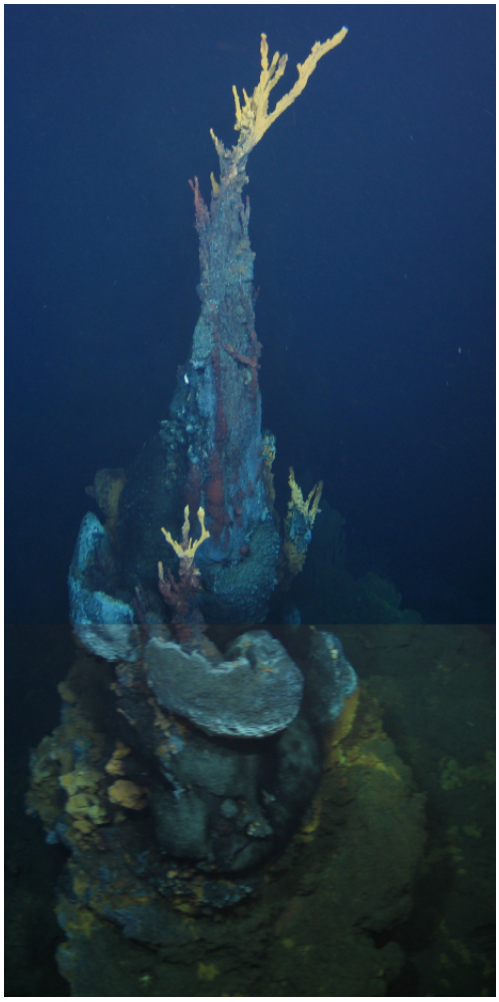
RRS JAMES COOK
RESEARCH CRUISE JC67
DRAGON VENT FIELD, SW INDIAN OCEAN
27 - 30 NOVEMBER 2011



Cruise Report

Dr JT Copley
University of Southampton

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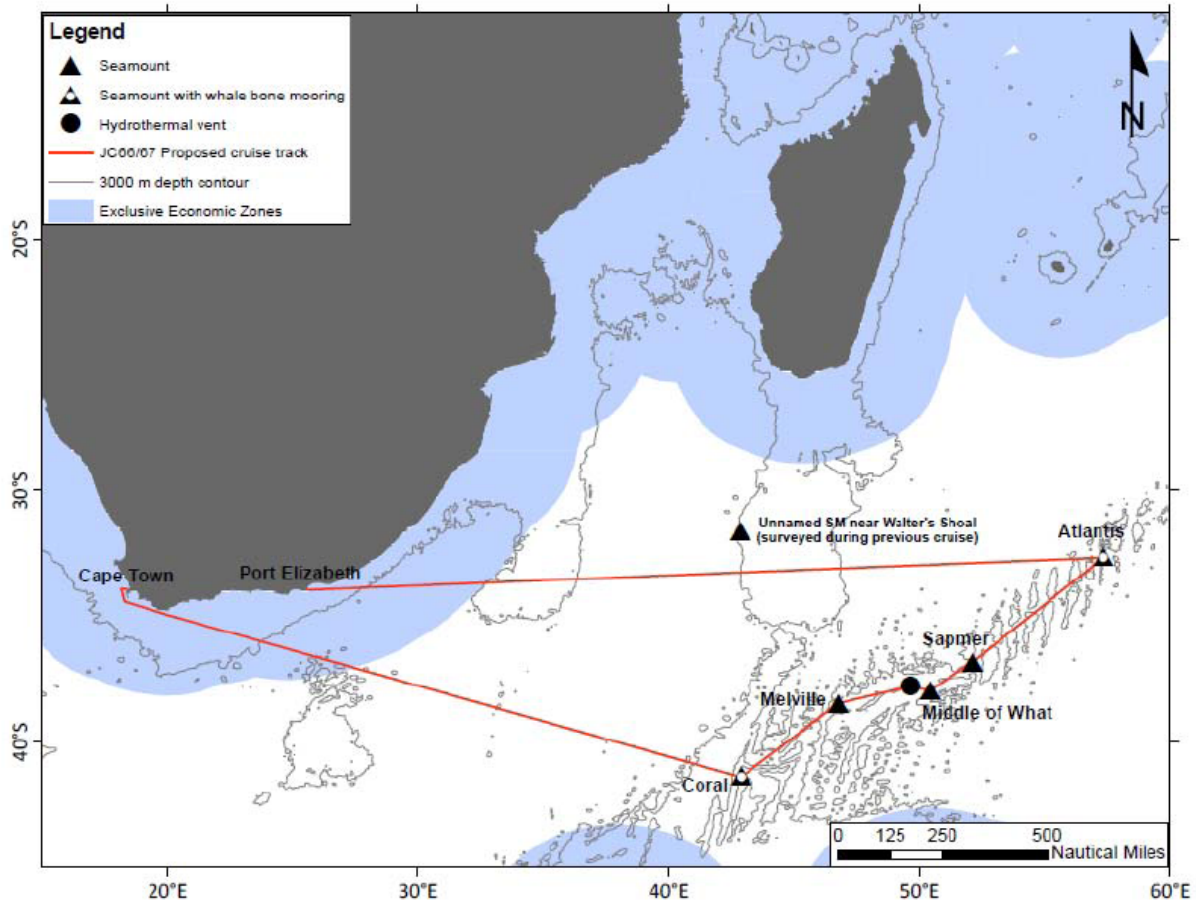
1 INTRODUCTION

