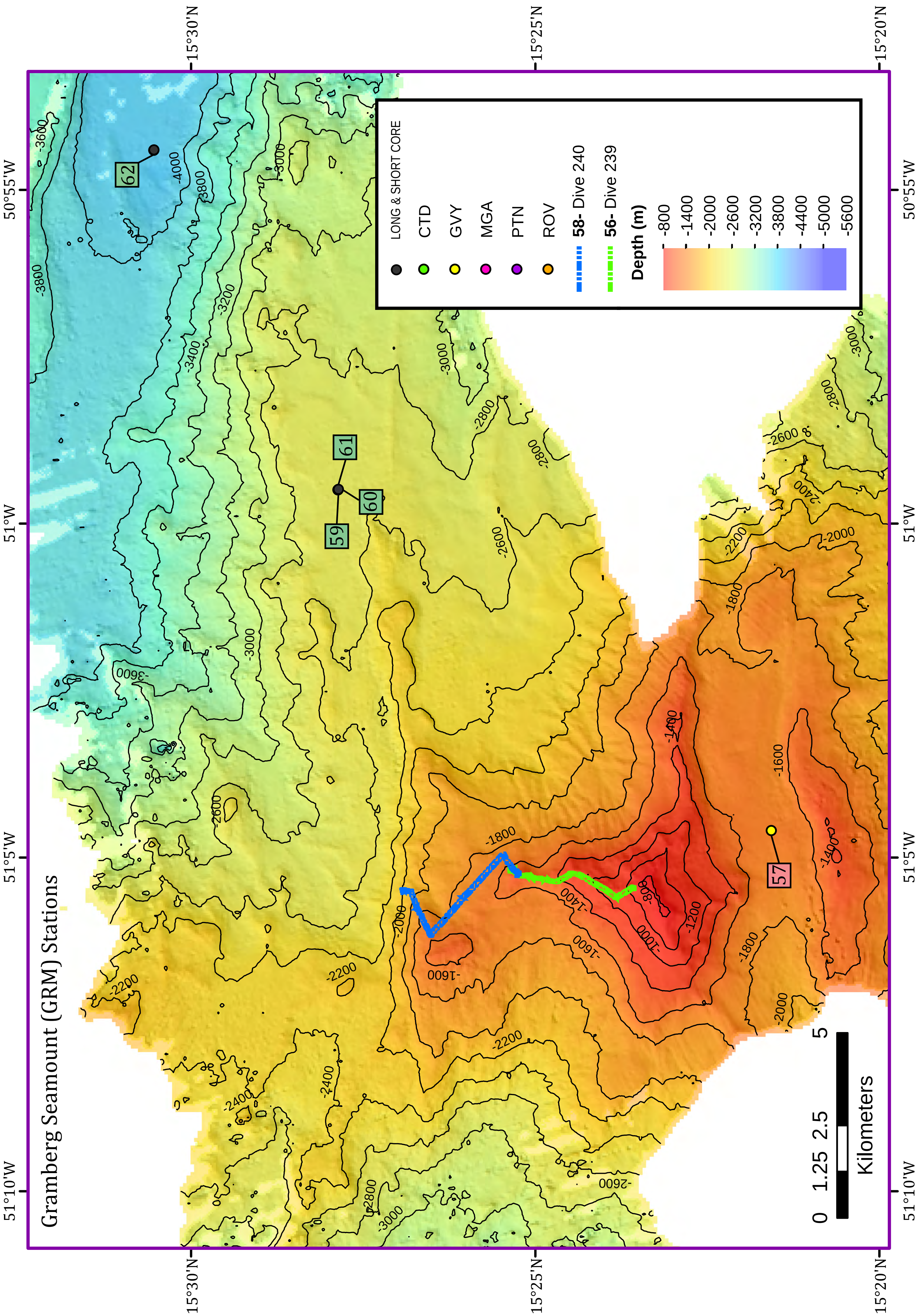
Knipovich Seamount (EBB) Stations
27°W
26°55'W
26°50'W
26°45'W
5°45'N
5°40'N
5°35'N
5°30'N
ROV
CTD
LONG & SHORT CORE
GVY
MGA
PTN
26- Dive 230
22- Dive 229
21- Dive 228
Depth (m)
500
1000
1500
2000
2500
3000
3500
4000
4500
25
23
24
20
27
28
-600
-800
-1000
-1200
-1400
-1600
-1800
-2000
-2200
-2400
-2600
-2800
-3000
-3200
-3400
0
1.5
3
6
Kilometers
27°20'W
27°10'W
27°W
26°50'W
26°40'W
5°50'N
5°40'N
5°30'N



Vema Fracture Zone (VEM) Stations
ROV
CTD
LONG & SHORT CORE
GVY
MGA
PTN
DRG
42- Dive 233
41- Dive 232
33- Dive 231
Depth (m)
-500
-1000
-1500
-2000
-2500
-3000
-3500
-4000
-4500
-5000
-5500
Kilometers
0
1.5
3
6
10°50'N
10°45'N
10°40'N
44°25'W
44°30'W
44°35'W
44°40'W
32
34
35
36
37
38
39
40
43



Vayda Seamount (VAY) Stations
BOX
CTD
LONG & SHORT CORE
GVY
MGA
PTN
ROV
49- Dive 237
48- Dive 236
45- Dive 235
Depth (m)
-400
-900
-1300
-1800
-2200
-2700
-3100
-3600
-4000
44
46
47
52
50
51
53
54
55
0 1.5 3 6
Kilometers
48°15'W
48°10'W
48°5'W
48°W
15°N
14°55'N
14°50'N
15°10'N
14°50'N
14°40'N
48°30'W
48°20'W
48°10'W
47°50'W
47°40'W



Gramberg Seamount (GRM) Stations
LONG & SHORT CORE
CTD
GVY
MGA
PTN
ROV
58- Dive 240
56- Dive 239
Depth (m)
-800
-1400
-2000
-2600
-3200
-3800
-4400
-5000
-5600
57
59
60
61
62
0 1.25 2.5 5
Kilometers
15°30'N
15°25'N
15°20'N
50°55'W
51°W
51°5'W
51°10'W

4.4 Sample summary graphs

Vayda Summary ***(Page 16):*** These graphs give a general summary of sampling that occurred on the Vayda Seamount. **Graph A** represents the temperature (RED, degrees Celsius) and salinity (BLUE, PSU) by depth, collected during CTD006. **Panel B** displays the overall ROV dive time (hours) at depth (calculated by binning the ISIS Techsas data into 50m bins by depth), with individual dives distinguished by colour. **Graph C** represents at what depth water samples were collected by gear type. **Graph D** shows at what depth coral samples, distinguished by live or fossil, were collected. **Graph E** depicts at what depths sediment samples were taken from by gear type (PSH and SLP are during ROV dives).

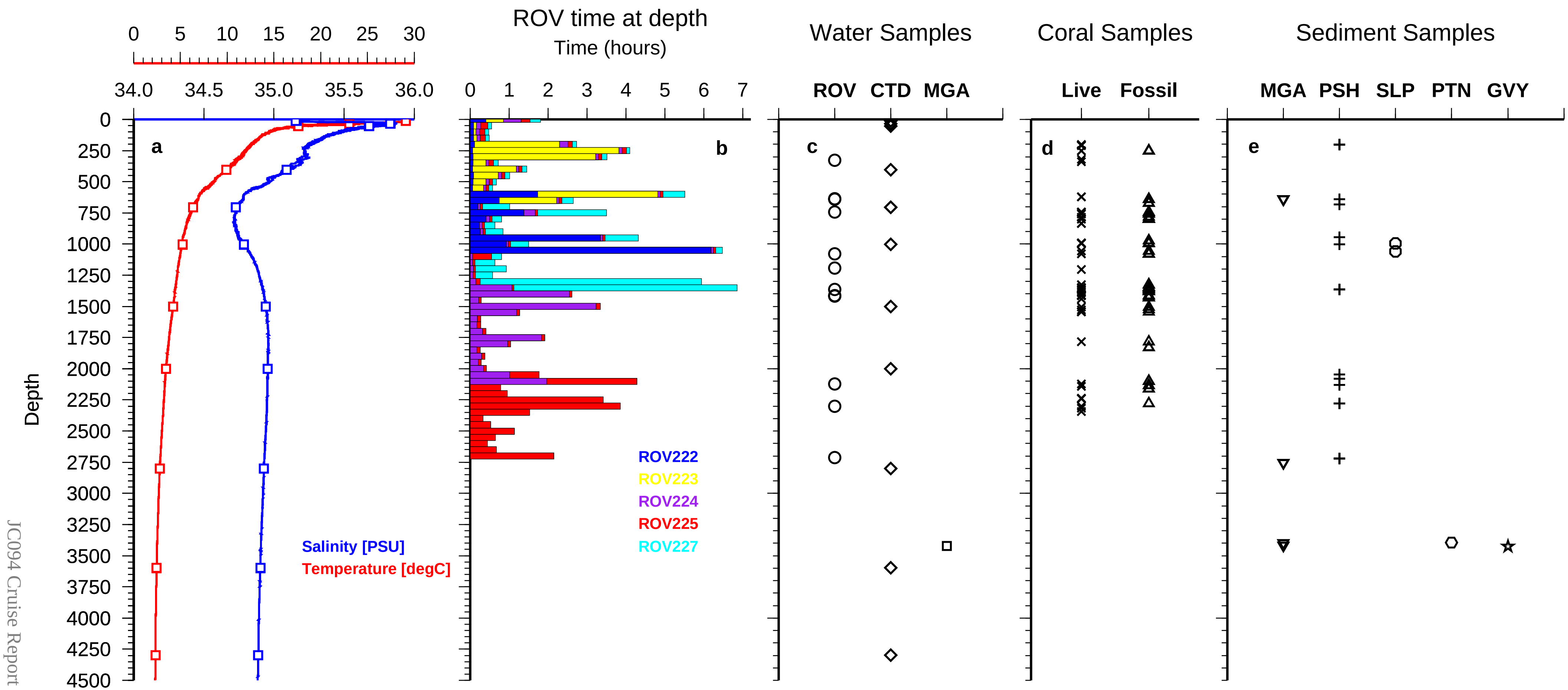
Carter Sampling Summary ***(Page 17):*** These graphs give a general summary of sampling that occurred on Carter Seamount. **Graph A** represents the temperature (RED, degrees Celsius) and salinity (BLUE, PSU) by depth, collected during CTD002. **Graph B** displays the overall ROV dive time (hours) at depth (calculated by binning the ISIS Techsas data into 50m bins by depth), with individual dives distinguished by colour. **Graph C** represents at what depth water samples were collected by gear type. **Graph D** shows at what depth coral samples, distinguished by live or fossil, were collected. **Graph E** depicts at what depths sediment samples were taken from by gear type (PSH and SLP are during ROV dives).

Knipovich Summary ***(Page 18):*** These graphs give a general summary of sampling that occurred on Knipovich Seamount. **Graph A** represents the temperature (RED, degrees Celsius) and salinity (BLUE, PSU) by depth, collected during CTD003. **Graph B** displays the overall ROV dive time (hours) at depth (calculated by binning the ISIS Techsas data into 50m bins by depth), with individual dives distinguished by colour. **Graph C** represents at what depth water samples were collected by gear type. **Graph D** shows at what depth coral samples, distinguished by live or fossil, were collected. **Graph E** depicts at what depths sediment samples were taken from by gear type (PSH and SLP are during ROV dives).

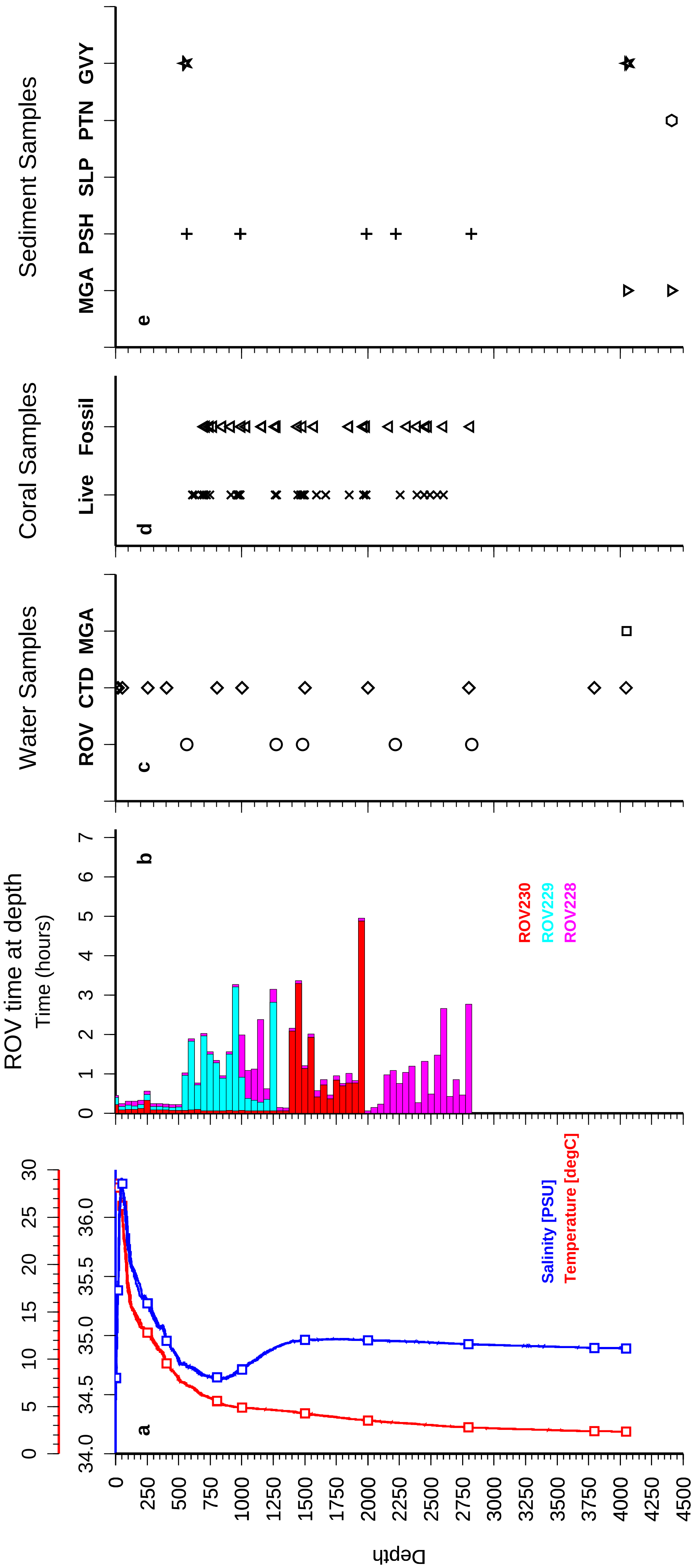
Vema Summary ***(Page 19):*** These graphs give a general summary of sampling that occurred at the Vema Fracture Zone. **Graph A** represents the temperature (RED, degrees Celsius) and salinity (BLUE, PSU) by depth, collected during CTD004. **Graph B** displays the overall ROV dive time (hours) at depth (calculated by binning the ISIS Techsas data into 50m bins by depth), with individual dives distinguished by colour. **Graph C** represents at what depth water samples were collected by gear type. **Graph D** shows at what depth coral samples, distinguished by live or fossil, were collected. **Graph E** depicts at what depths sediment samples were taken from by gear type (PSH and SLP are during ROV dives).

Gramberg Summary ***(Page 20):*** These graphs give a general summary of sampling that occurred on the Gramberg Seamount. **Graph A** represents the temperature (RED, degrees Celsius) and salinity (BLUE, PSU) by depth, collected during CTD006. **Graph B** displays the overall ROV dive time (hours) at depth (calculated by binning the ISIS Techsas data into 50m bins by depth), with individual dives distinguished by colour. **Graph C** represents at what depth water samples were collected by gear type. **Graph D** shows at what depth coral samples, distinguished by live or fossil, were collected. **Graph E** depicts at what depths sediment samples were taken from by gear type (PSH and SLP are during ROV dives).

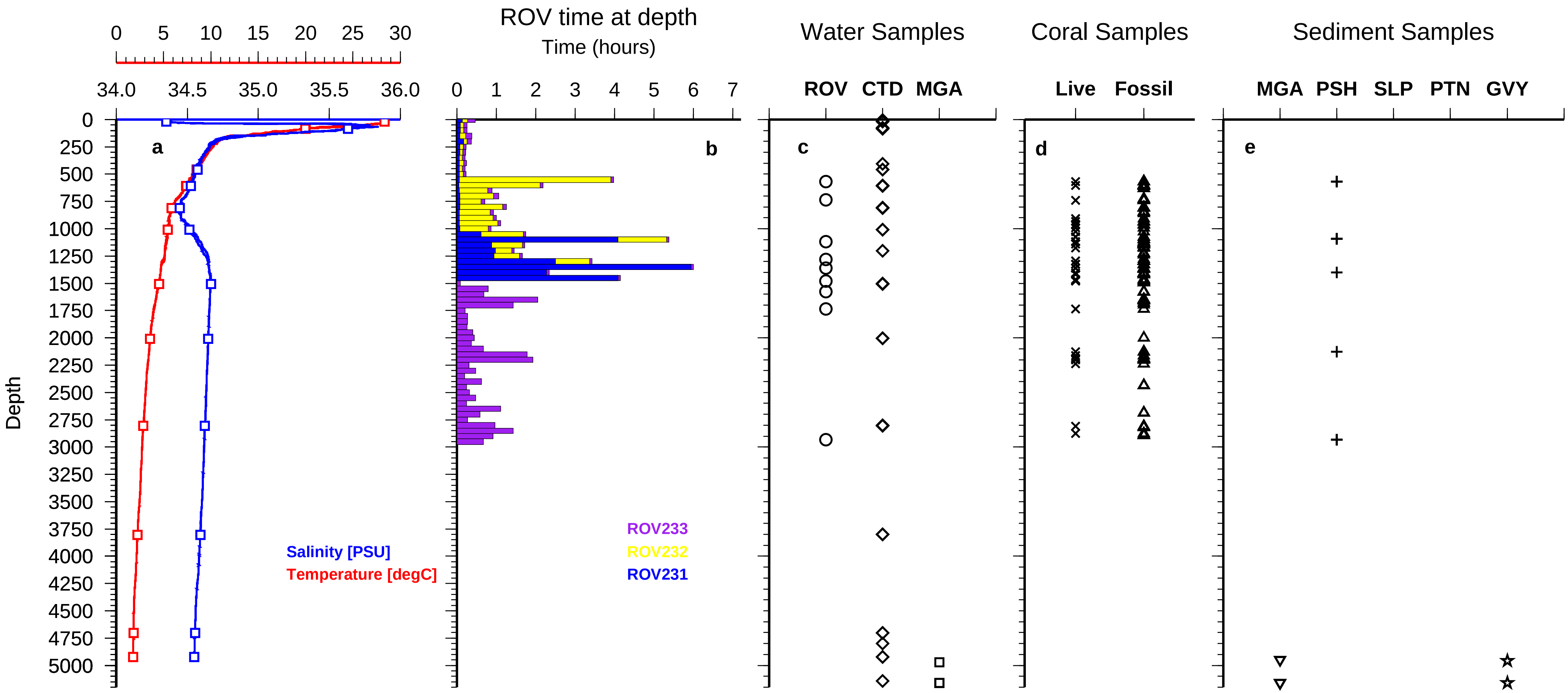
Carter Summary Figure



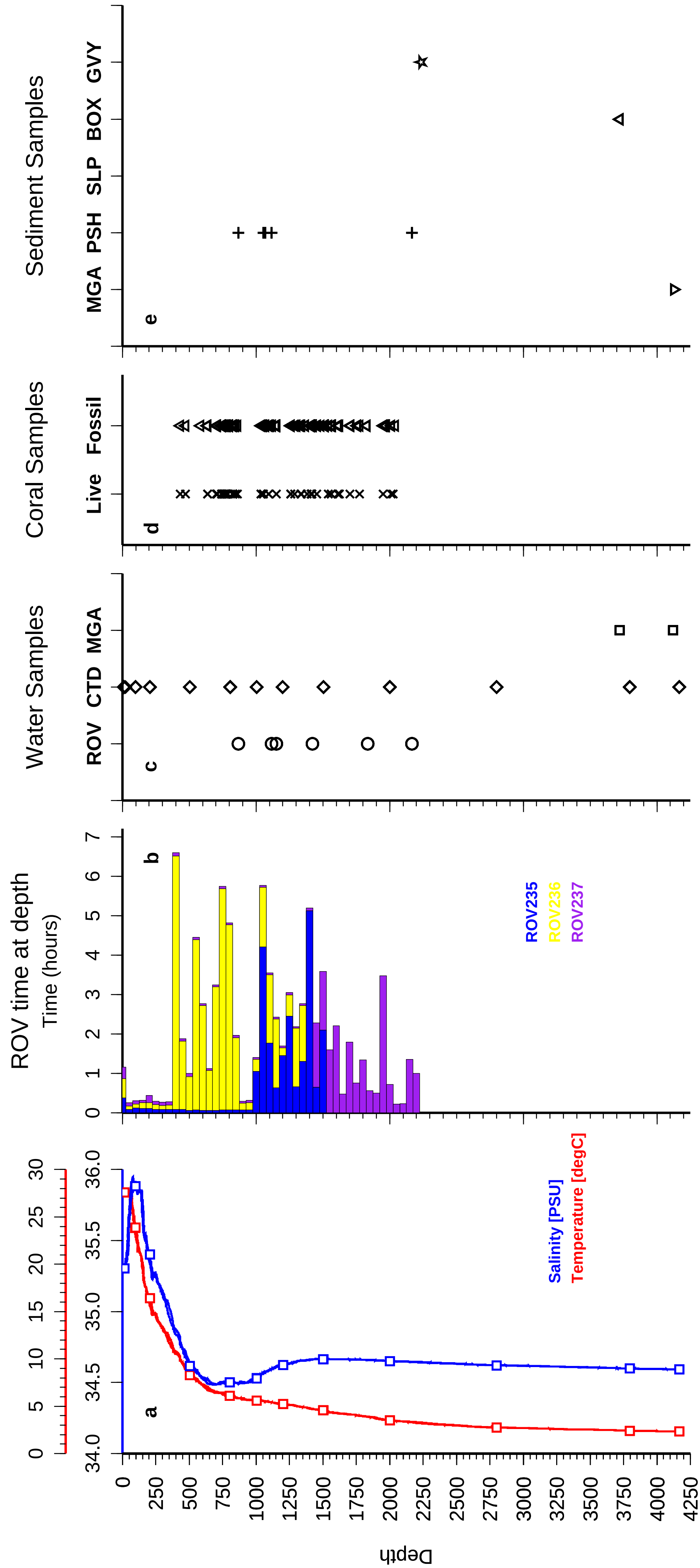
Knipovich Summary Figure



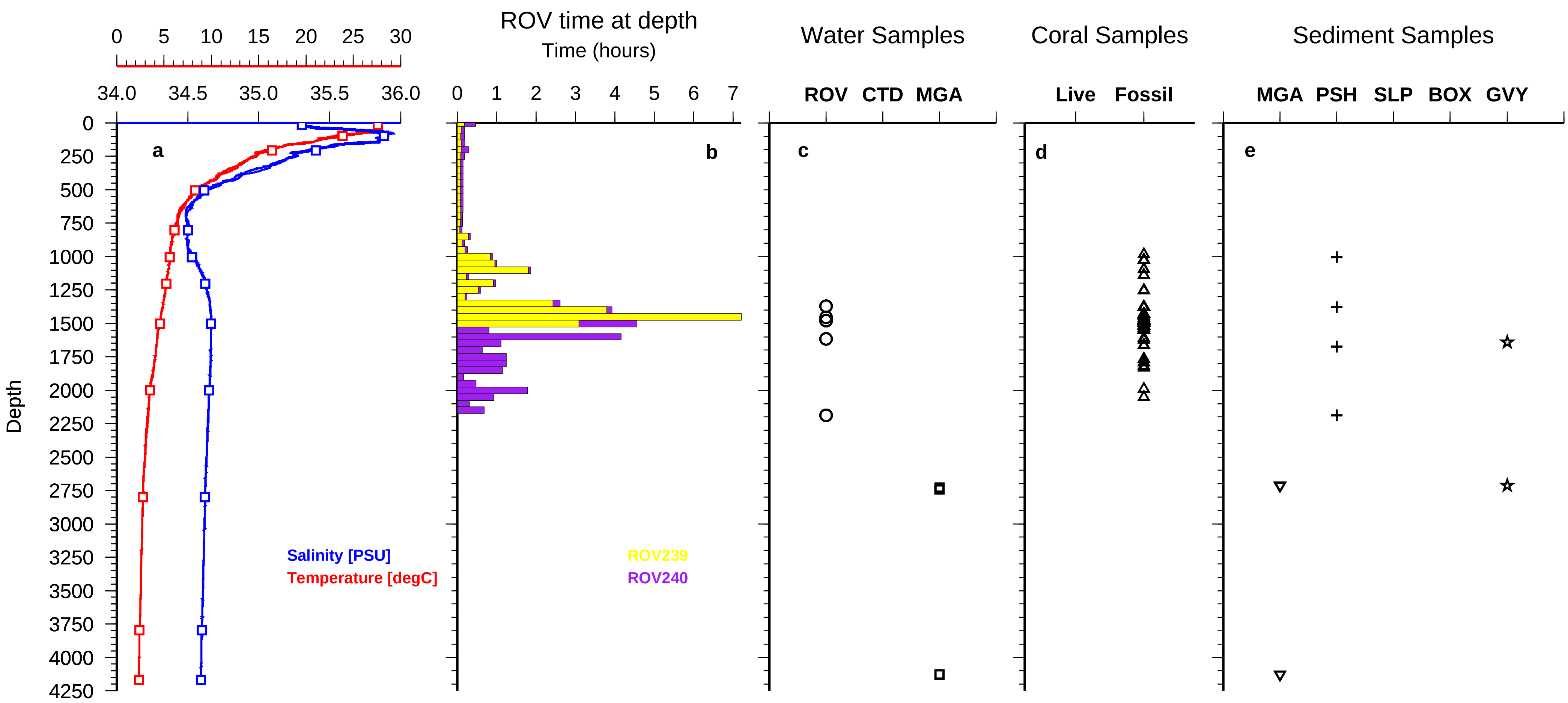
Vema Summary Figure



Vayda Summary Figure



Gramberg Summary Figure



4.5 Station Tables

Transit Stations ***(Page 22):*** This table lists all of the stations that occurred between the 5 main sampling sites. The stations are coloured by gear type (GREEN= CTD, PINK= CORE, BLUE= DREDGE and ORANGE= ROV). Each station is described by attributes: **Transit** (which transit the station occurred during), **Gear #** (ID for gear type), **Date** (date of initial deployment, GMT), **Time** (time of initial deployment, GMT), **Latitude and Longitude** (taken from ship's GPS, Degree Decimal Minutes), **Depth** (from EM-120 multibeam, Meters), and **Comments.**

Carter Stations ***(Page 23):*** This table lists all of the stations at Carter Seamount (EBA). The stations are coloured by gear type (GREEN= CTD, PINK= CORE, BLUE= DREDGE and ORANGE= ROV). Each station is described by attributes: **Gear #** (ID for gear type), **Date** (date of initial deployment, GMT), **Time** (time of initial deployment, GMT), **Latitude and Longitude** (taken from ship's GPS, Degree Decimal Minutes), **Depth** (from EM-120 multibeam, Meters), and **Comments.**

Knipovich Stations ***(Page 24):*** This table lists all of the stations that occurred at Knipovich Seamount (EBB). The stations are coloured by gear type (GREEN= CTD, PINK= CORE, BLUE= DREDGE and ORANGE= ROV). Each station is described by attributes: **Gear #** (ID for gear type), **Date** (date of initial deployment, GMT), **Time** (time of initial deployment, GMT), **Latitude and Longitude** (taken from ship's GPS, Degree Decimal Minutes), **Depth** (from EM-120 multibeam, Meters), and **Comments.**

Vema Stations ***(Page 25):*** This table lists all of the stations that occurred at the Vema Fracture Zone (VEM). The stations are coloured by gear type (GREEN= CTD, PINK= CORE, BLUE= DREDGE and ORANGE= ROV). Each station is described by attributes: **Gear #** (ID for gear type), **Date** (date of initial deployment, GMT), **Time** (time of initial deployment, GMT), **Latitude and Longitude** (taken from ship's GPS, Degree Decimal Minutes), **Depth** (from EM-120 multibeam, Meters), and **Comments.**

Vayda Stations ***(Page 26):*** This table lists all of the stations that occurred at Vayda Seamount (VAY). The stations are coloured by gear type (GREEN= CTD, PINK= CORE, BLUE= DREDGE and ORANGE= ROV). Each station is described by attributes: **Gear #** (ID for gear type), **Date** (date of initial deployment, GMT), **Time** (time of initial deployment, GMT), **Latitude and Longitude** (taken from ship's GPS, Degree Decimal Minutes), **Depth** (from EM-120 multibeam, Meters), and **Comments.**

Gramberg Stations ***(Page 27):*** This table lists all of the stations that occurred at Gramberg Seamount (GRM). The stations are coloured by gear type (GREEN= CTD, PINK= CORE, BLUE= DREDGE and ORANGE= ROV). Each station is described by attributes: **Gear #** (ID for gear type), **Date** (date of initial deployment, GMT), **Time** (time of initial deployment, GMT), **Latitude and Longitude** (taken from ship's GPS, Degree Decimal Minutes), **Depth** (from EM-120 multibeam, Meters), and **Comments.**

Transit Stations

ROV		CTD	DRG	CORE

Station #	TRANSIT	Gear #	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	depth (m)	Comments
001	TRS_1	CTD001	15-Oct	09:02	25	5.02	21	24.84	4552	practice CTD, profile taken, niskins
016	TRS_2	MGA006	28-Oct	03:29	7	48.00	21	24.00	3400	max tension= 3.60-3.71. 3 tubes came up full, but two emptied once out of the water. 2 trigger devices snapped. Core sampled without taking pore fluids
017	TRS_2	PTN002	28-Oct	08:05	7	48.02	21	24.01	3394	max tension= 5.95tons.looked to be a clean hit and pull out. Mud in core catcher but barrel empty and core catcher a little bent
018	TRS_2	GVY001	28-Oct	16:13	7	26.10	21	47.78	3426	max tension= 4.94 ton at pull out. Core succesful. Completely full up to the top valve in the barrel. 5.34m of sandy mud
019	TRS_2	MGA007	28-Oct	20:08	7	26.09	21	47.78	3419	4 sucesful megacores about 25cm - 40cm long composed of muddy sand and sandy mud
029	TRS_3	MGA009	04-Nov	22:16	6	48.71	32	54.73	4055	4 successful mega cores
030	TRS_3	GVY005	05-Nov	02:45	6	48.73	32	54.76	4055	Completey full gravity core- mud coming out of the top. Max tension=5.6 tons
031	TRS_3	GVY006	05-Nov	08:28	6	48.71	32	54.73	4054	Full gravity core. Max tension=5.37tons

CARTER STATIONS

ROV	CTD	DRG	CORE

Station #	Gear #	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	depth (m)	Comments
002	CTD002	19-Oct	04:16	9	17.07	21	37.93	4522	CTD in and out of water (mini core attached at 04:10:00). 24 successful bottles.
003	ROV221	19-Oct	15:30	9	13.21	21	18.99	914	Recovered Isis Dive before it got to the bottom. Problems with USBL
003	ROV221	19-Oct	19:18	9	12.60	21	18.66	523	END STATION
004	ROV222	20-Oct	03:57	9	12.96	21	18.95	1090	Successful dive, 5 niskins, fossil coral, bio and rocks. Push cores failed
004	ROV222	20-Oct	18:25	9	13.41	21	18.89	642	END STATION
005	ROV223	21-Oct	00:03	9	13.37	21	18.83	672	Fossil collections at base. Barren patches on way up. Lots of live sampling
005	ROV223	21-Oct	16:15	9	14.82	21	19.71	214	END STATION
006	MGA001	21-Oct	17:45	9	13.43	21	18.89	640	no sediments recovered but two tubes had fossil corals.
007	ROV224	21-Oct	22:46	9	11.73	21	17.05	2140	saw fossil corals at landing. Large collection. Traversed up seamount collecting fossils and samples. Hard to collect push cores.
007	ROV224	22-Oct	14:20	9	12.36	21	17.90	1354	END STATION
008	MGA002	22-Oct	21:18	9	16.68	21	38.27	4590	3 cores succeded. 3 did not fire. 2 were empty. Niskin success
009	PTN001	23-Oct	04:48	9	16.68	21	38.27	4567	7.5m of mud recovered. Forams at base
010	MGA003	23-Oct	14:52	9	10.16	21	16.27	2755	All fired, but no sediment collected. Niskin fired-Lucy
011	ROV225	23-Oct	20:41	9	10.17	21	15.92	2743	Deep part of dive sandy plain with scarce life. Moving up slope began to see rocks then some scattered corals. Around 2200 barnale shells. We were able to collect live solitary corals at several depths. 6 push cores recovered.
011	ROV225	24-Oct	16:05	9	11.40	21	16.08	2075	END STATION
012	MGA004	24-Oct	19:29	9	13.37	21	18.89	662	Came back with 7 broken tubes, no sediment recovered. Niskin fired but no one sampled.
013	ROV226	25-Oct	23:23	9	13.97	21	18.96	510	Reson multibeam survey of previous dive sites
013	ROV226	26-Oct	17:59	9	13.88	21	19.36	655	END STATION
014	MGA005	26-Oct	18:03	9	13.42	21	18.89	642	No cores retrieved. Some coral and foram sand found.
015	ROV227	26-Oct	22:09	9	12.33	21	17.94	1357	Extensive coral (live and solitary) collections at 1400m and 800m. Beautiful coral gardens 1300-1200m. Problems with slurp chambers- lots of material stuck in the tube.
015	ROV227	27-Oct	16:56	9	13.45	21	18.81	675	END STATION
016	MGA006	28-Oct	03:29	7	48.00	21	24.00	3400	max tension= 3.60-3.71. 3 tons came up full, but two emptied once out of the water. 2 trigger devices snapped. Core sampled without taking pore fluids
017	PTN002	28-Oct	08:05	7	48.02	21	24.01	3394	max tension= 5.95tons.looked to be a clean hit and pull out. Mud in core catcher but barrel empty and core catcher a little bent

Knipovich Stations

ROV	CTD	DRG	CORE

Station #	Gear #	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	depth (m)	Comments
020	CTD003	30-Oct	06:42	5	47.50	26	40.99	4054	successful ctd, 24 niskins, no mini corer, altimeter working
021	ROV228	30-Oct	19:00	5	36.04	26	58.02	1993	Found Caryophillia burried in sediment at deepest place. Slowly traversed up slope looking for fossil corals and biological samples
021	ROV228	31-Oct	12:38	5	36.67	26	57.45	1487	END OF STATION
022	ROV229	31-Oct	20:40	5	37.47	26	58.00	1300	mix of sediments and rocks, much more sediment than Carter overall. Several large purple solitary corals collected, as weel as fossils and other live collections
022	ROV229	01-Nov	14:18	5	37.63	26	56.38	569	END OF STATION
023	GVY002	01-Nov	15:52	5	37.69	26	54.34	552	Core came back empty. Limited pull out
024	GVY003	01-Nov	17:23	5	37.71	26	54.35	552	Second try of GVY002. Core came back empty.
025	GVY004	01-Nov	19:05	5	38.97	26	54.96	550	Change of location- empty
026	ROV230	01-Nov	23:55	5	35.36	26	59.67	2830	Flat sedimented plain with star fish and urchins. Later rocky outcrops, then very steep rocks. At about 2200m moved up to 1200m to colelct fossil corals
026	ROV230	02-Nov	21:53	5	37.25	26	57.48	1004	END OF STATION
027	MGA008	03-Nov	02:03	5	42.35	27	16.46	4405	4 successful megacores, ranging from 22 to 41 cm long - sandy mud top over glacial mud.
028	PTN003	03-Nov	07:13	5	42.36	27	16.44	4405	12m barrel piston core. Max tension: 6.01T. Barrel and weight covered in mud, but liner empty and shattered. 50cm trigger core in barrel.

Vema Stations

ROV	CTD	DRG	CORE

Station #	Gear #	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	depth (m)	Comments
032	CTD004	08-Nov	07:17	10	33.29	44	30.89	4949	successful ctd, 24 niskins, no mini corer, altimeter working
033	ROV231	08-Nov	16:06	10	44.58	44	34.73	1497	Long, slow climb up ridge. Degraded coral rubble. Steep rocky swept areas. Tow pieces of intense current where ROV could not overcome using thrusters. Areas of manganese nodules and solitary corals. Stop dive due to increasing weather conditions
033	ROV231	09-Nov	14:25	10	44.52	44	33.47	1108	END OF STATION
034	MGA010	09-Nov	17:34	10	33.29	44	30.91	4950	2 full cores and 2 empty. Max Tension= 4.75 tons
035	GVY007	09-Nov	22:38	10	33.29	44	30.90	4956	9 m barrel, successful, total recovery ca.6m. Max Tension=6.75Tons
036	MGA011	10-Nov	11:35	10	51.78	44	29.46	5160	4 tubes, all empty, did not fire. Niskin successfully fired and sampled. Max Tension= 4.85t, 5.06t, 5.12t
037	MGA012	10-Nov	17:08	10	51.79	44	29.44	5162	4 tubes, all empty, did not fire. Niskin successfully fired and sampled. Max Tension= 5.07tons
038	GVY008	10-Nov	22:59	10	51.79	44	29.46	5161	9 m barrel, successful, total recovery: 7.07m. Max Tension= 6.9Tons
039	CTD005	11-Nov	05:00	10	51.78	44	29.48	5161	CTD successful. 24 bottles fired. No altimeter.
040	DRG001	11-Nov	15:53	10	42.15	44	25.68	873	Few small corals: stylasterids and solitary, pebbles, brittle stars. Samples in net and in bucket
041	ROV232	11-Nov	21:45	10	43.72	44	25.52	1326	Spectacular cliff at start with branching coral debris at base of rocks. Madrepora > ROV size. Up over steep terrain onto flatter slope up to the top of vema. Sand, fine coral rubble, and squat lobsters.
041	ROV232	12-Nov	14:44	10	42.40	44	24.80	567	END OF STATION
042	ROV233	12-Nov	22:47	10	46.85	44	35.93	2950	Deep start with bamboo corals and spectacular sponges on roccky outcrops. Rocky ridges with small pockets of sediment. Large distances with no life. One fossil solitary coral ~2600m, fossil coralium and enallopsammia at end of dive
042	ROV233	13-Nov	18:42	10	45.15	44	36.22	1554	END OF STATION
043	ROV234	14-Nov	01:20	10	43.70	44	25.48	1250	map the steep topography around the 1300-1400m site where a large coral was found on Dive232. Bathymetry- video data collected on 3 walls to be integrated for full 3D habitat mapping.
043	ROV234	14-Nov	18:20	10	43.55	44	25.66	1430	END of STATION

Vayda Stations

ROV | CTD | DRG | CORE

Station #	Gear #	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	depth (m)	Comments
044	CTD006	16-Nov	09:33	15	16.25	48	15.58	4171	CTD. 22 bottles were successful. Bottle 6 and 7 did not close. Sound velocity profiler did not work.
045	ROV235	16-Nov	21:22	14	51.73	48	14.53	1473	Landed several hundred meters before first WP and saw fields of fossil corals. Started to suck them up individually, but then scooped them up. Continued up slope collecting samples. High currents stopped ROV from making progress so we had to pull up to 200m above seafloor in order to move across towards east.
045	ROV235	17-Nov	18:46	14	52.08	48	12.57	1080	END OF STATION
046	MGA013	18-Nov	04:29	15	10.44	48	15.01	4125	Mega core recovered with 4 samples, tow the water leaked out and only 1-2 inches of disturbed sediment. Two had 5-6 inches of mud with water overlaying. Extensive scrolling problems with winch.
047	GVY009	18-Nov	10:37	15	10.43	48	15.01	4128	Max Tension= 4.8T. Payout extra beyond core depth to try and resolve scrolling issues. Core up empty, although mud on outside, about 12 inches of barrel. Core catcher fingers clean? Fall over, or not enough soft sediment.
048	ROV236	18-Nov	19:12	14	53.48	48	9.00	867	Came up slope from 850m across sediments and fossil corals. Latter part of upward traverse smooth brown rock with brittle stars. Top of seamount the same. Wind picks up to >35kts so ship asks us to stop moving. After waiting to recover, continue to top of plateau. Move to deeper side of seamount and traverse towards top again.
048	ROV236	20-Nov	13:02	14	52.73	48	7.62	472	END OF STATION
049	ROV237	20-Nov	23:15	14	51.00	48	15.99	2181	Start sediment plain, then move up basalt steep slopes. Sponges and sediment in crevices. Few corals. Much the same up to the top. Strong current on top of ridge, so need to lift up and move east. Strong currents prevent sampling at top.
049	ROV237	21-Nov	18:29	14	51.72	48	14.51	1458	END OF STATION
050	MGA014	21-Nov	22:12	14	45.99	48	15.04	3733	Pull out at 3.7 tons. 4 tubes. 2 with holes. 2 without. Niskin Sampled. Failed. It had a USBL beacon that was lost during ascent, probably the wire went around it and pulled, breaking the frame.
051	GVY010	22-Nov	02:48	14	45.99	48	15.01	3722	Pull out at 4.8 tons. Failed: core catcher contained bad sediment on external surface. Clayey silt. Some Holocene forams could be seen on microscope. Core probably went in around 30-40cm, bounced, and fell on the side. Rate of penetration was ~15m/min. We are trying again at a site 250m to the south and with a rate of penetration of 25m/min
052	GVY011	22-Nov	06:55	14	45.87	48	15.08	3722	Pull-out: 4.5-4.65 ton - Core empty
053	BOX001	22-Nov	13:39	14	45.99	48	15.05	3722	Pull-out: 3.92 tons. Approx 16cm of sediment. Subsampled with piston core liners for storage and with megacore tubes for sampling 1 cm slices (first 2 cores) and 2cm slices (last core). Two subcores for plastics study. Independent S-numbers for each tube and the whole box core. Bulk samples stored in bags.
054	GVY012	22-Nov	19:30	14	51.27	48	15.85	2235	Pull-out: 3.3 tons. About 31cm of sediment. Stratigraphic order possibly not preserved. Sediment was spread in the liner when laid horizontally and shaken during barrel extraction from bomb.
055	ROV238	22-Nov	00:29	14	53.43	48	9.07	835	ROV microbathymetry dive with Reson 7125 in normal downward-facing configuration
055	ROV238	23-Nov	15:14	14	52.84	48	9.33	632	END OF STATION

Gramberg Stations

ROV	CTD	DRG	CORE

Station #	Gear #	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	depth (m)	Comments
056	ROV239	24-Nov	17:01	15	25.32	51	5.18	1564	Started out on small knoll North of seamount. Extensive fields of fossil corals. Carried on up ridge, but fossils less abundant with increasing height. Towards top smooth rock with crinoids. Did not quite reach summit. USBL crash due to over heating.
056	ROV239	25-Nov	16:09	15	23.56	51	5.45	900	END OF STATION
057	GVY013	25-Nov	18:00	15	21.56	51	4.59	1643	6m barrel. Max Tension- 2.64 then up to 3.0T. Core appeared to bounce on seafloor and came up empty
058	ROV240	25-Nov	22:36	15	26.90	51	5.49	2157	Deep parts were rocks/boulders and sediment. Lots of USBL issures, resolved by changing settings in software. At0800 GMT traverse to start of Dive 239 and scoop up nets of fossil corals.
058	ROV240	26-Nov	16:03	15	25.23	51	5.24	1430	END OF STATION
059	GVY014	26-Nov	19:43	15	27.86	50	59.49	2714	6m barrel. Max Tension- 4.2Tons. 3.88m of sediment
060	MGA015	26-Nov	22:38	15	27.86	50	59.49	2718	4 tubes set up. Only one tube with some sediment (~6-7cm). Partially leaking on one side and sediment being mixed. Rest of core seems intact, but core top will be mixed. Niskin not good leaking.
061	MGA016	27-Nov	01:48	15	27.86	50	59.49	2718	Four tubes with sediment between ~35 and ~15 cm. Short is for Lucy Woodall. Sampled as 1 cm slices, pore-fluids and 2 cm slices and 2 cm down to 5 cm and then every 15 cm. All 3 tubes got a core top sample extracted.
062	MGA017	27-Nov	05:30	15	30.54	50	54.40	4128	Max Tension= 4.20 Tons. 3 tubes contained sediment and water about 15cm in each. All cores sliced, no pore fluid analyses. One empty.

Chapter 5: Operations (Technical)

5.1 Mapping

5.1.2 Multibeam Acquisition and Processing

Acquisition: Eleven areas were mapped during JC094, 5 areas of interest and 6 transits between sites (Table 5.1). A total area of 75,751 km^2 was mapped using the Kongsberg EM-120 ship's hull-mounted echosounder. The EM-120 is a full ocean-depth ranged sonar, with 191 beams and a 12 kHz operating frequency. Dependent on weather, the EM-120 can achieve a swath width of up to 5.5 times the water depth. During JC094, the swath width acquired was around 3.5-5 times the water depth and beam angles were kept around 60° - 70° port and starboard.

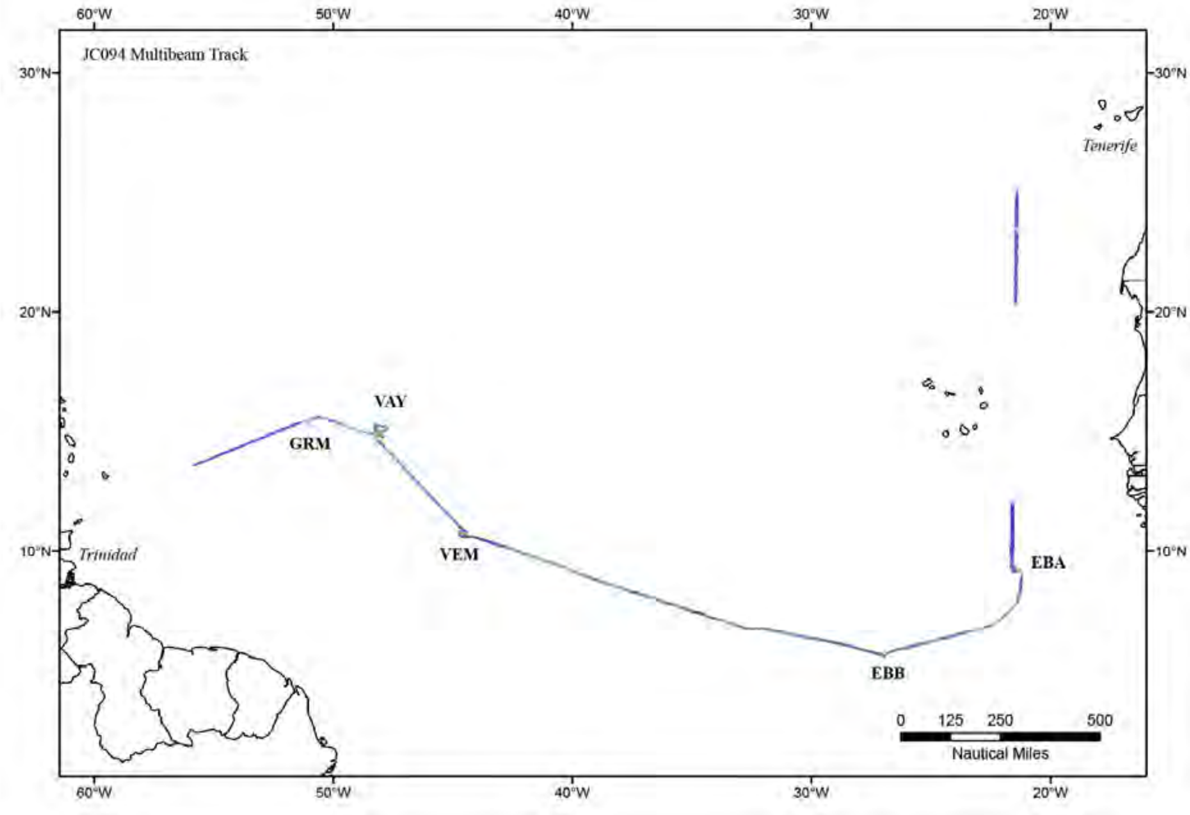


Figure 5.1: Overall multibeam track

Multibeam was acquired during the entire cruise (Figure 5.1), except for while in the Tenerife, Canary Island, Barbados and Trinidad and Tobago Economic Exclusive Zones (EEZs). Acquisition was performed using Kongsberg's Seafloor Information System (SIS) software. Line files were automatically broken every 30 minutes to avoid large file sizes. Occasionally, a line file would be manually increased at turn lines or at the start of a new survey. Parameters stayed consistent throughout the entirety of the cruise, with most settings being set to AUTO. At times, during rougher seas and faster vessel speeds, beam angles were brought in from the maximum of 70° port and starboard to 65° or 60° to achieve better data quality. Also, while surveying steeper slopes, beam steering was used to get better coverage up slope. Data quality was high at Carter and Knipovich Seamounts where calm seas prevailed, and reduced westward due to rougher seas. Rarely did the EM-120 lose the seafloor for more than a couple pings. Approximately three times the SIS computer was restarted due to freezing, or slower computer speed.

Site locations were surveyed at a vessel speed of 6 kts and transit lines were surveyed at maximum speed (approximately 10 kts). The 5 site locations were created by planning one 6 – 8 hour initial line that would yield enough information to get a sense of the bathymetry to perform an ROV *ISIS* dive.

Additional bathymetric surveys were carried out between over the side operations, and during poor weather. Bathymetric maps of five features were acquired: Carter Seamount, Knipovich Seamount, part of the Vema Fracture Zone, Vayda Seamount and Gramberg Seamount (Figure 5.2).

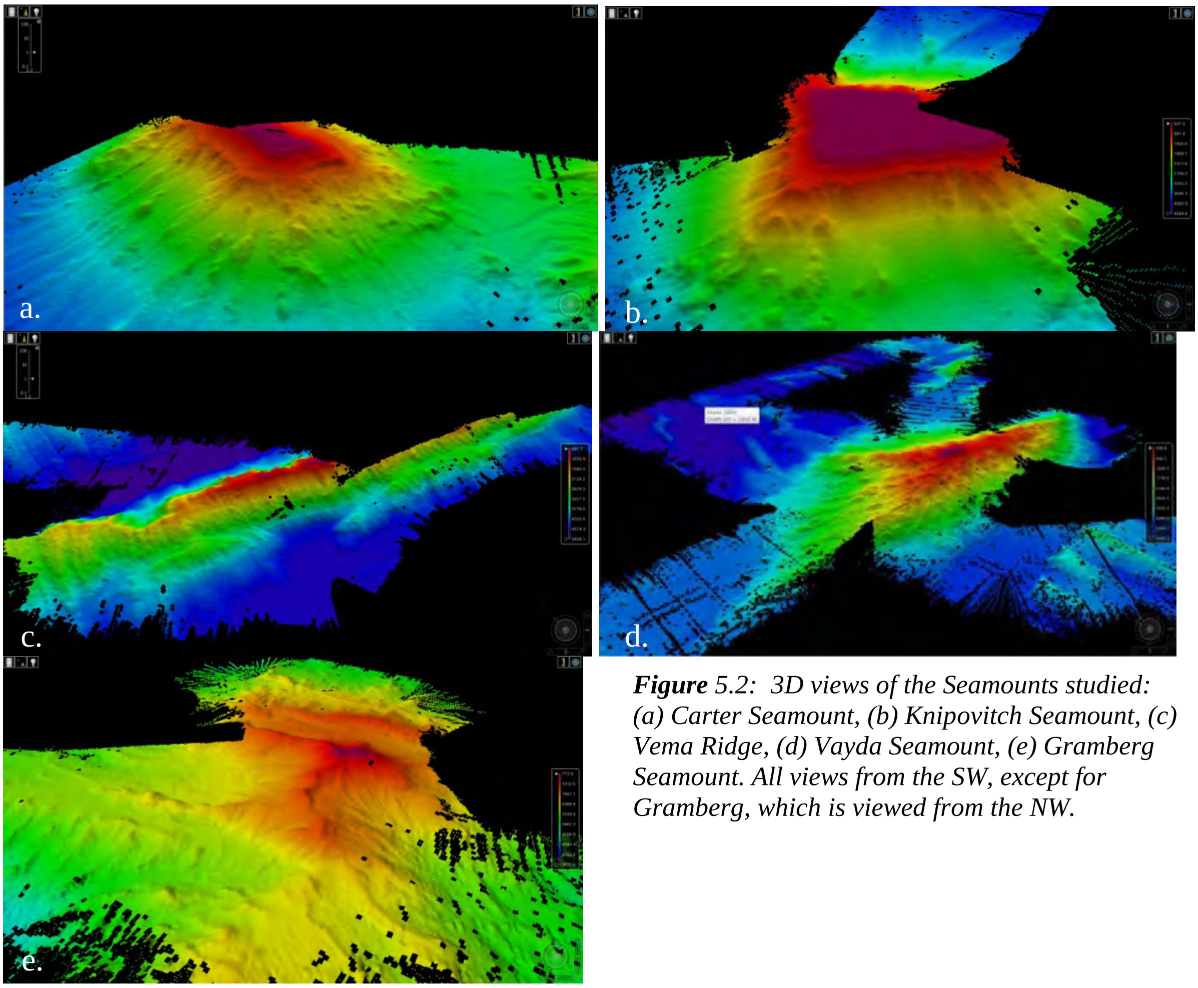


***Figure** 5.2: 3D views of the Seamounts studied: (a) Carter Seamount, (b) Knipovitch Seamount, (c) Vema Ridge, (d) Vayda Seamount, (e) Gramberg Seamount. All views from the SW, except for Gramberg, which is viewed from the NW.*

Sound velocity was acquired using a sound velocity probe during CTD deployments, typically at a 4000 m site prior to reaching each of the 5 locations. These profiles were immediately uploaded into SIS and applied to the multibeam data. The sound velocity profiler did not work at the CTD006 cast site on the Vayda seamount, so a sound velocity profile was inferred and created using the temperature, salinity and depth information. Also, during the first transit to Carter Seamount, a current sound velocity profile was not available for use; therefore there are significant refraction errors in the multibeam data.

Processing: Processing of EM-120 data was performed using CARIS HIPS AND SIPS 8.1©. EM-120 lines were automatically placed on the JC094 drive and then manually copied to the processing computer. All lines had a zerotide.tid file applied. Site location processing occurred immediately at a primary cleaning level to be used for ROV planning and navigation maps. A secondary clean was performed on the data during transits after sites. Transit lines were cleaned when time was available but the level of cleaning is poorer than the 5 targeted locations. Eleven field sheets were created in CARIS (specifications noted in Table 5.1). Basemaps were created (.csar files) at the best resolution to coverage ratio possible. In areas of shallower depths and slower vessel speeds, higher resolutions were obtained. The transit lines have a resolution of 100 meters and the site locations have basemaps created at both 100 m and 50 m. Basemaps were exported as ASCII files. The ASCII files were brought into Surfer 8© to create negative depth values, as CARIS records depths as positive. Grids (.grd files) were produced in Surfer to be put into ArcMap 10©. The Surfer grids are interpolated at a coarser resolution than the original basemap production to interpolate across small data gaps.

Table 5.1: Parameters for the field sheets and resulting base surfaces of the bathymetric data.

Location	*UTM Zone*	*Start Lat(DD)*	*Start Long(DD)*	*End Lat(DD)*	*End Long(DD)*	*Total Area (km^2)*	*Depth Range(m)*	*EM120 Lines*	*Grids*
TRS_1	27N	25.058N	21.409W	9.559N	21.635W	*12961*	*3300 - 5300*	*0000-0082*	100m
EBA	27N	9.559N	21.635W	8.658N	21.243W	*2324*	*210 - 4600*	*0082-0139*	50m 100m
TRS_2	26N	8.658N	21.243W	5.883N	26.403W	*8741*	*1290 - 4500*	*0139-0213*	100m
EBB	26N	5.883N	26.403W	5.793N	27.635W	*2288*	*540 - 4500*	*0213-0250*	25m 100m
TRS_3	25N-23N	5.793N	27.635W	10.505N	43.905W	*23995*	*1500 - 5500*	*0213-0439*	100m
VEM	23N	10.505N	43.905W	11.134N	44.799W	*2815*	*525 - 5160*	*0439-0511*	50m 100m
TRS_4	23N	11.134N	44.799W	14.551N	48.042W	*7595*	*2560 - 5285*	*0511-0566*	100m
VAY	22N	14.551N	48.042W	14.987N	48.838W	*4300*	*400 - 4200*	*0566-0654*	50m 100m
TRS_5	22N	14.987N	48.838W	15.594N	50.636W	*2685*	*1700 - 4800*	*0654-0674*	100m
GRM	22N	15.594N	50.636W	15.193N	51.878W	*2237*	*775 - 5500*	*0674-0708*	50m 100m
TRS_6	21N	15.193N	51.878W	13.569N	55.867W	*5810*	*4050 - 5585*	*0708-0752*	100m

5.1.2 Map Creation

Maps were used for planning and general navigation of the ROV ISIS. Maps for planning gear locations were created in an ArcMap 10.1 © project in a Mercator projection with a standard parallel of 10.0° North. These maps were compiled with up-to-date EM-120 bathymetric grids overlying Etopo1 altimetry data as well as prior core or coral sites.

For ISIS dives, specific maps were created to be used in the Ocean Floor Observation Protocol (OFOP) software as well as a background image for the Doppler DVL system. These maps were created in the WGS84 projection and exported as jpegs. The OFOP maps were georeferenced using the OFOP calibration tool and saved as a .map file. DVL maps were uploaded by imputing the X and Y locations of the Southwest and Northeast corners into the DVL software. These maps were useful for directing the ROV on a heading track to specific waypoints.

*Table 5.2 The final ArcMap project (JC094_cruisetrack.mxd). *Dive navigation lines are produced from smoothed USBL data (smoothed in ofop). Ship navigation lines are produced from GPS data at 3 min intervals*

GROUP	FILE	TYPE	DESCRIPTION
Cruise Locations	Stations_final	shapefile	Locations of stations
	Events_final2	shapefile	Locations of events
Dive Navigation	Dive222_navline	shapefile	Navigation line of ISIS dive 222
	Dive223_navline	shapefile	Navigation line of ISIS dive 223
	Dive224_navline	shapefile	Navigation line of ISIS dive 224
	Dive225_navline	shapefile	Navigation line of ISIS dive 225
	Dive227_navline	shapefile	Navigation line of ISIS dive 227
	Dive228_navline	shapefile	Navigation line of ISIS dive 228
	Dive229_navline	shapefile	Navigation line of ISIS dive 229
	Dive230_navline	shapefile	Navigation line of ISIS dive 230
	Dive231_navline	shapefile	Navigation line of ISIS dive 231
	Dive232_navline	shapefile	Navigation line of ISIS dive 232
	Dive233_navline	shapefile	Navigation line of ISIS dive 233
	Dive235_navline	shapefile	Navigation line of ISIS dive 235
	Dive236_navline	shapefile	Navigation line of ISIS dive 236
	Dive237_navline	shapefile	Navigation line of ISIS dive 237
	Dive239_navline	shapefile	Navigation line of ISIS dive 239
	Dive240_navline	shapefile	Navigation line of ISIS dive 240
Navigation	Nav_XXX_sf	47 shapefiles	Ship navigation lines from Julian day 287 through 333
Bathymetry	TRS_1_a_100m_sf	GRD file	100m grid of the first half of TRS_1
	TRS_1_b_100m_sf	GRD file	100m grid of the second half of TRS_1
	Carter_25m_final_sf	GRD file	25m grid of EM120 Carter survey
	Carter_100m_final_sf	GRD file	100m grid of EM120 Carter survey
	Dive226_L12345.img	RRD file	50cm grid of Reson7125 survey
	TRS_2_a_100m_sf	GRD file	100m grid of the first half of TRS_2
	TRS_2_b_100m_sf	GRD file	100m grid of the second half of TRS_2
	Knipovich_final_100m_sf	GRD file	100m grid of EM120 Knipovich survey
	Knipovich_final_50m_sf	GRD file	50m grid of EM120 Knipovich survey
	TRS_3_a_100m_sf	GRD file	100m grid of first part of TRS_3
	TRS_3_b_100m_sf	GRD file	100m grid of second part of TRS_3
	TRS_3C_100m_sf	GRD file	100m grid of third part of TRS_3
	TRS_3d_100m_sf	GRD file	100m grid of last part of TRS_3
	Vema_100m_final_sf	GRD file	100m grid of EM120 Vema survey
	Vema_317_50m	GRD file	50m grid of EM120 Vema survey
	TRS_4_100m_sf	GRD file	100m grid of TRS_4
	Vayda_50m_final_sf	GRD file	50m grid of EM120 Vayda survey
	Vayda_100m_final_sf	GRD file	100m grid of EM120 Vayda survey
	Dive238_40cm.img	RRD file	40cm grid of Reson7125 Vayda survey
	Dive238_40cm_b.img	RRD file	40cm grid of Reson7125 Vayda survey
	TRS_5_100m_sf	GRD file	100m grid of TRS_5
	Gramberg_final_50m_sf	GRD file	50m grid of EM120 Gramberg survey
	Gramberg_final_100m_sf2	GRD file	100m grid of EM120 Gramberg survey
	TRS_6_100m_sf	GRD file	100m grid of TRS_6
Basemap	Etopo_84	Raster	1 min Etopo altimetry data

5.2 Coring Operations

The coring strategy was designed to obtain a representative sample located at the depth of each of the major water masses in a nearly zonal transit across the East and West Atlantic basins, as well as from the Mid-Atlantic Ridge. In addition, sampling was also aimed to obtain a depth distribution as even as possible within the constraints of bathymetric geomorphology.

5.2.1 Selection of sampling sites

Sub-bottom profiles acquisition (fig. 5.3) was performed on arrival to each study area or ad-hoc in potential coring sites with a Kongsberg SBP-120 emitting a linear chirp pulse (2.5-7 kHz) in single or burst-mode were appropriate considering bottom and sea conditions. Target areas for coring were selected based on clear identification of sedimentary deposits of sufficient thickness on SBP profiles.

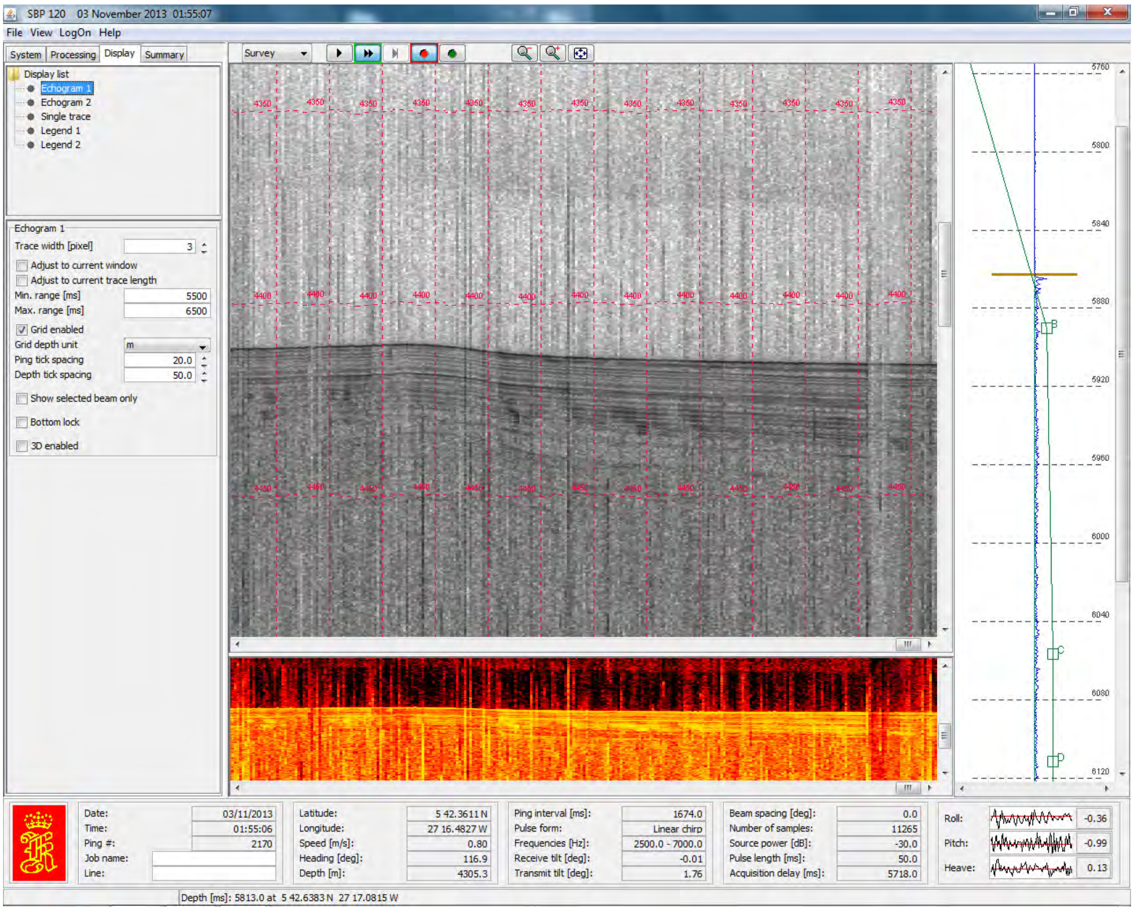


Figure 5.3. Example of a Sub-Bottom Profile acquired in the Knipovich Seamount area.

Failure in some of the electronic boards of the SBP120 prevented normal operation in some stations for some hours. Rebooting the system remotely from the Main lab on board RRS James Cook solved some of these issues, but in other instances the technician on-board was needed to access the electronic boards and test them.

High-resolution bathymetric surveys with a Kongsberg EM120 Multibeam Echosounder were also processed on board and inspected to identify flat bed areas likely to be composed of sedimentary deposits suitable for coring.

5.2.2 Sample Collection

Sediment samples during JC094 cruise were collected using a suite of sampling tools specifically designed for different terrain conditions and sampling goals. The goal at each sampling site was to obtain a short mega-core or box-core with undisturbed core-top, and a long-core that will allow reconstructing the paleoceanographic history at each site. In addition, short push-cores and slurped surficial sediments were collected using the Remotely Operated Vehicle (ROV) Isis. Long-core sampling during JC094 was attempted using Piston and Gravity cores. Short undisturbed cores were sampled using a mega-corer or a box-corer. After recovery long-cores were extruded from the barrel, and cut into 1.5 m sections for easier manipulation and storage until further processing. Sediment samples from the core catcher and from each section cut were also obtained at this stage for preliminary foraminiferal assemblage analysis.

***Figure 5.4**. Core splitter employed during cruise JC094.*

Core sections were split on board along the axis of the core with a core splitter borrowed from Veit Huhnebach at NOC, with training provided by Veerle Huvenne. The core splitter consisted of a router mounted on rails over a cradle where the core section being split was secured (fig. 5.4). The router height was adjusted so only the core liner thickness would be routed out, and the router was moved along the core so a straight cut was made along one side of the liner. Then the core section was rotated 180 degrees and a second straight cut was made on the opposite side of the liner. To finally split the core a nylon line was passed along the core through the cuts and two halves were obtained. One core half was labelled Archive half, and the other half was the Working half. Subsampling of the cores was performed on the working half.

Reusable mega-core tubes were sampled in situ at variable depth resolutions depending on the different types of analyses to be performed on them. Box-core samples were subsampled with mega-core tubes to be sampled in situ, and core liners for long-term storage. Bulk sediment from box-cores was also obtained and stored in bags. Sediment samples and core halves were stored in bags in the on-board refrigerated container at 4 ºC. Core halves were wrapped in cling film to slow drying and inserted in D-tubes for core protection and easier manipulation and storage.

Sample naming followed the convention set-up for the JC094 cruise and explained in detail in this report. Short sediment sample names are composed of the cruise identification JC094 and the unique S number. An example of such unique sediment sample ID would be JC094-S9999. Both naming conventions are used in this chapter.

5.2.2i Piston corer (PTN) Collection of long-cores was attempted by using a NIOZ Piston Corer with barrels up to 12 m long. Piston coring allows recovery of long sections through the combined action of gravity and suction by a piston located inside the core liners. Due its complex operation compared to gravity coring, and the success in obtaining long gravity cores, piston coring was abandoned in favour of simpler gravity coring operations.

Piston corers were deployed from the starboard side of the ship (fig. 5.5) and lowered at 40 m/min. Approximately 50 m above the bottom they were stabilised and then lowered at 10-15 m/min. A trigger core hanging a few m below the piston core released the piston core for free-fall penetration a few metres above the sea floor.

5.2.2ii Gravity coring (GVY) Sediments were collected by lowering a long barrel with core liner (6 or 9 m length) to the seafloor and letting it sink by the action of an approximately 1-ton weight at the top of the barrel. Gravity corers were deployed from the starboard side of the ship (fig. 5.5) and lowered at 40 m/min. Approximately 50 m above the bottom they were stabilised and then lowered at 10-15 m/min for penetration into the sediment.

Figure 5.5. Piston corer being deployed at Carter Seamount. Gravity corer uses the same bomb and barrels, but no piston inside the liners nor trigger core.

5.2.2iii Mega-coring (MGA). A Mega-corer was used to obtain multiple short sediment cores with relatively undisturbed sediment-water interfaces. Coring operations took place from the starboard side of the ship, using the same winch as for piston and gravity coring (fig. 5.6). Two types of tubes were used during the TROPICS cruise. One set of tubes were standard mega-core tubes, which were labelled MCN (Mega-Core No holes). The other set of tubes had holes pre-drilled on them to allow extraction of pore fluids. The holes were sealed with duct tape on the outside to prevent loss of sediment during recovery. These tubes were labelled MCH (Mega-Core Holes).

Initially eight tubes were simultaneously loaded in each mega-core cast. Once on deck, tubes were carefully removed from the mega-corer and placed on wooden stands ready for sampling. Water overlying the sediment was extracted using a peristaltic pump and sampled for trace metals and nutrients analyses in all tubes except those designated for microplastic analyses.

Figure 5.6. Mega-corer being recovered from the starboard side. Taped tubes are MCH tubes. Non-taped tubes were labelled MCN. The Niskin bottle attached to the Mega-corer can be seen on the right of the frame.

Figure 5. Mega-core drilled tube (MCH) sampled for pore-fluids with Rhizon filters.

An MCH tube was sampled for pore-fluids every 2 cm using Rhizon filter (fig. 5.7). Porefluid extraction was enhanced by creating a vacuum with syringes locked to the Rhizon filters and maintained in pulled positions with wooden sticks. Subsequently, to these operations sedimen sampling was performed by placing the mega-core tubes in a core extruder bench borrowed from Prof. David Hodell at U. of Cambridge. A core-top sample was obtained from all the tubes except the one designated for microplastic analyses. Then tubes were sampled down-core in 1 cm slices the first available tube, 2 cm slices the tube sampled for pore-fluids, 1 cm slices down to 5 cm depth, and 5 cm slices below that if more tubes were available. Samples were bagged and stored at 4º C. The top 5 cm of the core designated for microplastic was sampled for plastic microfibers analyses. After that, 5 cm slices were sampled down-core and stored in bags and kept refrigerated at 4ºC.

In addition to sediments, the mega-corer was equipped with a 10 L Niskin bottle to collect bottom-water samples. The Niskin bottled was rigged to fire on impact with the sea floor. Analyses of seawater collected during Mega-coring are detailed in the seawater sampling section of this report

5.2.2 iv Box-core A box-core (fig. 5.8) was used where sediment was positively identified and mega-cores and gravity cores may have been unsuccessful. The box-core was deployed from the starboard side and lowered to the ocean floor at an approximate speed of 40 m/min. 50 m from the seafloor pay-out was stopped to stabilize the box-core. After stabilization the box-core was lowered at a rate of 10 m/min and let sink in the sediment.

Figure 5.8. Box-core employed during JC094 cruise.

Once on deck, sediment was subsampled (fig. 5.9) using short gravity core liners for storage at 4ºC, and mega-core tubes that were immediately sampled at 1-2 cm resolution and stored in bags at 4ºC. A core-top sample was obtained from each tube and from the box-core by carefully scraping the surface with a pallet knife. A bulk sample from the box-core was also obtained and stored in a bag at 4ºC.

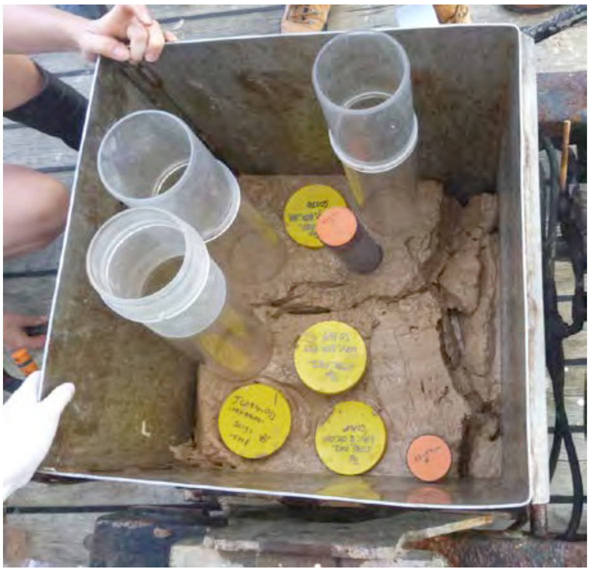


Figure 5.9. Subsampling of box-core during JC094 cruise.

5.2.2v ROV: Sediment sampling during TROPICS cruise was also performed using the Remotely Operated Vehicle ISIS. Two different types of sediment samples were obtained:

Push-cores (PSH): ISIS carried a set of 6 cylinders 30 cm long and 5.5 cm in diameter to retrieve small cores from the seabed. The port arm was used to pick each core using a handle inserted at the top of each cylinder and push it into the sediment (fig. 5.10). Three replicate cores were collected at each sampling site. These cores were then sampled for a core-top sample and then generally sliced in 1 cm slices down-core. If core recovery was good the longest core was sampled for a core-top sample and the capped and stored as an archive core. One core of each set of three was designated for microplastics analyses. All bagged samples and cores were stored at 4ºC.

Figure 5.10. Push-core operation on board ROV ISIS.

Slurp-gun (SLP): If push-coring was not possible, surficial sediments were sampled using the Slurp-gun in ISIS. Sediment would get collected into a slurp chamber and then bagged after ISIS recovery. Samples were stored at 4ºC.

5.3 CTD operations

Taken from the Sensors and Moorings Report, JC094, D Childs (November 2013)

The initial stainless sensor configuration was as follows:

- Sea-Bird 9plus underwater unit, s/n: 09P-54047-0943
- Frequency 0 - Sea-Bird 3 Premium temperature sensor, s/n: 03P- 2919
- Frequency 1 - Sea-Bird 4 conductivity sensor, s/n: 04C-2841
- Frequency 2 - Digiquartz temperature compensated pressure sensor, s/n: 110557
- Frequency 3 - Sea-Bird 3 Premium temperature sensor, s/n: 03P - 4151
- Frequency 4 - Sea-Bird 4 conductivity sensor, s/n: 04C-3698
- V0 - Sea-Bird 43 dissolved oxygen sensor, s/n: 43-1882
- V1 - Free
- V2 – Free
- V3 – Free
- V4 – CTG transmissometer, s/n: 09-7107-001
- V5 – CTG Aquatracka MKIII fluorimeter, s/n: 088195
- V6 - WETLabs turbidity sensor, s/n: BBRTD-168
- V7 – Benthos PSA-916T altimeter, s/n: 41302

Ancillary instruments & components:

- Sea-Bird 11plus deck unit, s/n: 11P-24680-0587
- Sea-Bird 24-position Carousel, s/n: 32-31240-0423
- 24 x Ocean Test Equipment 20L water samplers, s/n's: 1b through 24b
- TRDI WHM 300kHz LADCP, s/n: 15288
- TRDI WHM 300kHz LADCP, s/n: 12369
- NOCS LADCP battery pack, s/n: WH005

Generally, CTD operations consisted of one cast per main work site. For each cast, samples were taken by the scientific party on board, with different people sampling from different bottles as required. During this time, log sheets were completed, LADCP data was downloaded and backed up and the CTD data processed.

There were issues with the CTD wire whilst on board; after each cast the CTD wire was disconnected from the CTD and allowed to spin, removing some of the built up torque present in the wire. Part way through the cruise a partial stream of the wire took place, based on advice given by the CPOS, to a depth of approximately 200m. Throughout the cruise it was observed that the CTD wire was being 'opened-up' by the out haulers, video evidence of this occurring was captured by the CPOS and forwarded to Management back at NOC. I am unaware, at this time, as to any advice given by Management.

After Cast 5, it was decided that the CTD wire should be re-terminated both electronically and mechanically, and to remove approximately 200m of wire. After the new termination had been completed, a load test was carried out, as per the normal procedure.

A total of 6 CTD "casts" were completed on this cruise numbered sequentially.

For each cast the ship's crew deployed the CTD package once permission was granted from the officer on watch. Crew assisted in getting the CTD over the bulwark and into or out of the CTD annex. For every cast, the crew was ready in advance of the deployment time, helping to ensure casts were completed as efficiently as possible.

Figure 5.11: CTD recovery during JC094

Due to a failure in the lab fitted ODIM HMI unit and no spares being present on board, the crew had to drive the winch from the remote winch cab. This added a small delay to each cast as the crew switched from the belly box control to the winch cab control. Hand over from the belly box to the winch cab control took place at a wire out of 100m, the crew completed the handovers as safely and efficiently as possible. Credit should be given to both the Ships ETO, Paul and to the Computing Technician, Martin who tried their very best to repair the faulty HMI. It should be noted that if a spare had been present then these delays, however small, would not have occurred.

The carousel was fitted with a complete set of 24 10L water samplers, numbered 1 through to 24. Two bottles were fired at each depth allowing for any seal or misfire problems. Generally most bottles closed properly, most of the time. However two bottles didn't seal correctly on three casts, although they had fired correctly, and showed no signs of leaking upon recovery, samples taken from them indicated that they contained a water sample different to what was expected and different to the second bottle fired at the same depth. Both bottles were checked for signs of damage, had their o-rings checked and replaced but unfortunately the fault was never found, if more CTD casts were to be completed, then the bottles would have been swapped out with spares.

The pressure sensor was located 30cm below the bottom and approximately 75cm below the centre of the 10L water sampling bottles.

Cast depths ranged from approximately 200 meters for the test dip, through to 4900 meters, aiming to get as close to the seabed as possible, making full use of the fitted altimeter.

All bottle firing depths were chosen by the scientific party who were present throughout each cast.

Sensor Failures

During all casts all of the CTD sensors worked as expected, and no replacements we used. A complete set of replacement sensors were on board should a failure have occurred.

LADCP

For this cruise two LADCP's were fitted in a master and slave configuration. The master LADCP was located on the bottom of the CTD frame looking down, whilst the slave LADCP was fitted to the outside of the CTD frame, looking up. Each cast the fitted LADCP's were set up to log data via the PC using the BBTalk software application and a pre configured script file.

Table 5.3 The following commands were used to set up the LADCP prior to each deployment:

Master:	Slave:
PS0	PS0
CR1	CR1
CF11101	CF11101
EA00000	EA00000
EB00000	EB00000
ED00000	ED00000
ES35	ES35
EX11111	EX11111
EZ0011111	EZ0011111
TE00:00:01.00	TE00:00:01.00
TP00:01.00	TP00:01.00
LD111100000	LD111100000
LF0500	LF0500
LN016	LN016
LP00001	LP00001
LS1000	LS1000
LV250	LV250
LJ1	LJ1
LW1	LW1
LZ30,220	LZ30,220
SM1	SM2
SA001	SA001
SW05000	ST0
CK	CK
CS	CS

Data Processing
CTD cast data was post-processed using SBE Data Processing (V7.20g) software. The raw data files were converted through the following steps as recommended by BODC basic on-board data processing guidelines for SBE-911 CTD (version 1.0, October 2010):

Data Conversion (DatCnv)
Bottle file generation (BottleSum)
Filter
AlignCTD
Cell Thermal Mass (CellTM)
Loopedit
Derive
Bin Average to 1m intervals (BinAve)
Strip

Copies of all raw data were saved on the local CTD computer in the following directory: C:\Program Files\Sea-Bird\SeasaveV7\JC094\Raw Data.

Copies of all processed data were saved in the following location:
C:\Program Files\Sea-Bird\SeasaveV7\JC094\Processed Data.

Sound Velocity Profiles
For each CTD cast a Sound Velocity probe was attached to the CTD frame in order to obtain an accurate Sound Velocity profile for the current work site. In addition to the frame mounted SV probe, a SBE Data Processed profile was also produced. These were saved in the following location:
C:\Program Files\Sea-Bird\SeasaveV7\JC094\Processed Data\CTD SV Profiles.

Data Backup
All data was routinely backed up to the following location on the Network:
\\Cookfs.cook.local\ctd\JC094

From this location the scientific party was able to access all data, for their own particular requirements.

5.4 Dredging operations

Dredging was carried out using the NOC rock dredge when weather rendered us unable to deploy the ROV. The dredge consists of a metal frame with a chain bag lined with a coarse netting bag secured to the trawl wire via a 3T weaklink. A secondary weak link was attached to the bridle. A metal ‘bucket’ (dimensions) was attached to the trailing edge of the rock dredge via a chain. The dredge was lined with burlap sacking to minimize damage to samples collected (sewn with shipping twine and with brass eyelets at the top). It was attached with rope through eyelets to the upper part of dredge frame, and with cable ties to secure the base and prevent ballooning. The dredge was deployed from the aft A-frame.

Operations proceeded as follows:

- With ship stationary dredge deployed at 45m/min until it reached the seafloor (judged using tensiometer) and 10m more wire payed out.
- Ship moved forward at 0.2knots paying out wire at 25m/min* for 200m
- Ship stopped
- Wire pulled in at 10m/min until off seafloor
- Dredge recovered at 40m/min
- Samples recovered by lifting back of dredge using crane
-

* The pay out was too fast and all 200m were payed out with the ship only 60m along trajectory.
The tension during deployment was ~1.07T which dropped to about 0.7T on the seafloor. During pull in the tension bounced around 0.7-1.0T.

Figure 5.12: Dredging operations.

5.5 ROV operations

The remotely operated vehicle (ROV) ISIS was our main sampling platform. Depth rated to 6500 m, ISIS is tethered to the ship by a high voltage, optic fiber cable that allows high precision bespoke sampling of the seabed. With continuous power supplied to the vehicle and real-time high definition video feeds, diving can continue 24 hours a day and is only limited by sample capacity and vehicle maintenance requirements. Apart from the first dive that was aborted before reaching the seabed due to problems with detecting USBL beacon signal, the 19 dives ranged from 15-42 hours in duration, with over 372 hours on the bottom. See the ISIS team technical report (appendix) for further information on the vehicle's technical performance.

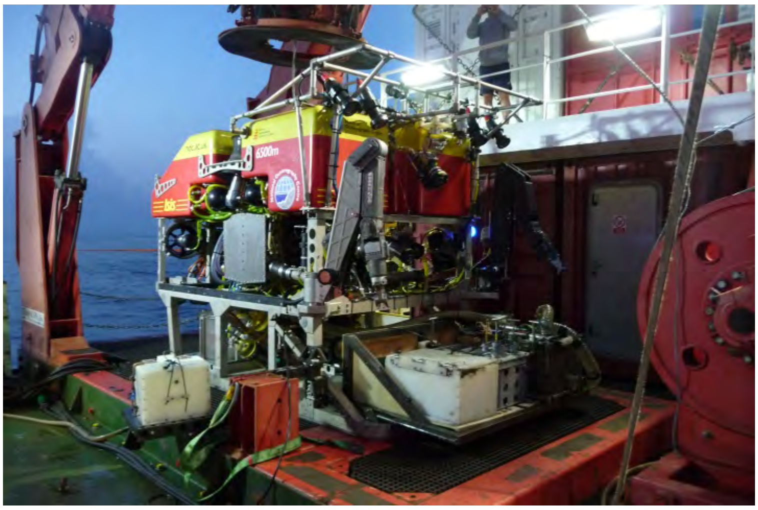


Figure 5.13 ISIS on its landing pad with the tool-tray and swing arm extended. The control van is accessed through the door in the background.

ISIS was controlled from a control van consisting of two 20 foot containers joined together side-by-side. With two pilots and a lead scientist sitting front row directing and controlling the vehicle, a further 2-3 scientists sat at a rear console (back bench) logging all the operations and monitoring the banks of video recorders using pen and paper logs as well as the OFOP logging program. Once the ROV had landed on the seabed and the pilots were happy with the buoyancy and handling of the vehicle, direction of the dive was handed over to the scientific dive leader. Using a dive plan prepared before deployment (appendix), the dive leader controlled the HD Science camera to pick out sites of interest and directed the pilots towards samples they wished to collect. There was free-flowing information between the dive leader and the back bench to get specialist input where necessary and to communicate where samples should be stored on the vehicle.

Figure 5.14 Inside the control van

ISIS was equipped with several different sampling options that allowed the operators to select the best approach to each sampling event. When a suitable target was spotted using the HD Science camera, HD pilot camera, or occasionally one of the other cameras, the pilots would be made aware of the target, who would then stop the vehicle and set down in a suitable location near to the target. The ISIS pilots were also in regular contact with the bridge to direct the ship where to move next and stop.

Figure 5.15 **From left to right**: scoop, push core, net, slurp gun nozzle and hose. All items have a T-handle so they can be picked up with a manipulator arm.

5.5.1 Sampling seafloor samples

Two manipulator arms allowed the direct picking up of samples or the manipulation of sampling devices such as the suction sampler nozzle, nets, push cores, scoops, the opening and closing of bio-boxes, and general movement and stowage of equipment and samples on the tool-tray. Each manipulator arm was controlled by a pilot using a bench-top replica arm in the control van. If necessary, both arms could be operated simultaneously, but this required both pilots.

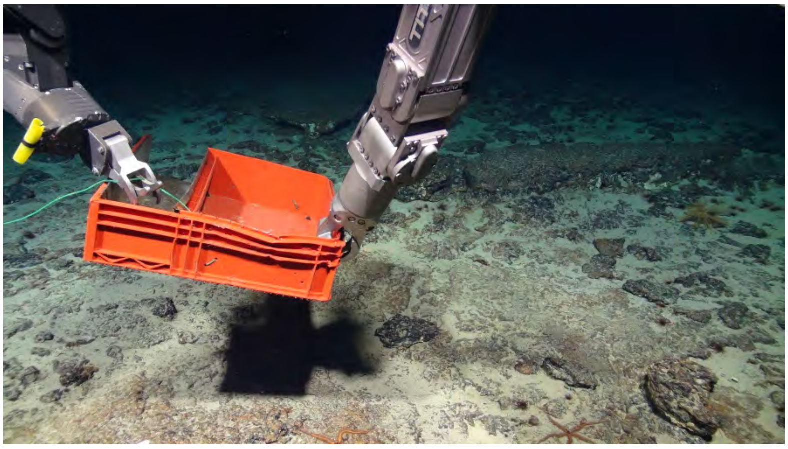


Figure 5.16 Two manipulator arms sampling some anthropogenic material.

Suction sampler

The suction sampler, or "slurp gun", was a heavily used sampling tool. It is essentially a deep-sea vacuum cleaner with 5 inter-changeable rotating chambers for storing samples. It has a variable suction flow rate, and a perforated gate that could be slid across the nozzle, which allowed samples to be picked up by suction alone, or held up against the gate while the nozzle is positioned over a receptacle, and then deposited after the suction was switched off. The perforations in the gate were 10 mm in diameter, so occasionally small slender corals passed through the gate and into a slurp chamber. When using this mode of sampling, one chamber was assigned to catch all the sediment, mud and by catch so as to keep the other chambers clear for other samples. The slurp gun was used extensively during dives. When not in use, the nozzle was stowed in one of the forward rock boxes and secured with a bungee. Some problems with blocking of the suction tube and rotation of the slurp chambers are discussed below in the sample storage section.

Figure 5.17 The slurp gun nozzle with the gate open (**left**) and closed (**middle**). When the gate is closed the hose is covered by a perforated gate with 10 mm holes. These holes can be seen on the left. The slurp gun preparing to collect a solitary coral (**right**).

Push cores

The tool-tray was equipped with a set of 6 push cores on every dive. Each push core barrel was 30 cm long by 5.5 cm internal diameter, and was stored in a tube terminated with a large rubber stopper onto which the core barrel could be push and sealed. A T-handle at the top was used to maneuver the push core with one of the manipulator arms. A rubber one-way valve gasket at the top of the tube allowed water to be expelled from the core barrel as it was inserted into the sediment, but sealed as the core was withdrawn. For further information and pictures see the coring section.

Scoop

A scoop was stowed in the forward bio-box and using the manipulator arm was used to scoop samples (coral rubble, rocks, biology) into a sample box. The tool-tray was equipped with the scoop on dives 221-235 and 240 but was used less and less so was removed from the tool-tray on dives 236-239 to free up space in the bio-box.

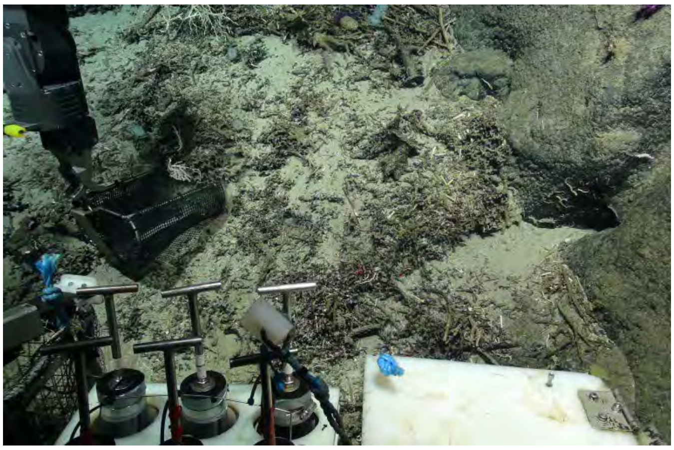


Figure 5.18 The scoop collecting fossil coral rubble.

Nets

Typically three nets were stored on the tool-tray. Nets had an aperture of 31x21cm and had green netting material sewn onto the frame. The base of the net was weighed down with a lead weight sewn into the bottom. A manipulator arm used the net to scoop up coral rubble until it was full, at which point it was twisted closed and then stowed on the tool-tray.

Figure 5.19 Nets collecting fossil corals.

Sample storage
ISIS had multiple sample storage locations: the main tool-tray, two swing arm bio-boxes and five slurp chambers.

Tool-tray: The tool-tray is a platform at the front of the vehicle that could be extended forward to give access to a variety of sample storage options. When in flight, the tool-tray was stowed by retracting it to within the framework of the vehicle, and hence extended when sampling access was required. The tool-tray can be configured to the users' requirements and adapted between dives if needed. The initial configuration of the tool tray included a set of 6 push-cores, a grey plastic open-top box divided into 4 sections, an open-top wire/netting rock-box divided into 6 sections with one section used to stow the slurp gun, and a lidded bio-box split into two sections (forward & aft), in which the scoop was stored in the forward section when included on the tool-tray. During later dives the lid of the bio-box was removed as opening and closing the lid was time consuming and samples were usually rocks or coral fragments that remained adequately weighed down. The nets (3, occasionally 4) were also stored on the tool tray, zip tied with T-handle up so they could be easily picked up before sampling. When full, they were usually twisted shut and stowed behind the bio-box/grey box/push cores on an open piece of tray. Large or lengthy samples such as bamboo coral could simply be stored across the back of the tool-tray.

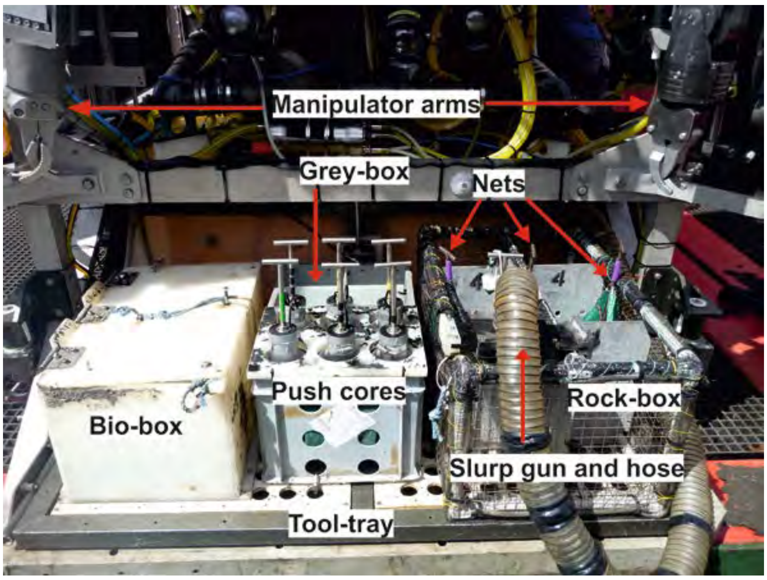


Figure 5.20 The tool-tray configuration for dives 221-227.

Alteration to the tool-tray sample containment occurred during turn around between dives 227-228 and 228-229. For dive 228, three lengths of yellow tubing were secured in front of the of the push cores. This increased the number of discrete sample storage locations on the tool-tray and allowed far more discrete samples to be taken from identifiable sampling locations. This approach proved very successful, so a further 13 tubes were added for dive 229. The usual approach for depositing a sample in one of the tubes involved using the slurp gun with the gate closed to pick up the sample and then releasing it into one of the tubes.

Figure 5.21 The tool-tray configuration for dives 229-240 with the yellow sample tubes. Dive 228 only had the 3 front tubes to trial their use before full adoption.

Swing arm bio-boxes

ISIS has two swing arm lidded bio-boxes, one on the port side and one on the starboard side. These were tucked into the sides of the vehicle when not in use, but could be swung out to the side of the tool-tray to provide additional sample storage.

Figure 5.22 The starboard swing arm bio-box in its stowed position prior to diving (**left**), and fully swung into position ready to accept a sample (**right**).

Slurp chambers

The slurp gun had 5 interchangeable sampling chambers that could be rotated into place for samples sucked up with the slurp gun with the gate open. The slurp chambers were good for storing large or light biological samples (i.e. holothurians, sponges, squat lobsters). However, when used to sample solitary corals and coral rubble, we encountered problems with blockage along the tube and near the opening to the storage chambers. Whereas large or light samples could be easily paired to a sampling event, trying to pair solitary corals to sampling events proved challenging to impossible. This problem was exacerbated by problems with unreliable rotation of the slurp chambers during early dives. This lack of reliable sample segregation prompted us to rethink how we stored solitary corals and lead us to the yellow sampling tube solution described in the tool-tray configuration above. After the slurp chamber rotation problem was investigated and fixed during the first few dives (see ISIS team technical report, section 4.5), and the yellow sampling tubes were installed we no longer encountered problems with the suction sampling system.

Figure 5.23 The slurp chamber carousel mounted on the aft starboard side of ISIS.

Niskin bottles

A small rosette of Niskin bottles was mounted on the aft port side of ISIS. The rosette had space for 6 x 1.2 L General Oceanics Niskin bottles, but routinely only 5 bottles were mounted to help prevent firing lanyards from tangling. The whole rosette could be slid out from the vehicle and taken to the wet lab for sampling after recover.

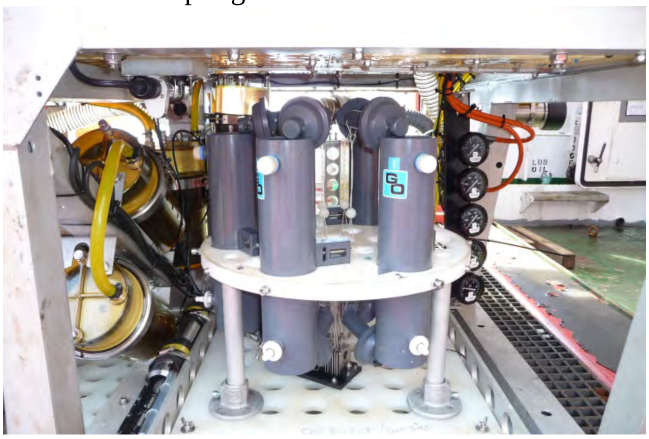


Figure 5.24 The Niskin rosette mounted on the aft port side of ISIS.

5.5.2 Imaging and lighting on the Isis ROV

Camera	Model	Video Resolution	Stills Image resolution	Format recorded	Lasers
HD Pilot (**HDPT**)	Insite Mini Zeus	1920 x 1080 HD	-	Apple ProRes 422	-
HD Science (**HDSCI**)	Insite Mini Zeus	1920 x 1080 HD	-	Apple ProRes 422	Yes
Super Scorpio (**SCORPIO**)	Insite Super Scorpio	1920 x 1080 HD	12.3 Effective Megapixels (4672 x 2628)16:9 Format	Apple ProRes 422	Yes
Pilot (**PAL**) composite	Insite Pegasus	720 x 576 PAL 450 horizontal lines	-	Apple ProRes 422	-

Table 5.4 : Isis ROV camera systems

Imaging and lighting equipment (Table 5.4; Figure 5.25) carried by the *Isis* ROV during the JC094 dive campaign included three optically corrected **H**igh-**D**efinition (HD) cameras mounted to the front of the vehicle.

HDPT (HD Pilot) was mounted on a pan-and-tilt module central to the vehicle and was used primarily for piloting and sampling procedures. HDSCI (HD Science) was also mounted on a pan-and-tilt module above the HDPT, central to the vehicle. Watch leaders and the scientific party have full control of the pan-and-tilt and zoom functions of this camera during dive operations. The HD video and stills camera (SCORPIO) was mounted on a fixed bracket on starboard of the centre line of the vehicle. Other cameras on the *Isis* ROV used for piloting (not recorded for science) include numerous composite video cameras and one low-light aft camera.

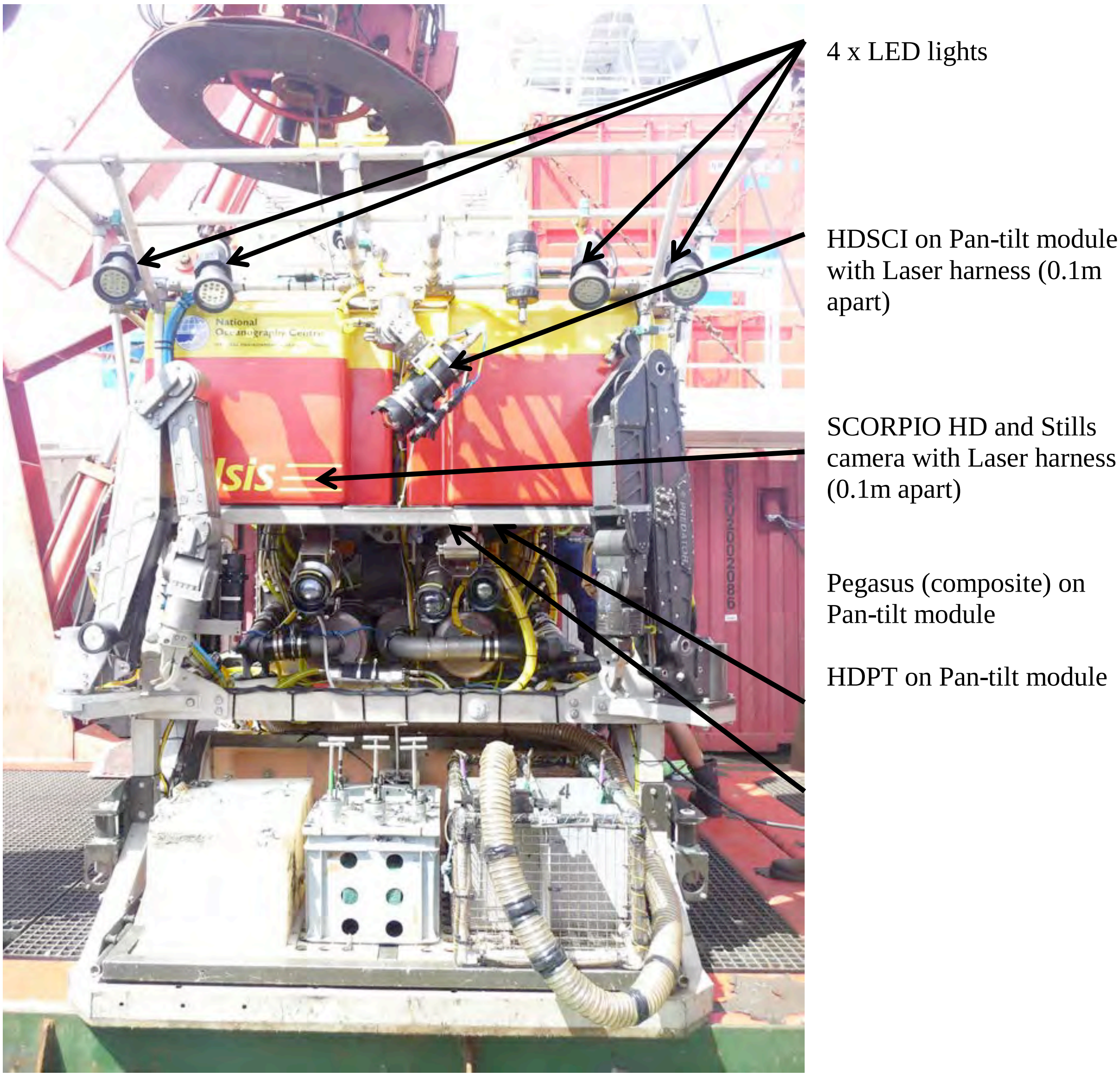


Figure 5.25 : Isis ROV camera configuraton

Four LED lamps provided illumination for the cameras on a fixed-mount lighting bar at the front of the vehicle (Figure 5.25). To provide a fixed scale in images, two lasers were mounted 0.1m apart parallel to the focal axis of the HDSCI and SCORPIO cameras.

Alterations to camera configuration during the cruise.

The ideal camera configuration is that discussed in above and set out in Figure 5.25. The following section outlines variations to the configuration during JC094:

- Dive 231, both lasers failed on HDSCI
- Dive 232, no lasers on HDSCI and one laser failed on SCORPIO
- Dive 234, long range lasers were trialled on the HDPT camera for the vertical swath dive. One laser failed. This revealed that there was a problem with the laser harness connection and not the laser module itself. In addition, it was discovered prior to deployment of this dive, the dome on the HDSCI camera had failed. Operationally, the ROV was reduced to one working HD camera and wone working set of lasers. Subsequently, the HDPT camera was moved into the position of the HDSCI camera (on a pan-and –tilt module) and the HDPT camera was replaced with a composite video camera (Pegasus Pilot; Table 5.4).
- Dive 235 onwards, operational cameras HDSCI, PAL (Pegasus Pilot) and SCORPIO. Parallel lasers on SCORPIO.
- Dive 237, ground fault on lasers
- Dive 240, ground fault on lasers.

Recording protocols during dive operations
All of the HD camera feeds correspond to an AQA dual KiPro recording deck in the *Isis* ROV control van. At the start of each dive the timecode was checked so that all videos are correctly time-stamped (GMT). Each KiPro deck and camera has three corresponding 300GB solid-state drives (SSD). At the start of the cruise, it was decided that all three HD cameras feeds would be recorded (Apple ProRes 422, 1920 x 1080).

Site	**Dive**	**Bottom_time_video**	**Comments**
Carter	222	14:37:43	
Carter	223	16:01:50	
Carter	224	16:48:36	
Carter	225	19:32:13	
Carter	226	00:00:00	Downward looking swath - no video
Carter	227	18:40:19	
Knipovich	228	17:44:50	
Knipovich	229	17:35:48	
Knipovich	230	19:32:03	
Vema	231	18:27:01	
Vema	232	17:03:02	
Vema	233	19:51:15	
Vema	234	15:00:44	Vertical swath-limited video
Vayda	235	21:21:28	
Vayda	236	38:16:34	
Vayda	237	19:12:26	
Vayda	238	00:00:00	Downward looking swath - no video
Granberg	239	23:01:38	
Granberg	240	17:38:35	
Total Hours recorded		**330:26:05**	

Table 5.5: *Total hours of footage recorded from JC094*

Recording would commence on deployment, and would continue to record on descent to the seabed. On the seabed, all three cameras were stopped simultaneously and the KiPro recording deck was changed to a second SSD. During operational dive hours, the video footage was recorded in 2-hour files of approximately 110GB.

On approaching the seabed, the HDSCI, HDPT and SCORPIO cameras were white balanced to provide the best representation of true colour at the depth of the imagery being recorded. The total number of hours of video recorded in shown in Table 5.5.

Site	Dive	Total_SCORPIO_images	Total_data(GB)	Start_file	End_file
Carter	222	1719	8.31	DSC00001	DSC01718
Carter	223	1063	5.12	DSC01719	DSC02780
Carter	224	633	3.14	DSC02781	DSC3412
Carter	225	1274	6.45	DSC00001	DSC01272
Carter	226	-	-	-	-
Carter	227	945	5.21	DSC00001	DSC00943
Knipovich	228	834	4.04	DSC00001	DSC00833
Knipovich	229	1196	5.69	DSC00834	DSC02028
Knipovich	230	1369	5.8	DSC02029	DSC03396
Vema	231	910	5.4	DSC00001	DSC00908
Vema	232	1222	6.64	DSC00001	DSC01220
Vema	233	1471	7.52	DSC00001	DSC01469
Vema	234	-	-	-	-
Vayda	235	1136	6.18	DSC00001	DSC01135
Vayda	236	2259	11.1	DSC00001	DSC02258
Vayda	237	1157	5.98	DSC00001	DSC01155
Vayda	238	-	-	-	-
Granberg	239	871	4.58	DSC00001	DSC00870
Granberg	240	610	3.11	DSC00001	DSC00608
Total number of images		**18669**	**94.27**		

Table 5.6: Summary of SCORPIO images from JC094

Stills Imagery during dive operations

During operational dive hours the SCORPIO camera was set to take stills images (4672 x 2628; 16:9 Format) every 30 seconds, however, this function would be switched off during sampling events as to reduce the number of stills image captures. Total number of images captured is shown in Table 5.6.

Data storage

Every 2 hours the three KiPro SSD (HDPT, HDSCI and SCORPIO) were transferred to the *Isis* ROV Raid and a JC094 My Book Thunderbolt duo (Mac OS Extended) 6TB. The descent and ascent files for each dive were not transferred to external storage devices, however, a .txt file was created to account for missing .mov file numbers.

The *Isis* Raid will be kept at the National Oceanography Centre, Southampton for a limited time period. Please refer to the *Isis* ROV cruise report for further information.

Each JC094 My Book Thunderbolt duo (Mac OS Extended) 6TB has a mirror copy on WD My Book SMB (Windows; NTFS) 4TB. As a result of data storage limitations, it was decided that the HDPT camera would not be transferred as a full .mov file. Alternatively, an image sequence (.png) was exported from QuicktimePro (Ver.7.6.6) at 0.1 frames per second (equal to one image capture every 10-

seconds). Each HDPT_XXX.mov file has a corresponding folder represented on the Windows NTFS drive and an accompanying excel workbook providing a time-stamp for each 10-sec image capture.

After completion of the dive, SCORPIO stills images were downloaded and saved into the correct the Dive folder on both the Mac OS extended and NTFS drives.

Example folder structure for **Mac OS extended**:

Dive_xxx

- ➔ HDPT (contains .mov files)
- ➔ HDSCI (contains .mov files)
- ➔ SCORPIO (contains .mov files)
- ➔ SCORPIO_Stills (contains .jpeg files)

Example folder structure for **Windows NTFS**:

Dive_xxx

- ➔ HDPT (contains one folder to represent each .mov file, with accompanying excel workbook)
- ➔ HDSCI (contains .mov files)
- ➔ SCORPIO (contains .mov files)
- ➔ SCORPIO_Stills (contains .jpeg files)

Note: after Dive 235, all HDPT files are replaced with PAL composite files from the Pegasus camera.

Summary of data storage Please refer to Table 5.7.

Site	ROV_Dives	Mac_Disk_ID	Total_used_space	Windows_ Disk_ID	Total_used_space
Carter	221	-	-		-
Carter	222	-	-		-
Carter	223	Isis_Disk_01	5.47	JC094_001	3.31
Carter	224	-	-		-
Carter	225	-	-		-
Carter	226 (Swath)	Isis_Disk_02	5.96	JC094_002	3.63
Carter	227	-	-		-
Knipovich	228	Isis_Disk_03	5.93	JC094_003	3.62
Knipovich	229	-	-		-
Knipovich	230	Isis_Disk_04	5.88	JC094_004	3.63
Vema	231	-	-		-
Vema	232 (1 of 2)	Isis_Disk_05	5.92	JC094_005	3.63
Vema	232 (2 of 2)	-	-		-
Vema	233	-	-		-
Vema	234 (Swath)	Isis_Disk_06	4.64	JC094_006	3.09
Vayda	235	-	-		-
Vayda	236 (1 of 2)	Isis_Disk_07	5.93	JC094_007	3.96
Vayda	236 (2 of 2)	-	-		-
Vayda	237 (1 of 2)	-	-	JC094_008	3.74
Vayda	237 (2 of 2)	-	-		-
Vayda	238 (Swath)	Isis_Disk_08	4.26		-
Granberg	239	-	-	JC094_009	3.70
Granberg	240	Isis_Disk_09	3.62	JC094_010	1.67
Total Data			**47.61 TB**		**33.98 TB**

Table 5.7

All HD media logs completed from the lab can be found as an .xls workbook, supplied with this report. All times completed are for the HDSCI camera. (HD Media Log JC094.xls)

Additional data storage
All the SCORPIO images, HDPT (and PAL) image sequences are also backed-up separately on 2TB Seagate drives (one Mac OS Extended and one Windows NTFS). In addition, the JC094 Highlights (extended) and Highlights (short) are included in HD (1920 x 1080) along with the original highlights clips selected from each dive.

5.5.3 ROV CTD Data Processing

Basic processing of the ROV on board SeaBird SBE 49 CTD was carried out to assist the scientific party. This involved using the SBE Data Processing (V7.20g) software to convert the logged raw data and then producing a 1m bin averaged data set.

Two processing steps were carried out: Datacnv, Bin Average.

Datacnv was used to convert the raw data into a .cnv file containing values for Temperature, Conductivity, Pressure, Salinity, Sound Velocity, Depth and Elapsed Time.

Bin Average was then used to produce a condensed, 1m bin averaged data set.

All raw ROV CTD data was saved in the following location:
C:\Program Files\Sea-Bird\SeasaveV7\JC094\ROV CTD

With the processed data being saved in the following location:
C:\Program Files\Sea-Bird\SeasaveV7\JC094\ROV CTD\Processed.

5.5.4 Multibeam

The rebuilt ISIS ROV has been equipped with a new multibeam echosounder (MBES): a RESON Seabat 7125 dual frequency (200 and 400 kHz) system with 512 beams. The set-up is a modular one, where the MBES can be slotted in the location of the mini-Niskins (port aft quarter of the ROV) when required for a swath dive. The vehicle offsets versus a common reference point are listed in Table 5.8 and 5.9.

Table 5.8 Offsets for the various sensors versus a common reference point on ISIS (front of vehicle) as entered in PDS2000 (X: positive starboard, Y: positive forward, Z: positive up, all in metres)

	X	Y	Z
Compatt (USBL)	-1.01	-0.36	1.46
Doppler	0.58	-2.91	-0.17
MBES	-0.47	-1.63	-0.82
Octans (attitude)	0.00	-0.86	-0.49
Parascientific (depth)	0.55	-1.48	0.00

Table 5.9 Relative positioning of MBES transducers on the RESON base plate, as entered in the 7k hardware configuration settings

	X	Y	Z	Tilt (°)
200 kHz sensor	0.125	-0.218	0.050	0.00
400 kHz sensor	-0.125	-0.125	0.031	0.00

The sonar is operated and the settings are managed through the 7k software module, and the data is then forwarded to the PDS2000 software for real-time map visualisation and –more importantly- acquisition and storage. During JC094, the data were recorded in PDS2000, georeferenced with the USBL navigation. PDS2000 takes in Doppler information to steer its navigation Kalman filter, but does not actually take it as alternative navigation stream. In many cases, however, the Doppler navigation is still smoother and less prone to noise than the USBL navigation, so it can be integrated with the bathymetry during processing (see below). To make this process easier, a Doppler reset was carried out at the start of every line. The TECHSAS line number was also increased at the start and end of every line.

Additional note: In the event of a power shut-down on the MBES (e.g. as the result of a vehicle blackout), the Reson system and 7k software may show errors upon restart. This can be repaired by running the small program 'Reset to factory defaults' which can be found on the desktop.