Research Cruise JC67 of the *RRS James Cook* took place between 27-30th November 2011. JC67 was a "bolt-on" shiptime project, funded by a NERC Small Grant (NE/H012087/1, "*Biogeography and ecology of the first known deep-sea hydrothermal vent field on the ultraslow-spreading SW Indian Ridge*", PI Dr Jon Copley, University of Southampton) to take advantage of the opportunity presented by the location of the ship with an ROV in the Indian Ocean for Research Cruise JC66. The shiptime of JC67 therefore took place during the shiptime of JC66, diverting the ship for three days of ROV operations for the separate JC67 project.



Cruise track for JC66/67 (from JC66 Cruise Report, Rogers et al., 2012); circle symbol denotes operation area for JC67

1.1 Shipboard participants

JC67 PSO:	Dr Jon Copley, University of Southampton
JC67 XSO:	Leigh Marsh, University of Southampton
JC67 HyBIS ops:	Veit Hühnerbach, NOC-S
JC67 TLO & ROV ops:	David Edge, NMF-SS
JC67 CTD ops:	John Wynar, NMF-SS
JC67 ROV ops:	Russell Locke, NMF-SS
JC67 SHRIMP ops:	James Cooper, NMF-SS
JC67 SST:	Leighton Rolley, NMF-SS
Kiel6000 ROV ops:	Martin Pieper, IFM-GeoMar

	Dr Inken Suck, IFM-GeoMar
	Hannes Huusman, IFM-GeoMar
	Patrick Cuno, IFM-GeoMar
	Matthias Bodendorfer , IFM-GeoMar
	Jan Hennke , IFM-GeoMar
JC66 PSO:	Prof Alex Rogers, Oxford University
JC66/67 scientific party:	Dr Tim Ferrero, NHM
	Dr Lucy Woodall, NHM
	Margaret Packer, NHM
	Dr Jane Read, NOC-S
	Dr Michelle Taylor, Oxford University
	Dr Phillipe Supan-Bosche, Oxford University
	Elizabeth Müller, Oxford University
	Anni Djurhuus, Oxford University
	Chong Chen, Oxford University
	Dr Peter Lamont, SAMS
	Dr Natali Serpentti, SAMS
	Adam Chivers, SAMS
	Clare Webster, University of St Andrews
	Dr David Staples, University of Victoria, Aus
	Dr David Shale, photographer
JC66 mech eng:	Neil Sloan, NMF-SS