The multibeam data were recorded in the PDS2000 standard format (.pds), and in .xtf format for easy importation in both the Caris HIPS and SIPS and PRISM Backscatter processing software suites at a later stage. During the cruise, however, the data was processed in CARAIBES, the software package from IFREMER, because this gives some advantages in terms of data handling for ROV surveys (easy importation of attitude and depth information, adjustment of navigation etc.). To facilitate this, the data were exported from PDS2000 in .s7k format. The processing steps are summarised in the flowchart in Fig. 5.26. To summarise, they include data importation/conversion to CARAIBES formats, combination of the Doppler navigation and vehicle depth data with the bathymetry data (*Genexy* and *Coratt*), determination of potential pitch and roll offsets through calibration (*Calbat*), rectification of the Doppler navigation drift (*Regbat*) and gridding (*Mailla*). The resulting .flt and .hdr files can then be imported directly into the ArcGIS toolbox to be converted into an ESRI grid or .img file.

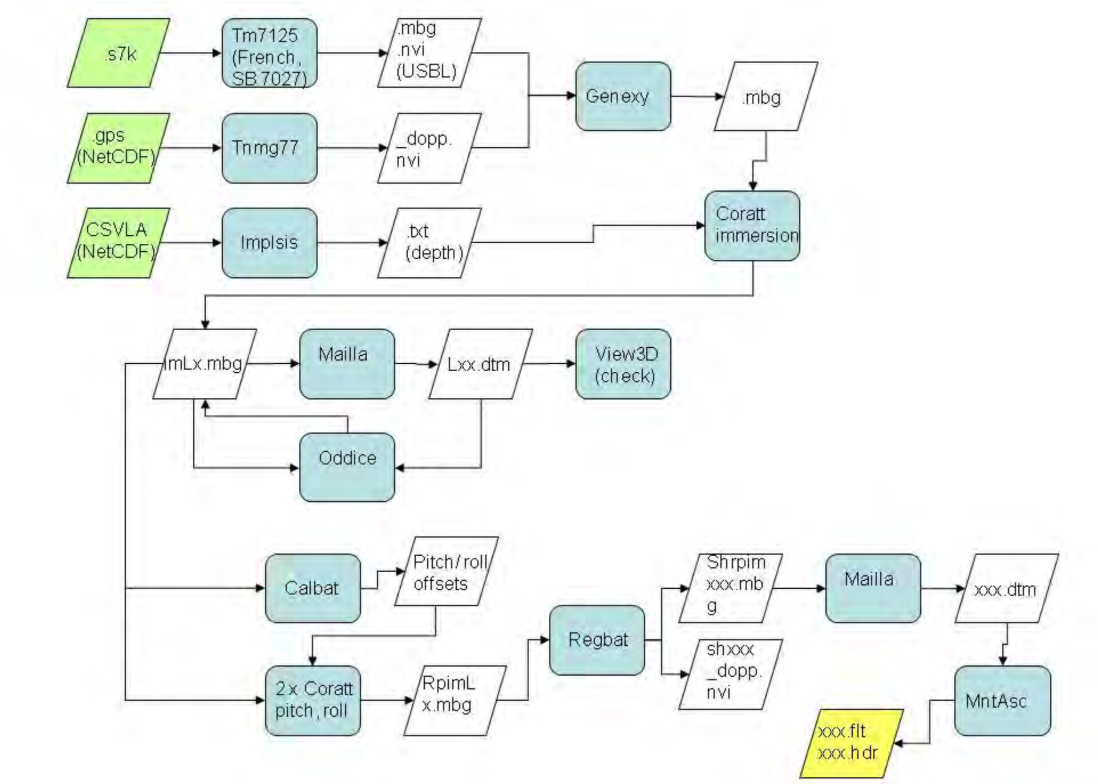


Fig. 5.26 Flowchart of the CARAIBES data processing. Input files from PDS2000 or TECHSAS for a standard processing flow are indicated in green, output files (.flt and .hdr) in yellow.

5.6 Underway Sampling

Underway seawater sampling was carried out directly from the unfiltered seawater supply taps.

1. Anthropogenics: samples filtered from tap in container.
2. Diatoms: water was filtered to harvest siliceous algae using 1-100um filters/mesh from tap # 177835 (chemistry lab). Filters and mesh were rinsed and frozen at -20 °C.
3. Carbonate chemistry: water sampled directly from tap #177809 (chemistry lab) and processed according to protocol (see section 12.2).

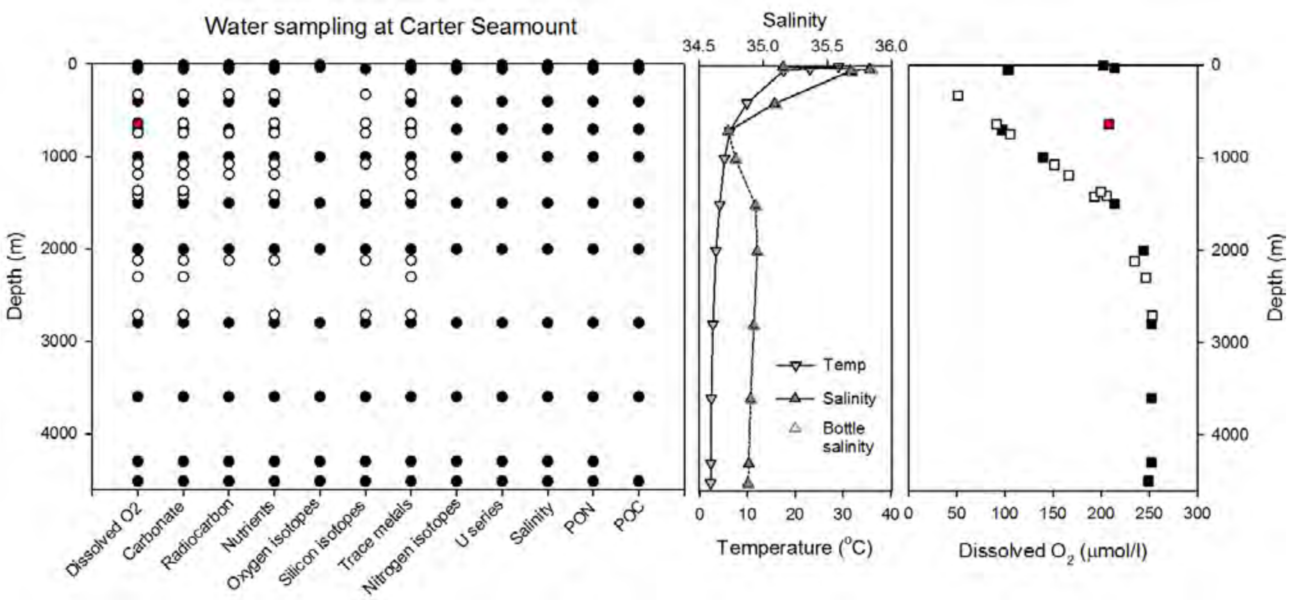
Chapter 6: Seawater sampling and analyses

Water profiling and sampling were conducted on the *RRS James Cook* in order to characterise the physical and chemical characteristics of the water masses in the Equatorial Atlantic. These data will 1) improve our understanding of the factors that influence the distribution of different benthic organisms, and 2) allow the calibration of geochemical proxies for paleoclimate applications. Water samples were collected by niskin bottles attached to the *RRS James Cook* CTD rosette, the ROV Isis, and the Megacorer. CTD profiles were obtained during each CTD deployment and throughout the ROV dives.

6. 1. Summary of water sampling at each site

6.1.1. Carter Seamount

Figure 6-1 depths of samples for Carter Seamount. Solid symbols show CTD niskin samples; hollow symbols show ROV and MGA niskin samples. Red symbols show misfired bottles.



CTD001, Station001
Lat: 25° 5.0165'N
Lon:21° 24.835'W
CTD001 was carried out as a test deployment and to train the science crew in sampling from a niskin bottle, sampling and measuring dissolved oxygen in seawater. All 24 bottles were fired, from three depths (100, 50 and 5m).

CTD002, Station002
Lat: 9° 17.062'N
Lon: 21° 37.9534'W
CTD002 was carried out in deep water near Carter Seamount on October 19th. The CTD was deployed at 04:46GMT and recovered at 08:06GMT All 24 bottles were fired; Bottle 4 apparently misfired, and gave an anomalously high temperature reading and low dissolved oxygen measurement. Bottle 22 was not sealed fully. Otherwise, all bottles fired successfully (see appendix 4) for depths and parameters sampled). An additional test sample was filtered from niskin bottle 2 (bottom depth) to test the onboard photospectrometer.

ROV222
Station004
Niskin bottles were fired during Event # 1 and 33 on October 20th.

Event#1: 9° 12.9617'N, 21° 18.9780'W (bottles 1,2 at 1080m)
Event #33: 9° 13.2864'N, 21° 18.932'W (bottles, 3,4,5 at 745m)

ROV223, Station005
Niskin bottles were fired during Event #5,6, 19,20 and 47 on October 21st.
Event #5: 9° 13.41'N, 21° 18.90'W (bottle 1 at 638m)
Event #6: 9° 13.41'N, 21° 18.90'W (bottle 2 at 638m)
Event #19: 9° 14.2058'N, 21° 19.3114'W (bottle 3 at 329m)
Event #20: 9° 14.2058'N, 21° 19.3114'W (bottle 4 at 329m)
Event #21: 9° 14.2058'N, 21° 19.3114'W (bottle 5 at 215m)

Niskin 5 did not fire correctly, so samples were not collected.

MGA001, Station006
Gantry failed, and no sediment collected.
10L niskin bottle filtered by LW for particulates.

ROV 224, Station007
Niskin bottles were fired during Event #6, 7, 46, 47, 56 on October 22nd.
Event #6: 9° 11.76'N, 21° 17.04'W (bottle 1 at 2121m)
Event #7: 9° 11.76'N, 21° 17.04'W (bottle 2 at 2121m)
Event #46: 9° 12.3355'N, 21° 17.8636'W (bottle 3 at 1414m)
Event #47: 9° 12.3355'N, 21° 17.8636'W (bottle 4 at 1414m)
Event #56: 9° 12.3516'N, 21° 17.9030'W (bottle 5 at 1418m)

MGA002, Station008
Lat: 9° 16.682'N
Lon: 21° 38.273'W
Depth: 4590m
Water from the sediment-water interface and porefluids (S0022) were collected and measured on board for nutrients (section 6; appendix 4), and filtered/acidified for transport to the UK.
10L niskin bottle filtered by LW for particulates.

MGA003, Station010
No sediment or water collected.
10L niskin bottle filtered by LW for particulates.

ROV225, Station0011
Niskin bottles were fired during Event #4, 5, 38, 39, 40 on October 22nd. Bottles 3 and 4 (events 38 and 39) failed to fire.
Event #4: 9° 10.49'N, 21° 16.32'W (bottle 1 at 2712m)
Event #5: 9° 10.49'N, 21° 16.32'W (bottle 2 at 2712m)
Event #40: 9° 11.4247'N, 21° 16.7796'W (bottle 5 at 2300m)

MGA004, Station0012
No sediment or water collected.

MGA005, Station0014
No sediment or water collected.

ROV227, Station 015
Niskin bottles were fired during Event #24, 25, 26, 47, 67 on October 27th. Bottles 1-3 did not fire.
Event #47: 9° 12.939'N, 21° 18.35'W (bottle 4 at 1193m)
Event #67: 9° 13.44'N, 21° 18.85'W (bottle 5 at 642m)

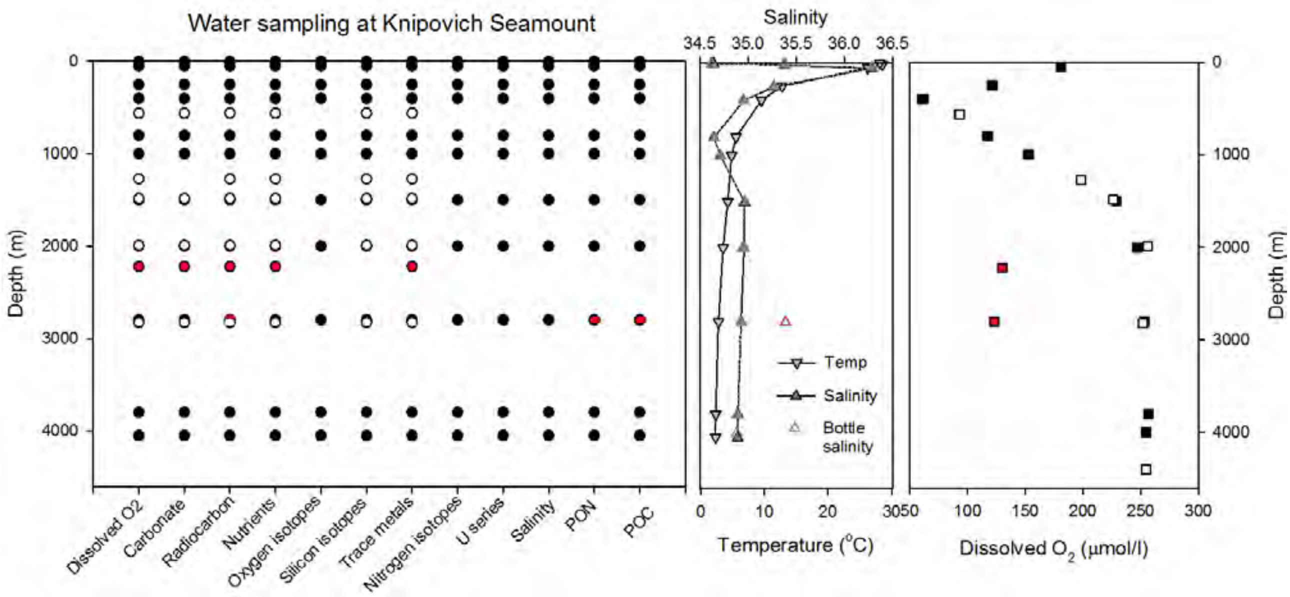
6.1.2. Transit

MGA006, Station016
Lat: 7° 48.002'N
Lon: 21° 24.00'W
Depth: 3400m
Water from the sediment-water interface was collected and measured on board for nutrients, and filtered/acidified for transport to the UK.
A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

MGA007, Station019
Lat: 7° 26.09'N
Lon: 21° 47.78'W
Depth: 3428m
Water from the sediment-water interface and porefluids (S0068, section 6) were collected and measured on board for nutrients, and filtered/acidified for transport to the UK.
A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

6.1.3. Knipovich Seamount

Figure 6-2 depths of samples for Knipovich Seamount. Solid symbols show CTD niskin samples; hollow symbols show ROV and MGA niskin samples. Red symbols show misfired bottles.



CTD003, Station020
Lat: 5° 47.50'N
Lon: 26° 41.00'W
CTD003 was carried out in deep water near Knipovich Seamount on October 29th. The CTD was deployed at 6:42GMT and recovered at 10:08GMT. All 24 bottles were fired; Bottle 6 apparently misfired, and gave an anomalously high temperature reading and low dissolved oxygen measurement. Otherwise, all bottles fired successfully (see appendix 4 for depths and parameters sampled).

ROV228, Station021
Niskin bottles were fired during Event #1,2,46 on October 30th/31st. An oxygen measurement was attempted for bottle 4 (JC094_W0510), but there was insufficient water remaining to overflow sufficiently and so this value should be treated with caution.
Event #1: 5 36.06'N, 26 58.06'W (bottle 1 at 1990m)
Event #2: 5 36.06'N, 26 58.06'W (bottle 2 at 1990m)
Event #46: 5 36.6654'N,26 57.4557'W (bottle 3,4,5 at 1483m)

Water from above the push cores (S0071 and S0072) was sampled, filtered and acidified. A small subsample was taken prior to filtration for nutrient analysis.

ROV229, Station022
Niskin bottles were fired during Event #2,3, 74, 75, 76 on October 31st/November 1st.
Event #2: 5° 37.49'N, 26° 57.98'W (bottle 1 at 1272m)
Event #3: 5° 37.49'N, 26° 57.98'W (bottle 2 at 1272m)
Event #74, 75, 76: 5° 37.6305'N, 26° 56.3908'W (bottle 3,4,5 at 563m)

ROV230, Station026
Niskin bottles were fired during Event #1,2,64,82 on November 1st/November 2nd. Bottle number 5 (event 82) failed to fire.
Event #1/2: 5° 35.37'N, 26° 59.68'W (bottle 1/2 at 2823m)
Event #64: 5° 35.9518'N, 26° 58.426'W (bottle 3/4 at 2218m)

6.1.4. Transit

MGA008, Station027
Lat: 5° 42.349'N
Lon: 27° 16.457'W
Depth: 4407m
Water from the sediment-water interface and porefluids (S0084) were collected. A 5ml subsample of each depth porefluid was frozen for nutrient analysis in the UK. The remainder was stored under cold conditions. The sediment-water interface waters were filtered and acidified for transport back to the UK.
A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

MGA009, Station029
Lat: 6° 48.712'N
Lon: 32° 54.712'W
Depth: 4055m
Water from the sediment-water interface and porefluids (S0097) were collected. A 5ml subsample of each depth porefluid was frozen for nutrient analysis in the UK. The remainder was stored under cold conditions. The sediment-water interface waters were filtered and acidified for transport back to the UK.
A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

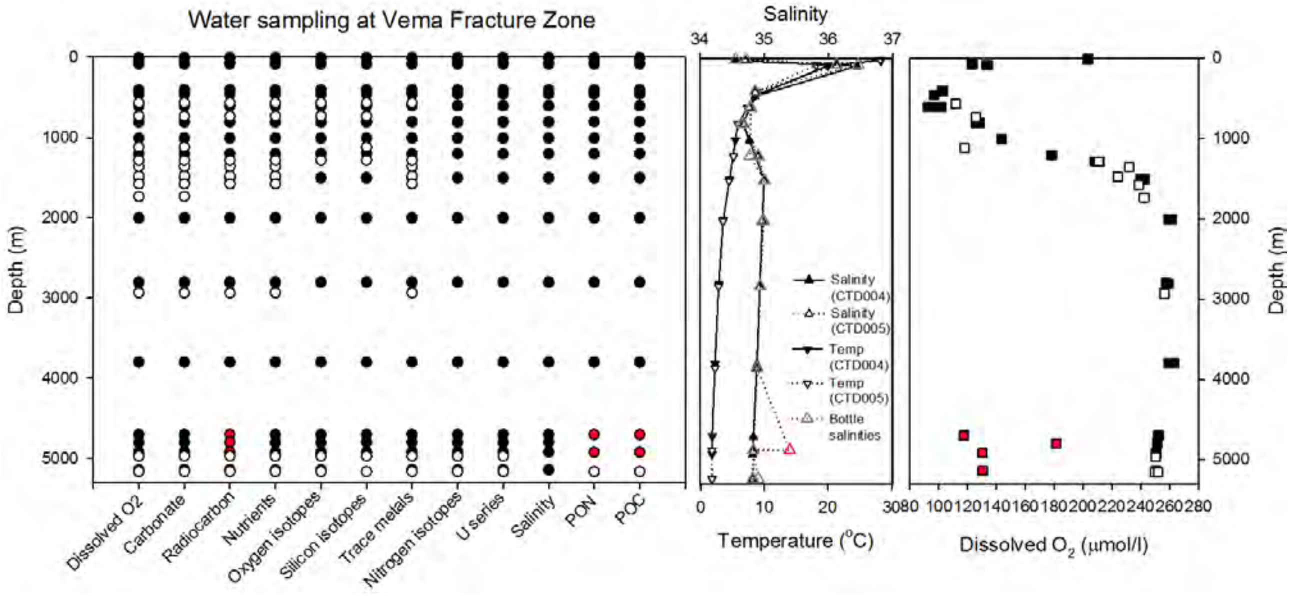
6.1.5. Vema Fracture Zone

CTD004, Station032
Lat: 10° 33.287'N
Lon: 44° 30.886'W
CTD004 was carried out in deep water near the Vema Fracture Zone on November 8th. The CTD was deployed at 7:17GMT and recovered at 11.53GMT. All 24 bottles were fired; Bottle 16 misfired and emptied before being recovered on deck. Bottles 2 and 4 apparently misfired, and gave an anomalously high temperature reading and low dissolved oxygen measurement. Otherwise, all bottles fired successfully (see appendix 4 for depths and parameters sampled).

ROV231, Station033
Niskin bottles were fired during Event #10,11,44,45,68 on November 9th/10th.
Event #10/11: 10° 44.5716'N, 44° 34.6702'W (bottle 1/2 at 1479m)
Event #44/45: 10° 44.51'N, 44° 34.28'W (bottle 3/4 at 1361m)

Event #68: 10° 44.4283'N, 44° 33.642'W (bottle 5 at 1118m)

Figure 6-3 depths of samples for Vema Fracture Zone. Solid symbols show CTD niskin samples; hollow symbols show ROV and MGA niskin samples. Red symbols show misfired bottles.



MGA010, Station034
Lat: 10° 33.287'N
Lon: 44° 30.913'W
Depth: 4975m
Water from the sediment-water interface and porefluids (S0103) were collected and measured on board for nutrients, and filtered/acidified for transport to the UK.
A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

MGA011, Station036
Lat: 10° 51.78'N
Lon: 44° 29.46'W
Depth: 5161m
No sediments were retrieved. A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

MGA012, Station037
Lat: 10° 51.789'N
Lon: 44° 29.441'W
Depth: 5161m
No sediments were retrieved. A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

CTD005, Station039
Lat: 10° 51.778'N
Lon: 44° 29.487'W
CTD005 was carried out in deep water near the Vema Fracture Zone on November 11th. The CTD was deployed at 05:00GMT and recovered at 09:02GMT. All 24 bottles were fired; Bottles 2 and 4 apparently misfired, and gave an anomalously high temperature reading and low dissolved oxygen measurement. Otherwise, all bottles fired successfully (see appendix 4 for depths and parameters sampled).

ROV232, Station041
Niskin bottles were fired during Event #40,69,70,71 on November 11th/12th.

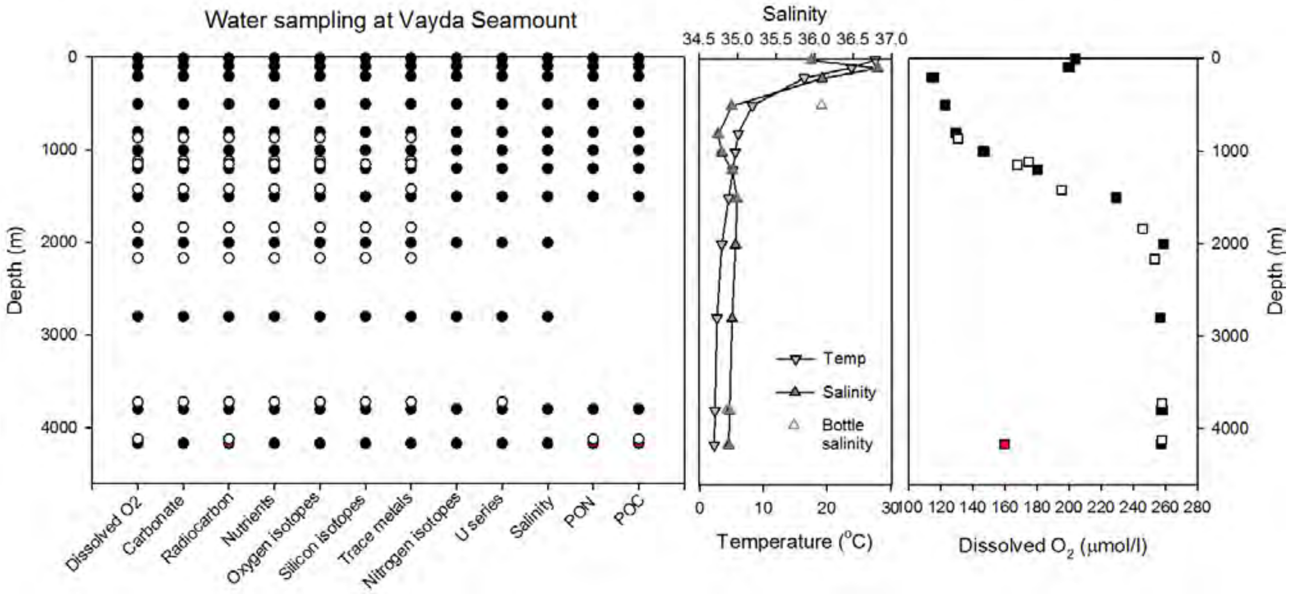
Event #40: 10° 42.8966'N, 44° 25.2914'W (bottle 1/2 at 734m)
Event #69/70/71: 10° 42.5137'N, 44° 25.0852'W (bottle 3-5 at 568m)

ROV233, Station042
Niskin bottles were fired during Event #13,14,80, 96 on November 12th/13th.
Event #13/14: 10° 46.8311'N, 44° 35.9362'W (bottle 1/2 at 2932m)
Event #80: 10° 45.5934'N, 44° 35.9910'W (bottle 3 at 1735m)
Event #96: 10° 45.1027'N, 44° 36.1935'W (bottle 4/5 at 1578m)

ROV234, Station043
Niskin bottles were fired during Event #1-5 on November 13th/14th.
Event #1-5: 10° 43.729'N, 44° 25.479'W (bottle 1-5 at 1283m)

6.1.5. Vayda Seamount

Figure 6-4 depths of samples for Vayda Seamount. Solid symbols show CTD niskin samples; hollow symbols show ROV and MGA niskin samples. Red symbols show misfired bottles.



CTD006, Station044
Lat: 15° 16.245'N
Lon: 48° 15.581'W
CTD006 was carried out in deep water near Vayda Seamount on November 16th. The CTD was deployed at 09:33GMT and recovered at 12:58GMT. All 24 bottles were fired; Bottles 6 and 7 did not fire. Bottle 2 apparently misfired, and gave an anomalously high temperature reading and low dissolved oxygen measurement. Otherwise, all bottles fired successfully (see appendix 4 for depths and parameters sampled).

ROV235, Station045
Niskin bottles were fired during Event #51,52,93,94 on November 16th/17th.
Event #51/52: 14° 51.6480'N, 48° 14.1526'W (bottle 1,2 at 1420m)
Event #93/94: 14° 52.0586'N, 48° 12.9877'W (bottle 3,4 at 1115m)

MGA013, Station046
Lat: 15° 10.443'N
Lon: 48° 15.025'W
Depth: 4126m
Water from the sediment-water interface was collected and measured on board for nutrients, and filtered/acidified for transport to the UK.

A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

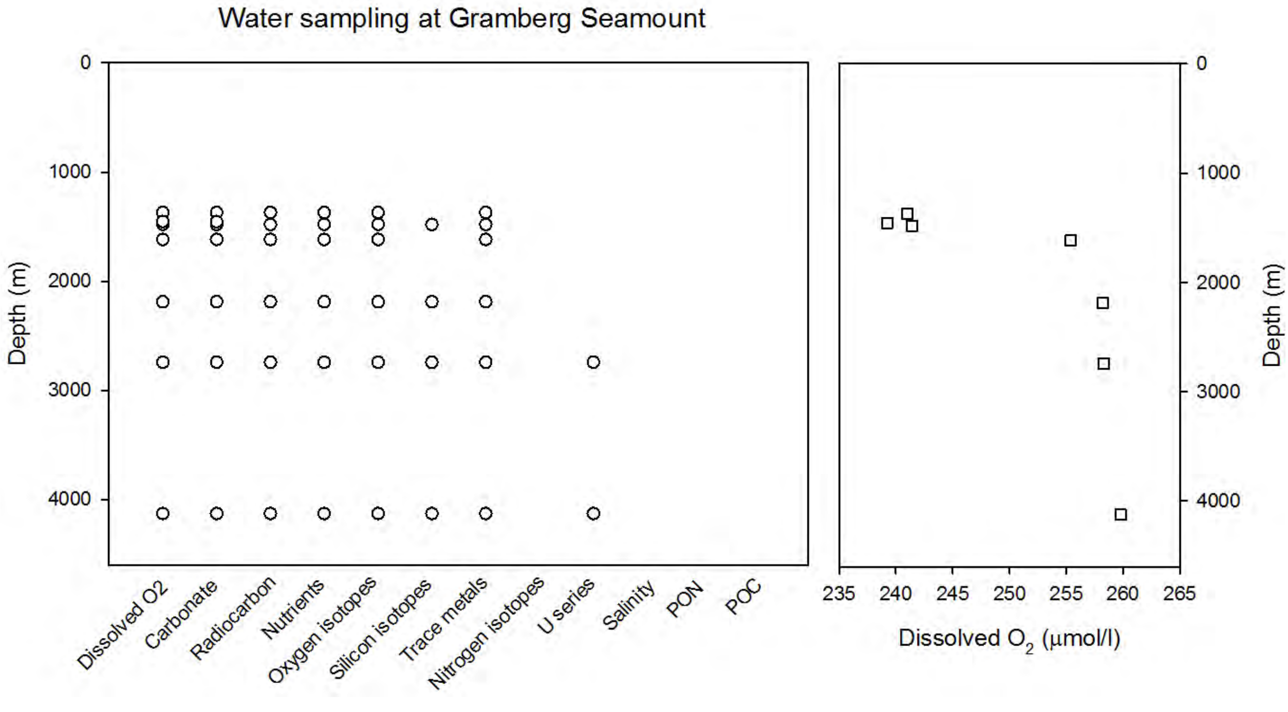
ROV236, Station048
Niskin bottles were fired during Event #6,7,81,82 on November 19th/29th.
Event #6/7: 14° 53.5142'N, 48° 08.9978'W (bottle 1,2 at 867m)
Event #93/94: 14° 53.4914'N, 48° 07.3019'W (bottle 3,4 at 1152m)

ROV237, Station049
Niskin bottles were fired during Event #4,5,32,33 on November 20th/21st.
Event #51/52: 14° 51.4673'N, 48° 14.1526'W (bottle 1,2 at 2166m)
Event #93/94: 14° 51.0318'N, 48° 15.994'W (bottle 3,4 at 1835m)

MGA014, Station050
Lat: 14° 45.993'N
Lon: 48° 15.040'W
Depth: 3723m
No sediments were retrieved. A 10L niskin bottle was fired near the seafloor and sampled (appendix 4).

6.1.6. Gramberg Seamount

Figure 6-5 depths of samples for Gramberg Seamount. Hollow symbols show ROV and MGA niskin samples. Note that there was no CTD cast at Gramberg Seamount.



ROV239, Station056
Niskin bottles were fired during Event #14,15,28,29 and 54 on November 24th/25th.
Event #14/15: 15 25.2899°'N, 51° 05.2106'W (bottle 1,2 at 1480m)
Event #93/94: 15° 25.1893'N, 51° 05.2714'W (bottle 3,4 at 1371m)
Event #54 misfired.

ROV240, Station058
Niskin bottles were fired during Event #4,5,26,27 and 39 on November 24th/25th.
Event #14/15: 15° 26.908'N, 51° 05.486'W (bottle 1,2 at 2187m)
Event #93/94: 15° 26.5334'N, 51° 06.1369'W (bottle 3,4 at 1617m)
Event #39: 15° 25.2655'N, 51° 05.2125'W (bottle 5 at 1454m)

MGA015, Station 60
Lat: 15° 27.860'N
Lon: 50° 59.488'W
Depth: 2727m
The niskin failed to fire, but waters were collected from the core sediment-water interface.

MGA016, Station 61
Lat: 15° 27.8605'N
Lon: 50° 59.4884'W
Depth: 2741m
Waters were collected from the niskin bottle and from the core sediment-water interface.

MGA017, Station 62
Lat: 15° 30.335'N
Lon: 50° 54.402'W
Depth: 4128m
Waters were collected from the niskin bottle and from the core sediment-water interface.

6.1.7 Underway water sampling

Underway seawater samples were collected and filtered by KH for diatoms and LW for plastics. Unfiltered samples were taken for carbonate chemistry analysis (see section 5.vi, appendix 5). See chapter 12 for details of anthropogenics sampling.

6.2. Summary of parameters

6.2.1. Analytical methods on board

Nutrients at sediment-water interface (and porefluids); High-level nutrients were analysed on board on the day of collection using standard chemical testing kits for nitrate, orthophosphate and silicic acid (Hach-Lange), measuring on a Hach-Lange DR3900 photospectrometer. See chapters 5 and 6 for more details on coring operations and porefluid sampling.

Salinity calibration: Water samples were sampled into glass bottles and sealed with a plastic stopper and metal cap for salinity measurement on board. The bottles, once at room temperature, were measured using a GuildLine Autosal salinometer (8400B serial number 60839) and Autosal software (2009). IAPSO standards were run for each CTD (batch P154, K_{15} = 0.99990; Practical salinity 34.996). K_d values were measured for each standard and sample three times, and repeats within acceptable bounds of the software were averaged and converted to practical salinity. These bottle salinity values were compared to the sensor salinity values (Sal1 and Sal2) from the CTD (Figure 6-6 and 6-7). Bottles that were known to have misfired gave anomalous salinity readings, and were excluded from the calibration. One other bottle (bottle 18, CTD06) also showed poor reproducibility and was also excluded from the calibration. Calibration statistics are given in table 6.1, excluding known misfired bottles.

	Sal1-Sal2	Sal1-Bottle	Sal2-Bottle
n	68	63	63
Mean	0.0015	0.0033	0.0020
Standard deviation	0.0028	0.0089	0.0085

Table 6.1: Salinity calibration statistics for JC094.

Figure 6-6: Bottle vs. mean sensor salinities for the different CTD casts

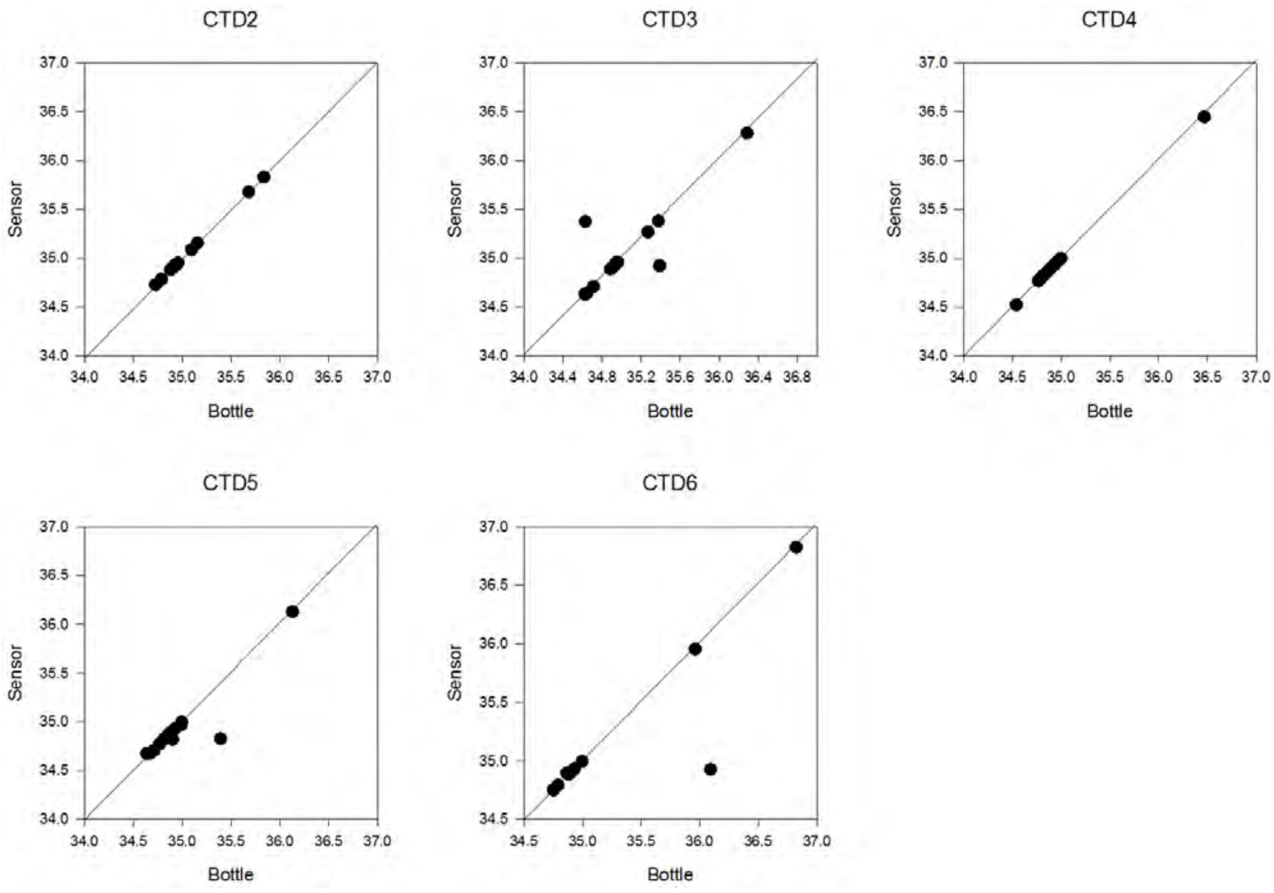
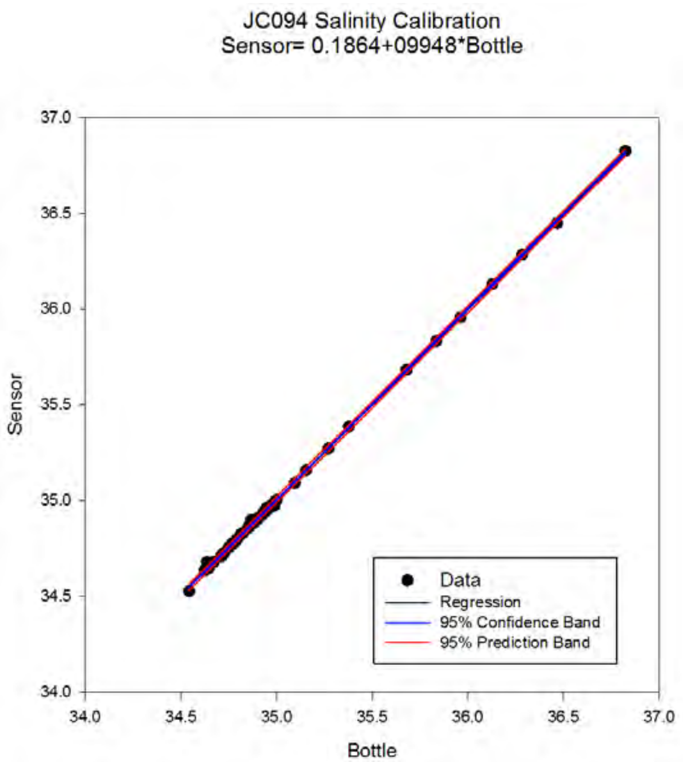


Figure 6-7: Bottle vs. mean sensor salinities (excluding misfired bottles and bottle 18, CTD6) for JC094



Dissolved Oxygen Dissolved oxygen (DO) in seawater was a core parameter measured on all Niskin bottles on every CTD station, one from each batch of Niskin bottles fired on ISIS dives, and the Niskin bottle attached to the mega-corer after successful mega-coring attempts. It is a wet chemistry analysis of whole-bottle seawater samples measured at sea using a Winkler titration (Carritt and Carpenter, 1966). With current techniques, the titration is now an automated process and comprises of a highly accurate and precise dosing burette coupled with a potentiometric electrode for determining the endpoint. This automation now removes a great deal inter-user variability from the titration step and gives rise to consistent and reproducible results. Apart from making discrete bottle measurements, these analyses can be used to ascertain the reliability of tripped Niskin bottles and the integrality of their seal. Furthermore, bottle measurements will be used to calibrate the dissolved oxygen sensor attached to the CTD electronics package so that complete, high resolution profiles of DO can be made. DO analysis of seawater has been described many times in the literature; here we use the WOCE guidelines from Dickson (1996) and Culberson (1991).

Sampling: Following conventional CTD sampling procedures of sampling gases first, DO was sampled first from Niskin bottles to minimize degassing of a cracked Niskin bottle. Silicone tubing was used to sample seawater directly into pre-calibrated (nominal vol. 125 ml) glass iodine determination bottles that have a flared neck to accommodate a water seal. Before the sample was drawn, bottles were rinsed and flushed with seawater for several seconds (about 3 times the volume of the bottle). Care was taken to avoid bubbles inside the sampling tube and bottle. The fixing reagents: 1 ml each of manganese chloride ($MnCl_2$) and sodium hydroxide/sodium iodide solutions (NaOH/NaI) were added using bottle-top dispensing pipettes just after the temperature of the sample was recorded using a hand held type-T thermocouple thermometer. The temperature was recorded to 0.1 °C. Chemical reagents were previously prepared at NOCS prior to loading the ship. Following the addition of reagents, the samples were capped, checked for trapped bubbles and were thoroughly mixed to form a homogenous precipitate. After returning the bottles to the lab, they were thoroughly mixed a second time to maximize the efficiency of the reaction and sealed with a water seal of unfiltered surface seawater to prevent the sample evaporating and bubbles entering the bottle. Samples were stored at room temperature out of direct light and were typically analysed within about 12 hours of collection. Immediately before titrating, the precipitate was dissolved with 1 ml of H2SO4, a stirrer bar added, placed on a magnetic stirrer. The electrode and burette tip was lowered into the sample and then the Titrino was programmed with the sample ID and the titration initiated. The Titrino titrated the sample beyond the endpoint and then back calculated to arrive at the endpoint. The final titre volume was displayed on the Titrino display and then recorded by the operator. All titrations (curves, parameters, titers) were saved to a USB stick so is archived as a backup.

Standardisation and Reproducibility DO determinations were performed with a Winkler titration controlled using a Ω-Metrohm 848 Titrino plus unit with potentiometric end point detection. Thiosulphate calibrations were carried out about every 10-14 days using 10 ml of a 1.667 mM certified commercially bought OSIL iodate standard. Calibration values summarised in Table 1 and shown in Figure 1 suggest little variation of the standard volume and thiosulphate concentration over time. Calculation of oxygen concentrations were computed in an Excel spreadsheet using the titre volume recorded from the Titrino, the fixing temperature and bottle volume. Replicate measurements of randomly-selected Niskin bottles were also carried out in order to test for reproducibility. At least 1 Niskin bottle was always sampled in duplicate; in total 9 duplicates were taken off the 6 CTD casts. Duplicate titrations showed that the average difference between replicates was 0.23 μmol O_2 L^{-1} (range 0.03-0.67 μmol O_2 L^{-1}) with one poor duplicate with a difference of 2.28 μmol O_2 L^{-1}, which was likely a flyer and hence excluded for the variability analysis. Using a sum of differences squared approach (Dickson *et al.*, 2007) an overall standard deviation that includes sampling and analysis was 0.21 μmol O_2 L^{-1} (mean RSD 0.14 %). The first CTD was a test cast that allowed for testing of the equipment and training of personnel. Eight Niskin bottles were tripped at three depths. DO was sampled from every Niskin bottle and each DO sample was collected and analysed by a different user. The RSD of eight replicates collected and analysed by eight users ranged from 0.11-0.29 % and is in keeping with the mean RSD calculated through duplicates. This result highlights the user-independent nature of this method and equipment.

Table 6.2. *Thiosulphate standardizations using 10 ml 1.667 mM KIO3. Date, standard titer and calculated thiosulphate.*

Calibration run	Date	Standard titer (ml)	Thiosulphate molarity
1	16/10/2013	1.0171±0.0007 (n=3)	0.0983±0.0001 (n=3)
2	29/10/2013	1.0195±0.0015 (n=6)	0.0981±0.0001 (n=6)
3	16/11/2013	1.0198±0.0012 (n=6)	0.0981±0.0001 (n=6)
4	25/11/2013	1.0195±0.0017 (n=2)	0.0981±0.0002 (n=2)
5	25/11/2013	1.0208±0.0018 (n=6)	0.0980±0.0002 (n=6)
6	25/11/2013	1.0205±0.0018 (n=8)	0.0980±0.0002 (n=8)

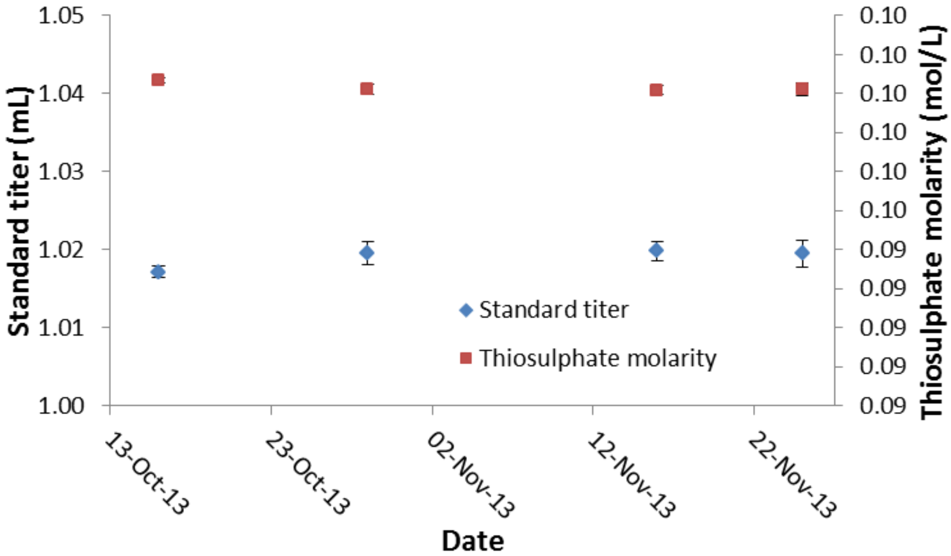


Figure 6.8 *Volume of sodium thiosulphate added to titrate 10 ml of a 1.667 mM iodate standard (red/brown squares), and the resultant calculated thiosulphate molarity (blue diamonds). Error bars are one standard deviation from replicate standards.*

Blanks

The titration blank was determined once during the cruise following the procedure of Dickson (1994). The titration blank quantifies the effect of redox species, excluding oxygen in the reagents, that behaves equivalently to oxygen in the analysis. It is typically very small and is thus a minor correction. The titration blank was estimated to be 0.0031±0.0009 ml. A second blank correction to account for the amount of dissolved oxygen added with 1 ml of both $MnCl_2$ and NaOH/NaI was given the generally accepted standard value of $7.6x10^{-8}$ mol (Dickson 1994).

CTD Niskin Bottle Performance

DO measurements were made on every CTD Niskin bottle and thus could be used to quality control Niskin bottles that didn't fire at the intended depth. Table 2 below gives a summary of Niskin bottle failures. When a titration failed this is noted because the integritiy of the niskin bottle could not be tested using DO.

Preparation

- Prepare the dissolved oxygen log sheet.
- Empty all the bottles into the dissolved oxygen waste carboy.
- Take to the Wetlab: oxygen bottles, thermometer, log sheet, reagents.

- Pump 2-3 ml of reagents into the waste tube to get fresh reagents into the pipette tips.

Table 6.3. *Summary of CTD Niskin bottle performance.*

CTD	Niskin	Comments
2	4	Anomalous DO2, likely Niskin miss-fire
2	15	Titration failed
2	17	Titration failed
2	18	Titration failed
2	22	Niskin miss-fire
3	6	Anomalous DO2, likely Niskin miss-fire
4	2	Anomalous DO2, likely Niskin miss-fire
4	4	Anomalous DO2, likely Niskin miss-fire
4	16	Niskin miss-fire, no DO2 sample taken
4	20	Titration failed
5	2	Anomalous DO2, likely Niskin miss-fire
5	4	Anomalous DO2, likely Niskin miss-fire
6	2	Anomalous DO2, likely Niskin miss-fire
6	6	Niskin miss-fire, no DO2 sample taken
6	7	Niskin miss-fire, no DO2 sample taken

Sampling for Dissolved Oxygen

Sampling

- Select bottle and check the bottle and cap are a matching pair.
- Connect silicone tubing onto the spigot.
- Open spigot, no water should flow out the spigot. This means the Niskin bottle is sealed and gas tight. If water flows, make a note on the log sheet.
- Open the bleed screw at the top of the Niskin bottle, water should now flow.
- Rinse the oxygen bottle twice with a small amount of water, dumping out the waste on the deck.
- With water flowing make sure there are no bubbles in the tubing.
- Insert the tubing to the base of the bottle and overflow the bottle with about 3 bottle volumes of seawater. Overflowing water can be used to rinse the cap.
- Remove the tubing with water still flowing.
- Close the spigot.
- Record the temperature of the sample on the log sheet.
- Add 1 ml of manganese chloride and 1 ml of alkaline iodide by putting the pipette tip blow the neck of the bottle, this prevents bubble entrainment.
- Cap the bottle without trapping bubbles beneath the cap and shake vigorously until the sample is completely homogenous.
- One replicate sample will be taken with oxygen bottle 25, the Niskin designated on the log sheet.

Sample storage

- About 20 mins after sampling, the precipitate should have settled about half way down the bottle. Shake the bottle vigorously again to re-suspend and remix the precipitate.
- Return the bottles to the box and fill the flared neck with seawater from the squirt bottle. Store the bottles out of direct light under the corner counter.

Analysing Dissolved Oxygen

Start up

- Move burette tip to the electrode holder.
- Flush the burette tip with fresh thiosulphate.
    - Menu>OK>Manual control>OK>PREP>OK.
    - This flushes 10 ml through the burette, 2 cycles by the piston, good if not used recently.
    - DOS>OK>Start (hold down) to manually dispense desired amount.
    - Press Back to return to main menu.
    - Rinse excess thiosulphate from the burette tip with MQ.
- Select Dissolved O2 method.
    - Method>OK>Dissolved O2>OK.
- Move electrode to electrode holder.
- Rinse the electrode with MQ, if a big drop of MQ is hanging off the electrode bulb remove it gently with a kim wipe.
- Dispense 1-2 ml of H_2SO_4 to get fresh acid in the pipette tip.

Running samples

- Select next sample.
- Remove water seal with pipette and completely dry around the stopper with a kim wipe.
- Remove stopper by twisting and gently pulling. Avoid “chinking” the stopper as this can chip the stopper and render the bottle calibration incorrect. If you cannot remove the stopper do not force it.
- Add 1 ml of H_2SO_4 to the sample with the pipette tip just below the sample surface. Gently tip the bottle and run the acid down the side of the bottle. This is to prevent the introduction of bubbles and to avoid disturbing the precipitate.
- Using the stirrer bar retriever, trace a small stirrer bar down the neck of the bottle and to the bottom of the bottle. This also is to prevent the introduction of bubbles and to avoid disturbing the precipitate.
- Place sample on stirrer plate.
- Lower the electrode and burette tip into the sample.
- On the Titrino.
    - Ensure the “Dissolved O2” method is selected. If not refer to the start up section.
    - Press “Start”
    - Enter the short ID in ID1. ID1>OK>WXXXX>Accept>OK. The key pad can be used to enter numbers (Num Lock must be on) but not letters, and BS=backspace.
    - Enter the bottle number in ID2. ID2>OK>XX>Accept>OK.
    - Ignore the unit line.
    - Press “Start” to begin the titration.
- The titration will take about 60 sec.
- Write down the titer volume on the Dissolved O2 log sheet.
- Raise the electrode and burette tip high enough so as not to catch the bottle on the electrode bulb.
- Remove the sample.
- Rinse the electrode and burette tip with MQ, if a big drop of MQ is hanging off the electrode bulb remove it gently with a kim wipe
- Retrieve the stirrer bar from the sample, dry the stirrer bar, cap the bottle, return to the box and select the next sample.

6.2.2. Analyses to be carried out on shore

Carbonate chemistry; Water samples for carbonate chemistry were taken following the procedure of Dickson, Sabine and Christian (2007). Briefly, samples were collected in 250 mL borosilicate glass bottles from the Niskin bottle using tygon tubing, first rinsing and then overfilling the bottle by at least 50%. A 1% headspace was removed from the bottle before the sample was poisoned with 50 µL of saturated mercuric chloride solution (7 g/100 mL in DI water). The ground glass joint was made gas-tight by application of Apiezon L grease and the bottle held closedwith electrical tape. Samples were taken within 10 minutes of opening of the Niskin bottle to prevent re-equilibration with the atmosphere and stored in a cool dark place.

Samples will be analysed for Total Dissolved Inorganic Carbon and Total Alkalinity by the UK Ocean Acidification Research Program Carbonate Chemistry Facility at the National Oceanography Centre, Southampton. For TDIC carbonate species are converted to CO_2 by addition of phosphoric acid (10% in 0.7 M NaCl), this generated CO_2 is then carried into the measurement cell using N_2 and analysed by coulometric titration using a VINDTA 3C (Marianda, Germany) connected to a 5011 coulometer (UIC, USA). For TA samples are titrated with 0.1 M HCl (prepared in 0.7 M NaCl) in 150 µL increments until the carbonic acid equivalence point is reached. The titration is monitored with the VINDTA 3C in a closed cell titration (Dickson, Sabine and Chrsitian, 2007)

The temperature, salinity and nutrient concentrations of the samples at time of sampling are then combined with the TDIC and TA measurements to calculate CO_2 system parameters.

Dissolved Inorganic Radiocarbon Unfiltered seawater samples were collected cleanly in 250 mL acid-cleaned and ashed glass bottles from the Niskin bottle using acid-cleaned silicone tubing, first rinsing and then overfilling the bottle by at least 50%. The sample, leaving head-space, was poisoned with 50 µL of saturated mercuric chloride solution, as above. The bottle was sealed with a plastic screwcap lid and o-ring. All measures were taken to avoid contamination e.g. avoiding niskin bottles that had been in contact with tygon tubing; and laying new, clean plastic down before setting the sample bottle down. Dissolved Inorganic Radiocarbon will be analysed at the University of California, Irvine, according to Gao et al., accepted. Headspace-equilibrated gases with sample carbon dioxide will be transferred using a syringe and cryogenically purified on a vacuum line for graphitisation, followed by analysis by ^{14}C-Accelerator Mass Spectrometry at the Keck Carbon Cycle AMS 31 facility (KCCAMS/UCI).

Nutrients: Unfiltered seawater samples were collected cleanly from the niskin into 60ml plastic bottles, rinsed three times with seawater, leaving head-space, and frozen at -20°C. The nutrients will be analysed back ashore by using a 5 channel segmented flow autoanalyser made by Bran and Luebbe, and with high resolution colorimeters, the nutrients analysed will be Nitrate+Nitrite, Nitrite, Silicate, Phosphate and Ammonium (Brewer & Riley,1965; Grasshoff, 1976; Mantoura & Woodward, 1983; Kirkwood, 1989; Zhang & Chi, 2002). Samples will be defrosted from frozen and the bottles washed and dried to ensure no contamination on opening the bottles from outside influences. Samples will be analysed along with a nutrient reference material (KANSO Technos, Japan) that will be sampled to ensure correct calibrations are made and to act as a cross reference.
Remaining porefluid samples will be analysed at Bristol University using standard chemical testing kits for nitrate, orthophosphate and silicic acid (Hach-Lange), measuring on a Hach-Lange DR3900 photospectrometer. See chapters 5 and 6 for more details on coring operations and porefluid sampling.

Oxygen isotopes: Unfiltered seawater samples were collected cleanly into 60ml glass bottles, sealed with a rubber plug and aluminium crimped cap, and stored at room temperature/transported in cool stow. Water oxygen isotopes (denoted by □^{18}O) will be measured at the NERC Isotope Geosciences Laboratory, NIGL, using the VG SIRA (with isoprep 18) mass spectrometer system.

Silicon isotopes: Seawater samples were filtered cleanly through acropak (0.2 micron) filters into acid-cleaned HDPE or LDPE containers. Seawater samples (and porefluids) will be analysed for silicon isotopes (denoted by $\delta^{30}Si$) at the University of Bristol and NIGL by Multi-Collector Inductively Coupled Plasma Mass Spectrometry (MC-ICP-MS, Neptune Thermo). Brucite will be precipitated at pH>10 using sodium hydroxide. The precipitate will be redissolved using distilled nitric acid or hydrochloric acid, before chemical separation using cation exchange resin (e.g. Hendry et al., 2010; de Souza et al., 2012). High levels of sulphate in the samples are matrix matched by doping all standards and samples with sulphuric acid (Hughes et al., 2011).

Trace metals: Seawater samples were filtered cleanly through acropak (0.2 micron) filters into acid-cleaned HDPE or LDPE containers, and acidified on the day of collection with 1%v/v ultrapure concentrated hydrochloric acid (Romil). Trace metals and their isotopes will be measured in the Bristol University Isotope Facilities.

Uranium series: Seawater samples were filtered cleanly through acropak (0.2 micron) filters into acid-cleaned plastic jerry cans, and acidified on the day of collection with 1%v/v ultrapure concentrated hydrochloric acid (Romil). Uranium series isotopes will be analysed following Auro et al., 2012. Seawater samples will be spiked with 229Th and 233 Pa, before being precipitated with ammonium hydroxide (pH 7.5-8). The supernatent will be removed using a peristaltic pump, and the precipitate dissolved in concentrated hydrochloric acid using anion exhange resin. Uranium series isotopes (e.g. 232Th, 230Th and 231Pa) will be measured by MC-ICP-MS (Neptune Thermo) at the University of Bristol.

Nitrogen isotopes: Seawater samples were filtered cleanly through acropak (0.2 micron) filters into acid-cleaned plastic vials, leaving head-space, and frozen on day of collection at -20°C. Approximately 4 litres of seawater was filtered through 0.4 micron Milli-Q rinsed polycarbonate membranes. The volume of seawater filtered was recorded, and the filters were rinsed with Milli-Q, removed, folded, sealed in pre-cleaned centrifuge tubes, and frozen at at -20°C. Forceps were cleaned with ethanol prior to use.

Samples will be oxidized with persulfate to convert total nitrogen to nitrate, and then isotopic composition (denoted by $\delta^{15}N$) will be determined with "denitrifier" method (Sigman et al., 2001). In this method, nitrate is converted to N_2O by *Pseudomonas chloraphis*, denitrifying bacteria (natural mutant, which does not go all the way to N_2, but stops at N_2O) and is transferred in a helium flow into an Isotope Ratio Mass Spectrometer (Princeton). The amount of total N will be determined in the mass spectrometer by area calibration.

Particulate Organic Carbon: 2-4 litres of seawater was filtered through 25mm pre-combusted and Milli-Q rinsed GF/F filters. Forceps were cleaned with ethanol prior to use. The volume of seawater filtered was recorded, and the filters were rinsed with Milli-Q, removed and loosely wrapped in combusted foil and dried in an oven at 50°C overnight. The dried foil packets were sealed tightly and frozen at -20°C in a clean plastic bag. POC measurements will be made in the UK at the University of Bristol or via NERC analytical facilities.

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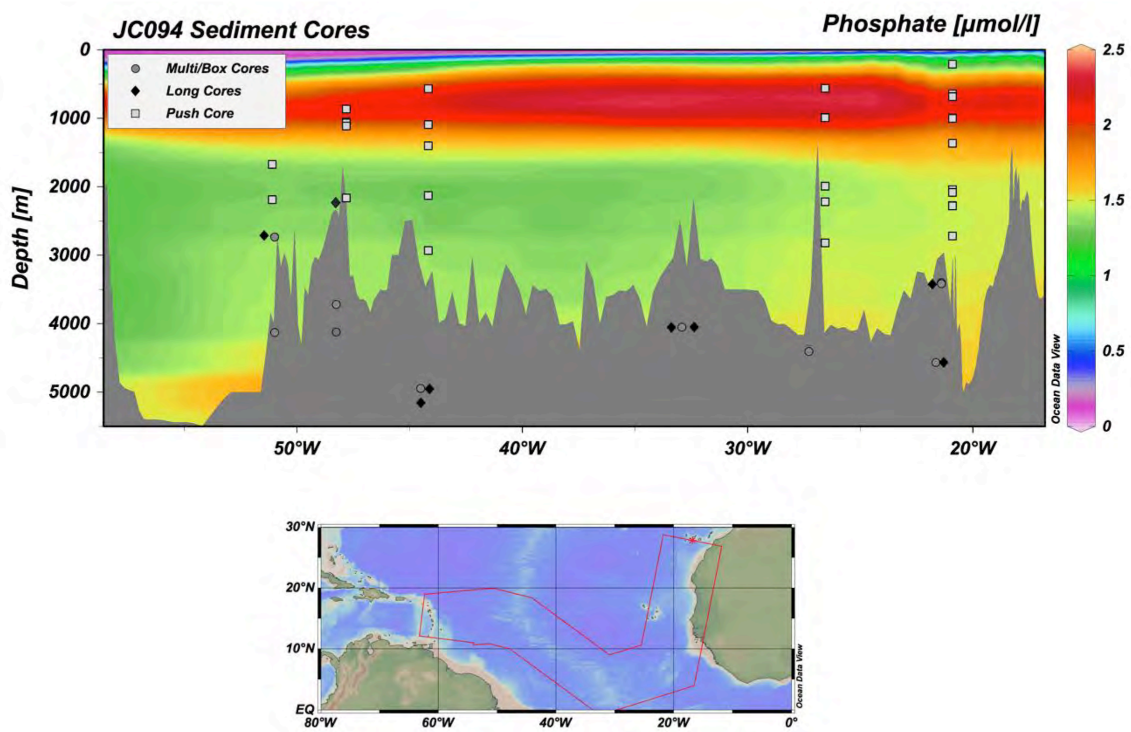
Chapter 7: SEDIMENT SAMPLING

7.1 Introduction

Marine sediment samples were collected during the JC094 TROPICS cruise to fulfil the following goals:

- Calibration of Paleoceanographic proxies. Marine sediments lying at the sediment-water interface (core-tops) provide a link between current water masses conditions and the sedimentary record. Calibration of proxies will be accomplished by paired measurements of physical and chemical water sample conditions and surficial (i.e. modern) sediment samples.
- Reconstruct the paleoclimatic and paleoceanographic history of the Equatorial Atlantic by analysing environmental proxies in continuous sedimentary sequences extending several glacial-interglacial cycles, with a focus on the last deglaciation.

The coring strategy was designed to obtain a representative sample located at the depth of each of the major water masses in a nearly zonal transit across the East and West Atlantic basins, as well as from the Mid-Atlantic Ridge. In addition, sampling was also aimed to obtain a depth distribution as even as possible within the constraints of bathymetric geomorphology. Each sampling cast attempted to recover a sample with a well-preserved core-top, as well as a long-core that would help unravel the paleoceanographic history of each site back to at least the last glacial cycle. Table 1 presents a summary of sampling at each site, and figure 1 shows the coring distribution with depth and type of sample for the complete cruise transect.



Table

Figure 7.1. Sediment samples distribution with depth and sample type overlaid on the Phosphate concentration showing the major water masses in the Equatorial Atlantic.

Sample naming followed the convention set-up for the JC094 cruise and explained in detail in this report. Short sediment sample names are composed of the cruise identification JC094 and the unique S number. An example of such unique sediment sample ID would be JC094-S9999. Both naming conventions are used in this chapter. Detailed information about successful sampling events is presented in summary tables for each site in the following tables. Basic information is full sample name according to JC094 sample codification, position as latitude and longitude in degrees and decimal minutes, water depth of sample and length where available. In some instances length of some of the mega-core tubes or push-cores was not recorded because they where probably mixed and stored in bags. Detailed information for cores designated for microplastic analyses should be found in the microplastics section in this report.

7.1. Sampling summary for each of the studied sites showing successful sampling attempts per gear type employed. Numbers in parenthesis indicate the total number of attempts at each site.

	Sample Type								
Study Area	BOX	GVY	MCH	MCN	PSH	PTN	SLP	TRG	*Total*
Carter Seamount		1 (1)	5 (22)	3 (22)	19 (19)	1 (2)	3 (3)	0 (2)	*32 (71)*
Knipovich Seamount		0 (3)	2 (2)	2 (2)	13 (15)	0 (1)	0 (0)	1 (1)	*18 (24)*
Transit Knipovich-Vema		2 (2)	2 (2)	2 (2)	0 (0)	0 (0)	0 (0)	0 (0)	*6 (6)*
Vema Fracture Zone		2 (2)	1 (6)	1 (6)	11 (11)	0 (0)	0 (0)	0 (0)	*15 (25)*
Vayda Seamount	1 (1)	1 (4)	2 (4)	2 (4)	15 (15)	0 (0)	0 (0)	0 (0)	*21 (28)*
Gramberg Seamount	0 (0)	1 (2)	3 (6)	5 (6)	11 (12)	0 (0)	0 (0)	0 (0)	*20 (26)*
Total	**1 (1)**	**7 (14)**	**15 (42)**	**15 (42)**	**69 (72)**	**1 (3)**	**3 (3)**	**1 (3)**	**112 (180)**

7.2 Sample summary tables

Table 7. 2. Sample summary for Carter Seamount.

Core Name	Latitude N	Longitude W	Depth (m)	Length (cm)
JC094_004_EBA_ROV222_PSH036_S0001	9º 13.4050'	21º 18.8867'	642	Not recorded
JC094_004_EBA_ROV222_SLP009_S0002	9º 12.9930'	21º 18.9711'	1058	NA
JC094_004_EBA_ROV222_SLP014_S0003	9º 13.0706'	21º 18.9642'	994	NA
JC094_004_EBA_ROV222_SLPNot assigned_S0004	Unknown	Unknown	Unknown	NA
JC094_005_EBA_ROV223_PSH052_S0005	9º 14.800'	21º 19.681'	201	7
JC094_005_EBA_ROV223_PSH053_S0006	9º 14.800'	21º 19.681'	201	Not recorded
JC094_005_EBA_ROV223_PSH054_S0007	9º 14.800'	21º 19.681'	201	14
JC094_007_EBA_ROV224_PSH003_S0016	9º 11.75'	21º 17.03'	2131	1.5
JC094_007_EBA_ROV224_PSH014_S0016	9º 11.80'	21º 17.08'	2082	1.5
JC094_007_EBA_ROV224_PSH017_S0017	9º 11.83'	21º 17.16'	2045	Not recorded
JC094_008_EBA_MGA002_MCH001_S0018	9º 16.682'	21º 38.273'	4565	38
JC094_008_EBA_MGA002_MCN004_S0021	9º 16.682'	21º 38.273'	4565	41
JC094_008_EBA_MGA002_MCH005_S0022	9º 16.682'	21º 38.273'	4565	40
JC094_009_EBA_PTN001_PTN001_S0026	9º 16.6834'	21º 38.2726'	4565	713.5
JC094_011_EBA_ROV225_PSH001_S0036	9º 10.44'	21º 16.32'	2719	18
JC094_011_EBA_ROV225_PSH002_S0037	9º 10.43'	21º 16.33'	2719	9.5
JC094_011_EBA_ROV225_PSH003_S0038	9º 10.43'	21º 16.33'	2719	10
JC094_011_EBA_ROV225_PSH028_S0039	9º 10.9065'	21º 16.4818'	2278	18.5
JC094_011_EBA_ROV225_PSH029_S0040	9º 10.9068'	21º 16.4816'	2278	12
JC094_011_EBA_ROV225_PSH030_S0041	9º 10.9068'	21º 16.4813'	2278	16
JC094_015_EBA_ROV227_PSH021_S0053	9º 12.4127'	21º 17.9832'	1366	Very little sediment
JC094_015_EBA_ROV227_PSH022_S0054	9º 12.4127'	21º 17.9832'	1366	19
JC094_015_EBA_ROV227_PSH023_S0055	9º 12.4127'	21º 17.9832'	1366	19
JC094_015_EBA_ROV227_PSH051_S0056	9º 13.15'	21º 18.58'	1003	To Lucy Woodall
JC094_015_EBA_ROV227_PSH053_S0057	9º 13.1632'	21º 18.5887'	947	Not recorded
JC094_015_EBA_ROV227_PSH068_S0058	9º 13.45'	21º 18.85'	684	8-9

Table 7.3. Sample summary for Knipovich Seamount.

Core Name	Latitude N	Longitude W	Depth (m)	Length (cm)
JC094_016_TRS2_MGA006_MCH001_S0059	7º 48.0019'	21º 24.0040'	3400	34
JC094_018_TRS2_GVY001_GVY001_S0065	7º 26.102'	21º 47.778'	3426	522
JC094_019_TRS2_MGA007_MCN001_S0066	7º 26.092'	21º 47.778'	3419	36
JC094_019_TRS2_MGA007_MCN002_S0067	7º 26.092'	21º 47.778'	3419	31.5
JC094_019_TRS2_MGA007_MCH003_S0068	7º 26.092'	21º 47.778'	3419	35
JC094_019_TRS2_MGA007_MCH004_S0069	7º 26.092'	21º 47.778'	3419	25

Table 7.4. Sample summary for Knipovich Seamount.

Core Name	Latitude N	Longitude W	Depth (m)	Length (cm)
JC094_021_EBB_ROV228_PSH003_S0070	5º 36.06'	26º 58.06'	1990	10-14
JC094_021_EBB_ROV228_PSH004_S0071	5º 36.06'	26º 58.03'	1990	21
JC094_021_EBB_ROV228_PSH005_S0072	5º 36.06'	26º 58.03'	1990	Very little sediment
JC094_022_EBB_ROV229_PSH017_S0073	5º 37.5167'	26º 58.03'	989	19
JC094_022_EBB_ROV229_PSH018_S0074	5º 37.5160'	26º 57.6985'	990	16
JC094_022_EBB_ROV229_PSH072_S0076	5º 37.6288'	26º 56.4020'	565	8
JC094_022_EBB_ROV229_PSH073_S0077	5º 37.6288'	26º 56.4020'	565	Very little sediment
JC094_026_EBB_ROV230_PSH003_S0079	5º 35.37'	26º 59.67'	2820	10
JC094_026_EBB_ROV230_PSH004_S0080	5º 35.37'	26º 59.67'	2820	14-16
JC094_026_EBB_ROV230_PSH005_S0081	5º 35.37'	26º 59.67'	2820	16
JC094_026_EBB_ROV230_PSH063_S0082	5º 35.7488'	26º 58.4276'	2220	19
JC094_026_EBB_ROV230_PSH063_S0083	5º 35.7488'	26º 58.4276'	2220	7
JC094_026_EBB_ROV230_PSH063_S0084	5º 35.7488'	26º 58.4276'	2220	8
JC094_027_EBB_MGA008_MCN001_S0085	5º 42.339'	27º 16.429'	4405	41
JC094_027_EBB_MGA008_MCN002_S0086	5º 42.339'	27º 16.429'	4405	38
JC094_027_EBB_MGA008_MCH003_S0087	5º 42.339'	27º 16.429'	4405	37
JC094_027_EBB_MGA008_MCH004_S0088	5º 42.339'	27º 16.429'	4405	22
JC094_028_EBB_PTN003_TRG002_S0999	5º 42.359'	27º 16.443'	4408	46

Table 7.5. Sample summary for the transit Knipovich – Vema Fracture Zone.

Core Name	Latitude N	Longitude W	Depth (m)	Length (cm)
JC094_029_TRS3_MGA009_MCH001_S0094	6º 48.712'	32º 54.726'	4055	31
JC094_029_TRS3_MGA009_MCN002_S0095	6º 48.712'	32º 54.726'	4055	35
JC094_029_TRS3_MGA009_MCN003_S0096	6º 48.712'	32º 54.726'	4055	39.5-41
JC094_029_TRS3_MGA009_MCH004_S0097	6º 48.712'	32º 54.726'	4055	36
JC094_030_TRS3_GVY005_GVY001_S0099	6º 48.710'	32º 54.719'	4055	~510
JC094_031_TRS3_GVY006_GVY001_S0100	6º 48.71'	32º 54.72'	4065	637.5

Table 7.6. Sample summary for Vema Fracture Zone.

Core Name	Latitude N	Longitude W	Depth (m)	Length (cm)
JC094_033_VEM_ROV231_PSH029_S0101	10º 44.592'	44º 34.529'	1402	Not measured
JC094_034_VEM_MGA010_MCN001_S0102	10º 33.288'	44º 30.887'	4948	33
JC094_034_VEM_MGA010_MCH002_S0103	10º 33.288'	44º 30.887'	4948	36
JC094_035_VEM_GVY007_GVY001_S0104	10º 33.289'	44º 30.894'	4959	539
JC094_038_VEM_GVY008_GVY001_S0113	10º 51.783'	44º 29.463'	5161	703
JC094_041_VEM_ROV232_PSH014_S0114	10º 43.542'	44º 25.421'	1094	7
JC094_041_VEM_ROV232_PSH015_S0115	10º 43.542'	44º 25.421'	1094	5
JC094_041_VEM_ROV232_PSH016_S0116	10º 43.542'	44º 25.421'	1094	17
JC094_041_VEM_ROV232_PSH067_S0118	10º 42.5174'	44º 25.0915'	570	1.5
JC094_041_VEM_ROV232_PSH068_S0119	10º 42.5181'	44º 25.0913'	570	13
JC094_042_VEM_ROV233_PSH010_S0120	10º 46.8334'	44º 35.9358'	2932	14
JC094_042_VEM_ROV233_PSH011_S0121	10º 46.8327'	44º 35.9399'	2932	11
JC094_042_VEM_ROV233_PSH012_S0122	10º 46.8309'	44º 35.9344'	2932	8
JC094_042_VEM_ROV233_PSH070_S0123	10º 45.9989'	44º 36.0410'	2128	22-23

Table 7.7. Sample summary for Vayda Seamount.

Core Name	Latitude N	Longitude W	Depth (m)	Length (cm)
JC094_045_VAY_ROV235_PSH092_S0124	14º 52.0586'	48º 12.9877'	1115	24
JC094_045_VAY_ROV235_PSH091_S0125	14º 52.0586'	48º 12.9877'	1115	To Lucy Woodall
JC094_045_VAY_ROV235_PSH090_S0126	14º 52.0586'	48º 12.9877'	1115	11
JC094_045_VAY_ROV235_PSH111_S0127	14º 52.07'	48º 12.67'	1070	To Lucy Woodall
JC094_045_VAY_ROV235_PSH112_S0128	14º 52.07'	48º 12.67'	1070	16
JC094_045_VAY_ROV235_PSH113_S0129	14º 52.07'	48º 12.67'	1070	26
JC094_046_VAY_MGA013_MCH001_S0130	15º 10.430'	48º 15.009'	4126	7
JC094_046_VAY_MGA013_MCN002_S0131	15º 10.430'	48º 15.009'	4126	11
JC094_046_VAY_MGA013_MCH003_S0132	15º 10.430'	48º 15.009'	4126	4
JC094_046_VAY_MGA013_MCN004_S0133	15º 10.430'	48º 15.009'	4126	4
JC094_048_VAY_ROV236_PSH003_S0134	14º 53.5147'	48º 08.9966'	867	3
JC094_048_VAY_ROV236_PSH004_S0135	14º 53.5145'	48º 08.9960'	867	4
JC094_048_VAY_ROV236_PSH005_S0136	14º 53.5143'	48º 08.9965'	867	6
JC094_048_VAY_ROV236_PSH077_S0138	14º 53.4330'	48º 07.3905'	1055	19
JC094_048_VAY_ROV236_PSH078_S0139	14º 53.4332'	48º 07.3902'	1055	9
JC094_049_VAY_ROV237_PSH001_S0140	14º 51.0340'	48º 15.9990'	2166	22
JC094_049_VAY_ROV237_PSH002_S0141	14º 51.0340'	48º 15.9990'	2166	To Lucy Woodall
JC094_049_VAY_ROV237_PSH003_S0142	14º 51.0340'	48º 15.9990'	2166	22-23
JC094_053_VAY_BOX001_BOX008_S0155	14º 45.993'	48º 15.040'	3721	Not recorded
JC094_053_VAY_BOX001_BOX009_S0156	14º 45.993'	48º 15.040'	3721	Not recorded
JC094_054_VAY_GVY012_GVY001_S0158	14º 51.0745'	48º 15.8545'	2234	31

Table 7.8. Sample summary for Gramberg Seamount.

Core Name	Latitude N	Longitude W	Depth (m)	Length (cm)
JC094_056_GRM_ROV239_PSH025_S0159	15º 25.1918'	51º 05.2746'	1379	To Lucy Woodall
JC094_056_GRM_ROV239_PSH027_S0161	15º 25.1918'	51º 05.2746'	1379	19
JC094_056_GRM_ROV239_PSH053_S0162	15º 23.6555'	51º 05.5013'	1004	To Lucy Woodall
JC094_056_GRM_ROV239_PSH051_S0163	15º 23.6555'	51º 05.5013'	1004	14
JC094_058_GRM_ROV240_PSH002_S0167	15º 26.908'	51º 05.486'	2187	17
JC094_058_GRM_ROV240_PSH003_S0168	15º 26.908'	51º 05.486'	2187	To Lucy Woodall
JC094_058_GRM_ROV240_PSH021_S0169	15º 26.5839'	51º 06.0318'	1675	To Lucy Woodall
JC094_058_GRM_ROV240_PSH022_S0170	15º 26.5839'	51º 06.0318'	1675	11
JC094_059_GRM_GVY014_GVY001_S0172	15º 27.860'	50º 59.488'	2714	388
JC094_060_GRM_MGA015_MCN001_S0173	15º 27.860'	50º 59.488'	2714	8
JC094_061_GRM_MGA016_MCN001_S0177	15º 27.859'	50º 59.486'	2714	28 (plus a bag with mud in bun)
JC094_061_GRM_MGA016_MCH002_S0178	15º 27.859'	50º 59.486'	2714	36
JC094_061_GRM_MGA016_MCN003_S0179	15º 27.859'	50º 59.486'	2714	To Lucy Woodall
JC094_061_GRM_MGA016_MCH004_S0180	15º 27.859'	50º 59.486'	2714	35
JC094_062_GRM_MGA017_MCN001_S0181	15º 30.533'	50º 54.401'	4128	8
JC094_062_GRM_MGA017_MCH002_S0182	15º 30.533'	50º 54.401'	4128	To Lucy Woodall
JC094_062_GRM_MGA017_MCN003_S0183	15º 30.533'	50º 54.401'	4128	10

7.3 Shipboard Analyses

7.3.1 Core Description and Photography (Logs)

After recovery, cores were split on board and photographed immediately afterwards (Fig. 7.2). Cores were visually described and log-sheets created with notes and a sketch of each core section. Based on this information, digital copies of the sedimentary logs were created using SedLog 3.0 (Zervas et al., 2009). An example of such log for core JC094-S0065 is presented in figure 3.

Figure 7.2. Core JC094-S0065 photographed after splitting.

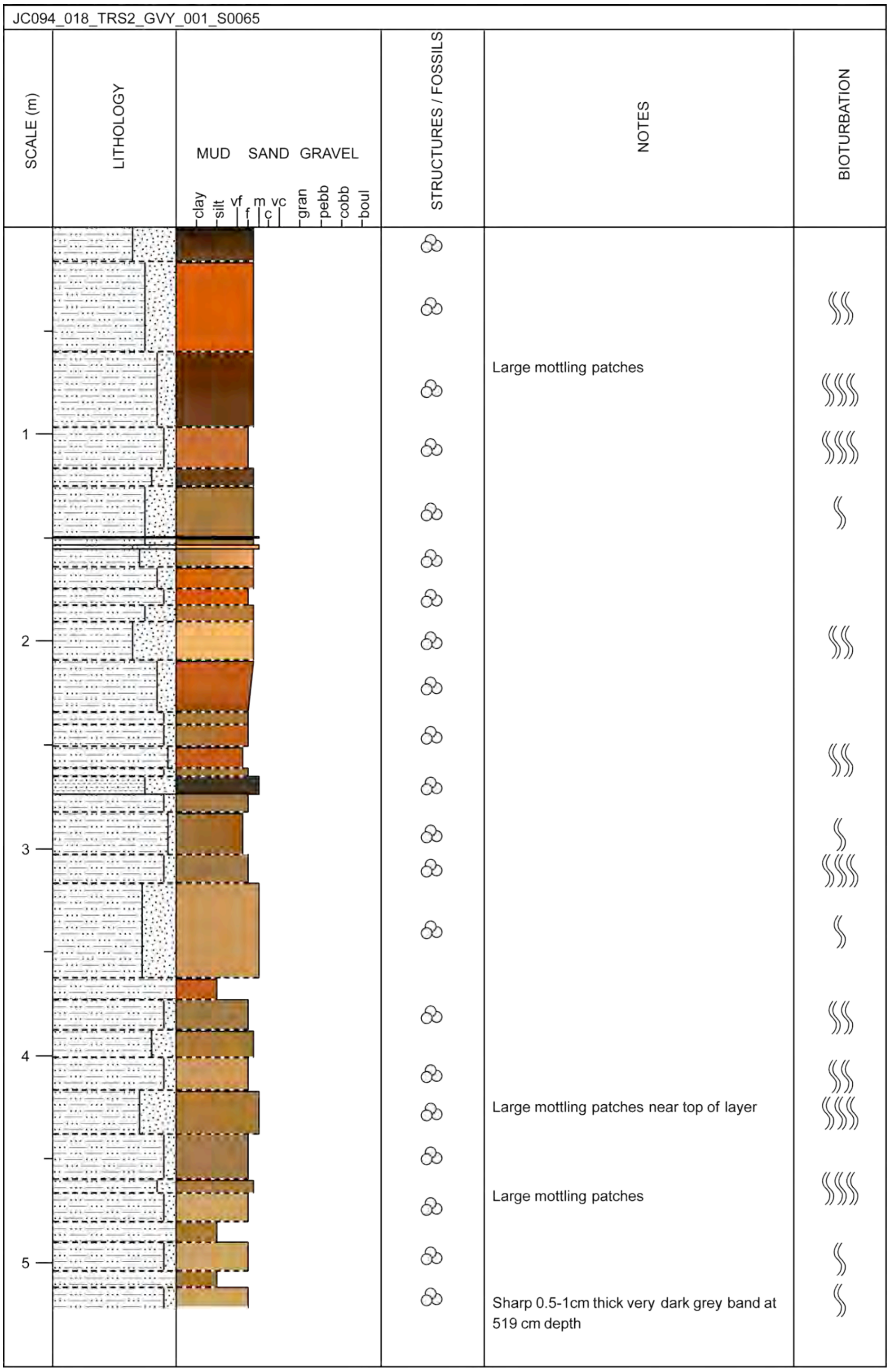


Figure 7.3. Example of a sedimentary log created with SedLog v.3.0 for core JC094-S0065.

7.3.2 Colour Scanning

Colour of the cores was measured in the archive half of split cores every 2 cm with a Konica Minolta CM-2600d spectrophotometer. Before measurements, the surface of the core was smoothed using a glass slide and covered in transparent cling film. Colour results were reported in L*a*b* colour-space and in Hue, Chroma and Value of the Munsell scale. Colours were determined with the Specular Component Included (SCI) and Excluded (SCE) methods. An example of a colour profile (Luminosity) in core JC094-S0026 is shown in figure7. 4.

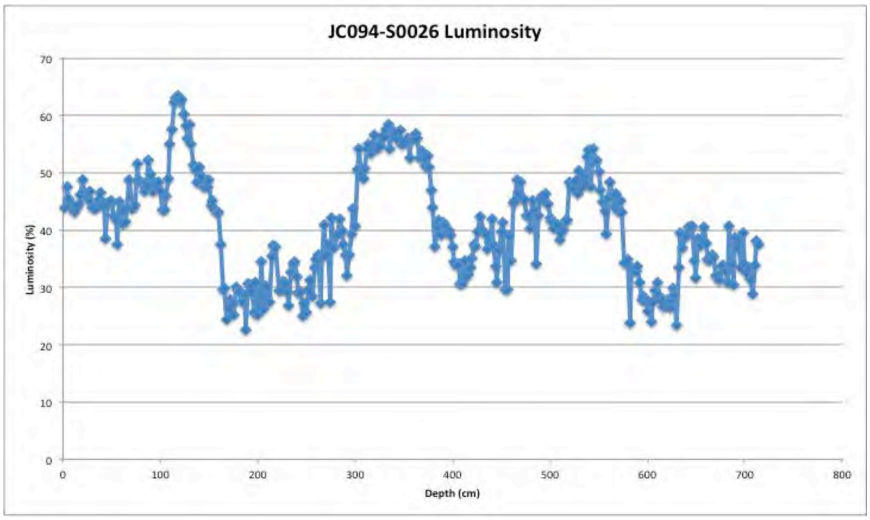


Figure 7.4. Example of Luminosity (L) measurement every 2 cm using the hand-held spectrophotometer Konica-Minolta CM-2600d on piston core JC094-S0026.*

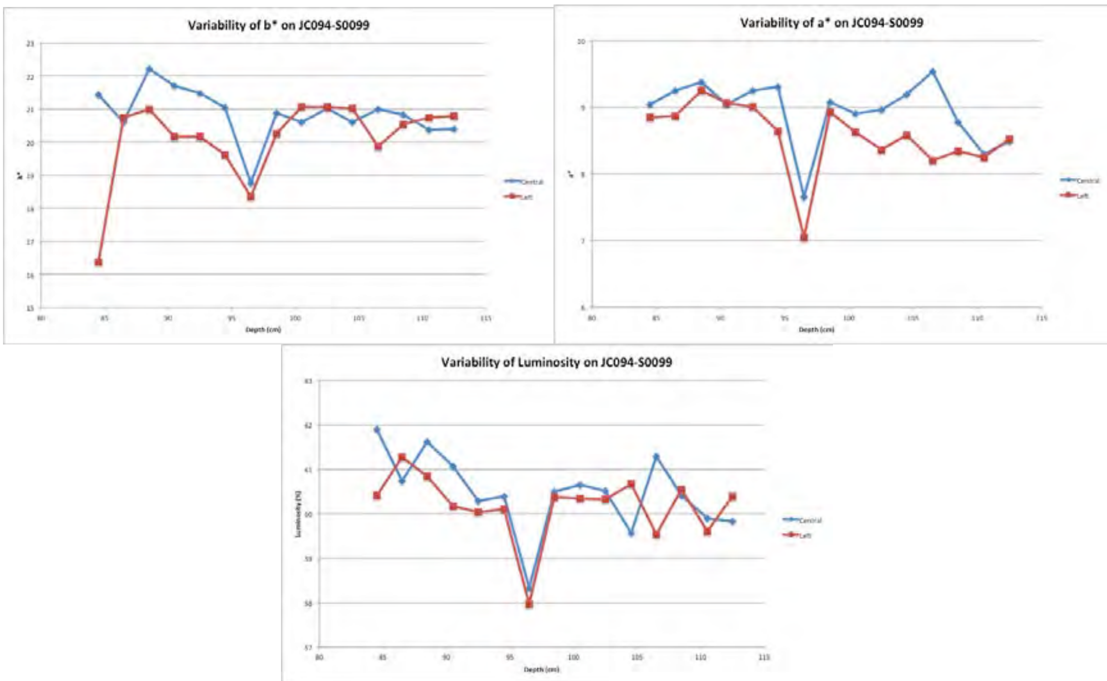
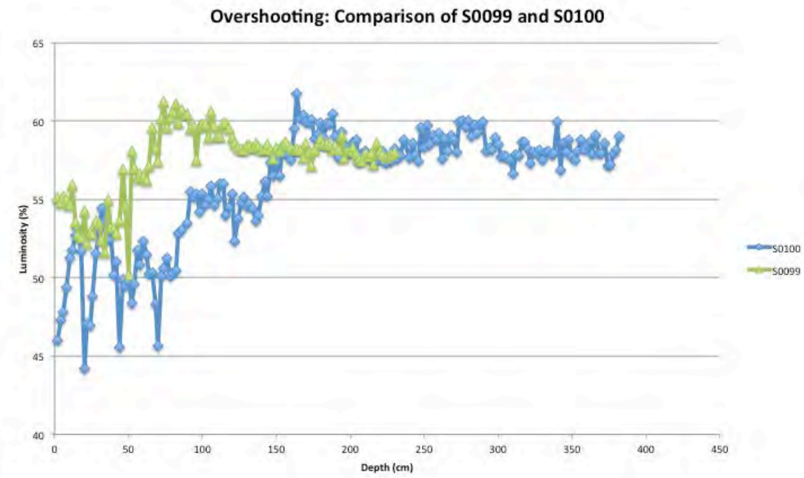


Figure 7.5. Natural colour variability test along parallel tracks in core JC094-S0099. Top left: Luminosity; top right: a; Bottom: b*.*

Precision of the measurements was estimated by 10 replicate measurements at 102.5 cm and 122.5 cm of section 2/4 of core JC094_S0099. Maximum relative standard deviations were 0.89% for Luminosity (L), 1.26% for a*, and 2.26% for b*. Natural variability in colour measurements was estimated by measuring two parallel tracks from 84.5 to 112.5 on section 2/4 of core JC094_S0099. Figure 5 shows the results of the natural variability test for the three colour parameters of the L*a*b* colour-space.

Colour measurements proved useful for confirming the overpenetration of core JC094-S0099, where loss of a significant amount of top sediment was suspected. A duplicate core JC094-S0100 was obtained at the same site. Colour measurements were performed along the latter core and the top part of core JC094-S0099. Comparison of both records suggested that 88 cm of core JC094-S0099 were lost due to overpenetration (fig. 7.6)



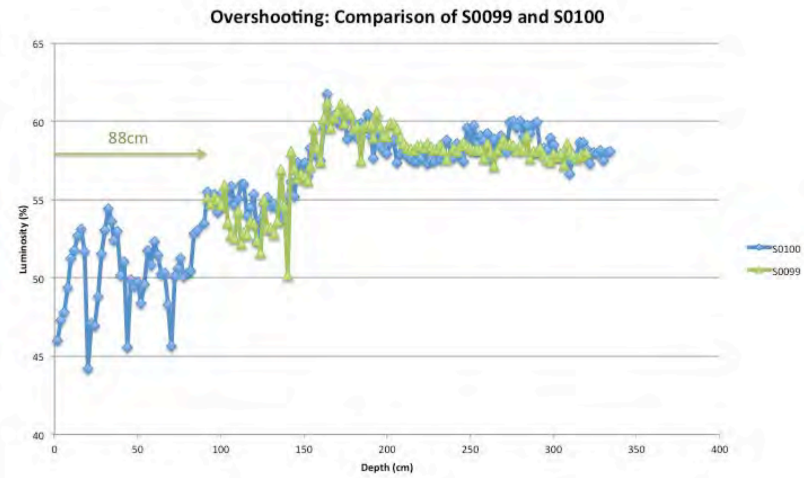


Figure 7.6. Estimation of core-top loss due to overpenetration using the hand-held colour scanner Konica Minolta CM2600-d. Top: Parallel cores assuming top of core is at sediment/water interface. Bottom: Estimation of core-top loss in JC094-S0099 due to overpenetration by comparison of Luminosity records from both cores.

7.4 Foraminifer biostratigraphy

A goal of cruise JC094, cruise scientists was to capture marine sediment cores spanning the last deglacial termination (TI) and as much of the Last Glacial Maximum (LGM) as possible. To achieve this goal it was important to assess the time/depth penetration of each core as soon after retrieval as possible. While chronostratigraphy for marine sediment cores is typically done using benthic oxygen isotope stratigraphies or correlation of physical properties, these techniques were not possible given the constraints of the present cruise. The method chosen was planktonic foraminifera biostratigraphy and assemblage assessment. Previous studies in the equatorial Atlantic have revealed shifts in the distribution of foraminifera species throughout the Quaternary as a result of changes in climate (eg: Be et al., 2008; Ericson an Wollin, 1956, 1968) and thus previously identified trends in assemblage and abundance were applied to infer the approximate age of JC094 sediments. Specifically, studies have indicated that *Globorotalia menardii* is the Atlantic planktonic foraminifera species most sensitive to changes in climate during the Pleistocene, and fluctuations in its relative abundance downcore are thus most useful for biostratigraphic zonation. The presence or absence of *G. menardii* characterizes well-defined zones in the Pleistocene, which are widespread in the equatorial Atlantic and Caribbean. It is generally more abundant in warmer interglacial climates and absent or rare during glacials. In addition, the relative abundance of other warm and cold-water species was used to identify glacial-interglacial transitions.

Biostratigraphic techniques were applied on JC094 by sampling sediment from easily accessible depths within selected cores (often pre-split cores). On long-cores (gravity and piston) samples were taken from the core barrel, core catcher and from each section break (approx. every 1.5m). Mega-core samples were typically taken from the top and bottom of most sediments. Samples were wet sieved using either a >250um or >150um sieve depending upon an initial assessment of sediment characteristics including principle components and clay content. Once sediments were clear of the fine fraction, sieves were placed in an oven at 60C and were kept at constant temperature until dry. Due to space and sieve limitations, samples were often transferred into plastic petri dishes after washing.

After the samples were dry they were passed through a 250um sieve to guarantee a mature size fraction (immature foraminifera often have cryptic tests) for counting and examination. At least 200 individuals were counted per sample (in many cases more) and a tally was also kept of foraminifera shell fragments as this is often an indicator of sediment dissolution. All counts were entered into an excel spreadsheet to facilitate record keeping and visual depiction of results (fig 7.7).

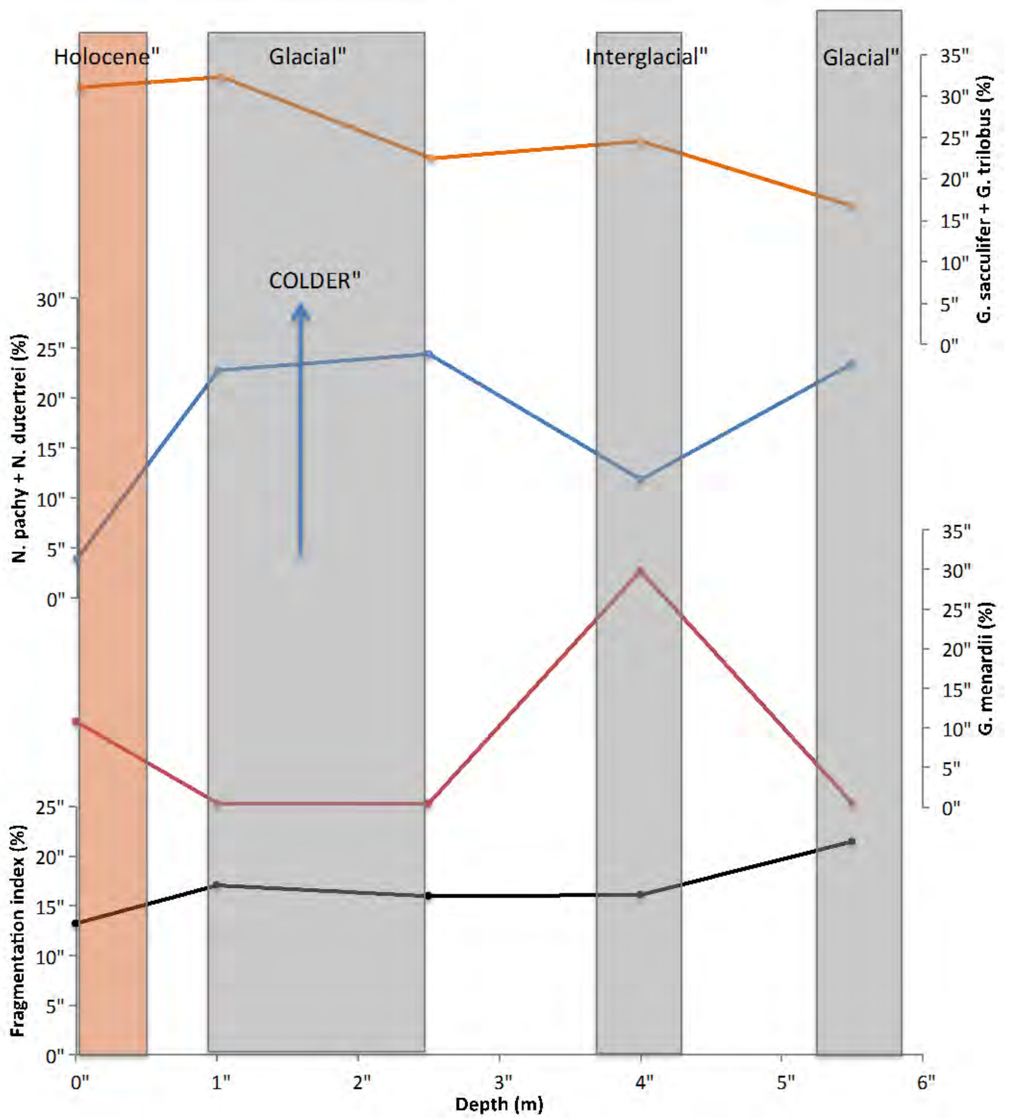


Figure 7.7. Depth in gravity core GVY001_S0065 versus percentage abundance of the climate sensitive species G. menardii, the major cold water species (N. pachyderma + N. dutertrei), the major warm water species (G. ruber + G. trilobus) and the fragmentation index.

In keeping with the published literature we found that the abundance of *G. menardii* varied substantially downcore. In many cores *G. menardii* was the most variable foraminifera species and as expected, changes in its abundance can to a first order to be correlated with other glacial/interglacial indicators such as colour change and sediment composition (coarse/fine fraction ratio). The index of fragmentation did not turn out to be a particularly diagnostic tool for JC094 sediment cores, likely because different foraminifera species have different preservation potentials and assemblage changes overwhelm the dissolution signal due to lysocline changes in these cores. Early on in the cruise the utility of using the presence/absence of *G. menardii* and *G. menardii flexuosa* (present only from 70-400kya) in a whole sample was identified and thus detailed down core counts were only carried out for the first few long sediment cores. Because sediment samples could not be counted at a sufficient resolution (due to time and sampling constraints) to determine the exact depth of the "LGM" this approximation method allowed for a quick and easy determination of whether or not a given sediment core had captured the relevant time interval and was thus considered a 'success'. Higher resolution age/depth relationships required for paleoclimate work will be carried out using planktonic oxygen isotope stratigraphy at the Lamont-Doherty Earth Observatory.

7.5 Subsampling

Subsampling of marine sediments during JC094 cruise was done for mega-cores, push-cores and long-cores as summarized in the Sediment Sampling Database. U-channels were extracted along the central axis of all the long-cores. Discrete samples subsampling of these cores (fig. 8) was generally done with the aim to obtain samples going back to the last glacial maximum (LGM). The position of the LGM was estimated based on average sedimentation rates and initial foraminifer assemblages observations. A summary of subsampling is shown in table 7.9.

Table 7.9. Summary of subsampling done in long- and mega-cores during cruise JC094.

		Subsample type	U-channel	Magnetic	Foram δ18O	Diatom	Past circulation proxy (Pa/Th, Δ14C, sortable silt)
		(Sampling resolution cm)	Continuous	1	3-4	3-4	3-12
Location	**Core**	**Water depth (m)**	**Subsampled?**	**Counts of subsample**			
East of Eastern Basin	MGA_002_S0021	4565	-	30	-	-	-
	PTN_001_S0026	4565	√	-	30	23	10
	MGA_006_S0059	3400	-	34	-	-	-
	GVY_001_S0065	3426	√	-	38	38	13
	MGA_007_S0066	3419	-	35	-	-	-
		Subtotal	-	99	68	61	23
West of Eastern Basin	MGA_008_S0085	4405	-	39	13	13	6
	MGA_009_S0096	4055	-	37	-	-	-
	GVY_006_S0100	4065	√	-	33	33	11
		Subtotal	-	76	46	46	17
Vema	MGA_010_S0102	4948	-	33	-	-	-
	GVY_007_S0104	4959	√	-	15	-	11
	GVY_008_S0113	5161	√	-	-	-	-
		Subtotal	-	33	15	0	11
East of Western Basin	GVY_014_S0172	2714	√	-	-	-	-
	MGA_016_S0177	2714	-	27	-	-	-
		Subtotal	-	27	0	0	0
		Total	-	235	129	107	51

Core-top samples were also obtained where well-preserved core-tops where obtained. A summary of the core-top samples obtained during JC094grouped by water depth range cruise is presented in the table 7.10.

Figure 7. 8. Example of subsampling of the top section of core JC094-S0026 1/6.

Table 7.10. Core-tops obtained during cruise JC094 grouped by sampling area and water depth.

		Counts of core top subsamples					Total core tops subsampled for each location
Coring gear		ROV push core			Mega/Box core		
Water depth (m)		< 500	500 - 1500	1500 - 4000	1500 - 4000	> 4000	
Location	East of Eastern Basin	1	2	3	1	1	8
	West of Eastern Basin	-	1	5	-	2	8
	Vema Fracture Zone	-	3	2	-	1	6
	East of Western Basin	-	6	4	3	3	16
						Grand total	38

7.6 Pore-fluids

Core top mega-cores waters were syphoned off using silicone tubing attached to a peristaltic pump at 300-1000L/min. Porefluids were extracted from Mega-core subcores at 2cm intervals using Rhizon filters (Rhizosphere Research Products, NL) into pre-cleaned syringes.

Short code	Type	Nutrients measured?	Comments
JC094_S0022	Porefluids	Y	18 depths, no frozen subsamples
JC094_S0068	Porefluids	Y	20 depths, no frozen subsamples
JC094_S0084	Porefluids	N	17 depths, frozen subsamples
JC094_S0097	Porefluids	N	17 depths, frozen subsamples
JC094_S0103	Porefluids	Y	17 depths, no frozen subsamples

Table 7.11. Summary of porefluids analyses during cruise JC094.

Porefluid nutrients and core top waters were analysed on board on the day of collection using standard chemical testing kits for nitrate, orthophosphate and silicic acid (Hach-Lange), measured on a Hach-Lange DR3900 photospectrometer (NB: some nitrate measurements were below the calibration range of the Hach-Lange automated method; all phosphate and silicic acid measurements were within the calibration range). Reproducibility was assessed for silicic acid measurements: internal reproducibility was ~0.3%; external reproducibility based on replicate subsamples of bottom waters was ~2%. Note that duplicate samples from core top waters showed greater variability suggesting greater heterogeneity (mean offset between duplicate 13%, 4%, 7% for nitrate, phosphate and silicic acid respectively). For porefluid samples not analysed for nutrients on the day of collection, a 5ml subsample was frozen at -20°C for analysis in the UK. Remaining archived samples (~10-15ml) were stored in cool stow. Remaining core top waters were filtered through 0.4 mm polycarbonate membranes (Whatman) and preserved (See chapter 12 for full details of core top water samples). Table 7.11 presents a summary of porefluid analyses during cruise JC094. Figures 7.9, 7.10 and 7.11 show the porefluid profiles for the cores analysed on board. Figure 12 presents the results of the core-top waters nutrients contents for the cores analysed during the JC094 cruise.

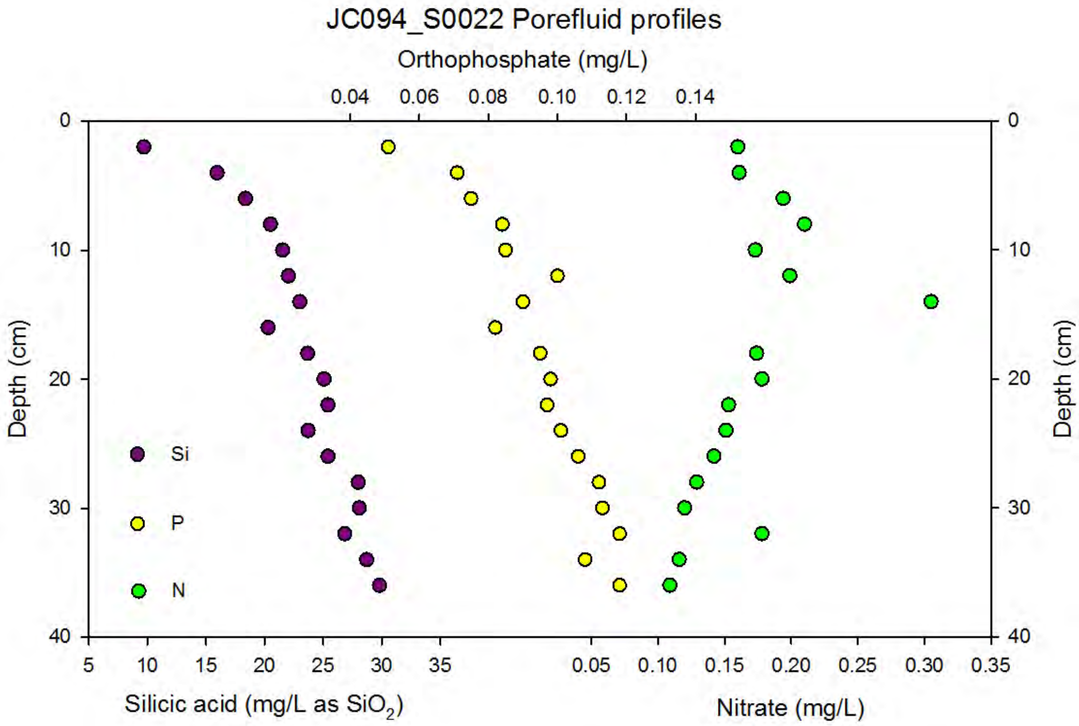


Figure 7.9. Porefluid profile for JC094-S0022 (MGA002)

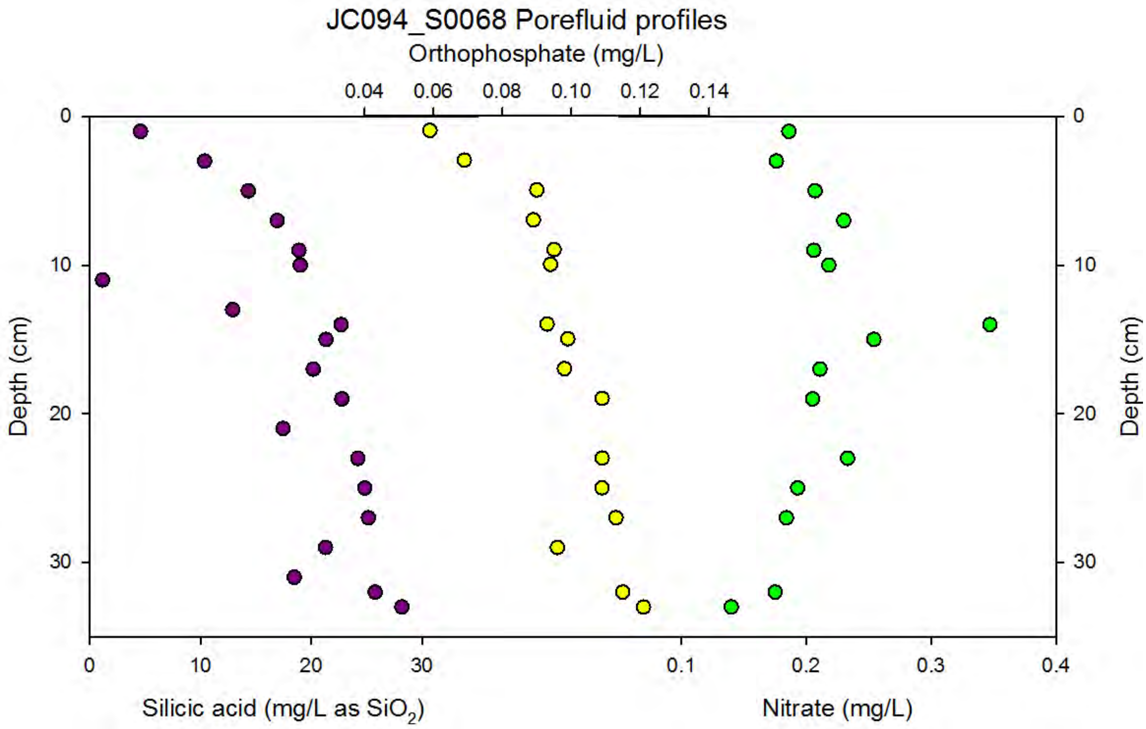


Figure 7.10. Porefluid profile for JC094-S0068 (MGA007)

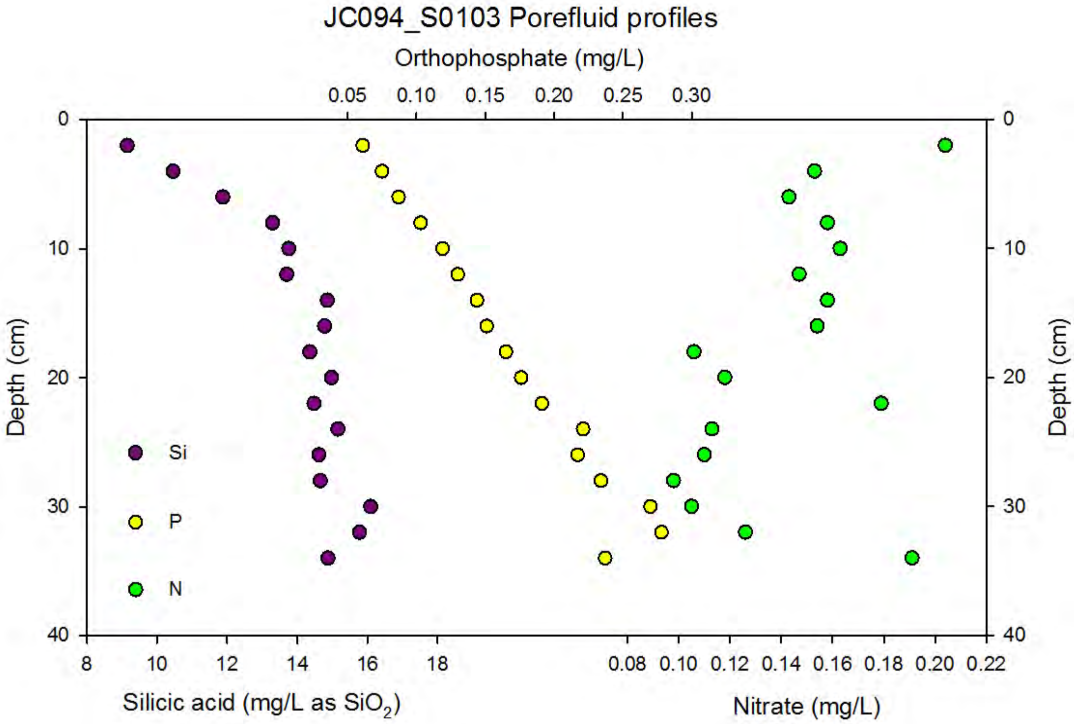


Figure 7.11. Porefluid profile for JC094-S0103 (MGA010)

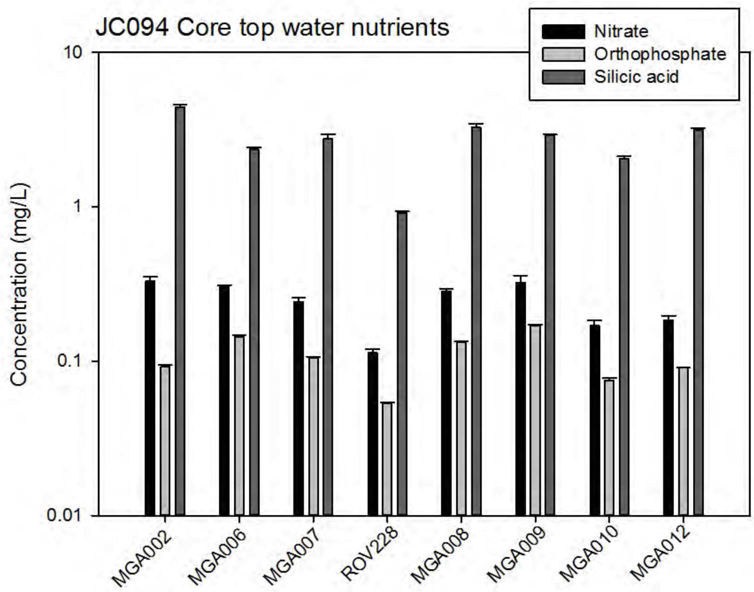


Figure 7.12. Core-top nutrients (error bars based on duplicate analyses).

Be, A.W.H., Damuth, J.E., Lott, L. & Free, R. (2008) Late Quaternary Climatic Record in Western Equatorial Atlantic Sediment. *GSA Memoir* 145 1–36 (2008).

Ericson, D. B. & Wollin, G. Micropaleontological and isotopic determinations of Pleistocene climates. (1956). *Micropaleontology*, 257–270.

Ericson, D. B. & Wollin, G. Pleistocene climates and chronology in deep-sea sediments. (1968). *Science* 162, 1227–1234.

Zervas, D., Nichols, G.J., Hall, R., Smyth, H.R., Lüthje, C., Murtagh, F. (2009). SedLog: A shareware program for drawing graphic logs and log data manipulation. *Computers and Geosciences* 35, 2151-2159.

Chapter 8: Coral Sampling

This section describes the collection of corals (both live and fossil) and how they have been processed, catalogued and subsampled. Live and fossil corals were collected from five locations: Carter Seamount, Knipovich Seamount, the Vema Fracture Zone, Vayda Seamount and Gramberg Seamount. Samples were collected during a total of 16 ROV ISIS dives, 1 Dredge and 2 Mega Cores. Our overall yield was: 2043 fossil solitary Scleractinian corals, 143 g of fossil solitary Scleractinian fragments, 504 live solitary Scleractinian corals, 34 live colonial Scleractinian corals, 154 live octocorals, 67 live stylasterids, 85 kg of fossil colonial Scleractinian corals, 54 kg of fossil octocorals, 0.9 kg of fossil stylasterids and 100 kg of small pieces of mixed coral rubble or unidentified colonial corals.