NOC-S = National Oceanography Centre, Southampton
NHM = Natural History Museum, London
SAMS = Scottish Association for Marine Science

Master:	William Richardson
1st Officer:	Richard Warner
2nd Officer:	Michael Hood
3rd Officer:	Amy Walker
Chief Engineer:	Robert Lucas
2nd Engineer:	Christopher Uttley
3rd Engineer:	Ian Collin
3rd Engineer:	Innes Maclean
ETO:	David Hawksworth
PCO:	Antony Stevens
CPOS:	Mick Minnock
CPOD:	Andy Maclean
POD:	David Price
SG1A:	Ian Cantlie
SG1A:	William Mackenzie
SG1A:	Kenneth Sims
SG1A:	Peter Smith
ERPO:	James Harris
Head Chef:	Christopher Keighley
Chef:	Wally Link
Steward:	Graham Mingay
Assistant Steward:	Roger Herbertson

1.2 JC67 science background

The discovery of faunal assemblages supported by chemosynthetic primary at hydrothermal vents in the Eastern Pacific in 1977 initiated one of the most productive fields in deep-ocean science, yielding more than 400 new faunal species so far (Desbruyères *et al.*, 2006) and advancing understanding of the dispersal of deep-sea fauna from studies of these ephemeral and insular seafloor habitats (Tyler & Young, 2003). The continuing discovery of hydrothermal vent fields indicates that they are more widespread features of the deep ocean than originally realised, with more than six biogeographical provinces so far proposed from differences in the taxonomic composition of vent communities (Van Dover *et al.*, 2002; Bachraty *et al.*, 2009; Vrijenhoek, 2010; Rogers *et al.*, 2012). The first-order question of how these provinces originate and are maintained, however, remains unanswered (Tyler *et al.*, 2002).

The occurrence of hydrothermal venting along mid-ocean ridges exhibits a linear relationship with seafloor spreading rate (German & Parson, 1998; Baker *et al.*, 2004). On fast-spreading ridges, such as the East Pacific Rise (EPR), vent fields may be less than tens of kilometres apart, while on slow-spreading ridges, such as the Mid-Atlantic Ridge (MAR), vent fields are hundreds of kilometres apart. Ridge spreading rate could therefore be a factor influencing the biogeography of vent fauna, acting as a filter on the dispersal capabilities of species. The vent fauna of ultraslow-spreading ridges, however, remain largely unknown (Pedersen *et al.*, 2010; Connelly *et al.*, 2012), despite such ridges constituting >20% of the global mid-ocean ridge system by length (Baker *et al.*, 2004).

Faunal assemblages at hydrothermal vents in the Indian Ocean were first observed on the intermediate-spreading Central Indian Ridge (CIR) in 2000 (Hashimoto *et al.*, 2001; Van Dover *et al.*, 2001). The fauna of CIR vents exhibit taxonomic affinities with those of the western Pacific, although sites are also dominated by a species of alvinocaridid shrimp closely related to that found at deep Mid-Atlantic vents (Watabe & Hashimoto, 2002; Komai et al., 2007; Komai & Segonzac, 2008). In the Indian Ocean there is a discontinuity in the spreading rate of the mid-ocean ridge at the Rodriguez Triple Junction, where the ultraslow-spreading SW Indian Ridge (SWIR) meets the intermediate-spreading Central and SE Indian Ridges, providing an opportunity to examine the influence of spreading rate on the biogeography of vent fauna. The SWIR was therefore identified by the international Census of Marine Life ChEss (Chemosynthetic Ecosystems) programme as a priority area to elucidate global biogeographic patterns and processes in chemosynthetic ecosystems (ChEss Steering Committee, 2007).