8.1 Live Corals

Live corals were collected for a variety of purposes including palaeoclimate proxy calibration, genetics, reproduction studies and coral distribution studies. In order to fulfil these aims, corals were collected from as many depth intervals as possible at each sampling site, spanning 2990 m to 200 m water depth and 3.0^{o}C to 12.1^{o}C water temperature. Key features of the physical ocean sampled include the thermocline, Antarctic Intermediate Water (AAIW) and North Atlantic Deep Water (NADW). Scleractinian corals were identified to genus (and in some cases species) level on board where possible. Octocorals were identified to either family/genus level. Stylasterids were identified to family level. The colonial Scleractinia collected were identified as *Madrepora*, *Solensmilia*, *Dendrophyllia* and *Enallopsammia*. Solitary corals were identified as *Flabellum*, *Javania*, *Caryophyllia*, *Dasmosmilia*, *Polymyces* and *Stephanocyathus*. Octocorals collected include *Corallium*, *Acanthogorgia*, *Anthomastus*, *Iridogorgia*, *Candidella*, *Paragorgia* and bamboo corals of the Isididae. For a more complete discussion of the varieties of soft coral collected the reader is referred to Chapter 10.

The number of samples collected at each site is discussed in Section 8.1.1. All live coral samples are catalogued in the Biology database. Those samples taken for palaeoclimate studies are also included in the Fossil Corals database (Section 7.2.2). Figures in Section 7.1.1 show the numbers of hard corals collected according to depth at each site. These figures are based on the corals taken for palaeoclimate proxy calibration and include all hard colonial corals collected and the great majority of solitary Scleractinia. Solitary Scleractinia taken for biological analysis form a small subset of the corals collected and not all have yet been identified, so they are not included in the figures.

8.1.1 Sampling Locations

We plot the samples collected at every seamount with a background of ocean temperature and nutrient data (figs 8.1-8.4).

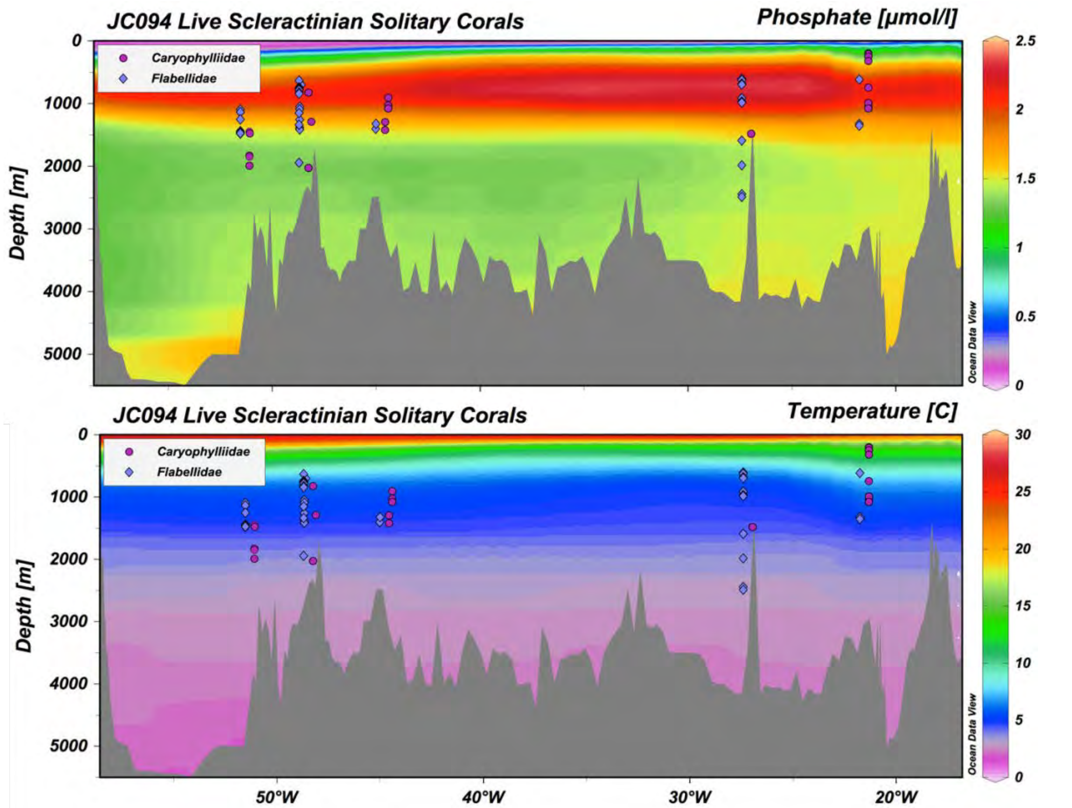


Figure 8.1: Live Scleractinian solitary corals collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

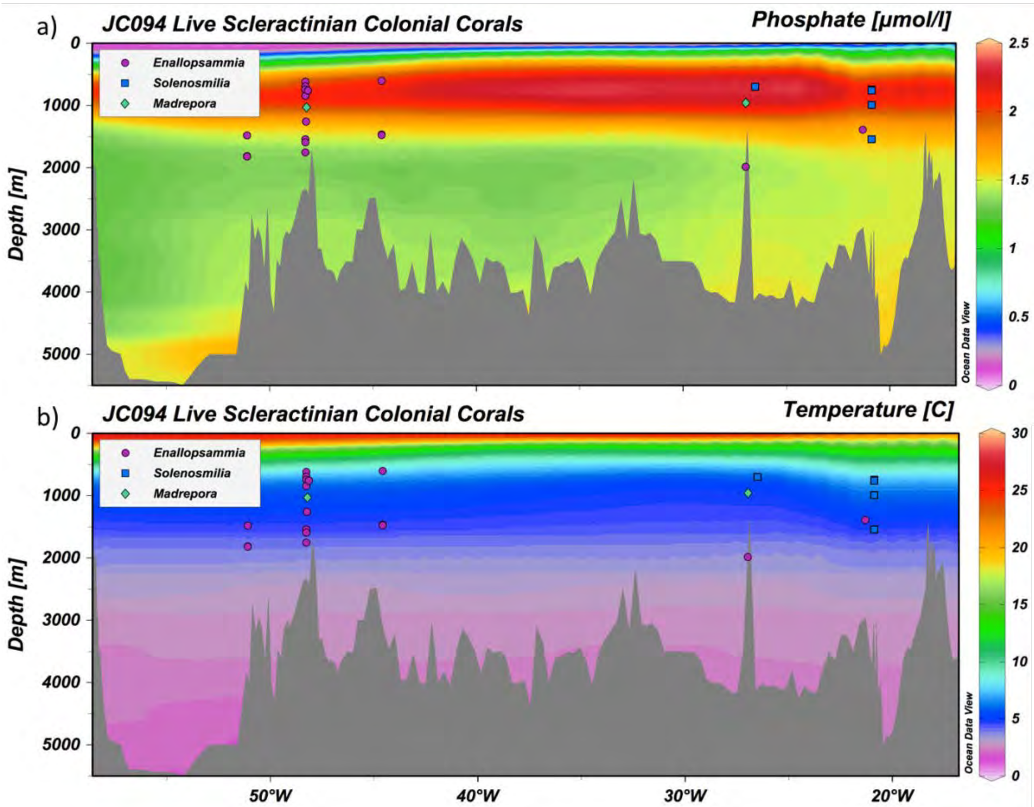


Figure 8.2: Live Scleractinian colonial corals collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

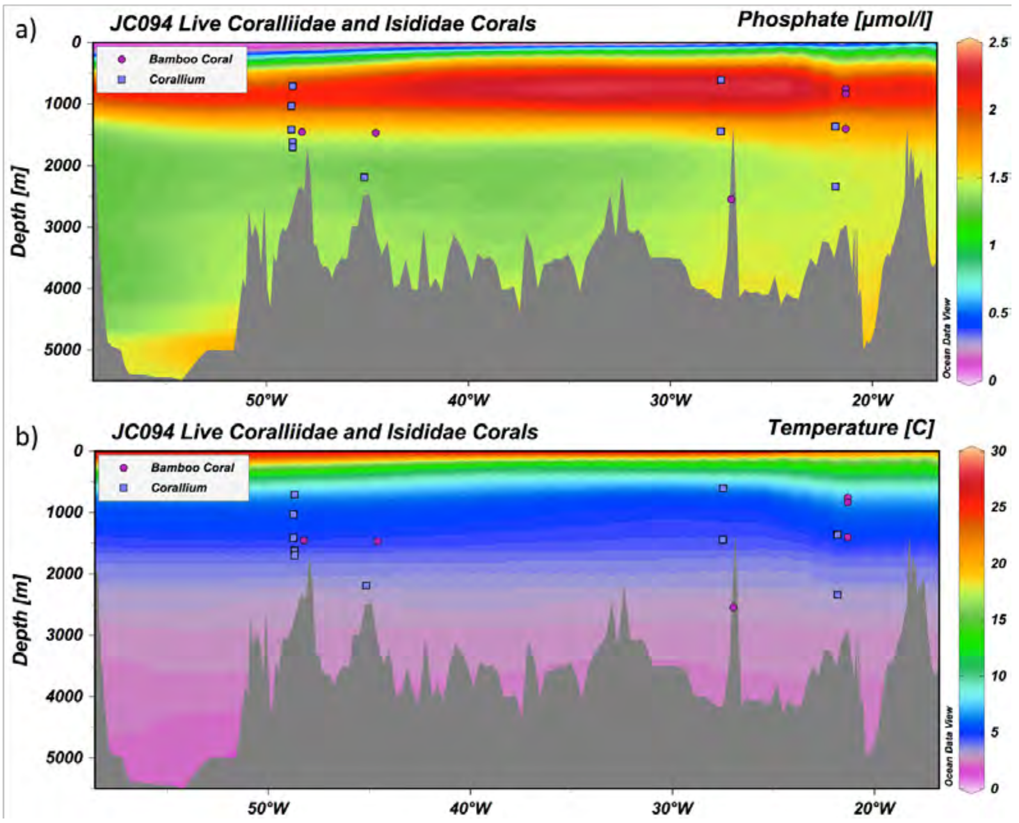


Figure 8.3: Live octocorals collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

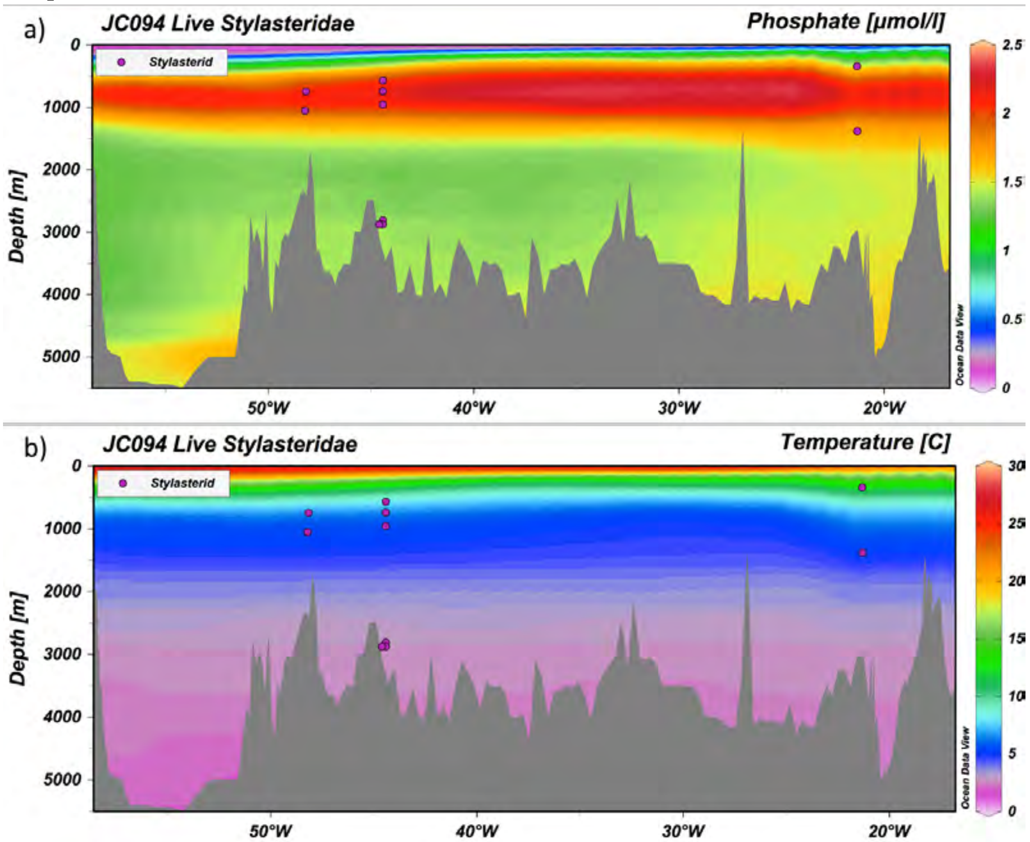


Figure 8.4: Live Stylasteridae collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

a) Carter Seamount

Corals were collected during 5 dives of the ROV ISIS. The deepest collection was 2343 m and the shallowest was 201 m. The number of samples collected according to depth is shown in the figures below (figs 8.5 and 8.6).

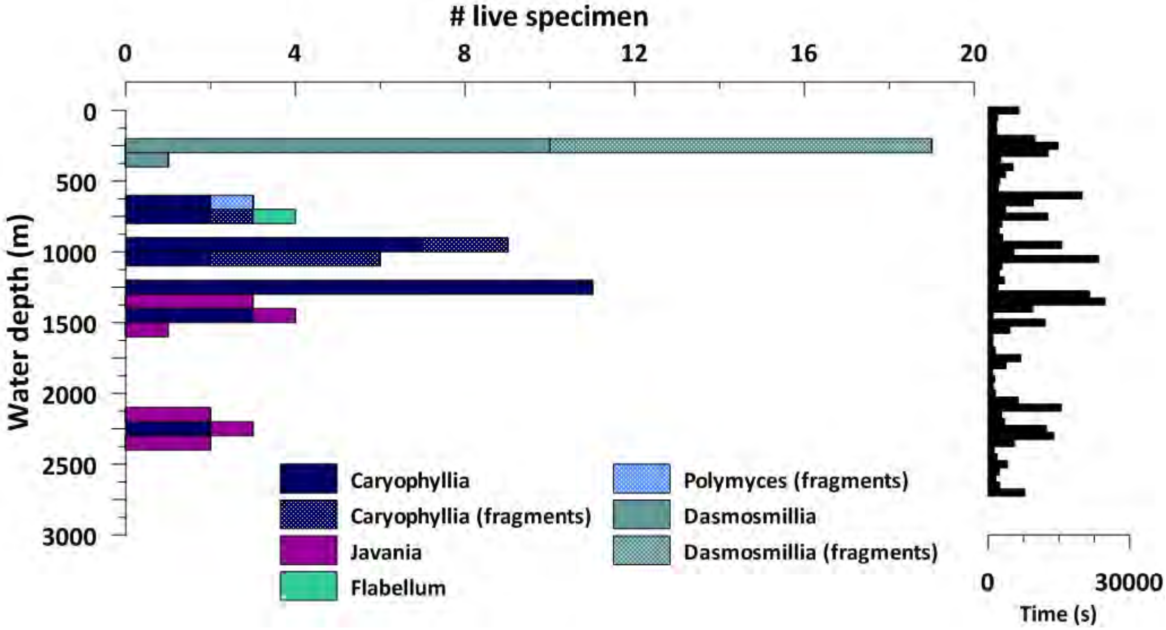


Figure 8.5: Number of live solitary corals collected at Carter Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 5 dives. 5 genera are represented by our sampling efforts here.

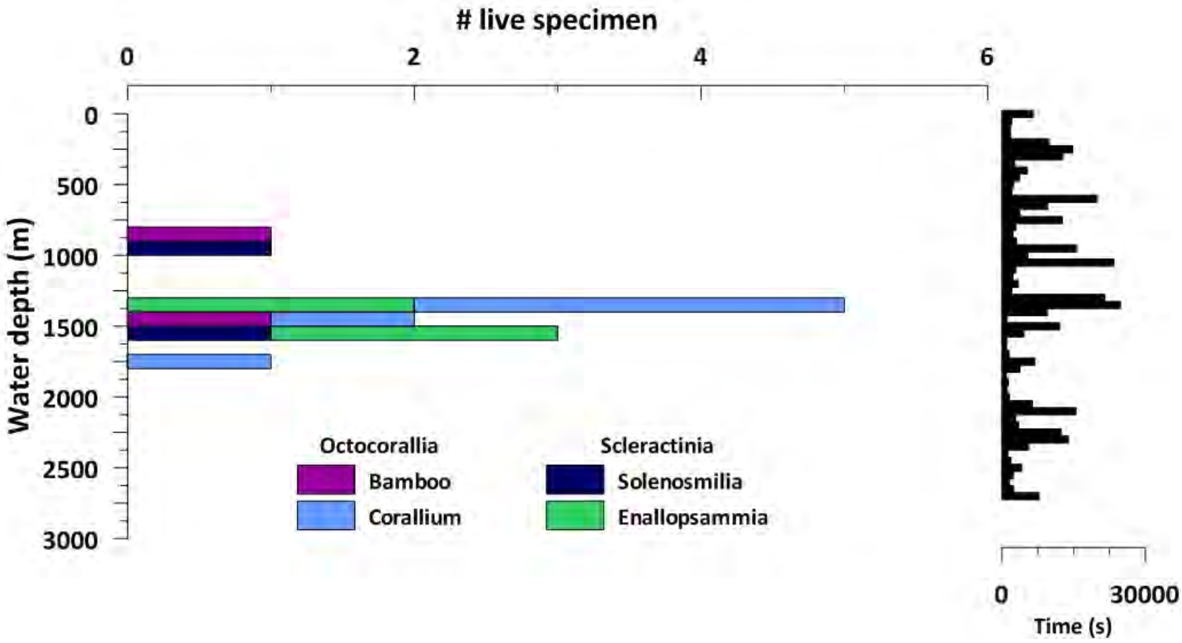


Figure 8.6: Number of live colonial corals collected at Carter Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 5 dives. 2 genera of Scleractinia are represented by our sampling efforts here.

b) Knipovich Seamount

Corals were collected during 3 dives of the ROV ISIS. The deepest collection was 2548 m and the shallowest was 611 m. The number of samples collected according to depth is shown in the figures below (figs 8.7 and 8.8).

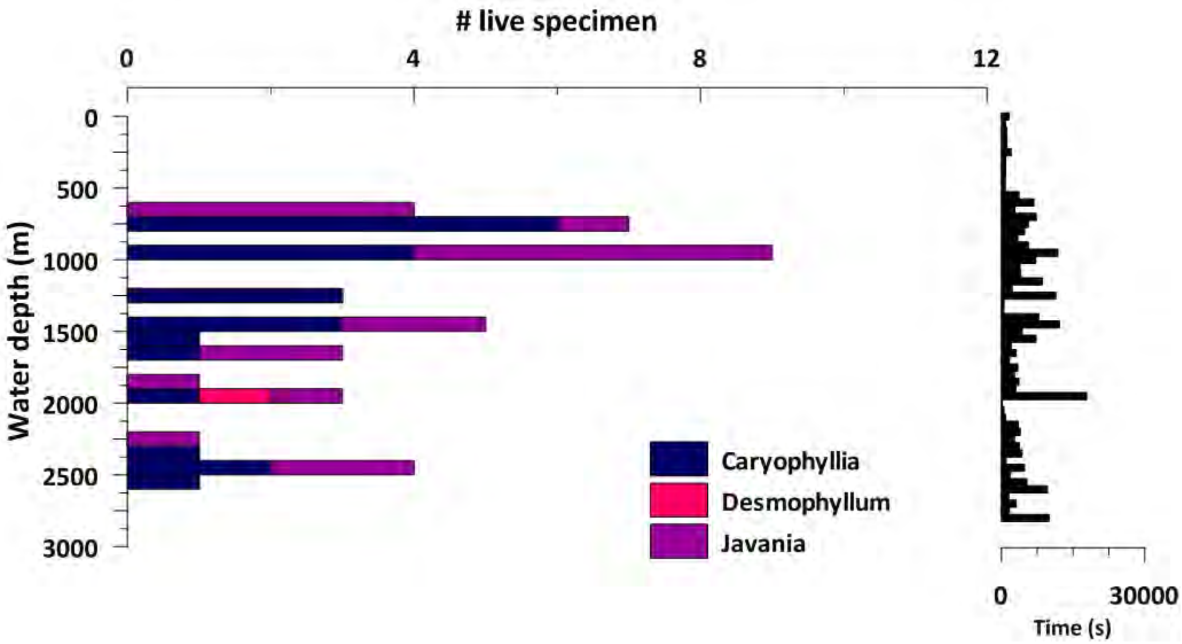


Figure8.7: Number of live solitary corals collected at Knipovich Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 3 genera are represented by our sampling efforts here.

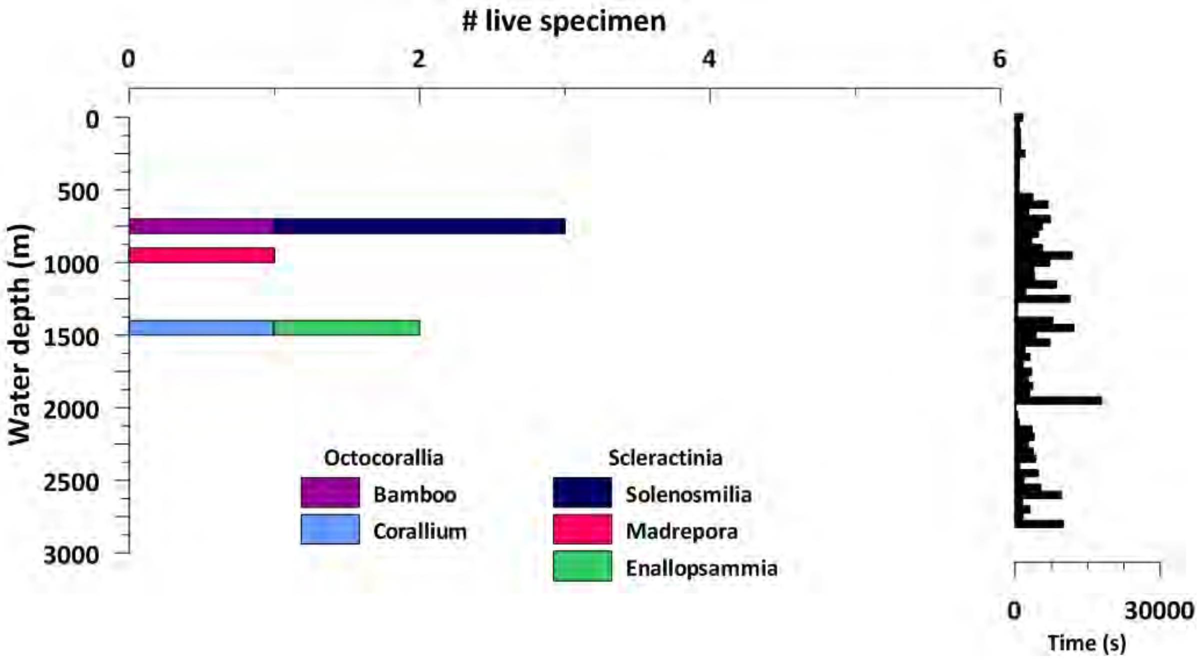


Figure 8.8: Number of live colonial corals collected at Knipovich Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 3 genera of Scleractinia are represented by our sampling efforts here.

c) Vema Fracture Zone

Corals were collected during 3 dives of the ROV ISIS. The deepest collection was 2875 m and the shallowest was 570 m. The number of samples collected according to depth is shown in the figures below (figs 8.9 and 8.10).

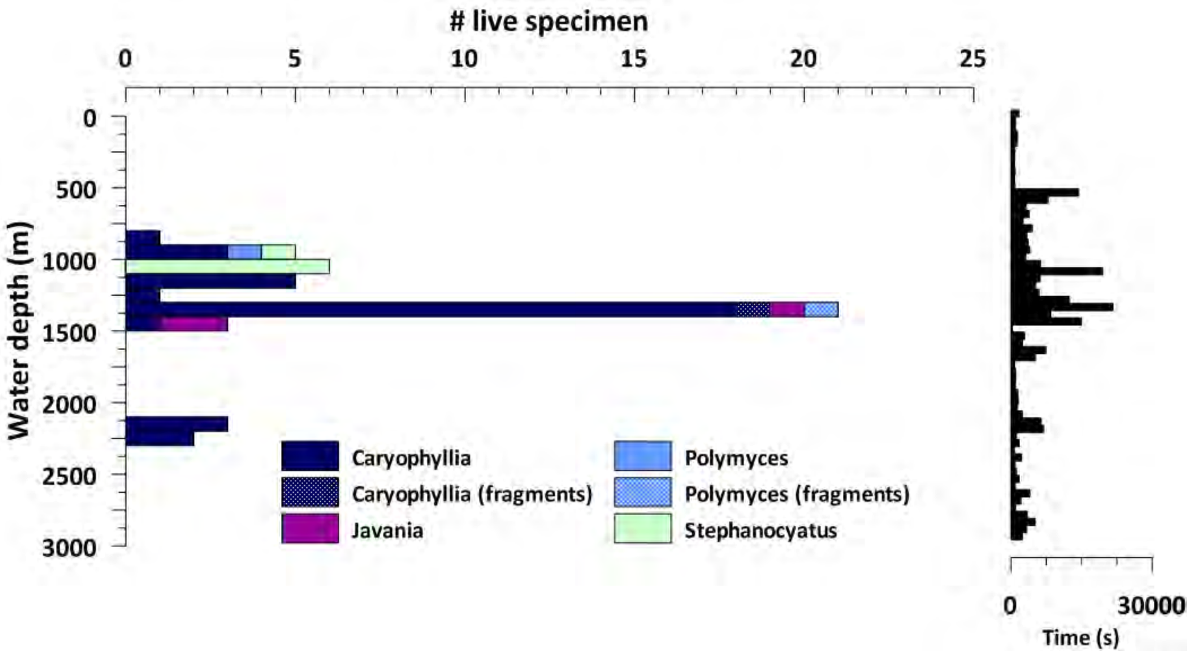


Figure 8.9: Number of live solitary corals collected at the Vema Fracture Zone in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 4 genera are represented by our sampling efforts here.

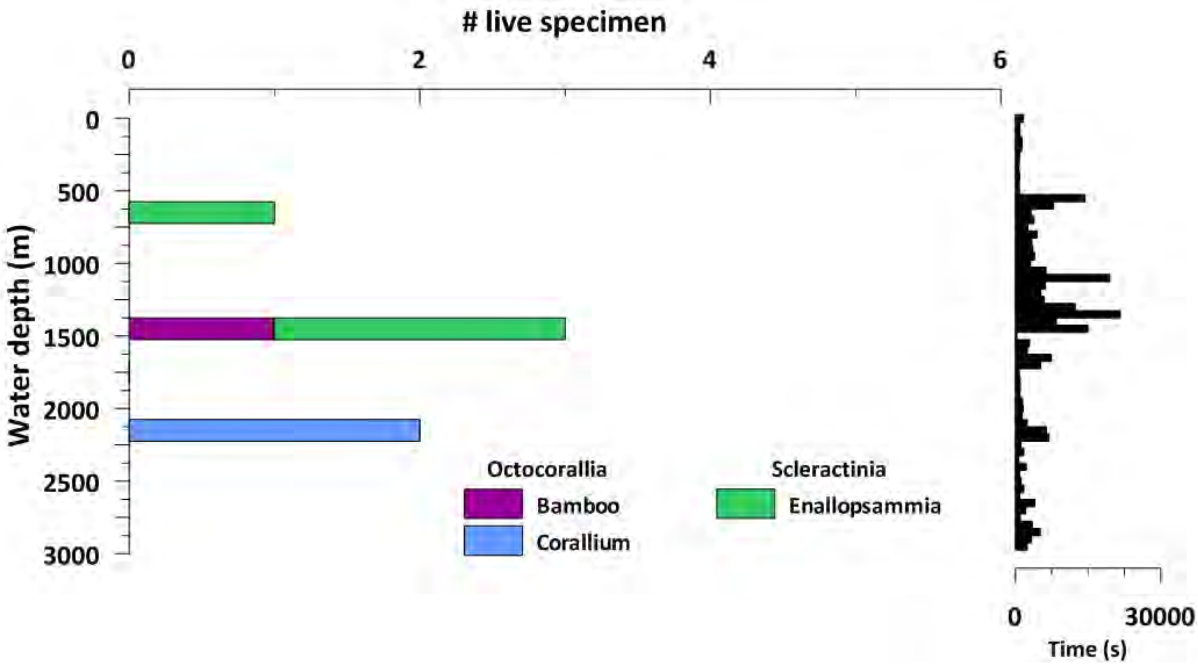


Figure 8.10: Number of live colonial corals collected at the Vema Fracture Zone in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 1 genera of Scleractinia is represented by our sampling efforts here.

d) Vayda Seamount

Corals were collected during 3 dives of the ROV ISIS. The deepest collection was 2012 m and the shallowest was 431 m. The numer of samples collected according to depth is shown in the figures below (figs 8.11 and 8.12).

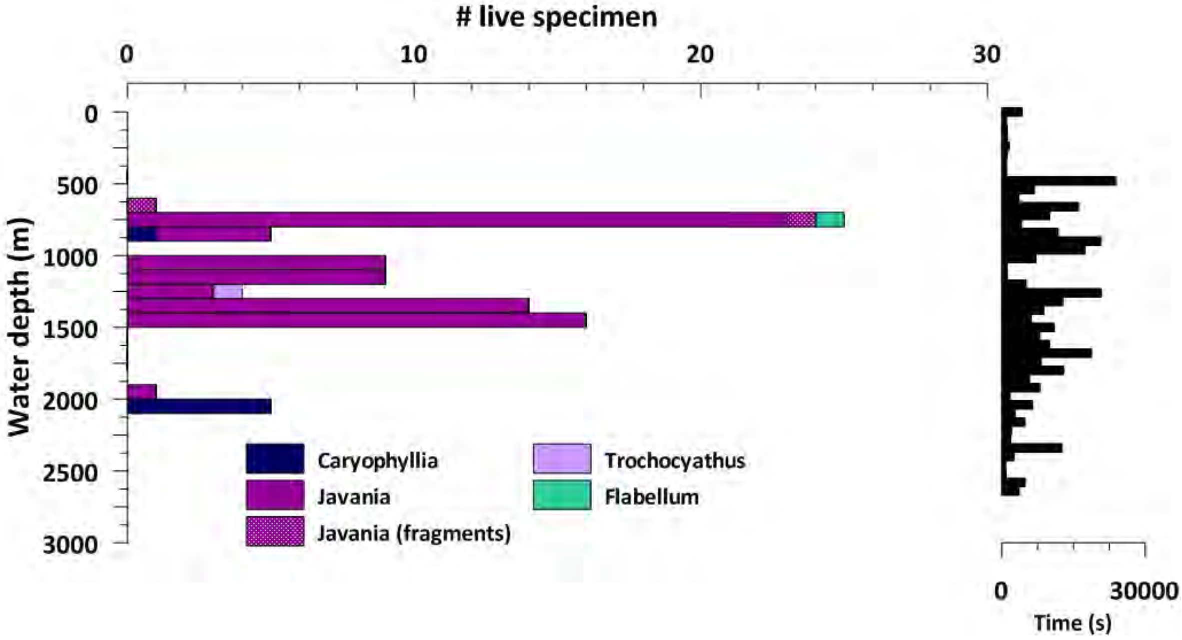


Figure 8.11: Number of live solitary corals collected at Vayda Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 4 genera are represented by our sampling efforts here.

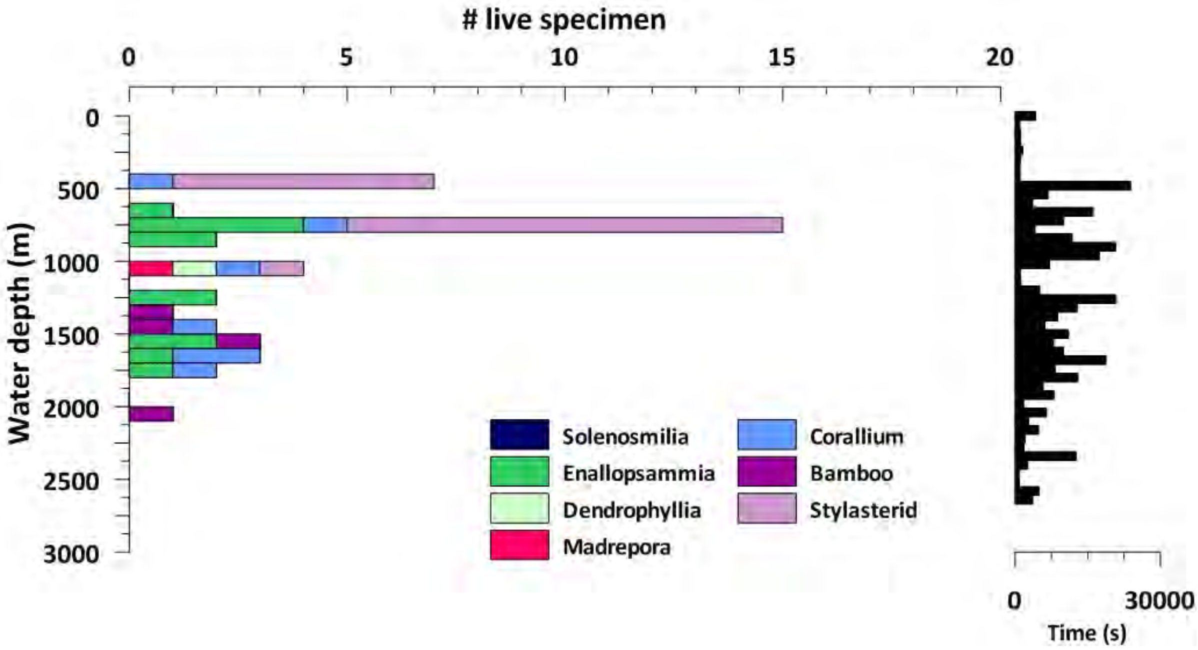


Figure 8.12: Number of live colonial corals collected at Vayda Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 4 genera of Scleractinia are represented by our sampling efforts here.

e) Gramberg Seamount

Corals were collected during 2 dives of the ROV ISIS. The deepest collection was 1992 m and the shallowest was 1096 m. The number of samples collected according to depth is shown in the figures below (figs 8.13 and 8.14).

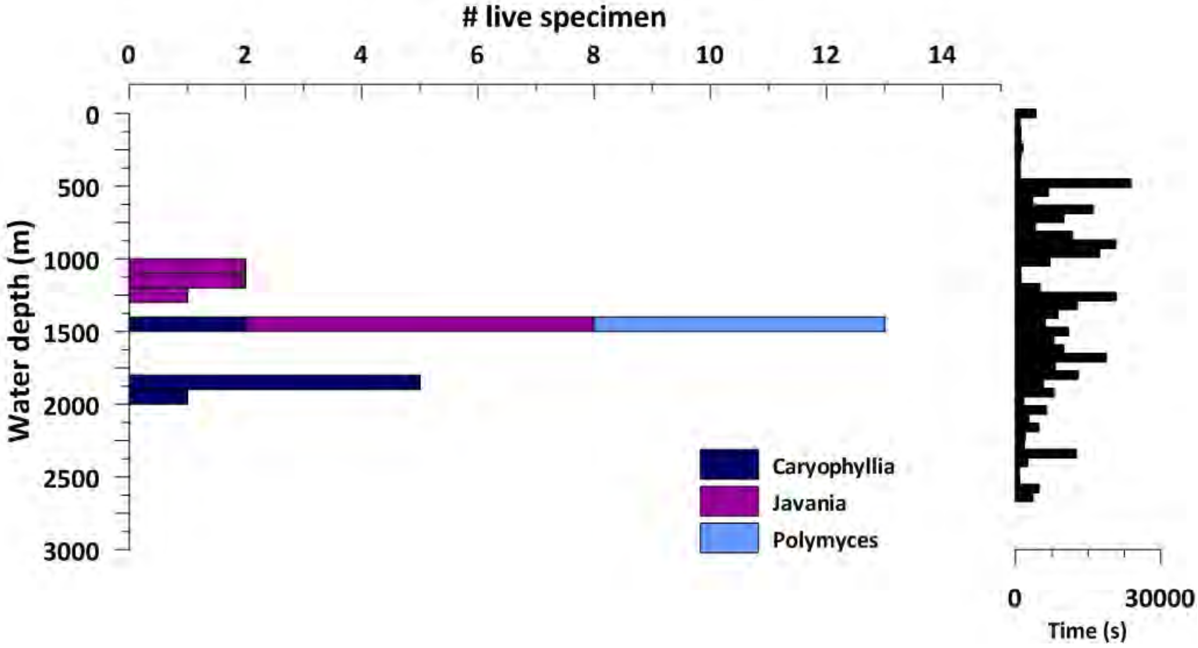


Figure 8.13: Number of live solitary corals collected at Gramberg Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 2 dives. 3 genera are represented by our sampling efforts here.

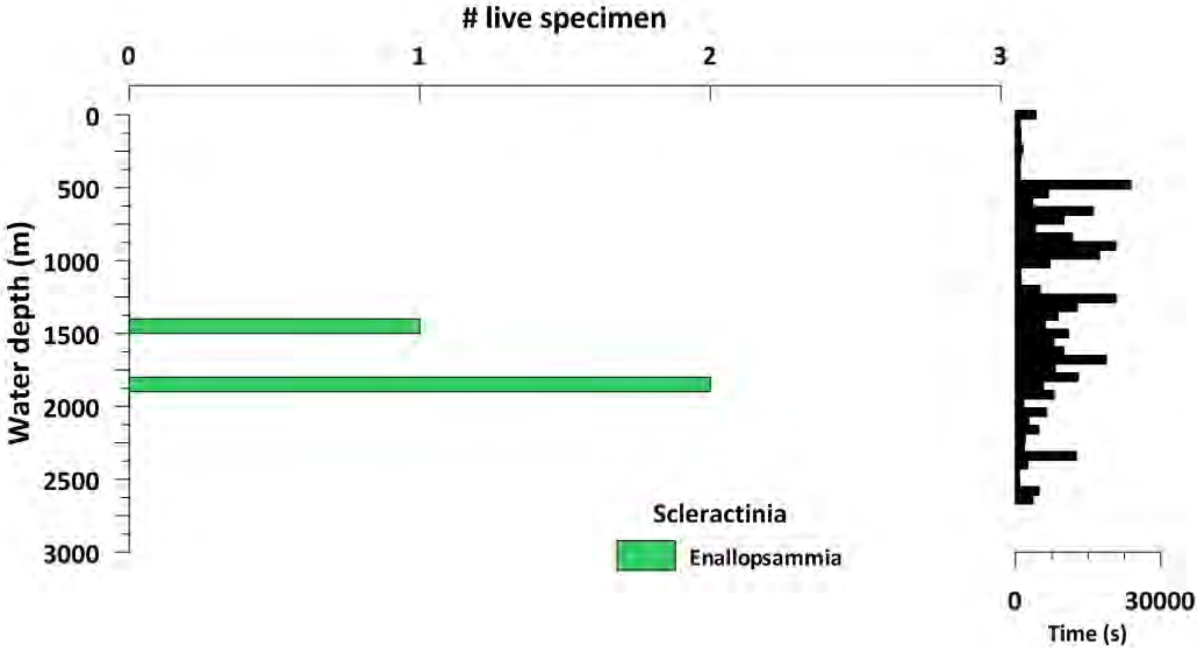


Figure 8.14: Number of live colonial corals collected at Gramberg Seamount in 100 m depth bins. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 2 dives. 1 genera of Scleractinia is represented by our sampling efforts here.

8.1.1 Live corals for palaeoclimate proxy calibration

In total, 251 live solitary scleractinian corals, 34 live colonial scleractinian corals, 30 live octocorals and 67 live stylasterids were collected for palaeoclimate proxy calibration work. These samples form the bulk of all live coral samples. All samples were soaked in 2.5% bleach overnight to remove organic tissue and then rinsed with fresh water. All solitary coral samples were photographed twice, once in side-view and once in calicular-view to assist with identification. Colonial scleractinia were also mostly photographed twice, once to view the whole specimen and once to get a close up of the coral polyps.

Solitary scleractinia of 6 genera from 2 families (Figure 8.15) and colonial scleractinia of 4 genera from 3 families (Figure 8.16) are represented in our samples. We also have examples from the families Isididae and Coralliidae of the subclass Octocorallia (Figure 8.17), and the family Stylasteridae belonging to the class Hydrozoa (Figure 8.18).

8.1.2. Live corals for biological analyses

Sampling protocols for hard corals for biological analyses are outlined in Section 10.

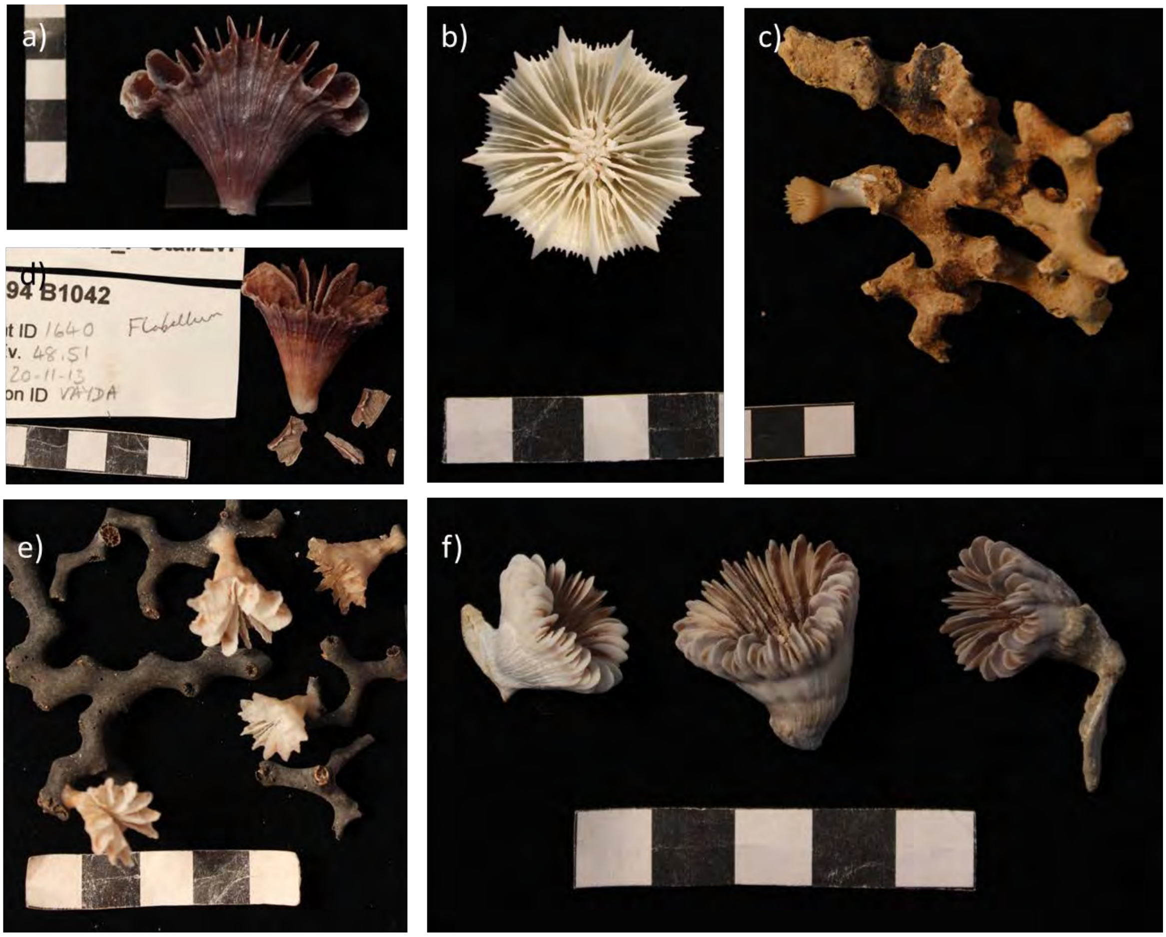


Figure 8.15: Examples of solitary scleractinia collected live. Scale bar in cm squares. a) *Javania*, b) *Stephanocyathus*, c) *Caryophyllia*, d) *Flabellum*, e) *Polymyces*, f) *Dasmosmillia*.

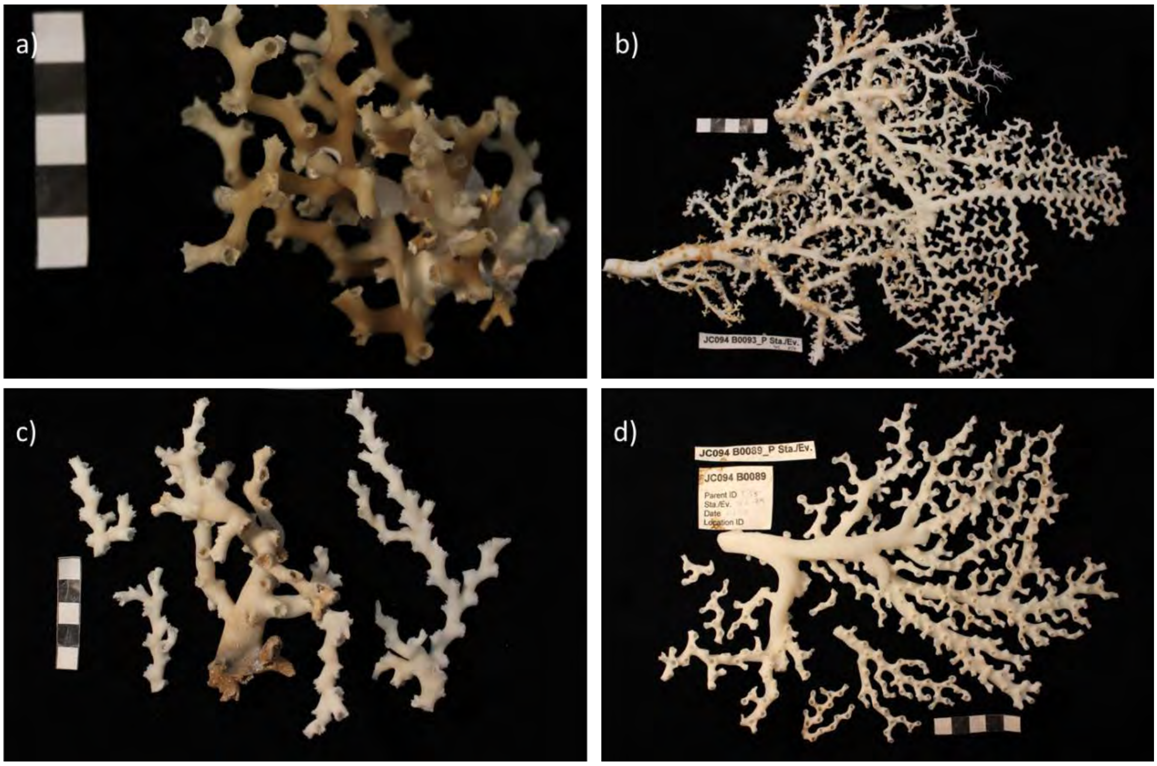


Figure 8.16: Examples of colonial scleractinia collected live. Scale bar in cm squares. a) *Solenosmilia*, b) *Madrepora*, c) *Dendrophyllia*, d) *Enallopsammia*.

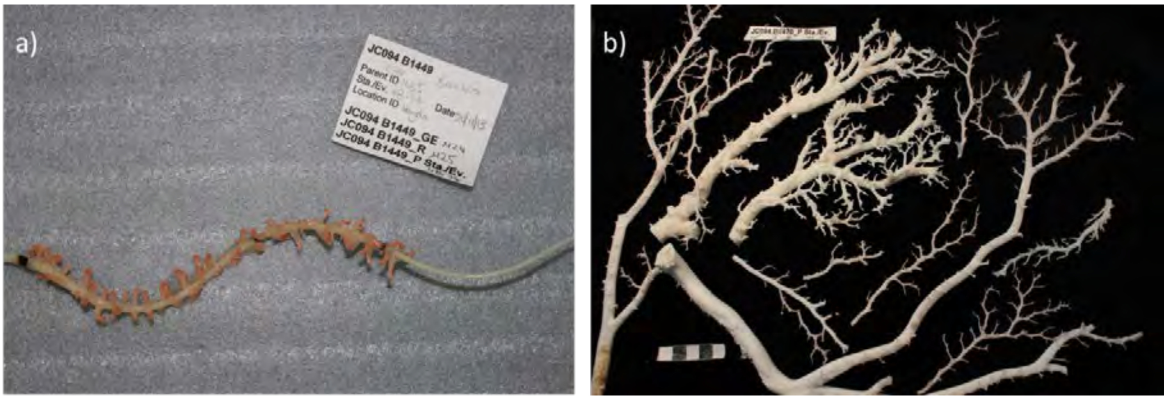


Figure 8.17: Examples of octocorals collected live. Scale bar in cm squares. a) Bamboo, b) Corallium.

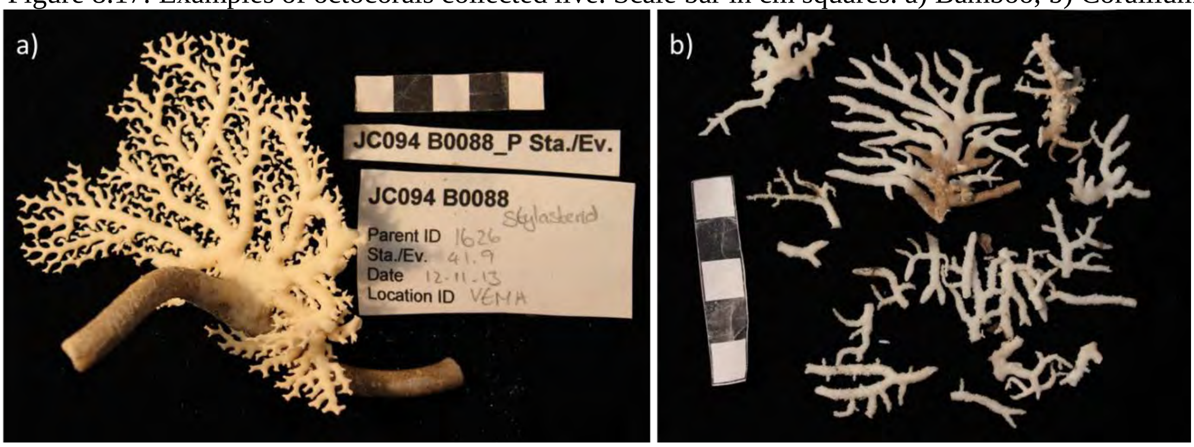


Figure 8.18: Examples of Stylasterids collected live. Scale bar in cm squares. a) Stylasterid type 1, b) Stylasterid type 2.

8.2. Fossil Corals

Fossil corals were collected for palaeoclimate and coral population studies. In order to be able to study a variety of different ocean water masses, corals were collected from as many depth intervals as possible at each sampling site, spanning 2990m to 200m. Key features of the physical ocean sampled include the thermocline, Antarctic Intermediate Water (AAIW) and North Atlantic Deep Water (NADW). Scleractinian corals were identified to genus level on board where possible. At least 9 genera of solitary Scleractinia (Figure 8.20) and 4 genera of colonial Scleractinia are present in our samples (Figure 8.21). Two of these are very small and therefore of limited use in palaeoclimate studies and are not included in the following figures. Octocorals were identified to either family/genus level, and include Isididae (bamboo corals), *Corallium* and *Metallogorgia* (Figure 8.22). Stylasterids were identified to family level (Figure 8.23). The number of samples collected at each site is discussed in the sections below. All fossil coral samples are catalogued in the Fossil Corals database (see section 8.2.2) and tabulated in Appendix 3.

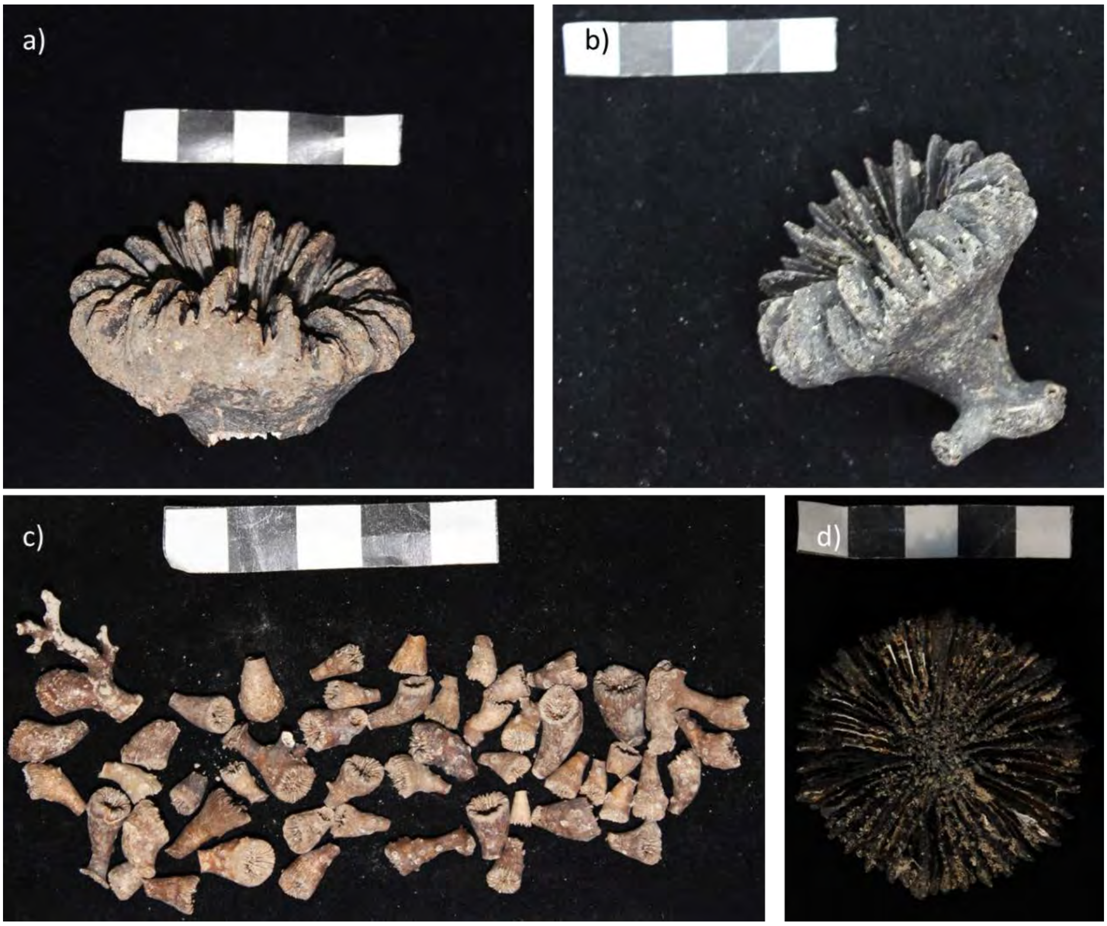


Figure 8.20: Examples of some of the solitary Scleractinia collected as fossils. Scale bar in cm squares. a) *Desmophyllum dianthus*, b) *Desmophyllum dianthus*, c) *Caryophyllia*, d) *Stephanocyathus*.

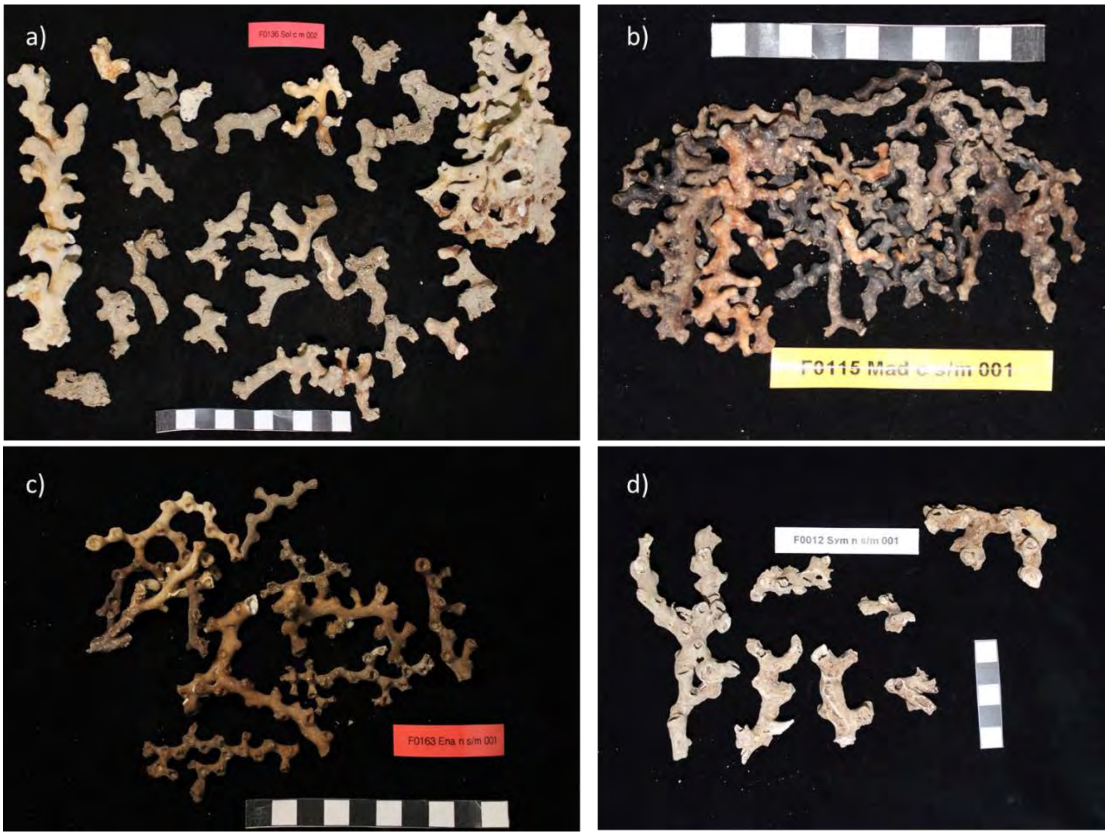


Figure 8.21: Examples of the colonial Scleractinia collected as fossils. Scale bar in cm squares. a) *Solenosmilia*, b) *Madrepora*, c) *Enallopsammia*, d) *Sympodangia?*.

Figure 8.22: Examples of the 2 major types of octocorals collected as fossils. Scale bar in cm squares. a) Bamboo coral, c) *Corallium*.

Figure 8.23: Example of the stylasterids collected as fossils. Scale bar in cm squares.

8.2.1 Sampling Locations

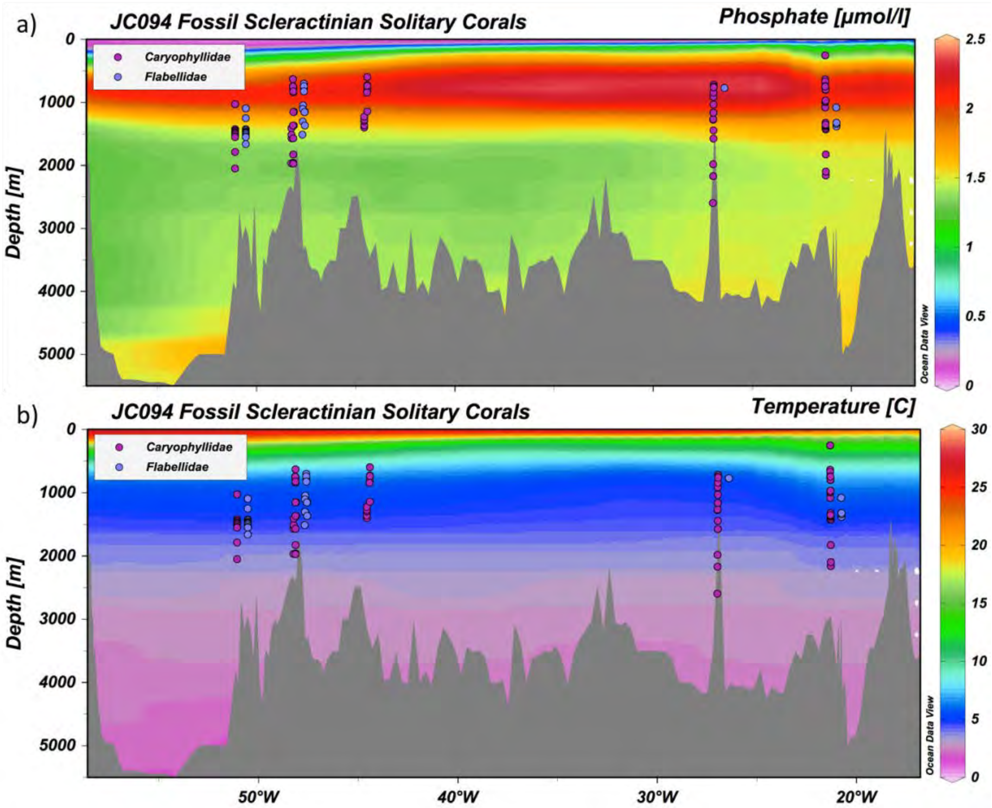


Figure 8.24: Fossil Scleractinian solitary corals collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

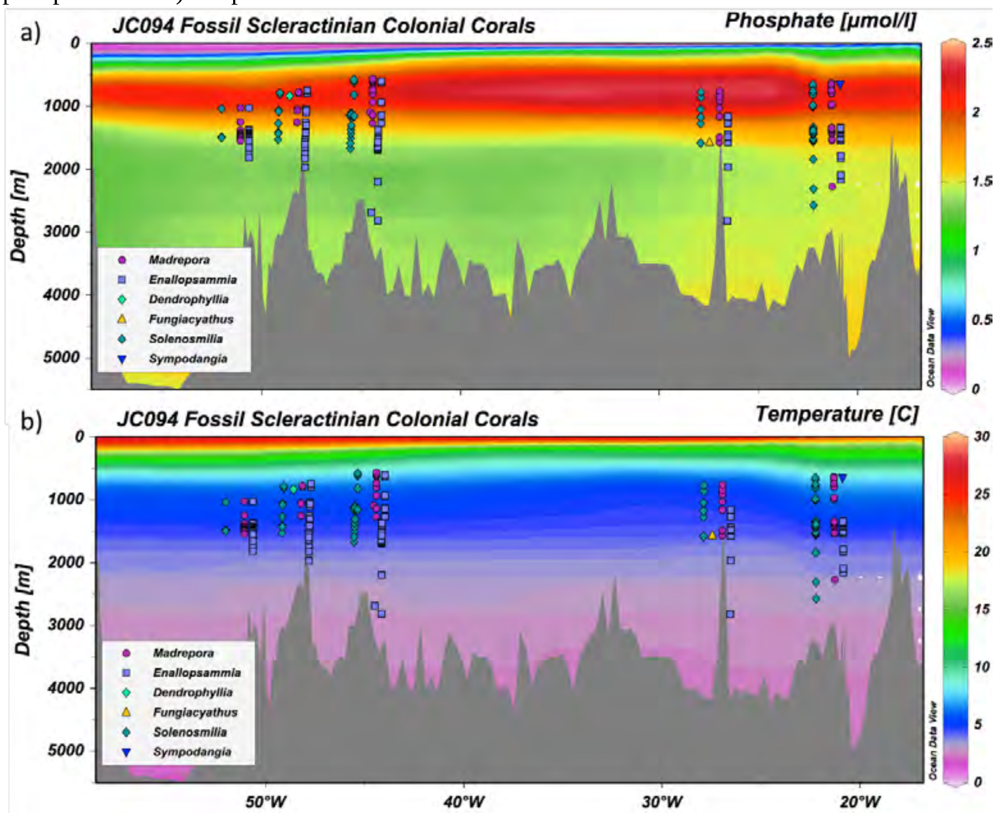


Figure 8.25: Fossil Scleractinian colonial corals collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

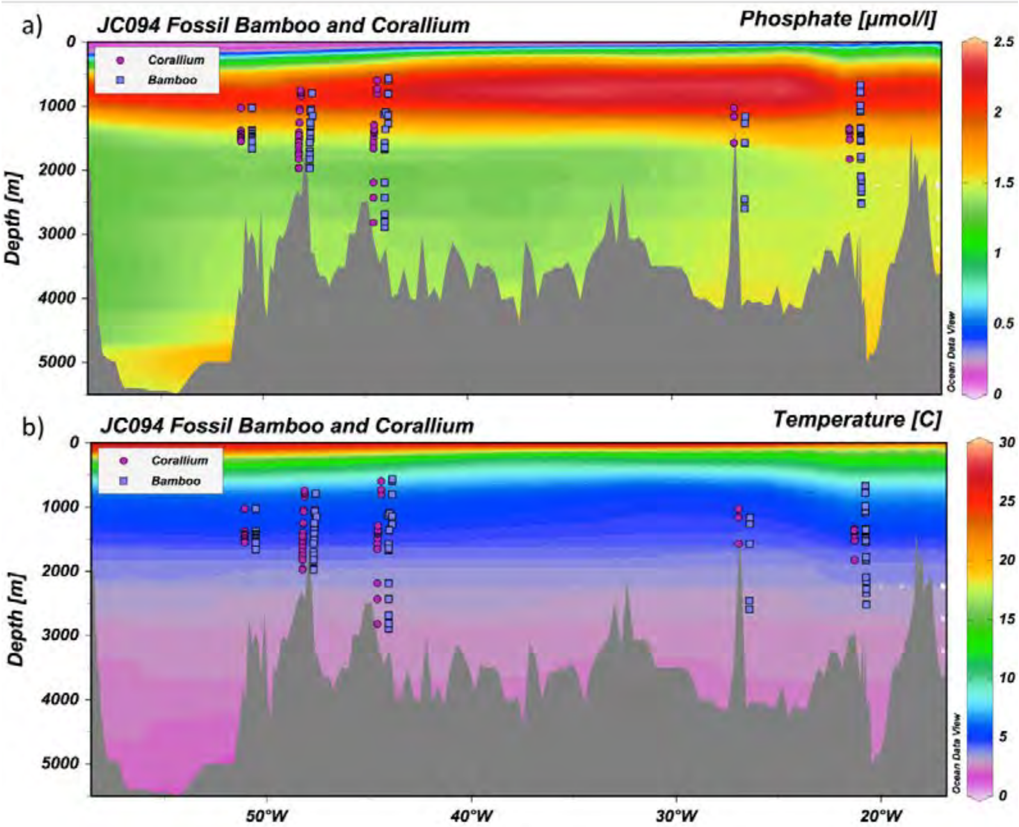


Figure 8.26: Fossil Octocorallia collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

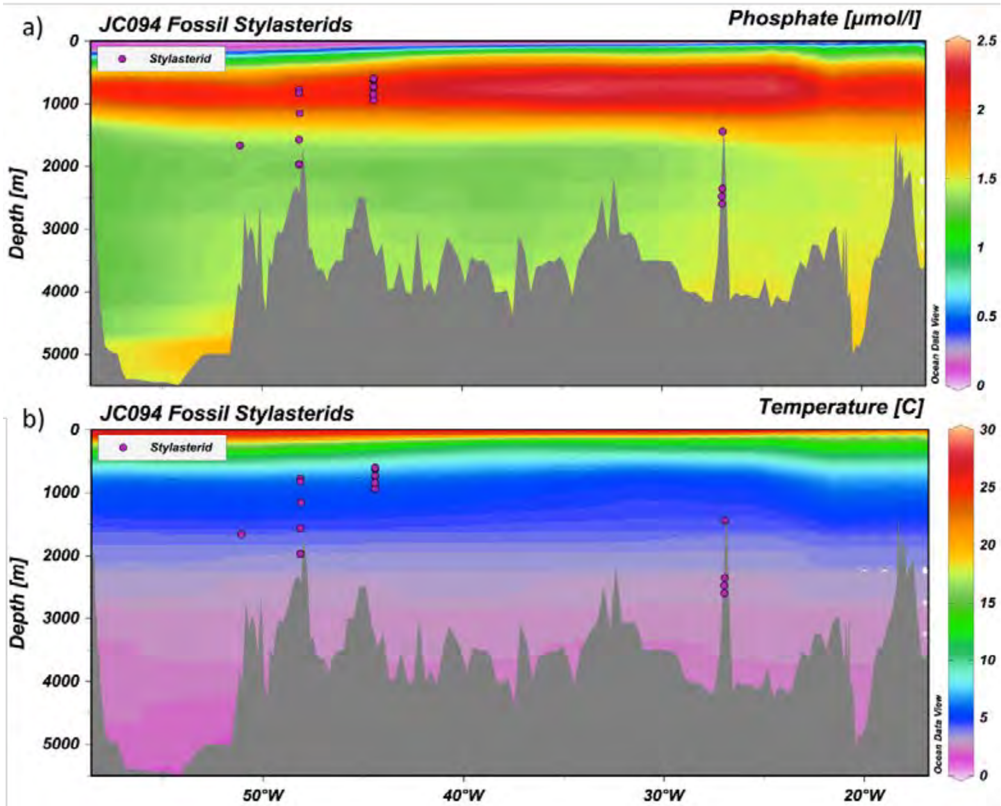
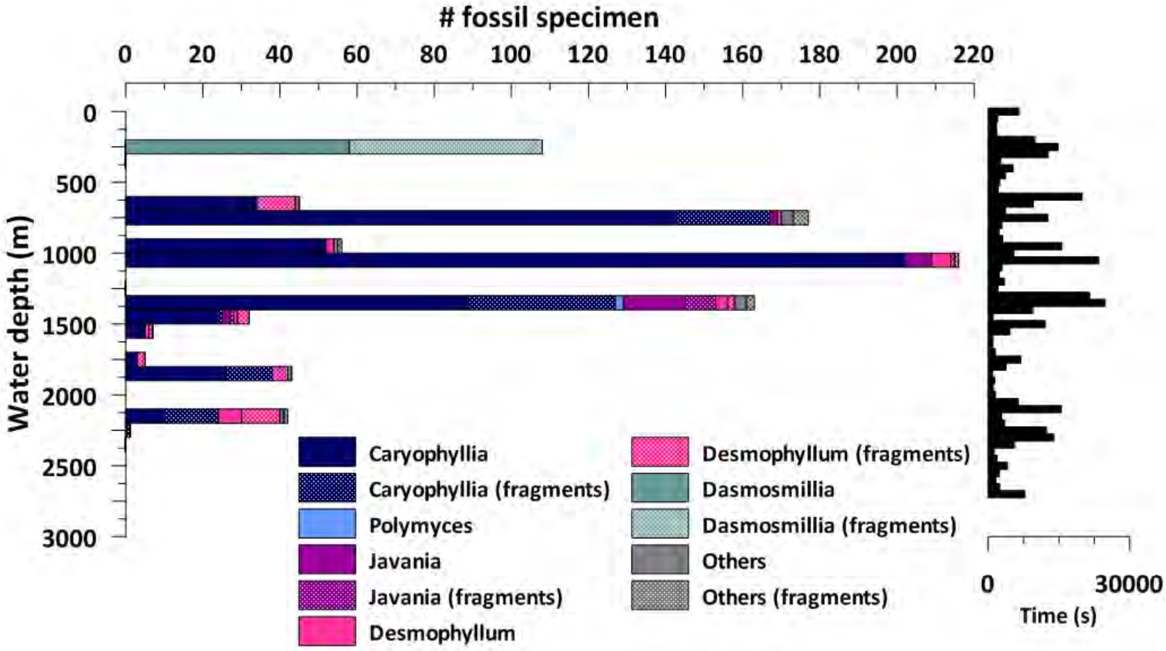


Figure 8.27: Fossil Stylasteridae collected at each sampling site, also showing a) dissolved phosphate and b) temperature.

a) Carter Seamount

Corals were collected during 5 dives of the ROV ISIS. The deepest collection was 2559 m and the shallowest was 256 m. 662 solitary Scleractinia, 44 kg of colonial Scleractinia and 20 kg of octocorals were collected. The number of genera collected according to depth in 100 m bins is shown in the figures below (figs 28 and 29).

a)



b)

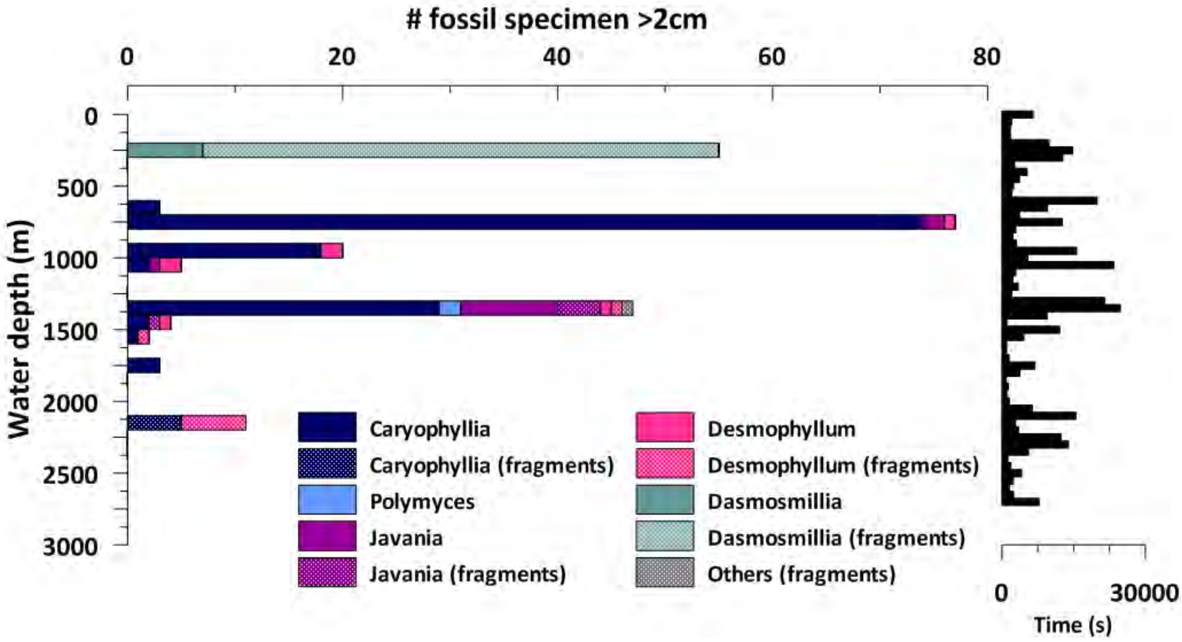
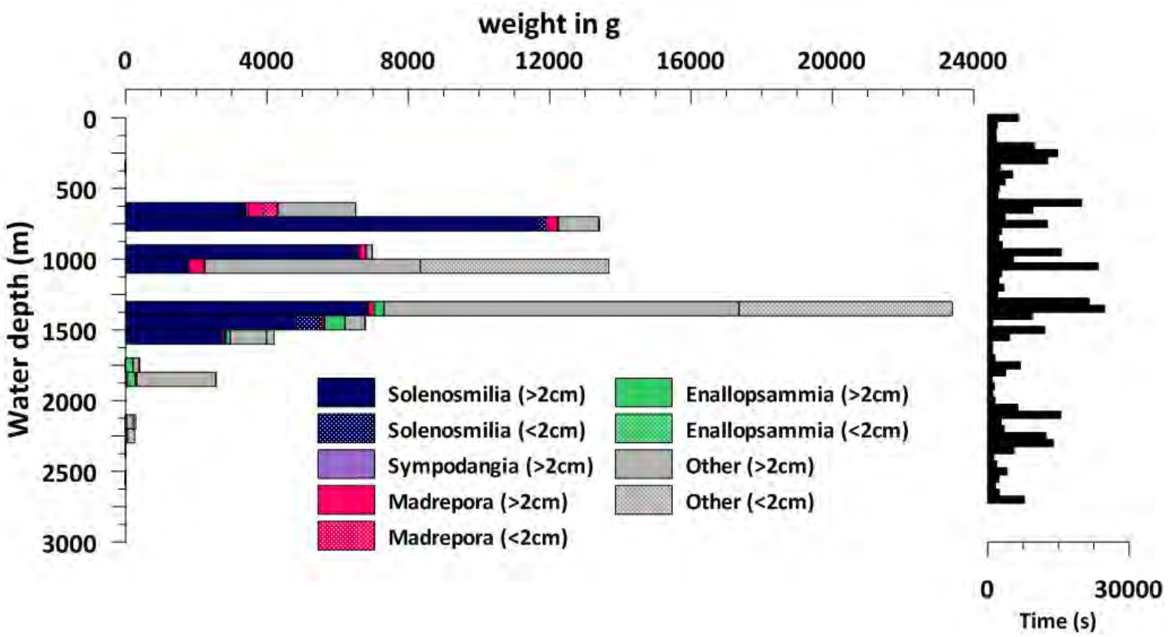


Figure 8.28: Numbers of fossil solitary corals collected at Carter Seamount in 100 m depth bins showing a) Total numbers of corals and b) Numbers of corals greater than 2 cm across. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 5 dives. 5 genera are represented by our sampling efforts here. Other (fragments) are unidentifiable small pieces of solitary coral.

a)



b)

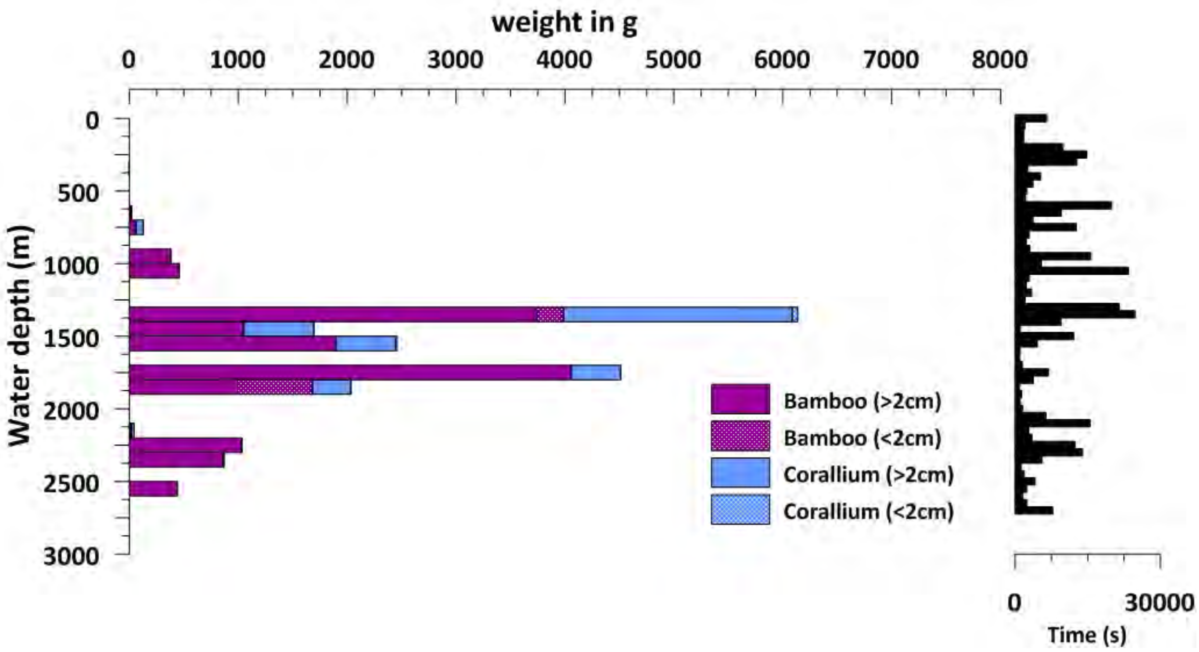
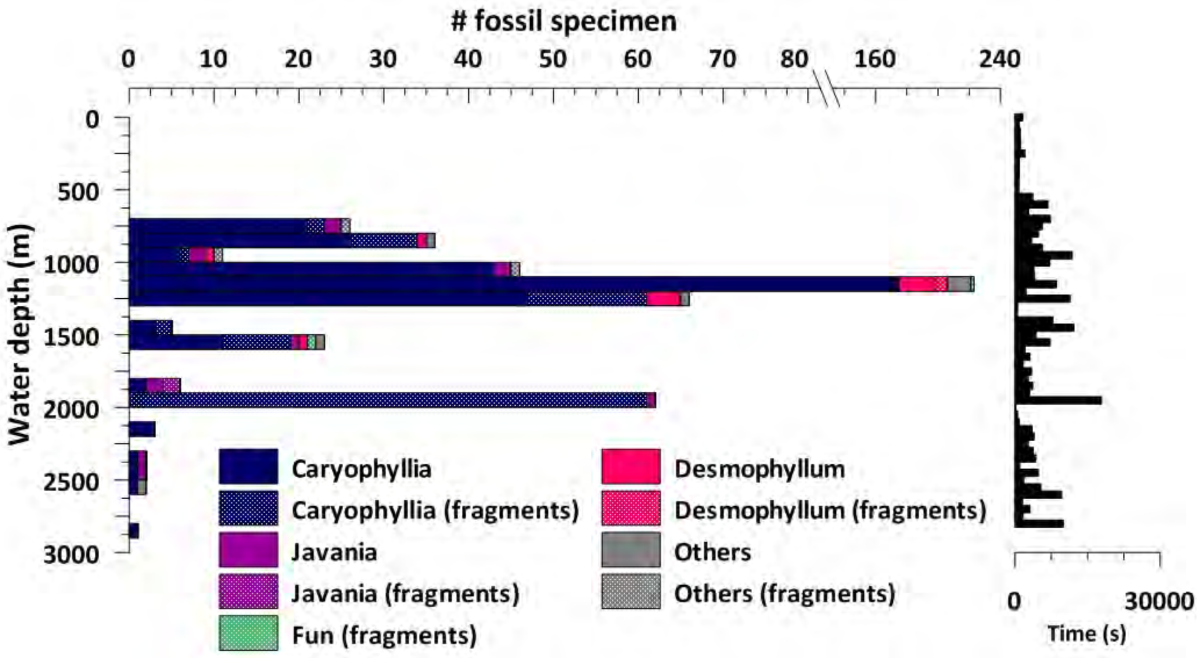


Figure 8.29: Masses of fossil colonial corals collected at Carter Seamount in 100 m depth bins showing a) Total mass of Scleractinian corals and b) Total mass of octocorals. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 5 dives.

b) Knipovich Seamount

Corals were collected during 3 dives of the ROV ISIS. The deepest collection was 2824 m and the shallowest was 718 m. 513 solitary Scleractinia, 16 kg of colonial Scleractinia, 4 kg of octocorals and 180 g of stylasterids were collected. The number of genera collected according to depth in 100 m bins is shown in the figures below (figs 30 and 31).

a)



b)

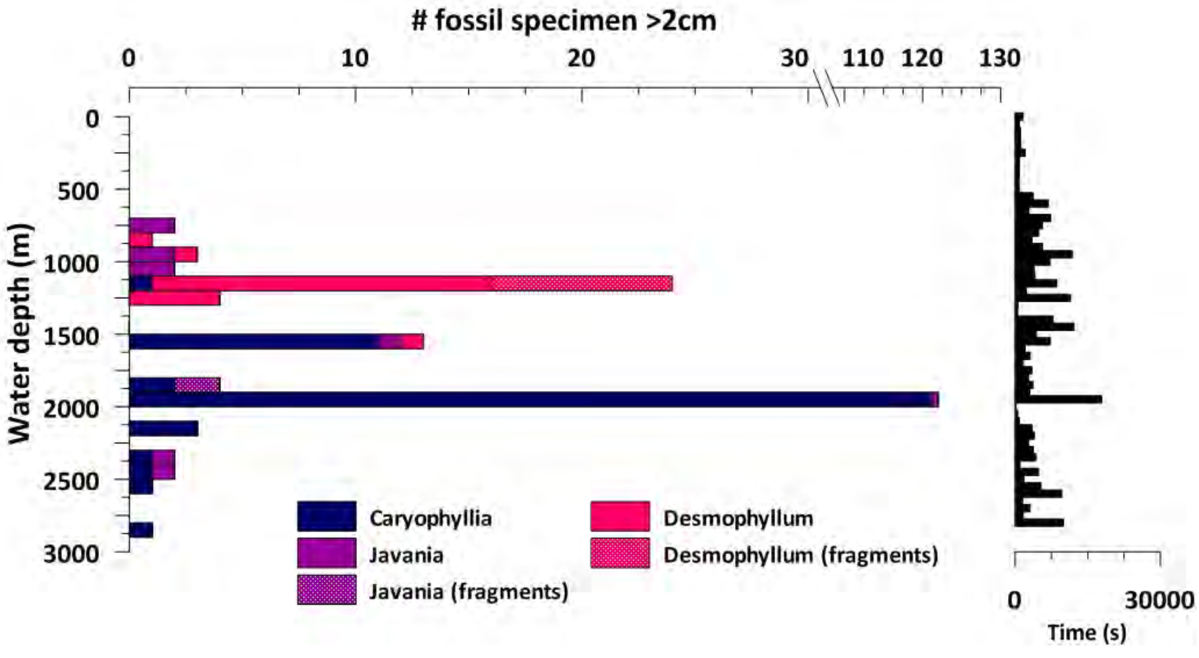
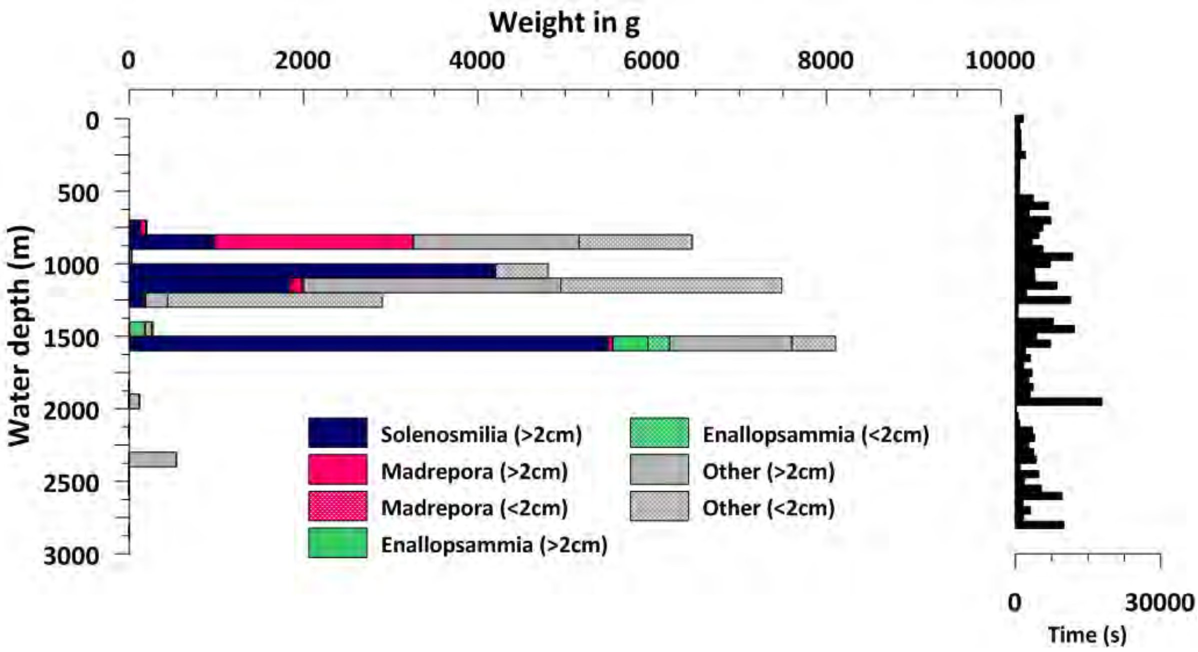


Figure 8.30: Numbers of fossil solitary corals collected at Knipovich Seamount in 100 m depth bins showing a) Total numbers of corals and b) Numbers of corals greater than 2 cm across. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 3 genera are represented by our sampling efforts here.

a)



b)

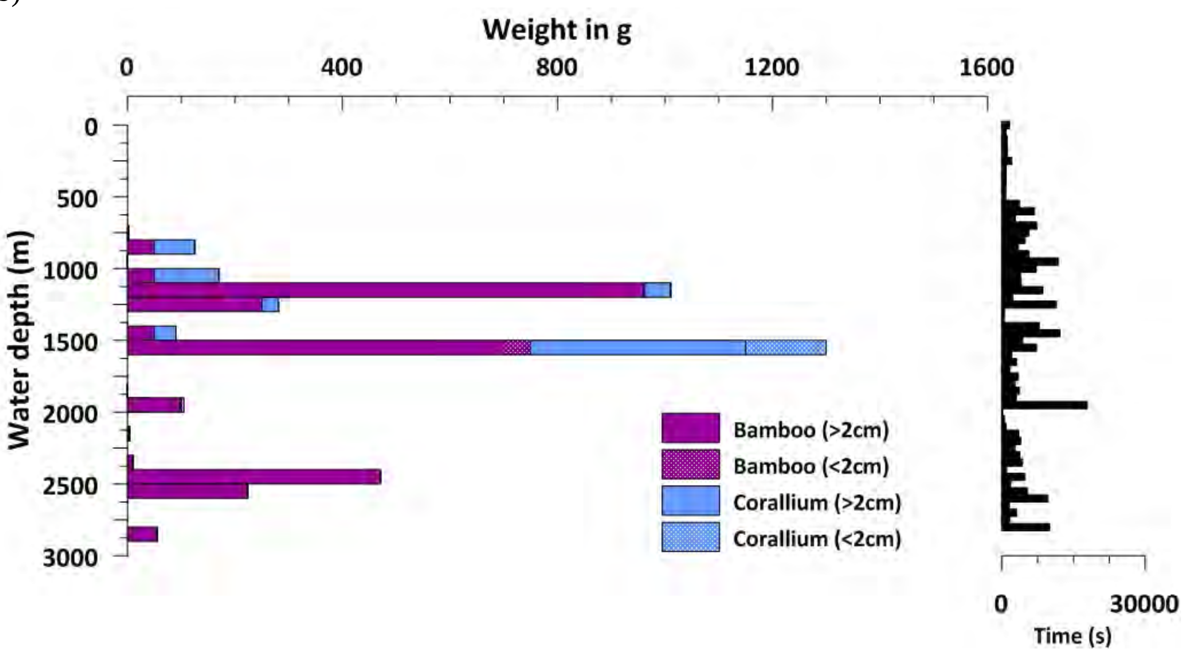
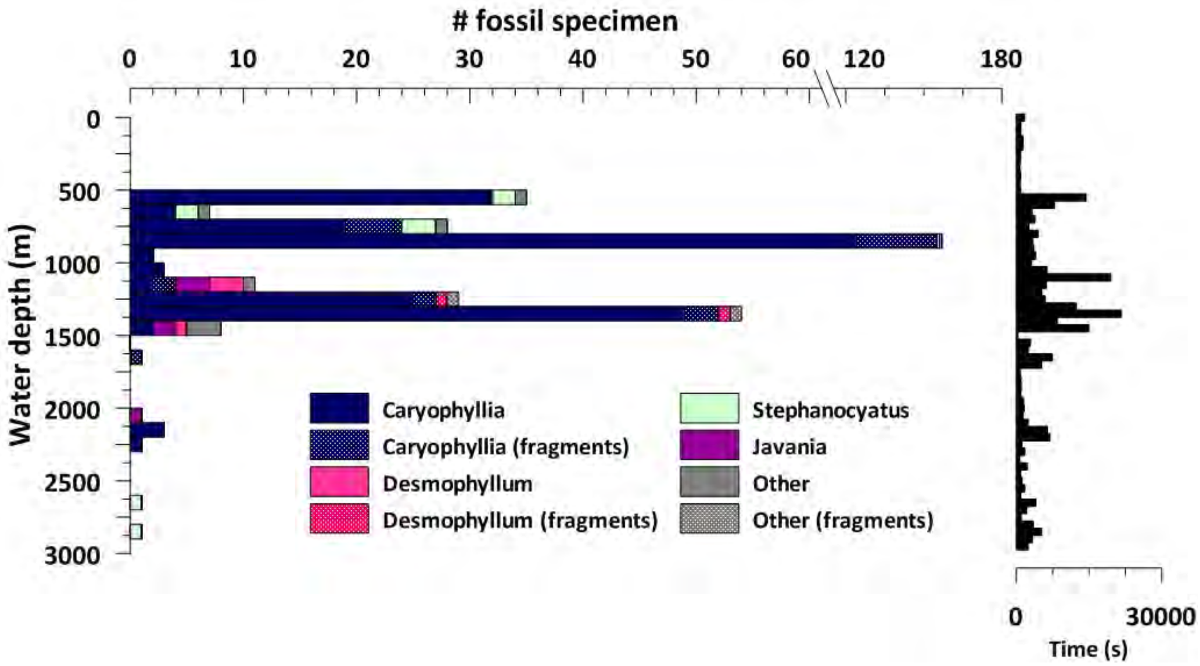


Figure 8.31: Masses of fossil colonial corals collected at Knipovich Seamount in 100 m depth bins showing a) Total mass of Scleractinian corals and b) Total mass of octocorals. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives.

c) Vema Fracture Zone

Corals were collected during 3 dives of the ROV ISIS and one dredge. The deepest collection was 2894 m and the shallowest was 568 m. 279 solitary Scleractinia, 17 kg of colonial Scleractinia, 10 kg of octocorals and 690 g of stylasterids were collected. The number of genera collected according to depth in 100 m bins is shown in the figures below (figs 32 and 33).

a)



b)

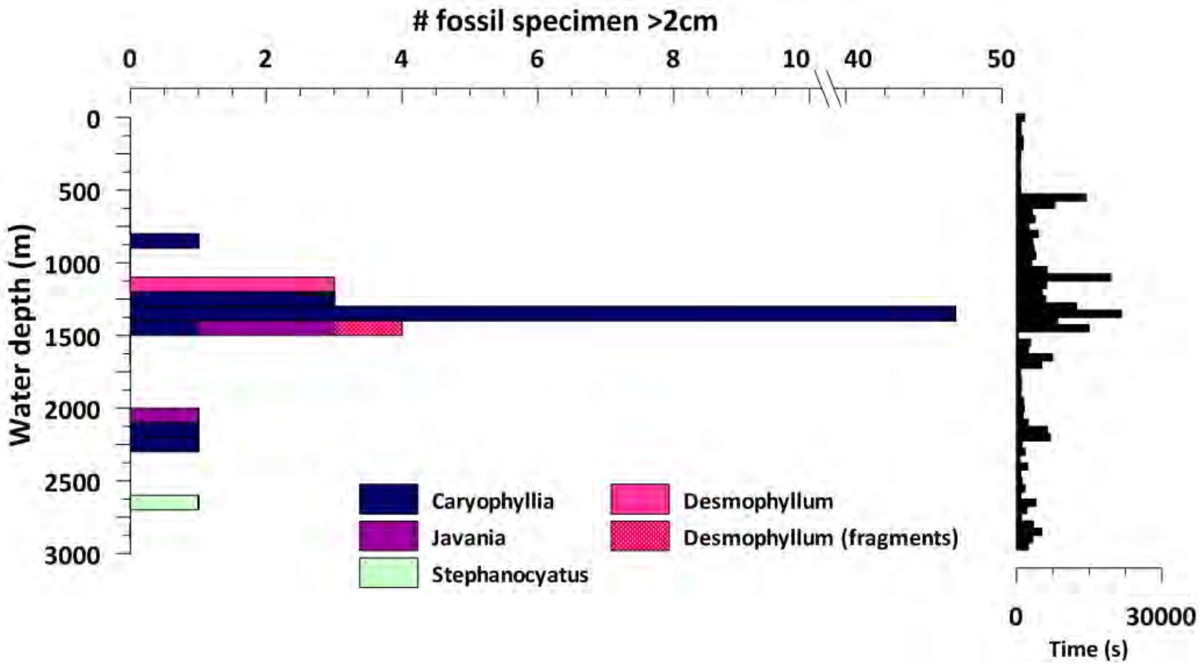
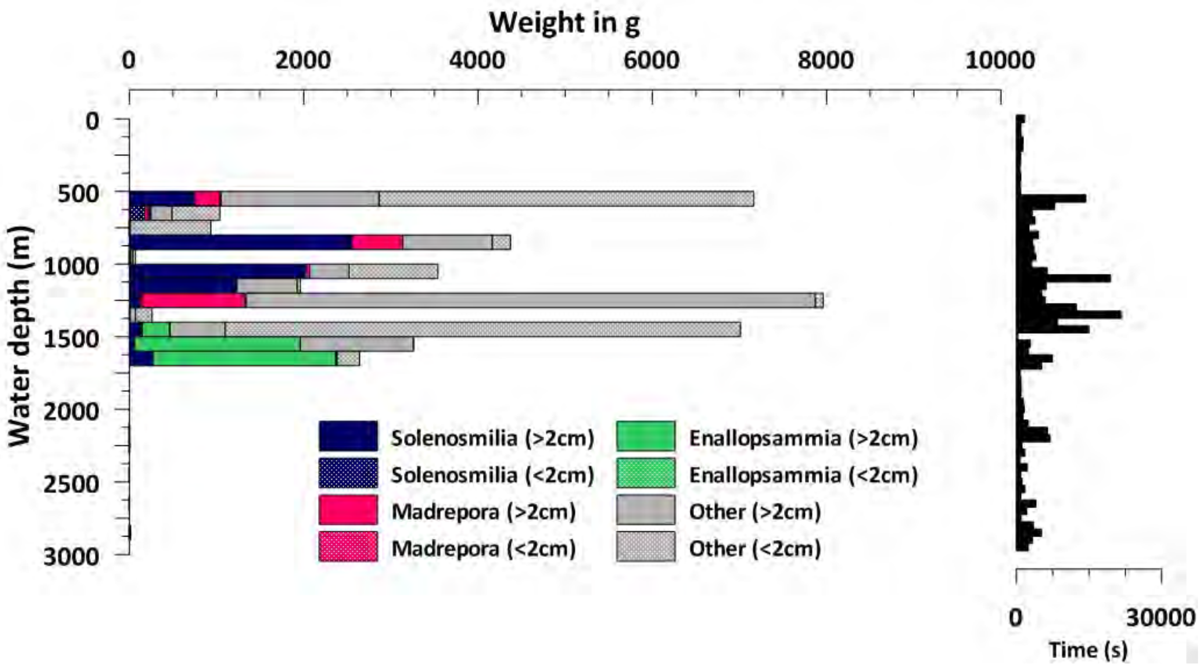


Figure 8.32: Numbers of fossil solitary corals collected at the Vema Fracture Zone in 100 m depth bins showing a) Total numbers of corals and b) Numbers of corals greater than 2 cm across. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 4 genera are represented by our sampling efforts here.

a)



b)

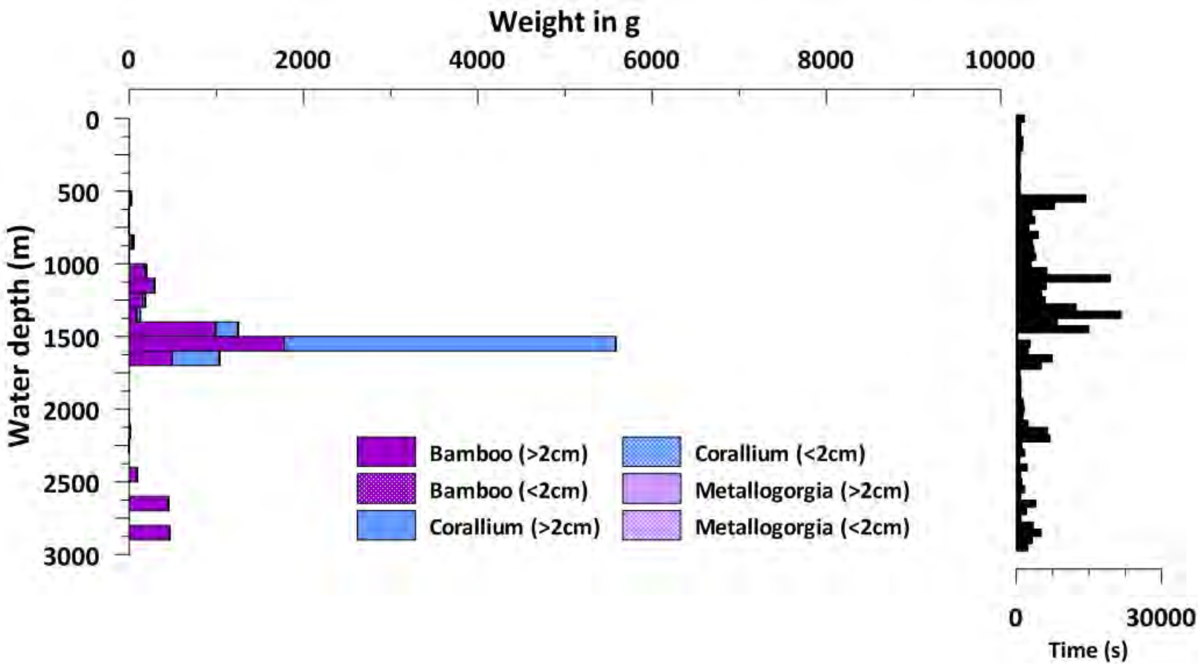
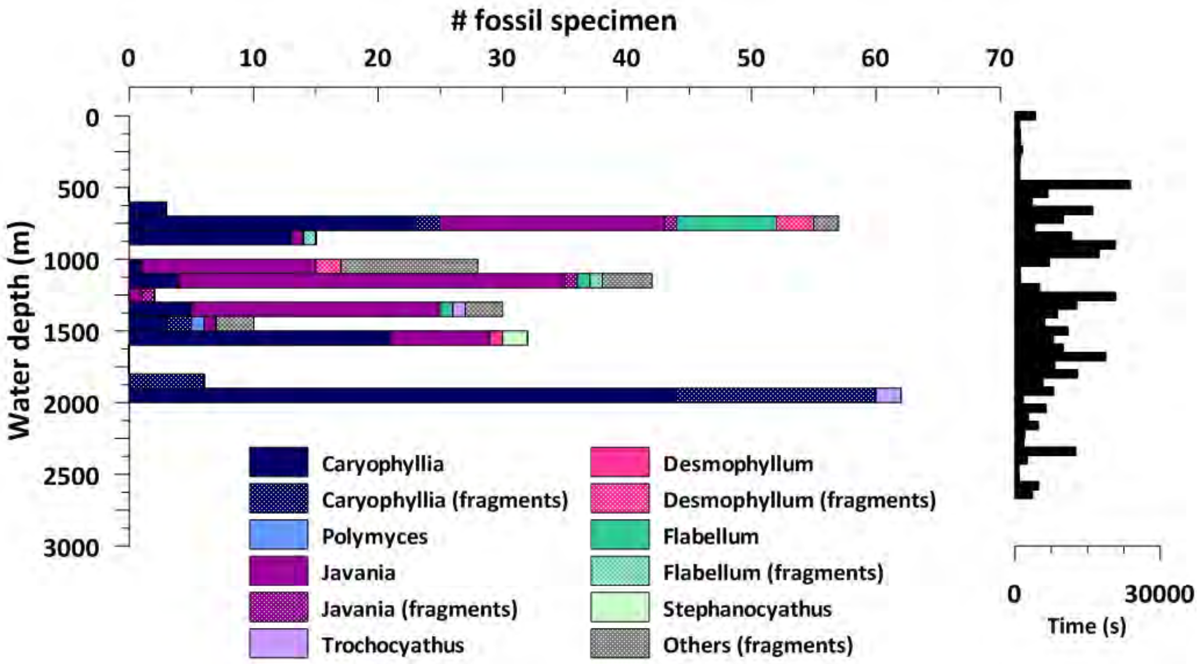


Figure 8.33: Masses of fossil colonial corals collected at the Vema Fracture Zone in 100 m depth bins showing a) Total mass of Scleractinian corals and b) Total mass of octocorals. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives.

d) Vayda Seamount

Corals were collected during 3 dives of the ROV ISIS. The deepest collection was 1971 m and the shallowest was 583 m. 228 solitary Scleractinia, 1 kg of colonial Scleractinia, 11 kg of octocorals and 10g of sylasterid were collected. The number of genera collected according to depth in 100 m bins is shown in the figures below (figs 34 and 35).

a)



b)

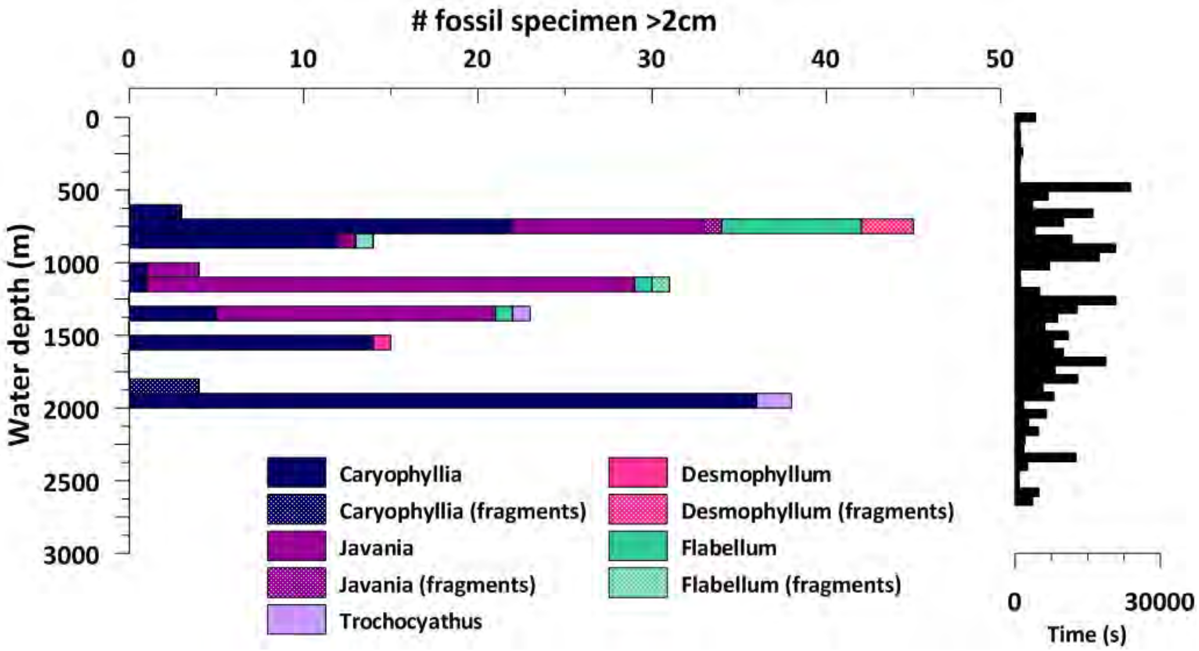
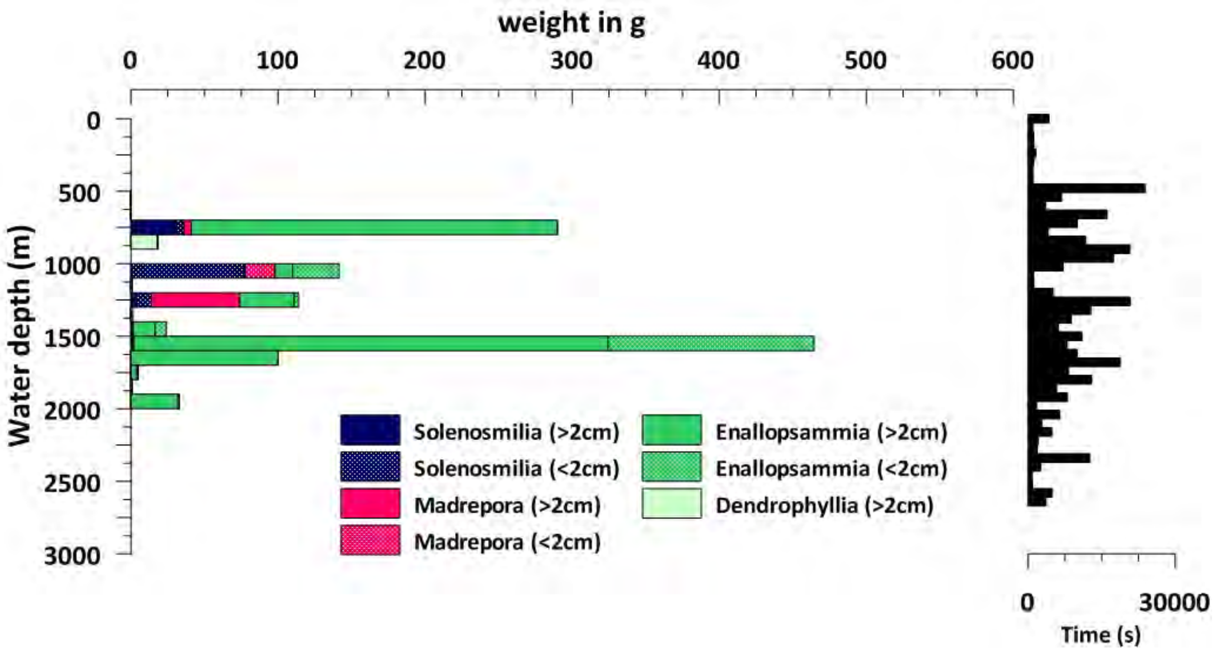


Figure 8.34: Numbers of fossil solitary corals collected at Vayda Seamount in 100 m depth bins showing a) Total numbers of corals and b) Numbers of corals greater than 2 cm across. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives. 7 genera are represented by our sampling efforts here.

a)



b)

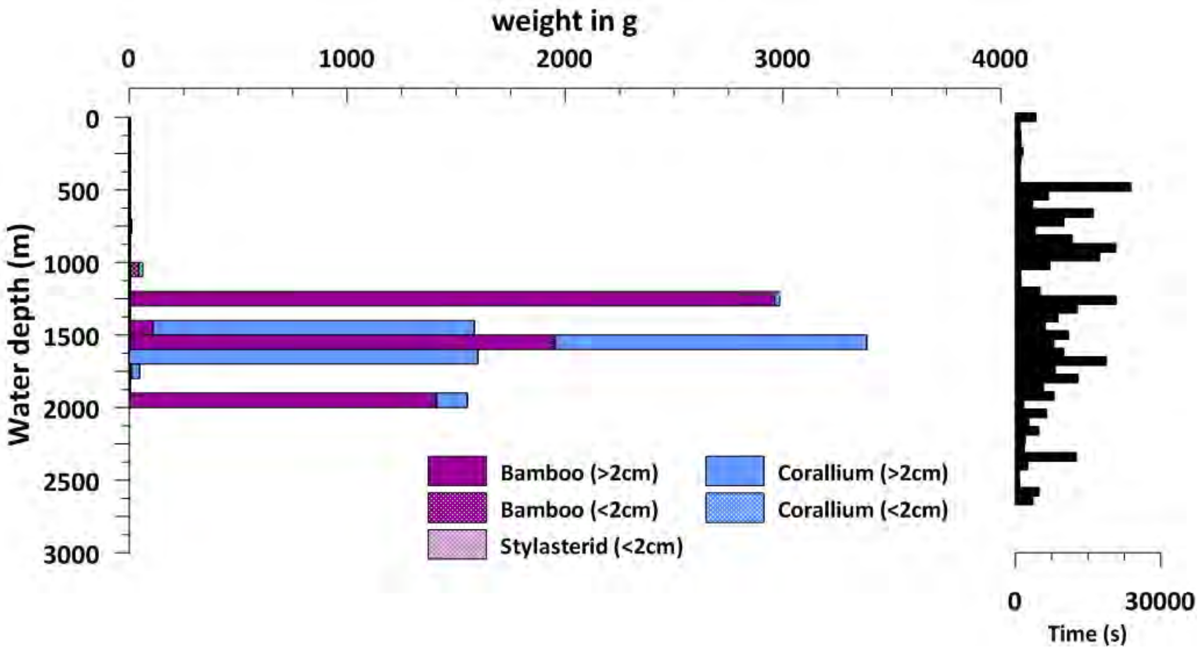
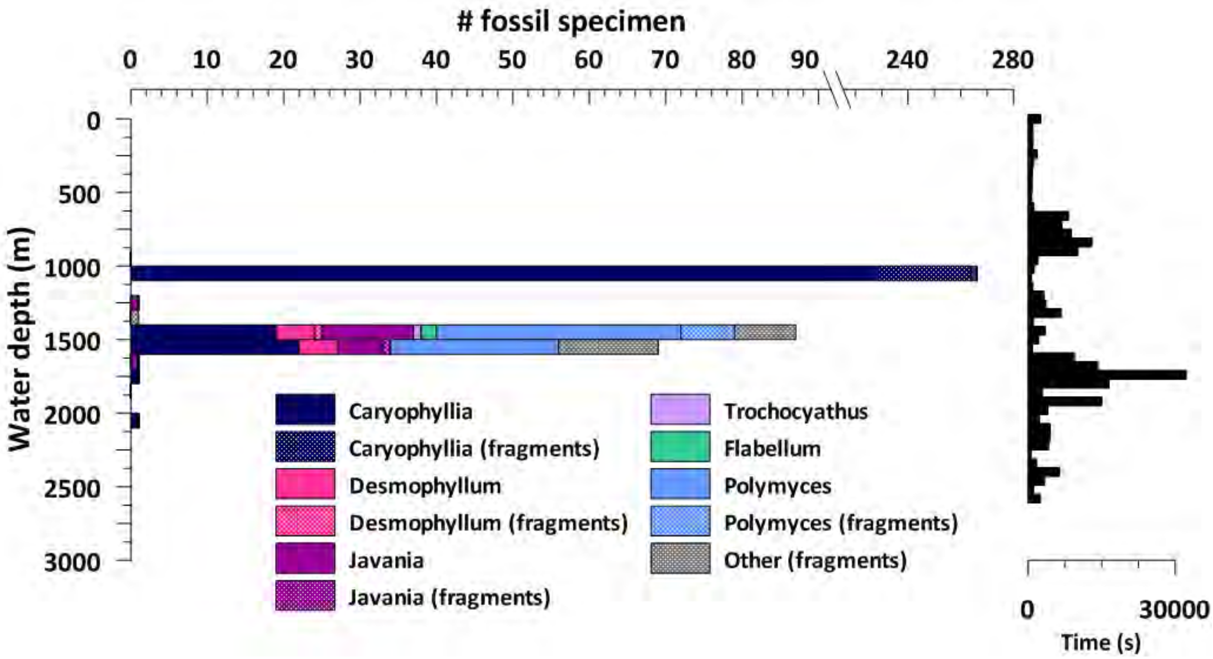


Figure 8.35: Masses of fossil colonial corals collected at Vayda Seamount in 100 m depth bins showing a) Total mass of Scleractinian corals and b) Total mass of octocorals and stylasterids. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 3 dives.

e) Gramberg Seamount

Corals were collected during 2 dives of the ROV ISIS. The deepest collection was 2051 m and the shallowest was 981 m. 361 solitary Scleractinia, 7 kg of colonial Scleractinia, 5.5 kg of octocorals and 7 g of stylasterid were collected. The number of samples collected according to depth in 100 m bins is shown in the figures below (figs 8.36 and 8.37).

a)



b)

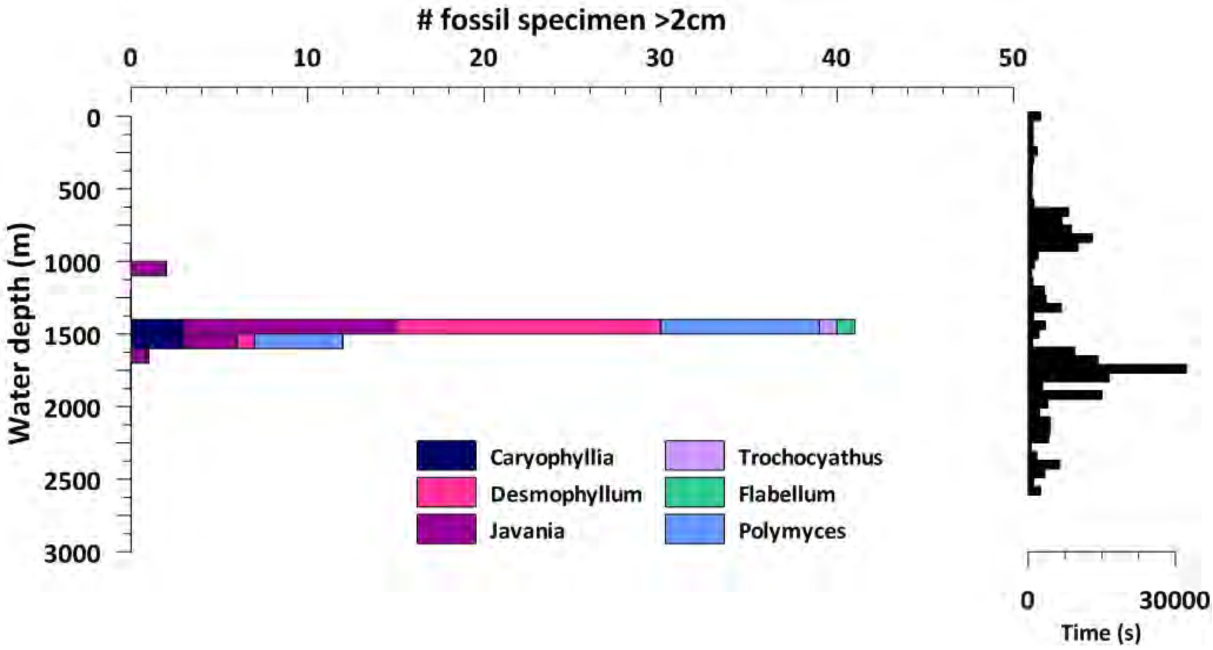
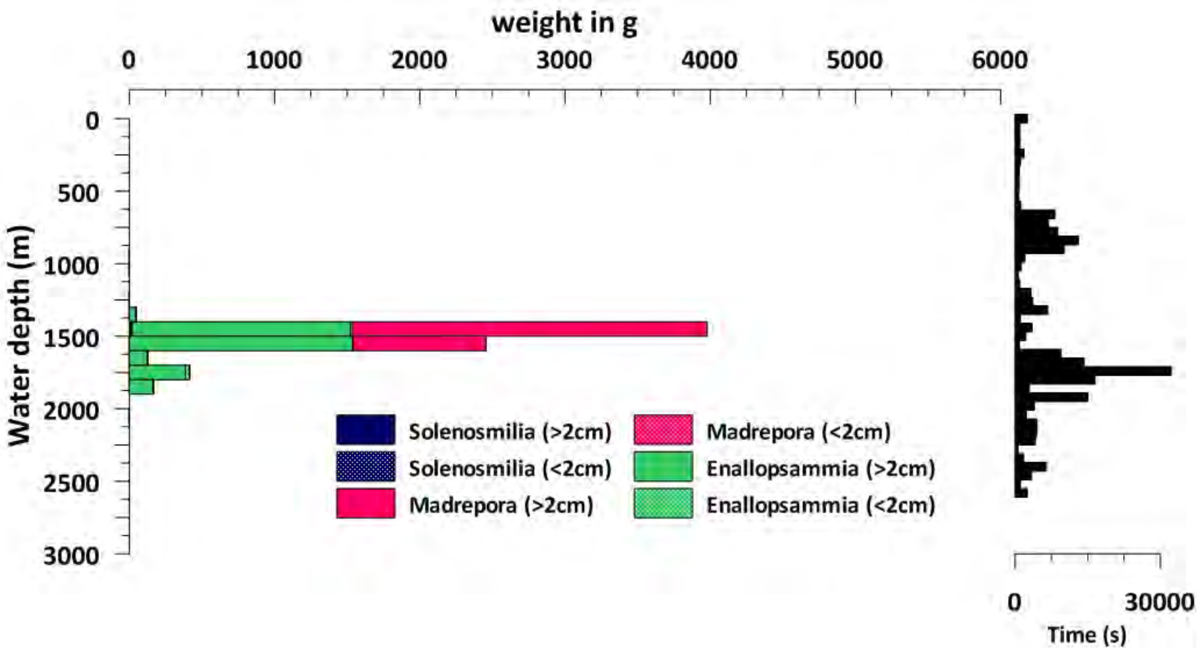


Figure 8.36: Numbers of fossil solitary corals collected at Gramberg Seamount in 100 m depth bins showing a) Total numbers of corals and b) Numbers of corals greater than 2 cm across. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 2 dives. 6 genera are represented by our sampling efforts here.

a)



b)

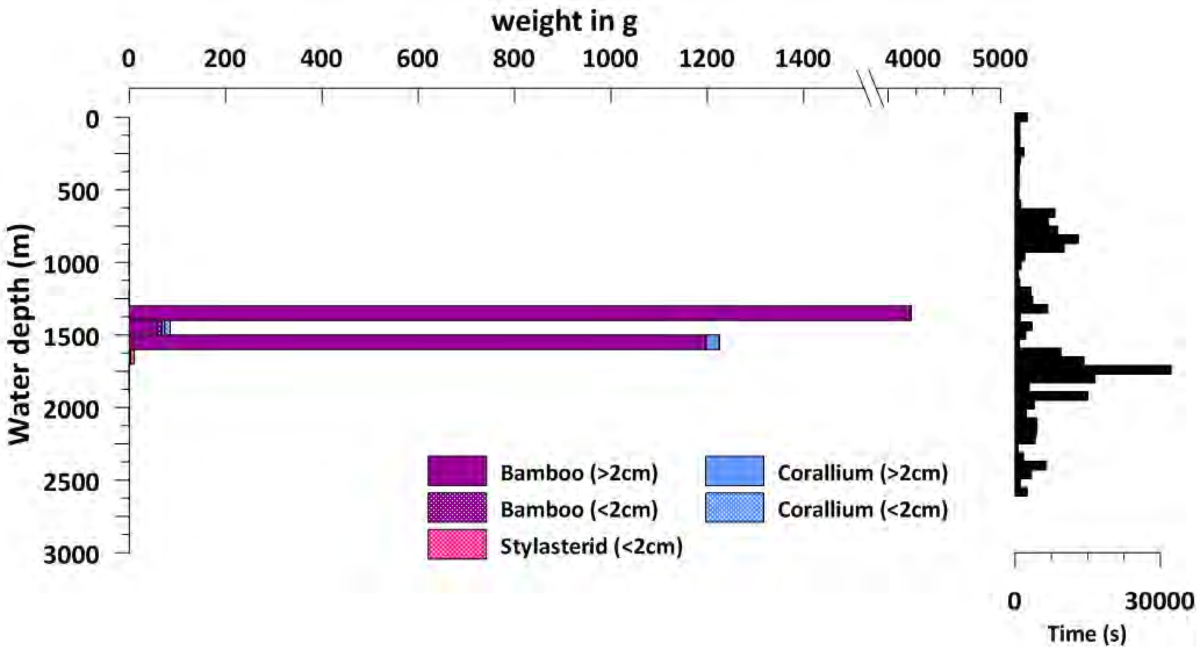


Figure 8.37: Masses of fossil colonial corals collected at Gramberg Seamount in 100 m depth bins showing a) Total mass of Scleractinian corals and b) Total mass of octocorals and stylasterids. Also shown is the amount of time spent at each depth by the ROV ISIS over the course of 2 dives.