Water column signals indicative of several hydrothermal vent fields along the SWIR were detected in 1997 (German *et al.*, 1998) and the first seafloor observation of an active vent field on the ridge was made by an Autonomous Underwater Vehicle (AUV) during a Chinese research cruise in February-March 2007 (Tao *et al.*, 2012),

The vent field, named the "Dragon Vent Field", is located at 37° 47' S 49° 39' E at a water depth of ~2800 m. The 2007 AUV survey obtained images of black smoker venting, sulfide edifices and vent fauna at the site, but did not have the capability to collect samples. Images from the AUV showed stalked barnacles, anemones, and gastropods (Tao *et al.*, 2012), similar to the fauna observed at vent fields on the CIR (Hashimoto *et al.*, 2001; Van Dover *et al.*, 2001), and on the East Scotia Ridge by NERC Consortium NE/D01249X/1 (Rogers *et al.*, 2012).

Collecting samples and surveying the fauna from the Dragon Vent Field therefore provides the opportunity to advance understanding of the biogeography of deep-sea chemosynthetic environments, which in turn offer a model for understanding dispersal and evolution in the deep sea. The Dragon Vent Field also lies within the designated area where the China Ocean Minerals Research Agency (COMRA) has recently (June 2011) been granted a licence by the United Nations International Seabed Authority (ISA) for exploratory mining of polymetallic sulfide deposits associated with deep-sea hydrothermal vents.

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1.3 JC67 scientific objectives

The NERC Small Grant supporting research cruise JC67 was funded to achieve the following specific objectives:

(1) characterise vent fauna from the SWIR, collecting samples of the dominant fauna for taxonomic identification and phylogenetic analysis, to elucidate the biogeographic affinities of SWIR vent fauna;

(2) test the hypothesis that the lower incidence of hydrothermal venting along ultraslow-spreading ridges may impose a filter on the life-history biology of faunal species at vents;

(3) determine the interannual variability of faunal microdistribution for the first time at a vent field on an ultraslow-spreading ridge, by comparing imagery from JC67 with that obtained by AUV dives in 2007.

1.4 Preparations and planning for JC67

JC67 was designed to take advantage of the opportunity presented by RRS James Cook Research Cruise JC66, which was funded to investigate seamounts in the SW Indian Ocean with the UK ROV facility (NERC Standard Grant NE/F005504/01; PI: Alex Rogers, Oxford University). The proposed cruise track for JC66 came within ~110 km of the Dragon Vent Field, thereby allowing a short "bolt-on" project to divert the ship and enable the first ROV dives at that site.

The only mechanism available for funding "bolt-on" shiptime in 2007 was via the NERC Small Grant scheme, which at that time had a £25k limit for directly incurred project costs. Unlike NERC Standard Grants, where shiptime is provided "free at the point of use", full costs of "bolt on" shiptime including ROV operation costs had to be included as directly incurred costs in the Small Grant proposal. The maximum amount of "bolt-on" shiptime with ROV operations that could therefore be funded for this project was 72 hours.

To achieve its scientific objectives in 72 hours of "bolt-on" shiptime, the funded proposal specified two dives with the UK's *Isis* ROV, as follows:

Dive#1: videographic survey of the vent field using high-definition camera and laser scale, repeating and augmenting AUV survey lines from 2007, for Objectives 1 and 3 (16 hours required for >5 km total of survey lines at 0.1 ms^{-1}); first collection of dominant fauna, using ROV manipulators and suction sampler as appropriate, for Objectives 1 and 2 (6 hours); total dive time including 8 hours for deployment / descent and ascent / recovery: 30 hours.

Dive#2: further sampling of fauna, with integrated temperature / pH / Eh probe measurements to quantify microhabitat parameters, for Objectives 1 and 2 (14 hours); sampling of meiofauna with push cores and scoops where

appropriate, for Objective 1 (4 hours); sampling of vent fluids using titanium syringe, for Objective 1 (4 hours); total dive time including 8 hours for deployment / descent and ascent / recovery: 30 hours.

Based on previous experience with the *Isis* ROV at vent fields in similar depths, four hours of deck time were anticipated for turnaround of the vehicle between dives, with eight hours included for contingency or extension of the activities, giving a total of 72 hours of ROV operations at the site.