8.2.2 The fossil coral database

All fossil coral specimens and all live coral specimens taken for palaeoclimate proxy work are included in the fossil coral database. As well as a spreadsheet including all sample information, the database also includes a labelling key, details of coral genera collected, summary sheets for each sampling location and an overall summary sheet outlining the number/weight of corals collected at each station. This latter sheet can be found in Appendix 3.

Each sample consists of a selection of corals from the same sampling event, being of the same family/genus and having similar states of preservation. If more than one sample is present with these same characteristics the samples are labelled sequentially from 001. Solitary corals all have individual labels. Pieces of colonial coral of the same type were separated into bags and weighed, with each bag being treated as an individual sample. We have also given each sample a label indicating the sizes of the corals it represents. Corals < 2 cm across are labelled small (s). Corals > 2 cm but < 10 cm across are labelled medium (m). Corals > 10 cm across are labelled large (l). Where corals were too corroded/small/fragmented to identify or too small to effectively sort they were given the label 'Other' and a description of the sample was included in the spreadsheet. Examples of the coral labelling nomenclature are included in Table 1. Other information in the database includes latitude, longitude and depth of sample collection, whether the sample was growing on another kind of coral or rock, and for the samples collected live, the water temperature and salinity in which they were growing. Temperature and salinity were measured by CTD instruments on the ROV.

Cruise	Station	Location ID	Gear ID	Gear #	Event ID	Event #	Sample ID	Sample #	Coral type	Pres.	Size	Sample #
JC094	045	VAY	ROV	235	SLP	001	F	0165	Jav	c	s	001
JC094	045	VAY	ROV	235	SLP	001	F	0165	Oth	c	s	001
JC094	045	VAY	ROV	235	SLP	001	F	0165	Oth	c	s	002

Table 8.1: Construction of coral labels. Each station (ROV dive) is made up of many individual sampling events. All fossil corals from one event have the same sample ID and #. The coral type is usually the first three letters of the coral genus, or 'Other' (Oth) for unidentified pieces. There are three possible preservation states (Pres.): 1) Corroded (c), 2) Normal (n), 3) Pristine (p). If there is more than one entry with the same Sample ID, #, Coral type and Preservation state, samples are labelled 001, 002 etc. The 'Size' category is included so that larger samples can be readily identified.

Chapter 9: Sponges (Porifera)

Silicon (Si) is an essential nutrient for photosynthetic diatoms, which play a key role in the cycling of carbon. In the modern surface ocean, biological formation of amorphous silica (biogenic opal) by diatoms is the dominant process that removes dissolved Si (silicic acid, or $Si(OH)_4$) from seawater. Diatom blooms rely on upwelling sources of $Si(OH)_4$ because efficient utilisation strips almost all of the Si from surface waters. Ocean circulation and variations in algal populations result in distinct $Si(OH)_4$ concentrations in different deep water masses. The intermediate waters that form in the Southern Ocean and spread throughout most of the ocean, for example, are characterized by low $Si(OH)_4$, relative to other nutrients. An understanding of past $Si(OH)_4$ is required to reconstruct the supply of nutrients from the Southern Ocean through time.

Calibration work, largely carried out on material from the Southern Ocean, has showed that Silicon isotopes (denoted by δ^{30}Si) in sponge spicules reflects the concentration of $Si(OH)_4$ in the waters in which the sponges grow as a result of Si-dependent growth rates (e.g. Hendry & Robinson, 2012). Hence, spicule δ^{30}Si can be used to investigate Si uptake processes in sponges, and can be used as a palaeoproxy for $Si(OH)_4$. Other opal isotope systems are under investigation for biochemical and palaeoceanographic applications (e.g. Hendry & Andersen, 2013).

A secondary aim for JC094 was to collect more sponge material from different oceanic settings in order to carry out further studies of sponge silicification processes and to fine-tune the palaeonutrient calibration.

Sponges (Phylum Porifera) were collected (either as large individual sponges or as by-catch on other organisms) during the ROV dives, photographed, and subsamples taken for drying and preservation in ethanol or freezing for transportation back to the UK (at both -20 and -80°C, the latter to enable molecular analysis). Basic classification of the larger specimens as Hexactinellids or Demosponges was carried out on board using both binocular and petrological microscopes, and smear slides of cleaned spicules. Some dead /fossil sponge material was also recovered as by-catch with fossil framework coral, dried and transported back to the UK. In total, at least 24 different morphotypes of Hexactinellids, and 14 different morphotypes of Demosponges, were recovered (with several small specimens remaining unidentified).

1) Carter Seamount
Only Hexactinellid sponges were identified from Carter Seamount, including large, vase-shaped glass sponges (e.g. Figure 9-1; Appendix 8).
2) Knipovich Seamount
Knipovich Seamount was notable for sponge abundance and diversity, including both Hexactinellids and Demosponges (e.g. Figure 9-2; Appendix 8).
3) Vema Fracture Zone
Vema was also notable for sponge abundance and diversity, with several morphospecies of both Hexactinellids and Demosponges (e.g. Figure 9-3; Appendix 8). A large hexactinellid was recovered from dive ROV 233 with >cm size basal spicules (Figure 9-3A,B).
4) Vayda and Gramberg Seamounts
Vayda and Gramberg both yielded a good diversity of sponges, with notable collections of Demosponges (e.g. Figure 9-4; Appendix 8). Similarly to that found at Vema, a large >cm sized spicule hexactinellid was recovered from dive ROV 237 (Figure 9-5A). A distinct morphospecies of white fan hexactinellid was also recovered during this dive (e.g. Figure 9-5B). At least three morphospecies of demosponges were found at Gramberg that were not recovered at the other locations (e.g. Figure 9-6).
Figure 9-7 gives an overview of the sampling locations relative to major water masses.

Figure 9-1: Example photos of hexactinellids from Carter. A-B) Vase sponge B0194.

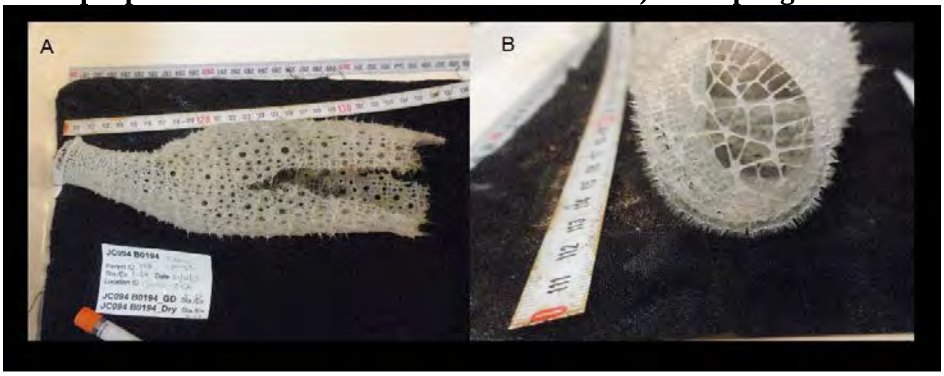


Figure 9-2: Example photos of demosponges from Knipovich A) B0078, B) B01140.

9-3: Example photos of hexactinellids from Vema. A)-B) B01607, C) B01674, D) microscope view of microspicules from B01674, x600).

Figure 9-4: Example photos of demosponges from Vayda. A) B01661, B) B01671, C) B1968, D) B01637.

Figure 9-5: Example photos of hexactinellids from Vayda. A) B1965, B) B1963.

Figure 9-6: Example photos of demosponges from Gramberg. A) B1954, B) B1958.

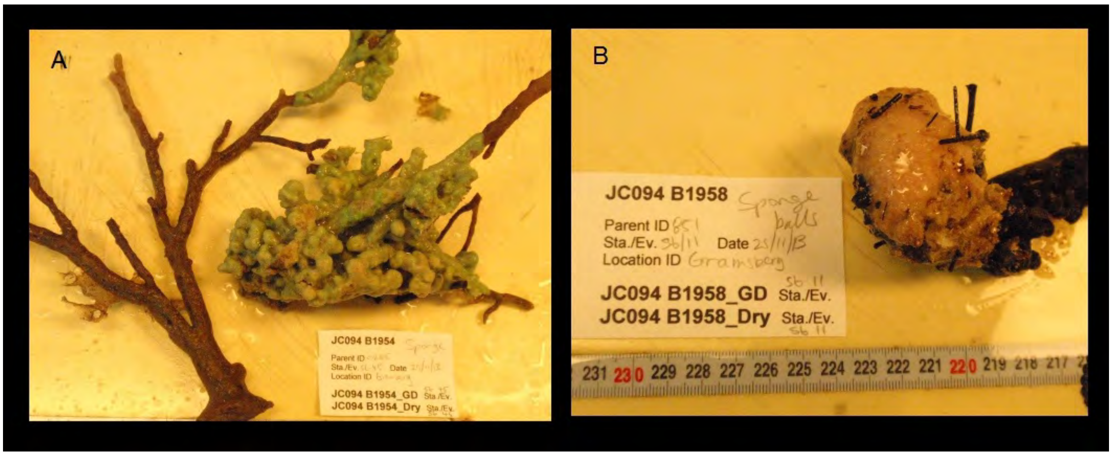
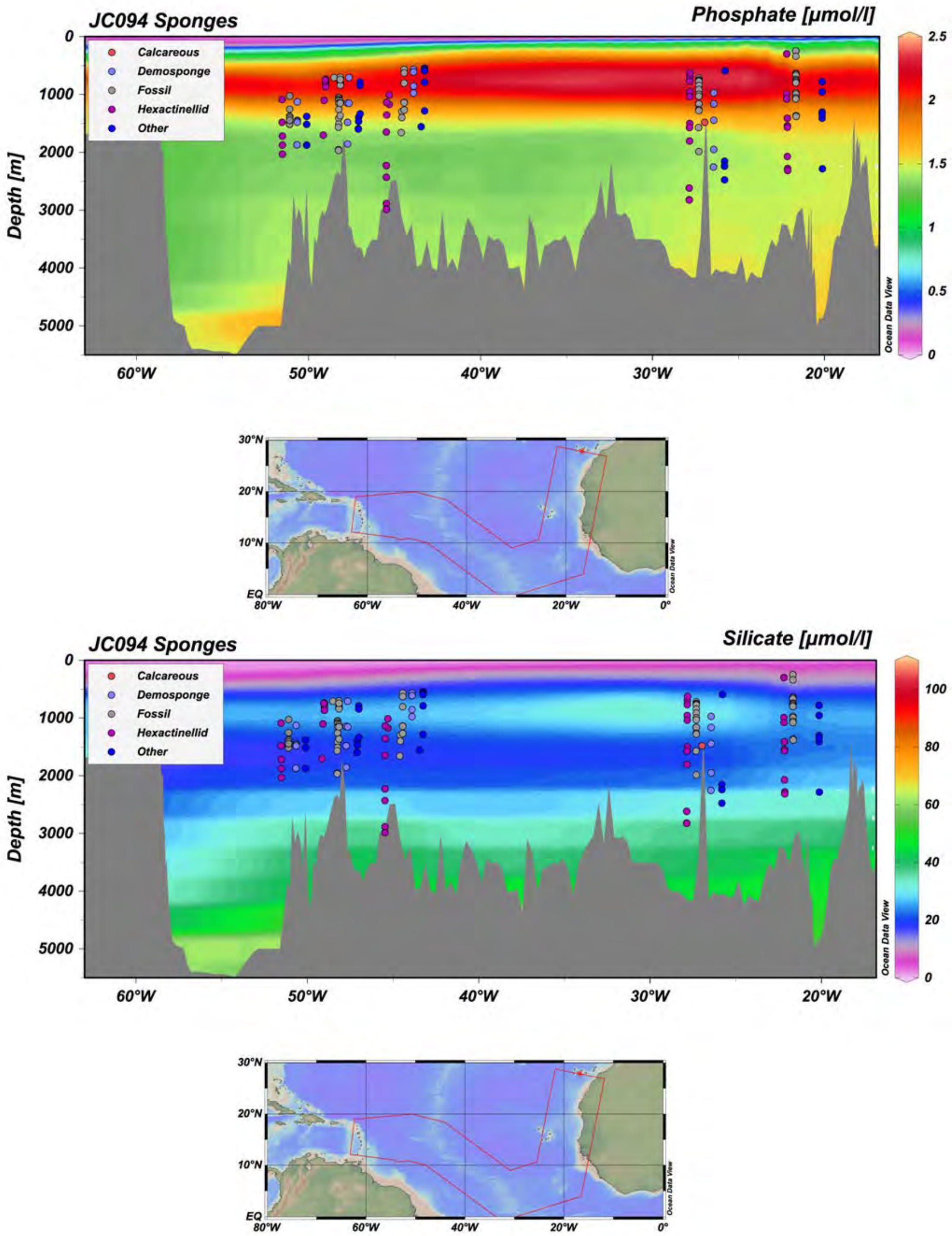


Figure 9-7: Sponge sampling locations during JC094, relative to seawater phosphate (top) and silicic acid (bottom) concentration. Images produced using Ocean Data View by A. Jacobel.



References:

Hendry, K. R., and Robinson, L. F., 2012, The relationship between silicon isotope fractionation in sponges and silicic acid concentration: modern and core-top studies of biogenic opal: Geochimica et Cosmochimica Acta, v. 81, p. 1-12.

Hendry, K.R. & Andersen, M.B., 2013, The zinc isotopic composition of siliceous marine sponges: investigating nature's sediment traps. Chemical Geology, v. 354, p. 33-41.

Chapter 10. BIOLOGY REPORT

Objectives of biological surveys and collections

1. To collect live Scleractinia, *Corallium* and stylasterids to support fossil coral dating work.
2. To collect Scleractinia (solitary and colonial) and stylasterids for genetic and reproduction studies.
3. To collect sponges for biogenic silica studies.
4. To collect 10 of any individual species to undertake cross-Atlantic population connectivity research.
5. To collect common benthic organisms to ensure habitat and seamount zones are accurately described.

10.1 Summary of biological collections

A total of 3389 individual biological specimens were collected on JC094. Table 1 and Figure 10.1 show that collection success generally varied across phyla and changed with each seamount visited. Sample collection depended on the communities of organisms seen, those targeted, collection techniques utilised and the time available for biological collections.

Table 10.1. Number of biological samples collected at each JC094 seamount

	Vema	Carter	Knipovich	Vayda	Gramberg
Annelida	88	302	80	575	34
Arthropoda	40	100	7	61	23
Porifera	34	23	47	31	16
Mollusca	7	12	0	22	0
Echinodermata	434	275	114	139	71
Cnidaria	72	247	200	272	59
Nemertea	0	2	0	0	0
Sipuncula	0	2	0	0	0

All phyla (apart from Sipuncula and Nemertea that were only collected at Carter seamount) were collected from a broad depth range at every seamount.

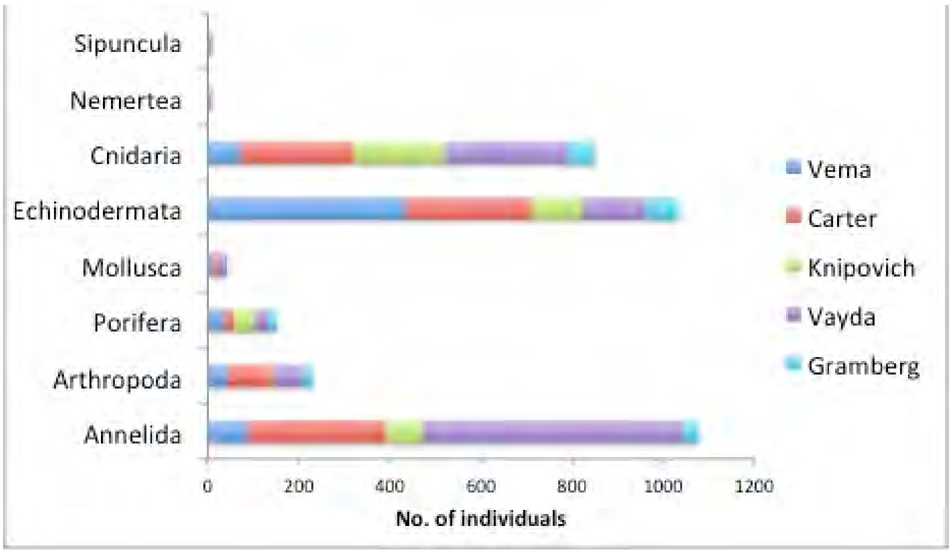


Figure 10.1. Phylum breakdown of biological specimens collected at each seamount.

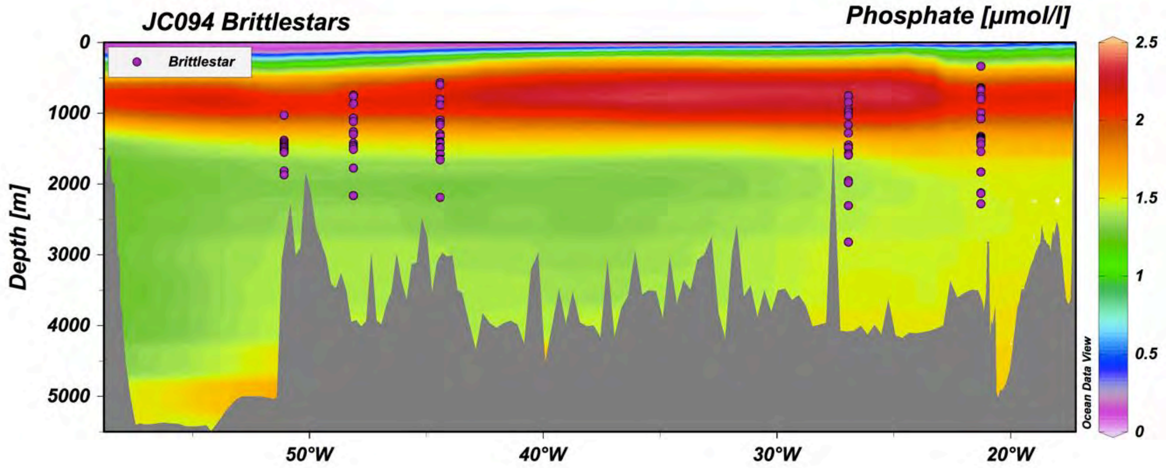
Cnidaria – Scleractinia: As this expedition was focused on collecting Scleractinia this formed a major portion of live biological collections. The majority of Scleractinia collected were for proxy research and as such have been explained in details in the ‘Coral sampling’ (Chapter 8) of this expedition report. The colonial Scleractinia collected were identified as *Madrepora*, *Solensmilia*, and *Enallopsammia*. Solitary corals were from the following genera: *Flabellum*, *Javania*, *Caryophyllia*, *Dasmosmilia*, *Polymyces*, and *Stephanocyathus*.

Cnidaria – Octocorallia At least two species of Paragorgiidae and at least 3 species of Acanthogorgiidae were collected. One species of *Anthomastus* was common across the Atlantic and 11 specimens were collected, 8 from Carter and 3 from Vayda. At least two species of *Corallium* were collected, potentially three, and at least two species of Isididae. A rare specimen of *Swiftia* was collected and *Scleracis* appeared common.

Within Primnoidae at least 5 species were collected, one which is potentially new.

Other major collections: Two other large collection were made: Ophiuroidea (brittlestars, within the Echinodermata phylum) and Polychaeta (within the Annelida phylum).

Brittlestars were common members of the deep-sea communities surveyed. They were found in the large sampling efforts made when nets full of fossil coral rubble were collected and they were frequently sampled on octocorals (*Paragorgia* sp., *Scleracis* sp.). Some species of brittlestars appeared common across depths and the sample locations and it is these species we shall focus on for future population genetics studies.



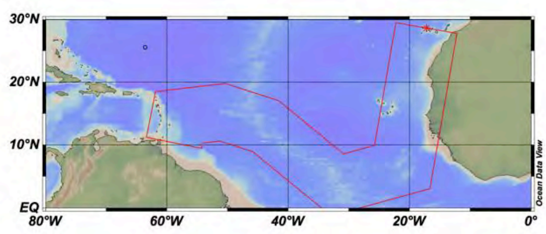
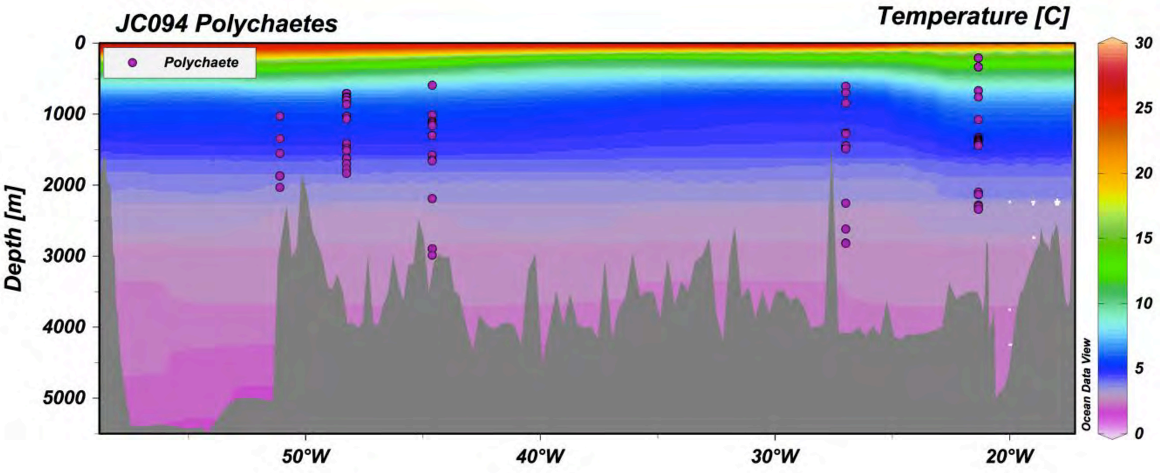


Figure 10.2. Brittlestar (Ophiuroidea) collections along the expedition path plotted against depth and phosphate concentration.

The polychaetes that were collected were also from different species but were sampled across all locations and a wide range of depths (see below). Commensal polychaetes dominated our collections and were frequently found on colonies of *Corallium*, Primnoidae, and inside some sponges.



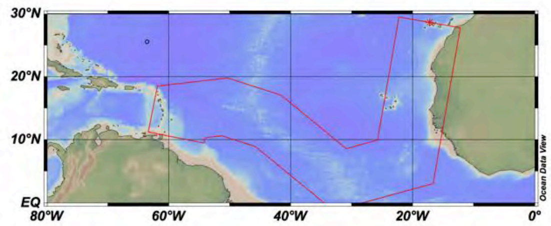


Figure 10.3. Polychaeta collections along the expedition path plotted against depth and temperature.

10.2 BIOLOGY SAMPLING PROTOCOLS

Sample collection using *Isis*
Live solitary corals were originally collected with the slurp gun and deposited in rock boxes on the aft of *Isis*. A modified collection technique, involving tubes being inserted into the rock boxes, creating smaller, separate compartments into which corals could be placed, saw the efficiency and number of corals collected increase.

Figure 10.4. Front tray of Isis at the end of Dive 240. Front centre are the two large open bioboxes, collection tubes fill the rock boxes towards the back of the image, and three tubes are connected to the front of the push core area. The tool tray in the centre has green nets and a large fan, Paragorgia, in it.

Colonial corals were collected usually by arm or scoop and placed into open or closed rock boxes. Lighter and delicate organisms, such as sponges and octocorals, were placed into closed bioboxes. Urchins were slurped and placed into closed bioboxes. Holothurians, squat lobsters, and much mobile fauna were slurped directly into sealed chambers. Oversized bamboo corals and fan corals were placed on the tool tray which was shut for the ascent making the organisms secure. When on deck all biology and fossil samples were transferred into pre-chilled, pre-labelled buckets (2°C) (see figure below) before being taken into the constant temperature room (set to 2°C).

Sample processing in the constant temperature room on RRS *James Cook*

To maximise the usefulness and breadth of research possible with the samples collected there was a substantial number of subsamples and post-processing on board.

A photo of every individual organism, with a scale bar and label in shot, was taken to ensure “live” colour and state were recorded as best as possible. As all creatures collected exist in the marine environment an aquarium with glass plates to hold organisms upright, and side lights was set-up to aid accurate recording of fleshy features such as polyps, antenna, branching structure etc the structure of which is often lost in non-aquatic conditions.

No organism was preserved in formalin without a piece being taken for genetics (or, in the case of when taxonomy requires formalin and there were a sufficient number of individuals collected, one individual was saved for formalin preservation) unless the sole use for the specimen was reproductive studies (only solitary corals were just placed in formalin). A genetics sample requires at least three times the volume of 100% ethanol as the tissue volume to ensure long-term viability of the tissue.

The labelling protocol involved every location on *Isis* e.g. rock boxes, bioboxes etc being given a unique “parent code”. Everything from that location was given a unique “sample ID code” and the parent code was noted in the database. Should organisms then be removed from an organism, e.g. polychaetes from a primnoid coral, the parent code of the polychaetes is the primnoid ID code, with the polychaets themselves being given a unique sample ID.

Figure 10.5. Colony of *Enallopsammia* being placed into bucket of chilled seawater (left). Buckets ready for processing in temperature controlled room (right).

10.2.1 CORALS

SCLERACTINIAN PROTOCOL

Solitary corals: If there were over 10 individuals of one species from a given dive / depth then 10 were placed whole in formalin (for 7-14 days before being transferred to 70% ethanol) for reproduction studies (to be undertaken by Dr Rhian Waller), and, depending on the size of the solitary coral, one was placed whole in flash freeze (for genomics studies to be undertaken by Dr Marcelo Kitahara) and another whole in 100% ethanol (for phylogenetic studies to be undertaken by Dr Rhian Waller) and put in the -80 freezer; if the solitary corallites were wider than 1.5 cm then two genetics sub-samples were taken from one individual, one to be preserved by flash freeze (liquid nitrogen) and one in 100% ethanol (both being placed in the -80 freezer) – the remainder of the individual was usually given to the fossil preservation team for proxy work or preserved in formalin for reproduction studies.

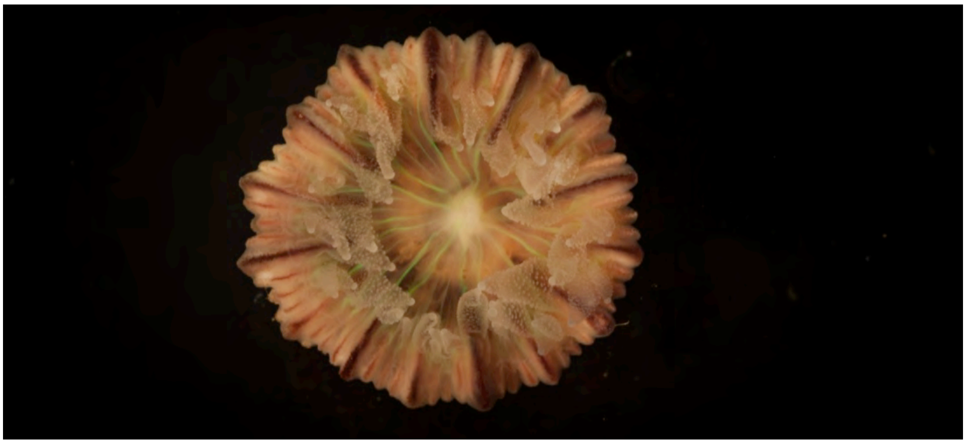


Figure 10.6. Caryophyllia sp. Photo by Sam Crimmin

Subsampling a solitary coral was done using forceps/scalpel or fine points to scrape around edge of mouth (this would break some of the septae); it is also possible to remove tissue using tweezers (that must be cleaned before being re-used). We were careful to not dig deep into the polyp as this is where the coral gametes are located, at the base of the polyp, and sometimes, if there were few solitary corals, the remainder of the coral was preserved in formalin for reproduction studies.

Colonial corals: There were fewer collections of colonial corals but each collection yielded a large number of polyps making the subsampling possible for every individual collected (with the exception of a few very small stylasterid corals that were too small to sub-sample).

After a photo record was taken, at least 5-10 polyps were removed and placed in 95-100% non-denatured ethanol (molecular grade) then into the -80 freezer for future genetics studies (to be undertaken by Dr Rhian Waller) and another 5-10 polyps into formalin (for 7-14 days before being transferred to 70% ethanol) for reproduction studies (to be undertaken by Dr Rhian Waller). Another 5 polyps were preserved by flash freeze (liquid nitrogen) for genomics studies to be undertaken by Dr Marcelo Kitahara. The remainder of the colony was given to the fossil preservation team for proxy work.

OCTOCORAL PROTOCOL

After a photo record was taken (which was often enhanced by the aquarium set-up), a few branchlets of polyps were removed and placed in 95-100% non-denatured ethanol (molecular grade) and placed into the -80 freezer for future genetics studies (to be undertaken by Dr Michelle Taylor). A second sub-sample of ~10-15 polyps (a branch or two) was place in buffered formalin for 24hrs before being transferred to 70% ethanol. *It is really important to change the sample into ethanol within 48hrs MAX.*

Figure 10.7. Colony of *Candidella* sp. with commensal polychaetes in tunnels. Photo by Sam Crimmin

The remaining colony was placed into a suitable-sized Nalgene container or oversized octocorals were be double-edged thermosealed, in double bags i.e. double thermoseal one side of the plastic tube to create a packet, place octocoral and label inside packet, place enough 70% ethanol in packet so that octocoral shall be completely covered in transit (at least 3 times the volume of the organism). Squeeze out air if possible and double thermoseal open end, place this sealed packet into a second doubly thermosealed packet. The bags were left for 24 hrs to check for leaks before being placed in a longer-term storage area.

STYLASTERID PROTOCOL: After a photo record is taken a sub-sample of a branch tip (1-2 cm) is placed into a cryovial / 50ml Falcon tube with 95-100% molecular ethanol for future genetic studies (to be undertaken by Dr Alberto Lindner). A second sub-sample of at least 20 polyps is placed in buffered formalin for 5-7 days, after which it is transferred to 70% ethanol. The remaining colony is stored in 70% ethanol (as above octocoral protocol) or, if the sample is over-sized, frozen at -20 in a thermosealed / whirlpack bag.

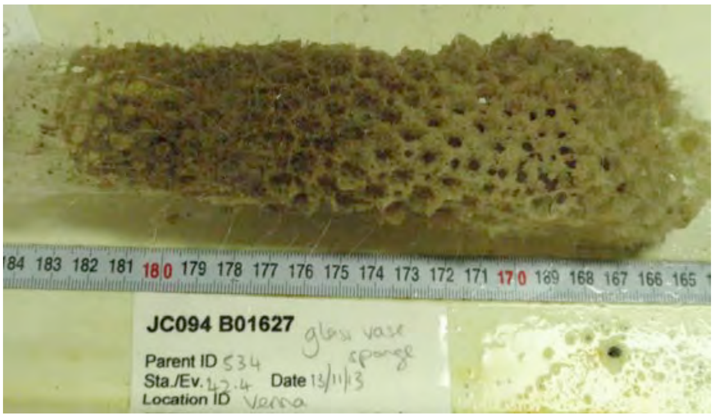


Figure 10. 8. Glass sponge. This sponge had a DNA sample taken, a section was dried and the remainder preserved in a thermosealed bag in the -20°C freezer.

10.2.2 NON-CORAL BIOLOGY PROTOCOLS

PORIFERA – SPONGES As such a small genetics sub-sample (3cm by 3 cm) of each sponge (of a suitable size) was placed inside a sample bag (with a label) and kept in the -80 freezer. A fist-sized section was placed on a drying tray for future silicate analysis. The remainder of the sample was stored in Nalgenes / a bucket in 70% ethanol or, if too large, placed in the -20 freezer in a thermosealed bag.

HYDROIDS Dr Lea-Anne Henry, Heriot-Watt University, requested that any hydroids collected were preserved with their holdfasts in 70% ethanol.

POPULATION GENETICS: Dr Michelle Taylor is interested in deep-sea population connectivity and as such aimed to collect at least 10 individuals of the same species of any deep-sea creature from the east and again from the west Atlantic. Several target species were collected successfully. All samples were preserved whole / subsampled, in 100% ethanol which was placed in the -80 freezer.

After some collection it was apparent that the likely subjects (and their preservation techniques) were:

ALL INDIVIDUALLY in 95-100% ethanol:
POLYCHAETES
ACTINARIA (sea anemones)
CRUSTACEANS (specifically squat lobsters – specimens were small and placed whole in 100% ethanol)
OPHIUROIDEA (brittlestars) – mostly small and preserved whole in 100% ethanol.

SUBSAMPLE in 95-100% ethanol, remainder in 70% ethanol
ECHINOIDEA (urchins)
HOLOTHUROIDEA (sea cucumber)

10.3 Summary of biology seen on *Isis* ROV dives and collections made per seamount

10.3.1 Carter Seamount (EBA)

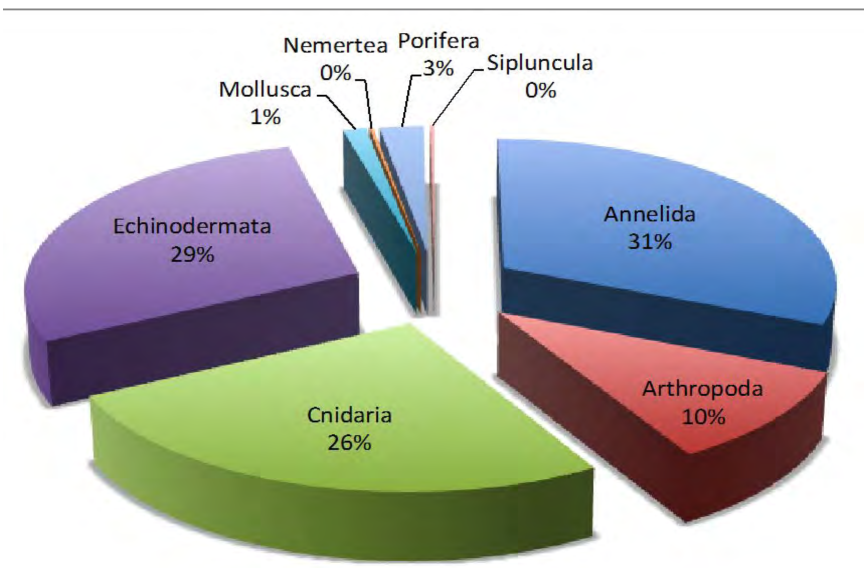


Figure 10.9. Chart showing percentage breakdown of biological specimens collected at Carter seamount by phylum.

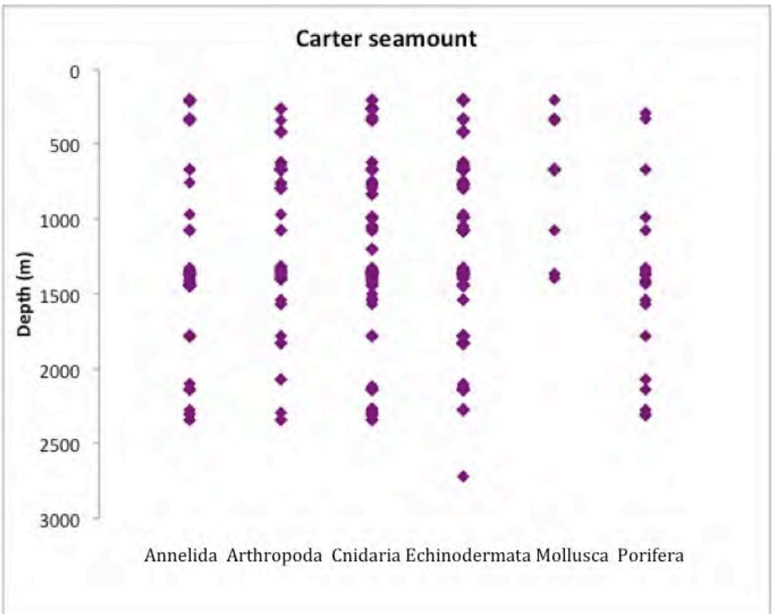


Figure 10.10. Major biology phylum collected at different depths on Carter seamount.

Dive 222 – 1080 > 640 m depth

Habitat and associated corals
The dive covered a large number of steep inclines, many with flat rock walls. Early in the dive, deeper areas had many stalked crinoids attached to the walled areas, with frequent black corals (Antipatharia), fans of Scleractinia (*Enallopasmmia* sp.), bamboo (Isididae) fans and whips, and fly trap anemones clinging to the otherwise bare rock faces.

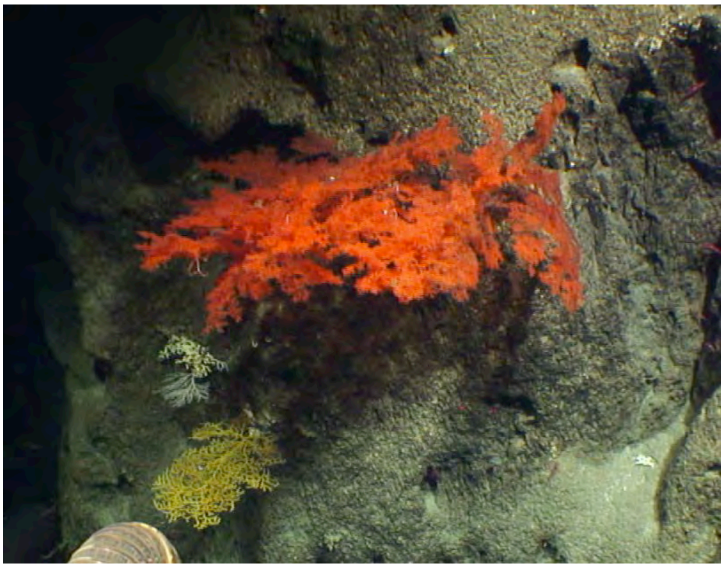


Figure 10.11. Large black coral (Antipatharia)

As is usual the corals were inhabited by a variety of epifauna. Black corals often had resident squat lobsters, octocoral fans were host to many crinoids and squat lobsters, and bamboo corals had a number of small ring anemones circling their branches. Stylasterids were a relatively infrequent member of the benthic fauna. Fourteen solitary live corals were collected. After initial identification as *Desmophyllum* some of these specimens were actually found to be *Javania* sp., with some *Polymyces* sp. and some examples of *Caryophyllia* species. The two live colonies of coral collected were both identified as *Enallopsmmia*. Towards the end of the dive the rock had more caves and a greater rugosity (as below).

Rattail fish (Chimaeridae) were common as were an as yet unidentified eel-like fish species. One unusual goosefish (Lophiidae) was also spotted.

Figure 10.12. Rock face with small caves.

Dive 223 - 670 > 200 m depth

Habitat and associated corals

Starting at the approximate depth that the first dive finished at the beginning of this dive was steep walled. Sections of flatter sediment saw a change in fauna to holothurian (sea cucumbers), and pencil urchins. Again *Enallopsammia* were common, as were some *Corallium* and yellow octocoral fans. At the top of seamount (208m) there was plentiful fish fauna. There was also a different species of holothurian across the summit compared to the flanks.

Dive 224 - 1931 > 1350 m depth

Habitat and associated corals

Steep, lightly sedimented slope with low-relief coral rubble framework cover was found at the start of the dive. Coral colonies were mostly dead, with some small live patches of *Solensmilia* and small octocorals (black coral, gorgonians) on boulders. The slope developed into a field of larger rocky outcrops where more substantial coral colonies and octocoral fans were found. Shallower areas had finer sediment interspersed with similar rocky outcrops. Sediment fauna included sea cucumbers (holothurians), decorator crabs (holding their preferred species of gorgonian or black coral), urchins of several different species, and some predatory ambush fish such as the one shown below.

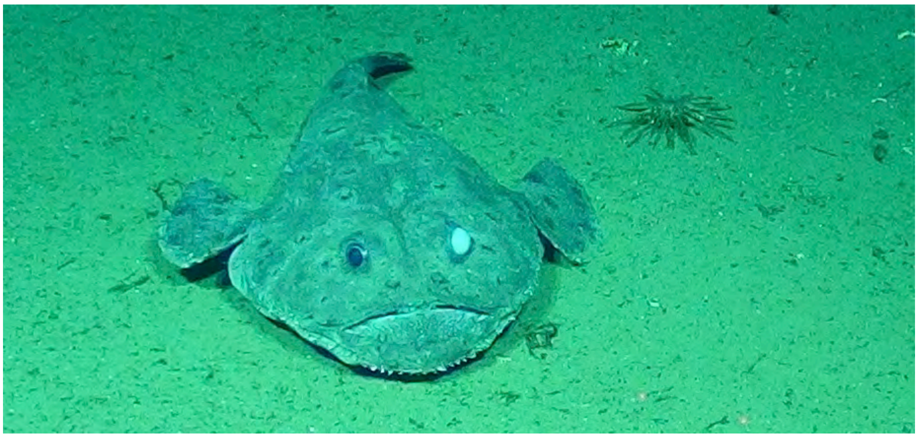


Figure 10.13. Large predatory fish with damaged eye.

After a large steep rock face the fine sediment plains with frequent rocky outcrops became a field of mostly small rocks and boulders, still on a steep incline. Again urchins and sea cucumbers were the major megafauna. Other common taxa included the fly trap anemones and sea stars. After this zone a new area of sediment with rare small boulders was surveyed. Here we found a large patch of pencil sea urchins.

Figure 10.14. Large patch of pencil sea urchins. Red dot is one of the two lasers we use for scale on the science camera.

Towards the end of the dive there were more frequent rock faces and some large overhangs. This area had bedrock made of solidified fossil which was home to a many white sea urchins, thousands of brittlestars and many small, pink, armoured holothurians (sea cucumbers).

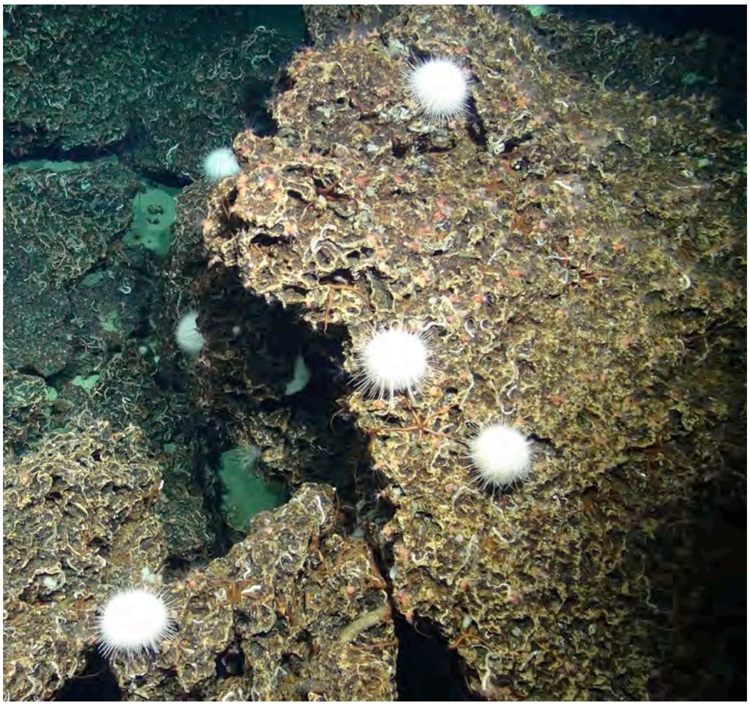


Figure 10.15. Large white sea urchins on fossil rock that was covered with brittlestars and armoured sea holothurians (sea cucumbers)

Areas of fine rippled sediment (with little megafauna) followed the above area; this was followed by a steep rock face with rare, but large, colonies of stylasterid and *Paragorgia* (bubblegum coral). Crevasses in the rock face had accumulations of coral framework rubble and shallower areas of slope allowed quantities of finer sediment to also accumulate. There were rare patches with octocoral fans and a few rat tail fish in this area (at around ~1200m) but it had less benthic fauna than deeper areas.

The last 50 m of dive (1300m upwards) were much more frequently covered in octocoral colonies and megafauna (see below).

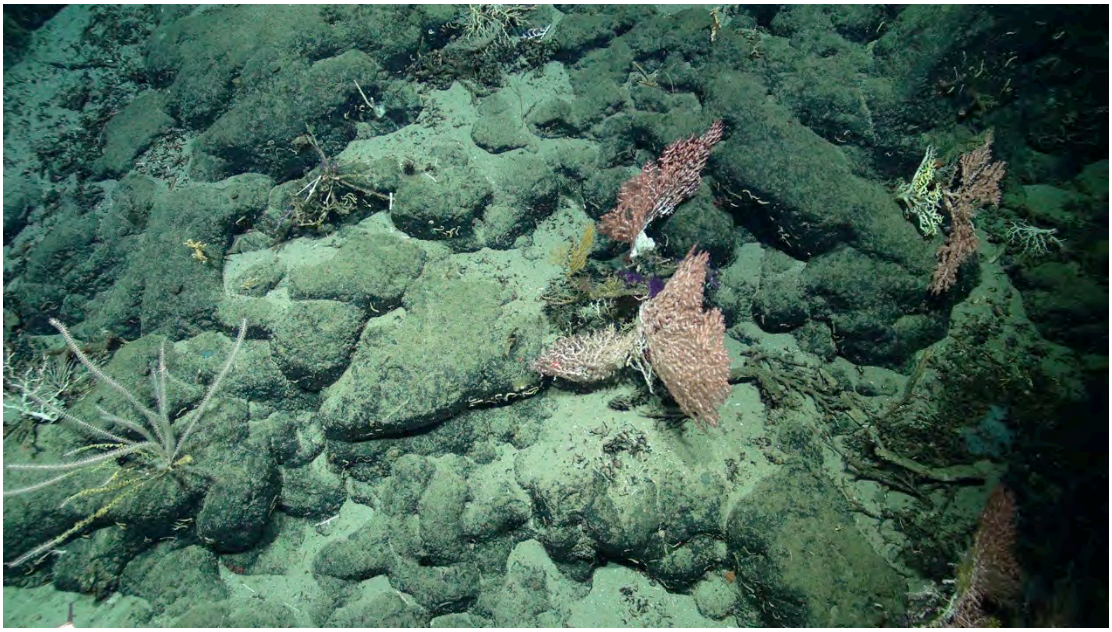


Figure 10.16. Bamboo coral (bottom left), alongside unusually pink examples of the *Paragorgia*, which are usually brighter red.

In the last few metres of this dive we collected a 2 metre wide candelabra bamboo coral. Other unusual specimens from the dive include a rare example of a sponge that is host (commensal or symbiotic?) to many hundreds of zoanthid polyps.

Dive 225 - 510 > 665 m depth

Dive commenced in an area of coarse sediment. Here we saw an unusual red sea cucumber (holothurian), rat tail fish, and sea urchins. As the slope got steeper sand become more coarser and there were frequent sand-covered outcrops; other than a few sponges, rare stalked crinoids and the unusual red sea cucumber this area was void of megafauna.

For the second quarter of the dive there was a steep but rounded rock face that was dominated by dead sparsely bushy octocorals which were often host to several *Anthomastus* octocorals. Pink *Corallium* fan colonies were also common in this area.

Some deep crevasses in the flat, plateau area of the dive, were covered in a dense garden of mixed live and dead octocoral colonies.

A coarse sediment slope with frequent boulders and rocky patches followed. Many rocks were mini oases of coral life. The sediment portions were home to less fauna; a few pink holothurians, some urchins, and rat tail fish.

A zone of thick coarse sediment, the main constituent of which were dead barnacles shells, followed. And a tall candelabra bamboo coral was collected at the end of this dive.

Dive 227 - 1330 > 681 m depth

As this was our last dive at Carter seamount it is was undertaken with the intention of filling in gaps of animal and fossil collection at required depths to ensure complete data sets for a variety of projects (sponge, proxy work, genetics); as such this dive spanned a large depth range and many of the same habitat that were covered in the previous dives.

This dive covered a more eastern flank of the southern edge of Carter seamount and we located some of the most lush gardens of octocorals yet seen on JC094. *Corallium, Paragorgia, Scleracia, Enallopasmmia,* black corals and small stylasterids were the many community members in these areas.

Towards the middle areas of the dive there was more sedimented areas. These areas often had rocks and boulders covering them where corals would reside. Sea stars, urchins, *Enallopasmmia,* and sponges were found here.

Rubble made of degraded coral framework dominated the last area of this dive. Crabs, burrowing anemones, and urchins were living alongside small patches of *Enallopasmmia,* and some rare but large bamboo corals. Close-ups of the framework rubble revealed a range of macrofauna: hermit crabs, squat lobsters, brittlestars and sea stars.

10.3.2 Knipovich seamount (EBA)

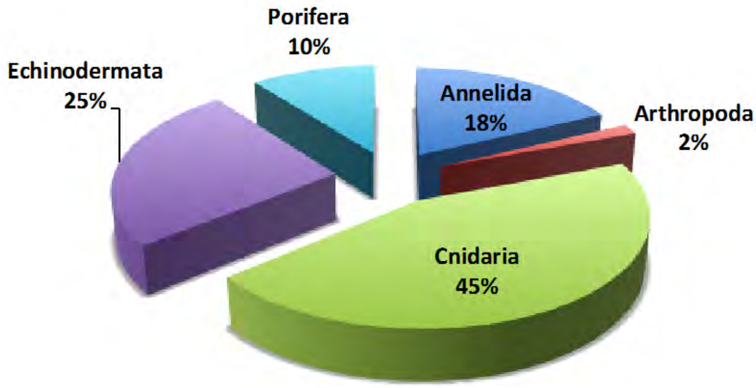


Figure 10.17. Chart showing the breakdown of phyla collected at Knipovich seamount

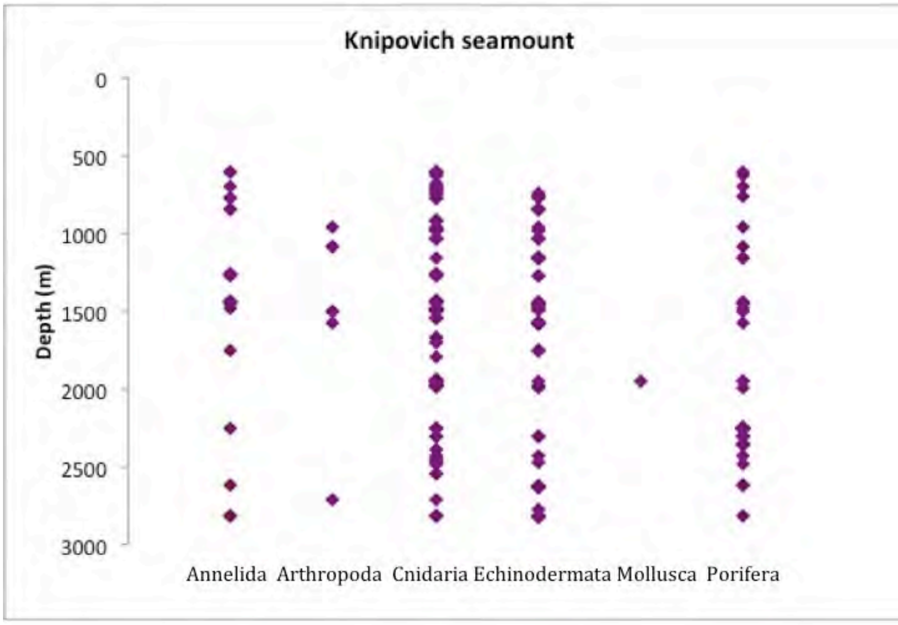


Figure 10.18. Major biology phylum collected at different depths on Knipovich seamount.

Dive 228 > 1993 to 1446 m

The slope here is mostly sediment with large boulders. Boulders dominated areas from 1600 to 1400 m. Black corals, hundreds of stalked crinoids, small yellow octocorals, and small *Ensallopsammia* scleractinian coral were found on said boulders.

In sedimented areas there were pink holothurians, urchins with poison sacks on their backs, and white sea urchins.

A ridge area saw the highest concentration of megafauna; a field of *Ensallopsammia*, large dead and partially overgrown Scleractinia, purple stoloniferous octocorals covered many dead bamboo bases and fans, a rare *Anthomastus* was seen and some large whip bamboo corals completed the community here.

Not many fish were noted; The few seen were large conger-like eels.

Dive 229 > 1019 to 571 m

The beginning of the dive covered an area with some rocky patches. Here many crinoids were collected and much coral framework. Much of the dive was shallow slope dominated by sediment. Megafauna was infrequent (but included large sea pens, 120 cm + tall) and concentrated on the small patches of ancient fossilised reef that intermittently stuck through the sedimented sea floor (and potentially is found just under the layer of sediment up the entire slope – it was certainly there every time any sand excavation took place or a push core was atempted). There were sea urchins, rat tail fish, mounds of sand, presumably housing polychaetes within, and larger errant polychaetes scuttering across the sandy sea floor.

Figure 10.19. Unusual sightings include a dumbo octopus (left) and a long tubular floating 3ft long tunicate colony called a pryosome (see below).

Figure 10.20. Tubular pyrosome.

Dive 230 > 2758 to 1030 m

The deeper areas of this dive, up to 2500 m, were dominated by sediment plains and slopes. The usual sediment fauna of holothurians (sea cucumbers, of a shocking pink variety), sea urchins, starfish and brittlestars were seen. Occasionally burrows in the sediment were also seen. Upwards of 2500 m a system of ledges and rocky patches brought in more sedentary members of the deep community: sponges were frequent and varied (barrels, stalked, small and large), rare octocoral fans of Primnoidae, as well as gold corals of the genus *Metallogorgia*, and some whip-shaped bamboo corals.

At 2170 m depth, *Isis* left the bottom and flew mid-water to get to a shallower area where sampling was required. This part of the dive started at 1190 m. The following section of the dive was dominated by steep and craggy rock formations with many stalked crinoids, urchins, hydroids, black corals and *Paragorgia* fans.

A descent into a canyon at around 1480 m saw a wall of stalked sponges and some large bamboo fans. The dive finished with some gigantic octocorals: a bamboo coral that was larger than *Isis* and at least four 2 m plus wide *Paragorgia* fans (below) covered with snake sea stars and all manner of epifauna.

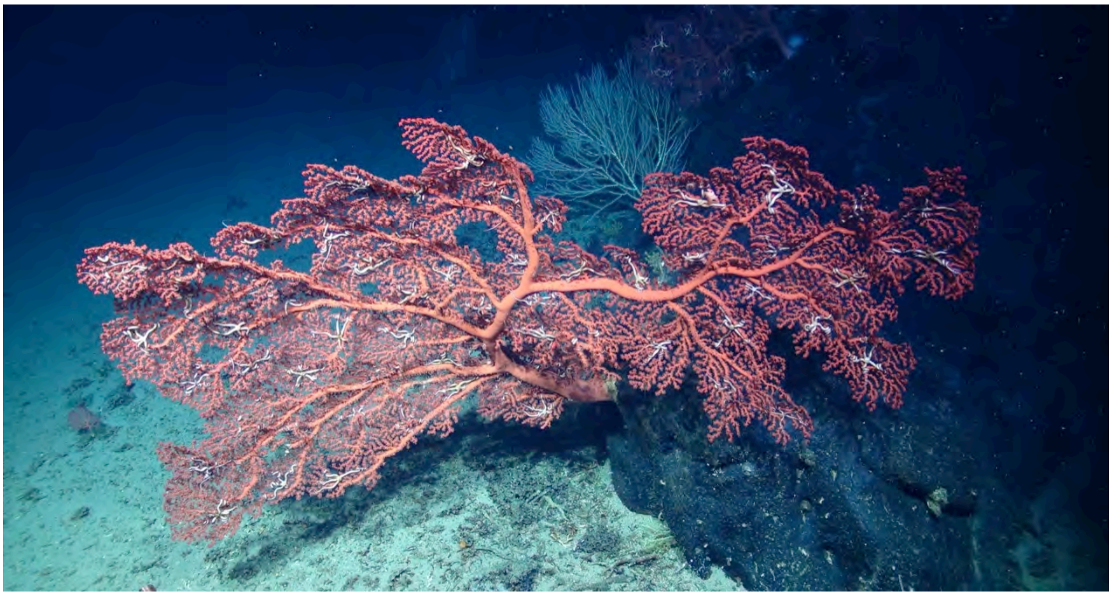


Figure 10.21. A massive and aged colony of *Paragorgia* laden with snake brittle stars.

10.3.3 Vema Fracture Zone (WBA)

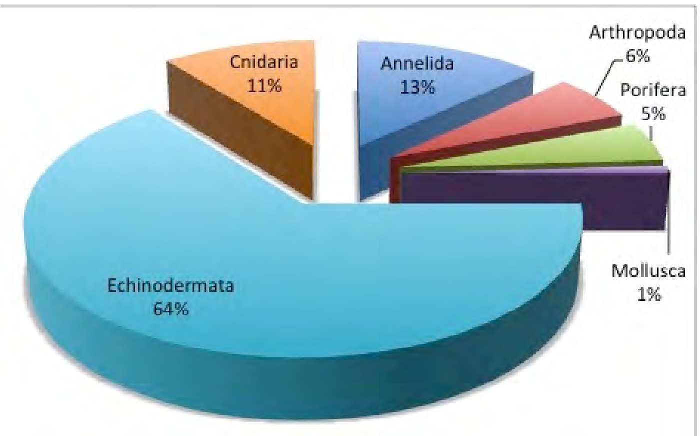


Figure 10.22. Chart showing the breakdown of samples collected from the Vema Fracture zone

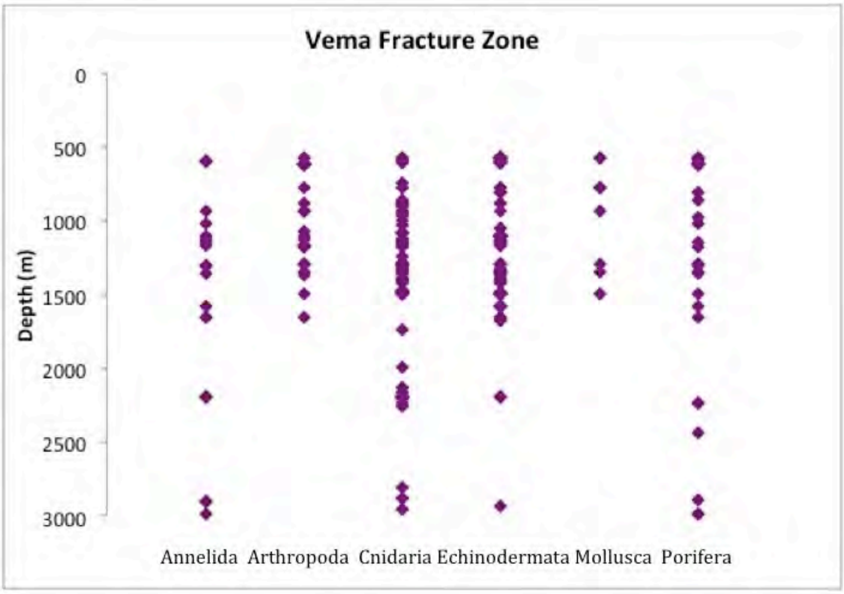


Figure 10.23. Major biology phylum collected at different depths at the Vema Fracture Zone.

Dive 231 > 1097 to 1495 m

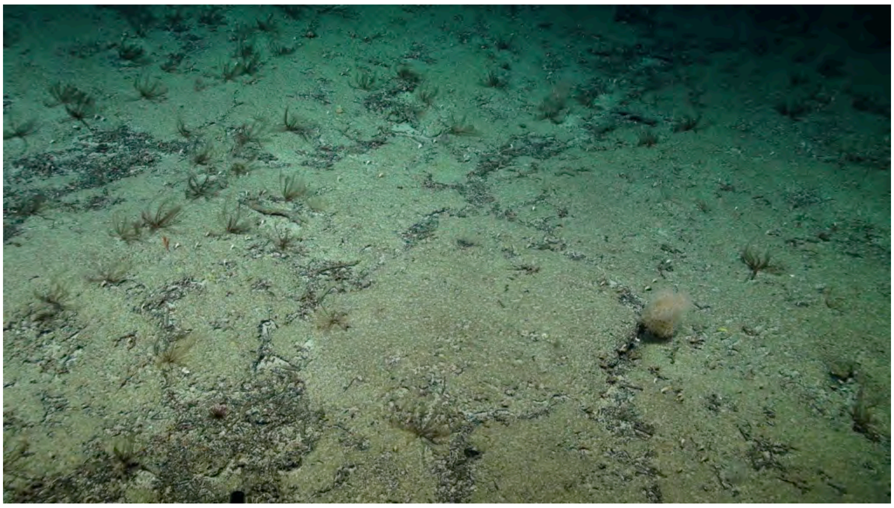


Figure 10.24. Sediment covered rock with a field of crinoids

Crinoids were the dominant fauna seen on this dive. The slope of the dive started as almost flat rock. Large boulders did appear, especially when the slope became steeper. The rugosity of the rocky surface increased on the slopes. Fossil rubble was often present on the more flat rocky patches. Stalked crinoids tended to be more frequent when the rugosity was low. Different, unstalked, crinoids were numerous when rocks were present or rugosity was high. Again very tall sea pens were found in the sedimented areas. *Paragorgia*, long, whip-shaped bamboo corals and *Enallaposammia* fans were found on the frequent boulders outcrops. The number of *Enallaposammia* colonies was especially high close to plateaus, especially around 1350 m and 1405 m depths. Small encrusting sponges were frequently observed as were *Metallogorgia* and *Iridogorgia* and armoured holothurians.

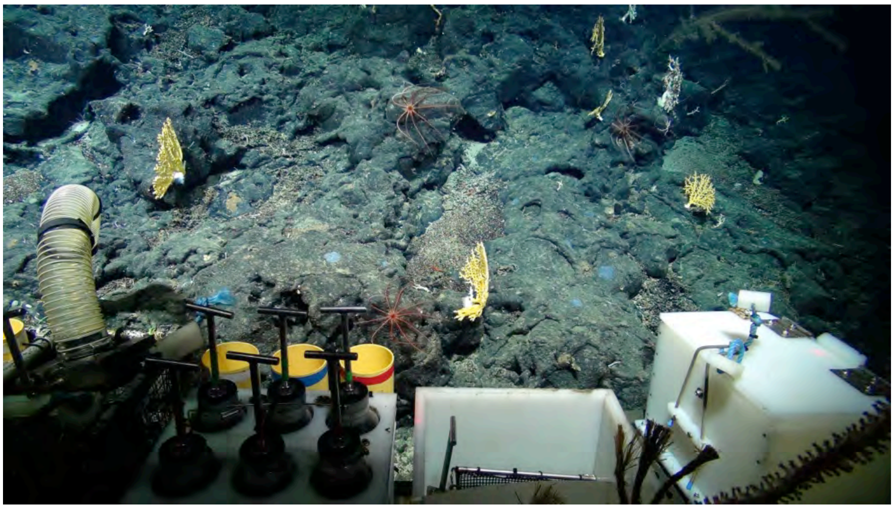


Figure 10.25. View from science camera; in the foreground there are yellow *Enallopsammia* fan colonies, and some large crinoids.

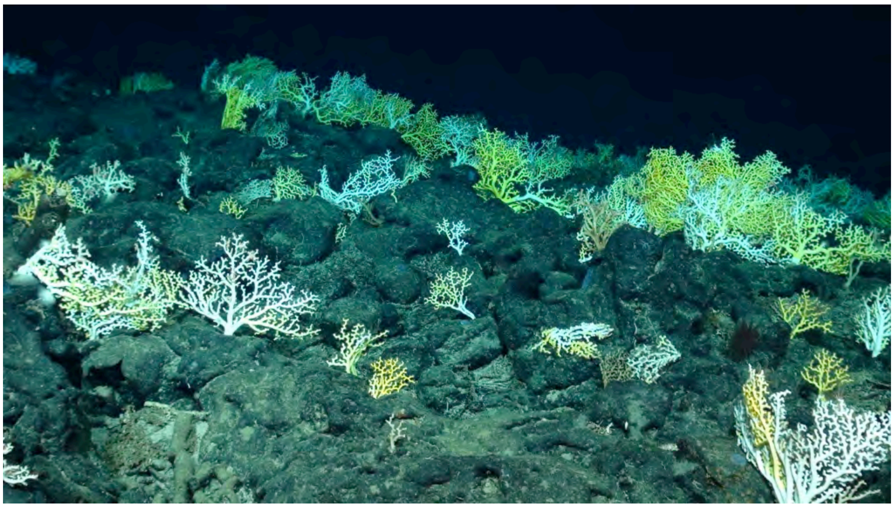


Figure 10.26. A field of yellow (alive) and dead *Enallopsammia* corals.

Dive 232 > 568 to 1302

The dive alternated between relatively steep slopes and flat sediment plains. At the beginning of the dive, the slopes are dominated by live and fossil *Madrepora*, with an occasional live primnoid and large, whip-shaped bamboo corals. Squat lobsters were observed on the *Madrepora*. A red goosefish was spotted around 1270 m depth. Small primnoids were more dominant on rocks on the sedimented plains.

Around 1070 m depth, unattached solitary scleratinian corals, of the genus *Stephanocyathus*, were found on the sediment surface. Large crabs were observed on the sediment plain, and a few pink lobsters were spotted at around 940 m depth. A huge number of shrimp were present as well.


Figure 10.27. An unattached solitary coral, *Stephanocyathus*

A slope at around 630 m, had a few large crabs, many shrimps and squat lobsters are present. More fish, mainly rattails, were seen too. Another goosefish was spotted around 600 m depth (see below).

Figure 10.28. A colourful predatory goosefish

The nets here contained hundreds of brittle stars. Furthermore, an unusual sponge with zoanthids was sampled, with polychaetes living inside the sponge as well.

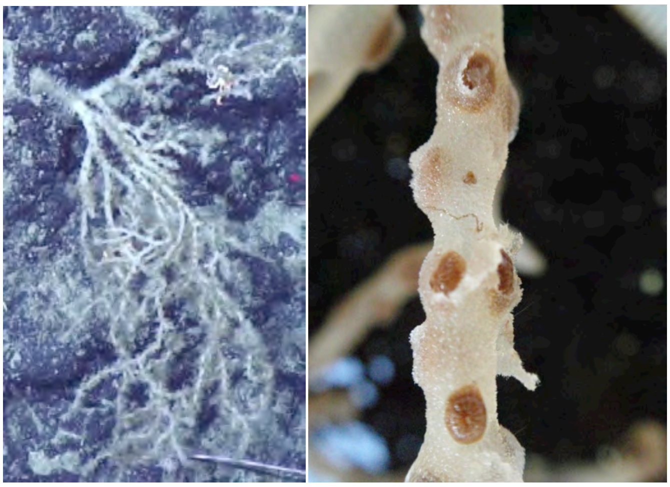


Figure 10.29. A colony of the unusual sponge/ zoanthid symbiosis (left); a close-up of the colony (right).

Figure 10.30. The nets here contained hundreds of brittle stars; above is a close-up of them pre-preservation

Dive 233 - 2985 to 1578 m

The first part of the dive was up a steep slope with small patches of sediments. A few sponges were observed clinging to the walls. Around 2890 m depth, more corals (bamboo corals) and large sponges were found.

Figure 10.31. A variety of sponge fauna

Sediment cover increased around 2870 m depth. Stalked sponges and small bamboo corals dominated the sparse community. At around 2810 m depth, seafloor rugosity increased again and sediment became rare. At the top of this part of the ridge, many corals were present, bamboo corals (branching and whip-shaped), stylasterids, and stylasterids were regularly seen; something that has not occurred since Carter seamount. A goosefish was spotted at 2690 m depth. The slopes that followed had more sediment cover, and sponges dominated the community. On reaching the top of this ridge section, like before, many corals were present. Around 2600 m depth, there was a large sediment plain and a few large sea pens were seen here. A steep slope followed, covered with mainly sediment and large rocks. The rocks disappeared at 2500 m, leaving a sedimentary slope where pink spiky holothurians and a few sea pens were observed. In shallower areas organisms were sparse. Small encrusting sponges are observed, as well as one large *Corallium*. Around 1735 m depth, a few small colonies of *Enallopsommia*, black coral and yellow fan octocorals were found. Bamboo corals were observed more frequent again, as well as sponges.

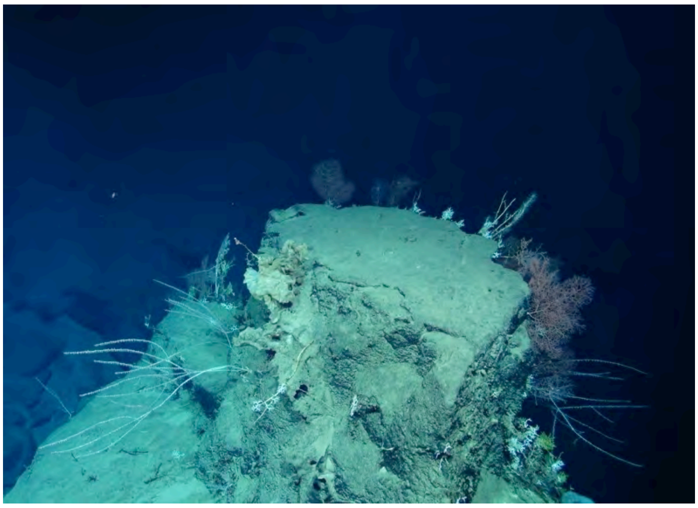


Figure 10.32. A pinnacle covered with long thin bamboo whips and candelabra colonies, Chrysogorgid corals and some soft corals (octocorals).

10.3.4 Vayda seamount (WBA)

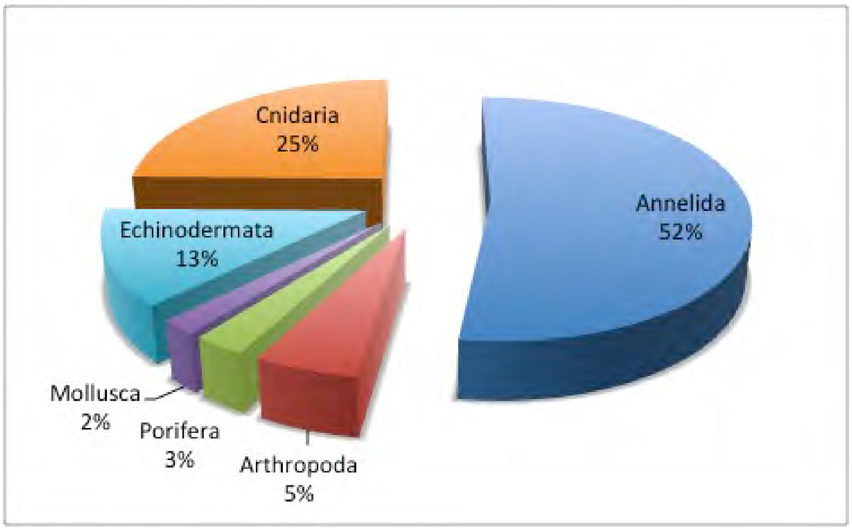


Figure 10.33. Chart showing breakdown of major Phyla collected at Vayda seamount

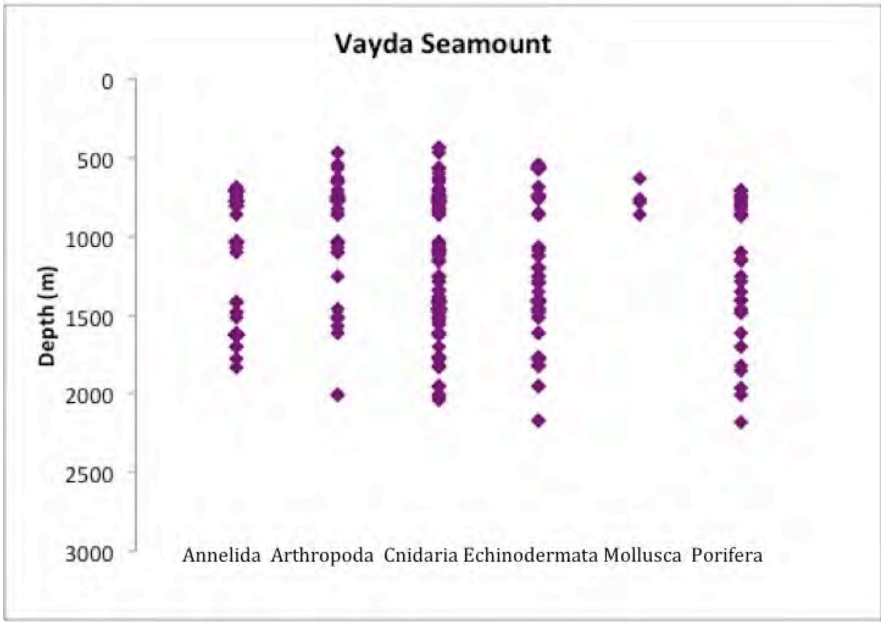


Figure 10.34. Major biology phylum collected at different depths on Vayda seamount.

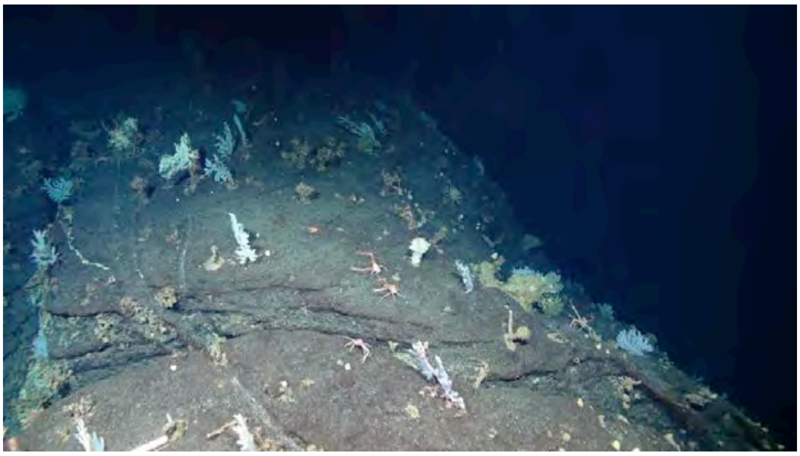
Dive 235 > 1514 to 1070 m

After landing on the seafloor in a field of bamboo fossil branches, with sporadic, small fossil corals, we ascended to a harder basalt rock surface. Here *Metallogorgia*, rare *Ensallospammia* fans, yellow octocorals (Plexauridae) with their commensal brittlestar, and live, long, whip-shaped bamboo corals dominated the community. A huge portion of the community was dead; this included some massive *Corallium* fans, large *Ensallopsammia* colonies - larger specimens than any seen alive. Many of the dead coral fans have been taken over by sponges, creating some huge sponge fans. There was a wide variety of sponges, from small golf balls to large yellow encrusting mats and huge white barrel sponges. Armoured holothurians were regularly seen and collected. We transversed the first rocky mound and then flew in blue water across to the next mound. At the top of the second mound (1100 m) there were a wider variety of octocoral fans (purple Calcaxonia with pale purple brittle star commensals, *Iridogorgia*, and huge whip bamboo corals), alongside the *Ensallopsammia* and rare, usually partially dead, *Corallium* (white polyps). *Anthomastus* were common and for the first time we saw a number of basketstars, *Gorgonacephalus* sp. Again, other than rare rattails, not many fish species were noted.

Dive 236 > 864 to 408 m and 1366 m to 503 m

This was a relatively shallow dive compared to those previous with a relatively shallow slope with thicker sediment cover and many small rocks. Any larger boulders were covered in many sponges, stylasterids, primnoids, and yellow octocorals. A few rare *Swiftia* (bright red octocoral fan) were seen at the beginning of the dive. The remainder of the surveyed area, up to the flat top of the seamount, was ideal for sponges and we saw an array of shapes and sizes. Basketstars (*Gorgonacephalus*) were more apparent in the community, often resting on the top of lilac *Acanthogorgia* octocorals.

Figure 10.35. Large rock face covered in squat lobsters, small colonies of yellow octocorals and stylasterids



At around 750 m depth, a rocky, flat surface started. More corals were present here and less sponges, the sediment cover started to increase, and sponges were seen more frequently again. Squat lobsters were present in relatively high numbers from 740 m depth. A short, steep rocky slope started at 675 m depth, where many live and dead sponges were clinging to the rock wall; Some *Corallium* and primnoids were also observed, as were basketstars and squat lobsters. When the wall had a shallower slope, pencil urchins were occasionally seen. The seamount peak was relatively flat, hard rock face that was dominated by orange, and unusually, black hairy brittlestars. A few fish species were also seen.

Figure 10.36. A bed of brittlestars

We were unable to recover the ROV due to worsening weather conditions. A decision was made to make a transit to a deeper part of the seamount and continue the dive from this point. The ocean floor at the start point of the second part of the dive was a sediment layer on rocky subtrata. Again, many ophiuroids (brittlestars) and yellow crinoids were seen here. Sponges were not as common as in the shallower areas observed. There were also more fish present; Three large sharks floated through our survey area. More anemones appear, especially in the cracks in the rocky surface where sediment is present. At around 1340 m depth, small, whip-shaped bamboo corals start appearing, as well as *Metallogorgia*, and a few small sea pens. Small sponges were again seen in relatively high numbers. At 1055 m depth, a large, flat sediment plain appeared. Only a few small sea pens were present here, as well as a few small fish. At the end of the dive, there were many large boulders with sponges clinging to them and an occasional squat lobster. From 500 m depth, yellow crinoids were the dominant community megafauna. Large *Corallium* fans were seen throughout the dive and infrequent patches of white *Enallopsammia*. And, one large, fossilized shark tooth was collected.

Figure 10.37. A large shark investigating our progress

Dive 237 > 2166 to 1457 m depth

Large, yellow sponges were observed at the beginning of the dive. This was followed by a sediment plain with scarce animal life; Only a handful of small barrel-shaped glass sponges and shrimps were observed. A slope, covered in sediment followed with again hardly any live fauna. The few animals observed included a sea pen, purple star fish, pink sea cucumbers, sponges and *Anthomastus* octocorals (red long polyps, see below).

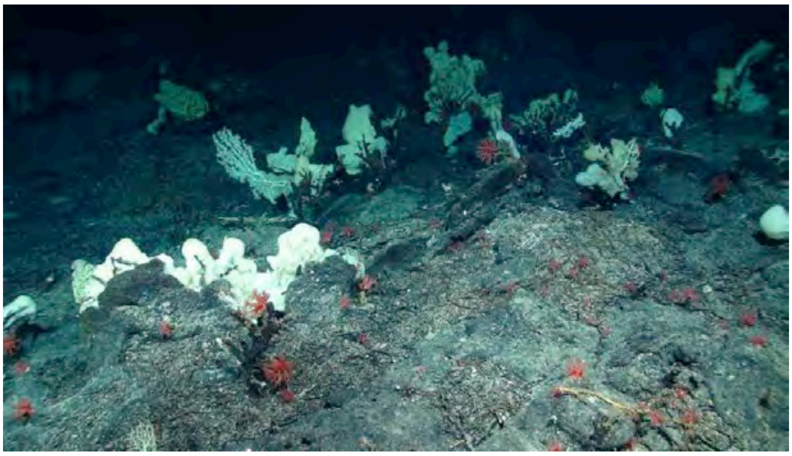


Figure 10.38. Sponge colonies overgrowing dead *Corallium* colonies.

A goosefish was spotted at 2040 m depth. From this point to the shallower areas, more animals were seen; *Metallogorgia* were frequently seen and at around 1830 m depth, large, whip-shaped bamboo corals appear, as well as small yellow octocorals (Plexauridae), *Iridogorgia*, and some small fans of *Enallopsommia*. Sponges of all kinds of sizes and shapes were seen in large numbers. *Anthomastus* became common around 1660 m depth. Large sponges overgrowing dead *Corallium* and shocking purple encrusting octocorals, likely a Clavulariidae, were present too. Many crinoids, brittlestars and *Gorgonacephalus* were again present and frequent.

10.3.5 Gramberg seamount

These dives were very focused on fossil coral collection but we were able to collect a number of biological specimens in the last few minutes of the last dive. Most Cnidaria below are solitary corals. The majority of Annelida were polychaetes found within tunnels on Primnoidae specimens. Again most of the Echinodermata were brittlestars. And the Arthropoda were squat lobsters and a few hermit crabs.

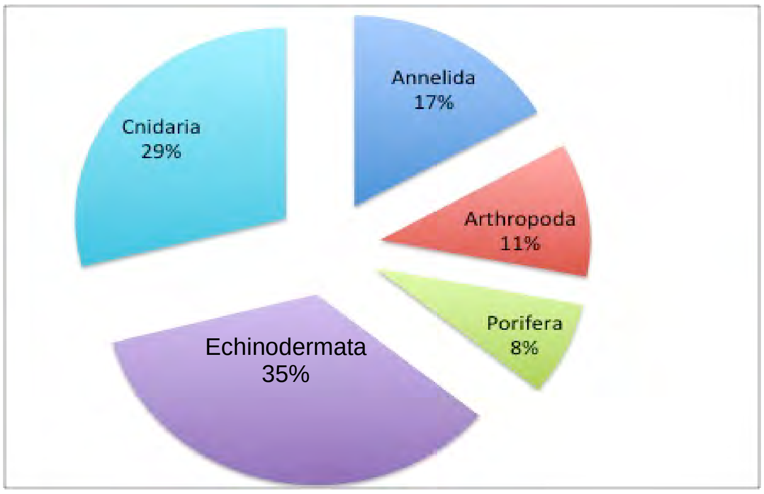


Figure 10.39. Breakdown of biology samples collected from Gramberg seamount

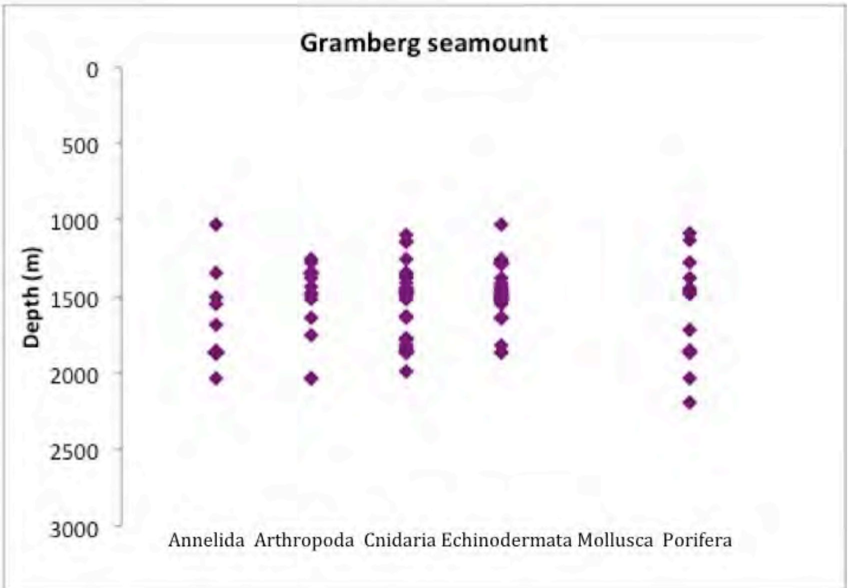


Figure 10.40. Major biology phylum collected at different depths on Gramberg seamount.

Dive 239 – 1565 to 900 m

The dive was relatively bare in animal life until around 1400 m depth. From there on orange curly whip corals were common (Antipatharia), there were large pink bamboo fans and some very small bushes of Chrysogorgiidae. Purple crinoids perched on top of any topography; corals, rocks and sponges. Sponges were low and encrusting and of the tall, stalked variety. There were some very small sea pens in the sediment patches seen and infrequent colonies of *Metallogorgia* and *Iridogorgia*.

The end of the dive, towards the pinnacle of the seamount, was a smoother terrain, covered with crinoids.

Dive 240 - 2155 to 1565 m

Figure 10.41. A thin whip bamboo coral (Isididae) from the beginning of the dive

There was a fine sediment covering of rocky outcrops at the beginning of the dive with little mega fauna. One or two large pink holothurian, infrequent sponges (some large barrel-shaped examples), thin whip bamboo corals (Isididae), rare fan colonies of *Enallopsammia*, and *Metallogorgia.* In the patches of fine sediment a few pennatulacea (sea pens) were seen.

It was decided to finish this dive at the location of the start of Dive 239, where fossil coral fields were seen and sampled. We blue-water transited to this site and finished the dive with a large fossil coral collection followed by collection of a large *Paragorgia* fan, squat lobsters and Primnoidae colonies.

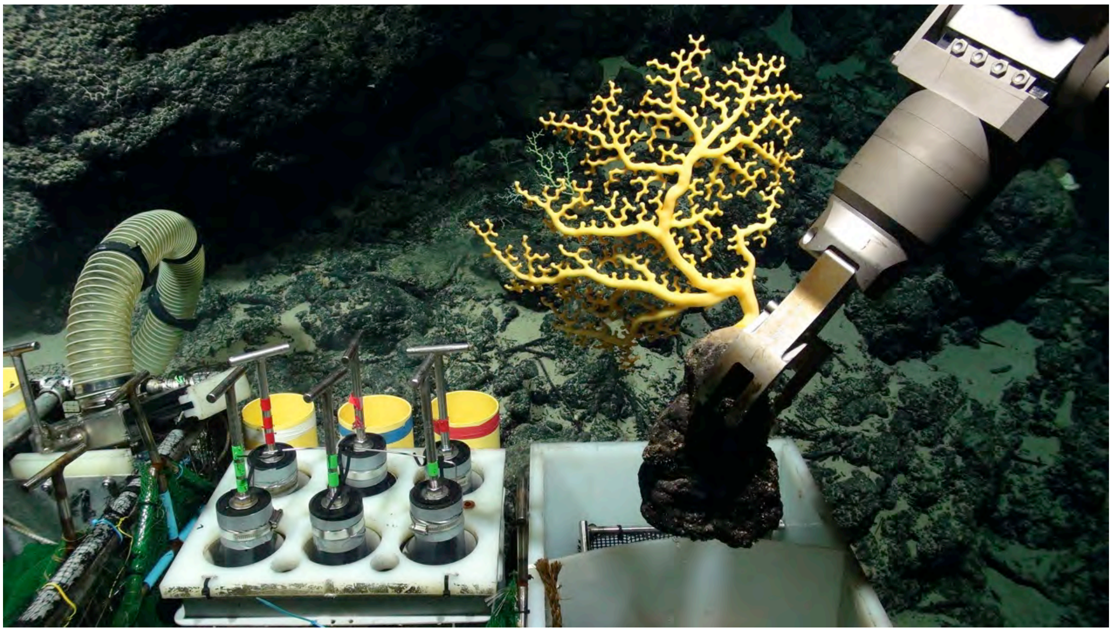


Figure 10.42. Sampling a colony of *Enallopsammia*

Chapter 11
Habitat mapping (Video and ROV mounted Multibeam)

11.1 Habitat mapping

Based on extensive worldwide evidence, seamounts are generally considered as hotspots for biodiversity. A combination of different seabed substrata, in addition to specific oceanographic phenomena and current patterns (e.g. Taylor columns) that promote increased surface production, often results in an increased beta-diversity (species turnover) in addition to higher than average faunal abundance. The seamounts visited during JC094 indeed revealed a wealth of seabed habitats, each with their associated fauna. Especially Carter and Knipovitch Seamounts demonstrated a rich benthic megafauna, at first sight driven by local substratum and slope patterns, although further quantitative study will have to clarify the potential additional role of water mass properties in the spatial distribution of the faunal communities.

The dive transects, ranging from 3000 m to the seamount tops, give a good overview of the different habitats at each of the study sites. An initial classification of some of the seabed video data from Carter Seamount according to substrate type (sediment, boulders, rock, or fields of fossil coral debris) and dominant fauna (representing the community) shows a clear zonation of assemblages, apparently related to depth, slope angle and substratum type (see Fig. 2 under the ROV multibeam section). A full quantification of the faunal assemblages at all sites will be carried out as part of the post-cruise scientific analysis.

To obtain a better insight in the relationships between the faunal assemblages and the local physical factors that create their habitat, high-resolution ROV-based swath surveys were carried out on Carter and Vayda Seamounts (Dives 226 and 238). Derived variables (e.g. rugosity, bathymetric position index, etc.) will be combined with the depth and slope information, and with water mass properties (e.g. ROV CTD data) to quantify the species-habitat relationships. A similar analysis will be carried out at the scale of the entire seamounts, bringing to light potential large-scale faunal patterns and their variation across the Equatorial Atlantic. From the first analysis, it appears that Carter Seamount may be the site with the highest diversity and strongest zonation, although this initial observation will have to be supported by the full quantitative analysis before actual conclusions can be drawn.

11. 2 ROV mounted Reson Multibeam swath bathymetry

Three ROV swath dives were completed during the cruise (D226, D234 and D238). Dive 234 was aimed at the mapping of a vertical wall, and required a specific set-up that will be discussed later. The settings for the traditional downward looking surveys (Dives 226 and 236) are summarised in Table 3. The maximum ping rate was kept at 10 Hz, as this is the frequency of data recording of the Octans attitude sensor. With a survey speed of 0.3kn (0.15 m/s) this gives more than sufficient data density along-track. The pressure reading from the Parascientific Digiquartz depth sensor is not correctly converted to depths within PDS2000, hence all data were recorded as relative depths below the vehicle. Actual vehicle depths were then applied during post-processing, using depth values recorded in TECHSAS.

Dive 226 - Carter Seamount

The aim of Dive 226 was to carry out a detailed bathymetry survey to support habitat mapping work on the flanks of Carter Seamount. Throughout Dives 222 and 223, the scientific party had observed a distinct zonation in faunal assemblages, partly related to the type of substratum (rock, boulders, sand). A survey plan, including a set of terraces and steep slopes, was prepared. Once the ROV was at the seabed, however, a number of issues prevented us to complete the entire survey plan, and only the shallower half was completed (depth range 350-700 m). The problems included software instabilities in PDS2000 (acceptance of the USBL incoming stream and calculation of the ROV position is dependent on the exact name of the USBL beacon, and may require switching off and on various parameters.

Similarly, the XYZ calculation of the multibeam data only came on after toggling between vessel and ROV). The second problem encountered during the survey consisted of a strong current, which pushed the ROV back onto its track each time the vertical thruster had to be engaged (and hence the horizontal thrusters received less power). In addition, one vertical thruster was out of use.

Altogether the survey covered 0.89km^2 of an area consisting of rocky terraces and ledges, which do correspond well to the habitats observed. A very preliminary example of the data is presented in Fig. 11.2.

Table 11.1 RESON survey settings for Dive 226 and Dive 238

	Dive 226 - Carter	Dive 238 - Vayda
MBES Frequency	400 kHz	400 kHz
Altitude	50 m	40 m
Line spacing	150 m	120 m
Beam angle	120-140°	140°
Power	217 - 210 dB	210 dB
Gain	39 -22 dB	15 dB
Pulse length	80 - 60 µsec	60 µsec
Absorption	0 - 85dB /km (not set for line1 - adjusted early in line 2)	85 dB/km
Spreading	0 - 20dB/km (not set for line 1, adjusted early in line 2)	30 dB/km
Duration (at seabed)	15 h 30 min	14 h 35 min
Survey speed	0.2-0.3 kn	0.3-0.5 kn
Area covered	893500 m^2	1160989 m^2
Pixel size	50 cm	40 cm

Dive 238 - Vayda Seamount

The second downward-looking swath dive comprised a study of a spur and associated set of subcones on Vayda Seamount, covering a depth range of 550-850m. The current conditions were very good, and a survey speed of up to 0.5 kn could be maintained during the second half of the survey. The area had been visited before, at the start of Dive 238, and contains a range of habitats, including sponge fields, mixed sponge and soft coral communities and more barren rocky landscapes. Also in terms of geology and geomorphology, a range of features was observed that could provide more information on the formation history of Vayda Seamount. They include rocky strata with different erosional properties, potential lava flows and small mass-wasting features (rock falls, slab slides). The total area covered exceeded 1 km^2; Fig. 11.3 shows an example of the results.

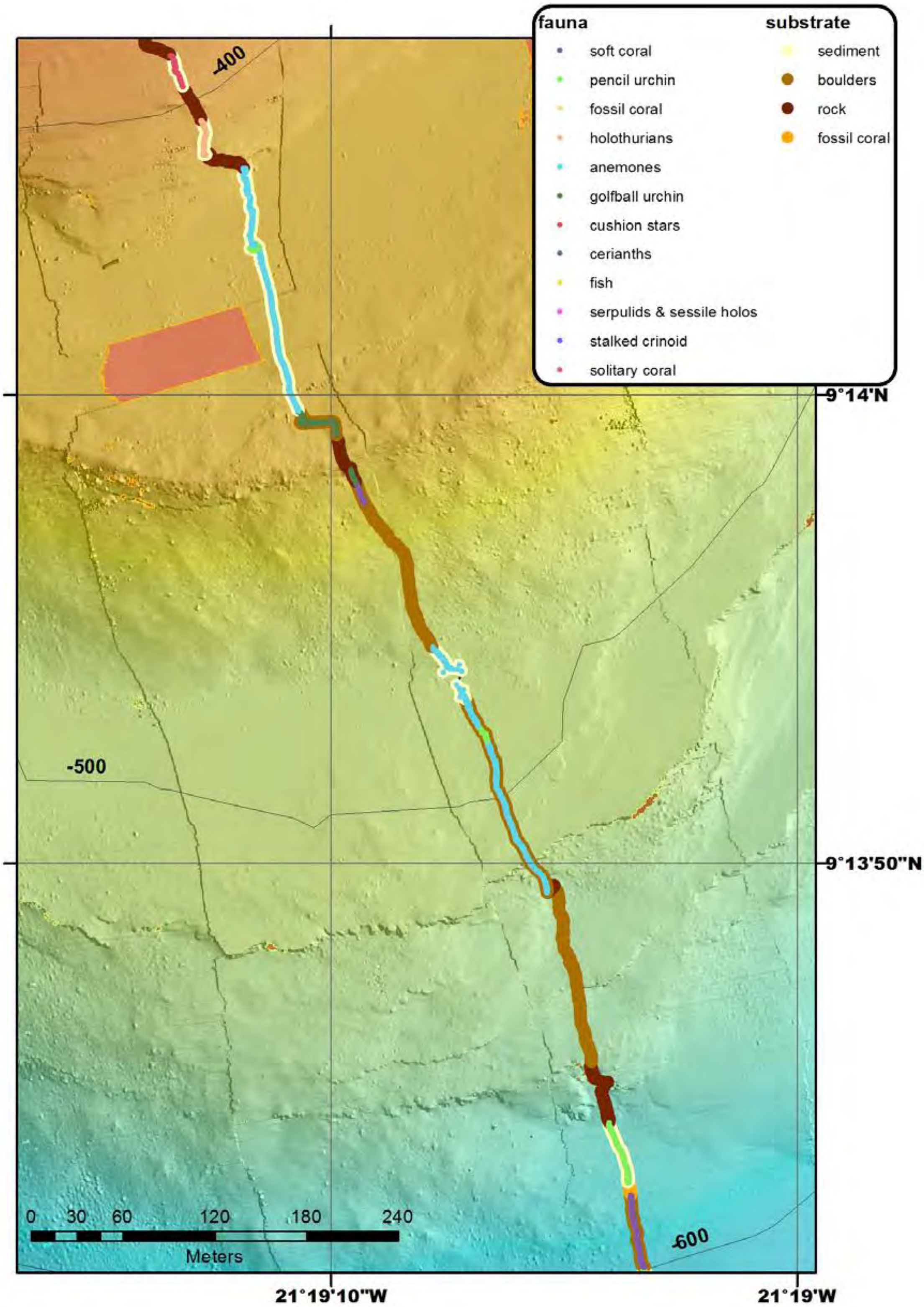


Fig. 11.2 Zoom on part of the ROV multibeam survey results of Carter Seamount, including a preliminary classification of the faunal assemblages and seabed type along Dives 222 and 223.

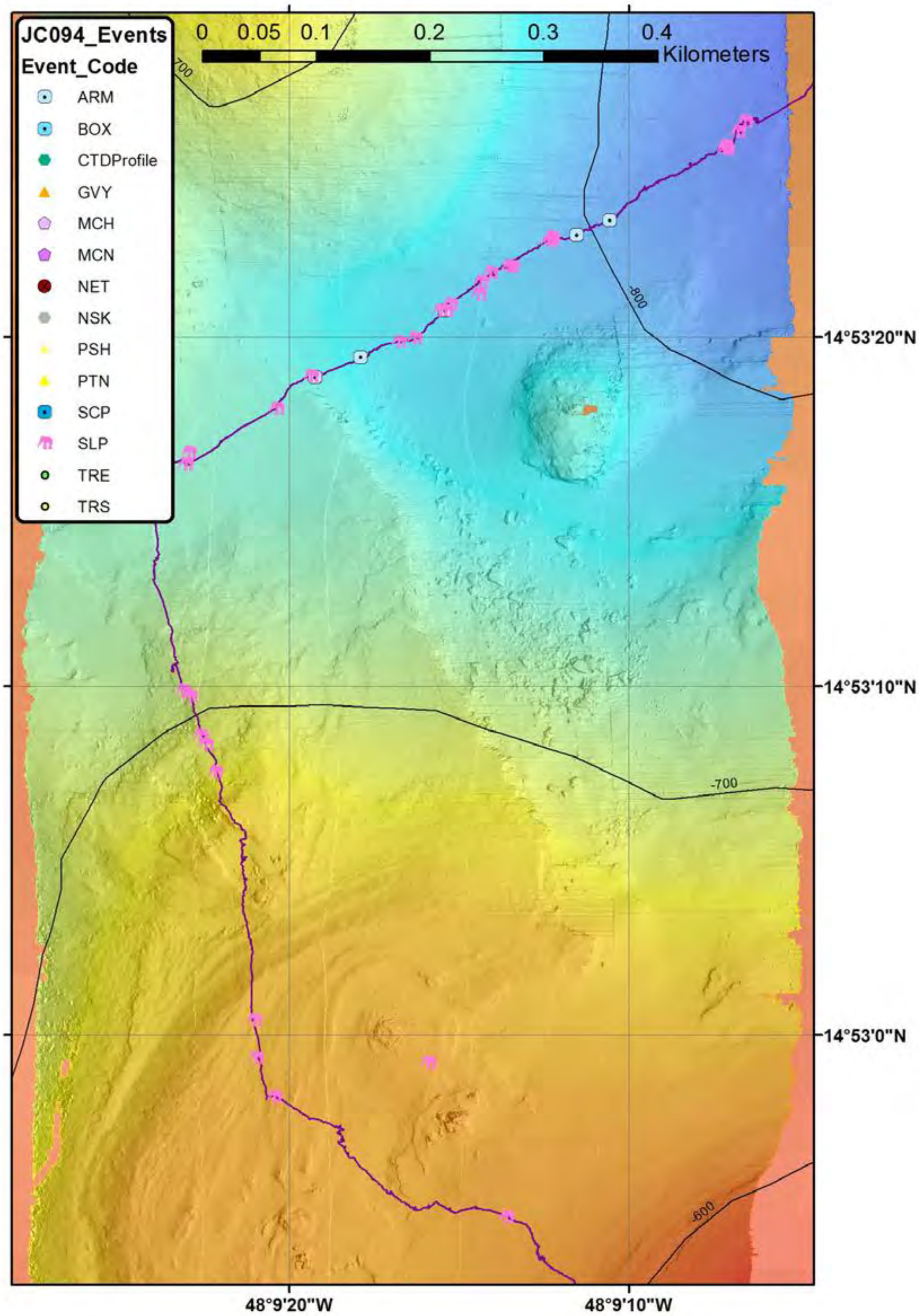


Fig. 11.3 Extract of the Vayda microbathymetry data collected during Dive 238, including the track and sample locations of Dive 236.

Dive 234 - Vema Seamount forward mapping

The second ROV multibeam dive was carried out with an entirely different setup: the Reson system was mounted on the front of the ROV, in a forward-looking position, with the aim to map a set of three steep cliffs on Vema Seamount. This technique has been trialled on ISIS once before, with the previous Simrad SM2000 multibeam system (see Huvenne et al. (2011) for details and results). The offsets from the common reference point on ISIS are listed in Table 4 (measured in the standard reference frame - this will be rotated during the processing stage).

Table 11.4 Offsets for the various sensors versus a common reference point on ISIS (front of vehicle) as used for the forward mapping approach, within the conventional vehicle reference frame (X: positive starboard, Y: positive forward, Z: positive up, all in metres)

	X	Y	Z
Compatt (USBL)	-1.01	-0.36	1.46
Doppler	0.58	-2.91	-0.17
MBES	0.215	0.115	0.344
Octans (attitude)	0.00	-0.86	-0.49
Parascientific (depth)	0.55	-1.48	0.00

The vehicle was flown in a set of parallel passes, each pass being carried out at a constant depth and with a constant distance from the cliff face. Surveys were carried out at 50m, 20m and 8m distance, the latter one combining the acoustic mapping with visual surveying using the HD Pilot camera. Unfortunately, damage had been detected in the HD Science camera during the pre-dive checks, which meant this video stream was not available for Dive 234. Hence video recordings were also made with the Pilot PAL camera, which is installed on the same pan-and-tilt unit as the HD Pilot camera. The SCORPIO camera was taken off the vehicle to make space for the Reson system. A photograph of the setup is shown in Fig. 3, and the main multibeam settings are listed in Table 5.

Fig. 11.3 ISIS set-up for forward-looking swath surveys.

Table 11.5 RESON survey settings for Dive 234

	Dive 234 -Vema
MBES Frequency	400 kHz
Distance from wall	50, 20, 8 m
Line spacing	90, 45 m
Beam angle	120-140°
Power	210 dB
Gain	20 dB
Pulse length	60 µsec
Absorption	85dB /km (not set for line1 - adjusted early in line 2)
Spreading	30dB/km (not set for line 1, adjusted early in line 2)
Duration (at seabed)	15 h
Survey speed	0.3 kn

Initial data processing was undertaken at sea, to confirm the collection of a robust dataset. However, further work is necessary before a coherent overview map can be made. This will involve a double coordinate transformation on the raw data, and the smoothing of the USBL navigation. Due to the close distance to the rock, the USBL signal was fairly noisy. Unfortunately, the irregular terrain also caused problems for the Doppler signal, which therefore was not reliable.

Once fully processed, the vertical swath will be integrated with the horizontal ship-borne bathymetry data, and with the species assemblage information extracted from the video data.

Chapter 12
Anthropogenic litter and sampling of surface water and sediment for microplastics

Introduction: Plastic pollution has been evident in the seas over the last 50 years (Ryan & Moloney 1993; Gregory & Ryan 1996; Derraik 2002; Carpenter *et al.* 1972). In 2004 small, degraded plastic particles, termed microplastics were first discovered in surface water and inter-tidal sediment (Thompson *et al.* 2004). Plastic litter is known to be environmentally damaging to the environment. The main problem with large plastic litter is when it is retained in organisms' stomachs after ingestion, and filling them up, thus interfering with food digestion. In addition to the problems of mega debris, microplastics also convey persistent organic pollutants and heavy metals from surface waters into the depths. (Andrady 2011; Teuten *et al.* 2009). Recently microplastics were observed in deep-sea sediment for the first time (Woodall *et al.* in preparation). The research objectives for JC094 have been designed to examine specific hypotheses on the accumulation of microplastics and the toxicity of these pollutants.

Objectives

- Collect surface water samples at regular intervals along the transect from Tenerife to Trinidad.
- Collect sediment cores whenever possible.
- Collect surface water samples at every sediment core site and along the Atlantic transect.
- Collect seabed litter, ideally plastics, on an opportunistic basis.

The objectives of the cruise were implemented to ensure that microplastics were sampled from both surface water and sediment, from the East and West basins of the Atlantic. In addition, seabed litter was also targeted in-order to fully describe what was present at depth and also to sample biofilms present on anthropogenic litter items. The litter and microplastics recovered from the sea water and sediment will be assessed for biofilm communities at a later date using pyrosequencing, and meiofaunal communities will be documented.

Photo 12.11.1: Clean for plastics environment laboratory.

Methods

Sediment: The mega coring and ROV push coring protocols are described in other sections of this report (ROV ISIS and Coring). Once on deck sediment cores were removed to a clean environment container, which was cleaned for plastic debris (Photo 12.11.1). Once samplers donned protective gear (boiler suit, lab coat and head scarf), standard core slicing procedures were followed. Clean protocols were adhered to, ensuring control filter paper was exposed to the laboratory environment during the core slicing process. In brief: the cores were extruded and sampled for 0-2cm and 2-5cm horizons. The top water was also retained whenever possible. All mega core sections were subsampled with ROV core size tube (57mm diameter), after sections were sliced. All sediments were then preserved in at least two layers sterile aluminium foil, separated by paper towel, then placed into a cardboard box and removed to a -80°C freezer.

Water: Surface water samples were obtained through the standard 'non-toxic' salt water supply to the laboratories using regular ship pipework. The tap was flushed for at least five minutes, then water flow rate measured. If the sampling was on station, depth of equipment was checked to ensure it was greater than 150m. A clean sieve was then placed under the tap for sampling. At the end of the sampling duration (either 12h or when the equipment was to rise above 150m below the surface), the sieve was removed and water flow rate measured again.
Sieves were then rinsed into cleaned and new glass vials, sealed and placed in -80°C.

Litter

Sampled: Litter items were sampled with ROV Isis during scheduled dives. Once on deck, the litter samples were removed using sterile forceps, placed in a metal container taken to the 'clean environment container laboratory' for further processing. Litter that could be cut was divided by sterile scissors into at least five pieces of approx. 1cm^2 material, with the remaining material retained for reference. Objects that could not be divided in this way were preserved whole. All items were preserved as described above for the sediment samples, in layers of sterile aluminium foil, then stored at -80°C.

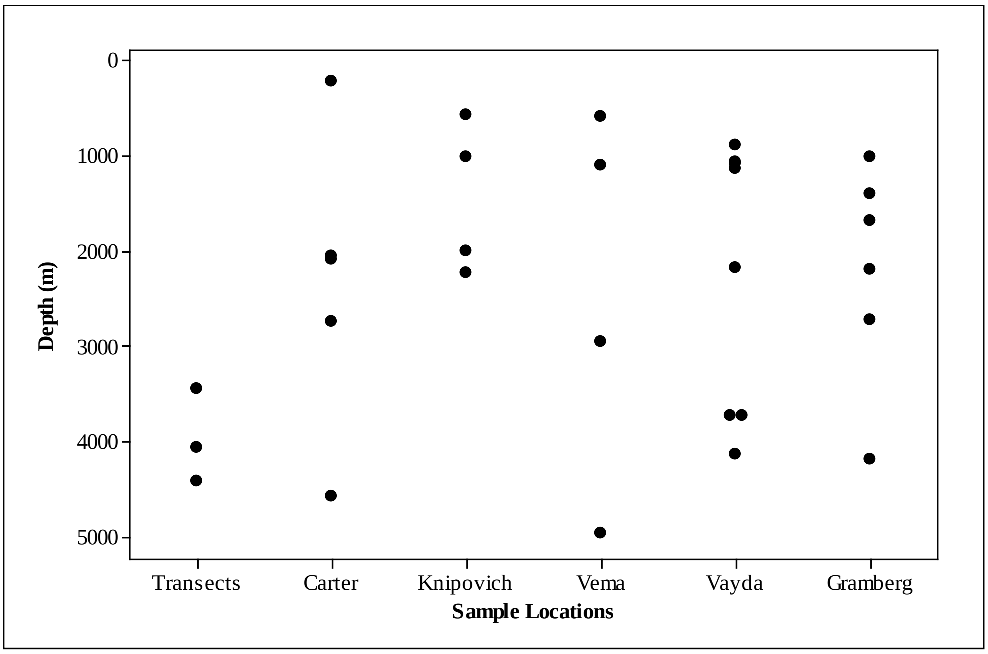
Observations: ROV ISIS HD video recordings from 'SCORPIO' camera were analysed for litter items. During the dive litter items were recorded by dive observers on OFOP. At completion of the dive the litter records were scrutinised, then accepted or rejected based on video recorded. All video was screened for anthropogenic litter, running footage at four times normal speed, using VARS (EMBARI). Any additional litter items seen were added to those recorded in OFOP. In this way the most conservative estimates of litter items were documented.

Samples: In total 102 samples were collected. Most were surface water samples collected at science stations.

Location	Surface water UW	Surface water at station	Sediment	Litter
TRANSECT	20	0	3	0
CARTER	0	12	7	3
KNIPOVICH	0	4	5	2
VEMA	0	6	3	2
VAYDA	0	5	8	6
GRAMBERG	0	5	6	0

Table 12.11.1: Summary of samples taken for anthropogenic study.

Sediment cores: Sample details are recorded in 'Sediment' Chapter 7. Below is a summary of locations and depth of samples collected (Graph 12.11.1).



Graph 12.11.1: Depths from which sediment samples were successfully collected.

Water: Sample details are recorded in 'Underway sampling' Chapter 6. Below is a summary map of where surface waters were collected.

Litter: Litter was seen at all sample locations, however the nature of the litter varied between sites and those items that could be directly attributed to the fishing industry were only found at three sites (Carter, Vayda and Gramberg),(Photo 12.11.2). A summary of the litter seen during the ROV Isis dives (Table 12.11.2) and samples collected are given below. Ghost fishing gear (probably from long-line fishery) became entangled on ISIS at Vayda (Dive 236). Further analysis of the video is required to determine at which location the gear first became snared.

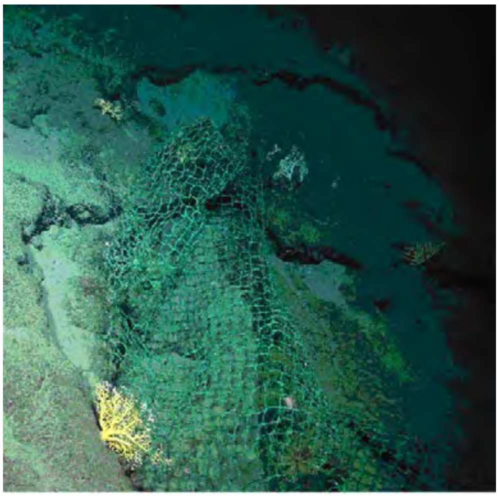
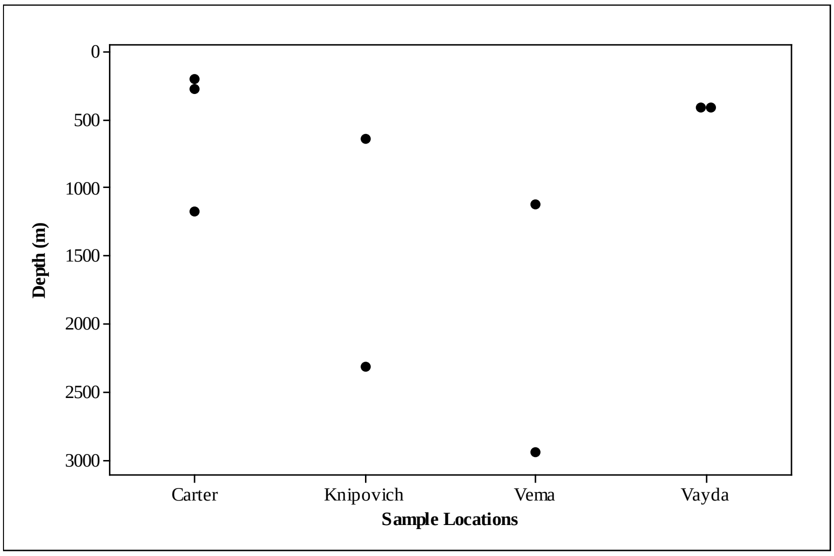


Photo 12.11.2: Dive 227- Carter Seamount, ghost fishing gear.

Location	Glass	Plastic	Metal	Rubber	Other
CARTER	6	8	4	2	1
KNIPOVICH	2	0	2	0	0
VEMA	3	0	1	1	2
VAYDA	0	6	1	0	0
GRAMBERG	0	1	0	0	1

Table 12.11.2: Litter seen from ROV ISIS video footage.



Graph 12.11.2: Depths from which litter items were successfully collected.

Glass bottles were the most numerous items of litter seen (Photo 12.11.3), and were seen at all sites. In addition rubber objects were also common (Photo 12.11.4). The only confirmed plastic litter was found at Vayda, this included a large red box (Photo 12.11.5). All the litter seen could easily have come from passing shipping, although this route of entry into the environment can't be confirmed (Photo 12.11.6). However more unusual items were also seen (Photo 12.11.7).

Photo 12.11.3: Glass bottle.

Photo 12.11.4: Insulation rubber.

Photo 12.11.5: Red plastic box.

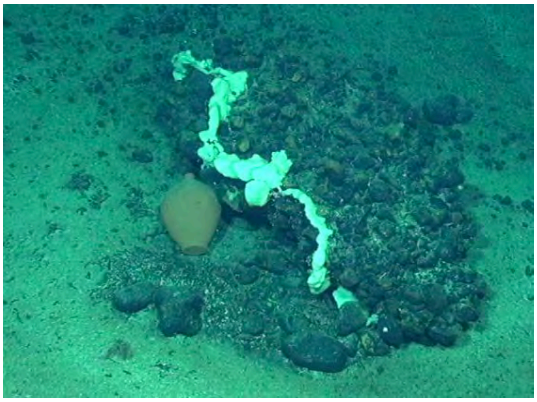


Photo 12.11.6: Urn.

The nature and the main objectives of the scheduled ROV ISIS dives (fossil and live coral collection) meant that specific depth ranges were targeted, thus an unbiased assessment of litter at the sampling sites was not possible. In future analysis the number of litter pieces per m of transected seabed could be determined. In addition the depth bias and distance from seamount summit could also be worked out.

Summary: Water, sediment and litter samples were successfully collected at all stations. In addition surface water was sampled during the entire transect of the Atlantic Ocean from East to West. Future analyses of these samples are required to provide details on abundance and variety of microplastic fibres and meiofauna, as well as the composition of biofilm communities.

Chapter 13: Outreach report

13.1. Social media
Kate Hendry
A cruise blog was maintained (http://tropics.blogs.ilrt.org), with a total of 25 blog posts, daily photos, and background information on the cruise, deep-sea corals, personnel, laboratory work, relevant publications, and links to the cruise Twitter, Flickr (72 photos) and Facebook accounts. In addition, 4 podcasts were made throughout the cruise, and posted on the cruise YouTube channel. More podcasts will be produced about the cruise in 2014 and a highlights video will be made available to the public in the Bristol Aquarium in 2014.

13.2. Press releases
Kate Hendry
Press releases were given by the European Research Council; news articles appeared in the Southern Daily Echo (UK), Servico de Information y Noticas Cientificas (SINC, ES, www.ageniciasinc.es) and will be reported in The Trinidad Guardian and via the Royal Society, UK.

13.3. Nature Live, Natural History Museum (NHM), London, 20th November 2013
Lucy Woodall
A Nature Live event is run daily by the public engagement team (PEG) at NHM. At these events scientists who work at NHM talk to a general public audience who are visiting the museum. The Nature Live is advertised across NHM and takes place in a specially designated lecture theatre/studio room in the new part of NHM (The Darwin Centre). The room is called the Attenbourgh Studio as it was named by Sir David Attenbourgh and holds about 100 people when at capacity.

Preparation prior to 15th November

1. Met with PEG team to discuss how to run the event and put in place a contingence in case communication from the ship was not possible.
2. Once aboard James Cook good quality images of cruise were sent to NHM
    - ship life (e.g. The mess)
    - sampling equipment (e.g. Megacorer)
    - sample processing (e.g. coral drying and sorting in deck lab)
    - underwater images from ROV
    - movie of the ship's track, made by Leigh Marsh
3. Test phone calls made from the NHM facilitator to James Cook on 15th and 18th November. All these were successful and the line was clear.

The Event

1. Initially NHM could not reach the ship by telephone, but eventually they got through, twice.
2. In both calls the satellite reception from the ship was not good enough for the Attenbourgh Studio to hear me and for me to stay connected on the telephone line.
3. The backup plan was employed. A colleague from NHM was in the studio, she has previously been to sea and talked through some of the images I sent and some photo that she had from past research cruises.

Outcome

1. The studio was at capacity for the event.
2. The event was recorded and will be available as a podcast from NHM.
3. I have been asked to do a follow-up event in January for the Nature Live.

Appendices for JC094

Appendix 1: Station logs

Appendix 2: Event logs

Appendix 3: Coral log

Appendix 4: Water numbers

Appendix 5: Underway samples

Appendix 6: ROV dive plans

Appendix 7: ROV dive maps

Appendix 8: Sponge samples

Appendix 9: Sediment samples

Appendix 10: Isis logsheets

Appendix 11: Isis Technical report

JC094 STATION LOG

NSK= Niskin **SLP**= Slurp **SCP**= Scoop **MGA**= Mega Core **KTN**= Kasten **BOX**= BoxCore **GVY**= GravityCore **PTN**= PistonCore **DRG**= Dredge **PSH**= PushCore **NET**= Net **ARM**= Arm

blue entries= from ofop | yellow entries that have been corrected and hence differ from the Sample Logs | DIVE START/STOP = ON/OFF bottom | ALL OTHERS START/STOP = IN/OUT of water

Cruise	Station #	Location	Gear	Gear #	JDay (Start)	Start Date	Start Time GMT	Start Lat ° N	Start Lat Min N	Start Long ° W	Start Long Min W	Start Lat (DD)	Start Long (DD)	Start depth (m)	JDay	End Date	End Time GMT	End Lat ° N	End Lat Min N	End Long ° N	End Long Min N	End Lat (DD)	End Long (DD)	End depth (m)	Comments	success?
JC094	001	TRS_1	CTD	CTD001	288	15/10/2013	09:02:57	25	5.0160	21	24.8350	25.0836	-21.4139	4552	288	15/10/2013	09:25:00	25	5.0130	21	24.8370	25.0836	-21.4140	4543	practice CTD, profile taken, niskins	success
JC094	002	EBA	CTD	CTD002	292	19/10/2013	04:16:00	9	17.0700	21	37.9300	9.2845	-21.6322	4522	292	19/10/2013	08:10:00	9	17.0680	21	37.9530	9.2845	-21.6326	4525	CTD in and out of water (mini core attached at 04:10:00). 24 successful bottles.	success
JC094	003	EBA	ROV	ROV221	292	19/10/2013	15:30:00	9	13.2100	21	18.9900	9.2202	-21.3165	914	292	19/10/2013	19:18:00	9	12.6000	21	18.6600	9.2100	-21.3110	523	Recovered Isis Dive before it got to the bottom. Problems with USBL	failed
JC094	004	EBA	ROV	ROV222	293	20/10/2013	03:57:00	9	12.9600	21	18.9500	9.2160	-21.3158	1090	293	20/10/2013	18:25:00	9	13.4100	21	18.8900	9.2235	-21.3148	642	Successful dive. 5 niskins, fossil coral, bio and rocks. Push cores failed	success
JC094	005	EBA	ROV	ROV223	294	21/10/2013	00:03:00	9	13.3707	21	18.8346	9.2228	-21.3139	672	294	21/10/2013	16:15:00	9	14.8239	21	19.7070	9.2471	-21.3285	214	Fossil collections at base. Barren patches on way up. Lots of live sampling	success
JC094	006	EBA	MGA	MGA001	294	21/10/2013	17:45:00	9	13.4250	21	18.8930	9.2238	-21.3149	640	294	21/10/2013	19:29:00	9	13.4260	21	18.8940	9.2238	-21.3149	642	no sediments recovered but two tubes had fossil corals.	failed
JC094	007	EBA	ROV	ROV224	294	21/10/2013	22:46:00	9	11.7300	21	17.0500	9.1955	-21.2842	2140	295	22/10/2013	14:20:00	9	12.3600	21	17.9000	9.2060	-21.2983	1354	saw fossil corals at landing. Large collection. Traversed up seamount collecting fossils and samples. Hard to collect push cores.	success
JC094	008	EBA	MGA	MGA002	295	22/10/2013	21:18:00	9	16.6830	21	38.2730	9.2781	-21.6379	4590	295	22/10/2013	23:49:00	9	16.6830	21	38.2720	9.2781	-21.6379	4590	3 cores succeded. 3 did not fire. 2 were empty. Niskin success	success
JC094	009	EBA	PTN	PTN001	296	23/10/2013	04:48:00	9	16.6833	21	38.2726	9.2781	-21.6379	4567	296	23/10/2013	10:04:00	9	16.7045	21	38.7911	9.2784	-21.6465	4568	7.5m of mud recovered. Forams at base	success
JC094	010	EBA	MGA	MGA003	296	23/10/2013	14:52:00	9	10.1611	21	16.2655	9.1694	-21.2711	2755	296	23/10/2013	17:40:00	9	10.1440	21	16.2440	9.1691	-21.2707	2748	All fired, but no sediment collected. Niskin fired-Lucy	failed
JC094	011	EBA	ROV	ROV225	296	23/10/2013	20:41:00	9	10.1700	21	15.9220	9.1695	-21.2654	2743	297	24/10/2013	16:05:00	9	11.4000	21	16.0800	9.1900	-21.2680	2075	Deep part of dive sandy plain with scarce life. Moving up slope began to see rocks then some scattered corals. Around 2200 barnale shells. We were able to collect live solitary corals at several depths. 6 push cores recovered.	success
JC094	012	EBA	MGA	MGA004	297	24/10/2013	19:29:00	9	13.3701	21	18.8860	9.2228	-21.3148	662	297	24/10/2013	20:30:00	9	13.3690	21	18.8870	9.2228	-21.3148	662	Came back with 7 broken tubes, no sediment recovered. Niskin fired but no one sampled.	failed
JC094	013	EBA	ROV	ROV226	298	25/10/2013	23:23:00	9	13.9720	21	18.9630	9.2329	-21.3161	510	299	26/10/2013	17:59:00	9	13.8780	21	19.3600	9.2313	-21.3227	655	Reson multibeam survey of previous dive sites	success
JC094	014	EBA	MGA	MGA005	299	26/10/2013	18:03:00	9	13.4200	21	18.8900	9.2237	-21.3148	642	299	26/10/2013	19:01:00	9	13.4200	21	18.8900	9.2237	-21.3148	645	No cores retrieved. Some coral and foram sand found.	failed
JC094	015	EBA	ROV	ROV227	299	26/10/2013	22:09:00	9	12.3290	21	17.9400	9.2055	-21.2990	1357	300	27/10/2013	16:56:00	9	13.4500	21	18.8130	9.2242	-21.3136	675	Extensive coral (love and solitary) collections at 1400m and 800m. Beautiful coral gardens 1300-1200m. Problems with slurp chambers- lots of material stuck in the tube.	success
JC094	016	TRS_2	MGA	MGA006	301	28/10/2013	03:29:00	7	48.0019	21	24.0040	7.8000	-21.4001	3400	301	28/10/2013	06:55:00	7	48.0000	21	24.0000	7.8000	-21.4000	3400	max tension= 3.60-3.71. 3 tubes came up full, but two emptied once out of the water. 2 trigger devices snapped. Core sampled without taking pore fluids	success
JC094	017	TRS_2	PTN	PTN002	301	28/10/2013	08:05:00	7	48.0200	21	24.0100	7.8003	-21.4002	3394	301	28/10/2013	11:52:00	7	48.0010	21	24.0000	7.8000	-21.4000	3406	max tension= 5.95tons.looked to be a clean hit and pull out. Mud in core catcher but barrel empty and core catcher a little bent	failed
JC094	018	TRS 2	GVY	GVY001	301	28/10/2013	16:13:00	7	26.1020	21	47.7780	7.4350	-21.7963	3426	301	28/10/2013	19:19:00	7	26.0914	21	47.7800	7.4349	-21.7963	3425	max tension= 4.94 ton at pull out. Core succesful. Completely full up to the top valve in the barrel. 5.34m of sandy mud	success
JC094	019	TRS 2	MGA	MGA007	301	28/10/2013	20:08:00	7	26.0920	21	47.7780	7.4349	-21.7963	3419	301	28/10/2013	23:33:00	7	26.0920	21	47.7780	7.4349	-21.7963	3423	4 sucesful megacores about 25cm - 40cm long composed of muddy sand and sandy mud	success
JC094	020	EBB	CTD	CTD003	303	30/10/2013	06:42:00	5	47.5000	26	40.9900	5.7917	-26.6832	4054	303	30/10/2013	10:11:00	5	47.5000	26	40.9900	5.7917	-26.6832	4055	successful ctd, 24 niskins, no mini corer, altimeter working	success
JC094	021	EBB	ROV	ROV228	303	30/10/2013	19:00:00	5	36.0400	26	58.0200	5.6007	-26.9670	1993	304	31/10/2013	12:38:00	5	36.6682	26	57.4540	5.6111	-26.9576	1487	Found Caryophillia burried in sediment at deepest place. Slowly traversed up slope looking for fossil corals and biological samples	success
JC094	022	EBB	ROV	ROV229	304	31/10/2013	20:40:00	5	37.4700	26	58.0000	5.6245	-26.9667	1300	305	01/11/2013	14:18:00	5	37.6300	26	56.3800	5.6272	-26.9397	569	mix of sediments and rocks, much more sediment than Carter overall. Several large purple solitary corals collected, as weel as fossils and other live collections	success
JC094	023	EBB	GVY	GVY002	305	01/11/2013	15:52:00	5	37.6900	26	54.3400	5.6282	-26.9057	552	305	01/11/2013	16:32:00	5	37.6900	26	54.3300	5.6282	-26.9055	555	Core came back empty. Limited pull out	failed
JC094	024	EBB	GVY	GVY003	305	01/11/2013	17:23:00	5	37.7050	26	54.3540	5.6284	-26.9059	552	305	01/11/2013	18:15:00	5	37.6840	26	54.3270	5.6281	-26.9055	555	Second try of GVY002. Core came back empty.	failed
JC094	025	EBB	GVY	GVY004	305	01/11/2013	19:05:00	5	38.9680	26	54.9640	5.6495	-26.9161	550	305	01/11/2013	19:46:00	5	38.9680	26	54.9640	5.6495	-26.9161	550	Change of location- empty	failed
JC094	026	EBB	ROV	ROV230	305	01/11/2013	23:55:00	5	35.3600	26	59.6700	5.5893	-26.9945	2830	306	02/11/2013	21:53:00	5	37.2456	26	57.4830	5.6208	-26.9581	1004	Flat sedimented plain with star fish and urchins. Later rocky outcrops, then very steep rocks. At about 2200m moved up to 1200m to colelct fossil corals	success
JC094	027	EBB	MGA	MGA008	307	03/11/2013	02:03:00	5	42.3490	27	16.4570	5.7058	-27.2743	4405	307	03/11/2013	06:19:00	5	42.3380	27	16.4280	5.7056	-27.2738	4407	4 successful megacores, ranging from 22 to 41 cm long - sandy mud top over glacial mud.	success
JC094	028	EBB	PTN	PTN003	307	03/11/2013	07:13:00	5	42.3590	27	16.4430	5.7060	-27.2741	4405	307	03/11/2013	11:44:00	5	42.3400	27	16.4300	5.7057	-27.2738	4405	12m barrel piston core. Max tension: 6.01T. Barrel and weight covered in mud, but liner empty and shattered. 50cm trigger core in barrel.	failed
JC094	029	TRS 3	MGA	MGA009	308	04/11/2013	22:16:00	6	48.7120	32	54.7250	6.8119	-32.9121	4055	309	05/11/2013	02:22:00	6	48.7120	32	54.7260	6.8119	-32.9121	4052	4 successful mega cores	success
JC094	030	TRS 3	GVY	GVY005	309	05/11/2013	02:45:00	6	48.7260	32	54.7630	6.8121	-32.9127	4055	309	05/11/2013	06:27:00	6	48.7200	32	54.7570	6.8120	-32.9126	4054	Completey full gravity core- mud coming out of the top. Max tension=5.6 tons	success
JC094	031	TRS_3	GVY	GVY006	309	05/11/2013	08:28:00	6	48.7100	32	54.7290	6.8118	-32.9122	4054	309	05/11/2013	12:21:00	6	48.7100	32	54.7200	6.8118	-32.9120	4065	Full gravity core. Max tension=5.37tons	success
JC094	032	VEM	CTD	CTD004	312	08/11/2013	07:17:00	10	33.2870	44	30.8860	10.5548	-44.5148	4949	312	08/11/2013	11:53:00	10	33.2890	44	30.8860	10.5548	-44.5148	4950	successful ctd, 24 niskins, no mini corer, altimeter working	success
JC094	033	VEM	ROV	ROV231	312	08/11/2013	16:06:00	10	44.5805	44	34.7305	10.7430	-44.5788	1497	313	09/11/2013	14:25:00	10	44.5158	44	33.4673	10.7419	-44.5578	1108	Long, slow climb up ridge. Degraded coral rubble. Steep rocky swept areas. Tow pieces of intense current where ROV could not overcome using thrusters. Areas of manganese nodules and solitary corals. Stop dive due to increasing weather conditions	success
JC094	034	VEM	MGA	MGA010	313	09/11/2013	17:34:00	10	33.2870	44	30.9130	10.5548	-44.5152	4950	313	09/11/2013	22:15:00	10	33.2850	44	30.8960	10.5548	-44.5149	4956	2 full cores and 2 empty. Max Tension= 4.75 tons	success
JC094	035	VEM	GVY	GVY007	313	09/11/2013	22:38:00	10	33.2850	44	30.8960	10.5548	-44.5149	4956	314	10/11/2013	03:37:00	10	33.2880	44	30.9110	10.5548	-44.5152	4953	9 m barrel, successful, total recovery ca.6m. Max Tension=6.75Tons	success
JC094	036	VEM	MGA	MGA011	314	10/11/2013	11:35:00	10	51.7800	44	29.4600	10.8630	-44.4910	5160	314	10/11/2013	16:43:00	10	51.7900	44	29.4400	10.8632	-44.4907	5162	4 tubes, all empty, did not fire. Niskin successfully fired and sampled. Max Tension= 4.85t, 5.06t, 5.12t	failed
JC094	037	VEM	MGA	MGA012	314	10/11/2013	17:08:00	10	51.7910	44	29.4410	10.8632	-44.4907	5162	314	10/11/2013	22:32:00	10	51.7910	44	29.4400	10.8632	-44.4907	5161	4 tubes, all empty, did not fire. Niskin successfully fired and sampled. Max Tension= 5.07tons	failed
JC094	038	VEM	GVY	GVY008	314	10/11/2013	22:59:00	10	51.7850	44	29.4550	10.8631	-44.4909	5161	315	11/11/2013	03:52:00	10	51.7800	44	29.4760	10.8630	-44.4913	5161	9 m barrel, successful, total recovery: 7.07m. Max Tension= 6.9Tons	success
JC094	039	VEM	CTD	CTD005	315	11/11/2013	05:00:00	10	51.7780	44	29.4760	10.8630	-44.4913	5161	315	11/11/2013	09:02:00	10	51.7790	44	29.4860	10.8630	-44.4914	5161	CTD successful. 24 bottles fired. No altimeter.	success
JC094	040	VEM	DRG	DRG001	315	11/11/2013	15:53:00	10	42.1540	44	25.6800	10.7026	-44.4280	873	315	11/11/2013	17:53:00	10	42.2300	44	25.6020	10.7038	-44.4267	809	Few small corals: stylasterids and solitary, pebbles, brittle stars. Samples in net and in bucket	success
JC094	041	VEM	ROV	ROV232	315	11/11/2013	21:45:00	10	43.7230	44	25.5200	10.7287	-44.4253	1326	316	12/11/2013	14:44:00	10	42.4039	44	24.7959	10.7067	-44.4133	567	Spectacular cliff at start with branching coral debris at base of rocks. Madrepora > ROV size. Up over steep terrain onto flatter slope up to the top of vema. Sand, fine coral rubble, and squat lobsters.	success
JC094	042	VEM	ROV	ROV233	316	12/11/2013	22:47:00	10	46.8500	44	35.9300	10.7808	-44.5988	2950	317	13/11/2013	18:42:00	10	45.1500	44	36.2200	10.7525	-44.6037	1554	Deep start with bamboo corals and spectacular sponges on roccky outcrops. Rocky ridges with small pockets of sediment. Large distances with no life. One fossil solitary coral ~2600m, fossil coralium and enallopsammia at end of dive	success
JC094	043	VEM	ROV	ROV234	318	14/11/2013	01:20:00	10	43.6980	44	25.4830	10.7283	-44.4247	1250	317	14/11/2013	18:20:00	10	43.5520	44	25.6630	10.7259	-44.4277	1430	ROV microbathymetry dive with reson 7125 faced in a forward-looking configuartion to map the steep topography around the 1300-1400m site where a large coral was found on Dive232. Bathymetry- video data collected on 3 walls to be integrated for full 3D habitat mapping.	succcess
JC094	044	VAY	CTD	CTD006	320	16/11/2013	09:33:00	15	16.2450	48	15.5810	15.2708	-48.2597	4171	320	16/11/2013	12:58:00	15	16.2460	48	15.5800	15.2708	-48.2597	4168	CTD. 22 bottles were successful. Bottle 6 and 7 did not close. Sound velocity profiler did not work.	success
JC094	045	VAY	ROV	ROV235	320	16/11/2013	21:22:00	14	51.7280	48	14.5280	14.8621	-48.2421	1473	321	17/11/2013	18:46:00	14	52.0819	48	12.5680	14.8680	-48.2095	1080	Landed several hundred meters before first WP and saw fields of fossil corals. Started to suck them up individually, but then scooped them up. Continued up slope collecting samples. High currents stopped ROV from making progress so we had to pull up to 200m above seafloor in order to move across towards east.	success
JC094	046	VAY	MGA	MGA013	322	18/11/2013	04:29:00	15	10.4430	48	15.0080	15.1741	-48.2501	4125	322	18/11/2013	09:50:00	15	10.4300	48	15.0100	15.1738	-48.2502	4109	Mega core recovered with 4 samples, tow the water leaked out and only 1-2 inches of disturbed sediment. Two had 5-6 inches of mud with water overlaying. Extensive scrolling problems with winch.	success
JC094	047	VAY	GVY	GVY009	322	18/11/2013	10:37:00	15	10.4334	48	15.0113	15.1739	-48.2502	4128	322	18/11/2013	15:23:00	15	10.4520	48	15.0180	15.1742	-48.2503	4128	Max Tension= 4.8T. Payout extra beyond core depth to try and resolve scrolling issues. Core up empty, although mud on outside, about 12 inches of barrel. Core catcher fingers clean? Fall over, or not enough soft sediment.	failed
JC094	048	VAY	ROV	ROV236	322	18/11/2013	19:12:00	14	53.4802	48	9.0017	14.8913	-48.1500	867	324	20/11/2013	13:02:00	14	52.7280	48	7.6240	14.8788	-48.1271	472	Came up slope from 850m across sediments and fossil corals. Latter part of upward traverse smooth brown rock with brittle stars. Top of seamount the same. Wind picks up to >35kts so ship asks us to stop moving. After waiting to recover, continue to top of plateau. Move to deeper side of seamount and traverse towards top again.	success
JC094	049	VAY	ROV	ROV237	324	20/11/2013	23:15:00	14	50.9981	48	15.9921	14.8500	-48.2665	2181	325	21/11/2013	18:29:00	14	51.7154	48	14.5116	14.8619	-48.2419	1458	Start sediment plain, then move up basalt steep slopes. Sponges and sediment in crevices. Few corals. Much the same up to the top. Strong current on top of ridge, so need to lift up and move east. Strong currents prevent sampling at top.	success
JC094	050	VAY	MGA	MGA014	325	21/11/2013	22:12:00	14	45.9930	48	15.0400	14.7666	-48.2507	3733	326	22/11/2013	02:15:00	14	45.9940	48	15.0380	14.7666	-48.2506	3723	Pull out at 3.7 tons. 4 tubes. 2 with holes. 2 without. Niskin Sampled. Failed. It had a USBL beacon that was lost during ascent, probably the wire went around it and pulled, breaking the frame.	failed
JC094	051	VAY	GVY	GVY010	326	22/11/2013	02:48:00	14	45.9850	48	15.0130	14.7664	-48.2502	3722	326	22/11/2013	06:11:00	14	46.0030	48	15.0700	14.7667	-48.2512	3714	Pull out at 4.8 tons. Failed: core catcher contained bad sediment on external surface. Clayey silt. Some Holocene forams could be seen on microscope. Core probably went in around 30-40cm, bounced, and fell on the side. Rate of penetration was ca. 15m/min. We are trying again at a site 250m to the south and with a rate of penetration of 25m/min	failed
JC094	052	VAY	GVY	GVY011	326	22/11/2013	06:55:00	14	45.8651	48	15.0836	14.7644	-48.2514	3722	326	22/11/2013	10:18:00	14	45.8680	48	15.1040	14.7645	-48.2517	3713	Pull-out: 4.5-4.65 ton - Core empty	failed
JC094	053	VAY	BOX	BOX001	326	22/11/2013	13:39:00	14	45.9850	48	15.0510	14.7664	-48.2509	3722	326	22/11/2013	17:54:00	14	45.9920	48	15.0390	14.7665	-48.2507	3713	Pull-out: 3.92 tons. Approx 16cm of sediment. Subsampled with piston core liners for storage and with megacore tubes for sampling 1 cm slices (first 2 cores) and 2cm slices (last core). Two subcores for plastics study. Independent S-numbers for each tube and the whole box core. Bulk samples stored in bags.	success
JC094	054	VAY	GVY	GVY012	326	22/11/2013	19:30:00	14	51.2740	48	15.8545	14.8546	-48.2642	2235	326	22/11/2013	21:44:00	14	51.0750	48	15.8540	14.8513	-48.2642	2241	Pull-out: 3.3 tons. About 31cm of sediment. Stratigraphic order possibly not preserved. Sediment was spread in the liner when laid horizontally and shaken during barrel extraction from bomb.	success
JC094	055	VAY	ROV	ROV238	326	22/11/2013	00:29:00	14	53.4320	48	9.0650	14.8905	-48.1511	835	327	23/11/2013	15:14:00	14	52.8380	48	9.3340	14.8806	-48.1556	632	ROV microbathymetry dive with Reson 7125 in normal downward-facing configuration	success
JC094	056	GRM	ROV	ROV239	328	24/11/2013	17:01:00	15	25.3168	51	5.1846	15.4219	-51.0864	1564	329	25/11/2013	16:09:00	15	23.5605	51	5.4464	15.3927	-51.0908	900	Started out on small knoll North of seamount. Extensive fields of fossil corals. Carried on up ridge, but fossils less abundant with increasing height. Towards top smooth rock with crinoids. Did not quite reach summit. USBL crash due to over heating.	success
JC094	057	GRM	GVY	GVY013	329	25/11/2013	18:00:00	15	21.5649	51	4.5930	15.3594	-51.0766	1643	329	25/11/2013	19:34:00	15	21.5630	51	4.5930	15.3594	-51.0766	1643	6m barrel. Max Tension- 2.64 then up to 3.0T. Core appeared to bounce on seafloor and came up empty	failed
JC094	058	GRM	ROV	ROV240	329	25/11/2013	22:36:00	15	26.8960	51	5.4890	15.4483	-51.0915	2157	330	26/11/2013	16:03:00	15	25.2269	51	5.2352	15.4204	-51.0873	1430	Deep parts were rocks/boulders and sediment. Lots of USBL issures, resolved by changing settings in software. At0800 GMT traverse to start of Dive 239 and scoop up nets of fossil corals.	success
JC094	059	GRM	GVY	GVY014	330	26/11/2013	19:43:00	15	27.8600	50	59.4880	15.4643	-50.9915	2714	330	26/11/2013	22:04:00	15	27.8590	50	59.4880	15.4643	-50.9915	2714	6m barrel. Max Tension- 4.2Tons. 3.88m of sediment	success
JC094	060	GRM	MGA	MGA015	330	26/11/2013	22:38:00	15	27.8600	50	59.4880	15.4643	-50.9915	2718	331	27/11/2013	01:22:00	15	27.8600	50	59.4870	15.4643	-50.9915	2714	4 tubes set up. Only one tube with some sediment (ca.6-7cm). Partially leaking on one side and sediment being mixed. Rest of core seems intact, but core top will be mixed. Niskin not good leaking.	success
JC094	061	GRM	MGA	MGA016	331	27/11/2013	01:48:00	15	27.8605	50	59.4884	15.4643	-50.9915	2718	331	27/11/2013	04:36:00	15	27.8590	50	59.4860	15.4643	-50.9914	2713	Four tubes with sediment between ca. 35 and ca.15 cm. Short is for Lucy Woodall. Sampled as 1 cm slices, pore-fluids and 2 cm slices and 2 cm down to 5 cm and then every 15 cm. All 3 tubes got a core top sample extracted.	success
JC094	062	GRM	MGA	MGA017	331	27/11/2013	05:30:00	15	30.5350	50	54.4018	15.5089	-50.9067	4128	331	27/11/2013	09:46:00	15	30.5350	50	54.4010	15.5089	-50.9067	4128	Max Tension= 4.20 Tons. 3 tubes contained sediment and water about 15cm in each. All cores sliced, no pore fluid analyses. One empty.	success

JC094 EVENT LOG

NSK= Niskin **SLP**= Slurp **SCP**= Scoop **MGA**= Mega Core **KTN**= Kasten **GVY**= GravityCore **PTN**= PistonCore **PSH**= PushCore **BOX**= BoxCore **NET= Net** **ARM**= Arm **MBS**= Multibeam start **MBE**= multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	001	CAN	CTD	CTD001	NSK	001	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	002	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	003	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	004	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	005	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	006	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	007	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	008	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		100m	water
JC094	001	CAN	CTD	CTD001	NSK	009	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	010	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	011	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	012	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	013	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	014	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	015	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	016	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		40m	water
JC094	001	CAN	CTD	CTD001	NSK	017	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	NSK	018	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	NSK	019	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	NSK	020	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	NSK	021	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	NSK	022	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	NSK	023	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	NSK	024	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		0m	water
JC094	001	CAN	CTD	CTD001	CTDprofile	025	288	15/10/2013	09:02:57	25	5.01600	21	24.83500	25.08360	-21.41392	4552		practiceCTD	water
JC094	002	EBA	CTD	CTD002	NSK	001	292	19/10/2013	06:23:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		4512m	water
JC094	002	EBA	CTD	CTD002	NSK	002	292	19/10/2013	06:23:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		4512m	water
JC094	002	EBA	CTD	CTD002	NSK	003	292	19/10/2013	06:30:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		4297m	water
JC094	002	EBA	CTD	CTD002	NSK	004	292	19/10/2013	06:30:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		4297m	water
JC094	002	EBA	CTD	CTD002	NSK	005	292	19/10/2013	06:44:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		3598m	water
JC094	002	EBA	CTD	CTD002	NSK	006	292	19/10/2013	06:44:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		3598m	water
JC094	002	EBA	CTD	CTD002	NSK	007	292	19/10/2013	07:00:00	9	17.06800	21	37.95300	9.28447	-21.63255	4526		2800m	water
JC094	002	EBA	CTD	CTD002	NSK	008	292	19/10/2013	07:00:00	9	17.06800	21	37.95300	9.28447	-21.63255	4526		2800m	water
JC094	002	EBA	CTD	CTD002	NSK	009	292	19/10/2013	07:15:00	9	17.06800	21	37.95400	9.28447	-21.63257	4526		2002m	water
JC094	002	EBA	CTD	CTD002	NSK	010	292	19/10/2013	07:15:00	9	17.06800	21	37.95400	9.28447	-21.63257	4526		2002m	water
JC094	002	EBA	CTD	CTD002	NSK	011	292	19/10/2013	07:26:00	9	17.06700	21	37.95600	9.28445	-21.63260	4526		1503m	water
JC094	002	EBA	CTD	CTD002	NSK	012	292	19/10/2013	07:26:00	9	17.06700	21	37.95600	9.28445	-21.63260	4526		1503m	water
JC094	002	EBA	CTD	CTD002	NSK	013	292	19/10/2013	07:36:00	9	17.06800	21	37.95400	9.28447	-21.63257	4526		1004m	water
JC094	002	EBA	CTD	CTD002	NSK	014	292	19/10/2013	07:36:00	9	17.06800	21	37.95400	9.28447	-21.63257	4526		1004m	water
JC094	002	EBA	CTD	CTD002	NSK	015	292	19/10/2013	07:42:00	9	17.06700	21	37.95400	9.28445	-21.63257	4526		705m	water
JC094	002	EBA	CTD	CTD002	NSK	016	292	19/10/2013	07:42:00	9	17.06700	21	37.95400	9.28445	-21.63257	4526		705m	water
JC094	002	EBA	CTD	CTD002	NSK	017	292	19/10/2013	07:48:00	9	17.06800	21	37.95300	9.28447	-21.63255	4526		405m	water
JC094	002	EBA	CTD	CTD002	NSK	018	292	19/10/2013	07:48:00	9	17.06800	21	37.95300	9.28447	-21.63255	4526		405m	water
JC094	002	EBA	CTD	CTD002	NSK	019	292	19/10/2013	07:59:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		55m	water
JC094	002	EBA	CTD	CTD002	NSK	020	292	19/10/2013	07:59:00	9	17.06900	21	37.95400	9.28448	-21.63257	4526		55m	water
JC094	002	EBA	CTD	CTD002	NSK	021	292	19/10/2013	08:01:00	9	17.06800	21	37.95500	9.28447	-21.63258	4526		36m	water
JC094	002	EBA	CTD	CTD002	NSK	022	292	19/10/2013	08:01:00	9	17.06800	21	37.95500	9.28447	-21.63258	4526		36m	water
JC094	002	EBA	CTD	CTD002	NSK	023	292	19/10/2013	08:03:00	9	17.06800	21	37.95500	9.28447	-21.63258	4526		10.8m	water
JC094	002	EBA	CTD	CTD002	NSK	024	292	19/10/2013	08:03:00	9	17.06800	21	37.95500	9.28447	-21.63258	4526		10.8m	water
JC094	002	EBA	CTD	CTD002	CTDprofile	025	292	19/10/2013	08:03:00	9	17.06800	21	37.95500	9.28447	-21.63258	4526			water
JC094	004	EBA	ROV	ROV222	NSK	000	293	20/10/2013	04:46:00	9	12.96000	21	18.95400	9.21600	-21.31590	1080		First Niskin on ROV	water
JC094	004	EBA	ROV	ROV222	NSK	001	293	20/10/2013	04:46:00	9	12.96000	21	18.95400	9.21600	-21.31590	1080		Second Niskin	water
JC094	004	EBA	ROV	ROV222	SLP	002	293	20/10/2013	05:02:00	9	12.97180	21	18.97070	9.21620	-21.31618	1080		Seapen, solitary coral, fossil framework, slurped - Aft BIOBOX	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	002	293	20/10/2013	05:24:52	9	12.97020	21	18.96380	9.21617	-21.31606	1080		fossil framework, Scooped, AFT BIOBOX	fossil
JC094	004	EBA	ROV	ROV222	SCP	002	293	20/10/2013	06:14:58	9	12.97680	21	18.97630	9.21628	-21.31627	1079.6		Desmo on fossil coral framework - AFT BIOBOX	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	002	293	20/10/2013	06:18:55	9	12.97680	21	18.97600	9.21628	-21.31627	1079.6		Sponge, stalked crinoid - Aft BIOBOX	bio
JC094	004	EBA	ROV	ROV222	SCP	002	293	20/10/2013	06:26:00	9	12.96700	21	18.96700	9.21612	-21.31612	1079		Large scoop of assorted coal debris - Aft BIOBOX	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	003	293	20/10/2013	06:47:00	9	12.97330	21	18.97520	9.21622	-21.31625	1078		Sponge attached to coral debris - scoop - AFT BIOBOX	bio/fossil
JC094	004	EBA	ROV	ROV222	NET	004	293	20/10/2013	07:07:00	9	12.97330	21	18.97520	9.21622	-21.31625	1079		Net Trawl - ROCK BOX3	fossil
JC094	004	EBA	ROV	ROV222	NET	004	293	20/10/2013	07:19:00	9	12.96990	21	18.98340	9.21617	-21.31639	1078		Net Trawl - ROCK BOX3	fossil
JC094	004	EBA	ROV	ROV222	NET	004	293	20/10/2013	07:25:00	9	12.96990	21	18.98340	9.21617	-21.31639	1078		Net Trawl - ROCK BOX3	fossil
JC094	004	EBA	ROV	ROV222	NET	004	293	20/10/2013	07:28:00	9	12.97320	21	18.98340	9.21622	-21.31639	1079		Net Trawl - ROCK BOX3	fossil
JC094	004	EBA	ROV	ROV222	SLP	005	293	20/10/2013	08:00:32	9	12.97250	21	18.97240	9.21621	-21.31621	1076		Large Desmophyllum - Slurped - AFT BIOBOX	fossil
JC094	004	EBA	ROV	ROV222	SCP	006	293	20/10/2013	08:08:31	9	12.97600	21	18.98070	9.21627	-21.31635	1076		Coral Framework - AFT BIOBOX	fossil
JC094	004	EBA	ROV	ROV222	SCP	006	293	20/10/2013	08:11:34	9	12.97600	21	18.98070	9.21627	-21.31635	1076		Coral Framework - AFT BIOBOX	fossil
JC094	004	EBA	ROV	ROV222	SCP	006	293	20/10/2013	08:23:54	9	12.97600	21	18.98070	9.21627	-21.31635	1073		Coral fragments - AFT BIOBOX	fossil
JC094	004	EBA	ROV	ROV222	SCP	006	293	20/10/2013	08:28:23	9	12.97600	21	18.98070	9.21627	-21.31635	1073		Coral fragments - AFT BIOBOX	fossil
JC094	004	EBA	ROV	ROV222	SCP	006	293	20/10/2013	08:38:50	9	12.97600	21	18.98070	9.21627	-21.31635	1072		Coral fragments and crinoid - AFT BIOBOX	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	006	293	20/10/2013	08:42:42	9	12.97600	21	18.98070	9.21627	-21.31635	1072		Desmophyllum - AFT BIOBOX	fossil
JC094	004	EBA	ROV	ROV222	PSH	007	293	20/10/2013	09:03:10	9	12.98380	21	18.97050	9.21640	-21.31618	1070		two attempts at pushcoring failed	
JC094	004	EBA	ROV	ROV222	SLP	009	293	20/10/2013	10:02:00	9	12.99300	21	18.97110	9.21655	-21.31619	1057.9		2 live Desmophyllum, crinoid - YELLOW CHAMBER	bio
JC094	004	EBA	ROV	ROV222	SLP	011	293	20/10/2013	10:17:00	9	13.00700	21	18.97670	9.21678	-21.31628	1048		basalt rock with lots, desmophyllum, caryophylla, crinoid-YELLOW CHAMBER	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	012	293	20/10/2013	10:36:00	9	13.00200	21	18.97270	9.21670	-21.31621	1047.5		coral (fan-like, live), worms? - AFT BIOBOX	bio
JC094	004	EBA	ROV	ROV222	SCP	013	293	20/10/2013	10:44:13	9	13.00600	21	18.97040	9.21677	-21.31617	1046		to WP7	
JC094	004	EBA	ROV	ROV222	SLP	014	293	20/10/2013	11:17:50	9	13.07060	21	18.96420	9.21784	-21.31607	994		desmophyllum live (x2), fossil solitary coral, maybe fossil dianthus (solitary for sure), crinoid, all into red chamber	bio/fossil
JC094	004	EBA	ROV	ROV222	ARM	015	293	20/10/2013	11:37:00	9	13.07060	21	18.96420	9.21784	-21.31607	994.5		live solitary coral and dead coral (FAILED), starboard biobox	
JC094	004	EBA	ROV	ROV222	SLP	016	293	20/10/2013	11:57:00	9	13.06500	21	18.96100	9.21775	-21.31602	994.2		two desmophllum and branching coral into rock box 4	bio
JC094	004	EBA	ROV	ROV222	SCP	017	293	20/10/2013	12:18:00	9	13.06860	21	18.95990	9.21781	-21.31600	993.8		greenish spone and coral fragments worms? Into rock box 1	bio

JC094 EVENT LOG

NSK= Niskin **SLP**= Slurp **SCP**= Scoop **MGA**= Mega Core **KTN**= Kasten **GVY**= GravityCore **PTN**= PistonCore **PSH**= PushCore **BOX**= BoxCore **NET= Net** **ARM**= Arm **MBS**= Multibeam start **MBE**= multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	004	EBA	ROV	ROV222	SCP	018	293	20/10/2013	12:41:45	9	13.07590	21	18.95890	9.21793	-21.31598	993		brown flwdle? W three large sponges and brittlestars, rock box 1	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	019	293	20/10/2013	13:10:30	9	13.07700	21	18.95850	9.21795	-21.31598	991.8		bamboo coral and stylasterid in rock box 1	bio
JC094	004	EBA	ROV	ROV222	SCP	021	293	20/10/2013	13:27:32	9	13.07040	21	18.95310	9.21784	-21.31589	990		solitary live coral and fragments of fossil, rock box 3	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	022	293	20/10/2013	13:34:24	9	13.07000	21	18.96000	9.21783	-21.31600	990		live solitarys and fossil fragments two crinoids on framework in rock box 3	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	023	293	20/10/2013	13:48:51	9	13.07470	21	18.96050	9.21791	-21.31601	989.8		scoop failed picked up with arm crinoid and octocorals all in aft bio	bio
JC094	004	EBA	ROV	ROV222	SCP	025	293	20/10/2013	14:59:00	9	13.23250	21	18.94630	9.22054	-21.31577	835		attempt to grab bamboo, live colonial and 1 anenome all in bio box 6 with partial deposition in 4 (colonial coral mostly in 4, bio in 6)	bio/fossil
JC094	004	EBA	ROV	ROV222	SCP	027	293	20/10/2013	15:18:59	9	13.26860	21	18.94400	9.22114	-21.31573	779.5		fossil coral rubble (mostly failed) into biobox 5 and incidentals into BB3	fossil
JC094	004	EBA	ROV	ROV222	SLP	028	293	20/10/2013	15:39:59	9	13.28060	21	18.90080	9.22134	-21.31501	779.8		seastar with coral framework into grey box 1	bio/fossil
JC094	004	EBA	ROV	ROV222	SLP	029	293	20/10/2013	15:43:09	9	13.27920	21	18.96040	9.22132	-21.31601	780		fossil coral into green chamber	fossil
JC094	004	EBA	ROV	ROV222	SLP	030	293	20/10/2013	15:46:10	9	13.27800	21	18.96440	9.22130	-21.31607	780		fossil coral into grey box 1	fossil
JC094	004	EBA	ROV	ROV222	SLP	031	293	20/10/2013	15:48:46	9	13.28230	21	18.96320	9.22137	-21.31605	780		fossil coral into green chamber	fossil
JC094	004	EBA	ROV	ROV222	ARM	032	293	20/10/2013	16:06:10	9	13.27940	21	18.96220	9.22132	-21.31604	779		rock into rock box 5	?
JC094	004	EBA	ROV	ROV222	NSK	033	293	20/10/2013	16:13:07	9	13.28640	21	18.95200	9.22144	-21.31587	766		niskin bottle 3, 4, 5	water
JC094	004	EBA	ROV	ROV222	SCP	034	293	20/10/2013	16:26:29	9	13.28470	21	18.95420	9.22141	-21.31590	766		fossil coral desmo? Into grey box 3 and some into grey box 4	fossil
JC094	004	EBA	ROV	ROV222	PSH	036	293	20/10/2013	17:13:20	9	13.40520	21	18.88670	9.22342	-21.31478	641.7		black 2 push core first attempt failed several attempts failed but managed to get some sediments from several attempts	sediment
JC094	004	EBA	ROV	ROV222	ARM	037	293	20/10/2013	17:13:30	9	13.45200	21	18.88690	9.22420	-21.31478	647.8		2 pencil urchins	bio
JC094	004	EBA	ROV	ROV222	SCP	020	293	20/10/2013		9	13.07370	21	18.96010	9.21790	-21.31600	990			
JC094	005	EBA	ROV	ROV223	SCP	001	294	21/10/2013	00:40:00	9	13.37100	21	18.83400	9.22285	-21.31390	671		scoop of fossil corals, aft bio	fossil
JC094	005	EBA	ROV	ROV223	SLP	002	294	21/10/2013	01:54:00	9	13.41000	21	18.90000	9.22350	-21.31500	639		slurp of living solitary caryophilia, yellow chamber	bio
JC094	005	EBA	ROV	ROV223	SLP	003	294	21/10/2013	01:57:00	9	13.41000	21	18.90000	9.22350	-21.31500	639		sponges on rocks next to corals from event 2, yellow chamber	bio
JC094	005	EBA	ROV	ROV223	SLP	004	294	21/10/2013	02:10:00	9	13.41000	21	18.90000	9.22350	-21.31500	638		potential desmophyllum fossil, yellow chamber	fossil
JC094	005	EBA	ROV	ROV223	NSK	005	294	21/10/2013	02:17:00	9	13.41000	21	18.90000	9.22350	-21.31500	638		niskin1	water
JC094	005	EBA	ROV	ROV223	NSK	006	294	21/10/2013	02:17:00	9	13.41000	21	18.90000	9.22350	-21.31500	638		niskin 2	water
JC094	005	EBA	ROV	ROV223	SLP	007	294	21/10/2013	03:21:00	9	13.63000	21	19.00000	9.22717	-21.31667	621		caryophilia (live), red chamber	bio
JC094	005	EBA	ROV	ROV223	SLP	008	294	21/10/2013	03:27:00	9	13.63000	21	19.00000	9.22717	-21.31667	621		pencil urchins 2, grey box 3	bio
JC094	005	EBA	ROV	ROV223	SLP	009	294	21/10/2013	03:49:00	9	13.63000	21	19.00000	9.22717	-21.31667	621		dead coralx3 and live coral x1, white chamber, 1x dead coral could be in red chamber due to problem	bio/fossil
JC094	005	EBA	ROV	ROV223	SLP	012	294	21/10/2013	06:29:00	9	14.05356	21	19.19343	9.23423	-21.31989	420		sampling pencil urchins -grey box 4	bio
JC094	005	EBA	ROV	ROV223	SLP	013	294	21/10/2013	06:37:00	9	14.05211	21	19.19272	9.23420	-21.31988	420		sampling 4 holothurians, green chamber	bio
JC094	005	EBA	ROV	ROV223	ARM	015	294	21/10/2013	07:39:00	9	14.19190	21	19.31060	9.23653	-21.32184	338.7		sampling stylasterid, grey box 2	bio/fossil
JC094	005	EBA	ROV	ROV223	SLP	016	294	21/10/2013	07:43:54	9	14.18920	21	19.32180	9.23649	-21.32203	338.5		three squat lobsters, sediment and coral debris all into green chamber	bio/fossil
JC094	005	EBA	ROV	ROV223	SLP	017	294	21/10/2013	07:55:22	9	14.18920	21	19.32180	9.23649	-21.32203	338.5		fossil and live debris into grey box 2 with some into 4	bio/fossil
JC094	005	EBA	ROV	ROV223	NSK	019	294	21/10/2013	08:22:50	9	14.20530	21	19.31160	9.23676	-21.32186	334		bottle 3 fired	water
JC094	005	EBA	ROV	ROV223	NSK	020	294	21/10/2013	08:24:12	9	14.20530	21	19.31160	9.23676	-21.32186	334		bottle 4 fired (note of 4/5 switch)	water
JC094	005	EBA	ROV	ROV223	SLP	021	294	21/10/2013	08:29:00	9	14.20530	21	19.31160	9.23676	-21.32186	334		holothurian sediment and two? Squat lobsters (1 for sure) into black canister	bio
JC094	005	EBA	ROV	ROV223	ARM	022	294	21/10/2013	08:57:00	9	14.21110	21	19.31330	9.23685	-21.32189	333.5		rock with 'things on it' grey box 3	bio
JC094	005	EBA	ROV	ROV223	SLP	024	294	21/10/2013	09:21:00	9	14.22350	21	19.32120	9.23706	-21.32202	328.8		solitary coral into black slurp	bio
JC094	005	EBA	ROV	ROV223	SLP	026	294	21/10/2013	09:40:00	9	14.25590	21	19.32260	9.23760	-21.32204	320.8		purple desmophyllum, grey box 3	bio
JC094	005	EBA	ROV	ROV223	SLP	028	294	21/10/2013	10:02:44	9	14.28420	21	19.32260	9.23807	-21.32204	314.8		2 solitary polyps live joined together, desmophyllum one polyp broken grouping may have broken apart all into grey box 3	bio/fossil
JC094	005	EBA	ROV	ROV223	SLP	029	294	21/10/2013	10:05:27	9	14.28440	21	19.33340	9.23807	-21.32222	314.8		desmophyllum live purple into grey box 4	bio
JC094	005	EBA	ROV	ROV223	SLP	030	294	21/10/2013	10:07:46	9	14.28550	21	19.33020	9.23809	-21.32217	314.8		live desmophyllum pole? Skeleton into black slurp	bio
JC094	005	EBA	ROV	ROV223	ARM	032	294	21/10/2013	10:28:00	9	14.31820	21	19.34380	9.23864	-21.32240	297.9		sponge x2 white into rock box 6	bio
JC094	005	EBA	ROV	ROV223	SLP	033	294	21/10/2013	10:35:57	9	14.38120	21	19.34380	9.23969	-21.32240	298		stylasterids, round sponge 1 squat lobster into black slurp	bio
JC094	005	EBA	ROV	ROV223	SLP	035	294	21/10/2013	12:00:45	9	14.55560	21	19.45800	9.24259	-21.32430	264		3x holothurians	bio
JC094	005	EBA	ROV	ROV223	SLP	036	294	21/10/2013	12:12:14	9	14.55600	21	19.46100	9.24260	-21.32435	264		solitary coral	bio
JC094	005	EBA	ROV	ROV223	SLP	037	294	21/10/2013	12:15:52	9	14.55600	21	19.45700	9.24260	-21.32428	262		2x holothurians	bio
JC094	005	EBA	ROV	ROV223	SLP	038	294	21/10/2013	12:38:00	9	14.58570	21	19.47500	9.24310	-21.32458	265		fossil and live coral into port bio box (sed too)	fossil and bio
JC094	005	EBA	ROV	ROV223	SLP	039	294	21/10/2013	12:49:00	9	14.58570	21	19.47500	9.24310	-21.32458	265		fossil and live coral ended in red slurp chamber	fossil and bio
JC094	005	EBA	ROV	ROV223	SLP	040	294	21/10/2013	12:58:00	9	14.58520	21	19.47210	9.24309	-21.32454	265		anenome (cerianth) x11 into red slurp	bio
JC094	005	EBA	ROV	ROV223	SLP	041	294	21/10/2013	13:06:00	9	14.58800	21	19.47160	9.24313	-21.32453	264		fossil coral and live coral into red slurp	fossil
JC094	005	EBA	ROV	ROV223	ARM	043	294	21/10/2013	13:49:00	9	14.68990	21	19.55980	9.24483	-21.32600	265.7		collecting anthopos encc stufl (illegible) grey box 1	
JC094	005	EBA	ROV	ROV223	SLP	045	294	21/10/2013	14:23:00	9	14.74140	21	19.61450	9.24569	-21.32691	229.4		stylasterid, brittle stars x 10, 1 holothurian, yellow slurp but maybe not entering chamber maybe on carousel? (illegible)	
JC094	005	EBA	ROV	ROV223	NSK	047	294	21/10/2013	14:50:00	9	14.77110	21	19.63490	9.24619	-21.32725	209.7		nks 5	water
JC094	005	EBA	ROV	ROV223	SLP	048	294	21/10/2013	14:51:00	9	14.77050	21	19.63560	9.24618	-21.32726	209.5		solitary corals into rock box 4	fossil
JC094	005	EBA	ROV	ROV223	SLP	049	294	21/10/2013	15:11:00	9	14.77650	21	19.63780	9.24628	-21.32730	209		solitary corals and brittle stars into rock box 1	fossil
JC094	005	EBA	ROV	ROV223	SLP	050	294	21/10/2013	15:21:00	9	14.77650	21	19.63780	9.24628	-21.32730	209		live solitary coral into rock box 1	bio
JC094	005	EBA	ROV	ROV223	PSH	052	294	21/10/2013	15:39:00	9	14.80000	21	19.68100	9.24667	-21.32802	212		push core red 3	sediment
JC094	005	EBA	ROV	ROV223	PSH	053	294	21/10/2013	15:40:00	9	14.80000	21	19.68100	9.24667	-21.32802	212		push core red 2	sediment
JC094	005	EBA	ROV	ROV223	PSH	054	294	21/10/2013	15:42:00	9	14.80000	21	19.68100	9.24667	-21.32802	212		push core red 1	sediment
JC094	005	EBA	ROV	ROV223	ARM	055	294	21/10/2013	15:44:00	9	14.80000	21	19.68100	9.24667	-21.32802	212		plastic bag? Into grey box 3	plastics
JC094	005	EBA	ROV	ROV223	SLP	057	294	21/10/2013	15:59:00	9	14.82130	21	19.70250	9.24702	-21.32838	211		solitary coral into forward biobox	bio
JC094	006	EBA	MGA	MGA001	MCH	003	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	006	EBA	MGA	MGA001	MCH	004	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	006	EBA	MGA	MGA001	MCN	005	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	006	EBA	MGA	MGA001	MCN	006	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	006	EBA	MGA	MGA001	MCN	007	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	006	EBA	MGA	MGA001	MCN	008	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	006	EBA	MGA	MGA001	NSK	009	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	sampled by lucy depth unknown	
JC094	006	EBA	MGA	MGA001	MCH	001	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	006	EBA	MGA	MGA001	MCH	002	294	21/10/2013	18:12:00	9	13.42400	21	18.89400	9.22373	-21.31490	640	650	core failed	
JC094	007	EBA	ROV	ROV224	NET	001	294	21/10/2013	23:09:00	9	11.73000	21	17.02000	9.19550	-21.28367	2135		Fossil coral rubble, sea urchin, behind biobox	bio/fossil
JC094	007	EBA	ROV	ROV224	ARM	002	294	21/10/2013	23:49:00	9	11.75000	21	17.04000	9.19583	-21.28400	2134		Primnoid (but failed)	
JC094	007	EBA	ROV	ROV224	PSH	003	294	21/10/2013	23:56:00	9	11.75000	21	17.03000	9.19583	-21.28383	2131		triple yellow (but failed)	
JC094	007	EBA	ROV	ROV224	ARM	004	295	22/10/2013	00:08:00	9	11.75000	21	17.04000	9.19583	-21.28400	2125		pink soft coral, stick like - Grey box 4	bio
JC094	007	EBA	ROV	ROV224	NSK	006	295	22/10/2013	00:25:00	9	11.76000	21	17.04000	9.19600	-21.28400	2121		Niskin 1	water
JC094	007	EBA	ROV	ROV224	NSK	007	295	22/10/2013	00:25:00	9	11.76000	21	17.04000	9.19600	-21.28400	2121		Niskin 2	water
JC094	007	EBA	ROV	ROV224	SCP	008	295	22/10/2013	00:29:00	9	11.76000	21	17.04000	9.19600	-21.28400	2121		Desmophyllum (living)	bio
JC094	007	EBA	ROV	ROV224	SCP	010	295	22/10/2013	00:45:00	9	11.78000	21	17.07000	9.19633	-21.28450	2099		Primnoid (living)	bio

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net** **ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs

green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	007	EBA	ROV	ROV224	ARM	012	295	22/10/2013	00:57:00	9	11.78000	21	17.07000	9.19633	-21.28450	2091		Sponge on a basalt rock	bio/rock
JC094	007	EBA	ROV	ROV224	PSH	014	295	22/10/2013	01:05:00	9	11.80000	21	17.08000	9.19667	-21.28467	2082		3 stripses push core_yellow. 2-3inches of sand	sediment
JC094	007	EBA	ROV	ROV224	ARM	016	295	22/10/2013	01:17:00	9	11.83000	21	17.10000	9.19717	-21.28500	2073		sponge- large/white	bio
JC094	007	EBA	ROV	ROV224	PSH	017	295	22/10/2013	01:48:00	9	11.83000	21	17.16000	9.19717	-21.28600	2045		doule red stripe. Very sandy	sediment
JC094	007	EBA	ROV	ROV224	NET	018	295	22/10/2013	03:23:00	9	11.93080	21	17.33220	9.19885	-21.28887	1829		net of coral ruble in between rocks	fossil
JC094	007	EBA	ROV	ROV224	SCP	019	295	22/10/2013	04:04:00	9	11.96570	21	17.34830	9.19943	-21.28914	1783		scoop of fossil corals	fossil
JC094	007	EBA	ROV	ROV224	ARM	020	295	22/10/2013	04:15:00	9	11.96530	21	17.34790	9.19942	-21.28913	1783		arm taking more thick coral branches	fossil
JC094	007	EBA	ROV	ROV224	ARM	022	295	22/10/2013	04:48:00	9	11.99180	21	17.37040	9.19986	-21.28951	1787		Live coral sample-black from vertical rock face	bio
JC094	007	EBA	ROV	ROV224	SCP	023	295	22/10/2013	06:22:00	9	12.15830	21	17.56880	9.20264	-21.29281	1544		they have decided to change tool (nothing collected)	
JC094	007	EBA	ROV	ROV224	ARM	024	295	22/10/2013	06:27:00	9	12.15680	21	17.57970	9.20261	-21.29300	1544		sponge	bio
JC094	007	EBA	ROV	ROV224	SCP	025	295	22/10/2013	06:44:00	9	12.16560	21	17.57030	9.20276	-21.29284	1545		coral debris (dead sea urchin), stylasterid	fossil
JC094	007	EBA	ROV	ROV224	ARM	027	295	22/10/2013	07:52:00	9	12.20920	21	17.64540	9.20349	-21.29409	1568		small tubular sponge	bio
JC094	007	EBA	ROV	ROV224	SLP	029	295	22/10/2013	08:30:00	9	12.26050	21	17.73590	9.20434	-21.29560	1541		fossil solitary lost through slurp (1 bit in box2)	fossil
JC094	007	EBA	ROV	ROV224	SLP	031	295	22/10/2013	08:47:00	9	12.27650	21	17.75940	9.20461	-21.29599	1529		live solitary	bio
JC094	007	EBA	ROV	ROV224	SLP	033	295	22/10/2013	09:09:00	9	12.27200	21	17.77760	9.20453	-21.29629	1524		fossil rubble	fossil
JC094	007	EBA	ROV	ROV224	ARM	034	295	22/10/2013	09:32:00	9	12.28120	21	17.78740	9.20469	-21.29646	1521		large fossil stylasterid	fossil
JC094	007	EBA	ROV	ROV224	ARM	035	295	22/10/2013	09:36:00	9	12.28120	21	17.78740	9.20469	-21.29646	1521		large fossil stylasterid	fossil
JC094	007	EBA	ROV	ROV224	SLP	037	295	22/10/2013	09:54:00	9	12.28570	21	17.80240	9.20476	-21.29671	1510		stylasterid from 4degreesC live	bio
JC094	007	EBA	ROV	ROV224	SCP	039	295	22/10/2013	10:00:00	9	12.28820	21	17.80300	9.20480	-21.29672	1506		live and dead stylasterids (live one broken, dead colonial)	bio/fossil
JC094	007	EBA	ROV	ROV224	ARM	040	295	22/10/2013	10:19:00	9	12.28820	21	17.80300	9.20480	-21.29672	1506		live stylasterid(new) attached to fossil framework	bio
JC094	007	EBA	ROV	ROV224	SCP	042	295	22/10/2013	10:54:00	9	12.32940	21	17.83110	9.20549	-21.29719	1442		live corallium? Pink. Accidental squat lobster	bio
JC094	007	EBA	ROV	ROV224	SCP	044	295	22/10/2013	11:25:00	9	12.33540	21	17.84640	9.20559	-21.29744	1431		fossil desmo rubble	fossil
JC094	007	EBA	ROV	ROV224	NSK	046	295	22/10/2013	12:10:00	9	12.33550	21	17.86560	9.20559	-21.29776	1413		Niskin 3	water
JC094	007	EBA	ROV	ROV224	NSK	047	295	22/10/2013	12:10:00	9	12.34380	21	17.86360	9.20573	-21.29773	1413		Niskin 4	water
JC094	007	EBA	ROV	ROV224	SLP	048	295	22/10/2013	12:14:00	9	12.34280	21	17.86580	9.20571	-21.29776	1413		solitary fossil coral with rubble	fossil
JC094	007	EBA	ROV	ROV224	SCP	049	295	22/10/2013	12:27:00	9	12.35260	21	17.86840	9.20588	-21.29781	1413		one live octocoral and fossil coral fragments. 2x solitary coral	bio/fossil
JC094	007	EBA	ROV	ROV224	ARM	051	295	22/10/2013	12:56:00	9	12.33980	21	17.86880	9.20566	-21.29781	1409		v. large pink live coral. Live pink framework coral	bio
JC094	007	EBA	ROV	ROV224	NET	053	295	22/10/2013	13:34:00	9	12.36260	21	17.89010	9.20604	-21.29817	1380		fossil coral fragments	fossil
JC094	007	EBA	ROV	ROV224	SCP	054	295	22/10/2013	13:55:00	9	12.34830	21	17.88910	9.20581	-21.29815	1380		fossil coral	fossil
JC094	007	EBA	ROV	ROV224	NSK	056	295	22/10/2013	14:07:00	9	12.35160	21	17.90300	9.20586	-21.29838	1372		Niskin 5	Water
JC094	008	EBA	MGA	MGA002	MCH	001	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**A:** length 38cm. Time=time on bottom	Lucy
JC094	008	EBA	MGA	MGA002	MCH	003	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**C:** did not fire	
JC094	008	EBA	MGA	MGA002	MCH	005	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**E:** length 40cm	sediment
JC094	008	EBA	MGA	MGA002	MCH	007	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**G:** empty	
JC094	008	EBA	MGA	MGA002	MCN	002	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**B:** did not fire	
JC094	008	EBA	MGA	MGA002	MCN	004	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**D:** length 41cm	sediment
JC094	008	EBA	MGA	MGA002	MCN	006	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**F:** empty	
JC094	008	EBA	MGA	MGA002	MCN	008	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	**H:** did not fire	
JC094	008	EBA	MGA	MGA002	NSK	009	296	22/10/2013	23:49:00	9	16.68200	21	38.27300	9.27803	-21.63788	4564	4619	Niskin given to lucy	Lucy
JC094	009	EBA	PTN	PTN001	PTN	001	296	23/10/2013	07:03:00	9	16.68337	21	38.27256	9.27806	-21.63788	4580	4583	7.5m of sediment recovered	sediment
JC094	009	EBA	PTN	PTN001	TGR	001	296	23/10/2013	07:03:00	9	16.68337	21	38.27256	9.27806	-21.63788	4580	4583	trigger core empty	sediment
JC094	010	EBA	MGA	MGA003	MCH	001	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	MCH	003	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	MCH	005	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	MCH	007	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	MCN	002	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	MCN	004	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	MCN	006	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	MCN	008	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Failed	
JC094	010	EBA	MGA	MGA003	NSK	009	296	23/10/2013	16:12:00	9	10.14086	21	16.24500	9.16901	-21.27075	2755	2755	Fired, Lucy sampled	Lucy
JC094	011	EBA	ROV	ROV225	PSH	001	296	23/10/2013	22:05:00	9	10.44000	21	16.32000	9.17400	-21.27200	2719		Best core?	sediment
JC094	011	EBA	ROV	ROV225	PSH	002	296	23/10/2013	22:12:00	9	10.43000	21	16.33000	9.17383	-21.27217	2719		core	sediment
JC094	011	EBA	ROV	ROV225	PSH	003	296	23/10/2013	22:15:00	9	10.43000	21	16.33000	9.17383	-21.27217	2719		similar to psh 002	sediment
JC094	011	EBA	ROV	ROV225	NSK	004	296	23/10/2013	22:30:00	9	10.49000	21	16.32000	9.17483	-21.27200	2712		Niskin1	Water
JC094	011	EBA	ROV	ROV225	NSK	005	296	23/10/2013	22:30:00	9	10.49000	21	16.32000	9.17483	-21.27200	2713		Niskin2	Water
JC094	011	EBA	ROV	ROV225	ARM	006	297	24/10/2013	00:17:00	9	10.67000	21	16.42000	9.17783	-21.27367	2559		Large fossil coral branching, about 30cm	fossil
JC094	011	EBA	ROV	ROV225	ARM	007	297	24/10/2013	00:54:00	9	10.69720	21	16.45900	9.17829	-21.27432	2526		fossil colonial	fossil
JC094	011	EBA	ROV	ROV225	ARM	008	297	24/10/2013	01:09:00	9	10.70760	21	16.46970	9.17846	-21.27450	2514		fossil coral that was still attached to rock	fossil
JC094	011	EBA	ROV	ROV225	SLP	009	297	24/10/2013	01:25:00	9	10.70810	21	16.46900	9.17847	-21.27448	2515		some fossil coral pieces same as event #8	fossil
JC094	011	EBA	ROV	ROV225	ARM	010	297	24/10/2013	03:00:00	9	10.86270	21	16.48490	9.18105	-21.27475	2343		Live stylasterid, live pink, fan like coral, fossil stylasterids, live orange branched coral	bio/fossil
JC094	011	EBA	ROV	ROV225	SLP	011	297	24/10/2013	03:36:00	9	10.86270	21	16.48490	9.18105	-21.27475	2338		Some sediments and rubble (in attempt to get live desmophyllum)	
JC094	011	EBA	ROV	ROV225	SCP	012	297	24/10/2013	04:06:00	9	10.86900	21	16.48100	9.18115	-21.27468	2338		nothing	
JC094	011	EBA	ROV	ROV225	SCP	014	297	24/10/2013	04:52:00	9	10.86830	21	16.48210	9.18114	-21.27470	2299.4		stylasterid white on bamboo coral. Crinoid	bio
JC094	011	EBA	ROV	ROV225	ARM	015	297	24/10/2013	05:08:00	9	10.87070	21	16.48100	9.18118	-21.27468	2301		fossil coral, dead bamboo and anthomastus	fossil
JC094	011	EBA	ROV	ROV225	NET	017	297	24/10/2013	05:31:00	9	10.90640	21	16.48250	9.18177	-21.27471	2278		sediment and coral rubble. Dead bamboo and crinoids	fossil
JC094	011	EBA	ROV	ROV225	PSH	028	297	24/10/2013	06:10:00	9	10.90650	21	16.48180	9.18178	-21.27470	2277		about half full	sed
JC094	011	EBA	ROV	ROV225	PSH	029	297	24/10/2013	06:17:00	9	10.90680	21	16.48160	9.18178	-21.27469	2277		about 1/3 full	sed
JC094	011	EBA	ROV	ROV225	PSH	030	297	24/10/2013	06:22:00	9	10.90680	21	16.48130	9.18178	-21.27469	2278		about half full	sed
JC094	011	EBA	ROV	ROV225	SCP	033	297	24/10/2013	09:20:00	9	11.41070	21	16.77830	9.19018	-21.27964	2318		live solitary coral-failed	
JC094	011	EBA	ROV	ROV225	SLP	034	297	24/10/2013	09:27:00	9	11.41770	21	16.77912	9.19030	-21.27965	2318.3		solitary coral	bio
JC094	011	EBA	ROV	ROV225	ARM	035	297	24/10/2013	09:29:00	9	11.41320	21	16.78430	9.19022	-21.27974	2317		piece of sponge	
JC094	011	EBA	ROV	ROV225	SLP (ARM)	037	297	24/10/2013	09:47:00	9	11.41450	21	16.78130	9.19024	-21.27969	2302		solitary coral	bio
JC094	011	EBA	ROV	ROV225	NSK	038	297	24/10/2013	09:53:00	9	11.42470	21	16.78610	9.19041	-21.27977	2299		Niskin 3	Water
JC094	011	EBA	ROV	ROV225	NSK	039	297	24/10/2013	09:55:00	9	11.42470	21	16.78610	9.19041	-21.27977	2299		Niskin 4- failed?	water
JC094	011	EBA	ROV	ROV225	NSK	040	297	24/10/2013	09:55:00	9	11.42470	21	16.77960	9.19041	-21.27966	2299		Niskin 5	water
JC094	011	EBA	ROV	ROV225	SLP	041	297	24/10/2013	10:12:00	9	11.46200	21	16.80400	9.19103	-21.28007	2278		live desmophyllum knocked off rock	bio
JC094	011	EBA	ROV	ROV225	SLP	042	297	24/10/2013	10:45:00	9	11.53620	21	16.83980	9.19227	-21.28066	2272		live desmo	bio
JC094	011	EBA	ROV	ROV225	SLP	043	297	24/10/2013	10:58:00	9	11.55600	21	16.85930	9.19260	-21.28099	2267		dead desmo	fossil

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net** **ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long — ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs — green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	011	EBA	ROV	ROV225	SLP	044	297	24/10/2013	11:07:00	9	11.55950	21	16.86010	9.19266	-21.28100	2260		dead desmo	fossil
JC094	011	EBA	ROV	ROV225	ARM	045	297	24/10/2013	12:04:00	9	11.61330	21	16.97000	9.19356	-21.28283	2216		trying to grab a rock but was too hard	
JC094	011	EBA	ROV	ROV225	SLP	047	297	24/10/2013	12:43:00	9	11.67201	21	16.99080	9.19453	-21.28318	2164		mabe solitary coral	bio
JC094	011	EBA	ROV	ROV225	NET	048	297	24/10/2013	13:09:00	9	11.73730	21	17.05110	9.19562	-21.28419	2142		rubble	fossil
JC094	011	EBA	ROV	ROV225	SLP	049	297	24/10/2013	13:45:00	9	11.75650	21	17.03350	9.19594	-21.28389	2141		live desmo and another live desmo	bio
JC094	011	EBA	ROV	ROV225	SLP	051	297	24/10/2013	14:10:00	9	11.77220	21	17.04800	9.19620	-21.28413	2133		desmo live the biggest of all those collected	bio
JC094	011	EBA	ROV	ROV225	ARM	053	297	24/10/2013	14:27:00	9	11.77700	21	17.04500	9.19628	-21.28408	2122		live bamboo coral only the top as the rest broke off	bio
JC094	011	EBA	ROV	ROV225	SLP	054	297	24/10/2013	14:53:00	9	11.77000	21	17.04000	9.19617	-21.28400	2124		fossil desmo collected from side of rock	fossil
JC094	011	EBA	ROV	ROV225	SLP	055	297	24/10/2013	15:14:00	9	11.82600	21	17.06700	9.19710	-21.28445	2100		sponge slurped	bio
JC094	011	EBA	ROV	ROV225	NET	056	297	24/10/2013	15:21:00	9	11.82600	21	17.06700	9.19710	-21.28445	2100		net fossil coral	fossil
JC094	012	EBA	MGA	MGA004	MCH	001	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed- hit rock	
JC094	012	EBA	MGA	MGA004	MCH	002	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed- hit rock	
JC094	012	EBA	MGA	MGA004	MCH	003	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed- hit rock	
JC094	012	EBA	MGA	MGA004	MCH	004	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed- hit rock	
JC094	012	EBA	MGA	MGA004	MCN	005	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed- hit rock	
JC094	012	EBA	MGA	MGA004	MCN	006	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed- hit rock	
JC094	012	EBA	MGA	MGA004	MCN	007	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed- hit rock	
JC094	012	EBA	MGA	MGA004	MCN	008	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	failed-not broken	
JC094	012	EBA	MGA	MGA004	NSK	009	297	24/10/2013	20:00:00	9	13.37010	21	18.88800	9.22284	-21.31480	662	677	nisken taken- not sampled	
JC094	013	EBA	ROV	ROV226	MBS	001	299	26/10/2013	01:26:00	9	13.94700	21	19.06700	9.23245	-21.31778	510		Begin Multibeam Survey	Shannon
JC094	013	EBA	ROV	ROV226	MBE	002	299	26/10/2013	17:03:00	9	13.89800	21	19.34220	9.23163	-21.32237	655		End multibeam Survey	Shannon
JC094	014	EBA	MGA	MGA005	MCH	001	299	26/10/2013	18:31:00	9	13.42000	21	18.89000	9.22367	-21.31483	641	645	empty	
JC094	014	EBA	MGA	MGA005	MCH	003	299	26/10/2013	18:31:00	9	13.42000	21	18.89000	9.22367	-21.31483	641	645	empty but for a few fossil corals	Fossil
JC094	014	EBA	MGA	MGA005	MCN	002	299	26/10/2013	18:31:00	9	13.42000	21	18.89000	9.22367	-21.31483	641	645	empty	
JC094	014	EBA	MGA	MGA005	MCN	004	299	26/10/2013	18:31:00	9	13.42000	21	18.89000	9.22367	-21.31483	641	645	empty	
JC094	014	EBA	MGA	MGA005	NSK	005	299	26/10/2013	18:31:00	9	13.42000	21	18.89000	9.22367	-21.31483	641	645	fired, but not sampled	
JC094	015	EBA	ROV	ROV227	SLP	001	299	26/10/2013	22:44:00	9	12.32000	21	17.93000	9.20533	-21.29883	1354		sponge, stalked unknown, debris (fossil debris)	bio/fossil
JC094	015	EBA	ROV	ROV227	SLP	002	299	26/10/2013	22:55:00	9	12.32000	21	17.93000	9.20533	-21.29883	1354		live sea urchin, fossil coral	bio/fossil
JC094	015	EBA	ROV	ROV227	SLP	003	299	26/10/2013	23:09:00	9	12.32000	21	17.93000	9.20533	-21.29883	1347		fossil debris, possible fossil soitary coral x3	fossil
JC094	015	EBA	ROV	ROV227	SLP	004	299	26/10/2013	23:30:00	9	12.33000	21	17.93000	9.20550	-21.29883	1345		debris, fossil solitary (brown	fossil
JC094	015	EBA	ROV	ROV227	ARM	005	299	26/10/2013	23:39:00	9	12.33000	21	17.93000	9.20550	-21.29883	1345		fossil solitary coral x2 attached to fossil colonial corals	fossil
JC094	015	EBA	ROV	ROV227	SLP	006	299	26/10/2013	23:44:00	9	12.33000	21	17.93000	9.20550	-21.29883	1345		debris (fossil coral)	fossil
JC094	015	EBA	ROV	ROV227	SLP	007	299	26/10/2013	23:47:00	9	12.33000	21	17.93000	9.20550	-21.29883	1345		fossil coral debris	fossil
JC094	015	EBA	ROV	ROV227	SCP	008	299	26/10/2013	23:54:00	9	12.33000	21	17.93000	9.20550	-21.29883	1345		white branched corals, possibly stylasterids, fossil debris and possible crinoid	fossil/bio
JC094	015	EBA	ROV	ROV227	SLP	009	300	27/10/2013	00:47:00	9	12.34000	21	17.94000	9.20567	-21.29900	1334		live solitary coral	bio
JC094	015	EBA	ROV	ROV227	SLP	010	300	27/10/2013	01:22:00	9	12.35610	21	17.94020	9.20594	-21.29900	1326		Fossil large solitary coral (desmo) attached to fossil colonial coral	fossil
JC094	015	EBA	ROV	ROV227	SLP	011	300	27/10/2013	01:24:00	9	12.35610	21	17.94020	9.20594	-21.29900	1326		live red solitary coarl (desmo). Fossil solitary coral (desmo)	fossil/bio
JC094	015	EBA	ROV	ROV227	ARM, SLP	012	300	27/10/2013	01:35:00	9	12.35780	21	17.94070	9.20596	-21.29901	1326		fossil solitary coral (desmo?)	fossil
JC094	015	EBA	ROV	ROV227	SLP	013	300	27/10/2013	01:37:00	9	12.35780	21	17.94070	9.20596	-21.29901	1326		live sponge ith male and felame shrimps inside	bio
JC094	015	EBA	ROV	ROV227	ARM, SLP	014	300	27/10/2013	01:47:00	9	12.35670	21	17.94050	9.20595	-21.29901	1326		fossil solitary coral	fossil
JC094	015	EBA	ROV	ROV227	SLP	015	300	27/10/2013	01:48:00	9	12.35920	21	17.94250	9.20599	-21.29904	1325		fossil solitary coral (1 medium, 1 small), fossil solitary coral (corroded with few colonial brances x2, one is caryophylia, yellow-brown solitary coral	fossil
JC094	015	EBA	ROV	ROV227	SLP	016	300	27/10/2013	02:22:00	9	12.36160	21	17.94600	9.20603	-21.29910	1320		live solitary coral (redwhite, small) x2, fossil solitary coral, med/large pinkish solitary coral	fossil/bio
JC094	015	EBA	ROV	ROV227	SLP	017	300	27/10/2013	02:50:00	9	12.37520	21	17.95130	9.20625	-21.29919	1320		live, solitary coral x3 and live shrimp, live white - pinkish solitary coral	fossil/bio
JC094	015	EBA	ROV	ROV227	SLP	019	300	27/10/2013	03:16:00	9	12.37470	21	17.95550	9.20625	-21.29926	1322		attempt to get a small live solitary coral but unsuccesful	
JC094	015	EBA	ROV	ROV227	PSH	021	300	27/10/2013	03:37:00	9	12.41270	21	17.98320	9.20688	-21.29972	1366		about 1/3 full	sediment
JC094	015	EBA	ROV	ROV227	PSH	022	300	27/10/2013	03:40:00	9	12.41270	21	17.98320	9.20688	-21.29972	1366		about 2/3 full	sediment
JC094	015	EBA	ROV	ROV227	PSH	023	300	27/10/2013	03:43:00	9	12.41270	21	17.98320	9.20688	-21.29972	1366		about 3/4 full	sediment
JC094	015	EBA	ROV	ROV227	NSK	024	300	27/10/2013	03:47:00	9	12.42090	21	17.99900	9.20702	-21.29998	1366		niskin 1: some issue when firing, may not seal properly	water
JC094	015	EBA	ROV	ROV227	NSK	025	300	27/10/2013	03:48:00	9	12.40900	21	17.99900	9.20682	-21.29998	1366		niskin 2	water
JC094	015	EBA	ROV	ROV227	NSK	026	300	27/10/2013	03:48:00	9	12.42090	21	17.99000	9.20702	-21.29983	1366		niskin 3	water
JC094	015	EBA	ROV	ROV227	NET	027	300	27/10/2013	03:53:00	9	12.42090	21	17.99580	9.20702	-21.29993	1366		fossil coral rubble	bio/fossil
JC094	015	EBA	ROV	ROV227	ARM	029	300	27/10/2013	04:44:00	9	12.42440	21	17.99980	9.20707	-21.30000	1346		acanthogorgian corallum live, gps not updating, most likely wrong latlong	bio
JC094	015	EBA	ROV	ROV227	SLP	031	300	27/10/2013	05:52:00	9	12.45800	21	18.03700	9.20763	-21.30062	1364		slp and spt into aft biobox. 2 caryophyllia and 1 large fossil coral	bio/fossil
JC094	015	EBA	ROV	ROV227	NET	032	300	27/10/2013	06:20:00	9	12.45800	21	18.03520	9.20763	-21.30059	1365		fossil coral, rubble and live stylasterid?	bio/fossil
JC094	015	EBA	ROV	ROV227	ARM	034	300	27/10/2013	07:16:00	9	12.47000	21	18.03500	9.20783	-21.30058	1368		live stylasterid	bio
JC094	015	EBA	ROV	ROV227	SLP	036	300	27/10/2013	07:32:00	9	12.50140	21	18.09330	9.20836	-21.30156	1375.1		solitary coral in pieces, and another in one piece	fossil
JC094	015	EBA	ROV	ROV227	ARM	038	300	27/10/2013	08:01:00	9	12.53000	21	18.04690	9.20883	-21.30078	1391		yello scleractinian	
JC094	015	EBA	ROV	ROV227	SLP	040	300	27/10/2013	08:27:00	9	12.55120	21	18.05380	9.20919	-21.30090	1395		live solitary coral x2. one dead. Plus one squat lobster	bio/fossil
JC094	015	EBA	ROV	ROV227	SLP	042	300	27/10/2013	09:17:00	9	12.69000	21	18.04000	9.21150	-21.30067	1351		live solitary coral	bio
JC094	015	EBA	ROV	ROV227	SLP	044	300	27/10/2013	09:35:00	9	12.76000	21	18.11000	9.21267	-21.30183	1319		fossil coral on top of fossil coral	fossil
JC094	015	EBA	ROV	ROV227	SLP	046	300	27/10/2013	10:29:00	9	12.92000	21	18.30000	9.21533	-21.30500	1204		21 solitary corals. 1 dead	bio/fossil
JC094	015	EBA	ROV	ROV227	NSK	047	300	27/10/2013	11:00:00	9	12.93000	21	18.32700	9.21550	-21.30545	1193.5		bottle 4	water
JC094	015	EBA	ROV	ROV227	ARM	049	300	27/10/2013	11:09:00	9	12.95000	21	18.36000	9.21583	-21.30600	1175		black piece of plastic	Lucy
JC094	015	EBA	ROV	ROV227	PSH	051	300	27/10/2013	12:04:00	9	13.15000	21	18.58000	9.21917	-21.30967	1002.9		about 1/4 full	sediment
JC094	015	EBA	ROV	ROV227	PSH	053	300	27/10/2013	12:12:00	9	13.16320	21	18.58870	9.21939	-21.30981	997.4		push core on rippled sand about 1/4 full	sediment
JC094	015	EBA	ROV	ROV227	NET	055	300	27/10/2013	12:34:00	9	13.18510	21	18.61270	9.21975	-21.31021	972.8		coral rubble	fossil
JC094	015	EBA	ROV	ROV227	NET	057	300	27/10/2013	13:48:00	9	13.30750	21	18.73200	9.22179	-21.31220	800		coral rubble	fossil
JC094	015	EBA	ROV	ROV227	SCP	058	300	27/10/2013	14:12:00	9	13.30950	21	18.73470	9.22183	-21.31225	798		coral rubble	fossil
JC094	015	EBA	ROV	ROV227	SLP	059	300	27/10/2013	14:52:00	9	13.31630	21	18.74080	9.22194	-21.31235	780		live solitary coral x2, sponges, fossil coral, fossil solitary	bio/fossil
JC094	015	EBA	ROV	ROV227	ARM	061	300	27/10/2013	15:13:00	9	13.33300	21	18.75020	9.22222	-21.31250	760		live bamboo coral, pale pink	bio
JC094	015	EBA	ROV	ROV227	SLP	063	300	27/10/2013	15:22:00	9	13.33460	21	18.74860	9.22224	-21.31248	760		live colonial coral, stylasterid	bio
JC094	015	EBA	ROV	ROV227	SLP	065	300	27/10/2013	15:35:00	9	13.34820	21	18.75610	9.22247	-21.31260	746		pencil urchin and fossil coral bits	bio/fossil
JC094	015	EBA	ROV	ROV227	SCP	066	300	27/10/2013	15:47:00	9	13.34820	21	18.75610	9.22247	-21.31260	746		fossil solitary and colonial live solitary	bio/fossil
JC094	015	EBA	ROV	ROV227	NSK	067	300	27/10/2013	16:39:00	9	13.44000	21	18.85000	9.22400	-21.31417	642		niskin 5	water
JC094	015	EBA	ROV	ROV227	PSH	068	300	27/10/2013	16:45:00	9	13.45000	21	18.85000	9.22417	-21.31417	642		1/3 full	sediment
JC094	016	TRS_2	MGA	MGA006	MCH	001	301	28/10/2013	05:10:00	7	48.00000	21	24.00000	7.80000	-21.40000	3430	3359	sediment - sampled without taking pore fluid	sediment
JC094	016	TRS_2	MGA	MGA006	MCH	002	301	28/10/2013	05:10:00	7	48.00000	21	24.00000	7.80000	-21.40000	3430	3359	failed	
JC094	016	TRS_2	MGA	MGA006	MCN	003	301	28/10/2013	05:10:00	7	48.00000	21	24.00000	7.80000	-21.40000	3430	3359	failed	

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net** **ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long — ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs — green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	016	TRS_2	MGA	MGA006	MCN	004	301	28/10/2013	05:10:00	7	48.00000	21	24.00000	7.80000	-21.40000	3430	3359	failed	
JC094	016	TRS_2	MGA	MGA006	NSK	005	301	28/10/2013	05:10:00	7	48.00000	21	24.00000	7.80000	-21.40000	3430	3359	Niskin fired- Kate sampled	Kate
JC094	017	TRS_2	PTN	PTN002	PTN	001	301	28/10/2013	09:42:00	7	48.00010	21	23.99940	7.80000	-21.39999	3400	3394	max tension= 5.95 tons. Looked to e clean hit and pull out but no core. Mud in core catcher	
JC094	017	TRS_2	PTN	PTN002	TGR	002	301	28/10/2013	09:42:00	7	48.00010	21	23.99940	7.80000	-21.39999	3400	3394	also empty	
JC094	018	TRS_2	GVY	GVY001	GVY	001	301	28/10/2013	17:34:00	7	26.09178	21	47.77862	7.43486	-21.79631	3428	3455	4.94 ton at pull out. Core succesful. Completely full up to the top value in the barrel. 5.34m of sandy mud	
JC094	019	TRS_2	MGA	MGA007	MCH	003	301	28/10/2013	21:52:00	7	26.09200	21	47.77800	7.43487	-21.79630	3428	3453	sampled for porewaters at 2 cm resolution. Also sampled sediments at 2 cm resolution afterwards	sediment/water
JC094	019	TRS_2	MGA	MGA007	MCH	004	301	28/10/2013	21:52:00	7	26.09200	21	47.77800	7.43487	-21.79630	3428	3453	sampled at 1 cm resolution down to 5 cm resolution	
JC094	019	TRS_2	MGA	MGA007	MCN	001	301	28/10/2013	21:52:00	7	26.09200	21	47.77800	7.43487	-21.79630	3428	3453	sampled at 1 cm resolution	sediment
JC094	019	TRS_2	MGA	MGA007	MCN	002	301	28/10/2013	21:52:00	7	26.09200	21	47.77800	7.43487	-21.79630	3428	3453	went to lucy woodall	
JC094	019	TRS_2	MGA	MGA007	NSK	005	301	28/10/2013	21:52:00	7	26.09200	21	47.77800	7.43487	-21.79630	3428	3453	fired	
JC094	020	EBB	CTD	CTD003	NSK	001	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 1: 4046m	water
JC094	020	EBB	CTD	CTD003	NSK	002	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 2: 4046m	water
JC094	020	EBB	CTD	CTD003	NSK	003	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 3: 3796m	water
JC094	020	EBB	CTD	CTD003	NSK	004	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 4: 3796m	water
JC094	020	EBB	CTD	CTD003	NSK	005	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 5: 2799m	water
JC094	020	EBB	CTD	CTD003	NSK	006	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 6: 2799m	water
JC094	020	EBB	CTD	CTD003	NSK	007	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 7: 2000m	water
JC094	020	EBB	CTD	CTD003	NSK	008	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 8: 2000m	water
JC094	020	EBB	CTD	CTD003	NSK	009	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 9: 1500m	water
JC094	020	EBB	CTD	CTD003	NSK	010	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 10: 1500m	water
JC094	020	EBB	CTD	CTD003	NSK	011	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 11: 1002m	water
JC094	020	EBB	CTD	CTD003	NSK	012	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 12: 1002m	water
JC094	020	EBB	CTD	CTD003	NSK	013	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 13: 803m	water
JC094	020	EBB	CTD	CTD003	NSK	014	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 14: 803m	water
JC094	020	EBB	CTD	CTD003	NSK	015	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 15: 404m	water
JC094	020	EBB	CTD	CTD003	NSK	016	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 16: 404m	water
JC094	020	EBB	CTD	CTD003	NSK	017	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 17: 254m	water
JC094	020	EBB	CTD	CTD003	NSK	018	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 18: 254m	water
JC094	020	EBB	CTD	CTD003	NSK	019	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 19: 55m	water
JC094	020	EBB	CTD	CTD003	NSK	020	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 20: 55m	water
JC094	020	EBB	CTD	CTD003	NSK	021	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 21: 20m	water
JC094	020	EBB	CTD	CTD003	NSK	022	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 22: 20m	water
JC094	020	EBB	CTD	CTD003	NSK	023	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 23: 5m	water
JC094	020	EBB	CTD	CTD003	NSK	024	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		Bottle 24: 5m	water
JC094	020	EBB	CTD	CTD003	NSK	025	303	30/10/2013	08:16:00	5	47.50000	26	40.99000	5.79167	-26.68317	4055		CTD profile uploaded into SIS	MBES
JC094	021	EBB	ROV	ROV228	NSK	001	303	30/10/2013	19:14:00	5	36.06000	26	58.06000	5.60100	-26.96767	1990		Niskin 1	water
JC094	021	EBB	ROV	ROV228	NSK	002	303	30/10/2013	19:14:00	5	36.06000	26	58.06000	5.60100	-26.96767	1990		Niskin 2	water
JC094	021	EBB	ROV	ROV228	PSH	003	303	30/10/2013	19:15:00	5	36.06000	26	58.06000	5.60100	-26.96767	1990		3 white stripes, 1/4 full	sediment
JC094	021	EBB	ROV	ROV228	PSH	004	303	30/10/2013	19:28:00	5	36.06000	26	58.03000	5.60100	-26.96717	1990		2 white stripes, 1/3 full	sediment
JC094	021	EBB	ROV	ROV228	PSH	005	303	30/10/2013	19:33:00	5	36.06000	26	58.03000	5.60100	-26.96717	1990		1 white stripe, 1/3 full	sediment
JC094	021	EBB	ROV	ROV228	SLP	006	303	30/10/2013	19:40:00	5	36.06000	26	58.04000	5.60100	-26.96733	1989		large glass barrel sponge	bio
JC094	021	EBB	ROV	ROV228	SCP	008	303	30/10/2013	20:03:00	5	36.09000	26	57.99000	5.60150	-26.96650	1985		fossil solitary corals with random rubble, plus live large dasmos	bio/fossil
JC094	021	EBB	ROV	ROV228	ARM	009	303	30/10/2013	21:23:00	5	36.09000	26	57.99000	5.60150	-26.96650	1985		live bamboo coral broken into 3 pieces	bio
JC094	021	EBB	ROV	ROV228	ARM	010	303	30/10/2013	21:37:00	5	36.09000	26	57.99000	5.60150	-26.96650	1984		orange- possible acanthogorgia, with ophuroids	bio
JC094	021	EBB	ROV	ROV228	SLP	012	303	30/10/2013	22:03:00	5	36.12040	26	57.94000	5.60201	-26.96567	1968		live solitary, smallest so far	bio
JC094	021	EBB	ROV	ROV228	SLP	013	303	30/10/2013	22:13:00	5	36.12700	26	57.94000	5.60212	-26.96567	1966		fossil solitary?plus debris and fragments	fossil
JC094	021	EBB	ROV	ROV228	SLP	014	303	30/10/2013	22:37:00	5	36.15550	26	57.91710	5.60259	-26.96529	1962		dead solitary whitish, small, also fossil fragments	fossil
JC094	021	EBB	ROV	ROV228	ARM	015	303	30/10/2013	23:11:00	5	36.16130	26	57.90900	5.60269	-26.96515	1958		white calcareous thing	
JC094	021	EBB	ROV	ROV228	SLP	016	303	30/10/2013	23:22:00	5	36.17150	26	57.89880	5.60286	-26.96498	1952		2 small dead solitary	fossil
JC094	021	EBB	ROV	ROV228	SLP	017	303	30/10/2013	23:28:00	5	36.17270	26	57.89720	5.60288	-26.96495	1952		2 live solitary, white, probably went through mesh, purple coral	bio
JC094	021	EBB	ROV	ROV228	SLP	017	303	30/10/2013	23:41:00	5	36.17550	26	57.89640	5.60293	-26.96494	1950		live solitary, white, small	bio
JC094	021	EBB	ROV	ROV228	SLP	018	303	30/10/2013	23:56:00	5	36.18060	26	57.89520	5.60301	-26.96492	1945		live solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	018	303	30/10/2013	23:57:00	5	36.17300	26	57.90900	5.60288	-26.96515	1945		live solitary in rock	bio
JC094	021	EBB	ROV	ROV228	SLP	018	304	31/10/2013	00:13:00	5	36.19110	26	57.88560	5.60319	-26.96476	1926		live solitary coral x2	bio
JC094	021	EBB	ROV	ROV228	SLP	018	304	31/10/2013	00:56:00	5	36.27000	26	57.83000	5.60450	-26.96383	1854		fossil solitary, white	fossil
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	01:03:00	5	36.27000	26	57.83000	5.60450	-26.96383	1853		small piece of fossil frame work	fossil
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	01:03:00	5	36.30000	26	57.82000	5.60500	-26.96367	1850		live solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	01:03:00	5	36.30000	26	57.82000	5.60500	-26.96367	1853		live solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	01:03:00	5	36.30000	26	57.82000	5.60500	-26.96367	1853		live solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	01:03:00	5	36.31000	26	57.81000	5.60517	-26.96350	1853		fossil fragment of dasmo, broke when sampling	fossil
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	01:03:00	5	36.32000	26	57.81000	5.60533	-26.96350	1853		fossil fragment of desmo	fossil
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	02:07:00	5	36.33000	26	57.80000	5.60550	-26.96333	1796		small white solitary, poss. Dead	fossil
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	02:11:00	5	36.33000	26	57.80000	5.60550	-26.96333	1791		possible solitary or anemone on white coral piece	bio
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	02:19:00	5	36.36000	26	57.79000	5.60600	-26.96317	1773		v. small white solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	02:24:00	5	36.36000	26	57.79000	5.60600	-26.96317	1773		lots of very small fragments	fossil
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	02:39:00	5	36.36000	26	57.79000	5.60600	-26.96317	1767		whitish fossil coral	fossil
JC094	021	EBB	ROV	ROV228	SLP	020	304	31/10/2013	02:48:00	5	36.36000	26	57.79000	5.60600	-26.96317	1758		live solitary coral	bio
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:04:00	5	36.40000	26	57.78000	5.60667	-26.96300	1719		live solitary coral, white	bio
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:16:00	5	36.42000	26	57.76000	5.60700	-26.96267	1683		small, dead white solitary	fossil
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:21:00	5	36.42000	26	57.76000	5.60700	-26.96267	1681		small possibly live, white solitary-broken into fragments	bio/fossil
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:34:00	5	36.43000	26	57.76000	5.60717	-26.96267	1686		small possibly dead white solitary, v-shaped	fossil
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:40:00	5	36.44000	26	57.76000	5.60733	-26.96267	1675		small live solitary coral-white	bio
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:45:00	5	36.45000	26	57.74000	5.60750	-26.96233	1666		small dead white solitary-broken	fossil
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:52:00	5	36.45000	26	57.74000	5.60750	-26.96233	1652		small live white solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	03:54:00	5	36.46000	26	57.73000	5.60767	-26.96217	1647		small live white solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	04:02:00	5	36.46000	26	57.73000	5.60767	-26.96217	1630		ver small live white solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	021	304	31/10/2013	04:10:00	5	36.47000	26	57.70000	5.60783	-26.96167	1616		small poss. Live/dead whtie solitary	bio/fossil

JC094 EVENT LOG

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Core and CTD Events are entered as the ON BOTTOM time/lat/long — ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs — green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	021	EBB	ROV	ROV228	SLP	022	304	31/10/2013	04:18:00	5	36.47000	26	57.69000	5.60783	-26.96150	1593		white, dead eroded solitary coral	fossil
JC094	021	EBB	ROV	ROV228	SLP	022	304	31/10/2013	04:31:00	5	36.47000	26	57.69000	5.60783	-26.96150	1574		fragments of coral framework/dead fossil	fossil
JC094	021	EBB	ROV	ROV228	SCP	023	304	31/10/2013	04:48:00	5	36.48000	26	57.68000	5.60800	-26.96133	1574		fossil framework with fossil solitary/solitaries	fossil
JC094	021	EBB	ROV	ROV228	SLP	024	304	31/10/2013	05:37:00	5	36.47650	26	57.68420	5.60794	-26.96140	1577		vase-shaped sponge, fragments collected	bio
JC094	021	EBB	ROV	ROV228	SLP	022	304	31/10/2013	06:18:00	5	36.48260	26	57.66980	5.60804	-26.96116	1542		live solitary coral (broken into pieces)	bio
JC094	021	EBB	ROV	ROV228	ARM	025	304	31/10/2013	06:35:00	5	36.48940	26	57.62110	5.60816	-26.96035	1505		glass vase sponge with shrimp	bio
JC094	021	EBB	ROV	ROV228	ARM	026	304	31/10/2013	06:58:00	5	36.49240	26	57.61630	5.60821	-26.96027	1503		primnoid? Branched	bio
JC094	021	EBB	ROV	ROV228	SLP	027	304	31/10/2013	07:18:00	5	36.50860	26	57.58630	5.60848	-26.95977	1503		solitary coral? Dead, solitary coral, live	bio/fossil
JC094	021	EBB	ROV	ROV228	SLP	028	304	31/10/2013	07:33:00	5	36.51190	26	57.57190	5.60853	-26.95953	1498		2 solitary corals on yellow, plus one solitar coral at 7:36 am	?
JC094	021	EBB	ROV	ROV228	SLP	029	304	31/10/2013	07:34:00	5	36.51200	26	57.57210	5.60853	-26.95954	1496		1 solitary coral (live,), plus 1 solitary live coral at 7:40	bio
JC094	021	EBB	ROV	ROV228	SLP	030	304	31/10/2013	07:48:00	5	36.51370	26	57.56790	5.60856	-26.95947	1493		coral fragments (dead), 3 solitary corals, 1 live solitary coral, 1 dead solitary, 1 broken live	bio/fossil
JC094	021	EBB	ROV	ROV228	SLP	031	304	31/10/2013	08:48:00	5	36.51420	26	57.56120	5.60857	-26.95935	1489		stylasterids and purple octocoral	bio
JC094	021	EBB	ROV	ROV228	SLP	030	304	31/10/2013	09:05:00	5	36.51690	26	57.55400	5.60862	-26.95923	1487		solitary coral (recently dead)	fossil
JC094	021	EBB	ROV	ROV228	ARM	032	304	31/10/2013	09:08:00	5	36.51680	26	57.55400	5.60861	-26.95923	1488		black coral (live)	bio
JC094	021	EBB	ROV	ROV228	ARM	033	304	31/10/2013	09:20:00	5	36.51650	26	57.54760	5.60861	-26.95913	1482		yellow stylasterid, enallopsammia on rock, plus crinoid	bio
JC094	021	EBB	ROV	ROV228	SLP	034	304	31/10/2013	09:33:00	5	36.52100	26	57.53160	5.60868	-26.95886	1467		complete live solitary coral- red tentacles	bio
JC094	021	EBB	ROV	ROV228	SLP	035	304	31/10/2013	09:46:00	5	36.52260	26	57.50720	5.60871	-26.95845	1444		fossil fragments from sediment	fossil
JC094	021	EBB	ROV	ROV228	SLP	036	304	31/10/2013	10:04:00	5	36.52390	26	57.49870	5.60873	-26.95831	1444		1 orange tentacle, live solitary	bio
JC094	021	EBB	ROV	ROV228	SLP	037	304	31/10/2013	10:04:00	5	36.52390	26	57.49870	5.60873	-26.95831	1444		1 orange tentacle, live solitary	bio
JC094	021	EBB	ROV	ROV228	ARM	038	304	31/10/2013	10:07:00	5	36.52390	26	57.49870	5.60873	-26.95831	1444		red busy octocoral, rarely branched	bio
JC094	021	EBB	ROV	ROV228	SCP	039	304	31/10/2013	10:20:00	5	36.52360	26	57.49670	5.60873	-26.95828	1445		white fan, stylasterid?	bio
JC094	021	EBB	ROV	ROV228	ARM	040	304	31/10/2013	10:23:00	5	36.52360	26	57.49670	5.60873	-26.95828	1445		dead gnallop. Skeleton	fossil
JC094	021	EBB	ROV	ROV228	SLP	041	304	31/10/2013	10:34:00	5	36.54480	26	57.57010	5.60908	-26.95950	1445		1 fossil, 1 recently dead coral, 1 live	bio/fossil
JC094	021	EBB	ROV	ROV228	ARM	042	304	31/10/2013	10:55:00	5	36.53780	26	57.57380	5.60896	-26.95956	1450		fragment of blobby white sponge	bio
JC094	021	EBB	ROV	ROV228	ARM	043	304	31/10/2013	11:33:00	5	36.60570	26	57.46340	5.61010	-26.95772	1432		bamboo coral, long, wavy, pink	bio
JC094	021	EBB	ROV	ROV228	SLP	044	304	31/10/2013	12:09:00	5	36.66500	26	57.45760	5.61108	-26.95763	1484		solitary coral, 2 live, 1 dead, 1 tiny	bio/fossil
JC094	021	EBB	ROV	ROV228	ARM	045	304	31/10/2013	12:21:00	5	36.66500	26	57.45760	5.61108	-26.95763	1484		big white sponge	bio
JC094	021	EBB	ROV	ROV228	NSK	046	304	31/10/2013	12:27:00	5	36.66540	26	57.45570	5.61109	-26.95760	1483		3 niskins fired	water
JC094	022	EBB	ROV	ROV229	SLP	001	304	31/10/2013	21:03:00	5	37.49000	26	57.98000	5.62483	-26.96633	1278		3x large fossil desmo, fossil coral rubble, 2x live solitary, 2x small live solitary	bio/fossil
JC094	022	EBB	ROV	ROV229	NSK	002	304	31/10/2013	21:24:00	5	37.49000	26	57.98000	5.62483	-26.96633	1272		Niskin1	water
JC094	022	EBB	ROV	ROV229	NSK	003	304	31/10/2013	21:24:00	5	37.49000	26	57.98000	5.62483	-26.96633	1272		Niskin2	water
JC094	022	EBB	ROV	ROV229	SLP	004	304	31/10/2013	21:43:00	5	37.49000	26	57.98000	5.62483	-26.96633	1271		small fossil debris, piece of framework, live solitary x1	bio/fossil
JC094	022	EBB	ROV	ROV229	SLP	005	304	31/10/2013	22:00:00	5	37.49000	26	57.98000	5.62483	-26.96633	1271		1x live solitary and some fossil solitary rubble. 1x live solitary/sediment and fossil fragments. Large amout of framework.	bio/fossil
JC094	022	EBB	ROV	ROV229	ARM	007	304	31/10/2013	22:27:00	5	37.49000	26	57.97000	5.62483	-26.96617	1267		Yellow Enallapsamia (branching) with base	bio
JC094	022	EBB	ROV	ROV229	SLP	009	304	31/10/2013	22:48:00	5	37.49000	26	57.97000	5.62483	-26.96617	1264		live solitaries	bio
JC094	022	EBB	ROV	ROV229	NET	010	304	31/10/2013	22:54:00	5	37.50000	26	57.97000	5.62500	-26.96617	1264		fossil coral rubble, fossil white bits and lots of crinoids	bio/fossil
JC094	022	EBB	ROV	ROV229	SLP	012	305	01/11/2013	00:13:00	5	37.50020	26	57.80640	5.62500	-26.96344	1089		large glass sponge, possibly with ghost shrimp. White	bio
JC094	022	EBB	ROV	ROV229	ARM	013	305	01/11/2013	00:44:00	5	37.50140	26	57.76590	5.62502	-26.96277	1033		Sea Pen. Large pink. Probably over 1m long	bio
JC094	022	EBB	ROV	ROV229	SLP	015	305	01/11/2013	01:25:00	5	37.51590	26	57.71850	5.62527	-26.96198	997		large fossil solitary, corroded	fossil
JC094	022	EBB	ROV	ROV229	PSH	017	305	01/11/2013	01:46:00	5	37.51670	26	57.69830	5.62528	-26.96164	989		3/4 push core full	sediment
JC094	022	EBB	ROV	ROV229	PSH	018	305	01/11/2013	01:49:00	5	37.51600	26	57.69850	5.62527	-26.96164	990		Full push core. Top may be difficult to identify	sediment
JC094	022	EBB	ROV	ROV229	PSH	019	305	01/11/2013	01:51:00	5	37.51670	26	57.69990	5.62528	-26.96167	989		Apparently full push core. Some turbulence seen in tube. May be mixed	sediment
JC094	022	EBB	ROV	ROV229	SLP	020	305	01/11/2013	02:05:00	5	37.49704	26	57.66822	5.62495	-26.96114	987		Live orange solitary coral	bio
JC094	022	EBB	ROV	ROV229	SLP	021	305	01/11/2013	02:10:00	5	37.51420	26	57.66980	5.62524	-26.96116	987		Possibly live small solitary corals slurped from rock.	bio
JC094	022	EBB	ROV	ROV229	SLP	022	305	01/11/2013	02:17:00	5	37.51390	26	57.66850	5.62523	-26.96114	987		Large grayish, possibly dead solitary, desmo-like	bio/fossil
JC094	022	EBB	ROV	ROV229	SLP	024	305	01/11/2013	02:48:00	5	37.52190	26	57.58390	5.62537	-26.95973	978		Solitary, possibly live coral	bio
JC094	022	EBB	ROV	ROV229	SLP	025	305	01/11/2013	02:53:00	5	37.52510	26	57.56580	5.62542	-26.95943	977		solitary live coral on sand patch near rock	bio
JC094	022	EBB	ROV	ROV229	SLP	026	305	01/11/2013	02:56:00	5	37.52480	26	57.55880	5.62541	-26.95931	977		Purple live solitary coral	bio
JC094	022	EBB	ROV	ROV229	SLP	027	305	01/11/2013	03:08:00	5	37.52040	26	57.50980	5.62534	-26.95850	972		Live solitary coral on sand, pale brown color	bio
JC094	022	EBB	ROV	ROV229	SLP	028	305	01/11/2013	03:23:00	5	37.51420	26	57.79100	5.62524	-26.96318	970		live solitary purple coral	bio
JC094	022	EBB	ROV	ROV229	SLP	029	305	01/11/2013	03:27:00	5	37.51420	26	57.47910	5.62524	-26.95799	970		live solitary purple coral	bio
JC094	022	EBB	ROV	ROV229	SLP	030	305	01/11/2013	03:28:00	5	37.50380	26	57.47800	5.62506	-26.95797	971		live solitary purple coral	bio
JC094	022	EBB	ROV	ROV229	ARM	032	305	01/11/2013	03:45:00	5	37.52000	26	57.44000	5.62533	-26.95733	960		2 fragments. Live stylasterid (possible?), white, rigid and breakable	bio
JC094	022	EBB	ROV	ROV229	SLP	034	305	01/11/2013	03:57:00	5	37.53000	26	57.43000	5.62550	-26.95717	959		Large glass sponge	bio
JC094	022	EBB	ROV	ROV229	SLP	036	305	01/11/2013	04:38:00	5	37.53000	26	57.30000	5.62550	-26.95500	923		Yellow sponge	bio
JC094	022	EBB	ROV	ROV229	SLP	038	305	01/11/2013	04:43:00	5	37.54000	26	57.29000	5.62567	-26.95483	915		Live solitary coral	bio
JC094	022	EBB	ROV	ROV229	SLP	040	305	01/11/2013	05:10:00	5	37.54480	26	57.24670	5.62575	-26.95411	915		large live solitary-purple	bio
JC094	022	EBB	ROV	ROV229	SLP	041	305	01/11/2013	05:18:00	5	37.54480	26	57.24670	5.62575	-26.95411	915		small white dead solitary corals x4	fossil
JC094	022	EBB	ROV	ROV229	SLP	043	305	01/11/2013	06:26:00	5	37.56930	26	57.04590	5.62616	-26.95077	863		Giant fossil desmo?	fossil
JC094	022	EBB	ROV	ROV229	NET	045	305	01/11/2013	06:36:00	5	37.57890	26	57.00400	5.62632	-26.95007	845		at least 1 live solitary. Fossil rubble, large colonial fossils	fossil
JC094	022	EBB	ROV	ROV229	SLP	047	305	01/11/2013	08:05:00	5	37.59700	26	56.88450	5.62662	-26.94808	773		Large solitary fossil coral	fossil
JC094	022	EBB	ROV	ROV229	SLP	048	305	01/11/2013	08:09:00	5	37.59700	26	56.88450	5.62662	-26.94808	773		very small white live solitary corals	bio
JC094	022	EBB	ROV	ROV229	SLP	049	305	01/11/2013	08:24:00	5	37.59750	26	56.88290	5.62663	-26.94805	766		hexactinnalid-glass sponge	bio
JC094	022	EBB	ROV	ROV229	SLP	050	305	01/11/2013	08:30:00	5	37.59750	26	56.88290	5.62663	-26.94805	771		large fossil desmo	fossil
JC094	022	EBB	ROV	ROV229	SLP	052	305	01/11/2013	08:55:00	5	37.59390	26	56.86610	5.62657	-26.94777	761		sediment, fossil colonial coral	fossil
JC094	022	EBB	ROV	ROV229	SLP	054	305	01/11/2013	09:24:00	5	37.59670	26	56.80520	5.62661	-26.94675	749		live solitaries and fossil coral framework. Small white solitaries	bio/fossil
JC094	022	EBB	ROV	ROV229	SLP	056	305	01/11/2013	10:04:00	5	37.59930	26	56.72240	5.62666	-26.94537	718		small live solitaries (at least 10), and fossil solitary?	bio/fossil
JC094	022	EBB	ROV	ROV229	ARM	057	305	01/11/2013	10:09:00	5	37.60080	26	56.72270	5.62668	-26.94538	719.5		pink bamboo coral (quite curly branches)	bio
JC094	022	EBB	ROV	ROV229	SLP	059	305	01/11/2013	10:31:00	5	37.60360	26	56.68770	5.62673	-26.94480	701		live large solitary coral with pink fan interior	bio
JC094	022	EBB	ROV	ROV229	SLP/SCP	060	305	01/11/2013	10:59:00	5	37.60290	26	56.68720	5.62672	-26.94479	701		live colonial corals with styll on it	bio
JC094	022	EBB	ROV	ROV229	SLP	061	305	01/11/2013	11:10:00	5	37.60200	26	56.68770	5.62670	-26.94480	701		sponge	bio
JC094	022	EBB	ROV	ROV229	SLP	062	305	01/11/2013	11:30:00	5	37.59690	26	56.66220	5.62662	-26.94437	684		live solitary coral	bio
JC094	022	EBB	ROV	ROV229	ARM	063	305	01/11/2013	11:56:00	5	37.60890	26	56.60780	5.62682	-26.94346	635		2 tins	?
JC094	022	EBB	ROV	ROV229	SLP	064	305	01/11/2013	12:14:00	5	37.61910	26	56.57250	5.62699	-26.94288	628		sponge, tubular-glass	bio
JC094	022	EBB	ROV	ROV229	SLP	065	305	01/11/2013	12:18:00	5	37.61850	26	56.57200	5.62698	-26.94287	628		solitary coral live (desmo?)	bio
JC094	022	EBB	ROV	ROV229	ARM	066	305	01/11/2013	12:25:00	5	37.61860	26	56.57150	5.62698	-26.94286	628		yellow-octocoral-fan	bio
JC094	022	EBB	ROV	ROV229	SCP	068	305	01/11/2013	13:01:00	5	37.61650	26	56.51770	5.62694	-26.94196	611		Corallium? Pink tips	bio
JC094	022	EBB	ROV	ROV229	SLP	069	305	01/11/2013	13:12:00	5	37.61190	26	56.51660	5.62687	-26.94194	611		purple large desmo x2	bio