Unfortunately, the *Isis* ROV was severely damaged in an accident in January 2011, and was therefore not available for use during the shiptime scheduled for JC66/67 in November 2011. NERC NMF-SS therefore negotiated the use of the *Kiel6000* ROV, operated by IFM-GeoMar, as an "alternative" system for JC67 operations.

During a late stage of cruise planning, it was confirmed that the *Kiel6000* ROV could only operate for a maximum of 12 hours per day, unlike the 24h-capable *Isis* ROV for which this project was designed. With only 72 hours of shiptime available for JC67, plans therefore had to be fundamentally altered as a result of this limitation.

It was therefore decided to use the HyBIS TV-grab system and SHRIMP deep-tow camera platform to conduct video reconnaissance of the vent field during the anticipated 12 hours of *Kiel6000* ROV downtime each day. The goal for these operations was to provide targets for subsequent ROV dives, and where possible survey of areas previously visited by the AUV in 2007, for Objective 3 of the funded project.

2 JC67 EQUIPMENT USED

*2.1 **CTD** (John Wynar, NMF-SS)*

The sensor configuration was as follows:

Sea-Bird 9plus underwater unit, s/n: 09P-0943
Frequency 0 - Sea-Bird 3 Premium temperature sensor, s/n: 03P- 2674
Frequency 1 - Sea-Bird 4 conductivity sensor, s/n: 04C-2231
Frequency 2 - Digiquartz temperature compensated pressure sensor, s/n: 110557
Frequency 3 - Sea-Bird 3 Premium temperature sensor, s/n: 03P - 4872
Frequency 4 - Sea-Bird 4 conductivity sensor, s/n: 04C-3258
V0 - Sea-Bird 43 dissolved oxygen sensor, s/n: 43-0862
V2 - Benthos PSA-916T 7Hz altimeter, s/n: 41302
V3 – WETLabs turbidity sensor, s/n: BBRTD-759R
V4 – Seatech Light Scatter Sensor s/n:339
V5 – Chelsea Aquatracka MKIII fluorometer, s/n: 88-2960-163
V6 - Free
V7 – Chelsea Alphatracka MKII transmissometer, s/n: 161047

Ancillary instruments & components:

Sea-Bird 11plus deck unit, s/n: 11P-24680-0587
Sea-Bird 24-position Carousel, s/n: 32-60380-0805
24 x Ocean Test Equipment 10L water samplers, s/n: 1A through 24A

CTD cast data were post-processed according to guidelines established with BODC (ref. Moncoiffe 7th July 2010). After plotting oxygen against pressure using Seaplot an oxygen advance of 8 seconds was chosen.

WildEdit was not used during processing, it being deemed unnecessary. LoopEdit was employed during processing but saved as a separate file and no further processing carried out on those files.

*2.2 **Kiel6000 ROV** (Dr Inken Suck, IFM-GeoMAR)*

ROV KIEL 6000 is a 6000 m rated deep diving platform, manufactured by Schilling Robotics LLC, Davis, USA. Its design is based on commercially available ROVs, but customised to our demands, e.g. being electrically driven and truly mobile. Until today, ROV KIEL 6000 has been operated from a variety of different research vessels (RV Sonne, N/O l'Atalante, RV Maria S. Merian, RV Meteor, RV Celtic Explorer and RV Polarstern). As an electric work class ROV of the type QUEST, this is build No 7. ROV KIEL 6000 is based at the Leibniz Institute for Marine Sciences IFM-GEOMAR in Kiel, Germany (GEOMAR/ Helmholtz Centre of Marine Research after 1st of January 2012).

Ship's power supply differs to other ships from which ROV KIEL 6000 has been operated. Instead of the more common 380 V, 415 V are fed into the

system. In addition, voltage on one of three phases was significantly higher, causing problems in all subsequent rectified DC-systems. The winch's frequency converter was able to handle this by changing firmware parameters. This was not the case for the ROV converter, i.e. no adjustments were possible.

The vehicle is equipped with 7 electric thrusters. Power is supplied through a 19 mm diameter steel armoured umbilical with 4160VAC/460 Hz. The deep sea winch (manufactured by Hatlapa, Uetersen, Germany) takes up 6500 m of umbilical (NSW, Nordenham, Germany).

ROV KIEL 6000 is configured as a "free flyer" and thus does not require a tether management system (TMS). Two sets of floats (i.e. 3 and 9 floats, each with a buoyancy of 7kg) mounted onto the first 60-70 metres of the umbilical decouple the ROV from ship's movements. Thus, the ROV is capable of making excursion of up to 200 metres away from the aft of the ship, before the ship needs to be re-positioned.

KIEL 6000 is equipped with two manipulator arms. A seven-function position controlled manipulator ORION is used for dexterious operations, and a five-function rate controlled manipulator RIGMASTER performs more rugged tasks.

A motion reference unit (MRU) containing a fibre optic gyro is mounted. The MRU is used for controlling the vehicle's balanced movements within the water column and at the bottom.

An RDI Doppler velocity log (DVL) allows the small-scale positioning /displacement of the vehicle in the range of 10s of centimetres at the seafloor, which is especially important during crucial operations like mosaicking.

For general underwater navigation, a USBL-based IXSEA POSIDONIATM system is installed on the ROV. As RRS James Cook is not equipped with POSIDONIA, during the present cruise, 2 mobile autonomous Sonardyne transponders (Fig. 11) were attached to the ROV for navigation. For more details on positioning and navigation see 'Telemetry and navigation' below.

A tool sled in the lower-most part of the vehicle is configured to take up the scientific payload. Located on the portside front of the tool sled is a sample tray that can be opened hydraulically and can be customized on demand using a modular set-up. On starboard front there is a drawer, likewise hydraulically driven, which can take up sample containers, probes or other scientific tools continuously mounted or used by the manipulator. Port aft and starboard aft are reserved for additional scientific payload which differ from mission to mission, e.g. the slurp gun carousel containing 8 containers, each with a volume of 2.5 litres.

Data transfer between the vehicle and the topside control van is managed by the digital telemetry system (DTSTM) that consists of two surface and four sub-sea nodes, each representing a 16-port module. Each port may be individually configured for serial (SIM), video (VIM) or network (NIM) purposes. During the present cruise, for example, communication to the NERC temperature probe was realized via a SIM.

The topside telemetry logging system ROVMon which has been developed and customized to our needs in-house, collects incoming data from ROV, ship, winch, CTD and Sonardyne navigation. It distributes data to several subsystems like the navigation system, the video overlay and data display clients. The telemetry system can handle TCP/IP, UDP and serial connections. The data are usually transferred as NMEA strings; if other formats are transferred, these can be converted by specialized frontends. The configuration of data logging is declared in advance where protocols, devices (sensors) and exports are specified for the ship and the cruise. The whole data set is written each second in CSV (comma separated values) files. The telemetry system starts a new file after a given interval for security reasons. The Sonardyne transponder information string is broadcasted by UDP datagrams to the ROVMon telemetry system. The date and the coordinates are converted for further use in the navigation system by a customized frontend.

For navigation and coordination with the ship during the dive we use the navigation software OFOP 3.2 (Ocean Floor Observation Protocol by SAMS, Texel, NL). Coordinates and heading data from the ship and the ROV are overlayed on a calibrated map.

Modifications to Kiel6000 facilities by UK NMF-SS *(Dave Edge)*

A requirement to provide continuous HD Video recording during dives, not provided by the Kiel system, offered the opportunity to advance the Isis HDV tape recorders to a hard disk solution. This provided superior quality video recording with Apple ProRes 422 (1.5 TB / 24 hrs.) compared with HDV (270GB / 24 Hrs.) in tape format. Benefits resulting with ease of video management and significant cost reduction in consumables.