JC094 EVENT LOG

NSK= Niskin **SLP**= Slurp **SCP**= Scoop **MGA**= Mega Core **KTN**= Kasten **GVY**= GravityCore **PTN**= PistonCore **PSH**= PushCore **BOX**= BoxCore **NET= Net** **ARM**= Arm **MBS**= Multibeam start **MBE**= multibeam end
Core and CTD Events are entered as the ON BOTTOM time/lat/long ROV Events are LAT/LONG of USBL and Depth from DVL
yellow entries that have been corrected and hence differ from the Sample Logs green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	022	EBB	ROV	ROV229	PSH	071	305	01/11/2013	13:58:00	5	37.62880	26	56.40200	5.62715	-26.94003	565		fail-some already in there	
JC094	022	EBB	ROV	ROV229	PSH	072	305	01/11/2013	13:58:00	5	37.62880	26	56.40200	5.62715	-26.94003	565		pushcore 1/3 full	sediment
JC094	022	EBB	ROV	ROV229	PSH	073	305	01/11/2013	14:12:00	5	37.62880	26	56.40200	5.62715	-26.94003	565		1 inch of sediment?	sediment
JC094	022	EBB	ROV	ROV229	NSK	074	305	01/11/2013	14:16:00	5	37.63050	26	56.39080	5.62718	-26.93985	564		Niskin 3	water
JC094	022	EBB	ROV	ROV229	NSK	075	305	01/11/2013	14:16:00	5	37.63050	26	56.39080	5.62718	-26.93985	564		Niskin 4	water
JC094	022	EBB	ROV	ROV229	NSK	076	305	01/11/2013	14:16:00	5	37.63050	26	56.39080	5.62718	-26.93985	565		Niskin 5	water
JC094	023	EBB	GVY	GVY002	GVY	001	305	01/11/2013	16:09:00	5	37.69000	26	54.34000	5.62817	-26.90567	555	560	Core Failed.	
JC094	024	EBB	GVY	GVY003	GVY	001	305	01/11/2013	17:46:00	5	37.68400	26	54.32800	5.62807	-26.90547	555	560	Core Failed. Pull out approximately 0.4 tons	
JC094	025	EBB	GVY	GVY004	GVY	001	305	01/11/2013	19:25:00	5	38.96800	26	54.96400	5.64947	-26.91607	550	540	Core Failed	
JC094	026	EBB	ROV	ROV230	NSK	001	306	02/11/2013	00:17:00	5	35.37000	26	59.68000	5.58950	-26.99467	2819		Niskin 1	water
JC094	026	EBB	ROV	ROV230	NSK	002	306	02/11/2013	00:17:00	5	35.37000	26	59.68000	5.58950	-26.99467	2819		Niskin 2	water
JC094	026	EBB	ROV	ROV230	PSH	003	306	02/11/2013	00:20:00	5	35.37000	26	59.67000	5.58950	-26.99450	2820		1/3 full	sediment
JC094	026	EBB	ROV	ROV230	PSH	004	306	02/11/2013	00:29:00	5	35.37000	26	59.67000	5.58950	-26.99450	2816		1/2 full	sediment
JC094	026	EBB	ROV	ROV230	PSH	005	306	02/11/2013	00:32:00	5	35.37000	26	59.67000	5.58950	-26.99450	2816		1/2 full	sediment
JC094	026	EBB	ROV	ROV230	SLP	007	306	02/11/2013	00:41:00	5	35.36000	26	59.65000	5.58933	-26.99417	2818		glass barrel sponge	bio
JC094	026	EBB	ROV	ROV230	SLP	008	306	02/11/2013	00:53:00	5	35.36000	26	59.65000	5.58933	-26.99417	2820		tiny white branched fan corals, living colonial	bio
JC094	026	EBB	ROV	ROV230	SLP	009	306	02/11/2013	00:57:00	5	35.36000	26	59.65000	5.58933	-26.99417	2824		fossil coral debris	fossil
JC094	026	EBB	ROV	ROV230	ARM	010	306	02/11/2013	01:15:00	5	35.36100	26	59.64300	5.58935	-26.99405	2821		Bamboo coral broken off above base. Bottom stalk and hold of bamboo	bio
JC094	026	EBB	ROV	ROV230	SLP	011	306	02/11/2013	01:24:00	5	35.36000	26	59.64300	5.58933	-26.99405	2820		Stalked glass sponge, went in slurp tube but did not appear to arrive in chamber	bio
JC094	026	EBB	ROV	ROV230	SLP	012	306	02/11/2013	01:33:00	5	35.36100	26	59.64000	5.58935	-26.99400	2818		small pieces of fossil framework coral. Yellow in color	fossil
JC094	026	EBB	ROV	ROV230	SLP	013	306	02/11/2013	01:40:00	5	35.36300	26	59.64300	5.58938	-26.99405	2819		pieces of fossil framework	fossil
JC094	026	EBB	ROV	ROV230	SLP	015	306	02/11/2013	01:57:00	5	35.35500	26	59.63200	5.58925	-26.99387	2820		3x fine spine pencil urchins. 1x fine spine pencil urchin. 1x fine spine pencil urchin + 1 ophuriod	bio
JC094	026	EBB	ROV	ROV230	SLP	017	306	02/11/2013	02:32:00	5	35.36200	26	59.61300	5.58937	-26.99355	2814		1x large fossil coral, orange color (solitary)	fossil
JC094	026	EBB	ROV	ROV230	SLP	018	306	02/11/2013	02:41:00	5	35.37300	26	59.60800	5.58955	-26.99347	2800		1x fossil solitary more eroded than previous	fossil
JC094	026	EBB	ROV	ROV230	SLP	019	306	02/11/2013	02:45:00	5	35.37640	26	59.60400	5.58961	-26.99340	2802		1x fossil solitary coral on sand (possibly sponge?)	fossil
JC094	026	EBB	ROV	ROV230	SLP	021	306	02/11/2013	03:19:00	5	35.45300	26	59.56800	5.59088	-26.99280	2735		Hermit crab with 2x live solitary corals on it! (maybe anemones)	bio
JC094	026	EBB	ROV	ROV230	SLP	022	306	02/11/2013	03:22:00	5	35.45300	26	59.56800	5.59088	-26.99280	2735		1x sea urchin fine spine	bio
JC094	026	EBB	ROV	ROV230	SLP	024	306	02/11/2013	03:45:00	5	35.48800	26	59.52760	5.59147	-26.99213	2713		Hermit crab with 2x live solitaries. Small rock, roundish/dark brown/red	bio
JC094	026	EBB	ROV	ROV230	SLP	026	306	02/11/2013	05:20:00	5	35.49970	26	59.23130	5.59166	-26.98719	2600		Fossil coral	fossil
JC094	026	EBB	ROV	ROV230	ARM	028	306	02/11/2013	05:53:00	5	35.51200	26	59.21640	5.59187	-26.98694	2599		bamboo fossils	fossil
JC094	026	EBB	ROV	ROV230	SLP	029	306	02/11/2013	06:09:00	5	35.51890	26	59.21700	5.59198	-26.98695	2599		solitary fossil coral	fossil
JC094	026	EBB	ROV	ROV230	ARM/SLP	031	306	02/11/2013	06:47:00	5	35.54940	26	59.18870	5.59249	-26.98648	2618		white stalked sponge, white globular sponge, dead?bushy sponge	bio
JC094	026	EBB	ROV	ROV230	SLP	033	306	02/11/2013	07:00:00	5	35.56380	26	59.16640	5.59273	-26.98611	2629		holothuriods (pink/purple) x10	bio
JC094	026	EBB	ROV	ROV230	ARM	035	306	02/11/2013	08:33:00	5	35.72970	26	58.98470	5.59550	-26.98308	2548		Fossil calcxonia skeleton-bamboo? White	fossil
JC094	026	EBB	ROV	ROV230	SLP	037	306	02/11/2013	08:54:00	5	35.74900	26	58.93770	5.59582	-26.98230	2494		solitary-live. White, orange tentacles	bio
JC094	026	EBB	ROV	ROV230	SLP	039	306	02/11/2013	09:07:00	5	35.73660	26	58.92400	5.59561	-26.98207	2474		Solitary live coral. White tentacles	bio
JC094	026	EBB	ROV	ROV230	SLP	041	306	02/11/2013	09:13:00	5	35.73710	26	58.90840	5.59562	-26.98181	2475		stylasterid fan and sponge	BIO
JC094	026	EBB	ROV	ROV230	ARM	042	306	02/11/2013	09:16:00	5	35.73710	26	58.90840	5.59562	-26.98181	2475		primnoid fan, light pink	bio
JC094	026	EBB	ROV	ROV230	SLP	044	306	02/11/2013	10:07:00	5	35.71150	26	58.75440	5.59519	-26.97924	2463		Bamboo? Skeleton-holdfast. Fossil	fossil
JC094	026	EBB	ROV	ROV230	SLP	046	306	02/11/2013	10:11:00	5	35.71300	26	58.75200	5.59522	-26.97920	2459		1x white solitary? 1x brown solitary	fossil
JC094	026	EBB	ROV	ROV230	SLP	047	306	02/11/2013	10:19:00	5	35.70200	26	58.73840	5.59503	-26.97897	2447		1x white solitary. Live coral. Plus 2 live solitary corals and coral rubble	bio/fossil
JC094	026	EBB	ROV	ROV230	SLP	049	306	02/11/2013	10:51:00	5	35.67910	26	58.68160	5.59465	-26.97803	2390		yellow thing on dead bamboo	bio/fossil
JC094	026	EBB	ROV	ROV230	SLP	050	306	02/11/2013	11:01:00	5	35.67140	26	58.66310	5.59452	-26.97772	2391		live solitary coral	bio
JC094	026	EBB	ROV	ROV230	SLP	051	306	02/11/2013	11:10:00	5	35.66790	26	58.65840	5.59447	-26.97764	2391		dead solitary coral	fossil
JC094	026	EBB	ROV	ROV230	SLP	053	306	02/11/2013	11:35:00	5	35.65100	26	58.63100	5.59418	-26.97718	2355		dead bamboo coral with ball-shaped yellowish sponge	bio/fossil
JC094	026	EBB	ROV	ROV230	ARM	055	306	02/11/2013	12:01:00	5	35.65100	26	58.59640	5.59418	-26.97661	2317		picking up a wine bottle	lucy
JC094	026	EBB	ROV	ROV230	ARM	057	306	02/11/2013	12:20:00	5	35.66650	26	58.57580	5.59444	-26.97626	2307		large yellow sponge. Other yellow sponge	bio
JC094	026	EBB	ROV	ROV230	SLP	059	306	02/11/2013	12:32:00	5	35.67810	26	58.54720	5.59464	-26.97579	2309		live solitary coral- orange	bio
JC094	026	EBB	ROV	ROV230	SLP	061	306	02/11/2013	13:10:00	5	35.71470	26	58.47320	5.59525	-26.97455	2257		live solitary coral on framework coral (+ophuroid +sponge) +large purple live	bio
JC094	026	EBB	ROV	ROV230	SLP	062	306	02/11/2013	13:17:00	5	35.71470	26	58.47320	5.59525	-26.97455	2257		Large aggregate of sponge, live coral, crysogrogid and rock	bio
JC094	026	EBB	ROV	ROV230	PSH	063	306	02/11/2013	13:55:00	5	35.74880	26	58.42760	5.59581	-26.97379	2220		psh cores. 15 inches (maybe?)	sediment
JC094	026	EBB	ROV	ROV230	NSK	064	306	02/11/2013	14:09:00	5	35.75180	26	58.42680	5.59586	-26.97378	2218		Niskin 3 and 4	water
JC094	026	EBB	ROV	ROV230	SLP	066	306	02/11/2013	15:00:00	5	35.83890	26	58.31970	5.59732	-26.97200	2170		fossil solitary x2	fossil
JC094	026	EBB	ROV	ROV230	SLP	068	306	02/11/2013	15:11:00	5	35.84100	26	58.32240	5.59735	-26.97204	2170		fossil solitary	fossil
JC094	026	EBB	ROV	ROV230	SLP	070	306	02/11/2013	18:41:00	5	37.17590	26	57.52610	5.61960	-26.95877	1164		fossil solitary (corroded) x4. coral rubble	fossil
JC094	026	EBB	ROV	ROV230	NET	071	306	02/11/2013	19:06:00	5	37.17450	26	57.53000	5.61958	-26.95883	1164		fossil coral rubble	fossil
JC094	026	EBB	ROV	ROV230	SLP	073	306	02/11/2013	19:22:00	5	37.18000	26	57.53000	5.61967	-26.95883	1162		Large fossil solitary x3 and other fossil rubble	fossil
JC094	026	EBB	ROV	ROV230	NET	074	306	02/11/2013	19:35:00	5	37.18000	26	57.53000	5.61967	-26.95883	1162		fossil coral rubble	fossil
JC094	026	EBB	ROV	ROV230	SLP	075	306	02/11/2013	19:54:00	5	37.18000	26	57.53000	5.61967	-26.95883	1162		fossil solitary	fossil
JC094	026	EBB	ROV	ROV230	ARM	077	306	02/11/2013	20:23:00	5	37.19000	26	57.51000	5.61983	-26.95850	1119		Fossil Solitary- Failed	
JC094	026	EBB	ROV	ROV230	NET	079	306	02/11/2013	21:14:00	5	37.24000	26	57.45000	5.62067	-26.95750	1035		fossil coral rubble	fossil
JC094	026	EBB	ROV	ROV230	ARM	081	306	02/11/2013	21:47:00	5	37.25640	26	57.47420	5.62094	-26.95790	1034		Red octocoral	bio
JC094	026	EBB	ROV	ROV230	NSK	082	306	02/11/2013	21:50:00	5	37.25570	26	57.47500	5.62093	-26.95792	1033		Niskin fired. Only one bottle	water
JC094	027	EBB	MGA	MGA008	MCH	003	307	03/11/2013	04:12:00	5	42.33900	27	16.42900	5.70565	-27.27382	4420	4455	~37cm recovery. Pore water extraction at 2cm intervals, then sliced at 2cm resolution	sediment/water
JC094	027	EBB	MGA	MGA008	MCH	004	307	03/11/2013	04:12:00	5	42.33900	27	16.42900	5.70565	-27.27382	4420	4455	~22cm recovery. Top 5 cm to Lucy Woodall, lower part sliced at 5cm intervals	sediment/plastics
JC094	027	EBB	MGA	MGA008	MCN	001	307	03/11/2013	04:12:00	5	42.33900	27	16.42900	5.70565	-27.27382	4420	4455	~41cm recovery. Sliced at 1cm resolution	sediment
JC094	027	EBB	MGA	MGA008	MCN	002	307	03/11/2013	04:12:00	5	42.33900	27	16.42900	5.70565	-27.27382	4420	4455	~38cm recovery. Sliced at 1cm resolution down to 5cm, then 5cm resolution	sediment
JC094	027	EBB	MGA	MGA008	NSK	005	307	03/11/2013	04:12:00	5	42.33900	27	16.42900	5.70565	-27.27382	4420	4455	fired	water
JC094	028	EBB	PTN	PTN003	PTN	001	307	03/11/2013	09:26:00	5	42.35900	27	16.44300	5.70598	-27.27405	4420	4423	12m barrel piston core. Max tension: 6.01T. Barrel and weight covered in mud, but liner empty and shattered.	sediment
JC094	028	EBB	PTN	PTN003	TGR	002	307	03/11/2013	09:26:00	5	42.35900	27	16.44300	5.70598	-27.27405	4420	4423	small amount of sediment, bagged up. S0090. In addition there is a 53cm core S0999.	sediment
JC094	029	TRS_3	MGA	MGA009	MCH	001	309	05/11/2013	00:18:00	6	48.71200	32	54.72600	6.81187	-32.91210	4065	4090	Top 5cm sampled, remaining sampled at 5 cm resolutin. 5 samples in total-lucy. S094	sediment
JC094	029	TRS_3	MGA	MGA009	MCH	004	309	05/11/2013	00:18:00	6	48.71200	32	54.72600	6.81187	-32.91210	4065	4090	1 core top. Pore waters at 2 cm intervals. Remaining core sampled at 2 cm intervals. 18 samples in total. S0097	sediment/water
JC094	029	TRS_3	MGA	MGA009	MCN	002	309	05/11/2013	00:18:00	6	48.71200	32	54.72600	6.81187	-32.91210	4065	4090	One core top samlpe. 1-4 cm sampled at 1 cm intervals. Remaining core at 5 cm interval. Total 12 samples. S0095	sediment
JC094	029	TRS_3	MGA	MGA009	MCN	003	309	05/11/2013	00:18:00	6	48.71200	32	54.72600	6.81187	-32.91210	4065	4090	1 core top. Remaining sampled at 1 cm intervals. 39 samples in total. S0096	sediment
JC094	029	TRS_3	MGA	MGA009	NSK	005	309	05/11/2013	00:18:00	6	48.71200	32	54.72600	6.81187	-32.91210	4065	4090	fired and sampled	water
JC094	030	TRS_3	GVY	GVY005	GVY	001	309	05/11/2013	04:19:00	6	48.71000	32	54.71900	6.81183	-32.91198	4065	4095	6m of core barrel. Over penetration of core right into sediment. Estimate about 1 m	sediment
JC094	031	TRS_3	GVY	GVY006	GVY	001	309	05/11/2013	10:19:00	6	48.71000	32	54.72000	6.81183	-32.91200	4066	4093	Repeat core using 9m barrel and slow rate of penetration. Recovered about 6.5m core is good condition with no over penetration	sediment
JC094	032	VEM	CTD	CTD004	NSK	001	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 1: 4923m	water
JC094	032	VEM	CTD	CTD004	NSK	002	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 2: 4923m	water

JC094 EVENT LOG

NSK= Niskin **SLP**= Slurp **SCP**= Scoop **MGA**= Mega Core **KTN**= Kasten **GVY**= GravityCore **PTN**= PistonCore **PSH**= PushCore **BOX**= BoxCore **NET= Net** **ARM**= Arm **MBS**= Multibeam start **MBE**= multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long — ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs — green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	032	VEM	CTD	CTD004	NSK	003	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 3: 4702m	water
JC094	032	VEM	CTD	CTD004	NSK	004	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 4: 4702m	water
JC094	032	VEM	CTD	CTD004	NSK	005	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 5: 3802m	water
JC094	032	VEM	CTD	CTD004	NSK	006	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 6: 3802m	water
JC094	032	VEM	CTD	CTD004	NSK	007	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 7: 2805m	water
JC094	032	VEM	CTD	CTD004	NSK	008	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 8: 2805m	water
JC094	032	VEM	CTD	CTD004	NSK	009	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 9: 2005m	water
JC094	032	VEM	CTD	CTD004	NSK	010	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 10: 2005m	water
JC094	032	VEM	CTD	CTD004	NSK	011	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 11: 1506m	water
JC094	032	VEM	CTD	CTD004	NSK	012	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 12: 1506m	water
JC094	032	VEM	CTD	CTD004	NSK	013	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 13: 1009m	water
JC094	032	VEM	CTD	CTD004	NSK	014	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 14: 1009m	water
JC094	032	VEM	CTD	CTD004	NSK	015	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 15: 810m	water
JC094	032	VEM	CTD	CTD004	NSK	016	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 16: 810m	water
JC094	032	VEM	CTD	CTD004	NSK	017	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 17: 609m	water
JC094	032	VEM	CTD	CTD004	NSK	018	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 18: 609m	water
JC094	032	VEM	CTD	CTD004	NSK	019	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 19: 460m	water
JC094	032	VEM	CTD	CTD004	NSK	020	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 20: 460m	water
JC094	032	VEM	CTD	CTD004	NSK	021	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 21: 85m	water
JC094	032	VEM	CTD	CTD004	NSK	022	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 22: 85m	water
JC094	032	VEM	CTD	CTD004	NSK	023	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 23: 16m	water
JC094	032	VEM	CTD	CTD004	NSK	024	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		Bottle 24: 16m	water
JC094	032	VEM	CTD	CTD004	CTDprofile	025	312	08/11/2013	09:35:00	10	33.28700	44	30.88600	10.55478	-44.51477	4949		CTD profile uploaded into SIS	MBES
JC094	033	VEM	ROV	ROV231	SLP	003	312	08/11/2013	16:46:00	10	44.59320	44	34.71740	10.74322	-44.57862	1494		1 dead solitary (orange, quarter sized) and fossil debris one recently dead solitary with white crest and orange base, 1 dead solitary (white)(silver dollar sized), 1 dead solitary (spotted on outside), pieces of bamboo coral all into 2x balck tube with some spill into 2x white tube	fossil
JC094	033	VEM	ROV	ROV231	ARM	008	312	08/11/2013	18:08:00	10	44.57110	44	34.67110	10.74285	-44.57785	1480		live colonial coral, corallium? Pink all over 30 cm across, brittle snake living on it, quite bendy into stbd bio	Bio
JC094	033	VEM	ROV	ROV231	SLP	009	312	08/11/2013	18:17:00	10	44.57110	44	34.67080	10.74285	-44.57785	1479		live colonial coral, yellow 5 cm across broken into pieces, scleractinian, probably enallopsammia all into 2x black rock tube in rock box 1	bio
JC094	033	VEM	ROV	ROV231	NSK	010	312	08/11/2013	18:19:00	10	44.57160	44	34.67020	10.74286	-44.57784	1479			
JC094	033	VEM	ROV	ROV231	NSK	011	312	08/11/2013	18:19:00	10	44.57160	44	34.67020	10.74286	-44.57784	1479			
JC094	033	VEM	ROV	ROV231	ARM	014	312	08/11/2013	18:32:00	10	44.57000	44	34.66510	10.74283	-44.57775	1474		v. long bamoo coral (curly, live) stored in tool tray	Bio/Fossil
JC094	033	VEM	ROV	ROV231	SLP	017	312	08/11/2013	18:47:00	10	44.56640	44	34.66060	10.74277	-44.57768	1468		live solitary coral with ornage tentacles x 2, one is very small, dead? Solitary coral -all white all into 2x black in rock box 1	Bio/Fossil
JC094	033	VEM	ROV	ROV231	SLP	020	312	08/11/2013	19:04:00	10	44.56420	44	34.58870	10.74274	-44.57648	1464		1x dead white solitary coral into 2x white rock box 1	Fossil
JC094	033	VEM	ROV	ROV231	ARM	021	312	08/11/2013	19:10:00	10	44.56020	44	34.68950	10.74267	-44.57816	1467		1x enallopsommia, yellow fan, scleractinia live into stbio	Bio/Fossil
JC094	033	VEM	ROV	ROV231	SLP	022	312	08/11/2013	19:28:00	10	44.56020	44	34.68950	10.74267	-44.57816	1467		1x live solitary coral , orange tentacles, 2x white rock box 1	Bio/Fossil
JC094	033	VEM	ROV	ROV231	SLP	025	312	08/11/2013	20:53:00	10	44.55700	44	34.57600	10.74262	-44.57627	1420		small live solitary coral, pale yellow and fossil debris, mixed fossil coral deris with live ophiroid, more fossil coral deris, more fossil coral debris all into 2x red tube	Bio/Fossil
JC094	033	VEM	ROV	ROV231	SLP	026	312	08/11/2013	21:27:00	10	44.56100	44	34.56100	10.74268	-44.57602	1407		dead?/recently-dead? Solitary, white, ophiroid wrapped around it, plus another white solitary that fragmented into bits, all into 2x blue tube	Bio/Fossil
JC094	033	VEM	ROV	ROV231	NET	027	312	08/11/2013	21:54:00	10	44.58700	44	34.53600	10.74312	-44.57560	1403		fossil coral rubble and sediment into orange net stored on tool tray	fossil
JC094	033	VEM	ROV	ROV231	ARM	028	312	08/11/2013	22:18:00	10	44.59200	44	34.52300	10.74320	-44.57538	1402		base of corallium/paragorgia pink fand and whole fan coral into aft bio	Bio/Fossil
JC094	033	VEM	ROV	ROV231	PSH	029	312	08/11/2013	22:29:00	10	44.59200	44	34.52900	10.74320	-44.57548	1402		1x green push core-too unconsolidated for core, so scraped some of coret-top using push core instead and tipped into hole	Sediment
JC094	033	VEM	ROV	ROV231	SLP	030	312	08/11/2013	22:46:00	10	44.59900	44	34.51300	10.74332	-44.57522	1387		small yelow/pale solitary coral live into white/red tube	bio
JC094	033	VEM	ROV	ROV231	SLP	031	312	08/11/2013	23:00:00	10	44.60100	44	34.50600	10.74335	-44.57510	1382		armored holothurian and small piece of fossil coral/rock into black slurp chamber	Bio/Fossil
JC094	033	VEM	ROV	ROV231	ARM	032	312	08/11/2013	23:03:00	10	44.58300	44	34.58000	10.74305	-44.57633	1382		rock with blue encrusting sponge into aft bio	bio
JC094	033	VEM	ROV	ROV231	SLP	033	312	08/11/2013	23:26:00	10	44.59700	44	34.50000	10.74328	-44.57500	1371		fossil coral solitary -didn't actually observe it going into red white stribed tube, labelled as ?33 on sheet	Fossil
JC094	033	VEM	ROV	ROV231	SLP	036	312	08/11/2013	23:46:00	10	44.59770	44	34.47910	10.74330	-44.57465	1355		sponge, white-on stick encrusting into red/white tube	B
JC094	033	VEM	ROV	ROV231	SLP	039	313	09/11/2013	00:58:00	10	44.52330	44	34.29120	10.74206	-44.57152	1361		fossil coral solitary orange x 5 most on rods into black/blue tube	Fossil
JC094	033	VEM	ROV	ROV231	ARM	040	313	09/11/2013	01:38:00	10	44.52330	44	34.29120	10.74206	-44.57152	1361		1x fossil coral on a larger rock so into aft biobox	Bio/Fossil
JC094	033	VEM	ROV	ROV231	ARM/SLP	041	313	09/11/2013	01:43:00	10	44.52330	44	34.29120	10.74206	-44.57152	1361		fossil solitary coral maybe alive plus 4 more fossil solitary corals (3 orange 1 brown) all into black/blue tube	Fossil
JC094	033	VEM	ROV	ROV231	SLP	042	313	09/11/2013	02:05:00	10	44.52230	44	34.29030	10.74204	-44.57151	1361		27 fossil solitary corals, 16 live solitary corals, fossil rubble, 1 colonial coral, at least two rocks, urchin, crinoid, 2 brittle stars all into black/blue tape tube, 1 fossil may have fallen between red/blue tube and black/blue tube	bio/fossil
JC094	033	VEM	ROV	ROV231	NSK	044	313	09/11/2013	04:41:00	10	44.51000	44	34.28000	10.74183	-44.57133	1361		nsk 3	water
JC094	033	VEM	ROV	ROV231	NSK	045	313	09/11/2013	04:41:00	10	44.51000	44	34.28000	10.74183	-44.57133	1361		nsk 4	water
JC094	033	VEM	ROV	ROV231	SLP	047	313	09/11/2013	05:19:00	10	44.48600	44	34.11300	10.74143	-44.56855	1327		13 live solitary corals, 4-5 dead solitary corals, 2 recently dead solitaries, ophiroid, brittle star, fossil rubble all into redblue tube. Possible live solitary into blk slurp chamber, yellow solitary coral in rock box 4	fossil/bio
JC094	033	VEM	ROV	ROV231	NET	050	313	09/11/2013	07:04:00	10	44.48400	44	34.00660	10.74140	-44.56678	1296		fossil coral rubble with possible live solitaries into dobule green tube and tool tray	Fossil
JC094	033	VEM	ROV	ROV231	SLP	053	313	09/11/2013	07:20:00	10	44.47290	44	34.00400	10.74122	-44.56673	1293		fossil solitary small dropped on tray? And medium size fossil solitary (2cm) both into white x 1 tube	bio/fossil
JC094	033	VEM	ROV	ROV231	SLP	055	313	09/11/2013	07:39:00	10	44.47250	44	33.97380	10.74121	-44.56623	1277		2 fossil solitary medium size	fossil
JC094	033	VEM	ROV	ROV231	SLP	056	313	09/11/2013	07:57:00	10	44.46010	44	33.92640	10.74100	-44.56544	1236		fossil solitary. Live solitary	bio/fossil
JC094	033	VEM	ROV	ROV231	SLP	057	313	09/11/2013	08:10:00	10	44.45790	44	33.91000	10.74097	-44.56517	1225		5 live solitary coral	bio
JC094	033	VEM	ROV	ROV231	SLP	058	313	09/11/2013	09:23:00	10	44.42070	44	33.81900	10.74035	-44.56365	1165		squat lobsters 12 and crinoid	bio
JC094	033	VEM	ROV	ROV231	ARM	059	313	09/11/2013	10:09:00	10	44.40600	44	33.75950	10.74010	-44.56266	1139		sponge	bio
JC094	033	VEM	ROV	ROV231	SCP	060	313	09/11/2013	10:23:00	10	44.40000	44	33.76000	10.74000	-44.56267	1132		fossil coral rubble	fossil
JC094	033	VEM	ROV	ROV231	SLP	061	313	09/11/2013	10:55:00	10	44.39500	44	33.72000	10.73992	-44.56200	1128		15 live solitaries 1 fossil	bio/fossil
JC094	033	VEM	ROV	ROV231	SLP	062	313	09/11/2013	11:16:00	10	44.39000	44	33.70000	10.73983	-44.56167	1122		gold coral?	bio
JC094	033	VEM	ROV	ROV231	ARM	063	313	09/11/2013	11:42:00	10	44.39440	44	33.66500	10.73991	-44.56108	1123		black cable, broken in half during sampling	plastics
JC094	033	VEM	ROV	ROV231	SCP	064	313	09/11/2013	11:49:00	10	44.39600	44	33.66570	10.73993	-44.56110	1123		live solitary coral, larger than everything else	Bio/Fossil
JC094	033	VEM	ROV	ROV231	SLP	067	313	09/11/2013	12:34:00	10	44.42290	44	33.64270	10.74038	-44.56071	1120		5 live solitary coral, Carophyllia, orange polyp	bio
JC094	033	VEM	ROV	ROV231	NSK	068	313	09/11/2013	12:56:00	10	44.42820	44	33.64470	10.74047	-44.56075	1117		Niskin	water
JC094	033	VEM	ROV	ROV231	ARM	071	313	09/11/2013	13:10:00	10	44.44080	44	33.62470	10.74068	-44.56041	1118		white live primnoa. 10 cm across. Fan	bio
JC094	033	VEM	ROV	ROV231	NET	076	313	09/11/2013	14:05:00	10	44.50500	44	33.46450	10.74175	-44.55774	1097		fossil coral rubble + crinoid	bio/fossil
JC094	034	VEM	MGA	MGA010	MCH	001	313	09/11/2013	19:58:00	10	33.28900	44	30.88500	10.55482	-44.51475	4949	4975	failed	
JC094	034	VEM	MGA	MGA010	MCN	002	313	09/11/2013	19:58:00	10	33.28900	44	30.88500	10.55482	-44.51475	4949	4975	sampled for top water, core top, and 1cm slices	sediment
JC094	034	VEM	MGA	MGA010	MCN	003	313	09/11/2013	19:58:00	10	33.28900	44	30.88500	10.55482	-44.51475	4949	4975	failed	
JC094	034	VEM	MGA	MGA010	MCH	004	313	09/11/2013	19:58:00	10	33.28900	44	30.88500	10.55482	-44.51475	4949	4975	sampled for top water, pore water and plastics - rest sliced at 2cm intervals	sediment/plastics
JC094	034	VEM	MGA	MGA010	NSK	005	313	09/11/2013	19:58:00	10	33.28900	44	30.88500	10.55482	-44.51475	4949	4975	samples	water

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net** **ARM**= Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long — ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs — green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	035	VEM	GVY	GVY007	GVY	001	314	10/11/2013	00:37:00	10	33.28900	44	30.89400	10.55482	-44.51490	4959	4972	6.3 m	
JC094	036	VEM	MGA	MGA011	MCH	001	314	10/11/2013	14:13:00	10	51.79100	44	29.44000	10.86318	-44.49067	5161	5210	failed	
JC094	036	VEM	MGA	MGA011	MCN	002	314	10/11/2013	14:13:00	10	51.79100	44	29.44000	10.86318	-44.49067	5161	5210	failed	
JC094	036	VEM	MGA	MGA011	MCN	003	314	10/11/2013	14:13:00	10	51.79100	44	29.44000	10.86318	-44.49067	5161	5210	failed	
JC094	036	VEM	MGA	MGA011	MCH	004	314	10/11/2013	14:13:00	10	51.79100	44	29.44000	10.86318	-44.49067	5161	5210	failed	
JC094	036	VEM	MGA	MGA011	NSK	005	314	10/11/2013	14:13:00	10	51.79100	44	29.44000	10.86318	-44.49067	5161	5210	sampled	
JC094	037	VEM	MGA	MGA012	MCH	001	314	10/11/2013	19:32:00	10	51.79200	44	29.44000	10.86320	-44.49067	5161	5200	failed	water
JC094	037	VEM	MGA	MGA012	MCN	002	314	10/11/2013	19:32:00	10	51.79200	44	29.44000	10.86320	-44.49067	5161	5200	failed	
JC094	037	VEM	MGA	MGA012	MCN	003	314	10/11/2013	19:32:00	10	51.79200	44	29.44000	10.86320	-44.49067	5161	5200	failed	
JC094	037	VEM	MGA	MGA012	MCH	004	314	10/11/2013	19:32:00	10	51.79200	44	29.44000	10.86320	-44.49067	5161	5200	failed	
JC094	037	VEM	MGA	MGA012	NSK	005	314	10/11/2013	19:32:00	10	51.79200	44	29.44000	10.86320	-44.49067	5161	5200	sampled	water
JC094	038	VEM	GVY	GVY008	GVY	001	315	11/11/2013	01:02:00	10	51.78300	44	29.46300	10.86305	-44.49105	5161	5195	7.07m recovery	sediment
JC094	039	VEM	CTD	CTD005	NSK	001	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 1: 5142m	water
JC094	039	VEM	CTD	CTD005	NSK	002	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 2: 5142m NOT SEALED	water
JC094	039	VEM	CTD	CTD005	NSK	003	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 3: 4799m	water
JC094	039	VEM	CTD	CTD005	NSK	004	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 4: 4799m NOT SEALED	water
JC094	039	VEM	CTD	CTD005	NSK	005	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 5: 3799m	water
JC094	039	VEM	CTD	CTD005	NSK	006	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 6: 3799m	water
JC094	039	VEM	CTD	CTD005	NSK	007	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 7: 2801m	water
JC094	039	VEM	CTD	CTD005	NSK	008	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 8: 2801m	water
JC094	039	VEM	CTD	CTD005	NSK	009	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 9: 2002m	water
JC094	039	VEM	CTD	CTD005	NSK	010	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 10: 2002m	water
JC094	039	VEM	CTD	CTD005	NSK	011	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 11: 1503m	water
JC094	039	VEM	CTD	CTD005	NSK	012	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 12: 1503m	water
JC094	039	VEM	CTD	CTD005	NSK	013	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 13: 1204m	water
JC094	039	VEM	CTD	CTD005	NSK	014	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 14: 1204m	water
JC094	039	VEM	CTD	CTD005	NSK	015	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 15: 804m	water
JC094	039	VEM	CTD	CTD005	NSK	016	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 16: 804m	water
JC094	039	VEM	CTD	CTD005	NSK	017	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 17: 605m	water
JC094	039	VEM	CTD	CTD005	NSK	018	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 18: 605m	water
JC094	039	VEM	CTD	CTD005	NSK	019	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 19: 406m	water
JC094	039	VEM	CTD	CTD005	NSK	020	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 20: 406m	water
JC094	039	VEM	CTD	CTD005	NSK	021	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 21: 76m	water
JC094	039	VEM	CTD	CTD005	NSK	022	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 22: 76m	water
JC094	039	VEM	CTD	CTD005	NSK	023	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 23: 5m	water
JC094	039	VEM	CTD	CTD005	NSK	024	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		Bottle 24: 5m	water
JC094	039	VEM	CTD	CTD005	CTDprofile	025	315	11/11/2013	06:46:00	10	51.77900	44	29.48600	10.86298	-44.49143	5161		CTD profile uploaded into SIS	Survey
JC094	040	VEM	DRG	DRG001	DRG	001	315	11/11/2013	16:26:00	10	42.15400	44	25.68000	10.70257	-44.42800	880		From 880-809: small corals:stylasterids, pebbles, brittle star	bio/fossil
JC094	041	VEM	ROV	ROV232	ARM	003	315	11/11/2013	22:22:00	10	43.71000	44	25.50800	10.72850	-44.42513	1296		large, dead, coral	fossil
JC094	041	VEM	ROV	ROV232	ARM	004	315	11/11/2013	22:36:00	10	43.71300	44	25.50800	10.72855	-44.42513	1302		sponge with zooanthids	bio
JC094	041	VEM	ROV	ROV232	ARM	005	315	11/11/2013	22:40:00	10	43.71100	44	25.50800	10.72852	-44.42513	1300		primnoid	bio
JC094	041	VEM	ROV	ROV232	SLP	008	315	11/11/2013	23:36:00	10	43.65100	44	25.47000	10.72752	-44.42450	1175		glass sponge-tubular	bio
JC094	041	VEM	ROV	ROV232	SLP	009	315	11/11/2013	23:44:00	10	43.65100	44	25.47100	10.72752	-44.42452	1175		white stylasterid fan	bio
JC094	041	VEM	ROV	ROV232	SLP	012	316	12/11/2013	00:10:00	10	43.62900	44	25.45500	10.72715	-44.42425	1146		mixed fossil corals- fossil solitary coral	fossil
JC094	041	VEM	ROV	ROV232	SLP	013	316	12/11/2013	00:37:00	10	43.62900	44	25.44900	10.72715	-44.42415	1140		Live Solitary Coral x2, mixed fossil coral and small white live stylasteterid	bio/fossil
JC094	041	VEM	ROV	ROV232	PSH	014	316	12/11/2013	01:32:00	10	43.54200	44	25.42100	10.72570	-44.42368	1094		approx 1/3 full	sediment
JC094	041	VEM	ROV	ROV232	PSH	015	316	12/11/2013	01:34:00	10	43.54200	44	25.42100	10.72570	-44.42368	1094		approx 1/3 full	sediment
JC094	041	VEM	ROV	ROV232	PSH	016	316	12/11/2013	01:38:00	10	43.54200	44	25.42100	10.72570	-44.42368	1094		approx 1/3 full	sediment
JC094	041	VEM	ROV	ROV232	SLP	017	316	12/11/2013	02:03:00	10	43.46730	44	25.40720	10.72446	-44.42345	1076		Live solitary x5	bio
JC094	041	VEM	ROV	ROV232	SLP	020	316	12/11/2013	02:27:00	10	43.39190	44	25.38390	10.72320	-44.42307	1028		large live solitary, like event 17	bio
JC094	041	VEM	ROV	ROV232	ARM	021	316	12/11/2013	02:44:00	10	43.36900	44	25.37940	10.72282	-44.42299	1014		glass tubular sponge attached to coral rubble	Bio/Fossil
JC094	041	VEM	ROV	ROV232	SLP	022	316	12/11/2013	03:12:00	10	43.35230	44	25.37510	10.72254	-44.42292	993		Live solitary coral on fossil coral branch	Bio/Fossil
JC094	041	VEM	ROV	ROV232	SLP	023	316	12/11/2013	03:27:00	10	43.32480	44	25.37210	10.72208	-44.42287	976		flat sponge	bio
JC094	041	VEM	ROV	ROV232	SLP	024	316	12/11/2013	03:38:00	10	43.31080	44	25.37000	10.72185	-44.42283	966		plastic? Shell?	plastics
JC094	041	VEM	ROV	ROV232	SLP	025	316	12/11/2013	03:41:00	10	43.30820	44	25.37040	10.72180	-44.42284	964		fossil solitary	fossil
JC094	041	VEM	ROV	ROV232	SLP	026	316	12/11/2013	03:49:00	10	43.30180	44	25.36800	10.72170	-44.42280	961		live solitary	bio
JC094	041	VEM	ROV	ROV232	SLP	027	316	12/11/2013	03:53:00	10	43.29930	44	25.36790	10.72166	-44.42280	959		small stylasterid	bio
JC094	041	VEM	ROV	ROV232	SLP	028	316	12/11/2013	04:17:00	10	43.22100	44	25.35200	10.72035	-44.42253	935		1 live solitary	bio
JC094	041	VEM	ROV	ROV232	SLP	029	316	12/11/2013	04:40:00	10	43.15160	44	25.33400	10.71919	-44.42223	906		Live solitary- flat and larger than previous	bio
JC094	041	VEM	ROV	ROV232	SLP	030	316	12/11/2013	05:29:00	10	43.03650	44	25.32270	10.71728	-44.42205	858		sponge, yellow desmo?	bio
JC094	041	VEM	ROV	ROV232	NET	033	316	12/11/2013	06:30:00	10	42.96290	44	25.31040	10.71605	-44.42184	808		fossil framework coral rubble with fossil stylasterids	fossil
JC094	041	VEM	ROV	ROV232	SLP	034	316	12/11/2013	06:57:00	10	42.94060	44	25.30740	10.71568	-44.42179	790		live? Small solitary coral x3 or 4	bio
JC094	041	VEM	ROV	ROV232	SLP	035	316	12/11/2013	07:01:00	10	42.94290	44	25.30680	10.71572	-44.42178	790		live white stylasterid	bio
JC094	041	VEM	ROV	ROV232	SLP	036	316	12/11/2013	07:02:00	10	42.94290	44	25.30670	10.71572	-44.42178	790		sponge- live (white globular)	bio
JC094	041	VEM	ROV	ROV232	SLP	037	316	12/11/2013	07:21:00	10	42.90110	44	25.29290	10.71502	-44.42155	739		live small stylasterid x15	bio
JC094	041	VEM	ROV	ROV232	SLP	038	316	12/11/2013	07:41:00	10	42.89840	44	25.29330	10.71497	-44.42156	738		fossil stylasterid	fossil
JC094	041	VEM	ROV	ROV232	SLP	039	316	12/11/2013	07:44:00	10	42.89810	44	25.29370	10.71497	-44.42156	737		coral rubble (tiny!)	fossil
JC094	041	VEM	ROV	ROV232	NSK	040	316	12/11/2013	07:47:00	10	42.89660	44	25.29140	10.71494	-44.42152	734		2 niskins (1 and 2)	water
JC094	041	VEM	ROV	ROV232	SLP	042	316	12/11/2013	08:09:00	10	42.84970	44	25.28260	10.71416	-44.42138	693		coral rubble. Live stylasterids	bio/fossil
JC094	041	VEM	ROV	ROV232	SLP	044	316	12/11/2013	08:27:00	10	42.82860	44	25.27430	10.71381	-44.42124	676		Coral rubble (maybe a fossil solitary)	fossil
JC094	041	VEM	ROV	ROV232	SLP	048	316	12/11/2013	09:32:00	10	42.75770	44	25.25290	10.71263	-44.42088	628		7 squat live lobsters	bio
JC094	041	VEM	ROV	ROV232	SLP	051	316	12/11/2013	09:58:00	10	42.71890	44	25.23290	10.71198	-44.42055	606		styalasterid rubble	fossil
JC094	041	VEM	ROV	ROV232	SLP	052	316	12/11/2013	10:14:00	10	42.71890	44	25.23290	10.71198	-44.42055	606		live white stylasterid fan	bio/fossil
JC094	041	VEM	ROV	ROV232	SLP	055	316	12/11/2013	10:25:00	10	42.71670	44	25.23390	10.71195	-44.42057	605		Ensallapsommia- from 3 different colonies	bio/fossil
JC094	041	VEM	ROV	ROV232	SLP	056	316	12/11/2013	10:35:00	10	42.71670	44	25.23390	10.71195	-44.42057	605		fossil rubble	fossil
JC094	041	VEM	ROV	ROV232	NET	059	316	12/11/2013	10:48:00	10	42.70270	44	25.22240	10.71171	-44.42037	599		Styalasterid and ensallopsommia rubble	fossil
JC094	041	VEM	ROV	ROV232	SLP	060	316	12/11/2013	11:20:00	10	42.69310	44	25.22400	10.71155	-44.42040	595		squat lobster x3	bio
JC094	041	VEM	ROV	ROV232	ARM	063	316	12/11/2013	11:30:00	10	42.68640	44	25.21930	10.71144	-44.42032	593		Purple soft coral	bio
JC094	041	VEM	ROV	ROV232	PSH	066	316	12/11/2013	12:41:00	10	42.51740	44	25.09150	10.70862	-44.41819	570		Push Core 1/2 to 1/3 full	sediment

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long — ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs — green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	041	VEM	ROV	ROV232	PSH	067	316	12/11/2013	12:44:00	10	42.51740	44	25.09150	10.70862	-44.41819	570		Push core about 1/4 full	sediment
JC094	041	VEM	ROV	ROV232	PSH	068	316	12/11/2013	12:46:00	10	42.51810	44	25.09130	10.70864	-44.41819	570		Push core about 1/3 full	sediment
JC094	041	VEM	ROV	ROV232	NSK	069	316	12/11/2013	12:50:00	10	42.51370	44	25.08320	10.70856	-44.41805	568		Niskin 3	water
JC094	041	VEM	ROV	ROV232	NSK	070	316	12/11/2013	12:50:00	10	42.51370	44	25.08320	10.70856	-44.41805	568		Niskin 4	water
JC094	041	VEM	ROV	ROV232	NSK	071	316	12/11/2013	12:50:00	10	42.51370	44	25.08320	10.70856	-44.41805	568		Niskin 5	water
JC094	041	VEM	ROV	ROV232	SLP	072	316	12/11/2013	12:53:00	10	42.51350	44	25.08310	10.70856	-44.41805	570		small white stylasterids, live	bio
JC094	041	VEM	ROV	ROV232	ARM	075	316	12/11/2013	13:14:00	10	42.57620	44	25.05700	10.70960	-44.41762	569		green sponge about 10 cm size attached to hard substrate	bio
JC094	041	VEM	ROV	ROV232	SLP	078	316	12/11/2013	14:18:00	10	42.40620	44	24.82950	10.70677	-44.41383	568		failed	
JC094	041	VEM	ROV	ROV232	NET	079	316	12/11/2013	14:22:00	10	42.40620	44	24.82950	10.70677	-44.41383	568		rubble net	fossil
JC094	042	VEM	ROV	ROV233	ARM	001	316	12/11/2013	23:01:00	10	46.85000	44	35.93000	10.78083	-44.59883	2949		glass bottle, anthropogenic into tool tray	Anthro
JC094	042	VEM	ROV	ROV233	ARM	002	316	12/11/2013	23:04:00	10	46.85	44	35.93000	10.78083	-44.59883	2950		live bamboo coral-long-whit with pink polyps into tool tray	bio
JC094	042	VEM	ROV	ROV233	ARM	003	316	12/11/2013	23:08:00	10	46.85	44	35.93000	10.78083	-44.59883	2950		small piece of white fossil coral-failed	
JC094	042	VEM	ROV	ROV233	SLP	004	316	12/11/2013	23:24:00	10	46.85	44	35.91000	10.78083	-44.59850	2985		large glass sponge into white slurp chamber	bio
JC094	042	VEM	ROV	ROV233	SLP	007	316	12/11/2013	23:30:00	10	46.842	44	35.90600	10.78070	-44.59843	2981		stalked sponge-might be caught in tubing, white slurp chamber	bio
JC094	042	VEM	ROV	ROV233	PSH/SCP	010	317	13/11/2013	00:00:00	10	46.8334	44	35.93580	10.78056	-44.59893	2932		push core used as schoop-about .5 full red x1	sediment
JC094	042	VEM	ROV	ROV233	PSH/SCP	011	317	13/11/2013	00:04:00	10	46.8327	44	35.93990	10.78055	-44.59900	2932		push core used as scoop.5 full red x2	sediment
JC094	042	VEM	ROV	ROV233	PSH/SCP	012	317	13/11/2013	00:07:00	10	46.8309	44	35.93440	10.78052	-44.59891	2932		push core used as scoop about 8 cm red x3	sediment
JC094	042	VEM	ROV	ROV233	NSK	013	317	13/11/2013	00:10:00	10	46.8311	44	35.93620	10.78052	-44.59894	2932		fired niskin 1	water
JC094	042	VEM	ROV	ROV233	NSK	014	317	13/11/2013	00:11:00	10	46.8311	44	35.93620	10.78052	-44.59894	2932		fired niskin 2	water
JC094	042	VEM	ROV	ROV233	SLP	017	317	13/11/2013	00:29:00	10	46.833	44	35.95420	10.78055	-44.59924	2898		fossil colonial coral rubble and sediment, into black x2 tube and white slurp chamber and red slurp chamber	fossil
JC094	042	VEM	ROV	ROV233	ARM	020	317	13/11/2013	00:57:00	10	46.8204	44	35.96060	10.78034	-44.59934	2887		very large ellow sponge-ear shaped into starboard bio box	bio
JC094	042	VEM	ROV	ROV233	ARM	021	317	13/11/2013	01:03:00	10	46.8272	44	35.95760	10.78045	-44.59929	2888		fossil colonial rubble into rock box 5	fossil
JC094	042	VEM	ROV	ROV233	ARM	024	317	13/11/2013	01:24:00	10	46.8247	44	35.97280	10.78041	-44.59955	2875		thick fossil base with thin live bamboo coral on it-rock box 5	bio/fossil
JC094	042	VEM	ROV	ROV233	SLP	025	317	13/11/2013	01:29:00	10	46.8258	44	35.97530	10.78043	-44.59959	2875		Live stylasterid colony x2 into white x2 tube	bio
JC094	042	VEM	ROV	ROV233	ARM	028	317	13/11/2013	02:02:00	10	46.7813	44	36.01440	10.77969	-44.60024	2818		large, thick fossil branches x 3 and colonial rubble into white x1 forward tube	fossil
JC094	042	VEM	ROV	ROV233	ARM	031	317	13/11/2013	02:27:00	10	46.784	44	36.02800	10.77973	-44.60047	2809		large stylasterid fan-broken into pieces, in fwd bio box	bio/fossil
JC094	042	VEM	ROV	ROV233	ARM	034	317	13/11/2013	03:43:00	10	46.6703	44	36.03970	10.77784	-44.60066	2688		large piece of fossil coral-possiblly bamboo, free-like branch into to pieces and piece on net, stored int ool tray	fossil
JC094	042	VEM	ROV	ROV233	SLP	035	317	13/11/2013	03:52:00	10	46.6686	44	36.03770	10.77781	-44.60063	2688		pieces of fossil colonial coral-broken branch bits, into 1x blue tube	fossil
JC094	042	VEM	ROV	ROV233	SLP	038	317	13/11/2013	04:28:00	10	46.614	44	36.02390	10.77690	-44.60040	2666		solitary fossil coral-5cm large into 1x blue tube	fossil
JC094	042	VEM	ROV	ROV233	SLP	041	317	13/11/2013	06:06:00	10	46.3916	44	36.03010	10.77319	-44.60050	2433		fossil bamboo coral, large pieces into 1x red forward tube	fossil
JC094	042	VEM	ROV	ROV233	SLP	042	317	13/11/2013	06:09:00	10	46.3912	44	36.03080	10.77319	-44.60051	2433		sponge, white, globular quite small into 1xred forward tube	bio
JC094	042	VEM	ROV	ROV233	SLP	046	317	13/11/2013	07:46:00	10	46.178	44	36.02300	10.76963	-44.60038	2235		live? solitary coral x2 into 2x red	bio
JC094	042	VEM	ROV	ROV233	SLP	048	317	13/11/2013	08:09:00	10	46.132	44	36.02700	10.76887	-44.60045	2230		stalked sponge and fan shaped sponge into port biobox	bio
JC094	042	VEM	ROV	ROV233	SLP	051	317	13/11/2013	08:51:00	10	46.099	44	36.03300	10.76832	-44.60055	2202		small white elongaated dead? Solitary coral and ellowing fossil coral. One may be the same or on anenome? And another dead one all int 2x blue vellow tube	fossil
JC094	042	VEM	ROV	ROV233	SLP	054	317	13/11/2013	09:23:00	10	46.091	44	36.04100	10.76818	-44.60068	2191		another small (larger than 51 though) dead? solitary coral- into white/red tube of rock box 3	fossil
JC094	042	VEM	ROV	ROV233	SLP	057	317	13/11/2013	09:50:00	10	46.0769	44	36.03580	10.76795	-44.60060	2192		small solitar coral x 2 (trumpet shaped, dead) short piece of bamboo coral into white/red tube-rock box 3	fossil
JC094	042	VEM	ROV	ROV233	SLP	058	317	13/11/2013	09:58:00	10	46.0769	44	36.03580	10.76795	-44.60060	2192		fossil sponge, pieces of dead/fossil octocoral- into white/red tube-rock box 3	fossil
JC094	042	VEM	ROV	ROV233	ARM	059	317	13/11/2013	10:04:00	10	46.0769	44	36.03580	10.76795	-44.60060	2193		rock	rock
JC094	042	VEM	ROV	ROV233	SLP	060	317	13/11/2013	10:10:00	10	46.0769	44	36.03780	10.76795	-44.60063	2190		solitary coral dead into white/red tube of rock box	fossill
JC094	042	VEM	ROV	ROV233	ARM	061	317	13/11/2013	10:20:00	10	46.0769	44	36.03780	10.76795	-44.60063	2190		corallium, fan, pink, live, dead base of corallium covered with hydroids into forward bio box	bio
JC094	042	VEM	ROV	ROV233	SLP	062	317	13/11/2013	10:29:00	10	46.0769	44	36.03780	10.76795	-44.60063	2190		dead double solitary coral into white/red tube of rock box 3	fossil
JC094	042	VEM	ROV	ROV233	SLP	065	317	13/11/2013	10:40:00	10	46.0586	44	36.03390	10.76764	-44.60057	2183		small dead solitary coral into red chamber	fossil
JC094	042	VEM	ROV	ROV233	SLP	067	317	13/11/2013	10:52:00	10	46.0472	44	36.03860	10.76745	-44.60064	2161		small live solitary coral into blackblue tube of rock box 3	bio
JC094	042	VEM	ROV	ROV233	SLP	068	317	13/11/2013	11:11:00	10	46.0001	44	36.03910	10.76667	-44.60065	2129		small live solitary coral x 2 into 2x whit tube in rock box 1	bio/fossil
JC094	042	VEM	ROV	ROV233	PSH	070	317	13/11/2013	11:14:00	10	45.9989	44	36.04100	10.76665	-44.60068	2128		green one strip 3/4 collected by scooping action (core top)	sediment
JC094	042	VEM	ROV	ROV233	SLP	073	317	13/11/2013	12:25:00	10	45.8725	44	36.03730	10.76454	-44.60062	2001		dead flared solitary coral into red chamber	fossil
JC094	042	VEM	ROV	ROV233	ARM/SLP	078	317	13/11/2013	14:19:00	10	45.5912	44	35.98870	10.75985	-44.59981	1735		yellow live enalopsamia (small piece) an some enalopsamia white/dead? Into 2x white tube	bio
JC094	042	VEM	ROV	ROV233	ARM	079	317	13/11/2013	14:35:00	10	45.5912	44	35.98870	10.75985	-44.59981	1735		yellow live enaloopsamia (larger piece of above coral) into port bio box	bio
JC094	042	VEM	ROV	ROV233	NSK	080	317	13/11/2013	14:39:00	10	45.5943	44	35.99100	10.75991	-44.59985	1735		niskin 3 fired	water
JC094	042	VEM	ROV	ROV233	ARM	082	317	13/11/2013	15:35:00	10	45.382	44	36.11860	10.75637	-44.60198	1694		madrepora dead (probably) into fwd bio box	fossil
JC094	042	VEM	ROV	ROV233	ARM	084	317	13/11/2013	15:51:00	10	45.3452	44	36.14410	10.75575	-44.60240	1678		coral rubble of reasonable size into white/black tube	fossil
JC094	042	VEM	ROV	ROV233	ARM	085	317	13/11/2013	16:00:00	10	45.3453	44	36.14500	10.75576	-44.60242	1678		coral branch (dead) into white/black tube	fossil
JC094	042	VEM	ROV	ROV233	SLP	086	317	13/11/2013	16:03:00	10	45.346	44	36.14580	10.75577	-44.60243	1678		coral branches of reasonable size into white/black tube some rubble went into white/blue tube	fossil
JC094	042	VEM	ROV	ROV233	NET	089	317	13/11/2013	16:48:00	10	45.3072	44	36.14900	10.75512	-44.60248	1657		mostly large pieces of fossil colonial coral into orange strip net	fossil
JC094	042	VEM	ROV	ROV233	SLP	092	317	13/11/2013	17:26:00	10	45.2647	44	36.15260	10.75441	-44.60254	1648		medium sized vase sponge with brown bits into yellow slurp chamber	bio
JC094	042	VEM	ROV	ROV233	SLP	093	317	13/11/2013	17:28:00	10	45.2664	44	36.15320	10.75444	-44.60255	1648		fossil colonial coral pieces into rock box 4 2ith some falling into red/blue tube	fossil
JC094	042	VEM	ROV	ROV233	ARM	097	317	13/11/2013	18:05:00	10	45.104	44	36.15430	10.75173	-44.60257	1578		fossil framework, too bio for bio box, small piece in forward aft, large in tool tray	fossil
JC094	042	VEM	ROV	ROV233	NSK	096	317	13/11/2013	18:05:00	10	45.1027	44	36.15350	10.75171	-44.60256	1578		fired 2 niskin bottles 4 and 5	water
JC094	042	VEM	ROV	ROV233	NET	098	317	13/11/2013	18:15:00	10	45.1434	44	36.10180	10.75239	-44.60170	1578		large pieces of fossil framework and smaller rubble in blue net and aft bio box	fossil
JC094	043	VEM	ROV	ROV234	NSK	001	318	14/11/2013	02:35:00	10	43.729	44	25.47900	10.72882	-44.42465	1283		Bottle 1	water
JC094	043	VEM	ROV	ROV234	NSK	002	318	14/11/2013	02:35:00	10	43.729	44	25.47900	10.72882	-44.42465	1283		Bottle 2	water
JC094	043	VEM	ROV	ROV234	NSK	003	318	14/11/2013	02:35:00	10	43.729	44	25.47900	10.72882	-44.42465	1283		Bottle 3	water
JC094	043	VEM	ROV	ROV234	NSK	004	318	14/11/2013	02:35:00	10	43.729	44	25.47900	10.72882	-44.42465	1283		Bottle 4	water
JC094	043	VEM	ROV	ROV234	NSK	005	318	14/11/2013	02:36:00	10	43.729	44	25.47900	10.72882	-44.42465	1283		Bottle 5	water
JC094	044	VAY	CTD	CTD006	NSK	001	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 1: 4168m	water
JC094	044	VAY	CTD	CTD006	NSK	002	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 2: 4168m	water
JC094	044	VAY	CTD	CTD006	NSK	003	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 3: 3798m	water
JC094	044	VAY	CTD	CTD006	NSK	004	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 4: 3798m	water
JC094	044	VAY	CTD	CTD006	NSK	005	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 5: 2800m	water
JC094	044	VAY	CTD	CTD006	NSK	006	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 6: 2800m DID NOT CLOSE	water
JC094	044	VAY	CTD	CTD006	NSK	007	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 7: 2001m DID NOT CLOSE	water
JC094	044	VAY	CTD	CTD006	NSK	008	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 8: 2001m	water
JC094	044	VAY	CTD	CTD006	NSK	009	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 9: 1503m	water
JC094	044	VAY	CTD	CTD006	NSK	010	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 10: 1503m	water
JC094	044	VAY	CTD	CTD006	NSK	011	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 11: 1200m	water
JC094	044	VAY	CTD	CTD006	NSK	012	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 12: 1200m	water
JC094	044	VAY	CTD	CTD006	NSK	013	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 13: 1004m	water
JC094	044	VAY	CTD	CTD006	NSK	014	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 14: 1004m	water

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET=** Net **ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long   ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs   green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	044	VAY	CTD	CTD006	NSK	015	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 15: 805m	water
JC094	044	VAY	CTD	CTD006	NSK	016	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 16: 805m	water
JC094	044	VAY	CTD	CTD006	NSK	017	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 17: 505m	water
JC094	044	VAY	CTD	CTD006	NSK	018	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 18: 505m	water
JC094	044	VAY	CTD	CTD006	NSK	019	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 19: 205m	water
JC094	044	VAY	CTD	CTD006	NSK	020	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 20: 205m	water
JC094	044	VAY	CTD	CTD006	NSK	021	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 21: 96m	water
JC094	044	VAY	CTD	CTD006	NSK	022	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 22: 96m	water
JC094	044	VAY	CTD	CTD006	NSK	023	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 23: 10m	water
JC094	044	VAY	CTD	CTD006	NSK	024	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		Bottle 24: 10m	water
JC094	044	VAY	CTD	CTD006	CTD profile	025	320	16/11/2013	11:10:00	15	16.246	48	15.58100	15.27077	-48.25968	4171		sound velocity profiler did not work. Profile infered from temperature and depth	survey
JC094	045	VAY	ROV	ROV235	SLP	001	320	16/11/2013	21:58:00	14	51.8193	48	14.51700	14.86366	-48.24195	1514		Fossil coral fragments	fossil
JC094	045	VAY	ROV	ROV235	SLP	002	320	16/11/2013	22:27:00	14	51.8193	48	14.51700	14.86366	-48.24195	1514		1x brown fossil solitary coral	fossil
JC094	045	VAY	ROV	ROV235	SLP	003	320	16/11/2013	22:36:00	14	51.8184	48	14.51630	14.86364	-48.24194	1513		fossil coral fragments + 1x brown fossil solitary	fossil
JC094	045	VAY	ROV	ROV235	NET	004	320	16/11/2013	22:59:00	14	51.821	48	14.51500	14.86368	-48.24192	1513		fossil coral debris- full net!	fossil
JC094	045	VAY	ROV	ROV235	ARM	007	320	16/11/2013	23:42:00	14	51.788	48	14.49100	14.86313	-48.24152	1483		1x golf ball demosponge. Large piece dead coral framework with large encrusting demosponge	bio/fossil
JC094	045	VAY	ROV	ROV235	ARM	010	320	17/11/2013	00:01:00	14	51.763	48	14.46600	14.86272	-48.24110	1455		Uber long bamboo whip coral (curly)	bio
JC094	045	VAY	ROV	ROV235	SLP	013	321	17/11/2013	00:32:00	14	51.713	48	14.45000	14.86188	-48.24083	1425		pink armoured holothurian	bio
JC094	045	VAY	ROV	ROV235	SLP	014	321	17/11/2013	00:34:00	14	51.713	48	14.45000	14.86188	-48.24083	1425		white golf ball sponge	bio
JC094	045	VAY	ROV	ROV235	SLP	015	321	17/11/2013	00:36:00	14	51.71	48	14.45000	14.86183	-48.24083	1425		pink armoured holothurian	bio
JC094	045	VAY	ROV	ROV235	SLP	018	321	17/11/2013	00:45:00	14	51.69	48	14.43000	14.86150	-48.24050	1416		white live stylasterid coral framework	bio
JC094	045	VAY	ROV	ROV235	SLP	021	321	17/11/2013	01:23:00	14	51.66	48	14.36000	14.86100	-48.23933	1394		pink armoured holothurian	bio
JC094	045	VAY	ROV	ROV235	SLP	024	321	17/11/2013	01:53:00	14	51.66	48	14.25000	14.86100	-48.23750	1416		pink armoured holothurian x2 (possibly 3) tiny sponge	bio
JC094	045	VAY	ROV	ROV235	SLP	027	321	17/11/2013	02:06:00	14	51.65	48	14.23000	14.86083	-48.23717	1412		pink armoured holothurian	bio
JC094	045	VAY	ROV	ROV235	SLP	030	321	17/11/2013	02:14:00	14	51.65	48	14.23000	14.86083	-48.23717	1412		fossil coral rubble. Small fossil solitary x8. Ophuriod and sponge. Event ended at 02:51	bio/fossil
JC094	045	VAY	ROV	ROV235	SLP	031	321	17/11/2013	02:16:00	14	51.65	48	14.22000	14.86083	-48.23700	1412		armoured holothorian	bio
JC094	045	VAY	ROV	ROV235	SLP	032	321	17/11/2013	02:30:00	14	51.65	48	14.22000	14.86083	-48.23700	1411		2 pink armoured holothurian	bio
JC094	045	VAY	ROV	ROV235	SLP	033	321	17/11/2013	03:04:00	14	51.6469	48	14.22440	14.86078	-48.23707	1411		live solitary coral (white top/ black-brown stem)	bio
JC094	045	VAY	ROV	ROV235	SLP	036	321	17/11/2013	03:53:00	14	51.6408	48	14.20230	14.86068	-48.23671	1407		Live, big, white, round, sponge with lumps on surface	bio
JC094	045	VAY	ROV	ROV235	SLP	039	321	17/11/2013	04:11:00	14	51.6411	48	14.19050	14.86069	-48.23651	1406		1 live pink armoured holothurian	bio
JC094	045	VAY	ROV	ROV235	SLP	040	321	17/11/2013	04:14:00	14	51.6411	48	14.19050	14.86069	-48.23651	1406		1 small white live solitary coral	bio
JC094	045	VAY	ROV	ROV235	SLP	043	321	17/11/2013	04:33:00	14	51.6459	48	14.15670	14.86077	-48.23595	1420		4 live solitary coral. Rock with 3 brittle stars	bio
JC094	045	VAY	ROV	ROV235	SLP	044	321	17/11/2013	04:43:00	14	51.6459	48	14.15670	14.86077	-48.23595	1420		1 dead small solitary coral	fossil
JC094	045	VAY	ROV	ROV235	SLP	045	321	17/11/2013	04:47:00	14	51.6459	48	14.15670	14.86077	-48.23595	1420		3 live Pink armoured holthurains plus a live brittle star	bio
JC094	045	VAY	ROV	ROV235	ARM	048	321	17/11/2013	05:05:00	14	51.6487	48	14.15260	14.86081	-48.23588	1421		1 live yellow large soft coral + 1 snakestar	bio
JC094	045	VAY	ROV	ROV235	SLP	049	321	17/11/2013	05:08:00	14	51.6487	48	14.15260	14.86081	-48.23588	1421		1 live pink armoured holothurian	bio
JC094	045	VAY	ROV	ROV235	SLP	050	321	17/11/2013	05:10:00	14	51.6487	48	14.52600	14.86081	-48.24210	1421		2 small live solitary coral.. 3 medium live solitary coral.	bio
JC094	045	VAY	ROV	ROV235	NSK	051	321	17/11/2013	05:23:00	14	51.648	48	14.15260	14.86080	-48.23588	1420		Niskin 1	water
JC094	045	VAY	ROV	ROV235	NSK	052	321	17/11/2013	05:23:00	14	51.648	48	14.15260	14.86080	-48.23588	1420		Niskin 2	water
JC094	045	VAY	ROV	ROV235	SLP	055	321	17/11/2013	05:30:00	14	51.6507	48	14.14040	14.86085	-48.23567	1420		7 small live solitary coral. Fossil coral fragments	bio/fossil
JC094	045	VAY	ROV	ROV235	SLP	056	321	17/11/2013	05:37:00	14	51.6507	48	14.14040	14.86085	-48.23567	1420		1 fossil solitary coral	fossil
JC094	045	VAY	ROV	ROV235	SLP	059	321	17/11/2013	05:53:00	14	51.6566	48	14.12070	14.86094	-48.23535	1416		2 small live solitary coral. 1 white small live solitary coral.	bio
JC094	045	VAY	ROV	ROV235	SLP	062	321	17/11/2013	06:12:00	14	51.6708	48	14.08300	14.86118	-48.23472	1390		2 live solitaries. Possibly 2 more live small solitaries.	bio
JC094	045	VAY	ROV	ROV235	SLP	065	321	17/11/2013	06:28:00	14	51.6759	48	14.06900	14.86127	-48.23448	1377		3 small solitary corals (live). 1 medium live solitary coral	bio
JC094	045	VAY	ROV	ROV235	ARM	070	321	17/11/2013	07:16:00	14	51.7102	48	13.94890	14.86184	-48.23248	1259		Yellow fan coral with brittle stars (Ena? Corallium?)	bio
JC094	045	VAY	ROV	ROV235	SLP	071	321	17/11/2013	07:30:00	14	51.7107	48	13.94790	14.86185	-48.23247	1259		Live solitary. Yellow fan coral fragments	bio
JC094	045	VAY	ROV	ROV235	SLP	072	321	17/11/2013	07:35:00	14	51.7097	48	13.94800	14.86183	-48.23247	1259		Fossil coral pieces (colonial framework)	fossil
JC094	045	VAY	ROV	ROV235	SLP	073	321	17/11/2013	07:50:00	14	51.711	48	13.94810	14.86185	-48.23247	1258		live solitaries (medium size) x3	bio
JC094	045	VAY	ROV	ROV235	NET	074	321	17/11/2013	07:57:00	14	51.7109	48	13.94720	14.86185	-48.23245	1258		fossil framework and colonial fragments	fossil
JC094	045	VAY	ROV	ROV235	SLP	081	321	17/11/2013	11:50:00	14	51.82	48	13.35360	14.86367	-48.22256	1303		fossil solitaries-small x4 + some other debris	fossil
JC094	045	VAY	ROV	ROV235	ARM	084	321	17/11/2013	12:42:00	14	51.9618	48	13.21680	14.86603	-48.22028	1150		Rounded mottled brown sponge fan on fossil branch base	bio/fossil
JC094	045	VAY	ROV	ROV235	PSH	090	321	17/11/2013	13:38:00	14	52.0586	48	12.98770	14.86764	-48.21646	1115		Push core about 2/3 full	sediment
JC094	045	VAY	ROV	ROV235	PSH	091	321	17/11/2013	13:40:00	14	52.0586	48	12.98770	14.86764	-48.21646	1115		Push core about 1/2 full	sediment
JC094	045	VAY	ROV	ROV235	PSH	092	321	17/11/2013	13:41:00	14	52.0586	48	12.98770	14.86764	-48.21646	1115		Push core about 3/4 full	sediment
JC094	045	VAY	ROV	ROV235	NSK	093	321	17/11/2013	13:45:00	14	52.0586	48	12.98770	14.86764	-48.21646	1115		Niskin 3 fired	water
JC094	045	VAY	ROV	ROV235	NSK	094	321	17/11/2013	13:45:00	14	52.0586	48	12.98770	14.86764	-48.21646	1115		Niskin 4 fired	water
JC094	045	VAY	ROV	ROV235	SLP	095	321	17/11/2013	14:09:00	14	52.0677	48	12.93690	14.86780	-48.21562	1094		Relatively small live white solitarx x7	Bio
JC094	045	VAY	ROV	ROV235	SLP	096	321	17/11/2013	14:20:00	14	52.0671	48	12.93480	14.86779	-48.21558	1094		whip primnoid- long	Bio
JC094	045	VAY	ROV	ROV235	SLP	101	321	17/11/2013	14:45:00	14	52.0669	48	12.89460	14.86778	-48.21491	1106		Solitaries: 3 small dead. 1 small live	bio/fossil
JC094	045	VAY	ROV	ROV235	SLP	102	321	17/11/2013	14:53:00	14	52.0669	48	12.89460	14.86778	-48.21491	1106		sponge(tentacled). 3 dead solitaries + fossil colonail bycatch	bio/fossil
JC094	045	VAY	ROV	ROV235	SLP	105	321	17/11/2013	16:02:00	14	52.0808	48	12.75310	14.86801	-48.21255	1049		3x fossil solitary coral. 3 x live purple solitary. Small white live stylasterid	bio/fossil
JC094	045	VAY	ROV	ROV235	ARM	107	321	17/11/2013	16:49:00	14	52.07	48	12.71000	14.86783	-48.21183	1035		Large piece of corallium and madrepora	bio
JC094	045	VAY	ROV	ROV235	NET	109	321	17/11/2013	17:21:00	14	52.07	48	12.66000	14.86783	-48.21100	1070		fossil coral rubble	fossil
JC094	045	VAY	ROV	ROV235	SLP	110	321	17/11/2013	18:00:00	14	52.07	48	12.66000	14.86783	-48.21100	1070		solitry coral	bio/fossil
JC094	045	VAY	ROV	ROV235	PSH	111	321	17/11/2013	18:11:00	14	52.07	48	12.67000	14.86783	-48.21117	1070		Push core about 1/2 full	sediment
JC094	045	VAY	ROV	ROV235	PSH	112	321	17/11/2013	18:15:00	14	52.07	48	12.67000	14.86783	-48.21117	1070		Push core about 1/2 full	sediment
JC094	045	VAY	ROV	ROV235	PSH	113	321	17/11/2013	18:17:00	14	52.07	48	12.67000	14.86783	-48.21117	1070		Push core about 3/4 full	sediment
JC094	045	VAY	ROV	ROV235	ARM	116	321	17/11/2013	18:43:00	14	52.05	48	12.54000	14.86750	-48.20900	1076		live branching sponge	bio
JC094	046	VAY	MGA	MGA013	MCH	001	322	18/11/2013	06:38:00	15	10.43	48	15.00800	15.17383	-48.25013	4124	4154	S0130- to Lucy	sediment
JC094	046	VAY	MGA	MGA013	MCN	002	322	18/11/2013	06:38:00	15	10.43	48	15.00800	15.17383	-48.25013	4124	4154	S0131- 8cm sediment	sediment
JC094	046	VAY	MGA	MGA013	MCH	003	322	18/11/2013	06:38:00	15	10.43	48	15.00800	15.17383	-48.25013	4124	4154	S0132- 4cm (bagged)	sediment
JC094	046	VAY	MGA	MGA013	MCN	004	322	18/11/2013	06:38:00	15	10.43	48	15.00800	15.17383	-48.25013	4124	4154	S0133- 4cm (bagged)	sediment
JC094	046	VAY	MGA	MGA013	NSK	005	322	18/11/2013	06:38:00	15	10.43	48	15.00800	15.17383	-48.25013	4124	4154	Niskin sampled	water
JC094	047	VAY	GVY	GVY009	GVY	001	322	18/11/2013	12:13:00	15	10.431	48	15.00900	15.17385	-48.25015	4128	4147	Payout all the way to 4178m to try to fix wire. Core came up emty	
JC094	048	VAY	ROV	ROV236	PSH	003	322	18/11/2013	19:53:00	14	53.5147	48	8.99660	14.89191	-48.14994	867		3x yelllow, about 1 inch of sediment, potentially mixed	sediment
JC094	048	VAY	ROV	ROV236	PSH	005	322	18/11/2013	20:02:00	14	53.5143	48	8.99650	14.89191	-48.14994	867		1x yellow, about a quarter full	sediment
JC094	048	VAY	ROV	ROV236	PSH	004	322	18/11/2013	20:04:00	14	53.5147	48	8.99600	14.89191	-48.14993	867		2x yellow, about 3 inches of sediment, mixed	sediment
JC094	048	VAY	ROV	ROV236	NSK	006	322	18/11/2013	20:06:00	14	53.5142	48	8.99780	14.89190	-48.14996	867		Niskin 1	water
JC094	048	VAY	ROV	ROV236	NSK	007	322	18/11/2013	20:06:00	14	53.5142	48	8.99780	14.89190	-48.14996	867		Niskin 2	water

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net** **ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	048	VAY	ROV	ROV236	SLP	010	322	18/11/2013	20:15:00	14	53.5095	48	69.00150	14.89183	-49.15003	865		white thin tubular sponge, green slurp chamber	bio
JC094	048	VAY	ROV	ROV236	SLP	011	322	18/11/2013	20:22:00	14	53.5083	48	9.00820	14.89181	-48.15014	862		live stylasterid on live colonial coral, 2x black tube	bio
JC094	048	VAY	ROV	ROV236	ARM	012	322	18/11/2013	20:46:00	14	53.4704	48	9.06040	14.89117	-48.15101	848		live scleractinian colonial coral on rock, aft biobox	bio
JC094	048	VAY	ROV	ROV236	SLP	013	322	18/11/2013	20:52:00	14	53.4705	48	9.06130	14.89118	-48.15102	846		live purple thin solitary, 2x black tube	bio
JC094	048	VAY	ROV	ROV236	SLP	014	322	18/11/2013	21:02:00	14	53.4557	48	9.07200	14.89093	-48.15120	840		medium black fossil solitaries, 15 alltogether for this event, 2x white tube	fossil
JC094	048	VAY	ROV	ROV236	SLP	015	322	18/11/2013	22:43:00	14	53.436	48	9.10940	14.89060	-48.15182	827		2 live white solitary, 2x white tube	bio
JC094	048	VAY	ROV	ROV236	SLP	016	322	18/11/2013	23:28:00	14	53.431	48	9.11260	14.89052	-48.15188	826		fossil coral rubble and 4 fossil solitaries, 2x red tube, maybe one more fossil	fossil
JC094	048	VAY	ROV	ROV236	SLP	017	323	19/11/2013	00:00:00	14	53.423	48	9.11810	14.89038	-48.15197	824		small live white solitary, 2x red tube	bio
JC094	048	VAY	ROV	ROV236	SLP	018	323	19/11/2013	00:05:00	14	53.4248	48	9.11850	14.89041	-48.15198	824		large white barrel sponge, glass, black chamber	bio
JC094	048	VAY	ROV	ROV236	SLP	019	323	19/11/2013	00:09:00	14	53.4233	48	9.11910	14.89039	-48.15199	824		white hard fan coral, enallopsammia, live?, 2x red	bio
JC094	048	VAY	ROV	ROV236	ARM	020	323	19/11/2013	00:55:00	14	53.389	48	9.17600	14.88982	-48.15293	806		sponge with zooanthids and basket start (gorgonocephalus), stb biobox	bio
JC094	048	VAY	ROV	ROV236	ARM	021	323	19/11/2013	01:15:00	14	53.382	48	9.19200	14.88970	-48.15320	799		dead colonial framework, 2 pieces, aft biobox	fossil
JC094	048	VAY	ROV	ROV236	SLP	022	323	19/11/2013	01:34:00	14	53.381	48	9.20400	14.88968	-48.15340	795		1 fossil solitary, brown, 2x blue tube	fossil
JC094	048	VAY	ROV	ROV236	SLP	023	323	19/11/2013	01:39:00	14	53.381	48	9.20400	14.88968	-48.15340	795		yellow glass sponge, green chamber	bio
JC094	048	VAY	ROV	ROV236	SLP	024	323	19/11/2013	01:46:00	14	53.38	48	9.20400	14.88967	-48.15340	795		1 live solitary coral long thin, 2x blue	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	025	323	19/11/2013	01:55:00	14	53.379	48	9.20600	14.88965	-48.15343	794		1 live solitary coral long thin, 2x blue	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	026	323	19/11/2013	02:22:00	14	53.367	48	9.22400	14.88945	-48.15373	788		fossil rubble. Possible fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	SLP	027	323	19/11/2013	02:53:00	14	53.367	48	9.22500	14.88945	-48.15375	788		fossil rubble. Possible 2 fossil solitaries +1 more	fossil
JC094	048	VAY	ROV	ROV236	SLP	028	323	19/11/2013	03:08:00	14	53.364	48	9.23400	14.88940	-48.15390	786		1 x fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	SLP	029	323	19/11/2013	03:16:00	14	53.354	48	9.24000	14.88923	-48.15400	784		1x live solitary coral long and thin and enallapsamia fragments	bio
JC094	048	VAY	ROV	ROV236	SLP	030	323	19/11/2013	03:28:00	14	53.36	48	9.23900	14.88933	-48.15398	784		3 x possible fossil solitaries	fossil
JC094	048	VAY	ROV	ROV236	SLP	031	323	19/11/2013	03:40:00	14	53.349	48	9.25400	14.88915	-48.15423	780		2 x fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	ARM	032	323	19/11/2013	04:04:00	14	53.346	48	9.25700	14.88910	-48.15428	780		Enalloopsamia	bio
JC094	048	VAY	ROV	ROV236	SLP	033	323	19/11/2013	04:10:00	14	53.346	48	9.25600	14.88910	-48.15427	780		1 x recently dead white solitary. 1 x dead solitary (brown_	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	034	323	19/11/2013	04:33:00	14	53.346	48	9.25840	14.88910	-48.15431	780		1 x live solitary. 2 x fossil solitary	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	035	323	19/11/2013	04:49:00	14	53.333	48	9.27100	14.88888	-48.15452	776		9 x fossil solitary corals. 7 x live solitary corals. Misc fossil rubble.	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	036	323	19/11/2013	04:52:00	14	53.333	48	9.27100	14.88888	-48.15452	776		Live stylasterid	bio
JC094	048	VAY	ROV	ROV236	SLP	037	323	19/11/2013	05:14:00	14	53.331	48	9.27900	14.88885	-48.15465	775		sponge	bio
JC094	048	VAY	ROV	ROV236	ARM	038	323	19/11/2013	05:30:00	14	53.324	48	9.29800	14.88873	-48.15497	772		large piece of live, white stylasterid (5+ pieces) + 1 squat lobster	bio
JC094	048	VAY	ROV	ROV236	SLP	039	323	19/11/2013	05:58:00	14	53.3142	48	9.32060	14.88857	-48.15534	762		1 x live solitary. 2x fossil solitary. 1 fossil solitary on rock	bio/fossil
JC094	048	VAY	ROV	ROV236	ARM	040	323	19/11/2013	06:05:00	14	53.314	48	9.32040	14.88857	-48.15534	762		Live solitary on Rock	bio
JC094	048	VAY	ROV	ROV236	SLP	041	323	19/11/2013	06:17:00	14	53.315	48	9.32220	14.88858	-48.15537	762		Basket star, 2 sponges, live solitary	bio
JC094	048	VAY	ROV	ROV236	SLP	042	323	19/11/2013	06:32:00	14	53.2994	48	9.33910	14.88832	-48.15565	754		3 x thin live solitary coral	bio
JC094	048	VAY	ROV	ROV236	SLP	043	323	19/11/2013	06:52:00	14	53.278	48	9.38220	14.88797	-48.15637	747		8 x fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	ARM	044	323	19/11/2013	07:06:00	14	53.2729	48	9.39390	14.88788	-48.15657	747		rock with fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	SLP	045	323	19/11/2013	07:11:00	14	53.2727	48	9.38350	14.88788	-48.15639	747		sponge and fossil solitary. Live solitary (purple) x2	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	046	323	19/11/2013	07:25:00	14	53.2714	48	9.39360	14.88786	-48.15656	746		2 x fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	SLP	047	323	19/11/2013	07:35:00	14	53.2697	48	9.39770	14.88783	-48.15663	746		2 x fossil solitary. 3 x live solitary (2 purple, 1 yellow)	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	048	323	19/11/2013	07:53:00	14	53.2545	48	9.40110	14.88758	-48.15669	743		6 x fossil solitary. 3 x live solitary	bio/fossil
JC094	048	VAY	ROV	ROV236	ARM/SLP	049	323	19/11/2013	08:37:00	14	53.1748	48	9.39040	14.88625	-48.15651	710		corallium? White fan coral with polyps seemingly only on 1 side fragments of fan. Bits of ennallapsammia also collected squat lobster and sponge	bio
JC094	048	VAY	ROV	ROV236	SLP	050	323	19/11/2013	09:15:00	14	53.1645	48	9.38460	14.88608	-48.15641	705		quite chunky fossil solitary and accidental sponge	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	051	323	19/11/2013	09:22:00	14	53.1618	48	9.38160	14.88603	-48.15636	703		Live solitary coral, purple, reddish, medium	bio
JC094	048	VAY	ROV	ROV236	SLP	052	323	19/11/2013	09:32:00	14	53.143	48	9.37640	14.88572	-48.15627	687		2 x fossil solitary corals	fossil
JC094	048	VAY	ROV	ROV236	SLP	053	323	19/11/2013	09:37:00	14	53.139	48	9.37380	14.88565	-48.15623	684		chunky fossil solitary coral	fossil
JC094	048	VAY	ROV	ROV236	SLP	054	323	19/11/2013	09:47:00	14	53.1255	48	9.36900	14.88543	-48.15615	675		recently dead solitary coral	bio
JC094	048	VAY	ROV	ROV236	SLP	056	323	19/11/2013	10:28:00	14	52.9896	48	9.34900	14.88316	-48.15582	636		live solitary	bio
JC094	048	VAY	ROV	ROV236	SLP	055	323	19/11/2013	10:32:00	14	53.0077	48	9.35000	14.88346	-48.15583	638		live white scleractinian fan bits	bio
JC094	048	VAY	ROV	ROV236	SLP	057	323	19/11/2013	10:53:00	14	52.9707	48	9.34000	14.88285	-48.15567	632		fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	SLP	058	323	19/11/2013	11:26:00	14	52.987	48	9.26450	14.88312	-48.15441	628		live (large) solitary, with rock and pedicle attached	bio
JC094	048	VAY	ROV	ROV236	SLP	059	323	19/11/2013	11:40:00	14	52.9136	48	9.22630	14.88189	-48.15377	621		small fragment (pink and white) of live solitary	bio
JC094	048	VAY	ROV	ROV236	SLP	060	323	19/11/2013	12:17:00	14	52.8543	48	9.13010	14.88091	-48.15217	570		10 x urchins	bio
JC094	048	VAY	ROV	ROV236	ARM	061	323	19/11/2013	13:12:00	14	52.6479	48	9.20020	14.87747	-48.15334	629		piece of ferromang crust and brittle star	bio/rock
JC094	048	VAY	ROV	ROV236	ARM	062	323	19/11/2013	13:38:00	14	52.641	48	9.14310	14.87735	-48.15239	601		piece of live primnoid (lite pink)	bio
JC094	048	VAY	ROV	ROV236	SLP	063	323	19/11/2013	14:02:00	14	52.6398	48	9.20600	14.87733	-48.15343	583		Shark's tooth (BIG)	fossil
JC094	048	VAY	ROV	ROV236	SLP	064	323	19/11/2013	17:39:00	14	52.645	48	8.96500	14.87742	-48.14942	478		squat lobster plus small white live corals- stylasterid?	bio
JC094	048	VAY	ROV	ROV236	ARM	065	323	19/11/2013	17:48:00	14	52.6493	48	8.95790	14.87749	-48.14930	471		octocoral/sty/scl? White fan coral. Live	bio
JC094	048	VAY	ROV	ROV236	SLP	066	323	19/11/2013	18:15:00	14	52.646	48	8.91600	14.87743	-48.14860	466		yellow white fan corals small enough to get into yellow tube. Live	bio
JC094	048	VAY	ROV	ROV236	SLP	067	323	19/11/2013	18:48:00	14	52.638	48	8.81090	14.87730	-48.14685	442		small white (live?) fan coral. No obv. Polyps	bio
JC094	048	VAY	ROV	ROV236	ARM	068	323	19/11/2013	19:11:00	14	52.625	48	8.74640	14.87708	-48.14577	431		plastic?	plastic
JC094	048	VAY	ROV	ROV236	SLP	069	323	19/11/2013	19:30:00	14	52.623	48	8.74600	14.87705	-48.14577	431		small white stylasterids in pieces	bio
JC094	048	VAY	ROV	ROV236	ARM/SLP	070	323	19/11/2013	21:45:00	14	52.768	48	8.38800	14.87947	-48.13980	408		green string	plastic
JC094	048	VAY	ROV	ROV236	ARM	071	323	19/11/2013	22:05:00	14	52.805	48	8.35800	14.88008	-48.13930	409		plastic tube piece, ridges on it	plastic
JC094	048	VAY	ROV	ROV236	SLP	072	324	20/11/2013	02:23:00	14	53.7909	48	7.14410	14.89652	-48.11907	1366		28 x fossil solitary. Plus fossil coral fragments	fossil
JC094	048	VAY	ROV	ROV236	SLP	073	324	20/11/2013	03:30:00	14	53.7914	48	7.11640	14.89652	-48.11861	1339		12 x live solitary	bio
JC094	048	VAY	ROV	ROV236	ARM	074	324	20/11/2013	04:13:00	14	53.7969	48	7.11620	14.89662	-48.11860	1337		long bamboo coral (live)	bio
JC094	048	VAY	ROV	ROV236	SLP	075	324	20/11/2013	04:48:00	14	53.744	48	7.17200	14.89573	-48.11953	1289		live pink solitary- large cup shaped	bio
JC094	048	VAY	ROV	ROV236	PSH	076	324	20/11/2013	06:08:00	14	53.6334	48	7.38960	14.89389	-48.12316	1055		about 3/4 full	sediment
JC094	048	VAY	ROV	ROV236	PSH	077	324	20/11/2013	06:11:00	14	53.633	48	7.39050	14.89388	-48.12318	1055		about 3/4 full	sediment
JC094	048	VAY	ROV	ROV236	PSH	078	324	20/11/2013	06:15:00	14	53.6332	48	7.39020	14.89389	-48.12317	1055		about 1/3 full (10cm)	sediment
JC094	048	VAY	ROV	ROV236	SLP	079	324	20/11/2013	07:24:00	14	53.4899	48	7.30230	14.89150	-48.12171	1153		8 x live solitary coral. 3 x fossil solitary coral	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	080	324	20/11/2013	07:50:00	14	53.4934	48	7.30110	14.89156	-48.12169	1153		white sponge yellow globular sponge	bio
JC094	048	VAY	ROV	ROV236	NSK	081	324	20/11/2013	07:52:00	14	53.4914	48	7.30190	14.89152	-48.12170	1152		Niskin 3	water
JC094	048	VAY	ROV	ROV236	NSK	082	324	20/11/2013	07:52:00	14	53.4914	48	7.30190	14.89152	-48.12170	1152		Niskin 4	water
JC094	048	VAY	ROV	ROV236	SLP	083	324	20/11/2013	08:07:00	14	53.4563	48	7.26290	14.89094	-48.12105	1164		Mystery black item (probably fossil solitary) x 2	fossil
JC094	048	VAY	ROV	ROV236	SLP	084	324	20/11/2013	08:15:00	14	53.4398	48	7.25460	14.89066	-48.12091	1163		7 x live solitary corals. 5 x fossil solitary corals	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	085	324	20/11/2013	08:40:00	14	53.4276	48	7.24790	14.89046	-48.12080	1160		fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	SLP	086	324	20/11/2013	08:47:00	14	53.4116	48	7.23360	14.89019	-48.12056	1149		small black fossil solitary (too small to be caught by gate)	fossil
JC094	048	VAY	ROV	ROV236	SLP	087	324	20/11/2013	08:50:00	14	53.404	48	7.23000	14.89007	-48.12050	1144		fossil solitary	fossil

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net** **ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs

green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	048	VAY	ROV	ROV236	SLP	088	324	20/11/2013	08:59:00	14	53.3915	48	7.23640	14.88986	-48.12061	1135		Live solitary and fossil solitary (dead scrapped from rock)	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	089	324	20/11/2013	09:13:00	14	53.3743	48	7.25550	14.88957	-48.12093	1121		4 x fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	SLP	090	324	20/11/2013	09:16:00	14	53.33743	48	7.25550	14.88896	-48.12093	1120		Piece of fossil (bamboo) coral, with live soft coral on it, brittle stars on soft coral	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	091	324	20/11/2013	09:18:00	14	53.379	48	7.25120	14.88965	-48.12085	1120		18 x fossil solitary. 9 x live solitary	bio/fossil
JC094	048	VAY	ROV	ROV236	SLP	092	324	20/11/2013	10:19:00	14	53.2921	48	7.29410	14.88820	-48.12157	1066		clump of fossil colonial coral	fossil
JC094	048	VAY	ROV	ROV236	SLP	093	324	20/11/2013	11:09:00	14	53.043	48	7.44800	14.88405	-48.12413	868		white, vase sponge	bio
JC094	048	VAY	ROV	ROV236	SLP	094	324	20/11/2013	11:20:00	14	53.03	48	7.45000	14.88383	-48.12417	853		fossil solitary	fossil
JC094	048	VAY	ROV	ROV236	ARM	095	324	20/11/2013	12:48:00	14	52.7313	48	7.62580	14.87886	-48.12710	503		piece of rock- carbonate platform x 2	rock
JC094	049	VAY	ROV	ROV237	PSH	001	324	20/11/2013	23:34:00	14	51.03400	48	15.99900	14.85057	-48.26665	2166		about 1/2 full	sediment
JC094	049	VAY	ROV	ROV237	PSH	002	324	20/11/2013	23:36:00	14	51.03400	48	15.99900	14.85057	-48.26665	2166		about 1/2 full	sediment
JC094	049	VAY	ROV	ROV237	PSH	003	324	20/11/2013	23:37:00	14	51.03400	48	15.99900	14.85057	-48.26665	2166		about 2/3 full	sediment
JC094	049	VAY	ROV	ROV237	NSK	004	324	20/11/2013	23:40:00	14	51.03180	48	15.99400	14.85053	-48.26657	2166		Niskin 1	water
JC094	049	VAY	ROV	ROV237	NSK	005	324	20/11/2013	23:40:00	14	51.03180	48	15.99400	14.85053	-48.26657	2166		Niskin 2	water
JC094	049	VAY	ROV	ROV237	ARM	006	324	20/11/2013	00:01:00	14	51.04800	48	15.96430	14.85080	-48.26607	2181		Huge yellowish white sponge (size of STBBIO) with crinoid on top	bio
JC094	049	VAY	ROV	ROV237	SLP	007	325	21/11/2013	02:05:00	14	51.28600	48	15.69600	14.85477	-48.26160	2041		white primnoid	bio
JC094	049	VAY	ROV	ROV237	ARM	008	325	21/11/2013	02:07:00	14	51.28600	48	15.69800	14.85477	-48.26163	2040		rock	rock
JC094	049	VAY	ROV	ROV237	SLP	009	325	21/11/2013	02:11:00	14	51.285	48	15.69800	14.85475	-48.26163	2040		small live solitary, white	bio
JC094	049	VAY	ROV	ROV237	ARM	010	325	21/11/2013	02:20:00	14	51.302	48	15.69300	14.85503	-48.26155	2012		2-branched bamboo coral, pink bits (amenomes?) at end of 1 branch	bio
JC094	049	VAY	ROV	ROV237	SLP	011	325	21/11/2013	02:27:00	14	51.301	48	15.69200	14.85502	-48.26153	2012		small live solitary x3 + fragments of small white octocoral	bio
JC094	049	VAY	ROV	ROV237	SLP	012	325	21/11/2013	02:37:00	14	51.306	48	15.69200	14.85510	-48.26153	2008		glass barrel sponge	bio
JC094	049	VAY	ROV	ROV237	SLP	013	325	21/11/2013	03:11:00	14	51.341	48	15.67800	14.85568	-48.26130	1971		fossil coral debris + 1 fossil solitary	fossil
JC094	049	VAY	ROV	ROV237	SLP	014	325	21/11/2013	03:34:00	14	51.36	48	15.66800	14.85600	-48.26113	1966		3xfossil solitary, possibly fragmented	fossil
JC094	049	VAY	ROV	ROV237	SLP	015	325	21/11/2013	03:38:00	14	51.36	48	15.66800	14.85600	-48.26113	1966		live solitary coral	bio
JC094	049	VAY	ROV	ROV237	NET	016	325	21/11/2013	03:45:00	14	51.361	48	15.67000	14.85602	-48.26117	1966		fossil coral debris	fossil
JC094	049	VAY	ROV	ROV237	SLP	017	325	21/11/2013	04:35:00	14	51.3768	48	15.66040	14.85628	-48.26101	1965		Fossil solitary (small) x 3	fossil
JC094	049	VAY	ROV	ROV237	SLP	018	325	21/11/2013	04:42:00	14	51.376	48	15.66000	14.85627	-48.26100	1965		Accidental slurp of white solitary poss. Dead x 3	bio/fossil
JC094	049	VAY	ROV	ROV237	SLP	019	325	21/11/2013	05:09:00	14	51.392	48	15.66500	14.85653	-48.26108	1959		2x small live solitary white	bio
JC094	049	VAY	ROV	ROV237	SLP	020	325	21/11/2013	05:10:00	14	51.392	48	15.66500	14.85653	-48.26108	1959		1 x glass sponge (broken into pieces)	bio
JC094	049	VAY	ROV	ROV237	SLP	021	325	21/11/2013	05:28:00	14	51.401	48	15.65700	14.85668	-48.26095	1956		1 x small live solitary white/pink	bio
JC094	049	VAY	ROV	ROV237	SLP	022	325	21/11/2013	05:28:00	14	51.401	48	15.65700	14.85668	-48.26095	1956		fossil coral stalk with ophuroid	bio/fossil
JC094	049	VAY	ROV	ROV237	SLP	023	325	21/11/2013	05:41:00	14	51.401	48	15.65200	14.85668	-48.26087	1954		fossil solitary + rubble	fossil
JC094	049	VAY	ROV	ROV237	SLP	024	325	21/11/2013	05:47:00	14	51.401	48	15.65200	14.85668	-48.26087	1954		1 x live solitary, white base and red top. 1 x white live	bio
JC094	049	VAY	ROV	ROV237	SLP	025	325	21/11/2013	05:57:00	14	51.401	48	15.65200	14.85668	-48.26087	1953		1 x white live solitary	bio
JC094	049	VAY	ROV	ROV237	SLP	026	325	21/11/2013	06:16:00	14	51.423	48	15.61300	14.85705	-48.26022	1949		1 x white large solitary live	bio
JC094	049	VAY	ROV	ROV237	SLP	027	325	21/11/2013	06:31:00	14	51.439	48	15.56900	14.85732	-48.25948	1938		2x white solitaries	bio
JC094	049	VAY	ROV	ROV237	SLP	028	325	21/11/2013	06:50:00	14	51.4625	48	15.49040	14.85771	-48.25817	1864		fossil solitary x 2	fossil
JC094	049	VAY	ROV	ROV237	SLP	029	325	21/11/2013	07:04:00	14	51.4627	48	15.47970	14.85771	-48.25800	1854		fossil solitary, sponge?, live solitary	bio/fossil
JC094	049	VAY	ROV	ROV237	SLP	030	325	21/11/2013	07:20:00	14	51.466	48	15.47110	14.85777	-48.25785	1838		live solitary coral	bio
JC094	049	VAY	ROV	ROV237	SLP	031	325	21/11/2013	07:22:00	14	51.4661	48	15.47090	14.85777	-48.25785	1836		stylasterid plus hydroid	bio/fossil
JC094	049	VAY	ROV	ROV237	NSK	032	325	21/11/2013	07:31:00	14	51.4673	48	15.46800	14.85779	-48.25780	1835		Niskin 3	water
JC094	049	VAY	ROV	ROV237	NSK	033	325	21/11/2013	07:31:00	14	51.4673	48	15.46800	14.85779	-48.25780	1835		Niskin 4	water
JC094	049	VAY	ROV	ROV237	SLP	034	325	21/11/2013	07:57:00	14	51.4951	48	15.39790	14.85825	-48.25663	1827		Fossil solitary	fossil
JC094	049	VAY	ROV	ROV237	SLP	035	325	21/11/2013	08:42:00	14	51.5805	48	15.38470	14.85968	-48.25641	1774		Small white fan shaped coral (live). Crinoid attached? Brittle Star?	bio
JC094	049	VAY	ROV	ROV237	SLP	036	325	21/11/2013	09:22:00	14	51.659	48	14.36600	14.86098	-48.23943	1701		Live stylasterid (possibly)	bio
JC094	049	VAY	ROV	ROV237	SLP	037	325	21/11/2013	09:50:00	14	51.749	48	15.36700	14.86248	-48.25612	1756		bycatch to green slurp, rubble mostly bamboo , fossil coral rubble wih 3 potential solitaries	fossil
JC094	049	VAY	ROV	ROV237	SLP	038	325	21/11/2013	10:38:00	14	51.8013	48	15.36380	14.86336	-48.25606	1706		fossil colonial coral fragments	fossil
JC094	049	VAY	ROV	ROV237	ARM	039	325	21/11/2013	11:09:00	14	51.8006	48	15.36520	14.86334	-48.25609	1706		large white fan sponge	bio
JC094	049	VAY	ROV	ROV237	ARM	040	325	21/11/2013	12:22:00	14	51.8942	48	15.34880	14.86490	-48.25581	1622		Corallium, with orange hairy brittlestars x2 along discal edge	bio
JC094	049	VAY	ROV	ROV237	ARM	041	325	21/11/2013	12:32:00	14	51.8942	48	15.34880	14.86490	-48.25581	1622		Large dead corallium branch with base	fossil
JC094	049	VAY	ROV	ROV237	ARM	042	325	21/11/2013	12:28:00	14	51.9043	48	15.34540	14.86507	-48.25576	1612		Scleractinian fan, yellow (Enallapsommia or Bathelia) with spong and stylasterid	bio
JC094	049	VAY	ROV	ROV237	ARM/SLP	043	325	21/11/2013	12:47:00	14	51.9064	48	15.34070	14.86511	-48.25568	1612		Sm. Pieces of fossil brown enallops.	fossil
JC094	049	VAY	ROV	ROV237	SLP	044	325	21/11/2013	13:04:00	14	51.9084	48	15.34360	14.86514	-48.25573	1612		Enallapsammia + anthomastus fossil	bio/fossil
JC094	049	VAY	ROV	ROV237	ARM	045	325	21/11/2013	15:43:00	14	51.9088	48	14.81470	14.86515	-48.24691	1563		yellow enallopsammia Live, about 20cm across	bio
JC094	049	VAY	ROV	ROV237	NET	046	325	21/11/2013	16:08:00	14	51.9021	48	14.80320	14.86504	-48.24672	1569		Orange net with fossil debris	fossil
JC094	049	VAY	ROV	ROV237	ARM	047	325	21/11/2013	17:03:00	14	51.8516	48	14.71550	14.86419	-48.24526	1539		Bamboo coral with/anemones	bio
JC094	049	VAY	ROV	ROV237	SLP	048	325	21/11/2013	18:19:00	14	51.722	48	14.50890	14.86203	-48.24182	1457		Yellow fan with brittle stars on it	bio
JC094	049	VAY	ROV	ROV237	ARM	049	325	21/11/2013	18:24:00	14	51.7203	48	14.50870	14.86201	-48.24181	1457		Corallium (dead) with biology on it	bio/fossil
JC094	050	VAY	MGA	MGA014	MCH	001	326	22/11/2013	00:04:00	14	45.994	48	15.03800	14.76657	-48.25063	3723	3755	Failed- S0143	
JC094	050	VAY	MGA	MGA014	MCH	002	326	22/11/2013	00:04:00	14	45.994	48	15.03800	14.76657	-48.25063	3723	3755	Failed- S0144	
JC094	050	VAY	MGA	MGA014	MCN	003	326	22/11/2013	00:04:00	14	45.994	48	15.03800	14.76657	-48.25063	3723	3755	Failed- S0145	
JC094	050	VAY	MGA	MGA014	MCN	004	326	22/11/2013	00:04:00	14	45.994	48	15.03800	14.76657	-48.25063	3723	3755	Failed- S0146	
JC094	050	VAY	MGA	MGA014	NSK	005	326	22/11/2013	00:04:00	14	45.994	48	15.03800	14.76657	-48.25063	3723	3755	Fired and sampled by hong chin	Water
JC094	051	VAY	GVY	GVY010	GVY	001	326	22/11/2013	04:14:00	14	45.992	48	15.04100	14.76653	-48.25068	3721	3739	Failed. Core catcher had sediment on external surface. Clayey Silt.	sediment
JC094	052	VAY	GVY	GVY0011	GVY	001	326	22/11/2013	08:16:00	14	45.867	48	15.08300	14.76445	-48.25138	3725	3747	Failed. Core empty.	
JC094	053	VAY	BOX	BOX001	BOX	001	326	22/11/2013	15:28:00	14	45.993	48	15.03900	14.76655	-48.25065	3722	3748	Succesful. Approx 16 cm sediment.	sediment
JC094	054	VAY	GVY	GVY012	GVY	001	326	22/11/2013	20:36:00	14	51.074	48	15.85400	14.85123	-48.26423	2232	2243	Succesful. Approx 31 cm of sediment. Stratigraphic order possibly not preserved.	sediment
JC094	055	VAY	ROV	ROV238	MBS	001	327	23/11/2013	00:29:00	14	53.432	48	9.06500	14.89053	-48.15108	835		Beging Multibeam Survey	Survey
JC094	055	VAY	ROV	ROV238	MBE	002	327	23/11/2013	15:57:00	14	52.836	48	9.33200	14.88060	-48.15553	626		End Multibeam Survey	Survey
JC094	056	GRM	ROV	ROV239	SLP	001	328	24/11/2013	17:26:00	15	25.3121	51	5.18550	15.42187	-51.08643	1520		Fossil solitary x2. Fossil Sponge, Fossil colonial coral (enallapsammia?), Fossil colonial coral (madrepora?)	fossil
JC094	056	GRM	ROV	ROV239	SLP	002	328	24/11/2013	17:49:00	15	25.3138	51	5.18790	15.42190	-51.08647	1519		Coral rubble	fossil
JC094	056	GRM	ROV	ROV239	NET	003	328	24/11/2013	18:03:00	15	25.31220	51	5.18830	15.42187	-51.08647	1519		Coral rubble	fossil
JC094	056	GRM	ROV	ROV239	SLP	004	328	24/11/2013	19:04:00	15	25.30900	51	5.19000	15.42182	-51.08650	1512		Fossil solitary coral x2. plus fossil coral rubble	fossil
JC094	056	GRM	ROV	ROV239	SLP	005	328	24/11/2013	19:28:00	15	25.29860	51	5.19250	15.42164	-51.08654	1504		Fossil solitary x7. plus fossil coral rubble	fossil
JC094	056	GRM	ROV	ROV239	SLP	006	328	24/11/2013	20:15:00	15	25.29070	51	5.20210	15.42151	-51.08670	1492		Attached fossil solitary x2. unattached fossil solitary x1. pluss rubble. Fossil colonial w/ophuroid	bio/fossil
JC094	056	GRM	ROV	ROV239	ARM	007	328	24/11/2013	20:28:00	15	25.29050	51	5.20180	15.42151	-51.08670	1492		Fossil enallapsammia	fossil
JC094	056	GRM	ROV	ROV239	ARM	008	328	24/11/2013	20:33:00	15	25.29050	51	5.20180	15.42151	-51.08670	1490		Fossil misc. colonial	fossil
JC094	056	GRM	ROV	ROV239	SLP	009	328	24/11/2013	20:35:00	15	25.29050	51	5.20180	15.42151	-51.08670	1490		Fossil solitaries x 9 + fossil rubble	fossil
JC094	056	GRM	ROV	ROV239	SLP	010	328	24/11/2013	21:55:00	15	25.29050	51	5.20180	15.42151	-51.08670	1484		Yellow, recently dead colonial scleractinian (2 pieces)	bio
JC094	056	GRM	ROV	ROV239	SLP	011	328	24/11/2013	22:02:00	15	25.29050	51	5.20180	15.42151	-51.08670	1484		White, round, sponges (2)	bio

JC094 EVENT LOG

NSK= Niskin **SLP=** Slurp **SCP=** Scoop **MGA=** Mega Core **KTN=** Kasten **GVY=** GravityCore **PTN=** PistonCore **PSH=** PushCore **BOX=** BoxCore **NET= Net** **ARM=** Arm **MBS=** Multibeam start **MBE=** multibeam end

Core and CTD Events are entered as the ON BOTTOM time/lat/long ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	056	GRM	ROV	ROV239	SLP	012	328	24/11/2013	22:12:00	15	25.28990	51	5.21060	15.42150	-51.08684	1484		Fossil Solitary	fossil
JC094	056	GRM	ROV	ROV239	SLP	013	328	24/11/2013	22:22:00	15	25.29130	51	5.20880	15.42152	-51.08681	1483		Squat lobster, sponge bits, branches of colonial rubble, ophuroids	bio
JC094	056	GRM	ROV	ROV239	NSK	014	328	24/11/2013	22:45:00	15	25.28990	51	5.21060	15.42150	-51.08684	1480		Niskin 1	water
JC094	056	GRM	ROV	ROV239	NSK	015	328	24/11/2013	22:45:00	15	25.28900	51	5.21060	15.42148	-51.08684	1480		Niskin 2	water
JC094	056	GRM	ROV	ROV239	SLP	016	328	24/11/2013	22:49:00	15	25.28990	51	5.21200	15.42150	-51.08687	1480		Live solitary coral	bio
JC094	056	GRM	ROV	ROV239	SLP	017	328	24/11/2013	22:52:00	15	25.29250	51	5.21360	15.42154	-51.08689	1478		Live solitary (?), fossil sponge branches, many ophuroids, fossil solitary x9, rock, fossil rubble	bio/fossil
JC094	056	GRM	ROV	ROV239	SLP	018	328	24/11/2013	23:14:00	15	25.29150	51	5.21500	15.42153	-51.08692	1478		Live solitary x2, fossil coral fragments	bio/fossil
JC094	056	GRM	ROV	ROV239	SLP	019	329	25/11/2013	02:22:00	15	25.29020	51	5.17400	15.42150	-51.08623	1473		Live solitary x2 + fossil coral rubble	bio/fossil
JC094	056	GRM	ROV	ROV239	SLP	020	329	25/11/2013	02:25:00	15	25.29020	51	5.17400	15.42150	-51.08623	1473		fossil solitary x3 plus fossil coral rubble	fossil
JC094	056	GRM	ROV	ROV239	SLP	021	329	25/11/2013	03:08:00	15	25.28330	51	5.22490	15.42139	-51.08708	1461		fossil solitary x 8. Fossil rubble.	fossil
JC094	056	GRM	ROV	ROV239	SLP	022	329	25/11/2013	03:16:00	15	25.28360	51	5.22560	15.42139	-51.08709	1460		spherical, yellow-brown sponge, attached to colonial coral	bio
JC094	056	GRM	ROV	ROV239	SLP	023	329	25/11/2013	04:07:00	15	25.27030	51	5.23650	15.42117	-51.08728	1439		fossil solitary x 7, piece of fossil enallapsammia, fossil colonial misc.	fossil
JC094	056	GRM	ROV	ROV239	ARM	024	329	25/11/2013	05:09:00	15	25.21440	51	5.27340	15.42024	-51.08789	1375		colonial fossil coral pieces (2)	fossil
JC094	056	GRM	ROV	ROV239	PSH	025	329	25/11/2013	05:26:00	15	25.19180	51	5.27460	15.41986	-51.08791	1379		successful- about 1/3 full	sediment
JC094	056	GRM	ROV	ROV239	PSH	026	329	25/11/2013	05:31:00	15	25.19180	51	5.27460	15.41986	-51.08791	1379		successful- about 3/4 full	sediment
JC094	056	GRM	ROV	ROV239	PSH	027	329	25/11/2013	05:37:00	15	25.19220	51	5.27220	15.41987	-51.08787	1379		successful- about 2/3 full	sediment
JC094	056	GRM	ROV	ROV239	NSK	028	329	25/11/2013	05:40:00	15	25.18930	51	5.27140	15.41982	-51.08786	1371		Niskin 3	water
JC094	056	GRM	ROV	ROV239	NSK	029	329	25/11/2013	05:40:00	15	25.19080	51	5.27130	15.41985	-51.08786	1371		Niskin 4	water
JC094	056	GRM	ROV	ROV239	NET	030	329	25/11/2013	05:50:00	15	25.18910	51	5.27370	15.41982	-51.08790	1380		orange net- fossil corals	fossil
JC094	056	GRM	ROV	ROV239	ARM	031	329	25/11/2013	06:53:00	15	25.16660	51	5.27920	15.41944	-51.08799	1382		small white pieces taken of sponge	bio
JC094	056	GRM	ROV	ROV239	ARM	032	329	25/11/2013	07:23:00	15	25.11980	51	5.37390	15.41866	-51.08957	1413		Pale pink primnoid with red/orange brittle stars attached	bio
JC094	056	GRM	ROV	ROV239	SLP	033	329	25/11/2013	07:35:00	15	25.09140	51	5.34000	15.41819	-51.08900	1428		Live solitary- medium sized. Quite flat, brown outside with white/pink top. Fossil solitary on colonial framewrok	bio/fossil
JC094	056	GRM	ROV	ROV239	SLP	034	329	25/11/2013	07:55:00	15	25.06110	51	5.35020	15.41769	-51.08917	1442		2x dead solitary	fossil
JC094	056	GRM	ROV	ROV239	SLP	035	329	25/11/2013	08:26:00	15	24.95400	51	5.31560	15.41590	-51.08859	1455		fossil solitary x 2	fossil
JC094	056	GRM	ROV	ROV239	SLP	036	329	25/11/2013	09:04:00	15	24.81470	51	5.33610	15.41358	-51.08894	1446		fossil solitary	fossil
JC094	056	GRM	ROV	ROV239	SLP	037	329	25/11/2013	09:25:00	15	24.80220	51	5.34290	15.41337	-51.08905	1446		solitary fossil	fossil
JC094	056	GRM	ROV	ROV239	SLP	038	329	25/11/2013	09:29:00	15	24.80160	51	5.34000	15.41336	-51.08900	1445		live solitary- caryophyllia or desmo	bio
JC094	056	GRM	ROV	ROV239	SLP	039	329	25/11/2013	09:31:00	15	24.80020	51	5.34120	15.41334	-51.08902	1445		fossil solitary- really large	fossil
JC094	056	GRM	ROV	ROV239	SLP	040	329	25/11/2013	09:37:00	15	24.79900	51	5.34300	15.41332	-51.08905	1446		slender fossil solitary- brown	fossil
JC094	056	GRM	ROV	ROV239	SLP	041	329	25/11/2013	11:04:00	15	24.41500	51	5.25100	15.40692	-51.08752	1253		live solitary	bio
JC094	056	GRM	ROV	ROV239	SLP	042	329	25/11/2013	12:28:00	15	24.02000	51	5.45900	15.40033	-51.09098	1096		live solitary. Fossil solitary x2	bio/fossil
JC094	056	GRM	ROV	ROV239	SLP	043	329	25/11/2013	12:43:00	15	24.00000	51	5.46800	15.40000	-51.09113	1090		1 x fossil solitary	fossil
JC094	056	GRM	ROV	ROV239	SLP	044	329	25/11/2013	12:48:00	15	24.00000	51	5.46800	15.40000	-51.09113	1090		1 round white sponge	bio
JC094	056	GRM	ROV	ROV239	SLP	045	329	25/11/2013	13:31:00	15	23.87100	51	5.56800	15.39785	-51.09280	1127		yellow sponge	bio
JC094	056	GRM	ROV	ROV239	PSH	046	329	25/11/2013	13:43:00	15	23.85400	51	5.57800	15.39757	-51.09297	1136		failed	
JC094	056	GRM	ROV	ROV239	SLP	047	329	25/11/2013	13:50:00	15	23.84100	51	5.58700	15.39735	-51.09312	1139		fossil slitary *dark brown, black)	fossil
JC094	056	GRM	ROV	ROV239	SLP	048	329	25/11/2013	14:00:00	15	23.84100	51	5.58700	15.39735	-51.09312	1139		2 x live solitary (desmo?) and one small one.	bio
JC094	056	GRM	ROV	ROV239	PSH	049	329	25/11/2013	14:40:00	15	23.76730	51	5.56660	15.39612	-51.09278	1078		1/4 full	sediment
JC094	056	GRM	ROV	ROV239	NET	050	329	25/11/2013	15:19:00	15	23.69900	51	5.52460	15.39498	-51.09208	1027		V. fine frubble fossil coral framework	fossil
JC094	056	GRM	ROV	ROV239	PSH	051	329	25/11/2013	15:33:00	15	23.65550	51	5.50130	15.39426	-51.09169	1004		push core about 3/4 full	sediment
JC094	056	GRM	ROV	ROV239	PSH	052	329	25/11/2013	15:36:00	15	23.65550	51	5.50130	15.39426	-51.09169	1004		push core more than 3/4 full	sediment
JC094	056	GRM	ROV	ROV239	PSH	053	329	25/11/2013	15:37:00	15	23.65550	51	5.50130	15.39426	-51.09169	1004		push core about 3/4 full	sediment
JC094	056	GRM	ROV	ROV239	NSK	054	329	25/11/2013	15:38:00	15	23.65550	51	5.50130	15.39426	-51.09169	1004		NSK 5	water
JC094	056	GRM	ROV	ROV239	ARM	055	329	25/11/2013	15:45:00	15	23.63490	51	5.48640	15.39392	-51.09144	981		2x rock	rock
JC094	057	GRM	GVY	GVY013	GVY	001	329	25/11/2013	18:45:00	15	21.56500	51	4.59300	15.35942	-51.07655	1643	1647	Failed. Core appeared to bounce on seafloor and came back empty	
JC094	058	GRM	ROV	ROV240	PSH	001	329	25/11/2013	23:04:00	15	26.90800	51	5.48600	15.44847	-51.09143	2187		Push core about 1/2 full	sediment
JC094	058	GRM	ROV	ROV240	PSH	002	329	25/11/2013	23:05:00	15	26.90800	51	5.48600	15.44847	-51.09143	2187		Push core about 1/2 full	sediment
JC094	058	GRM	ROV	ROV240	PSH	003	329	25/11/2013	23:08:00	15	26.90800	51	5.48600	15.44847	-51.09143	2187		Push core about 1/3 full	sediment
JC094	058	GRM	ROV	ROV240	NSK	004	329	25/11/2013	23:09:00	15	26.90800	51	5.48600	15.44847	-51.09143	2187		Niskin 1	water
JC094	058	GRM	ROV	ROV240	NSK	005	329	25/11/2013	23:09:00	15	26.90800	51	5.48600	15.44847	-51.09143	2187		Niskin 2	water
JC094	058	GRM	ROV	ROV240	ARM	006	330	26/11/2013	00:54:00	15	26.79290	51	5.51160	15.44655	-51.09186	2051		Solitary coral, live, long, extreme location	bio
JC094	058	GRM	ROV	ROV240	SLP	007	330	26/11/2013	01:58:00	15	26.79800	51	5.52600	15.44663	-51.09210	2034		Glass sponge in 2 pieces.	bio
JC094	058	GRM	ROV	ROV240	ARM	008	330	26/11/2013	02:34:00	15	26.75800	51	5.63900	15.44597	-51.09398	1992		Rock	rock
JC094	058	GRM	ROV	ROV240	SLP	009	330	26/11/2013	03:01:00	15	26.72300	51	5.73100	15.44538	-51.09552	1888		Live solitary, long and white x5. Event ends at 03:48	bio
JC094	058	GRM	ROV	ROV240	SLP	010	330	26/11/2013	03:22:00	15	26.71920	51	5.75540	15.44532	-51.09592	1868		Possible soft coral/ sponge zooanthids. Live brown/yellow	bio
JC094	058	GRM	ROV	ROV240	SLP	011	330	26/11/2013	03:26:00	15	26.72070	51	5.75550	15.44535	-51.09593	1869		White live primnoid fragmented	bio
JC094	058	GRM	ROV	ROV240	ARM	012	330	26/11/2013	03:37:00	15	26.71900	51	5.75580	15.44532	-51.09593	1869		White live sponge living on top of dead corallium?	bio/fossil
JC094	058	GRM	ROV	ROV240	SLP	013	330	26/11/2013	03:48:00	15	26.71810	51	5.76360	15.44530	-51.09606	1869		White live golfball sponge (large)	bio
JC094	058	GRM	ROV	ROV240	SLP	014	330	26/11/2013	04:10:00	15	26.69150	51	5.79910	15.44486	-51.09665	1831		Live solitary x10	bio
JC094	058	GRM	ROV	ROV240	ARM	015	330	26/11/2013	04:37:00	15	26.68860	51	5.81160	15.44481	-51.09686	1820		Possible dead enallapsammia: yellow/red/brown	bio/fossil
JC094	058	GRM	ROV	ROV240	ARM	016	330	26/11/2013	05:04:00	15	26.68520	51	5.82310	15.44475	-51.09705	1816		Yellow branched enallapsammia attached to rock	bio
JC094	058	GRM	ROV	ROV240	SLP	017	330	26/11/2013	05:25:00	15	26.66370	51	5.84620	15.44440	-51.09744	1791		White live solitary x2	bio
JC094	058	GRM	ROV	ROV240	SLP	018	330	26/11/2013	05:29:00	15	26.66340	51	5.84650	15.44439	-51.09744	1791		Fossil solitary x2	fossil
JC094	058	GRM	ROV	ROV240	ARM	019	330	26/11/2013	05:52:00	15	26.65020	51	5.87530	15.44417	-51.09792	1768		Dead branched coral, brown (enallap?), branched white coral (enallap?), think brown branched colonial coral	fossil
JC094	058	GRM	ROV	ROV240	SLP	020	330	26/11/2013	06:22:00	15	26.64510	51	5.84250	15.44409	-51.09738	1756		Possibly live solitary	bio
JC094	058	GRM	ROV	ROV240	PSH	021	330	26/11/2013	07:10:00	15	26.58390	51	6.03180	15.44307	-51.10053	1675		Push core. Empty - 1/4 full	sediment
JC094	058	GRM	ROV	ROV240	PSH	022	330	26/11/2013	07:19:00	15	26.58390	51	6.03180	15.44307	-51.10053	1675		Push core. About 1/3 full	sediment
JC094	058	GRM	ROV	ROV240	PSH	023	330	26/11/2013	07:21:00	15	26.58390	51	6.03180	15.44307	-51.10053	1675		Push core about 1/3 full	sediment
JC094	058	GRM	ROV	ROV240	SLP	024	330	26/11/2013	07:28:00	15	26.57480	51	6.04940	15.44291	-51.10082	1662		large white live solitary, maybe recently dead	bio
JC094	058	GRM	ROV	ROV240	SLP	025	330	26/11/2013	07:59:00	15	26.53760	51	6.12200	15.44229	-51.10203	1622		large live solitary, purple tentacles, fossil madrepora pieces? Primnoid sm, white	bio/fossil
JC094	058	GRM	ROV	ROV240	NSK	026	330	26/11/2013	08:18:00	15	26.53340	51	6.13690	15.44222	-51.10228	1617		Niskin 3	Water
JC094	058	GRM	ROV	ROV240	NSK	027	330	26/11/2013	08:18:00	15	26.53340	51	6.13690	15.44222	-51.10228	1617		Niskin 4	Water
JC094	058	GRM	ROV	ROV240	SLP	028	330	26/11/2013	11:44:00	15	25.45700	51	4.95610	15.42428	-51.08260	1720		White globular barrel sponge	bio
JC094	058	GRM	ROV	ROV240	SLP	029	330	26/11/2013	12:20:00	15	25.36420	51	5.10650	15.42274	-51.08511	1610		2 (possible) fossil solitaries	fossil
JC094	058	GRM	ROV	ROV240	SLP	030	330	26/11/2013	12:32:00	15	25.34920	51	5.13160	15.42249	-51.08553	1588		Large fossil solitary	fossil
JC094	058	GRM	ROV	ROV240	NET	031	330	26/11/2013	12:47:00	15	25.33050	51	5.16350	15.42218	-51.08606	1553		fine coral rubble	fossil
JC094	058	GRM	ROV	ROV240	NET	032	330	26/11/2013	13:18:00	15	25.32320	51	5.16850	15.42205	-51.08614	1544		coral rubble	fossil
JC094	058	GRM	ROV	ROV240	SLP	033	330	26/11/2013	13:49:00	15	25.31790	51	5.17690	15.42197	-51.08628	1534		Fossil (recently dead) solitary coral, white	fossil

JC094 EVENT LOG

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Core and CTD Events are entered as the ON BOTTOM time/lat/long

ROV Events are LAT/LONG of USBL and Depth from DVL

yellow entries that have been corrected and hence differ from the Sample Logs

green entries= lat/longs not accurate due to USBL drop out

Cruise	Station #	Location	Gear	Gear #	Event Code	Event #	Jday	Date	Time GMT	Lat ° N	Lat Min N	Long ° W	Long Min W	Lat (DD)	Long (DD)	Water depth (m)	Wire Out (Cores)	Comments	Recipient
JC094	058	GRM	ROV	ROV240	NET	034	330	26/11/2013	14:01:00	15	25.31020	51	5.18790	15.42184	-51.08647	1517		Larger coral rubble	fossil
JC094	058	GRM	ROV	ROV240	ARM	035	330	26/11/2013	14:31:00	15	25.31020	51	5.18790	15.42184	-51.08647	1513		Fossil enalapsammia	fossil
JC094	058	GRM	ROV	ROV240	SLP	036	330	26/11/2013	14:49:00	15	25.28610	51	5.20430	15.42144	-51.08674	1486		large fossil solitary and small browner fossil solitar	fossil
JC094	058	GRM	ROV	ROV240	NET	037	330	26/11/2013	14:59:00	15	25.28670	51	5.20510	15.42145	-51.08675	1486		fossil coral rubble	fossil
JC094	058	GRM	ROV	ROV240	ARM	038	330	26/11/2013	15:43:00	15	25.27150	51	5.20450	15.42119	-51.08674	1480		Pink Paragorgia with snake brittle stars	bio
JC094	058	GRM	ROV	ROV240	NSK	039	330	26/11/2013	15:49:00	15	25.26550	51	5.21250	15.42109	-51.08688	1454		Niskin 5	Water
JC094	058	GRM	ROV	ROV240	SLP	040	330	26/11/2013	15:58:00	15	25.23230	51	5.24140	15.42054	-51.08736	1345		Squat lobster x5 + shrimp and coral	bio
JC094	059	GRM	GVY	GVY014	GVY	001	330	26/11/2013	20:47:00	15	27.86000	50	59.48800	15.46433	-50.99147	2714	2731	pull-out: 4.20tons. 6m barrel. 3.88m of sediment	sediment
JC094	060	GRM	MGA	MGA015	MCN	001	331	27/11/2013	00:00:00	15	27.86000	50	59.48700	15.46433	-50.99145	2714	2733	pull-out: 3tons (but no clear pull-out). 6-7cm of sediment. Partially leaking on one side and sediment being remobilised. Rest of core seems intact, but core top may be mixed. Sampled for overlying water and core top, rest sliced in 1cm slices. S0173	sediment
JC094	060	GRM	MGA	MGA015	MCH	002	331	27/11/2013	00:00:00	15	27.86000	50	59.48700	15.46433	-50.99145	2714	2733	Failed - S0174	sediment
JC094	060	GRM	MGA	MGA015	MCN	003	331	27/11/2013	00:00:00	15	27.86000	50	59.48700	15.46433	-50.99145	2714	2733	Failed - S0175	sediment
JC094	060	GRM	MGA	MGA015	MCH	004	331	27/11/2013	00:00:00	15	27.86000	50	59.48700	15.46433	-50.99145	2714	2733	Failed - S0176	sediment
JC094	060	GRM	MGA	MGA015	NSK	005	331	27/11/2013	00:00:00	15	27.86000	50	59.48700	15.46433	-50.99145	2714	2733	Niskin not good, it was leaking	water
JC094	061	GRM	MGA	MGA016	MCN	001	331	27/11/2013	03:13:00	15	27.85900	50	59.48600	15.46432	-50.99143	2713	2733	3.1 tons pull-out. S0177. Ca. 35 cm recovery. Sampled for core top and 1cm slices.	sediment
JC094	061	GRM	MGA	MGA016	MCH	002	331	27/11/2013	03:13:00	15	27.85900	50	59.48600	15.46432	-50.99143	2713	2733	S0178. Sampled for core top, 1cm slices down to 5cm, 5cm slices below that	sediment
JC094	061	GRM	MGA	MGA016	MCN	003	331	27/11/2013	03:13:00	15	27.85900	50	59.48600	15.46432	-50.99143	2713	2733	S0179. ca. 15cm recovery. Core for plastics study (Lucy Woodall)	plastic
JC094	061	GRM	MGA	MGA016	MCH	004	331	27/11/2013	03:13:00	15	27.85900	50	59.48600	15.46432	-50.99143	2713	2733	S0180. ca. 33cm recovery. Sampled for pore fluids, core top and 2cm slices.	water/sediment
JC094	061	GRM	MGA	MGA016	NSK	005	331	27/11/2013	03:13:00	15	27.85900	50	59.48600	15.46432	-50.99143	2713	2733		water
JC094	062	GRM	MGA	MGA017	MCN	001	331	27/11/2013	07:28:00	15	30.53900	50	54.40100	15.50898	-50.90668	4128	4178	4.20 tons pull-out. May be disturbed due to bubbles coming up through the core during recovery. S0181. Ca. 10 cm recovery. Sampled for core top and 1cm slices	sediment
JC094	062	GRM	MGA	MGA017	MCH	002	331	27/11/2013	07:28:00	15	30.53900	50	54.40100	15.50898	-50.90668	4128	4178	S0182. Ca. 8cm recovery.May be disturbed due to bubbles coming up through the core during recovery. Core for plastics study (Lucy Woodall)	sediment
JC094	062	GRM	MGA	MGA017	MCN	003	331	27/11/2013	07:28:00	15	30.53900	50	54.40100	15.50898	-50.90668	4128	4178	S0183. Ca. 9cm recovery. May be disturbed due to bubbles coming up through the core during recovery. Sampled for core top and 1 cm slices	sediment
JC094	062	GRM	MGA	MGA017	MCH	004	331	27/11/2013	07:28:00	15	30.53900	50	54.40100	15.50898	-50.90668	4128	4178	S0184. Failed.	sediment
JC094	062	GRM	MGA	MGA017	NSK	005	331	27/11/2013	07:28:00	15	30.53900	50	54.40100	15.50898	-50.90668	4128	4178	sampled	water

Appendix 3.

The numbers of whole (w) and fragments (f) of fossil solitary Scleractinia collected for each event at every station, and the weights of fossil colonial corals (Scleractinia, octocorals and stylasterids) collected in grams (g). Totals for each station, each sampling location and for the whole cruise are included at the end of the table.

Station#	Event	Depth	*Desmophyllum (w)*	*Desmophyllum (f)*	*Dasmosmillia (w)*	*Dasmosmillia (f)*	*Caryophyllia (w)*	*Caryophyllia (f)*	*Polymyces(w)*	*Polymyces (f)*	*Javania (w)*	*Javania (f)*	*Flabellum(w)*	*Flabellum(f)*	*Stephanocyathus(w)*	*Stephanocyathus (f)*	*Trochocyathus (w)*	*Trochocyathus (f)*	*Fungiacyathus (w)*	*Madrepora (g)*	*Enallopsammia (g)*	*Solenosmillia (g)*	*Sympodangia (g)*	*Dendrophyllia (g)*	*Bamboo coral (g)*	*Corallium (g)*	*Stylasterid (g)*	*Other (g)*	*Other (f)*	Total Solitary (w)	Total weight (g)
4	2	1080	5	1	0	0	204	0	0	0	7	0	0	0	0	0	0	0	0	460	0	1745	0	0	458	0	0	9368	0	216	12031
4	9	1057	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	1	4
4	14	994	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	11	0	1	12
4	16	994	1	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	8	0	676	0	0	206	0	0	158	0	14	1050
4	21	990	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	2	0	740	0	0	41	0	0	1	0	4	784
4	28	780	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	21	0	38	0	0	1	0	0	2	0	1	62
4	29	780	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	5	0	242	0	0	2	0	0	2	0	3	251
4	34	766	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	7	0	10	0	0	0	0	0	117	0	2	134
5	1	671	0	9	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	420	0	4380	65	0	17	0	0	4182	0	34	9064.1
5	2	639	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	15	0	0	0	0	0	0	0	1	25
5	13	420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
5	38	265	0	0	5	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
5	39	265	0	0	8	22	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0
6	1	650	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	10
7	1	2135	0	1	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	4	2	0	97	0	0	106
7	18	1829	0	4	0	0	26	12	0	0	0	0	0	0	0	0	0	0	0	0	225	45	0	0	1683	350	0	2231	0	26	4535
7	19	1783	0	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	210	0	0	0	4060	450	0	170	0	3	4890
7	25	1545	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	43	29	2422	0	0	1844	85	0	680	0	1	5104
7	33	1524	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	21	35	104	0	0	50	15	0	250	0	3	476
7	35	1521	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	2	170	0	100	0	0	277
7	39	1506	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	55	225	0	0	0	3	0	0	0	2	283

7	44	1431	1	3	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	52	220	2500	0	0	900	590	0	565	0	19	4827
7	49	1413	0	0	0	0	6	1	0	0	1	0	0	0	0	0	0	0	0	5	351	2320	0	0	153	50	0	0	0	7	2881
7	53	1380	0	4	0	0	18	0	0	0	3	2	0	0	0	0	0	0	0	24	132	4168	0	0	317	304	0	400	0	21	5349
7	54	1380	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	19	495	0	0	426	28	0	0	0	3	969
11	6	2559	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	370	0	0	0	0	0	370
11	7	2526	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	20
11	8	2514	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	50
11	10	2343	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	537	0	0	0	0	0	537
11	15	2301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	330	0	0	0	0	0	331
11	17	2278	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	1030	0	0	200	0	0	1280
11	48	2160	0	6	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	5	20	0	52	0	3	80
11	56	2100	0	3	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	7	6	0	67	0	2	91
14	1	645	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	20
15	1	1354	0	0	0	0	7	2	0	0	3	0	0	0	0	0	0	0	0	5	12	0	0	0	55	18	0	150	0	10	244
15	5	1345	1	0	0	0	19	0	0	0	3	3	0	0	0	0	0	0	0	3	38	1660	0	0	871	950	0	2210	0	23	5745
15	11	1326	0	0	0	0	6	21	0	0	3	1	0	0	0	0	0	0	0	0	0	19	0	0	30	3	0	40	0	9	92
15	27	1366	1	0	0	0	38	8	0	0	0	3	0	0	0	0	0	0	0	125	62	1600	0	0	1540	220	0	6200	0	39	9747
15	32	1365	0	0	0	0	9	17	0	0	0	0	0	0	0	0	0	0	0	0	25	160	0	0	750	75	0	975	0	9	1985
15	36	1375.1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	429	0	0	0	350	0	0	0	1	779
15	38	1391	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	200
15	55	972.8	0	0	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	214	0	5150	0	0	130	0	0	0	0	45	5494
15	57	800	0	0	0	0	71	3	0	0	1	0	0	0	0	0	0	0	0	0	0	5285	0	0	0	0	0	276	0	72	5561
15	58	798	1	0	0	0	64	21	0	0	0	0	0	0	0	0	0	0	0	260	0	5625	0	0	55	65	0	16	0	65	6021
15	66	746	0	0	0	0	7	2	0	0	0	0	0	0	0	0	0	0	0	55	0	500	0	0	2	1	0	751	0	7	1309
21	8	1985	0	0	0	0	73	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	110	0	73	210
21	13	1966	0	0	0	0	54	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0	40	5	0	75	0	55	125
21	20	1853	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
21	23	1574	1	0	0	0	11	9	0	0	0	0	0	0	0	0	0	0	1	50	650	5500	0	0	750	550	0	1904	0	13	9414
21	30	1493	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5	10	0	0	0	40	0	0	15	0	0	80
21	40	1445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	0	0	0	0	0	0	5	0	0	125
21	41	1445	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	10	10	10	40	0	2	90
21	44	1484	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	30	0	60	0	0	120
22	1	1278	4	0	0	0	36	16	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	30	0	0	115	0	40	148

22	9	1264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	24	0	0	26
22	10	1264	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	0	15	0	170	0	0	220	30	0	2596	0	28	3035
22	15	997	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	4
22	41	915	0	0	0	0	6	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	7	25
22	45	845	1	0	0	0	26	9	0	0	0	0	0	0	0	0	0	0	0	2280	0	980	0	0	50	75	0	3201	0	27	6588
22	47	773	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
22	52	761	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	0	130	0	0	2	0	0	12	0	0	209
22	54	749	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	8	4
22	56	718	0	0	0	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
26	9	2824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	5	0	0	0	0	0	7
26	12	2818	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	50
26	17	2814	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
26	28	2599	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	183	0	170	2	0	0	355
26	29	2599	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	1	0	2	41
26	41	2475	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	3
26	44	2463	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	470	1	0	0	0	1	475
26	51	2391	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
26	53	2355	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	1	1	0	0	12
26	57	2307	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	540	0	0	540
26	59	2309	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
26	66	2170	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	3	4
26	70	1164	4	7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	35	0	0	2	1	0	44	0	5	84
26	71	1164	6	3	0	0	75	0	0	0	1	0	0	0	0	0	0	0	0	50	12	1300	0	0	800	10	0	3105	0	82	5279
26	73	1162	5	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0
26	74	1162	0	0	0	0	97	0	0	0	0	0	0	0	0	0	0	0	0	100	0	500	0	0	160	38	0	2342	13	97	3160
26	79	1035	0	0	0	0	43	0	0	0	2	0	0	0	0	0	0	0	0	5	0	4200	0	0	50	120	0	606	0	45	4982
33	3	1494	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7	20	0	0	5	10	0	83	0	1	125
33	20	1464	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
33	25	1420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	125	0	0	32	14	0	222	0	0	536
33	26	1407	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
33	27	1403	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	179	0	0	0	960	227	0	6240	0	1	7607
33	33	1371	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	1.5	0	12	0	1	17.5
33	39	1361	0	0	0	0	43	3	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	80	34	0	209	0	43	330

33	47	1327	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	30	0	5	36
33	50	1296	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	150	30	0	5530	0	15	5810
33	53	1293	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	3	29
33	55	1277	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
33	56	1236	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
33	57	1225	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	40	0	4	42
33	58	1165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	2	0	0	6	0	0	26
33	59	1139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
33	60	1132	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	525	0	0	368	0	0	479	0	1	1372
33	61	1128	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	3
33	67	1120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	14	0	0	225	0	0	250
33	76	1097	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	50	0	2020	0	0	195	0	10	1470	0	3	3745
40	1	845	0	0	0	0	33	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	722	0	33	767
41	3	000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1200	10	90	0	0	2	0	0	17	0	0	1320
41	12	1146	3	0	0	0	0	2	0	0	3	0	0	0	0	0	0	0	0	2	3	551	0	0	120	0	5	0	0	6	712
41	13	1140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	118	0	0	6	0	2	22	0	0	152
41	20/ 21/ 25	000	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	2
41	28	935	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	10	2	0	0	0	2	0	6	58	0	2	98
41	30	858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	10
41	33	808	0	0	0	0	93	26	0	0	0	0	0	0	0	0	0	0	0	590	0	2550	0	0	40	10	150	4100	0	93	7442
41	37	739	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165	95	0	1	260
41	38	738	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	15	88	0	4	104
41	41	727	0	0	0	0	14	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	750	0	14	795
41	48	628	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	10	143	0	0	158
41	51	606	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	45	20	180	0	0	0	0	60	645	0	4	950
41	59	599	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	294	0	750	0	0	15	6	60	6096	0	30	7221
41	72	570	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0	2	0	0	0	0	3	20	0	1	31
41	79	568	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	555	0	2120	0	0	2	0	60	1183	0	1	3920
42	17	2894	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	378	0	45	0	0	0	424
42	21	2888	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	180
42	28	2818	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	10	3	0	0	0	0	83
42	31	2809	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	30
42	34	2688	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	440	0	0	0	0	0	440

42	35	2688	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	10	0	2	0	0	1	13
42	41	2433	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	2	0	1	0	0	99
42	51	2202	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	2
42	54	2191	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	0	0	0	1	16
42	65	2183	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
42	68	2129	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	2
42	73	2001	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
42	82	1694	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	485	0	0	0	0	0	0	0	0	0	485
42	84	1678	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	40	0	0	15	0	0	95
42	89	1657	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1430	270	0	0	450	540	0	250	0	0	2942
42	93	1648	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	145	0	0	0	6	0	0	6	0	0	158
42	97	000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	20	0	0	75	3810	4	0	0	0	3942
42	98	1578	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1900	60	0	0	1780	0	0	1300	0	0	5044
45	1	1514	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2.5	2	0	0	2	19	0	76.25	0	1	101.75
45	4	1513	1	0	0	0	4	0	0	0	7	0	0	0	1	0	0	0	0	0	100	0	0	0	1777	989	0	5705	0	13	8572
45	7	1483	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	0	0	0	0	68
45	13	1425	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	8	0	0	3	0	0	16
45	30	1412	0	0	0	0	3	2	1	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	50	5	0	21	0	4	87
45	40	1406	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0.5	0	0	2	1	0	3.75	1	1	12.25
45	43	1420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	1	0	0	50	0	0	176.5	2	0	230
45	70	1259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	230	0	0	0	0	0	230
45	72	1259	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5	8	4	0	0	390	2	0	151	0	0	561
45	74	1258	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	55	32	10	0	0	2343	20	0	2804	0	1	5266.5
45	81	1303	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1.3	0	0	0	1	0	0	0.5	0	4	2.8
45	84	1150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
45	96	1094	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.5	0	0	4.5	0	0	10.5
45	101	1106	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	7	3.5
45	105	1054	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	1	2	0	0	1	1	0	3	0	3	11
45	109	1070	0	0	0	0	1	0	0	0	11	0	0	0	0	0	0	0	0	20	42	75	0	0	38	18	0	354.5	11	12	652.5
45	110	1070	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	1	0	0	2	0	0	4.5
48	14	840	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	1	0	96	0	8	116
48	16	826	0	0	0	0	5	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	6	30
48	21	799	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	240	0	0	0	0	0	0	4	0	1	244

48	22	795	0	3	0	0	12	1	0	0	2	0	1	0	0	0	0	0	0	1	1	31	0	0	4	3	1	138	0	15	180
48	35	776	0	0	0	0	2	0	0	0	5	0	1	0	0	0	0	0	0	4	0	5	0	0	0	3	2	31	0	8	49
48	39	762	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	162	0	1	168
48	43	747	0	0	0	0	4	0	0	0	1	0	2	0	0	0	0	0	0	0	2	0	0	0	0	2	0	8	1	7	22
48	44	747	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	46	746	0	0	0	0	1	0	0	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1
48	48	743	0	0	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0
48	50	705	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	4	5
48	57	632	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
48	63	583	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	72	1366	0	0	0	0	5	0	0	0	16	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3.5	3	23	15.5
48	79	1153	0	0	0	0	1	0	0	0	22	0	1	1	0	0	0	0	0	0	0	0	0	0	3	0	1	7	0	24	15
48	86	1149	0	0	0	0	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	4	5	15
48	90	1120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	33
49	13	1971	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	7	5	1	10	0	3	24
49	14	1966	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
49	16	1966	0	0	0	0	36	16	0	0	0	0	0	0	0	0	2	0	0	0	32	0	0	0	1403	135	4	6301	0	38	7876
49	22	1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	4
49	34	1827	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	2	0	0	6
49	37	1756	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5	5	0	80	0	0	91
49	38	1706	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	5	32	0	1	0	0	42
49	41	1622	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1600	0	0	0	0	1600
49	43	1612	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	44	1612	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	100
49	46	1569	0	0	0	0	17	0	0	0	0	0	0	0	1	0	0	0	0	0	360	0	0	0	177	420	1	4093	0	18	5052
49	49	1457	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1400	0	0	0	0	1400
56	1	1520	2	0	0	0	1	0	6	0	3	0	0	0	0	0	0	0	0	0	80	0	0	0	105	0	0	18	0	12	203
56	3	1519	1	0	0	0	7	0	9	0	0	0	0	0	0	0	0	0	0	590	510	0	0	0	354	10	0	3127	0	17	4636
56	6	1492	2	0	0	0	2	0	3	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0
56	7	1492	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	98	0	0	0	12	0	0	0	0	0	120
56	11	1484	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	0	0	0	0	0	0	0	45
56	17	1478	0	0	0	0	1	0	9	0	0	0	2	0	0	0	0	0	0	0	10	5	0	0	10	0	0	14	0	12	59
56	20	1473	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75	15	0	0	0	5	0	0	38	0	0	134

56	21	1461	0	0	0	0	1	0	4	0	2	0	0	0	0	0	0	0	0	73	19	0	0	0	0	0	0	22	0	7	118
56	23	1439	0	0	0	0	0	0	6	0	0	0	0	0	0	0	1	0	0	2	71	0	0	0	35	2	0	32	0	7	143
56	24	1375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	4	0	0	0	0	0	54
56	30	1380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4200	0	0	330	1	0	4530
56	33	1428	1	0	0	0	4	0	1	0	1	0	0	0	0	0	0	0	0	11	57	0	0	0	2.5	2	0	3	0	7	77.5
56	36	1446	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	6	2
56	41	1253	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
56	42	1096	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
56	50	1027	0	0	0	0	229	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	229	0
56	55	981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	6	2051	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
58	15	1820	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165	0	0	0	0	0	0	0	0	0	165
58	18	1791	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
58	19	1768	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	415	0	0	0	0	0	0	3	0	0	418
58	24	1662	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	125	0	0	0	3	0	7	0	0	1	135
58	29	1610	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	31	1553	2	0	0	0	6	0	1	0	0	0	0	0	0	0	0	0	0	80	100	0	0	0	34	2	0	2951	2	9	3169
58	32	1544	0	0	0	0	6	0	3	0	1	0	0	0	0	0	0	0	0	12	150	0	0	0	0	15	0	109	9	10	289
58	33	1534	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	3
58	34	1517	0	0	0	0	2	0	3	0	1	1	0	0	0	0	0	0	0	233	640	0	0	0	705	0	0	3652	2	6	5270
58	35	1513	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61	0	0	0	0	0	0	0	0	0	61
58	36	1486	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	3	0	0	0	0	2	8
58	37	1486	1	1	0	0	8	0	8	6	0	0	0	0	0	0	0	0	0	2270	1199	15	0	0	0	11	0	720	5	17	4216

Station Totals

4	7	1	0	0	226	0	0	0	9	0	0	0	0	0	0	0	0	503	0	3453	0	0	711	0	0	9659	0	242	14328
5	0	10	13	52	37	0	0	0	0	0	0	0	0	0	0	0	0	430	0	4395	65	0	17	1	0	4182.1	0	50	9090.1
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	10
7	1	18	0	0	80	19	0	0	4	2	0	0	0	0	0	0	0	145	1284	12279	0	0	9439	2047	0	4493	0	85	29697

11	0	9	0	0	5	4	0	0	0	0	0	0	0	0	0	0	0	50	13	0	0	0	2349	26	0	319	0	5	2759
15	3	0	0	0	267	74	0	0	10	7	0	0	0	0	0	0	0	662	137	20428	0	0	3433	1682	0	10818	0	280	37177
21	1	0	0	0	142	74	0	0	1	2	0	0	0	0	0	0	1	55	835	5500	0	0	940	595	10	2211	0	145	10166
22	6	0	0	0	110	29	0	0	4	0	0	0	0	0	0	0	0	2364	1	1280	0	0	302	105	0	5981	0	120	10039
26	15	10	0	0	228	0	0	0	5	0	0	0	0	0	0	0	0	156	14	6035	0	0	1774	170	174	6641	13	248	14992
33	0	1	0	0	81	5	0	0	2	0	0	0	0	0	0	0	0	50	322	2858	0	0	1817	316.5	10	14546	0	83	19948.5
40	0	0	0	0	33	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	722	0	33	767
41	3	0	0	0	151	33	0	0	3	0	0	0	0	0	0	0	0	2708	36	6361	0	0	190	16	581	13227	0	157	23175
42	0	0	0	0	4	1	0	0	1	0	0	0	1	0	0	0	0	0	4045	350	0	0	3355	4363	51	1574	0	6	13955
45	1	2	0	0	8	2	1	0	35	1	0	0	1	0	0	0	0	81	210.8	94.5	0	0	4896.5	1123	0	9304.5	14	46	15876.3
48	0	3	0	0	48	2	0	0	59	2	10	2	0	0	1	0	0	5	249	36	0	18	7	9	4	502.5	9	118	893.5
49	0	0	0	0	61	22	0	0	0	0	0	0	1	0	2	0	0	0	499	0	0	0	1599	3599	6	10488	0	64	16195
56	6	0	0	0	248	35	38	1	18	0	2	0	0	0	1	0	0	761	953	5	0	0	4727.5	16	0	3584	4	313	10121.5

58	4	1	0	0	24	0	16	6	4	1	0	0	0	0	0	0	0	2598	2857	15	0	0	745	28	7	7438	18	48	13734
Sampling Location Totals																													
Carter	11	38	13	52	615	97	0	0	23	9	0	0	0	0	0	0	0	1795	1434	40555	65	0	15949	3756	0	29476	0	662	93061.1
Knipovich	22	10	0	0	480	103	0	0	10	2	0	0	0	0	0	0	1	2575	850	12815	0	0	3016	870	184	14833	13	513	35197
Vema	3	1	0	0	269	44	0	0	6	0	0	0	1	0	0	0	0	2758	4403	9569	0	0	5362	4695.5	687	30069	0	279	57845.5
Vayda	1	5	0	0	117	26	1	0	94	3	10	2	2	0	3	0	0	86	958.8	130.5	0	18	6502.5	4731	10	20295	23	228	32964.8
Gramberg	10	1	0	0	272	35	54	7	22	1	2	0	0	0	1	0	0	3359	3810	20	0	0	5472.5	44	7	11022	22	361	23855.5
Cruise Totals	47	55	13	52	1753	305	55	7	155	15	12	2	3	0	4	0	1	10573	11456	63090	65	18	36302	14097	888	105695	58	2043	242923.9

W numbers for CTD001 (JC094_001_EBA_CTD001_NSK#_W####)

Niskin #	Depth (m)	Diss O2	d18O
1	4512	0001	0025
2	4512	0002	
3	4297	0003	
4	4297	0004	
5	3598	0005	
6	3598	0006	
7	2800	0007	
8	2800	0008	
9	2002	0009	
10	2002	0010	
11	1503	0011	
12	1503	0012	
13	1004	0013	
14	1004	0014	
15	705	0015	
16	705	0016	
17	405	0017	
18	405	0018	
19	55	0019	
20	55	0020	
21	36	0021	
22	36	0022	
23	10.8	0023	
24	10.8	0024	

W numbers for CTD002 (JC094_002_EBA_CTD002_NSK#_W####)

Extra sample from bottle 21 W0209

Niskin #	Depth (m)	Diss O2	CO3	14C	Nuts	d18O	d30Si	Metals	d15N	U series	Salinity	PON	POC
1	4512	0026	0051		0076/7	0100	0108	0116	0128	0140	0152		
2	4512	0027		0064		0199					0153	0176	0188
3	4297	0028	0052		0078/9	0101	0109	0117	0129	0141	0154	0177	
4	4297	0029		0065		0200					0155		
5	3598	0030	0053		0080/1	0102	0110	0118	0130	0142	0156		
6	3598	0031		0066		0201					0157	0178	0190
7	2800	0032	0054		0082/3	0103	0111	0119	0131	0143	0158		
8	2800	0033		0067		0202					0159	0179	0191
9	2002	0034	0055		0084/5	0104	0112	0120	0132	0144	0160		
10	2002	0035		0068		0203					0161	0180	0192
11	1503	0036	0056		0086/7	0105	0113	0121	0133	0145	0162		
12	1503	0037		0069		0204					0163	0181	0193
13	1004	0038	0057		0088/9	0106	0114	0122	0134	0146	0164		
14	1004	0039		0070		0205					0165	0182	0194
15	705	0040	0058		0090/1			0123	0135	0147	0166		
16	705	0041/42	0059	0071							0167	0183	0195
17	405	0043	0060		0092/3			0124	0136	0148	0168		
18	405	0044		0072							0169	0184	0196
19	55	0045	0061		0094/5			0125	0137	0149	0170		
20	55	0046		0073							0171	0185	0197
21	36	0047	0062		0096/7	0107	0115	0126	0138	0150	0172	0186	
22	36	0048		0074		0206					0173		0198
23	10.8	0049	0063		0098/9	0207		0127	0139	0151	0174		
24	10.8	0050		0075		0208					0175	0187	

W numbers for ROV222 (JC094_004_EBA_ROV222_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK1	0210	0211	0212	0213/0214		
2	NSK1					0215	0216
3	NSK33	0217	0218	0219			
4	NSK33					0222	0223
5	NSK33				0220/0221	0224	

W numbers for ROV223 (JC094_005_EBA_ROV223_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK5	0225	0226				
2	NSK6				0227/0228	0229	0230
3	NSK19	0231	0232	0233			
4	NSK20				0234/0235	0236	0237

W numbers for ROV224 (JC094_007_EBA_ROV224_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK6	0238	0239		0241		
2	NSK7			0240		0243	0244
3	NSK46	0245	0246				
4	NSK47				0248/0249	0250	0251
5	NSK56	0252	0253			0254	

W numbers for MGA002 (JC094_008_EBA_MGA002_MCX#_W####)

EVENT	Nuts	Metals	U series
MCN1			
MCN2	0255/0256	0257	0259
MCN3			
MCN4			
MCH1			
MCH2			
MCH3		0258	0260

W numbers for ROV225 (JC094_011_EBA_ROV225_NSK#_W####)

Niksin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK4	0261	0262		0263/0264		
2	NSK5					0265	0266
5	NSK40	0267	0268			0269	

W numbers for ROV227 (JC094_015_EBA_ROV227_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals
2	NSK25	0270	0271			
3	NSK26			0272	0273/0274	0275
4	NSK47	0276	0277			
5	NSK67	0278				0279

W numbers for MGA006 (JC094_016_TRS1_MGA006_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	0280	0281	0282	0283/0284	0285/0286	0287	0288	0289

EVENT	Nuts	d30Si	Metals
MCN1	0290/0291	0293	0292

W numbers for MGA007 (JC094_019_TRS2_MGA007_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	0294	0295	0296	0297/0298	0299/0300	0301	0302	0303

Spare filtered and acidified water W0306

EVENT	Nuts	d30Si	Metals
MCN1	0304/0305	0307	0308

W numbers for CTD003 (JC094_020_EBB_CTD003_NSK#_W####)

Niskin #	Depth (m)	Diss O2	CO3	14C	Nuts	d18O	d30Si	Metals	d15N	U series	Salinity	PON	POC
1	4046	0313	0339		0364/5	0388/9	0404	0412	0424	0436	0448		
2	4046	0314		0352							0449	0472	0484
3	3796	0315	0340		0366/7	0390/1	0405	0413	0425	0437	0450		
4	3796	0316		0353							0451	0473	0485
5	2799	0317	0341		0368/9	0392/3	0406	0414	0426	0438	0452		
6	2799	0318		0354							0453	0474	0486
7	2000	0319/0320	0342		0370/1	0394/5	0407	0415	0427	0439	0454		
8	2000	0321		0355							0455	0475	0487
9	1500	0322	0343		0372/3	0396/7	0408	0416	0428	0440	0456		
10	1500	0323		0356							0457	0476	0488
11	1002	0324	0344		0374/5	0398/9	0409	0417	0429	0441	0458		
12	1002	0325		0357							0459	0477	0489
13	803	0326	0345		0376/7	0400/1	0410	0418	0430	0442	0460		
14	803	0327		0358							0461	0478	0490
15	404	0328	0346		0378/9			0419	0431	0443	0462		
16	404	0329/0330	0347	0359							0463	0479	0491
17	254	0331	0348		0380/1			0420	0432	0444	0464		
18	254	0332		0360							0465	0480	0492
19	55	0333	0349		0382/3			0421	0433	0445	0466		
20	55	0334		0361							0467	0481	0493
21	20	0335	0350		0384/5	0402/3	0411	0422	0434	0446	0468		
22	20	0336		0362							0469	0482	0494
23	5	0337	0351		0386/7			0423	0435	0447	0470		
24	5	0338		0363							0471	0483	0495

W numbers for ROV228 (JC094_021_EBB_ROV228_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK1	0496	0497				
2	NSK2			0499	0500/0501	0502	0513
3	NSK46	0503	0504				
4	NSK46			0505	0506/0507	0508	
5	NSK46	0510					0509

W numbers for ROV229 (JC094_022_EBB_ROV229_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK2	0517		0518			
2	NSK3				0519/0520	0521	0522
3	NSK74	0523	0524				
4	NSK75			0525	0526/0527		
5	NSK76	0530				0528	0529

W numbers for ROV230 (JC094_026_EBB_ROV230_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK1	0531	0532				
2	NSK2			0533	0534/0535	0536	0537
3	NSK64	0538	0539				
4	NSK64			0540	0541/0542	0543	

W numbers for MGA008 (JC094_027_TRS3_MGA008_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	0546	0547	0548	0549/0550	0551/0552	0553	0554	0555

EVENT	Nuts	d30Si	Metals
MCN1			0558
MCN2		0561	0559/0560
MCH1	0556/0557	0564	0562/0563

W numbers for MGA009 (JC094_029_TRS3_MGA009_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	0565	0566	0567	0568/0569	0570/0571	0572	0573	0574

EVENT	Nuts	d30Si	Metals
MCN2		0578	0577
MCN3	0575/0576		0579
MCH4	0556/0557	0580	0581

W numbers for CTD004 (JC094_032_VEM_CTD004_NSK#_W####)

Niskin #	Depth (m)	Diss O2	CO3	14C	Nuts	d18O	d30Si	Metals	d15N	U series	Salinity	PON	POC
1	4923	0582	0608		0633/4	0657/8	0681	0691	0703	0715	0727		
2	4923	0583		0621							0728	0751	0763
3	4702	0584	0609		0635/6	0659/60	0682	0692	0704	0716	0729		
4	4702	0585		0622							0730	0752	0764
5	3802	0586	0610		0637/8	0661/2		0693	0705	0717	0731		
6	3802	0587		0623							0732	0753	0765
7	2805	0588	0611		0639/40	0663/4	0683	0694	0706	0718	0733		
8	2805	0589		0624							0734	0754	0766
9	2002	0590	0612		0641/2	0665/6		0695	0707	0719	0735		
10	2002	0591		0625							0736	0755	0767
11	1506	0592	0613		0643/4	0667/8	0684	0696	0708	0720	0737		
12	1506	0593		0626							0738	0756	0768
13	1009	0594	0614		0645/6	0669/70	0685	0697	0709	0721	0739		
14	1009	0595		0627							0740	0757	0769
15	810	0596	0615	0628	0647/8	0671/2	0686	0698	0710	0722	0741		
16	810												
17	609	0598	0616		0649/50	0673/4	0687	0699	0711	0723	0743		
18	609	0599		0629							0744	0759	0771
19	460	0600/0601	0617		0651/2	0675/6	0688	0700	0712	0724	0745		
20	460	0602		0630							0746	0760	0772
21	85	0603	0618		0653/4	0677/8	0689	0701	0713	0725	0747		
22	85	0604		0631							0748	0761	0773
23	16	0605	0619/0620		0655/6	0679/80	0690	0702	0714	0726	0749		
24	16	0606/607		0632							0750	0762	0774

Note bottle 16 misfired

W numbers for ROV231 (JC094_033_VEM_ROV231_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals	d30Si
1	NSK10	0775	0776				
2	NSK11			0777	0778/0779	0780	
3	NSK44	0781	0782				
4	NSK45			0783	0784/0785	0786	
5	NSK68	0787	0788				0789

W numbers for MGA010 (JC094_034_VEM_MGA010_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	0790	0791	0792	0793/4	0795/6	0797	0798	0799

EVENT	Nuts	d30Si	Metals
MCN1	0800/0801		0802
MCH2			0803

W numbers for MGA011 (JC094_036_VEM_MGA011_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	0804	0805	0806	0807/8	0809/10	0811	0812	0813

W numbers for MGA012 (JC094_037_VEM_MGA012_XXX#_W####)

Niskin #	Dissolved O2	PON	POC
1	0814	0815	0816

W numbers for CTD005 (JC094_039_VEM_CTD005_NSK#_W####)

Niskin #	Depth (m)	Diss O2	CO3	14C	Nuts	d18O	d30Si	Metals	d15N	U series	Salinity	PON	POC
1	5142	0817	0843		0866/7	0890/1		0923	0935	0947	0959		
2	5142	0818		0856							0960	0983	0995
3	4799	0819	0844		0868/9	0892/3	0914	0924	0936	0948	0961		
4	4799	0820		0857							0962	0984	0996
5	3799	0821	0845		0870/1	0894/5		0925	0937	0949	0963		
6	3799	0822		0858							0964	0985	0997
7	2801	0823	0846		0872/3	0896/7	0915	0926	0938	0950	0965		
8	2801	0824									0966	0986	0998
9	2002	0825	0847		0874/5	0898/9		0927	0939	0951	0967		
10	2002	0826/0841		0859							0968	0987	0999
11	1503	0827	0848/0855		0876/7	0900/1	0916	0928	0940	0952	0969		
12	1503	0828									0970	0988	1000
13	1204	0829	0849		0878/9	0902/3	0917	0929	0941	0953	0971		
14	1204	0830		0860							0972	0989	1001
15	804	0831/0842	0850		0880/1	0904/5	0918	0930	0942	0954	0973		
16	804	0832		0861							0974	0990	1002
17	605	0833	0851		0882/3	0906/7		0931	0943	0955	0975		
18	605	0834		0862							0976	0991	1003
19	406	0835	0852		0884/5	0908/9	0920	0932	0944	0956	0977		
20	406	0836		0863							0978	0992	1004
21	76	0837	0853		0886/7	0910/11		0933	0945	0957	0979		
22	76	0838		0864							0980	0993	1005
23	5	0839	0854		0888/9	0912/3	0922	0934	0946	0958	0981		
24	5	0840		0865							0982	0994	1006

W numbers for ROV232 (JC094_041_VEM_ROV232_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	d18O	Metals	d30Si
1	NSK40	1007	1008					
2	NSK40			1009	1010/11	1012/13		1014
3	NSK69	1015	1016					
4	NSK70			1017	0784/0785	1020/21		
5	NSK71		0788				1022	1023

W numbers for ROV233 (JC094_042_VEM_ROV233_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	Metals
1	NSK13	1024	1025			
2	NSK14			1026	1027/28	1029
3	NSK80	1030	1031			
4	NSK96	1032	1033			
5	NSK96			1034	1035/6	1037

W numbers for ROV234 (JC094_043_VEM_ROV234_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	d18O	Metals	d30Si
1	NSK1	1038	1043					
2	NSK2	1039		1044				
3	NSK3	1040			1045/6	1047/8		
4	NSK4	1041					1049	
5	NSK5	1042						1050

W numbers for CTD006 (JC094_044_VAY_CTD006_NSK#_W####)

Extra sample from bottle 22 W1246

Niskin #	Depth (m)	Diss O2	CO3	14C	Nuts	d18O	d30Si	Metals	d15N	U series	Salinity	PON	POC
1	4168	1051	1077		1102/3	1126/27	1150	1162	1174	1186	1198		
2	4168	1052		1090							1199	1222	1234
3	3798	1053	1078		1104/5	1128/29	1151	1163	1175	1187	1200		
4	3798	1054		1091							1201	1223	1235
5	2800	1055	1079	1092	1106/7	1130/31	1152	1164	1176	1188	1202		
6	2800												
7	2001												
8	2001	1058	1080	1093	1108/9	1132/33	1153	1165	1177	1189	1205		
9	1503	1059	1081		1110/11	1134/35	1154	1166	1178	1190	1206		
10	1503	1060		1094							1207	1226	1238
11	1200	1061	1082		1112/13	1136/37	1155	1167	1179	1191	1208		
12	1200	1062/1075		1095							1209	1227	1239
13	1004	1063	1083		1114/5	1138/39	1156	1168	1180	1192	1210		
14	1004	1064		1096							1211	1228	1240
15	805	1065	1084		1116/7	1140/41	1157	1169	1181	1193	1212		
16	805	1066		1097							1213	1229	1241
17	505	1067	1085		1118/9	1142/43	1158	1170	1182	1194	1214		
18	505	1068/1076		1098							1215	1230	1242
19	205	1069	1086		1120/21	1144/45	1159	1171	1183	1195	1216		
20	205	1070		1099							1217	1231	1243
21	96	1071	1087		1122/23	1146/47	1160	1172	1184	1196	1218		
22	96	1072		1100							1219	1232	1244
23	10	1073	1088/89		1124/25	1148/49	1161	1173	1185	1197	1220		
24	10	1074		1101							1221	1233	1245

Bottles 6 and 7 didn't fire; Bottle 2 misfired

W numbers for ROV235 (JC094_045_VAY_ROV235_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	d18O	Metals
1	NSK51	1247	1248				
2	NSK52			1249	1250/51	1262/63	1252
3	NSK93	1253	1254				
4	NSK94			1255	1256/57	1264/65	1259

W numbers for MGA013 (JC094_046_VAY_MGA013_XXX#_W####)

Niskin #	Dissolved O2	14C	POC	PON
1	1268	1269	1270	1271

EVENT	Nuts	d30Si	Metals
MCH1	1272/73	1276	1274/75/80
MCN2		1279	1277/78/81

W numbers for ROV236 (JC094_048_VAY_ROV236_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	d18O	Metals	d30Si
1	NSK6	1282	1283					
2	NSK7			1284	1285/86	1287/88	1289	
3	NSK81	1290	1291					
4	NSK82			1292	1293/94	1295/96	1298	1297

W numbers for ROV237 (JC094_049_VAY_ROV237_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	d18O	Metals	d30Si
1	NSK6	1299	1300					
2	NSK7			1301	1302/03	1304/05	1306	1307
3	NSK81	1326	1308					
4	NSK82			1309	1310/11	1312/13	1314	1315

W numbers for MGA014 (JC094_050_VAY_MGA014_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	1316	1317	1318	1319/20	1321/22	1323	1324	1325

W numbers for ROV239 (JC094_056_GRM_ROV239_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	d18O	Metals	d30Si
1	NSK6	1327	1328					
2	NSK7			1329	1330/31	1332/33	1334	1335
3	NSK81	1336	1337					
4	NSK82			1338	1339/40	1340/41	1344	

W numbers for ROV240 (JC094_058_GRM_ROV240_NSK#_W####)

Niskin #	EVENT	Dissolved O2	CO3	14C	Nuts	d18O	Metals	d30Si
1	NSK4	1345	1346					
2	NSK5			1347	1348/49	1350/51	1352	1353
3	NSK26	1354	1355					
4	NSK27			1356	1357/58	1359/60	1361	
5	NSK39	1362	1363					

W numbers for MGA015 (JC094_060_GRM_MGA015_XXX#_W####)

EVENT	Nuts	d30Si	Metals
MCN1	1364/65	1366	1367

W numbers for MGA016 (JC094_061_GRM_MGA016_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	1368	1369	1370	1371/72	1373/74	1375	1376	1377

EVENT	Nuts	d30Si	Metals
MCN1	1378/79	1380	1381
MCH1			1382
MCH3			1383

W numbers for MGA017 (JC094_062_GRM_MGA017_XXX#_W####)

Niskin #	Dissolved O2	CO3	14C	Nuts	d18O	d30Si	Metals	U series
1	1384	1385	1386	1387/88	1389/90	1391	1392	1393

EVENT	Metals
MCN1	1394
MCN2	1395

Appendix 5: Table of underway water samples taken during JC094 (Anth = anthropogenics; Diatom = algal assemblage counts; Carbonate = carbonate chemistry)

CODE	LOCATION	GEAR #	Julian day	Date	Time	Lat	Lon	Depth (m)	Purpose
UW001	TRS_1	uwTAP001	288	15-Oct-13	0:47	25.08353	-21.4081		Anth
UW003	TRS_1	uwTAP002	288	15-Oct-13	14:27	24.33833	-21.4247	4470	Anth
UW004	TRS_1	uwTAP003	288	15-Oct-13	20:31	23.30983	-21.4385	4518	Anth
UW006	EBA	uwTAP004	291	18-Oct-13	19:25	10.87583	-21.6138	5090	Anth
UW008	EBA	uwTAP005	292	19-Oct-13	16:12	9.213148	-21.3127	1083	Anth
UW009	EBA	uwTAP006	293	20-Oct-13	2:34	9.21605	-21.316		Anth
UW010	EBA	uwTAP007	293	20-Oct-13	6:06	9.216003	-21.3154		Diatom
UW011	EBA	uwTAP008	293	20-Oct-13	6:50	9.216033	-21.3159		Diatom
UW012	EBA	uwTAP009	293	20-Oct-03	16:12	9.221557	-21.3154		Diatom
UW013	EBA	uwTAP010	293	20-Oct-13	23:39	9.222828	-21.3057	648	Anth
UW015	EBA	uwTAP011	294	21-Oct-13	17:56	9.223755	-21.3149	642	Anth
UW016	EBA	uwTAP012	294	21-Oct-13	21:14	9.195789	-21.2846	1981	Anth
UW018	EBA	uwTAP13	295	22-Oct-13	21:30	9.278066	-21.6379	4565	Anth
UW020	EBA	uwTAP14	296	23-Oct-13	15:02	9.169011	-21.2708	2755	Anth
UW021	EBA	uwTAP15	296	23-Oct-13	19:04	9.172344	-21.2764	2700	Anth
UW022	EBA	uwTAP16	297	24-Oct-13	19:46	9.222851	-21.3148	645	Anth
UW024	EBA	uwTAP17	299	26-Oct-13	18:21	9.22376	-21.3149	642	Anth
UW025	EBA	uwTAP18	299	26-Oct-13	21:07	9.205471	-21.299	1336	Anth
UW027	TRS_2	uwTAP19	301	28-Oct-13	3:39	7.8	-21.4	3440	Anth
UW028	TRS_2	uwTAP20	301	28-Oct-13	7:38	7.800333	-21.4002		Carbonate
UW030	TRS_2	uwTAP21	301	28-Oct-13	20:18	7.434858	-21.7963	3428	Anth
UW031	TRS_2	uwTAP22	301	28-Oct-13	21:41	7.434833	-21.7963		Carbonate
UW033	EBB	uwTAP23	302	29-Oct-13	16:52	6.363236	-24.4322	4380	Anth
UW035	EBB	uwTAP24	303	30-Oct-13	17:38	5.615691	-26.9667	1987	Anth
UW036	EBB	uwTAP25	304	31-Oct-13	10:05	5.608686	-26.9584		Diatom
UW037	EBB	uwTAP26	304	31-Oct-13	10:15	5.608699	-26.9584		Diatom

UW039	EBA	uwTAP27	304	31-Oct-13	19:41	5.624628	-26.9667		Carbonate
UW040	EBA	uwTAP28	306	2-Nov-13	22:04	5.91187	-26.9968	2804	Anth
UW042	TRS_3	uwTAP29	307	3-Nov-13	2:45	5.705765	-27.2741	4374	Anth
UW043	TRS_3	uwTAP30	307	3-Nov-13	6:33	5.705817	-27.2743		Carbonate
UW043	TRS_3	uwTAP31	307	3-Nov-13	16:20	5.871648	-27.8836	4027	Anth
UW044	TRS_3	uwTAP32	308	4-Nov-13	2:58	6.288833	-29.6843	3677	Anth
UW045	TRS_3	uwTAP33	308	4-Nov-13	17:36	6.750615	-32.2104	3870	Anth
UW047	TRS_3	uwTAP34	308	4-Nov-13	22:31	6.811884	-32.9121	4055	Anth
UW048	TRS_3	uwTAP35	309	5-Nov-13	7:20	6.81185	-32.912		Carbonate
UW049	TRS_3	uwTAP36	309	5-Nov-13	22:20	7.343083	-34.5619	4052	Anth
UW050	TRS_3	uwTAP37	310	6-Nov-13	17:47	8.443707	-37.9775	3766	Anth
UW051	TRS_3	uwTAP38	311	7-Nov-13	4:42	9.128628	-39.9119	2989	Anth
UW053	TRS_3	uwTAP39	311	7-Nov-13	16:44	9.901337	-42.0768	3453	Anth
UW055	VEM	uwTAP40	312	8-Nov-13	13:33	10.74303	-44.5789	1413	Anth
UW056	VEM	MGA010	313	9-Nov-13	17:47	10.55482	-44.5149	4921	Anth
UW058	VEM	MGA011	314	10-Nov-13	13:38	10.8631	-44.4907	5127	Anth
UW059	VEM	MGA012	314	10-Nov-13	17:47	10.86315	-44.4907	5127	Anth
UW061	VEM	uwTAP44	315	11-Nov-13	20:46	10.72823	-44.4252	1158	Anth
UW063	VEM	uwTAP45	316	12-Nov-13	21:10	10.78105	-44.5989	2709	Anth
UW067	TRS_4	uwTAP46	318	14-Nov-13	21:35	10.82	-44.5175	3000	Anth
UW068	TRS_4	uwTAP47	319	15-Nov-13	6:27	11.955	-45.5893	3000	Anth
UW069	TRS_4	uwTAP48	319	15-Nov-13	19:44	13.61249	-47.1555	3594	Anth
UW070	VAY	uwTAP49	320	16-Nov-13	20:28	14.8616	-48.2413	1410	Anth
UW073	VAY	uwTAP50	322	18-Nov-13	4:57	15.17384	-48.0115	4110	Anth

RRS James Cook JC094:
ISIS Dive 222 Plan

Ship: RRS *James Cook* **JC94 station no: 004**

***Isis* Dive: 222** **Date: 19 October 2013** **Site: EBA Carter North**

Location (start point): 9 13.215 N 21 18.988W **Launch Time (GMT):**

Start Dive Depth: 900m **Bottom in sight (GMT):**

***Approximate* duration:** 12hours
Dive lead scientist: LFR

Dive Description
Start close to base of steep slope, to west of ridge axis.
Traverse up and to the east towards top of flat plateau . Look at plateau
If no samples found go across plateau to next upslope

Dive aims:
1 Fossil corals from full depth range (fill baskets, only one site per basket(

2 Live corals

solitary > 10,

framework 20+ polyps,

tree like/fanlike entire fan where appropriate

3 Push cores 2 sets of 3 taken close to beginning and end of dive

4 Niskins near to sediment and live corals, 1*2 near start and 1*3 near end

5. Up to ten (total in basin) of same species of small sized organisms. Photograph, store where convenient

6. Pick up easily collected plastics

Two fist sized rocks

Basket configuration: Standard agreed with 3 coral nets
Location (end point): **Time off bottom (GMT):**
End Dive Depth: **Time on surface (GMT):**
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094: ISIS Dive 223 Plan

Ship: RRS *James Cook* **JC94 station no: 005**

***Isis* Dive: 223** **Date: 19 October 2013** **Site: EBA Carter North**

Location (start point): 9 13.936 N 21 18.834W **Launch Time (GMT):**

Start Dive Depth: 650m **Bottom in sight (GMT):**
***Approximate* duration:** 12hours
Dive lead scientist: PJM
Dive Description
Start just below break in slope where there were abundant fossil corals.
Collect a full bio box / net full at 650m
Lift up from bottom and traverse rapidly across the flat plateau towards next waypoint
Start to ascend
Try to collect a bio box full at about 500m (around lip of next terrace)
Collect live corals etc on the transits. Continue until out of time.
Dive aims:
1 Fossil corals from full range (fill baskets, only one site per basket)

2 Live corals

solitary > 10,

framework 20+ polyps,

tree like/fanlike entire fan where appropriate

3 Push cores 2 sets of 3 taken close to beginning and end of dive

4 Niskins near to sediment and live corals, 1*2 near start and 1*3 near end

5. Up to ten (total in basin) of same species of small sized organisms. Photograph, store where convenient

6. Pick up easily collected plastics

7. Two fist sized rocks near end of dive

Basket configuration: Standard agreed with 3 coral nets
Location (end point): **Time off bottom (GMT):**
End Dive Depth: **Time on surface (GMT):**
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 223 Plan

Ship: RRS *James Cook* **JC94 station no: 005**

***Isis* Dive: 223** **Date: 20 October 2013** **Site: EBA Carter North**

Location (start point): 9 13.37 N 21 18.834W **Launch Time (GMT):**

Start Dive Depth: 650m **Bottom in sight (GMT):**
***Approximate* duration:** 12hours
Dive lead scientist: PJM
Dive Description
Start just below break in slope where there were abundant fossil corals.
Collect a full bio box / net full at 650m
Lift up from bottom and traverse rapidly across the flat plateau towards next waypoint, scanning quickly but not full video transect as we have done part already.
Start to ascend. Try to collect a bio box full at about 500m (around lip of next terrace)
Collect live corals etc on the transits. Continue until out of time.
Dive aims:
1 Fossil corals from full range (fill baskets, only one site per basket)

2 Live corals

solitary > 10,

framework 20+ polyps,

tree like/fanlike entire fan where appropriate

3 Push cores 2 sets of 3 taken close to beginning and end of dive

4 Niskins near to sediment and live corals, 1*2 near start and 1*3 near end

5. Up to ten (total in basin) of same species of small sized organisms. Photograph, store where convenient

6. Pick up easily collected plastics

7. Two fist sized rocks near end of dive

Basket configuration: Standard agreed with 3 coral nets
Location (end point): **Time off bottom (GMT):**
End Dive Depth: **Time on surface (GMT):**
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 224 Plan

s Cook **JC94 station no: 007**

***Isis* Dive: 224** **Date: 21 October 2013** **Site: EBA Carter North**

Location (start point): 9 11.7873 N 21 17.108 W **Launch Time (GMT):**

Start Dive Depth: 2090m **Bottom in sight (GMT):**
***Approximate* duration:** 12hours
Dive lead scientist: PJM/LFR/VH
Dive Description
Start at WP15 below base of small knoll
Move towards knoll
Collect samples as per last dives.
Dive aims:
1 Fossil corals from full range (fill baskets full)

2 Live corals

solitary > 10,

framework 20+ polyps,

tree like/fanlike entire fan where appropriate

3 Push cores 2 sets of 3 taken close to beginning and end of dive

4 Niskins near to sediment and live corals, 1*2 near start and 1*3 near end

5. Try to make bio samples up to ten - go for easy to collect things.

6. Pick up easily collected plastics

7. Two fist sized rocks near end of dive

Basket configuration: Standard agreed with 3 coral nets
Location (end point): **Time off bottom (GMT):**
End Dive Depth: **Time on surface (GMT):**
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094: ISIS Dive 225 Plan

s Cook **JC94 station no: 010**

***Isis* Dive: 225** **Date: 23 October 2013** **Site: EBA Carter North**

Location (start point): 9 10.141 N 21 16.247 W **Launch Time (GMT):**

Start Dive Depth: 2700m **Bottom in sight (GMT):**
***Approximate* duration:** 12hours
Dive lead scientist: PJM/LFR/VH
Dive Description
Start at WP27 below base of small knoll. Move towards knoll

Dive aims:

Priority

1 Fossil corals from full range

Focus on solitary corals

Try to fill nets and bioboxes to maximise chance of finding range of ages

2 Push cores 2 sets of 3 taken close to beginning and end of dive

3 Niskins near to sediment and live corals, 1*2 near start and 1*3 near end

4 Live solitary and calcified corals at bottom to get coldest temperature water

Secondary

1. Two fist sized rocks near end of dive – try to get rocks with sponges on them!

2. Try to make bio samples up to ten - only go for easy to collect items.

3. Pick up easily collected plastics

Basket configuration: Standard agreed with 3 coral nets
Location (end point): **Time off bottom (GMT):**
End Dive Depth: **Time on surface (GMT):**
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094: ISIS Dive 228 Plan

s Cook **JC94 station no: 021**

***Isis* Dive: 228** **Date: 30 October 2013** **Site: EBA Carter North**

Location (start point): 5° 58.025N 26°58.025W **Launch Time (GMT):**

Start Dive Depth: 2000m **Bottom in sight (GMT):**
***Approximate* duration:** 18hours
Dive lead scientist: LFR
Dive Description
This dive will consist of a depth transect up Knipovich seamount starting at about 2000m below a small knoll and traversing up to about 1500m

Dive aims:
1 Collect large nets of fossil solitary corals where possible.

2. Collect live solitary corals (>15 at one spot if possible) and colonial scleractinian corals

3. 1* large bamboo and 1* large corallium

4. Collect sponges –especially the vase shaped and yellow ones

5 Push cores 2 sets of 3 taken at roughly start and end

6 2* Niskins near to sediment and live corals

7. Biology: if abundant collect 5 squat lobsters, 5 * holothurians (see picture) and 2* primnoids

8. Pick up easily collected plastics

9. Two small rocks near end of dive – try to get rocks with sponges on them.

Basket configuration: 4* nets, 7 times yellow tubes, no lid on bio box.
Location (end point): **Time off bottom (GMT):**
End Dive Depth: **Time on surface (GMT):**
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 229 Plan

s Cook **JC94 station no: 022**

***Isis* Dive: 229** **Date: 31 October 2013** **Site: EBB Knipovich**

Location (start point): 5°37.479N 26°58.006 **Launch Time (GMT):**

Start Dive Depth: 1300m **Bottom in sight (GMT):**
***Approximate* duration:** 18hours
Dive lead scientist: LFR
Dive Description This dive will consist of a depth transect up Knipovich seamount starting close to end of last dive and reaching top. The Dive is focused on collecting samples from AAIW (900m to the top) so we should aim to spend more time towards the upper parts of the dive.

Dive aims:
1 Collect large nets / amounts of fossil solitary corals where possible.

2. Live collections across temperature range of the dive (e.g. at each degree shift)

Solitary scler. (~2 per temp)	Colonial scler (small ok)	Stylasterid (small ok)

3. Large live samples in core of AAIW (try for within 800-600m)

colonial scleractinian	stylasterid	Bamboo	Corallium

4. Live solitary corals for reproduction - >10 at one spot, but one time only ok

5. Collect sponges –especially the vase shaped and yellow ones

5 Push cores 2 sets of 3 taken at roughly start and end

6 2* Niskins near to sediment and live corals

7. Biology: if abundant collect 5 squat lobsters, 5 * holothurians (see picture) and 1*

primnoids or other organism where it is easy to collect 10.

8. Pick up easily collected plastics

9. Two small rocks near end of dive – try to get rocks with sponges on them.

Basket configuration: 4* nets, 17 times yellow tubes, no lid on bio box.
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 229 Plan

s Cook **JC94 station no: 022**

***Isis* Dive: 229** **Date: 31 October 2013** **Site: EBB Knipovich**

Location (start point): 5°37.479N 26°58.006 **Launch Time (GMT):**

Start Dive Depth: 1300m **Bottom in sight (GMT):**
***Approximate* duration:** 18hours
Dive lead scientist: LFR
Dive Description This dive will consist of a depth transect up Knipovich seamount starting close to end of last dive and reaching top. The Dive is focused on collecting samples from AAIW (900m to the top) so we should aim to spend more time towards the upper parts of the dive.

Dive aims:
1 Collect large nets / amounts of fossil solitary corals where possible.

2. Live collections across temperature range of the dive (e.g. at each degree shift)

Solitary scler. (~2 per temp)	Colonial scler (small ok)	Stylasterid (small ok)

3. Large live samples in core of AAIW (try for within 800-600m)

colonial scleractinian	stylasterid	Bamboo	Corallium

4. Live solitary corals for reproduction - >10 at one spot, but one time only ok

5. Collect sponges –especially the vase shaped and yellow ones

5 Push cores 2 sets of 3 taken at roughly start and end

6 2* Niskins near to sediment and live corals

7. Biology: if abundant collect 5 squat lobsters, 5 * holothurians (see picture) and 1* primnoids or other organism where it is easy to collect 10.

8. Pick up easily collected plastics

9. Two small rocks near end of dive – try to get rocks with sponges on them.

Basket configuration: 3* nets, 17 times yellow tubes, no lid on bio box.
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 230 Plan

s Cook **JC94 station no:**

***Isis* Dive: 230** **Date: 01 November 2013** **Site: EBB Knipovich**

Location (start point): 5° 35.724 26°59.7420 **Launch Time (GMT):**

Start Dive Depth: 2700m **Bottom in sight (GMT):**
***Approximate* duration:** 18hours
Dive lead scientist: LFR
Dive Description This dive will consist of a depth transect up Knipovich seamount at around 2800m and traversing up towards the start of the first Knipovich dive site (2000m)
The primary target is deep fossil corals.

Dive aims:

1 Collect fossil corals deep – at greatest depths (2800-2500) target any type, scleractinians, bamboos etc. Shallower than 2500m focus on the solitaries as in prior dives.

2. Live collections

    Solitary scleractinians (only large ones this time)

    Stylasterids (if possible!)

    1 Large enallapsamia

    1 * deep large bamboo

    1* primnoid

5. Different types of sponges –especially yellow ones

5 Push cores 2 sets of 3 taken at roughly start and end

6 2* Niskins near to sediment and live corals

7. Biology: if abundant collect 5 squat lobsters, 5 * holothurians (see picture) and set of ten other organisms where easy to collect 10.

8. Pick up easily collected plastics

9. Two small rocks– try to get rocks with sponges on them.

Basket configuration: 3* nets, 17 times yellow tubes, no lid on bio box.
Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 231 Plan

s Cook **JC94 station no: 033**

***Isis* Dive: 231** **Date: 08 November 2013** **Site: VEMA**

Location (start point): 10° 44.5794 44° 34.77 **Launch Time (GMT):**

Start Dive Depth: 1400m **Bottom in sight (GMT):**

***Approximate* duration:** 18hours? Longer or shorter depending on sampling

Dive lead scientist: LFR

Dive Description. This dive begins at about 1400m and will traverse up the ridge axis to about 1000m. We have seen great diversity of corals in this depth range before, so we hope that it will be equally as interesting here. There is a possibility that the shallow slope rather than the steep edges will yield few samples. If that is the case we may adjust the dive plan part way through or bring up the ROV and dive again before midnight. AAIW starts at about 1000m with a core at around 800m. We certainly hope to sample in that depth range, and whether we reach those waters in this dive depends on our progress. We will have another dive that gets up to 600m whilst at VEMA, so if we find lots of samples deeper we can collect those and leave shallow for another day. Focus all efforts on large fossil solitary corals.

Dive aims:

PRIORITY: Collect fossil corals. Preferred are solitary, but other fossils are ok too, especially if they are of a reasonable size (ie not centimetre scale coral rubble)

2. Live coral collections for proxy work

    Large solitary scleractinians try to get different species if possible

    Stylasterids if they are to be found

    Large enallapsamia, large bamboo, large corallium towards start and end

3. Small solitary scleractinians set of 15 for reproduction / genetics

5. Different types of sponges –especially yellow ones

5 Push cores 2 sets of 3 taken at roughly start and end

6 2* Niskins near to sediment and live corals

7. Genetics biology: Collect 10 of organisms on the genetics list. + 1* primnoid.

8. Pick up easily collected plastics

9. Two small rocks– try to get rocks with sponges on them.

Basket configuration: 3* nets, 17 times yellow tubes, no lid on bio box.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094: ISIS Dive 232 Plan

s Cook **JC94 station no: 041**

***Isis* Dive: 232** **Date: 11 November 2013** **Site: VEMA**

Location (start point): 10° 43.699 44° 25.484 **Launch Time (GMT):**

Start Dive Depth: 1400m **Bottom in sight (GMT):**

***Approximate* duration:**

Dive lead scientist: LFR

Dive Description.:

Dive aims: This dive aims to sample fossil corals within AAIW (< 1000m, see attached CTD plot) It also aims to look at the fauna/seafloor at the same depth as the last dive but on steeper terrain to help us chose our next dive site wisely.

PRIORITY: Collect fossil corals. Preferred are solitary, but other fossils are ok too, especially if they are of a reasonable size (ie not centimetre scale coral rubble)

2. Live coral collections for proxy work

LARGE solitary scleractinians try to get different species if possible, and at about 1°C spacing (only needed from 1000m up since we got lots on last dive, 1000m – 600m should be about 5C to about 8C)

Stylasterids if they are to be found

IN AAIW: Large enallapsamia, large bamboo, large corallium

5. Different types of sponges focus on AAIW - vase one would be nice

5 Push cores 2 sets of 3 taken at roughly start and end

6 2* Niskins near to sediment and live corals

7. Genetics biology: Collect 10 of organisms on the genetics list. + 1* primnoid.

8. Pick up easily collected plastics

9. Two small rocks– try to get rocks with sponges on them.

Basket configuration: 3* nets, 17 times yellow tubes, no lid on bio box.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 233 Plan

s Cook **JC94 station no: 042**

***Isis* Dive: 233** **Date: 12 November 2013** **Site: VEMA**

Location (start point): 10°46.8756 N 44°35.9064W **Launch Time (GMT):**

Start Dive Depth: 3000m **Bottom in sight (GMT):**

***Approximate* duration:** 18 hours

Dive lead scientist: LFR

Dive aims: The dive will follow a ridge on the north side of vema moving approximately due south to a local maxima at about 1600m. We will focus on collecting the deepest fossil corals (>2500m), so we should go slowly at the beginning looking carefully for fossil coral material. Collect any types of fossils at the start since we are unlikely to find much. We not get distracted by looking at other organisms (!) since we have a lot of ground to cover, and may well come back here for a video and MB survey if we like the site.

PRIORITY: Collect fossil corals. Preferred are solitary, but other fossils are ok too, especially if they are of a reasonable size and deep (ie not centimetre scale coral rubble)

2. Live coral collections for proxy work

    LARGE solitary scleractinians try to get different species if possible

    Stylasterids if they are to be found – large ones would be great

    Deep only: Large enallapsamia, large bamboo, large corallium

9. Two small rocks early on so we don't forget! try to get rocks with sponges on them.

5. Different types of sponges

5 Push cores 2 sets of 3 taken at roughly start and end

6 2* Niskins near to sediment and live corals

7. Genetics biology: Collect 10 of organisms on the genetics list.

8. Pick up easily collected plastics

Basket configuration: 3* nets, 17 times yellow tubes, no lid on bio box.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 234 Plan

Ship: RRS *James Cook* **JC94 station no: 043**

***Isis* Dive: 234** **Date: 13 November 2013** **Site: VEMA**

Location (start point): 10°43.69 N 44°25.48W **Launch Time (GMT):**
Start Dive Depth: ~1300m **Bottom in sight (GMT):**
***Approximate* duration:** 18 hours
Dive lead scientist: VH

Dive aims: This dive will revist the site of Dive 232 making swath map of the steep slopes wher corals were observed. At first an overview map will be made, then a higher reolsution map followed by sets of video mosaics.

PLEASE FIRE ALL FIVE NISKIN BOTTLES TOGETHER AT START OF TRANSECT.

PRIORITY:

MB bathymetry

Video mosaic

Niskin bottles

Basket configuration: Reson multibeam in vertical position. Niskin bottles.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 235 Plan

s Cook **JC94 station no: 045**

***Isis* Dive: 235** **Date: 16 November 2013** **Site: VAY**

Location (start point): 14°51.663 N 48°14.3508W **Launch Time (GMT):**

Start Dive Depth: 1400m **Bottom in sight (GMT):**

***Approximate* duration:** 18 hours

Dive lead scientist: LFR

Dive aims: This is the first dive on Vayda Seamount and we hope to get an idea of what we are likely to find here. The seamount is covered in rough topography including knolls and ridges, and may also have plateaus more similar to Carter than to Vema. The first dive will start near the top of a distinct EW trending ridge and traverse approximately due east towards a series of local bathymetric highs. Once we are at about 1100m we will decide whether to go up the cone shaped 900m feature to the NE, or continue to traverse to an 800m ridge to the East. Since we did not collect many fossil solitary corals on Vema, they will be the focus of the collections on Vayda Seamount.

PRIORITY: Collect fossil corals. Preferred are solitary, but other fossils are ok too, especially if they are of a reasonable size (ie not centimetre scale coral rubble)

Secondary aims

1. Live coral collections for proxy work.

    LARGE solitary scleractinians try to get different species if possible

    Stylasterids if they are to be found – one large one best

    ONE EACH OF Large enallapsamia, large bamboo, large corallium

2 Push cores 2 sets of 3 taken at roughly start and end

3 2* Niskins near to sediment and live corals

5. Different types of sponges

2. Two small rocks early on so we don't forget! Try to get rocks with sponges on them.

7. Genetics biology: Collect 10 of organisms on the genetics list.

8. Pick up easily collected plastics

Basket configuration: 3* nets, 17 times yellow tubes, no lid on bio box.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 236 Plan

s Cook **JC94 station no: 046**

***Isis* Dive: 236** **Date: 17 November 2013** **Site: VAY**

Location (start point): 14°53.4798 N 48°9.0018W **Launch Time (GMT):**

Start Dive Depth: 850m **Bottom in sight (GMT):**

***Approximate* duration:** 18 hours

Dive lead scientist: LFR

Dive aims: This dive will aim go from 850m up to the top of Vayda Seamount from the north west. The start will be in the south west direction, then we will turn and head south east up a couple of step like features and plateaus. The top should be flat at 400m.
The start of the dive will be in the core of AAIW, at about 6C, and by the end we should be at the upper extent of AAIW in ~10C water giving a 4C range (see CTD plot)

PRIORITY: Collect fossil corals. Preferred are solitary, but other scleractinian fossils are ok too, especially if they are of a reasonable size (ie not centimetre scale coral rubble) – Enallapsammia seems to be a good bet as it has a thick skeleton

Secondary aims

1. Live coral collections for proxy work – try to space at around 1C if possible

    850m = 5.5C, 560m = 7.5C, 480m = 9C, 400m= 10C

    Solitary corals of reasonable size (not the tiny ones)

    Stylasterids (small ok), Ennallapsammia (small ok)

2. One each of Large Enallapsammia, Large bamboo, Large stylasterid, Large Corrallium

3 Push cores 2 sets of 3 taken at roughly start and end

4 2* Niskins near to sediment and live corals

5. Different types of sponges

6. Two small rocks early on so we don't forget! Try to get rocks with sponges on them.

7. Genetics biology: Collect 10 of organisms on the genetics list where it is easy.

8. Pick up easily collected plastics

Basket configuration: 4* nets, 17 times yellow tubes, no lid on bio box. No scoop.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 237 Plan

s Cook **JC94 station no: 049**
***Isis* Dive: 237** **Date: 20 November 2013** **Site: VAY**
Location (start point): 14°50.9952 N 48°15.988W **Launch Time (GMT):**
Start Dive Depth: 2200m **Bottom in sight (GMT):**
***Approximate* duration:** 18 hours
Dive lead scientist: LFR
Dive aims: The dive will traverse up the south side of the seamount in a northward direction ending up on a ridge to the east of the start of Dive235.

PRIORITY: Collect fossil corals. Preferred are solitary, but other scleractinian fossils are ok too, especially if they are of a reasonable size (ie not centimetre scale coral rubble) – Enallapsammia seems to be a good bet as it has a thick skeleton. Deeper samples preferred.

Secondary aims

1. Live coral collections for proxy work
    - Solitary corals of reasonable size (not the tiny ones)
    - Stylasterids (small ok), Ennallapsammia (small ok)

2. One each of Large Enallapsammia, Large bamboo, Large stylasterid – deeper better

3 Push cores 2 sets of 3 taken at roughly start and middle

4 2* Niskins near to sediment and live corals

5. Different types of sponges

6. Two small rocks early on so we don't forget! Try to get rocks with sponges on them.

7. Genetics biology: Collect 10 of organisms on the genetics list where it is easy.

8. Pick up easily collected plastics –NO LINES OR WIRES, DO NOT STOP. DO NOT COLLECT

Basket configuration: 4* nets, 17 times yellow tubes, no lid on bio box. No scoop.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094: ISIS Dive 238 Plan

s Cook

JC94 station no: 055

***Isis* Dive: 238** **Date: 22 November 2013**

Site: VAY

Location (start point): 14°53.4318 N 48°9.065W

Launch Time (GMT):

Start Dive Depth: 800m

Bottom in sight (GMT):

***Approximate* duration:** 18 hours

Dive lead scientist: VH

Dive aims: This is a swath bathymetry dive with the Reson MB system facing downwards. The track will be a series of N-S swath tracks to cover the area seen in the earlier parts of Dive 236.

Basket configuration: Reson MB system, downward facing.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094:
ISIS Dive 239 Plan

s Cook

JC94 station no: 056

***Isis* Dive: 239** **Date: 24 November 2013**

Site: GAM

Location (start point): 14°50.9952 N 48°15.988W

Launch Time (GMT):

Start Dive Depth: 2200m

Bottom in sight (GMT):

***Approximate* duration:** 18 hours

Dive lead scientist: LFR

Dive aims: The dive will

PRIORITY: Collect fossil corals. Preferred are solitary, but other scleractinian fossils are ok too, especially if they are of a reasonable size (ie not centimetre scale coral rubble) – Enallapsammia seems to be a good bet as it has a thick skeleton. Deeper samples preferred.

Secondary aims

1. Live coral collections for proxy work
    - Solitary corals of reasonable size (not the tiny ones)
    - Stylasterids (small ok), Ennallapsammia (small ok)

2. One each of Large Enallapsammia, Large bamboo, Large stylasterid – deeper better

3 Push cores 2 sets of 3 taken at roughly start and middle

4 2* Niskins near to sediment and live corals

5. Different types of sponges

6. Two small rocks early on so we don't forget! Try to get rocks with sponges on them.

7. Genetics biology: Collect 10 of organisms on the genetics list where it is easy.

8. Pick up easily collected plastics

Basket configuration: 4* nets, 17 times yellow tubes, no lid on bio box. No scoop.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.

RRS James Cook JC094: ISIS Dive 240 Plan

s Cook **JC94 station no: 058**

***Isis* Dive: 240** **Date: 25 November 2013** **Site: GRM**

Location (start point): 15°26.8830 N 51°5.492W **Launch Time (GMT):**

Start Dive Depth: 2100m **Bottom in sight (GMT):**

***Approximate* duration:** 18 hours

Dive lead scientist: LFR

Dive aims: The last dive of the cruise will start at 220m on the north side of Gramberg Seamount and will end up at the start of dive 239. Overall we will be travelling southwards, although changing from south west to south east. At first we will look for fossil corals from 2200m up to about 1600m on the first knoll. We should not spend more than half of the dive here. If we have not been able to collect two sets of push cores, then we will pull up and head to WP209 and look for anew push core site on the plain. If we have six push cores already we will head straight for WP210 and start to traverse up the same knoll as dive 239 filling up all nets and scoops.

PRIORITY: We should prioritise collect fossil corals above everything else. Preferred are solitary, but other scleractinian fossils are ok too, especially if they are of a reasonable size. Fossil Enallapsammia seems to be a good bet as it has a thick skeleton.

2. Push cores 2 sets of 3 both on first knoll if possible

3. 2* Niskins near to sediment and live corals

Secondary aims

1. Live coral collections for proxy work
    - Solitary corals on first knoll, including Javania (deepest we have is 1500m)
    - Long bamboo if it has ring anemones.
    - Colonial Scleractinia – any below 1800m and any that are not Enallapsammia e.g. Madrepora/Lophelia above 1800m

2. Unusual and easily collected sponges

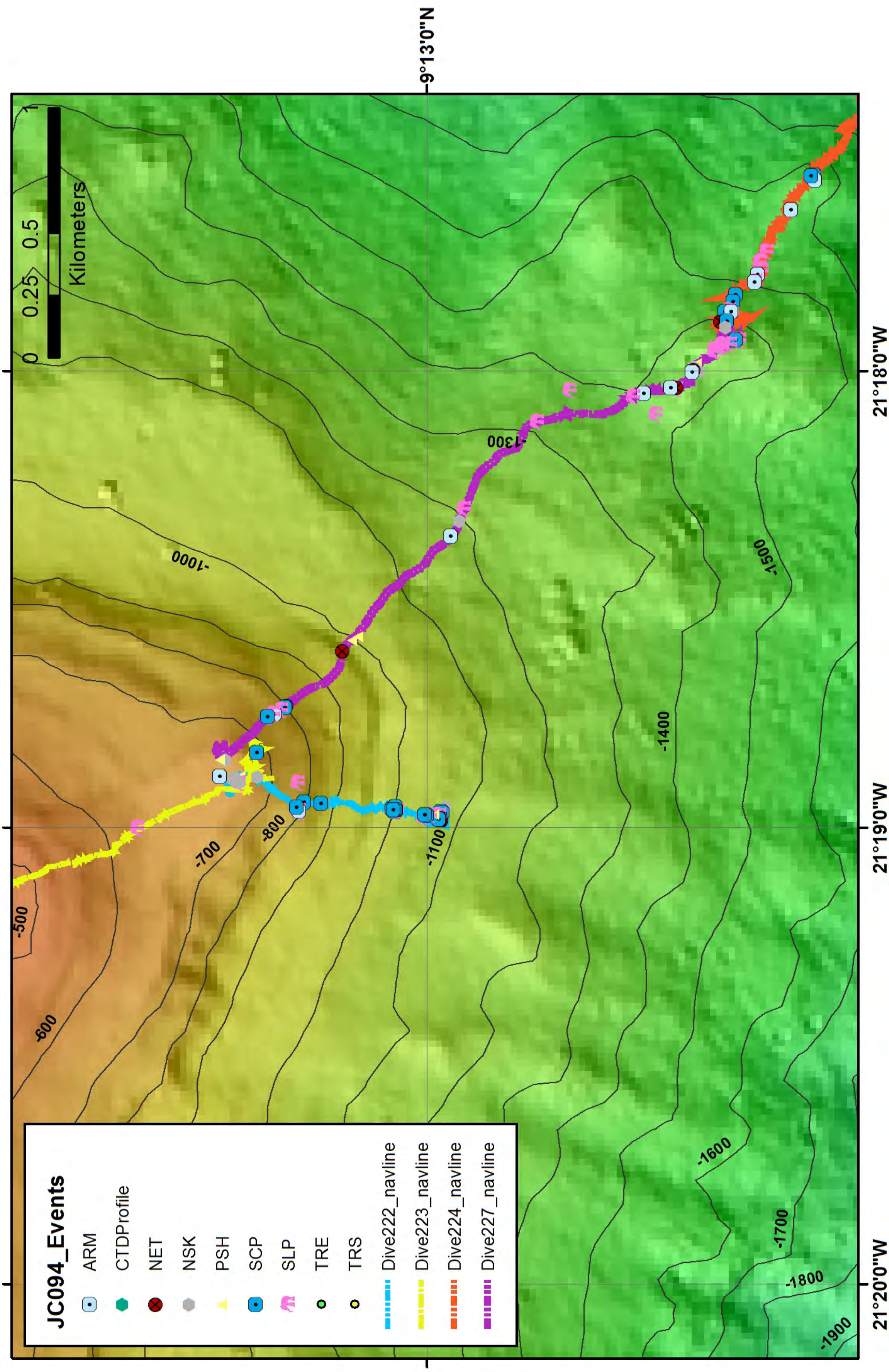
3. Two small rocks early on so we don't forget! Try to get rocks with sponges on them.

4. Genetics biology: Collect 10 of organisms on the genetics list where it is easy.

5. Pick up easily collected plastics

Basket configuration: 4* nets, 17 times yellow tubes, no lid on bio box. Scoop.

Total number of: ISIStoolMAP___; Dive Sample Sheets___; Dive Video Sheets___.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Dive227_navline
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0.25
0.5
1
Kilometers
9°13'0"N
21°18'0"W
21°19'0"W
21°20'0"W
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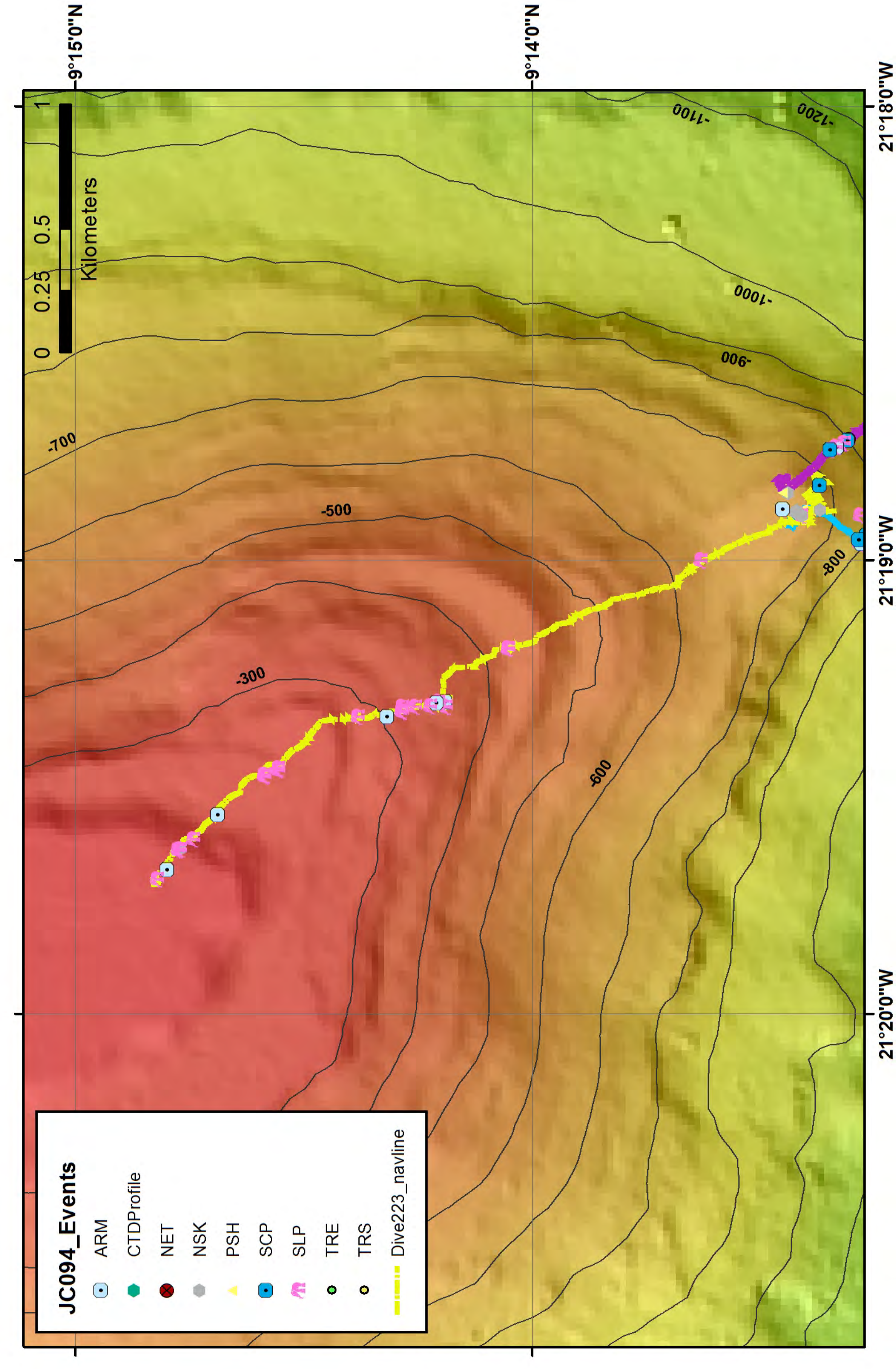

9°15'0"N
9°14'0"N
21°18'0"W
21°19'0"W
21°20'0"W
0 0.25 0.5 1
Kilometers
-300
-500
-600
-700
-800
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SLP
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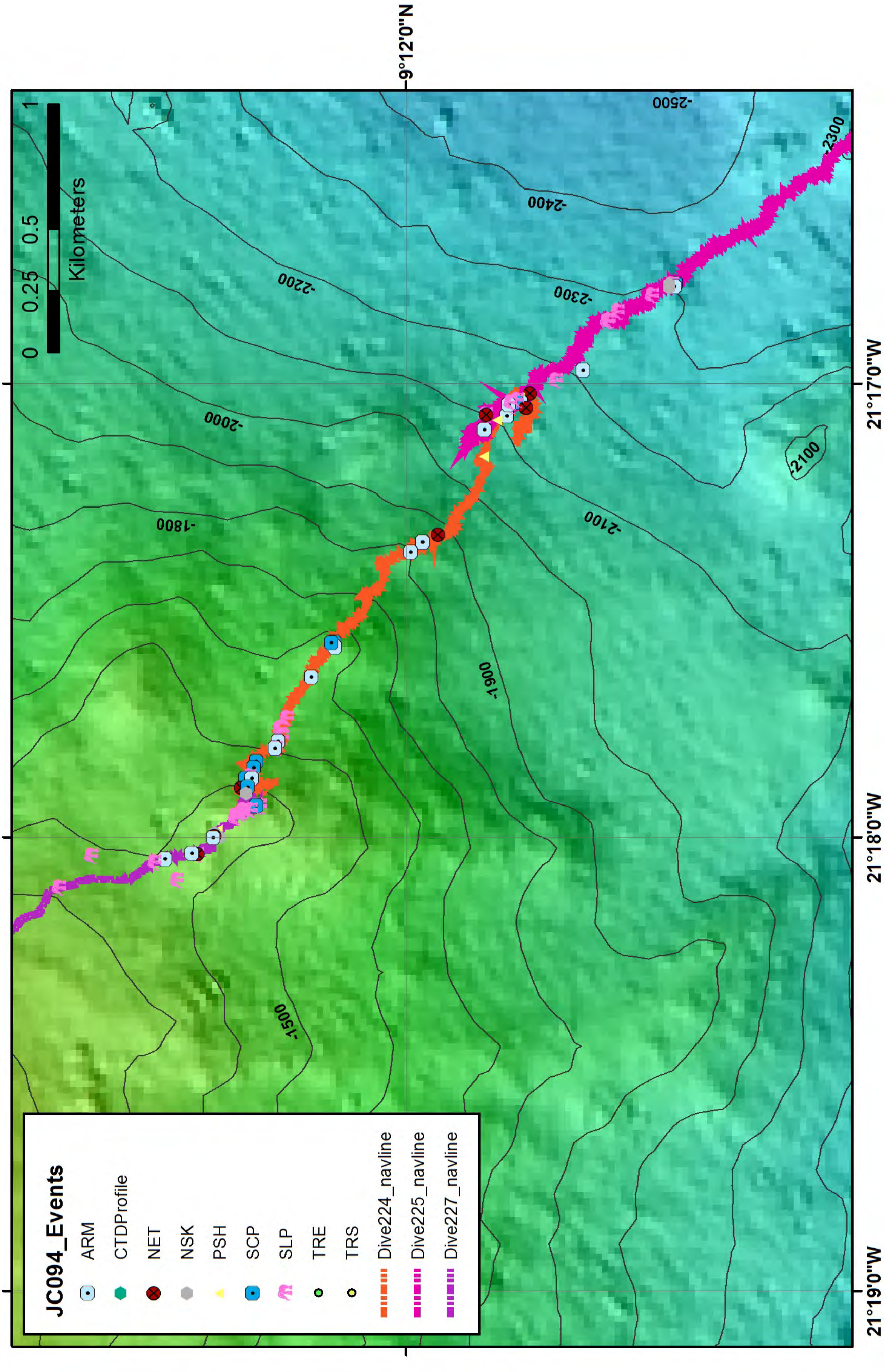
TRS
Dive223_navline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Dive225_navline
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0
0.25
0.5
1
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21°17'0"W
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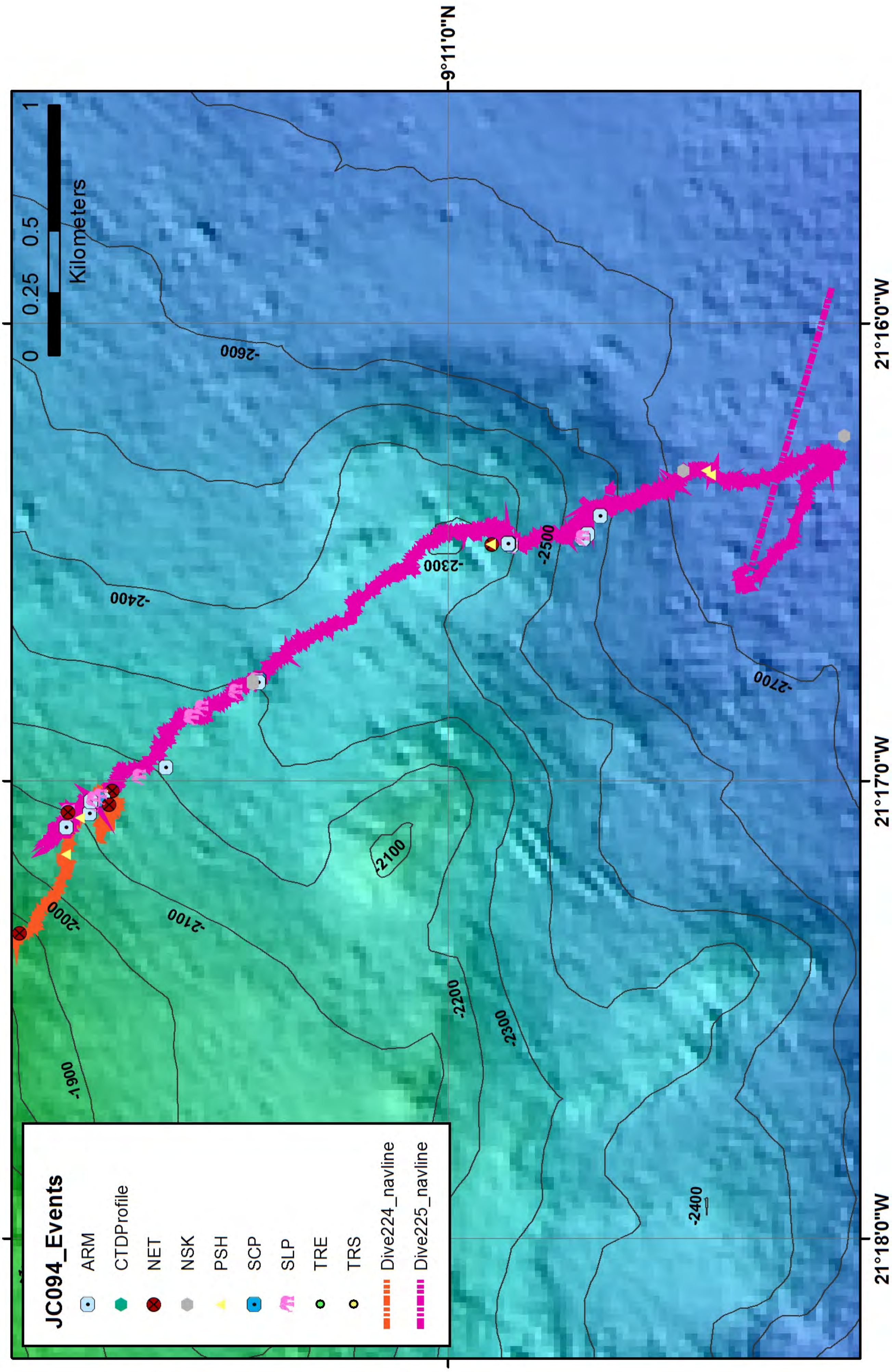
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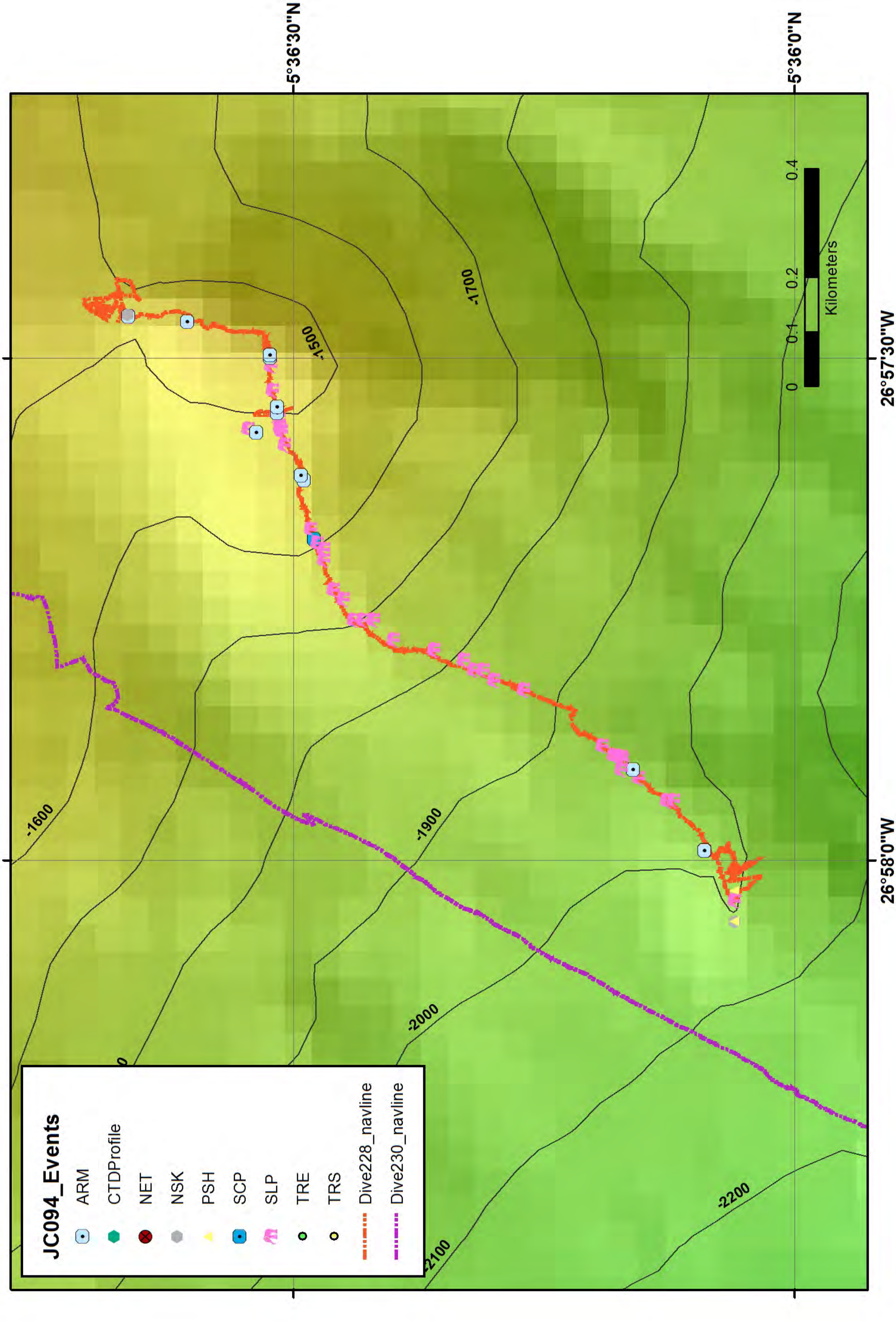
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26°57'30"W
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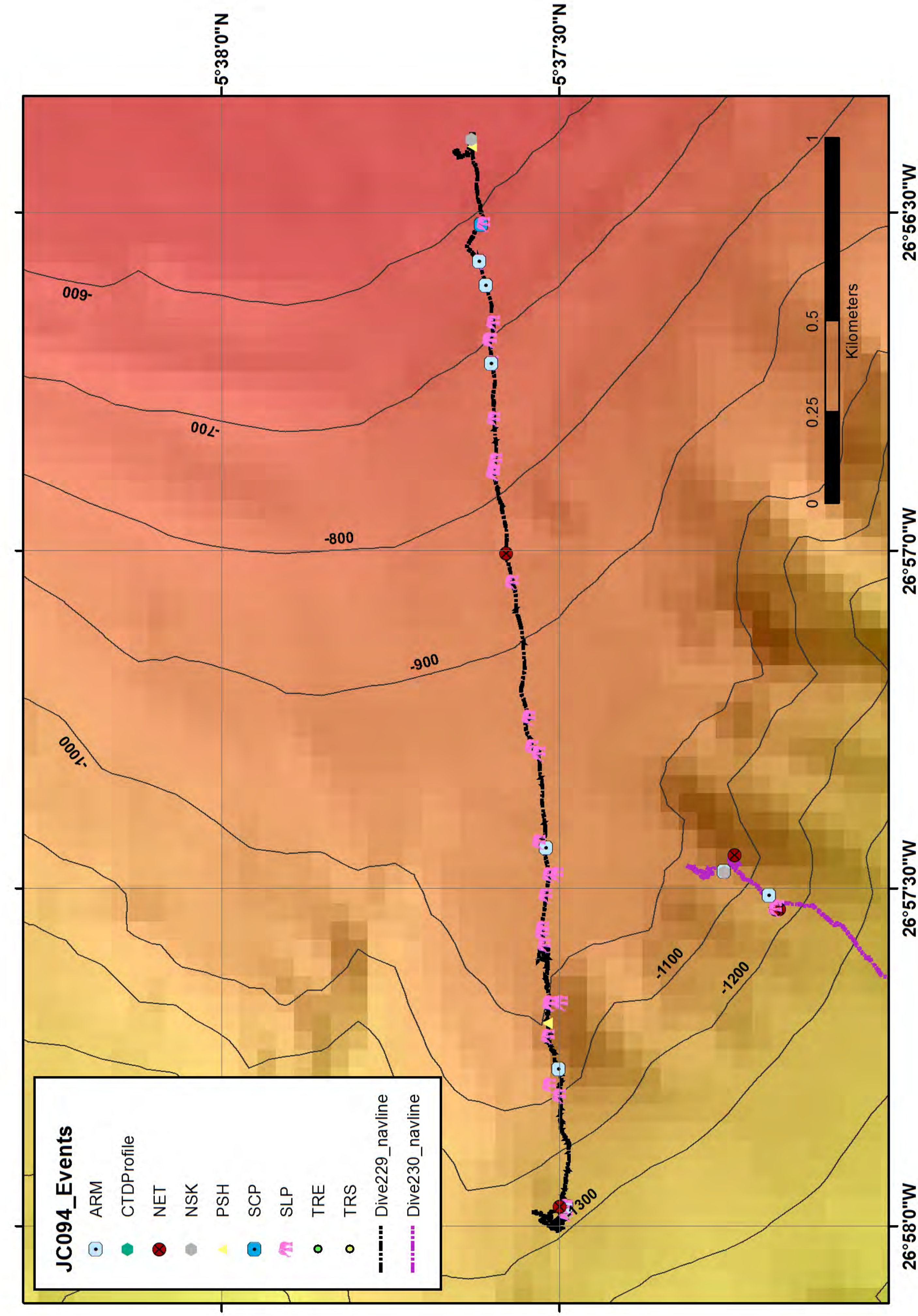
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5°37'30"N
26°56'30"W
26°57'0"W
26°57'30"W
26°58'0"W
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0.5
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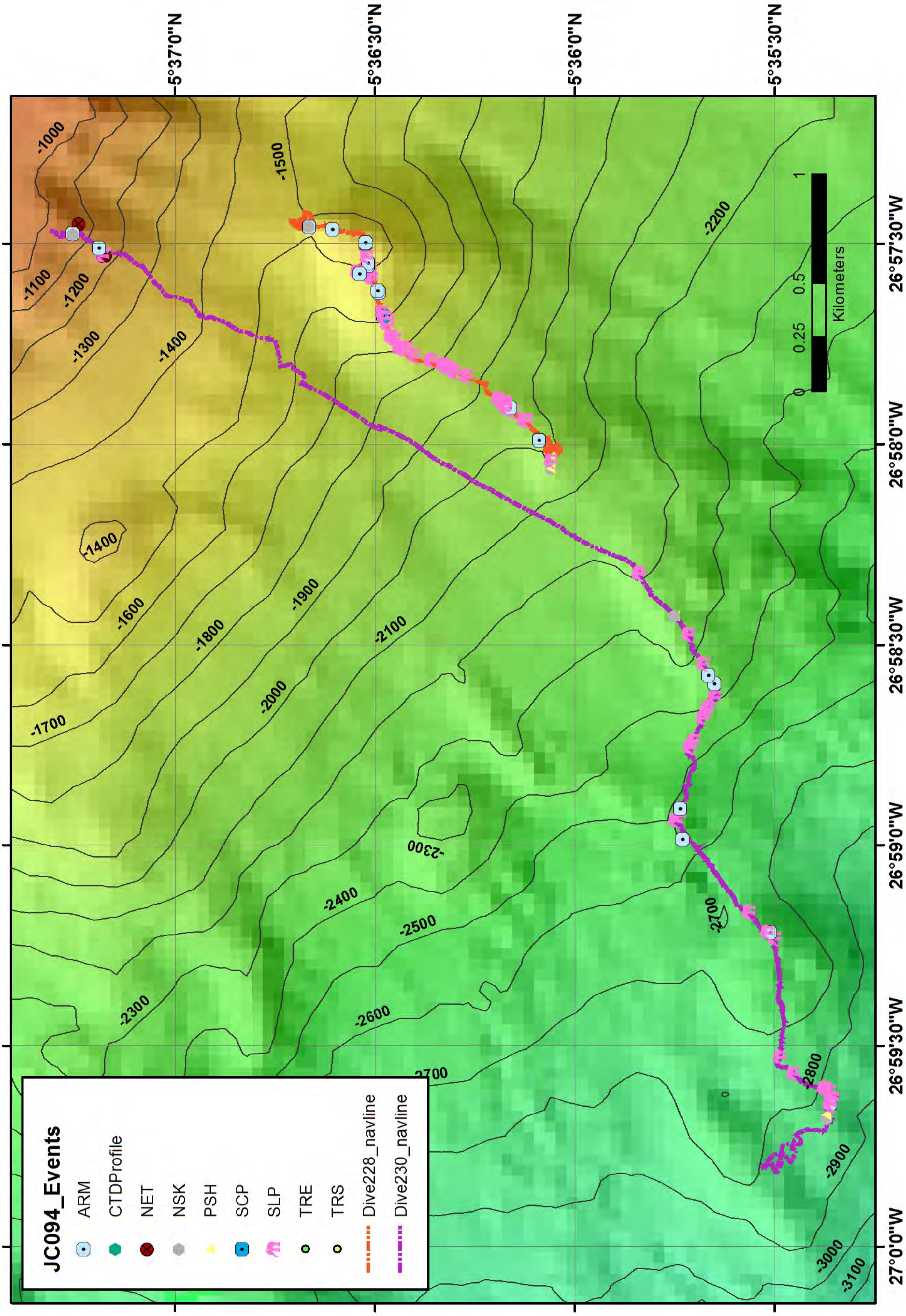
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Dive230_navline
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26°57'30"W
26°58'0"W
26°58'30"W
26°59'0"W
26°59'30"W
27°0'0"W
0 0.25 0.5 1
Kilometers
-1000
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-1300
-1400
-1500
-1600
-1700
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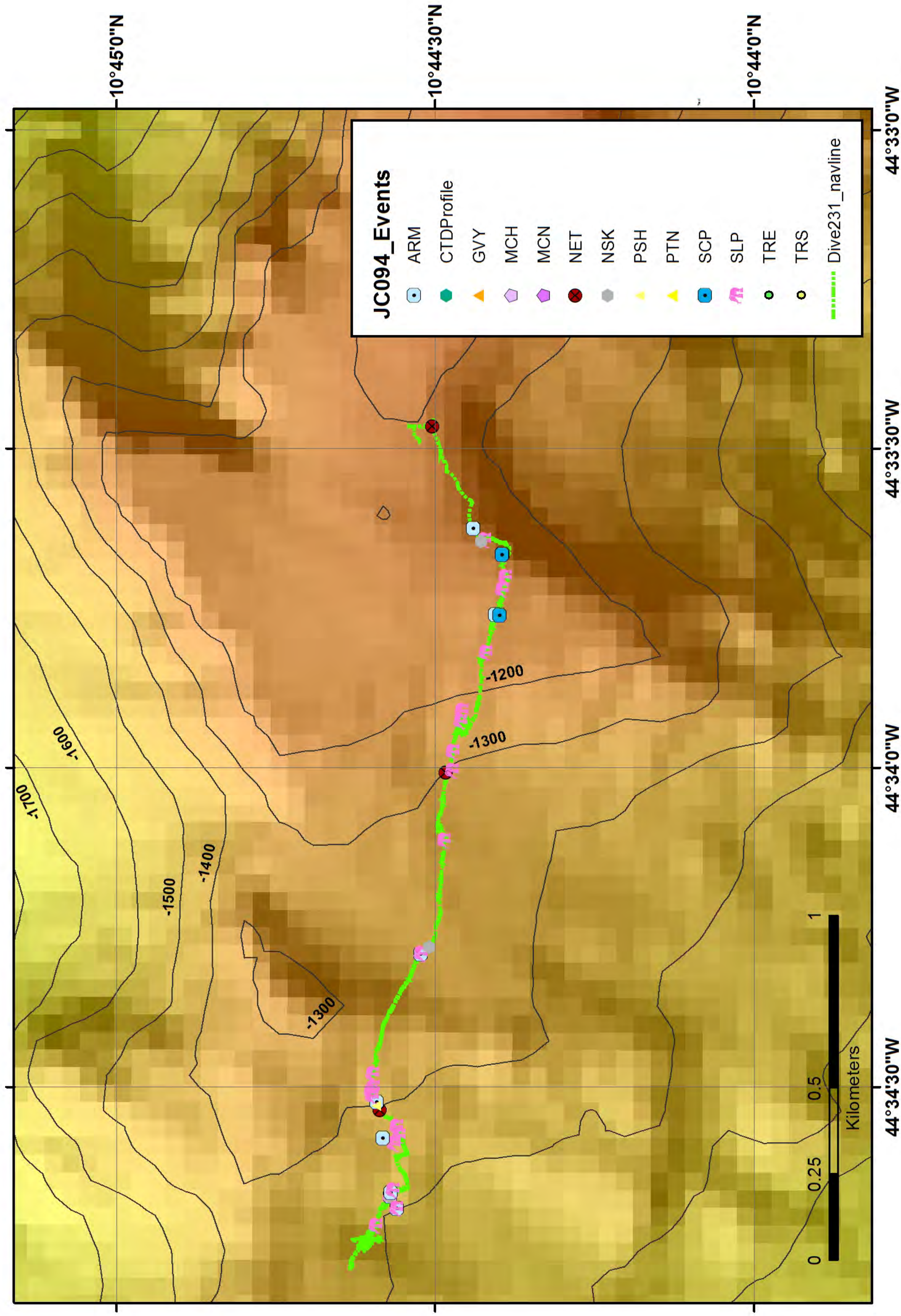
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10°44'30"N
10°44'0"N
44°33'0"W
44°33'30"W
44°34'0"W
44°34'30"W
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-1700
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0.5
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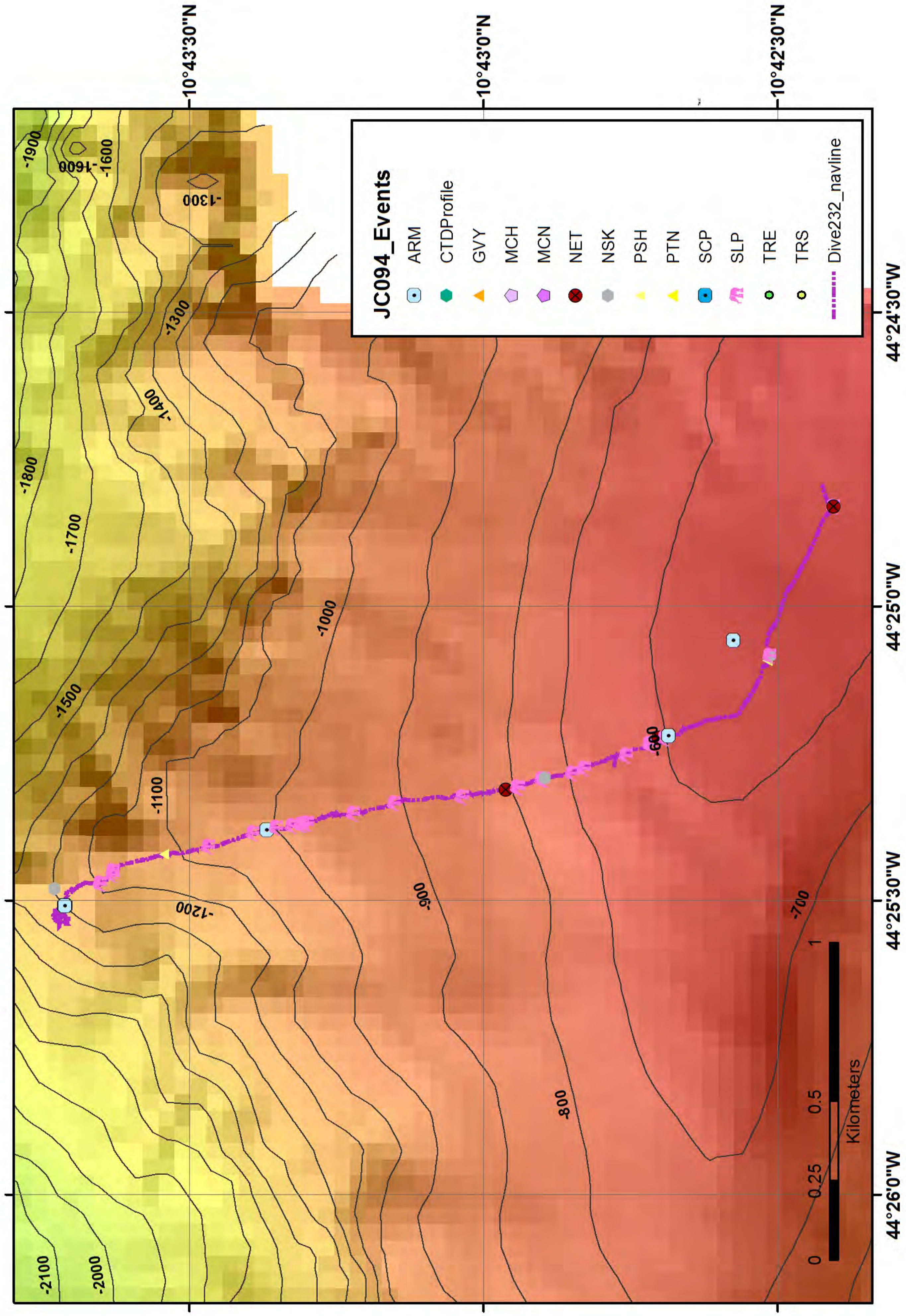
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10°42'30"N
44°24'30"W
44°25'0"W
44°25'30"W
44°26'0"W
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0.25
0.5
1
Kilometers
-2100
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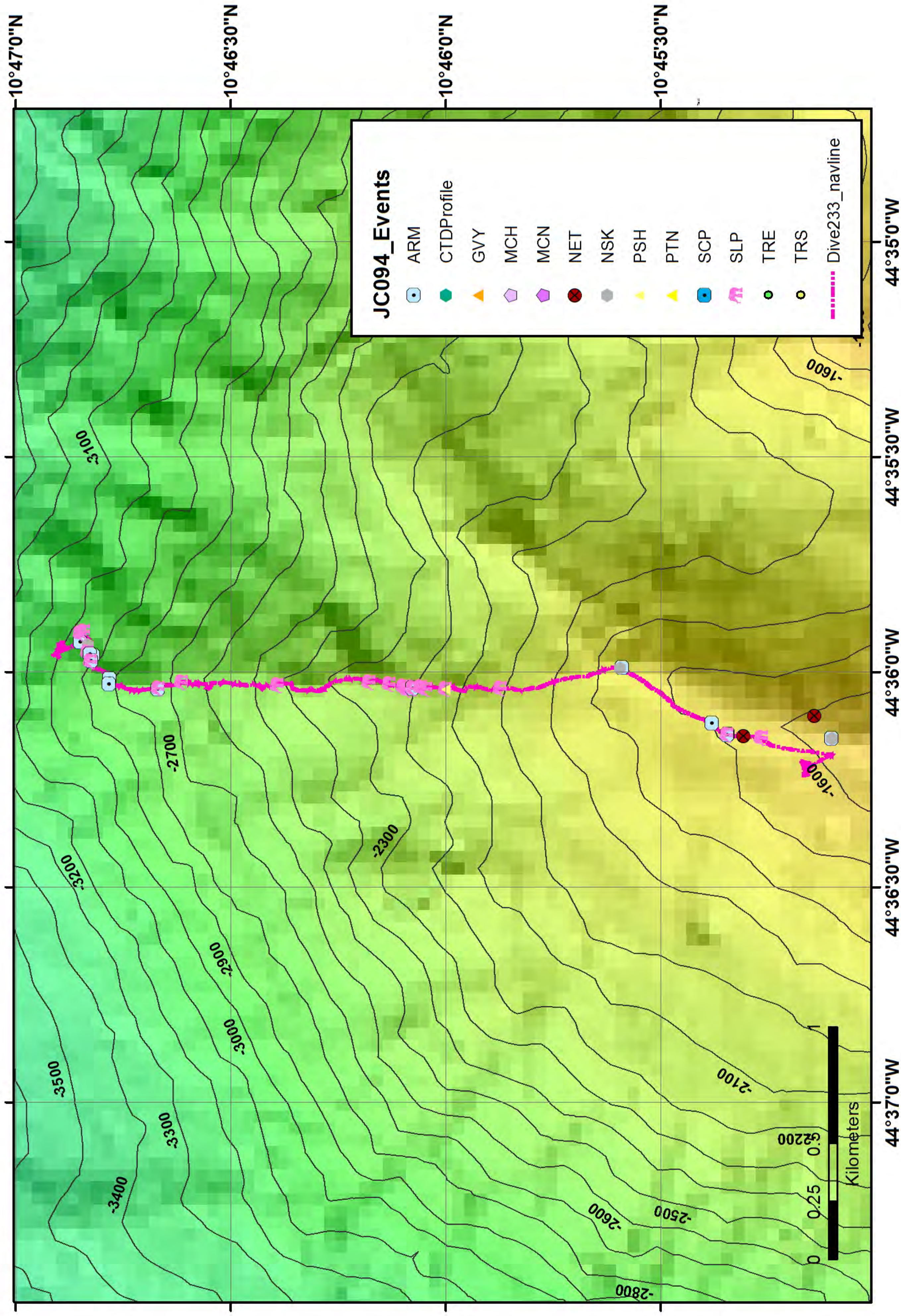
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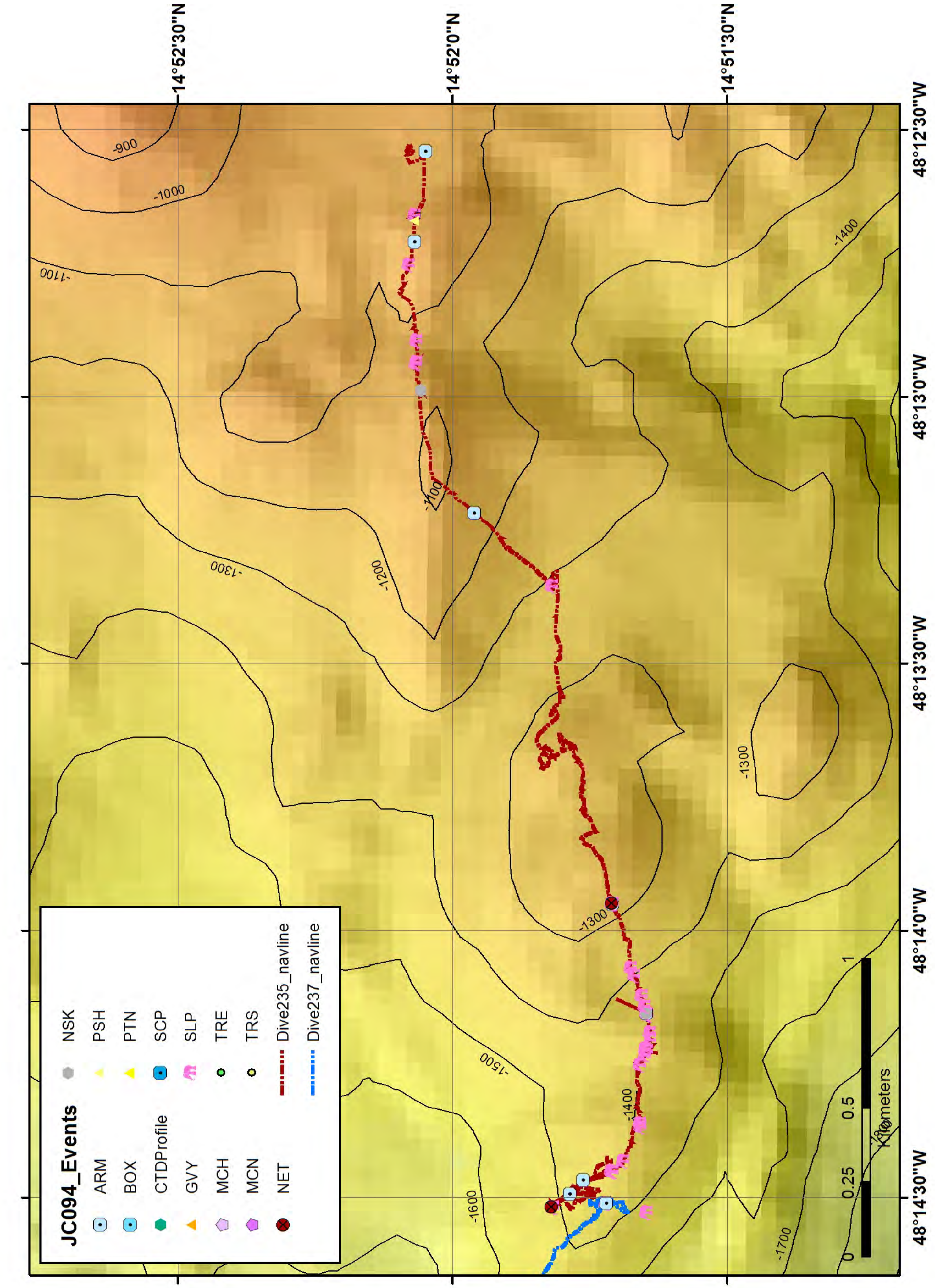

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Dive237_navline
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14°51'30"N
48°12'30"W
48°13'0"W
48°13'30"W
48°14'0"W
48°14'30"W
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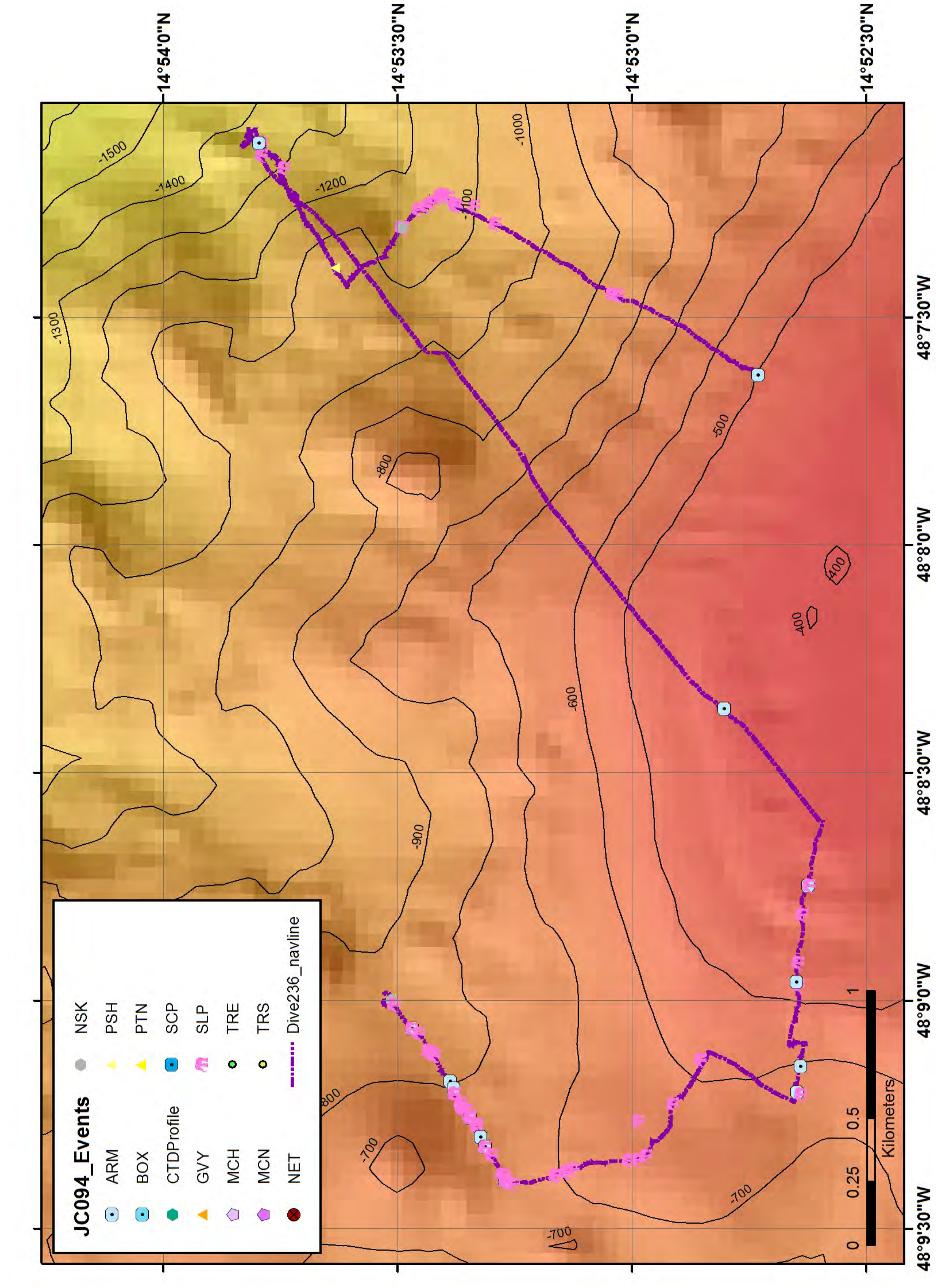

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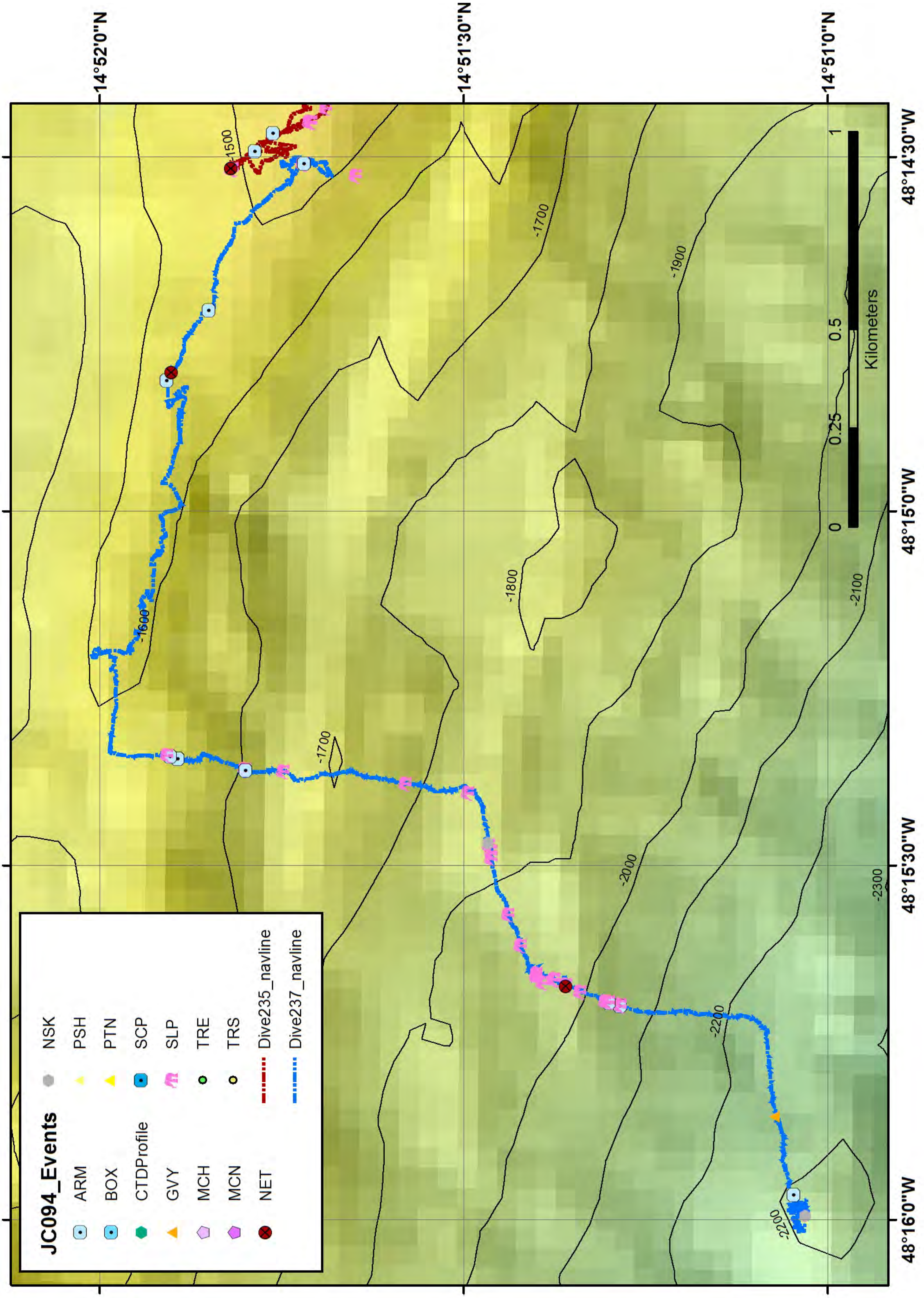
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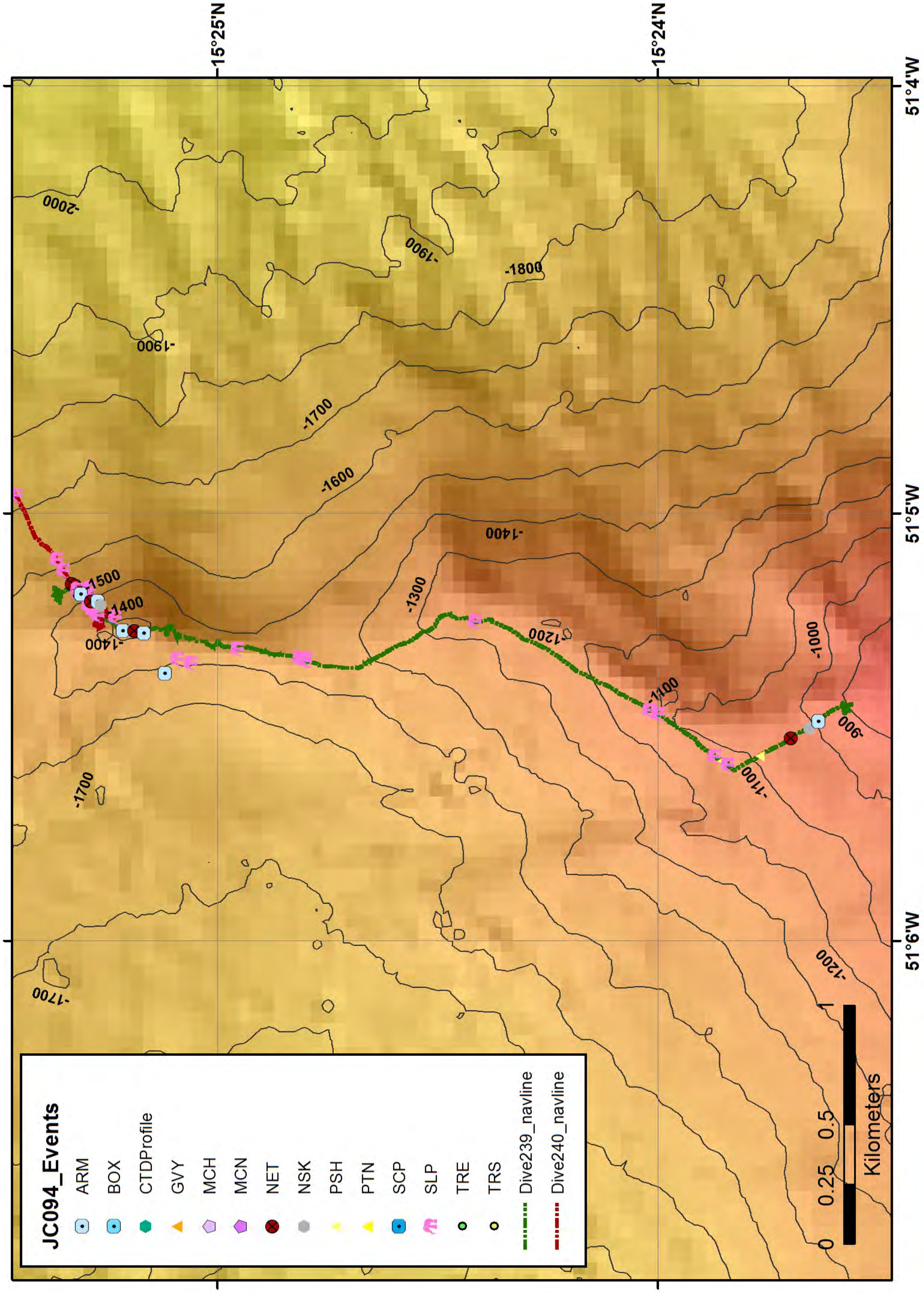
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Kilometers
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51°5'W
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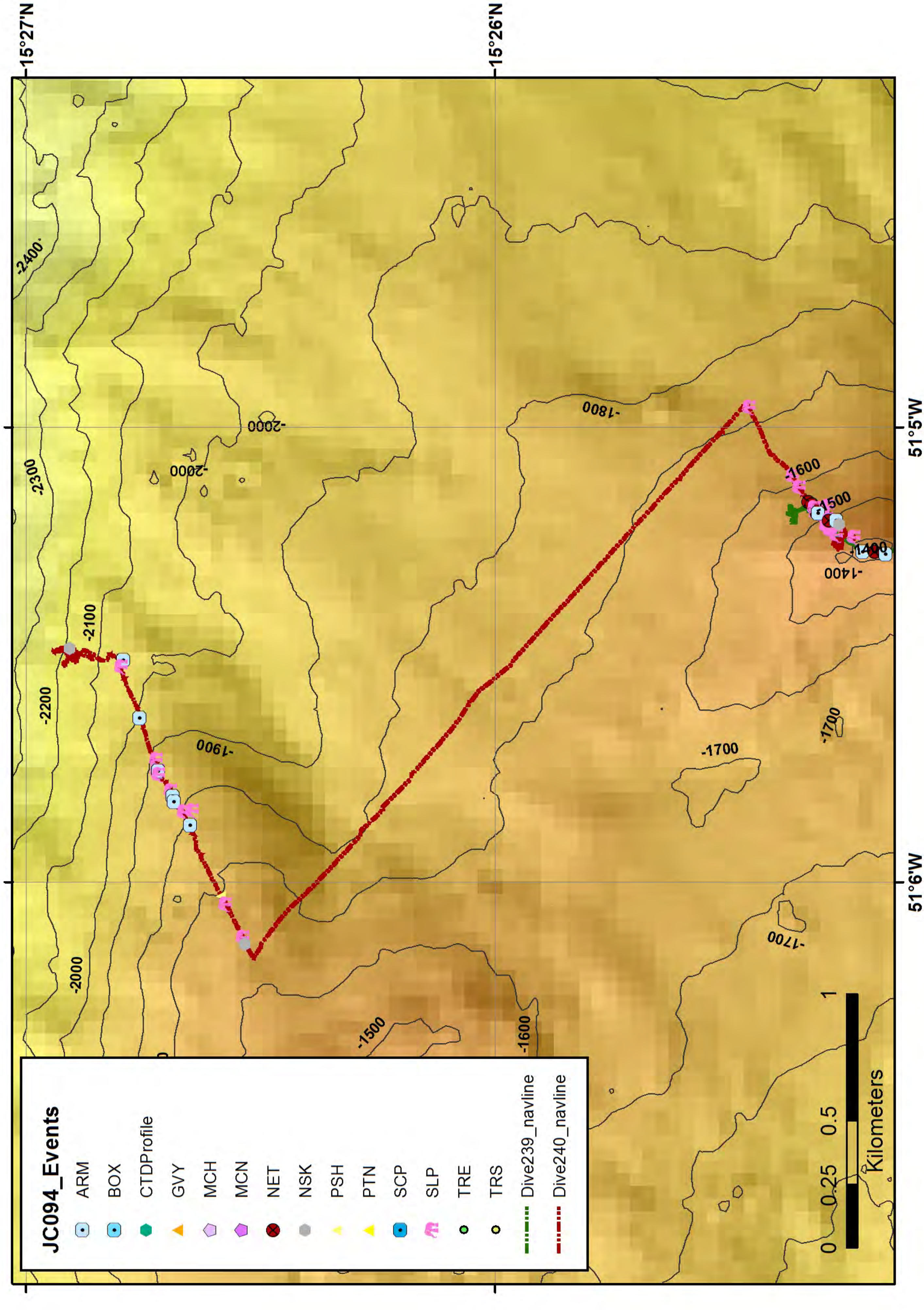
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SLP
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Dive239_navline
Dive240_navline
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15°26'N
51°5'W
51°6'W
0 0.25 0.5 1
Kilometers
-2400
-2300
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-1700
-1600
-1500
-1400

Appendix 8: Sponge samples

Lat (N)	Lon (W)	Depth	Station	Region	Gear	Gear #	Event	Event #	Sample #	
9 12.967	21 18.967	1079	004	EBA	ROV	222	SCP	2 or 6	B0151_dry	-80°C
9 13.069	21 18.960	994	004	EBA	ROV	222	SCP	17	B0155_dry	-80°C
9 12.967	21 18.967	1079	004	EBA	ROV	222	SLP/SCP/NET	2 or 6	F0001_sponge	
9 14.3182	21 19.3438	298	005	EBA	ROV	223	ARM	32	B0177_dry	-80°C
9 14.3182	21 19.3438	298	005	EBA	ROV	223	SLP	33	B0179_dry	-80°C
9 11.83	21 17.10	2073	007	EBA	ROV	224	ARM	16	B0195_dry	-80°C
9 12.3426	21 17.8684	1413	007	EBA	ROV	224	SCP	49	B0197_dry	
9 12.3426	21 17.8684	1414	007	EBA	ROV	224	SLP	48	B0198_dry	
			007	EBA	ROV	224			B0196_dry	-80°C
9 12.2092	21 17.6454	1569	007	EBA	ROV	224	ARM	27	B0194_dry	-80°C
9 12.3354	21 17.8464	1431	007	EBA	ROV	224	SCP	44	B0200_dry	-80°C
9 12.3626	21 17.8901	1381	007	EBA	ROV	224	NET	53	F030	
9 12.1568	21 17.5757	1544	007	EBA	ROV	224	ARM	24	B0768_dry	-80°C
9 12.3354	21 17.8464	1431	007	EBA	ROV	224	SCP	44	B0200_dry	
			007	EBA	ROV	224			B0199_dry	-80°C
9 10.8707	21 16.4810	2302	011	EBA	ROV	225	ARM	15	B0723_dry	
9 10.9064	21 16.4825	2278	011	EBA	ROV	225	NET	27	B0725_dry	
9 11.4132	21 16.7843	2318	011	EBA	ROV	225	ARM	35	B0958_dry	-80°C
9 12.4539	21 18.037	1364	015	EBA	ROV	227	SLP	31	B0977_dry	
9 12.32	21 17.93	1345- 1354	015	EBA	ROV	227	SLP	1	B0978_dry	
9 12.3578	21 17.9407	1326	015	EBA	ROV	227	SLP	13	B0975_dry	-80°C
9 12.4209	21 17.9958	1366	015	EBA	ROV	227	NET	27	F0047	
9 12.33	21 17.93	1345	015	EBA	ROV	227	ARM	5	F0044_live	
9 12.33	21 17.93	1345	015	EBA	ROV	227	ARM	5	F0044_dead	
9 13.1851	21 18.6127	973	015	EBA	ROV	227	NET	55	F0053	
9 13.3095	21 18.7374	798	015	EBA	ROV	227	SCP	58	F0054	
9 12.32	21 17.93	1364	015	EBA	ROV	227	SLP	1-6	F0059	
5 36.48	26 57.68	1575	021	EBB	ROV	228	SCP	23	F0065	
5 36.48	26 57.68	1575	021	EBB	ROV	228	SCP	23,33,39	B1214_dry	
5 36.48	26 57.68	1575	021	EBB	ROV	228	SCP	23,33,39	B1106_dry	
5 36.3	26 57.8	1758-	021	EBB	ROV	228	SLP	20	B1222_dry	

		1850								
5 36.4894	26 57.6211	1505	021	EBB	ROV	228	ARM	25	B1101_dry	-80/-20°C
5 36.6650	26 57.4576	1484	021	EBB	ROV	228	ARM	45	B1104_dry	-80/-20°C
5 36.8448	26 57.5701	1445	021	EBB	ROV	228	SLP	41	B1102_dry	-80/-20°C
5 36.06	26 58.04	1450	021	EBB	ROV	228	SLP	6	B1105_dry	-80/-20°C
5 36.5373	26 57.4738	1989	021	EBB	ROV	228	SLP/ARM	41/42	B0071_dry	
5 37.6191	26 56.5725	628	022	EBB	ROV	229	SLP	64	B01113_dry	-80°C
5 37.6020	26 56.6877	701	022	EBB	ROV	229	SLP	61	B01116_dry	-80°C
5 37.5038	26 57.4780	971	022	EBB	ROV	229	SLP	30	B0078_dry	-80°C
5 37.3753	26 57.43	959	022	EBB	ROV	229	SLP	34	B01112_dry	-80/-20°C
5 37.6165	26 56.5177	611	022	EBB	ROV	229	SCP	68	B1280_dry	
5 37.5975	26 56.8829	771	022	EBB	ROV	229	SLP	49	B01115_dry	-80°C
5 37.5002	26 57.8064	1039	022	EBB	ROV	229	SLP	12	B01114_dry	-80/-20°C
5 36.1755	26 57.89	1950	021	EBB	ROV	228	SLP	17	B1203_dry	
5 35.6665	26 58.5758	2307	026	EBB	ROV	230	ARM	57	B01140_dry	-80/-20°C
5 35.6665	26 58.5758	2307	026	EBB	ROV	230	ARM	57	B01157_dry	-80/-20°C
5 35.6665	26 58.5758	2307	026	EBB	ROV	230	ARM	57	B01163_dry	
5 35.651	26 58.631	2355	026	EBB	ROV	230	SLP	53	B01153_dry	
5 35.6665	26 58.5758	2307	026	EBB	ROV	230	ARM	57	B01147_dry	-80°C
5 35.651	26 58.631	2355	026	EBB	ROV	230	SLP	53	B01143_dry	
5 35.651	26 58.631	2355	026	EBB	ROV	230	SLP	53	B01132_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1384_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1363_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1370_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1349_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1387_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1373_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1366_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1381_dry	
5 35.5494	26 59.1887	2618	026	EBB	ROV	230	ARM/SLP	31	B01162_dry	-80/-20°C
5 35.360	26 59.643	2820	026	EBB	ROV	230	SLP	11	B01142_dry	-80°C
5 35.5494	26 59.1887	2618	026	EBB	ROV	230	ARM/SLP	31	B01175_dry	-80/-20°C
5 35.8410	26 58.3224	2170	026	EBB	ROV	230	SLP	68	B1280_dry	
5 35.5494	26 59.1887	2618	026	EBB	ROV	230	SLP		B1173_dry	-80/-20°C
5 35.360	26 59.65	2824	026	EBB	ROV	230		7	B1326_dry	-20°C

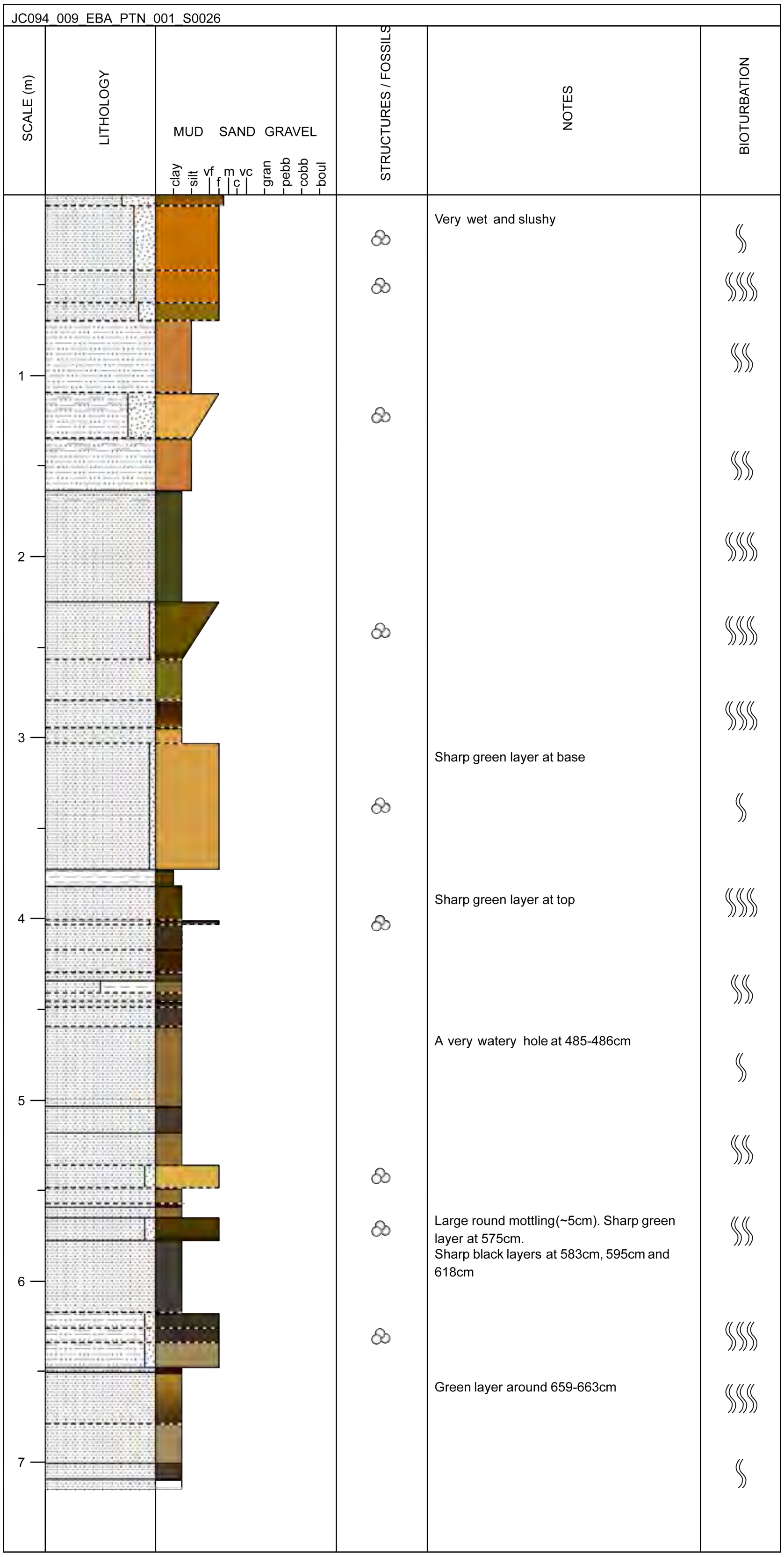
		2597-2257	026	EBB	ROV	230	ARM	29/61	B01152_dry	
5 35.6665	26 58.5758	2307	026	EBB	ROV	230	ARM	57	B1392_dry	
5 35.651	26 58.631	2355	026	EBB	ROV	230	SLP	53	B01133_dry	
5 35.7490	26 58.9377	2494	026	EBB	ROV	230	SLP	37	B01174_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1352_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1360_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1354_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B1375_dry	
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B01171_dry	-80/-20°C/Ethanol
5 35.7147	26 58.4732	2257	026	EBB	ROV	230	SLP	62	B01172_dry	-80°C
5 37.18	26 57.53	1162	026	EBB	ROV	230	NET	74	B01177_dry	-20°C
5 35.6665	26 58.5758	2307	026	EBB	ROV	230	ARM	57	B01165_dry	-80/-20°C
5 37.17	26 57.653	1164	026	EBB	ROV	230	NET	71	B01176	
10 44. 5977	44 34.4791	1355	033	VEM	ROV	231	SLP	36	B0846_dry	-80°C
10 44.4060	44 33.7595	1140	033	VEM	ROV	231	ARM	59	B0507_dry	-80°C
			033	VEM	ROV	231	SLP	31/47	B1517_dry	
		1382-1309	033	VEM	ROV	231			B1573_dry	
			041	VEM	ROV	232			B01615_dry	-80°C
10 43.0365	44 25.3227	858	041	VEM	ROV	232	SLP	30	B01676_dry	-80°C
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1816_dry	
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1789_dry	
10 42.4062	44 24.8295	568	041	VEM	ROV	232	NET	79	B1884_dry	
10 42.4062	44 24.8295	568	041	VEM	ROV	232	NET	79	B1856_dry	
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1876_dry	
10 42.6931	44 25.2240	595	041	VEM	ROV	232	NET	59	B1725_dry	
10 42.5135	44 25.0831	570	041	VEM	ROV	232	SLP	72	B1791_dry	
10 42.9629	44 25.3104	808	041	VEM	ROV	232	NET	33	B1590_dry	
10 43.713	44 25.508	1302	041	VEM	ROV	232	ARM	41/42	B1698_dry	-80°C/Ethanol
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1872_dry	
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1785_dry	
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1806_dry	
			041	VEM	ROV	232			B01613_dry	-80°C

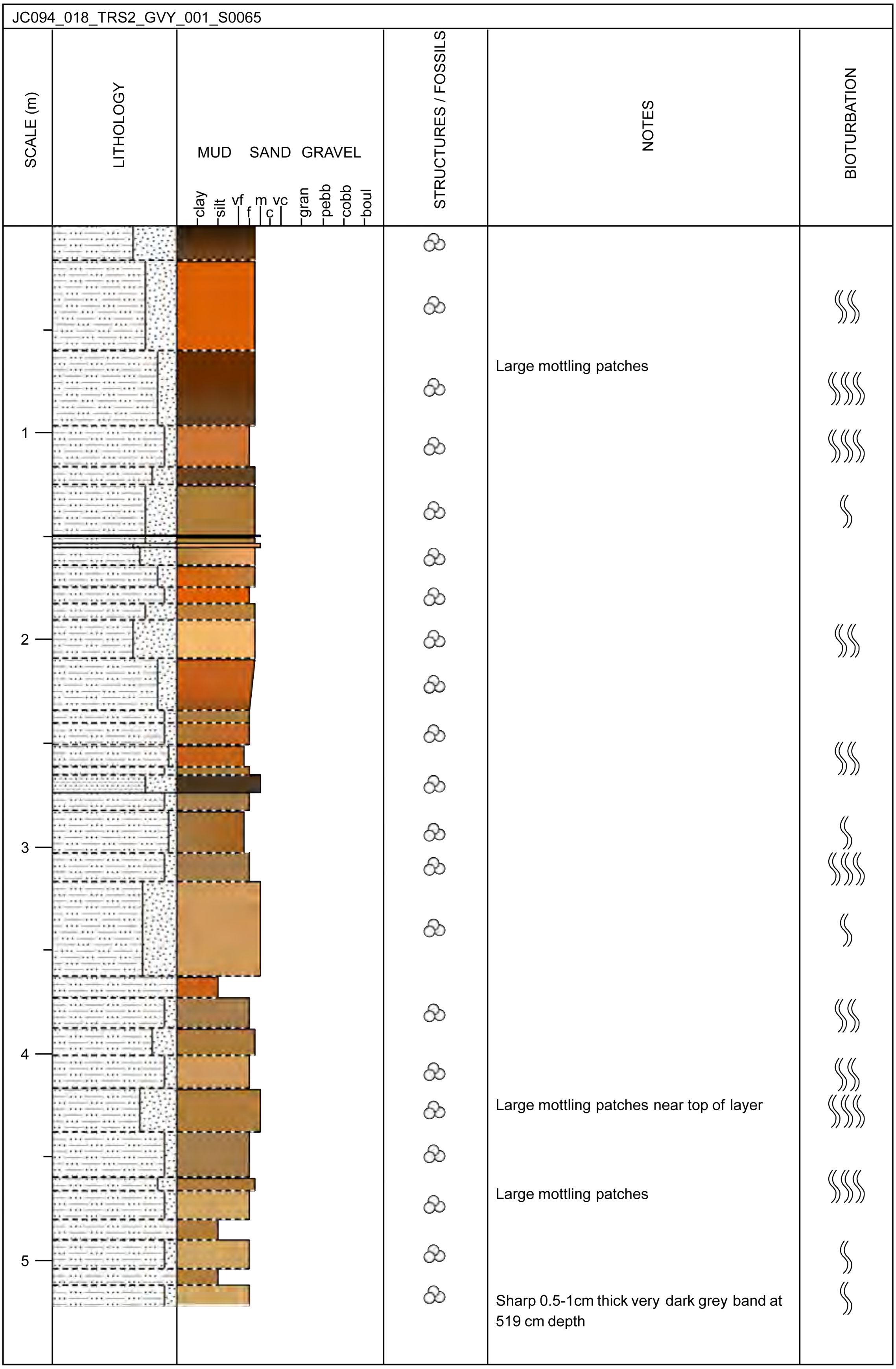
10 43.651	44 25.470	1175	041	VEM	ROV	232	SLP	8	B01670_dry	-80/-20°C/Ethanol
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1820_dry	
10 43.3690	44 25.3794	1014	041	VEM	ROV	232	ARM	21	B01605_dry	-80°C
10 43.3248	44 25.2721	976	041	VEM	ROV	232	SLP	23	B01623_dry	-80°C
			041	VEM	ROV	232			B01625_dry	-80°C
10 42.5170	44 25.0570	569	041	VEM	ROV	232	ARM	75	B01686_dry	-80°C
10 42.7	44 25.2	595-628	041	VEM	ROV	232	SLP	48/60	B1844_dry	
10 46.132	44 36.027	2230	042	VEM	ROV	233	SLP	48	B01696_dry	-80°C
10 46.132	44 36.027	2230	042	VEM	ROV	233	SLP	48	B01664_dry	-80°C
10 46.3912	44 36.0308	2433	042	VEM	ROV	233	SLP	42	B01684_dry	
10 46.85	44 35.91	2985	042	VEM	ROV	233	SLP	41/42	B01627_dry	-80°C
10 46.842	44 35.906	2981	042	VEM	ROV	233	SLP	7	B01674_dry	-80°C
10 45.1434	44 36.1018	1578	042	VEM	ROV	233	NET	98	B01694_dry	
10 96.8204	44 36.9606	2887	042	VEM	ROV	233	ARM	20	B01607_dry	-80/-20°C/Ethanol
			042	VEM	ROV	233			B0521_P	
10 45.2647	44 36.1526	1648	042	VEM	ROV	233	SLP	92	B01609_dry	-80°C
14 51.6408	48 14.2023	1407	045	VAY	ROV	235	SLP	36	B01681_dry	-80°C
		1421-1150	045	VAY	ROV	235	ARM	48/70/84	B1875_dry	
14 51.788	48 14.491	1483	045	VAY	ROV	235	ARM	7	B01661_dry	-80°C
14 51.788	48 14.491	1483	045	VAY	ROV	235	ARM	7	B01683_dry	-80°C
14 52.0669	48 12.8946	1106	045	VAY	ROV	235	SLP	102	B01691_dry	-80°C
14 51.9618	48 13.2168	1150	045	VAY	ROV	235	ARM	84	B01671_dry	-80/-20°C
14 51.65	48 14.22	1412	045	VAY	ROV	235	SLP	30/33	B1855_dry	
14 51.7107	48 13.9479	1259	045	VAY	ROV	235	SLP	71/72	B1859_dry	
14 51.788	48 14.491	1483	045	VAY	ROV	235	ARM	71/72	B01693_dry	
		1406-1425	045	VAY	ROV	235			B01683b_dry	
14 53.380	48 9.204	795	048	VAY	ROV	236	SLP	24	B01632_dry	-80°C
14 53.389	48 9.176	806	048	VAY	ROV	236	ARM	20	B01647_dry	-80°C/Ethanol
15 53.3	48 9.3	747-754	048	VAY	ROV	236	SLP	42/43/45	B2023_dry	
14 53.324	48 9.298	772	048	VAY	ROV	236	ARM	38	B2028_dry	
14 53.5095	48 9.0015	865	048	VAY	ROV	236	SLP	10	B01657_dry	-80°C
14 53.1748	48 9.3904	710	048	VAY	ROV	236	SLP/ARM	49	B1952_dry	
14 53.4248	48 7.3011	1153	048	VAY	ROV	236	SLP	80	B01637_dry	-80/-20°C

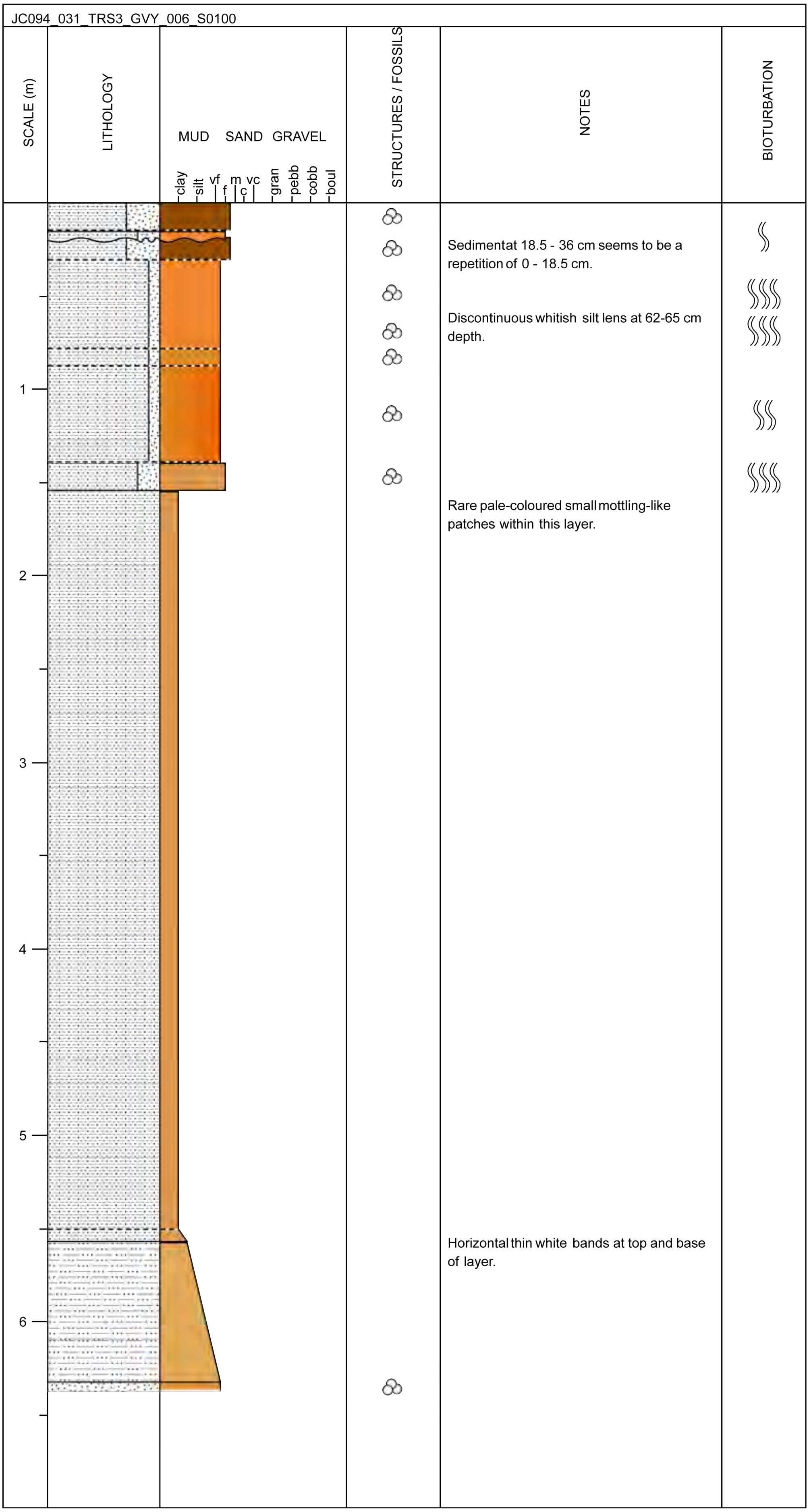
14 53.4248	48 9.1185	824	048	VAY	ROV	236	SLP	18	B0789_dry	-80°C
14 53.043	48 7.448	868	048	VAY	ROV	236	SLP	93	B01641_dry	-80°C
14 53.1748	48 9.3904	710	048	VAY	ROV	236	ARM/SLP	49	B1951_dry	-80°C
14 53.79	48 7.1	1339-1366	048	VAY	ROV	236	SLP	72/73	B2015_dry	
14 53.3150	48 9.3222	742	048	VAY	ROV	236	SLP	41	B0791_dry	-80°C
14 53.3150	48 9.3222	742	048	VAY	ROV	236	SLP	41	B0790_dry	-80°C
14 53.5095	48 9.0015	865	048	VAY	ROV	236	SLP	10	B2077_dry	
14 51.0480	48 15.9643	2181	049	VAY	ROV	237	ARM	6	B1965_dry	-80/-20°C
14 51.8006	48 15.3652	1706	049	VAY	ROV	237	ARM	39	B1963_dry	-80/-20°C
14 51.9084	48 15.3436	1612	049	VAY	ROV	237	SLP	44	B1962_dry	
14 51.9	48 15.34	1612-1622	049	VAY	ROV	237	ARM/SLP	40-44	B1966_dry	-80°C
			049	VAY	ROV	237			B1964_dry	-80°C
14 51.4627	48 15.4797	1854	049	VAY	ROV	237	SLP	29	B1968_dry	-80°C
14 51.392	48 15.665	1959	049	VAY	ROV	237	SLP	20	B1970_dry	-80°C
14 51.306	48 15.307	2008	049	VAY	ROV	237	SLP	12	B1961_dry	-80/-20°C
15 23.871	51 5.568	1127	056	GRM	ROV	239	SLP	45	B1954_dry	-80°C
15 24	51 5.468	1090	056	GRM	ROV	239	SLP	44	B1963_dry	
15 25.2405	51 5.2018	1484	056	GRM	ROV	239	SLP	11	B1960_dry	
15 25.2405	51 5.2018	1484	056	GRM	ROV	239	SLP	11	B1958_dry	-80°C
15 25.1666	51 5.2792	1382	056	GRM	ROV	239	ARM	31	B1956_dry	
15 25.2836	51 5.2256	1460	056	GRM	ROV	239	SLP	22	B1955_dry	-80°C
15 24.8	51 5.3	1445	056	GRM	ROV	239	SLP	36-40	B2294_dry	
15 25	51 5	1520	056	GRM	ROV	239	SLP	1/21/42	B2236_dry	
15 25.4570	51 04.9561	1720	058	GRM	ROV	240		28	B1985_dry	
15 26.7190	51 05.7559	1869	058	GRM	ROV	240		12	B1986_dry	
15 26.7190	51 05.7559	1869	058	GRM	ROV	240		12	B1987_dry	
15 26.7181	51 05.7636	1869	058	GRM	ROV	240			B1983_dry	-80/-20°C
15 26.798	51 05.526	2034	058	GRM	ROV	240		71/72	B1981_dry	-80/-20°C
15 26.7181	51 05.7	1869-1888	058	GRM	ROV	240		09/11/14	B1984_dry	
15 26.7181	51 05.7	1869-1888	058	GRM	ROV	240		09/11/14	B1982_dry	
			058	GRM	ROV	240		?	B1988_dry	
			058	GRM	ROV	240			Black slurp?	

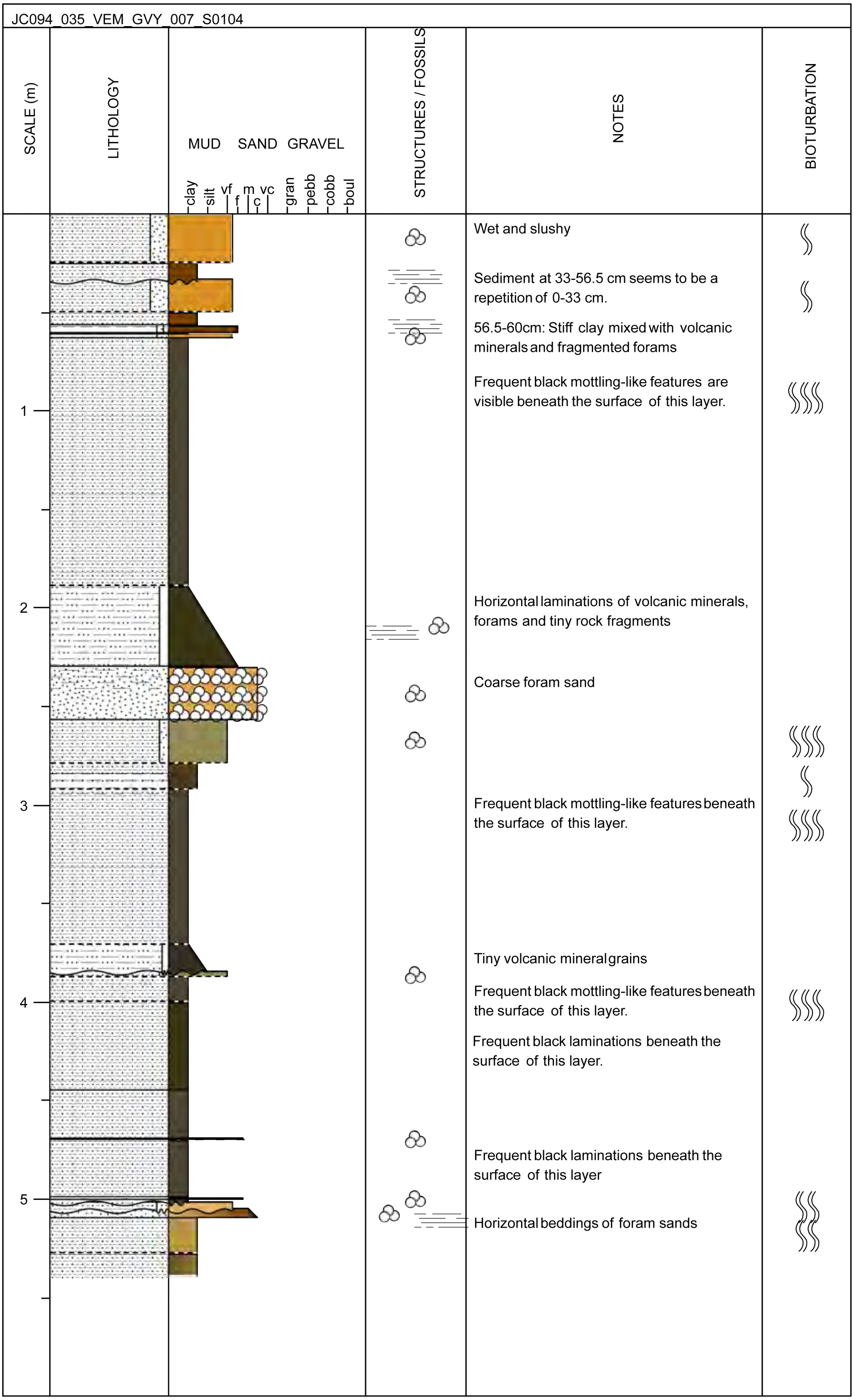
			058	GRM	ROV	240			Blue net?	
			058	GRM	ROV	240			with B1986/7?	

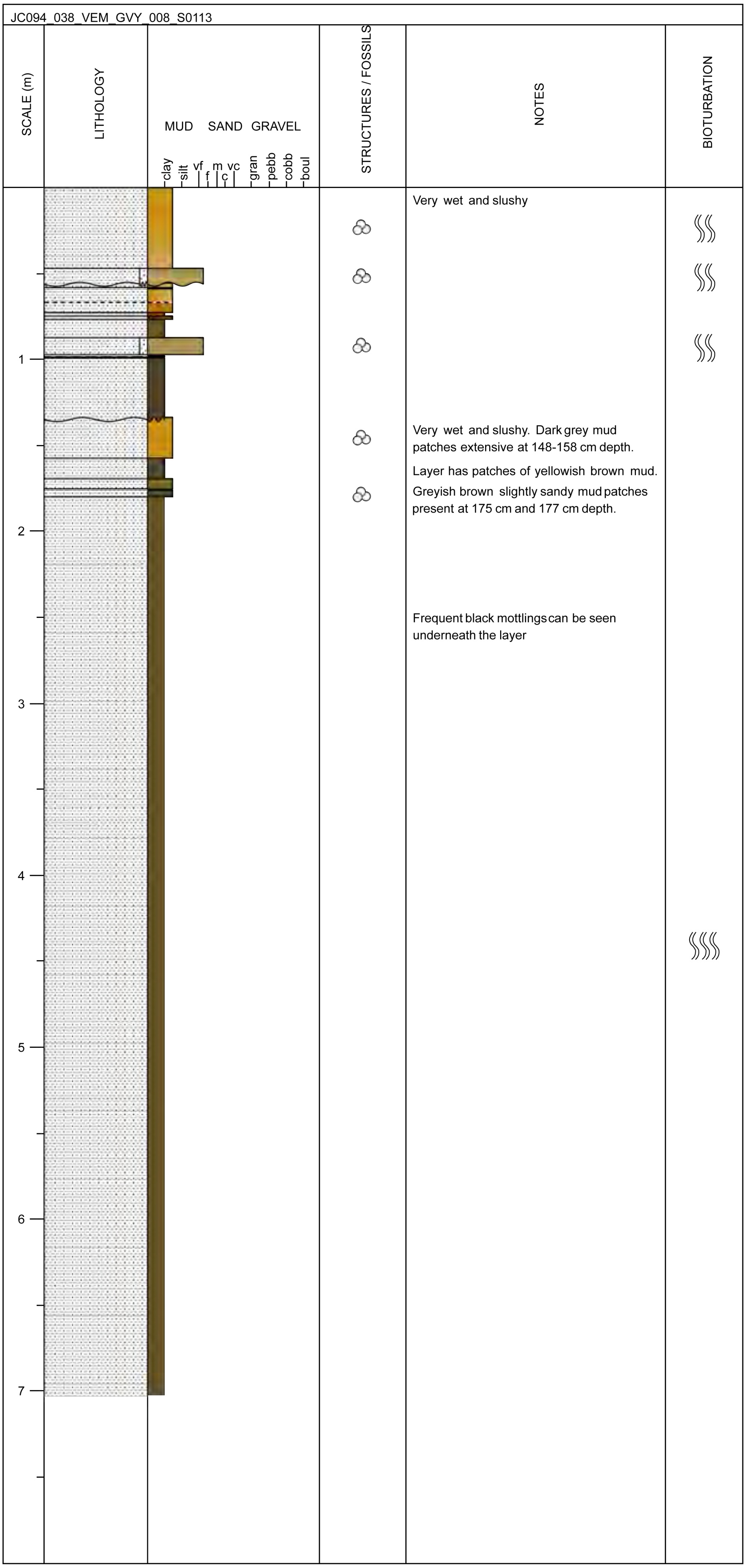
Appendix 9. Sedimentary Logs

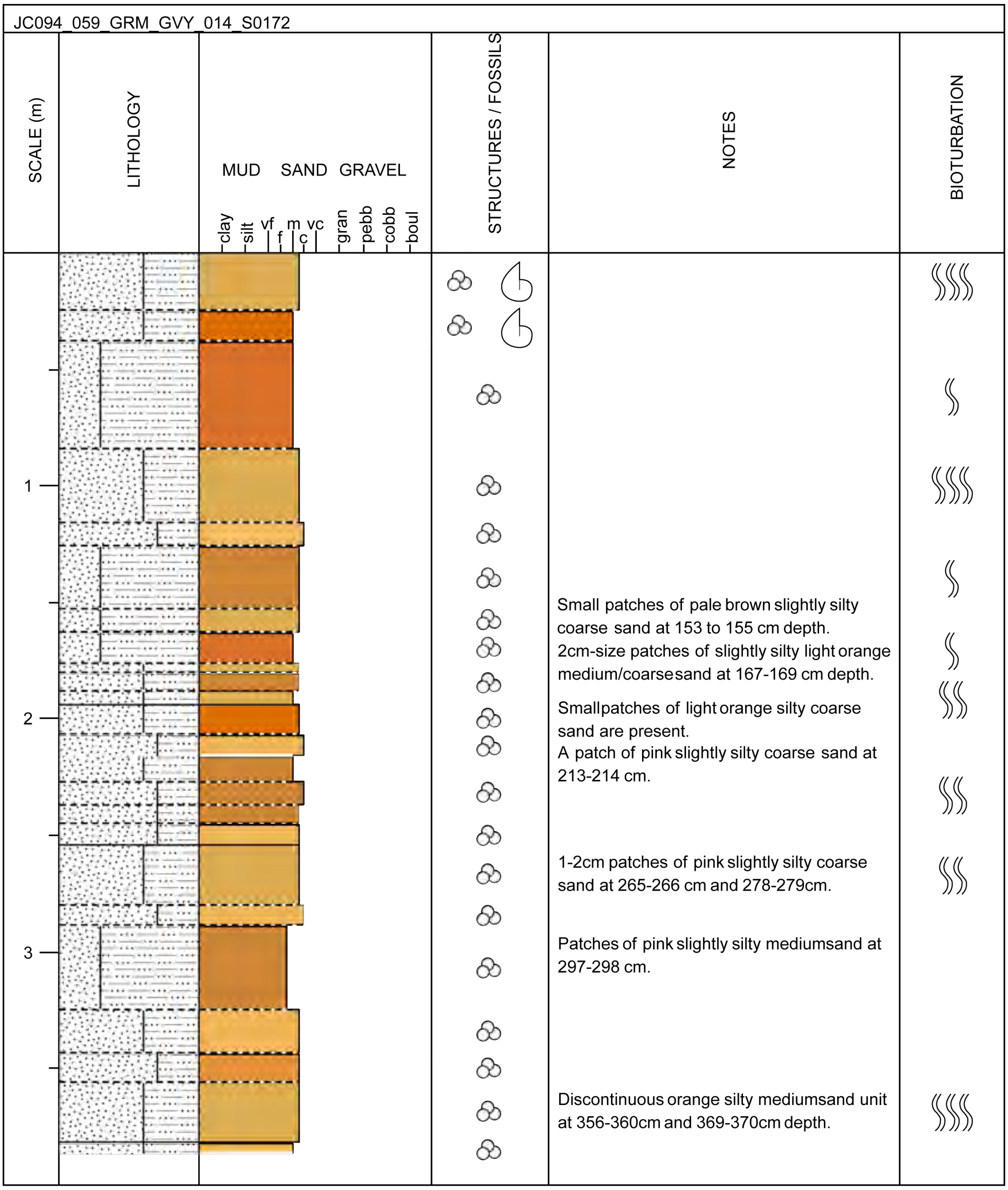



JC094_018_TRS2_GVY_001_S0065
SCALE (m)
LITHOLOGY
MUD SAND GRAVEL
clay
silt
vf
f
m
c
vc
gran
pebb
cobb
boul
STRUCTURES / FOSSILS
NOTES
BIOTURBATION
1
2
3
4
5
Large mottling patches
Large mottling patches near top of layer
Large mottling patches
Sharp 0.5-1cm thick very dark grey band at 519 cm depth


JC094_031_TRS3_GVY_006_S0100
SCALE (m)
LITHOLOGY
MUD SAND GRAVEL
clay
silt
vf
f
m
c
vc
gran
pebb
cobb
boul
STRUCTURES / FOSSILS
NOTES
BIOTURBATION
1
2
3
4
5
6
Sedimentat 18.5 - 36 cm seems to be a repetition of 0 - 18.5 cm.
Discontinuous whitish silt lens at 62-65 cm depth.
Rare pale-coloured small mottling-like patches within this layer.
Horizontal thin white bands at top and base of layer.


JC094_035_VEM_GVY_007_S0104
SCALE (m)
LITHOLOGY
MUD SAND GRAVEL
clay silt vf f m c vc gran pebb cobb boul
STRUCTURES / FOSSILS
NOTES
BIOTURBATION
1
2
3
4
5
Wet and slushy
Sediment at 33-56.5 cm seems to be a repetition of 0-33 cm.
56.5-60cm: Stiff clay mixed with volcanic minerals and fragmented forams
Frequent black mottling-like features are visible beneath the surface of this layer.
Horizontal laminations of volcanic minerals, forams and tiny rock fragments
Coarse foram sand
Frequent black mottling-like features beneath the surface of this layer.
Tiny volcanic mineral grains
Frequent black mottling-like features beneath the surface of this layer.
Frequent black laminations beneath the surface of this layer.
Frequent black laminations beneath the surface of this layer
Horizontal beddings of foram sands


JC094_038_VEM_GVY_008_S0113
SCALE (m)
LITHOLOGY
MUD SAND GRAVEL
clay
silt
vf
f
m
c
vc
gran
pebb
cobb
boul
STRUCTURES / FOSSILS
NOTES
BIOTURBATION
1
2
3
4
5
6
7
Very wet and slushy
Very wet and slushy. Dark grey mud patches extensive at 148-158 cm depth.
Layer has patches of yellowish brown mud.
Greyish brown slightly sandy mud patches present at 175 cm and 177 cm depth.
Frequent black mottlings can be seen underneath the layer


JC094_059_GRM_GVY_014_S0172
SCALE (m)
LITHOLOGY
MUD SAND GRAVEL
clay silt vf f m c vc gran pebb cobb boul
STRUCTURES / FOSSILS
NOTES
BIOTURBATION
1
2
3
Small patches of pale brown slightly silty coarse sand at 153 to 155 cm depth.
2cm-size patches of slightly silty light orange medium/coarse sand at 167-169 cm depth.
Small patches of light orange silty coarse sand are present.
A patch of pink slightly silty coarse sand at 213-214 cm.
1-2cm patches of pink slightly silty coarse sand at 265-266 cm and 278-279cm.
Patches of pink slightly silty medium sand at 297-298 cm.
Discontinuous orange silty medium sand unit at 356-360cm and 369-370cm depth.

SAMPLE LOG SHEET

Station No:		**ISIS Dive number :**		**Please note:** See sheet for guidance on event numbering **Depth to be read from DVL screen, lat and long from 'SUB' tab**			**Sheet No:**		
Event	**Event Type**	**GMT**	**Latitude**	**Longitude**	**Depth (m)**	**Sample description**	**Location**	**B, F, S, W**	**Logger Initials**

Event type: **NSK** (niskin bottle), **Slurp** (slurp with ROV), **SCP** (scoop with ROV), **PSH** (push core with ROV), **NET** (net with ROV), **ARM** (arm with rov), **TRS** (transect start), **TRE** (transect end)

VIDEO LOG SHEET

Station No.		**ISIS Dive number**	**Sheet No.**				
HDPPT/HDSCI /SCORPIO/PAL	**KiPro**	**Date**	**Time start GMT**	**Time end GMT**	**Comments/Observations**	**To Lab**	**Return-ed**

HD MEDIA LOG

Station No:	Platform: ISIS ROV	Dive Number:	Sheet Number:

Date (GMT)	HDSCI/HDPT/ SCORPIO/PAL	KiPro (1/2/3)	Time Start (GMT)	Time End (GMT)	File Name	Comments	Copied to		Check files		Protect		Delete KiPro/ empty trash
							RAID	WD	RAID	WD	RAID	WD	

JC94 ROV ISIS DIVE: DATE:

ROCK BOX

1 | 2 (SLP)
3 | 4
5 | 6

FWD BIO (scoop)

AFT BIO

GREY BOX

1 | 2
3 | 4

PTBIO

STBBIO

RED
Fine mesh
2 stripes

YELL
med mesh
3 stripes

GREEN
fine mesh
5 stripes

BLACK
med mesh
4 stripes

WHITE
Lrg mesh
1 stripe

NISKINS

JC94 ROV ISIS DIVE: **DATE:**

FWD TUBES

1x white | 1x blue | 1x red

Push cores

ROCK BOXES (see next page)

FWD BIOBOX

AFT BIOBOX

TOOL TRAY

JC94 ROV ISIS DIVE: **DATE:**

1
WHITE / BLUE
Lrg mesh
2 stripe

2
RED
Fine mesh
2 stripes

3
YELL
med mesh
3 stripes

Net information:

4 White Stripes	3 Blue stripes
2 green stripes	1 orange stripe

5
BLACK
med mesh
4 stripes

4
GREEN
fine mesh
5 stripes

NISKINS

PTBIO

STBBIO

2X BLACK	2X WHITE	SLP
2X RED	2X BLUE	
1		2
WHITE /RED	BLACK /BLUE	
WHITE /BLACK	RED/ BLUE	4
3		
WHITE /BLUE		
5		3X RED / 3X BLUE / 3X WHITE / 3X BLACK
		6

Cruise Dates: 13th Oct 2013 to 30th Nov 2013 (JC094)

Principal Scientist: Laura Robinson

ROV Operations Supervisor: Dave Turner

Sea Systems Cruise Manager: N/A

NMFD ROV team: James Cooper, Dave Edge, Russell Locke, Allan Davies, Martyn Rowse (contractor)

NMFD Techs: Ben Poole, Dave Childs, Martin Bridger, Ian Murdoch

Cruise Outline:

This cruise proposal will cross the Tropical Atlantic with start and end ports mostly likely in Brazil and Cape Verde. The science goals include:
(a) mapping deep water coral habitats and reconstruction of their population history through dating work
(b) geochemical proxy calibrations pairing seawater with modern corals and core top sediments
(c) reconstruction of the history of Antarctic intermediate and bottom waters, and of North Atlantic deep water either side of the mid Atlantic Ridge.
The tools required for this project are
(a) Coring ? multi cores for good collection of undisturbed core tops, longer coring for paleoclimate records
(b) Seawater collections - trace metal clean and regular sampling
(c) Deep water corals ? Isis or similar ROV for careful imaging and collecting of deep water corals.

Isis Stats:

No. of dives JC094: 20 (Dive no. 221 to Dive no.240)

Total run time for (JC094) thrusters:	425.56 hrs
Total time at seabed or survey depth:	371.79 hrs
Isis ROV *total* run time:	3527.95 hrs
Max Depth and Dive Duration:	2980 m and 19.92 hrs (Dive 233) (23.58 hrs in water)
Max Dive Duration and Depth:	41.82 hrs at 900m (Dive 236) (43.75 hrs in water)
Shallowest Depth and Duration	500 m for 17.1 hrs (Dive 226) (18.27 hrs in water)

Reson Seabat (267.25GB)
Techas (8.55GB)
CTD (613.5MB)
DVLNAV (30.48GB)
Sonardyne (1.18GB)
OFOP Event Logger (704.5MB)
HD Video (50TB)
Scorpio Digital Still (88.08GB)

Video 6TB Hard disks
Master1 Mybook Ser # WUM233600264
Master2 Mybook Ser # WUM233600265
Master3 Mybook Ser # WUM233600274
Master4 Mybook Ser # WUM233600254
Master5 Mybook Ser # WUM233600273
Master5 Mybook Ser # WUM233600263
Master5 Mybook Ser # WUM225000572
Master5 Mybook Ser # WUM225000586
Master5 Mybook Ser # WUM233600252
Master5 Mybook Ser # WUM233600257

NB: A copy of the JC094 Isis Data will remain on the Isis RAID system for a period of one month commencing from the end date of the cruise after which it will be deleted.

Contents

1. Mobilisation:

Southampton: 2nd Oct to 5th Oct 2013
Tenerife: 13th Oct (approx. 5hrs)

The Isis system was mobilised in Southampton. Due to the rebuild of the storage drum and installation of the new umbilical a load test was carried out for the Dynamic and Static testing of the complete LARS system. This was carried out using a Spectra rope wound on top of the storage drum cable (full). A 10,000kg water bag was attached and deployed outboard using the LARS. In a fully extended position the bag was slowly filled. The winch was gently hauled and veered at every 1000kg interval up to the max haul/veer SWL of 7000kg. At this point the winch stopped hauling and veering allowing a static test (brake test) to be carried out. 9000kg was applied (SWL *1.25) and held for 5 mins.

Prior to the load test a full electrical insulation resistance and continuity test was carried out using our 5kv Meggar which confirmed the electrical integrity of the cable. We also utilized our recently acquired Time Domain Reflectomitry machine (a Biccotest TDR225) to obtain a “Prior to putting into service” record of the characteristics of the cable. An initial calibration for the instrument was obtained from the manufacturer’s cable length tape which is installed during the lay-up of the cable. It is proposed that routine tests of the cable be carried out prior to each cruise so that a history of cable characteristics can be obtained which can be utilized as part of a predictive maintenance campaign and replacement projection plan.

Following the testing of the deployment system, the LARS was collapsed and made ready for sea. The majority of the mobilisation of the Isis system was completed in Southampton including the termination and load testing of the umbilical. The ROV was placed and secured on the rear deck between the Isis spares container and Isis miscellaneous container. Upon arrival in Tenerife the LARS was erected and ROV positioned into the A frame. Connection and final preparation of the ROV was completed on passage to the work site.

2. De-Mobilisation:

Trinidad Port of Spain: 30th Nov to 2nd Dec 2013

The de-mobilisation took place in Port of Spain, Trinidad.

The Dynacon traction head, LARS, Control Consul, and HPU were shipped direct to Dynacon, Bryan, Texas. All Isis containers, and Storage Drum were shipped to the UK.

3. Isis Handling System:

3.1 Hydraulic Power Unit (HPU):

Prior to the cruise the hydraulic oil and all hydraulic filters were changed. The filter housings and other parts were refurbished and a partial repaint was completed in house. As a result the unit worked well for the duration of the cruise.

Future modifications/requirements:

- None reported this cruise.
- Sent to Dynacon as part of the Traction Winch and LARS refurbishment.

3.2 Storage Drum/ Traction Winch/ Umbilical:

During the pre-cruise preparations a bespoke cable cooling system was designed and built in house which has replaced a Heath Robinson set up that was used on previous cruises. This proved to be an excellent addition to the storage drum.

This was the first time following the refurbishment of the storage drum and the installation of the new umbilical that the system had been used. During the installation of the umbilical onto the storage drum it was noted that the umbilical outer armor did not appear that tight, or indeed look as good as it could have. Approximately 100m was removed from the cotton reel before winding onto the storage drum commenced. Following the termination of the umbilical during the mobilisation it was again noted that wire did not look as tight as it should have, however a good termination was made and tested.

On passage to the first work station a slight detour was made to take the ship to deep water (deeper than the required max dive site) so that an umbilical stream (vertical deployment) could be carried out. This was done in 4,100m of water with the electrical termination put into an oil compensated vessel, and the mechanical termination attached to a 200kg weight and swivel mechanism. It was hoped that this stream would relieve any built up torque in the umbilical.

Following the streaming of the umbilical, the tension of the new storage drum drive chain and also the storage drum disk brake were adjusted.

Following Dive 225 (5th dive) the outer armor was showing further signs of looking less tight than after the termination, and with the vehicle having to make a couple of turns prior to being lifted out of the water, it was thought that some torque was building up. It was after this dive that the gimbal unit was lifted out of the vehicle so as to be able to inspect the inner core of the umbilical. It was noted that severe turns had been put into the electrical-F/O inner. (See below)

It was at this point it was decided to re-terminate the umbilical and remove a length of the cable in an attempt find a tighter section. Approx 140m was removed. The umbilical was load tested to 7000kg.

Following Dive 226 the gimbal unit was again removed from the ROV and an inspection of the inner umbilical was made. It was noted that the inner had yet again twisted but not as severe as previously experienced.

The termination was removed and disconnected from the vehicle. The twists in the inner were untwisted and tested electrically and for F/O attenuation. It was decided at this point that the umbilical was still usable and did not require a re-termination.

Due to the turns appearing so soon after a termination it was thought that more streaming of the umbilical was required. The umbilical termination was again attached a 200kg weight with the electrical-F/O element placed into the oil compensated vessel. 4 x deployments were made to 4300m with an hour stationary at the bottom of each deployment. During these deployments correspondence with engineers at NOC took place, of which their advice, taken from their dealing with Rochester, was to use a much heavier weight. It was thought that that this heavier weight would even out the tension in the deployed umbilical, helping to relieve torque within the wire.

A 950kg Kasten Core bomb was attached and a further 5th deployment was made.

A following 5 x dives were carried out on this termination, of which each time the gimbal unit was removed from the ROV and the inner core of the umbilical inspected for any signs of turns developing. No turns developed during these dives.

Following Dive 230 it was decided that a re-term be made due to the 5 day steam and time available to do so. 100m of umbilical was removed in an attempted to get to a tighter laid outer armor. 100m also gets past the area where the floats are attached, of which can get a little damaged during the attachment and removal process. A 7000kg load test was carried out.

Following Dive 234 signs of turns developing below the potted termination were identified. These were removed by disconnecting the electrical and F/O connections in the junction box, spinning out and then re-connecting. This is not an ideal situation, though does however prevent the inner from building up too many turns, thus then requiring being re-terminated. The remainder 6 dives were inspected for turns, but no significant amount of twist was identified.

During Dive 236 it was noted that some fishing line was caught around the umbilical. At which point in the dive it was picked up is a bit of a mystery. This developed to be a significant amount of line during the recovery process, of which most of the tangle ended up on top of the vehicle, still connected to more subsea. The stbd vertical thruster was isolated during the latter stages of recovery to stop entanglement with motor and blades. Recovery was made without incident, with the lines trailing into the sea being cut as the ROV came onto deck. Due to this entanglement several of the football floats were pushed together along the umbilical, which in the process broke one of the outer umbilical armor strands. This was later inspected, repaired by cutting out the damaged wire and securing using bulldog and insulating tape. This was deemed satisfactory for the remaining four dives of which were completed without any further complications.

Future modifications/recommendations/maintenance:

- Send removed 140m section of umbilical to Rochester for testing and evaluation.
- Talk to Rochester regarding problem.
- Talk to WHOI and Rueben Mills (Ocean exploration Trust) with regards to issues with their umbilical's.
- Send Traction Head and HPU to Dynacon. Traction head for refurbishment. (2013/14 FY)

3.3 Launch and Recovery System (LARS):

This worked well for the duration of the cruise.

Future modifications/recommendations/maintenance:

- Send to Dynacon for refurbishment (2013/14 FY)

3.4 CCTV:

The CCTV system used for launch, recover and winch monitoring performed without problems though on initial power up it was discovered that a power terminal had corroded away on the passage from Southampton on the pan and tilt camera. This was quickly diagnosed and repaired prior to the first dive. One camera providing a through A frame, a 2nd and 3rd providing storage and traction winch and a pan & tilt unit for following vehicle and floats when at the surface. The new LED floodlights purchased prior to the cruise proved a great success enabling both work to be carried out on ISIS and to enable the CCTV system to continue to be of use during the hours of darkness.

Future modifications/recommendations/maintenance:

- Inspection and refurbishment as necessary is needed following JC094 it would be advantageous if the individual cables feeding the pan and tilt camera be replaced with a single cable of the correct specification together with the refurbishment of the various connectors.
- It is recommended that two further units be purchased which would enable us to have complete autonomy from the ships lighting.

3.5 Portable Hydraulic Deck Pack Unit

As part of the pre cruise preparation a water filtration unit and a remote control facility was fitted to the deck pack. This enabled us to regularly flush and purge the hydraulic system without running the hydraulic motor on ISIS. (Running any of the ISIS motors out of water quickly leads to an overheating situation.) The use of the deck pack enabled us to operate the vehicle safely on deck for extended periods.

4. ISIS External Equipment:

4.1 Elevator A:

Not on cruise.

Future modifications required:

- None

4.2 Elevator B:

Not on cruise.

Future modifications required:

- None

4.3 USBL & LBL Acoustic System (Sonardyne):

ISIS control room USBL suite (PC and NCU)

NCU

Unit was restarted in consort with reboots of USBL PC, as a precautionary measure. USBL PC froze on several occasions and finally failed on Dive 239. The spare USBL PC was used as a replacement, using the hard drive from the existing PC

Future modifications/recommendations/maintenance:

- Investigate computer 'freezing' problem with excessive cooling fan operation

Ranger USBL survey PC
When entering the sound velocity file, the 'tracking maximum depth' box should be filled in appropriately for the working depth. Tracking will cease if the range is too small for the actual depth, as was discovered on Dive 240. Default depth seems to be 2000m. This option is in the 'Environmental' tab on the main menu bar.

Homer
Not used for the duration of the cruise.

Compatt Beacons
Dive 221 was aborted at 550m due to USBL tracking not being established, using Beacon 0210. It was consequently tested on a wire and tracked using both the ship and ROV Ranger system. The reason for the initially failure is unknown, but Unit 0110 was used throughout the cruise, as a precautionary measure given the unreliability of Unit 0210.

Future modifications/recommendations/maintenance:

- All USBL batteries are to be disposed of in the ships battery disposal.

4.4 Football Floats:
The older 5000m floats worked well for the duration of the cruise

Future modifications/recommendations/maintenance:

- Check and re-tighten float latches where necessary

4.5 Suction Sampler:
The suction sampler worked well throughout most of the cruise however some technical problems were encountered with the sampler rotation mechanism, early on.

During operation at the normal hydraulic operating pressure of ~1500 PSI the suction chamber would rotate at high speed then come to a complete stop, jammed between two of the suction positions. On one occasion the mechanism drive chain also broke and had to be replaced. After re-occurrence of this problem, the rotation mechanism was dismantled and examined. The mechanism looked okay but it was found that hydraulic motor could not produce much torque and so was replaced.
After re-assembly and adjustment of the hydraulic operating pressure down to approximately 1000 PSI the suction sampler worked okay.

During operation the suction hose did occasionally get blocked, preventing samples from reaching the chamber. This appeared to be due to irregular shaped large fossil corals, so an effort was made not to allow corals to be sucked past the suction nozzle gate.

Future modifications/recommendations/maintenance:

- Strip down and repair the faulty hydraulic rotation motor. Check operating pressure and maximum flow.
- Locate and repair leaks to outer chamber wall and lid.
- Look into improving lighting/camera on suction sampler.
- Strip down and service suction motor.
- Ensure suction sampler spares kit is replenished and enough spare suction hose is in stock.

4.6 Push Cores:

These worked well for the duration of the cruise.

Future modifications/recommendations/maintenance:

- Check number of tubes remaining and stock accordingly for next cruise.
- Look into design for core catcher.

4.7 Niskin Bottle Arrangement:

This worked significantly better than previous cruises. Only five bottles were used to avoid firing loops from getting tangled.

Future modifications/recommendations/maintenance:

- Investigate design changes to improve ease of cocking and repeatability of firing.
- Spares for Niskin bottles (to include rubber tubing, nylon firing lines and crimps)

5. Isis ROV:

5.1 Thrusters:

All thrusters worked well for the duration of the cruise. Slight leakage from the fwd lateral started after the 5th or 6^{th} dive. This was monitored, and however did not worsen significantly to warrant a seal replacement.

Future modifications/improvements/maintenance:

- Do the thrusters require the belafram pressure balance reservoir? Or could it be replace by an end cap incorporating a bleed to aid bleeding on assembly and water drain point.
- Check thruster spares and ensure sufficient are held in stock (including rotors).
- Fit bleed valve to spare thruster motor to ensure that it is a swappable spare.

Thruster Controllers:

The bi-pod thruster assembly located on the forward port mounting failed midway through the cruise during/following Dive 225, resulting in the inability to enable or drive the Port Vertical (PV) thruster motor. The pod assembly contains two drive block units, labeled 4A (for the PV thruster and 4B, a spare)

Unit 4B was temporarily used to drive the PV thruster for Dive 226, but a DC ground fault (GF) indication was present. To avoid potentially causing further damage the unit was disabled for the remainder of the dive though it was still available for use in an emergency.
Maintenance and inspection of the pod revealed water ingress possibly through a corroded high current 4 pin *Subconn* connector. Two of the connectors where replaced (those for unit 4A) and damage to the base plate face was repaired with the application of 9uM diamond paper. It should be noted also that the spare base plate unit was found to have a slightly damaged connector face.

Drive block 4A was disassembled and two surface mount 74 logic IC's where found to have suffered corrosion to their pins such that there was damage to the PCB tracks.
The IC's were de-soldered and re-attached and damaged tracking cleaned. No corrosion was found on the separate drive block controller board, which is screened by insulating gel, the only damage was on the communications board.

Drive block 4A was able to enable and drive the PV thruster motor, for Dive 227 onwards; however a DC ground fault still persisted. Following this dive the unit was opened again to further investigate the DC ground fault and to also check that the water ingress had ceased. During this process it was discovered that one set of brake resistors were showing a very low resistance to earth. These were changed for a new set. Unfortunately these changes made no significant changes to the ground fault.

This ground fault only occurs at surface and gradually disappears during a dive and returns again as the ROV ascends. This indicates a pressure related problem which is still as yet unresolved.

Drive block 4B was disassembled and corrosion was found on the test connector blocks. The corrosion was cleaned, however 4B still manifests an unacceptably high leakage fault current and was deemed to be used only in an emergency.

Future modifications/improvements/maintenance:

- Contact suppliers for update on availability of drive block units
- Start to look at replacements as present ones may be obsolete.
- Find out what WHOI are doing to get round this problem
- Manufacture spare pod and mid plane.

5.2 Vehicle Main System Compensators:

The vehicle main system compensators worked well for the whole duration of the cruise and no significant oil loss or pressure drop was observed between dives.
A small leak from one of the science bus bulkhead connectors was noted at the start of the cruise. This did not worsen or present and further problems.

Future modifications/improvements/maintenance:

- None

5.3 Tool Sled:

Drawer:

The draw worked well for the duration of the cruise. The drawer worked well for the duration of the cruise. The drawer was removed completely during the vertical swath dive to increase overall vehicle buoyancy and to improve vehicle trim.

Future modifications/improvements/maintenance:

- None

Swing Arms:

This worked well for the duration of the cruise.
The port swing arm was removed for the Reson SWATH electronics bottle.

Future modifications/improvements/maintenance:

- Strip and service both port and stbd units.
- Check latching pin position to ensure pin locates properly when closed and adjust if necessary.
- Service both latching pin hydraulic cylinders.

5.4 Hydraulic System:

The ISIS hydraulic system worked well for the duration of the cruise with no significant problems encountered. However during a couple of post-dive hydraulic oil checks it was suspected that water had entered the system as the appearance was cloudy. No source of obvious water ingress was found and the problem did not occur with any logical regularity. Upon discovery of contaminated oil the hydraulic reservoir was drained and the system flushed through using the deck pack and the Cardev water separator filters. Following Dive 234 during the post-dive checks it was noted that there was contaminated oil inside the hydraulic motor. The motor was removed and during inspection it was found that the rotor was damaged and so was replaced. During the flushing of the hydraulic system, as described above, on this post dive it was also noted that the manipulator pressure hoses had failed and were blistering when under pressure. All the affected hoses were replaced. At this point in time it was thought that these failed hoses may have contributed to the ingress of water noticed on the previous dives. Following Dive 236 it was again noted that the blisters had re-appeared when the system was pressurized. This time further investigation took place, with the conclusion that the blisters were the outer protective coating de-laminating from the hose. The hoses were continued in service monitoring for further problems. The remaining dives continued without any further damage, and water ingress was negligible.

Future modifications/improvements/maintenance:

- Flush system thoroughly
- Replace all filters/seperators and re-stock spares.
- Conduct visual inspection of hydraulic system and all hoses.
- Check that the type of hydraulic hose currently being used is suitable and ensure that enough spare hose is ordered.

5.5 Manipulators:

Port Side: KRAFT

The Kraft Predator arm was used extensively for sampling on most dives and worked reliably for the majority of the cruise.

During the final few dives (Dive 235) it was noticed that the arm had developed a twitch on the azimuth motor and that the jaws had started to stick closed. During the pre-dive for Dive 236 the arm failed on the azimuth actuator by which the azimuth potentiometer had to be changed. Following a full recalibration of the arm and a service of the sticky jaws, the arm functioned without further problems for the remaining five dives of the cruise. The Kraft mini master was swapped out following Dive 235 as problems with the indexing button were being experienced.

Future modifications/improvements/maintenance:

- Service of Kraft Predator used during JC094. Repair azimuth motor. Perform visual inspection and replace any leaking seals.
- Re-stock rotator pot in spares kit.
- Service mini master indexing button

Starboard Side: Schilling T4

The Schilling T4 arm was not used as extensively as the Kraft Predator due to vehicle tool configuration but performed well and remained reliable throughout the cruise.

Future modifications/improvements/maintenance:

- Perform visual inspection of Schilling T4. Flush compensating oil.

5.6 Pan & Tilt Units:

Following the installation of the Sidus pan and tilt unit on the light bar, the unit failed to take any calibration points and eventually failed to work in all directions. It was at this point it was decided to fit the spare Kongsberg unit which required some modifications to the camera controller software.

Following this both pan and tilt units worked well for the duration of the cruise.

Future modifications/improvements/maintenance:

- Flush comps on both units.
- Inspect and service as necessary
- Retire Sidus unit

5.7 CWDM Fibre Optic Multiplexor
This worked well for the cruise duration

Future modifications/improvements/maintenance:
- Spares should be obtained or complete 2nd system
- See Scorpio Camera section

5.8 Cameras:

Pegasus:
Used on Pilot Pan and Tilt with Pilot HD.
Following dive 235 the unit was repositioned to the vehicle central side of the pilot pan and tilt. This camera was now to be used as the primary pilot camera, whilst the pilot HD has to be re-positioned to the science pan and tilt.

Worked well for the duration of this cruise

Future modifications/improvements/maintenance:

- White balance did not appear to work from the Devcon GUI – the Insite GUI was found not to be compatible with Windows 7.

Super Scorpio digital still :
This unit worked well for cruise duration with deck lead download of images.

Future modifications/improvements/maintenance:

- Investigate marks on inside of glass dome.
- Include camera control in proposed joy-box development
- Prior to the cruise an attempt to improve image download speeds by rewiring from the prizm Ethernet port to the CWDM board failed. To resolve this new connectors appropriate to high speed Ethernet should be installed, possibly the same as the proven RESON connector

High Definition Pilot and Science camera units

Following Dive 232 it was noted that a crack had appeared on the dome of the science HD camera (unit Ser No. xxxxx).
The unit was removed from the vehicle. HD pilot was relocated to the science pan and tilt.

Future modifications/improvements/maintenance:

- Rtn camera for dome repair
- Rtn controllers for zoom drift repair
- Notify Insight of zoom drift and relation to iris control
- Investigate pal video lines on both HD pbof's

Mini Cams:
Uplook , Drawer, LED Sampler/Gauges

All worked well for the duration of the cruise.

Future modifications/improvements/maintenance:

- None

Mercury (Aft Cam):
This is an excellent low light monochrome camera providing sharp pictures with minimal lighting and is well suited for vehicle rear view monitoring. No problems were encountered.

Future modifications/improvements/maintenance:

- None.

5.9 Lights:

2 x Aphos LED (set at 100% power output) Port and starboard outer unit on ROV
2 x Aphos LED (set at 75% power output) port and Starboard inner unit on ROV

During dive 229 it was noted that the Port outer (100% power) LED was flickering. The unit was isolated for a period and then started again. It then appeared to be functioning normally for the rest of the dive. Dive 230 pre-dive demonstrated that the light was still functioning and therefor was used for this dive. Unfortunately during this dive the unit failed completely and was isolated at the GUI. It was also noted during this dive that the Stbd outer (100% power LED) looked considerably dimmer.
Following this dive both units were deck tested, resulting in the port unit coming on initially and then not at all and the stbd unit coming on but in a very dim capacity.
Both units were removed from the ROV and tested independently using the test unit and software from the manufacturers. Both units were still showing 100% output but were however clearly not delivering the 'brightness' that they should.

For Dive 232 two new 100% power LEDs were fitted to replace the failed units. These functioned well for the remainder of the cruise. It was noted on the GUI that the Port outer was drawing 1.5 amps when it should be similar to that of the Starboard outer of 2.1Amps. Visible power output was clearly running at 100%.

Future modifications/improvements/maintenance:

- Sort out Serial Nos and hrs run on the units to be returned to Cathx
- Rtn to Cathx.
- Investigate GUI amp readings compared to test rig power drawn readings
  3.7 amps bench 2.1 amps GUI
  2.6 amps bench 1.5 amps GUI

5.10 Lasers:
Dive 232 laser on the fixed Scorpio failed. It was unknown as to which unit out of the pair had failed. Both units were tested and serviced on deck checking out ok during Dive 233 pre-dive.
Laser module failed again on Dive 233.
Dive 234 was to be a swath dive with no lasers required, so it was decided to put the two green lasers on in this position and test. From this dive it was concluded that the fault must be in the laser harness. As this would involve opening the main junction box, it was agreed with science that we would no longer use this harness, but instead would reposition the lasers from the science HD/pan and tilt onto the fixed Scorpio position. No further problems were encountered.

Future modifications/improvements/maintenance:

- Check all lasers
- Replacement harness to fitted
- Order spare harnesses

5.11 Sonar's:

RDI Doppler WorkHorse Navigator 300KHz:

This operated well for the duration of the cruise.

Future modifications/improvements/maintenance:

- If money becomes available a spare should be purchased as they have been known to leak through transducer interface.

Tritech Imaging (Fwd):
The new Tritech Super Seaking dual frequency head performed well for the majority of the cruise. A GF developed part way through Dive 235, of which during the unit was isolated until required or end of the dive.

Future modifications/improvements/maintenance:

- If money becomes available a spare should be purchased.

Reson Multibeam
This system was only used on two (three –LFR) dive this cruise. On both occasions it worked well with no problems encountered. On the second dive it was used in a vertical configuration, mounted to the front of the ROV, between the top and bottom beam of the ROV frame. The tool sled, and swing arms were removed to save buoyancy and help trim the vehicle to the horizontal.

Future modifications/improvements/maintenance:

- Blanks required for cables

5.12 Digiquartz Pressure Sensor:

Worked well for the duration of the cruise.

Future modifications/improvements/maintenance:

- None

5.13 Electrical Systems and Wiring:

The DC deck cable is not functioning. Possibly due to failure to energize the HV relay.

Future modifications/improvements/maintenance:

- Investigate and repair

5.14 Altimeter:

Worked well for the duration of the cruise.

5.15 Novatech Radio/Strobe Beacons

Worked well for the duration of the cruise

5.16 PRIZM –FO Comms

Fibre optic losses through the entire system were in the order of 6-8db.

5.17 Scientific Sensors

CTD: SBE49 Ser no 4970149 - 0279

Whilst the unit performed correctly throughout the cruise it was discovered that after a number of dives the conductivity cell within the unit became contaminated and ceased to function. This was remedied by dismantling the unit and thoroughly cleaning the sensor and connecting pipes. It was suspected that the unit's location on the floor tray of ISIS made it susceptible to contamination from sediment disturbed by ISIS each time the vehicle landed on the sea bed. It is suggested that an alternative location be chosen for subsequent cruises higher up within the vehicle to mitigate this problem.

Thermometer: SBE38 Ser#
Not fitted

Turbidity: ECO-NTU-RTD
Not fitted

ICL Probe:
Not fitted

5.18 Low Voltage JB (port side):

The PAL composite lines in the cables to high definition cameras PILOT and SCIENCE are not connected into composite video ports in the LV junction box. This is to be remedied at base.
A science bus 7pin connector was notes to be slowly weeping at the beginning for the cruise.

Future modifications/improvements/maintenance:

- Documentation to be sorted.
- The current science bus connector plate is too replaced, ultimately by MCIL connectors.

5.19 HighPower JB (Starboard Side).

Prior to the cruise an additional lighting circuit was installed to utilize the spare lighting capacity in the high power tube, however this was not implemented on this cruise but was available should any of the other circuits have failed.

6. Isis System Topside:

6.1 Clearcoms:

Worked well for the duration of the cruise.

Future modifications/improvements/maintenance:

- None
- Identify no of spare headsets, or spares if necessary.

6.2 Jetway:

This operated well for the duration of the cruise.
A remote emergency stop facility was introduced on this cruise which, whilst not tested in anger, provided reassurance that should a fault develop within the jetway compartment then any one passing would have the opportunity to shut down the unit without opening the compartment and exposing themselves to possible injury.

Future modifications/improvements/maintenance:

- It is proposed that during the inter cruise layup further enhancements such as remote indicator lights etc be provided. It is also suggested that an oil change and check of the transformer internal connections be made.

6.3 Device Controller:

At the beginning of the cruise control software was modified to accommodate a 2nd Kongsberg Pan & Tilt in replacement of the ROS science unit

Future modifications/improvements/maintenance:

- Previous cruise recommendations remain

6.4 Techsas PC:

Operated well for the duration of the cruise

Future modifications/improvements/maintenance:

- None

6.5 CLAM PC:

Due to a failure of the serial com1 port which communicates with the remote winch control unit a spare PC was instated.

Future modifications/improvements/maintenance:

- Investigate potential repair of com port

6.6 Event Logger PC:

Operated well for the duration of the cruise

Future modifications/improvements/maintenance:

- None

6.7. Reson 7125 Multibeam:

Operated well for cruise duration

Future modifications/improvements/maintenance:

- Obtain cable and blank spares

6.8 Tritech Super Seaking PC:

Operated well for cruise duration
A ground fault appeared on this channel during Dive 235 but was found not associated with this device. The unit was only powered on when deemed necessary, due to the uncertainty of the GF problem.

Future modifications/improvements/maintenance:

- Investigate GF problem

6.9 Topside PC:

Operated well for the duration of the cruise

Future modifications/improvements/maintenance:

- None

6.10 DVLNAV PC:

Operated well for the duration of the cruise

Future modifications/improvements/maintenance:

- None

6.11 Pilot/Engineer PC

Operated well for the duration of the cruise

Future modifications/improvements/maintenance:

- None

6.12 Video Recording / Archiving

4 off AJA KiPro recorders connected to HD1 Science, HD2 Pilot, HD3 Scorpio and selectable composite channel provided video recording.

A main laboratory setup of 2 imac computers, 3 off 18TB (45TB total usable) Promise Raid 5 with Thunderbolt connectivity to WD MyBooks provided an archiving / editing facility. The 2nd imac computer was installed with Final Cut Pro X for editing

Future modifications/improvements/maintenance:

- A 4th 18TB Promise unit should be sourced as this cruise demonstrated the requirement for additional capacity as we now routinely recording 3 off HD video channels.
- Funding provided investigation to progress to a direct 4 channel video recording / archiving system

6.13 Network Video Stream:

Prior to the cruise the Avermedia PC unit was replaced with an Axis 4 channel video server. Live frame rate and compression controlled video was streamed on the ship network for science to monitor via a web browser or Axis software made available for download on the ship science server. An Avocent feed was supplied to the bridge DP position from the main lab.

7. Isis Topside Technical Details:

7.1 Ship Connections:

All ship data connections were made via Hangar Fieldbus FB17 junction box,

A remote HD-SDI fibre video feed was made via the new Hangar deep tow fibre junction box which breaks out in the aft section of the main lab. From here a fibre line was installed to the plot table viewing area.

This cruise saw the introduction of a KVM matrix for control of the ROV system computers. This comprised of 2 off 32 channel master stations (1 redundant) and associated remote consoles. This worked extremely well simplifying operations and enabled the setup of a remote pc console in the main lab for science to prepare event logger and multibeam computers prior to dives. The screen display was extended to the plot table area for general viewing.

7.2 Fibre Optic Terminations:

The stock of old ST FO connectors are now depleted, after 2 re-terminations, however new crimp and glue connectors currently supplied by RS and other suppliers have proven successful in terminating onto the armoured jacket.

Future modifications/improvements/maintenance:

- Check all test equipment.
- Replace and stock connectors, glue etc

7.3 Power Supplies

See remarks under Jetway.

Future modifications/improvements/maintenance:

- General check and refurbish as necessary – see also under Jetway.

7.4 Air Conditioning Units

Worked well for the duration of the cruise

Future modifications/improvements/maintenance:

- Look at an additional unit to improve overall cooling of control containers

8.0 ISIS Dive Summary (hrs run)

Cruise No.	Dive No.	Dive Hrs.	System Total Hrs	Max Depth (m)	Time at Bottom (hrs)
JC094	221	3.53		560	0
JC094	222	16.91		1079	14.53
JC094	223	17.22		666	16.18
JC094	224	18.87		2132	15.6
JC094	225	23.9		2742	19.38
JC094	226	18.27		500	17.1
JC094	227	21.18		1300	18.73
JC094	228	20.9		1987	17.75
JC094	229	19.5		1279	17.65
JC094	230	25.07		2823	21.97
JC094	231	24.62		1494	22.32
JC094	232	19		1270	17.32
JC094	233	23.58		2980	19.92
JC094	234	18.92		1540	15.88
JC094	235	23.67		1509	21.22
JC094	236	43.75		900	41.82
JC094	237	22.08		2280	19.25
JC094	238	19.25		840	14.55
JC094	239	25.17		1520	23.17
JC094	240	20.17		2175	17.45
JC094 Totals	**(20 dives)**	**425.56**	**3527.95**	**2980**	**371.79**