The equipment was setup in the main lab for scientific operation: an Apple IMac computer, AJA KiPro recorder with 500GB disk caddies and 6TB Western Digital Mybooks for archiving master and backup copies. As a fall back in the event of equipment failure suitable HDV tape quantities were available to cover the cruise requirements. The Isis HDV tape recorders shared between SHRIMP operations. It is noted that scientists found the Proxsys network software used by Kiel to be a good solution for access to server stored media files.

The Kiel single control container, which allows a maximum of 2 scientists during dives, required a remote display setup in the main lab for the benefit of other scientist participation. To achieve this, a dual single mode fibre

cable was installed, channelled through the Bosun store, deck lab and through the forward door to the corridor. From here the cable was inserted into the existing conduit and fed into the main lab via the pass through next to the winch room hatch. The obvious alternative route through the ship's coaxial junction boxes was initially attempted but the degradation in signal prevented this despite insertion of repeater amplifiers.

2 off HD-SDI channels fed both HD camera and multi-windowed display from the ROV control container, HD to the video recorder with pass through to a local, component input HD 32" TV and via an HDMI extender over CAT5 cable to the scientific plot table TV display. The multi-windowed display utilised a Kiel HDMI projector and fold down screen.

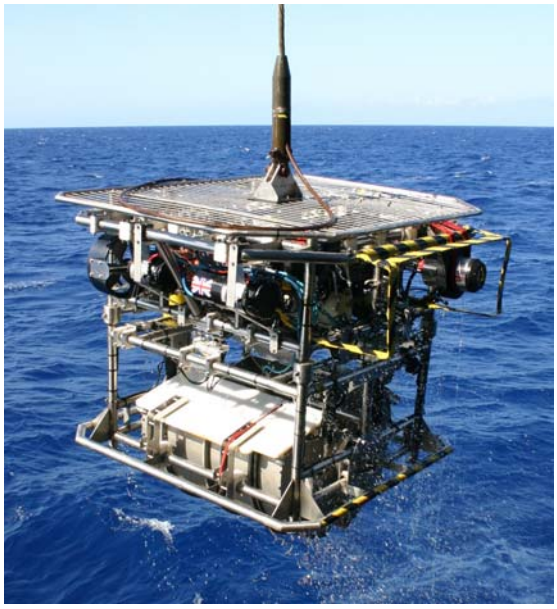
Two sets of 3 lasers were mounted on equilateral 0.1 m spacing brackets. One set of red lasers strapped to the HD camera housing and the other set of green lasers strapped to the upper pan & tilt camera housing; these were used for object scaling purposes. 24V power was supplied from the ROV via Schilling connector adaptor bottles to the two harnesses. During the cruise the alignment accuracy of the lasers were checked and adjusted in the lab. It was found that the internal laser modules were not in alignment with their housings.

*2.3 **HyBIS** (Veit Hühnerback, NOC-S)*

HyBIS is a multi-purpose robotic underwater vehicle (RUV) with a depth capability of 6000 m. It was designed and built in the UK by Hydro-Lek Ltd. in collaboration with the National Oceanography Centre, Southampton (NOC), in 2008.

The vehicle has a modular design; the top module consists of a command and power system with power management, cameras, lights, hydraulics, thrusters and telemetry. Telemetry is via a single-mode fibre optic link and provides 3 channels of real-time standard-definition colour video plus vehicle attitude data. Power is supplied through a single-phase 1500V ac, 8kVA umbilical and converted to 3-phase 120V on the vehicle by two silicon motor controllers, 240V ac for the lights, and 24 to 12 V dc for onboard instruments. For JC67, the lower module of HyBIS consisted of a 0.5 cubic metre clam-shell grab with a pay-load capacity of 750kg and closure force of 4 tonnes.

Unlike a conventional ROV, HyBIS does not have any floatation or buoyancy; it is suspended by its umbilical cable directly from the ship which makes it slightly susceptible to ship roll and heave motion.



HyBIS with lower grab module

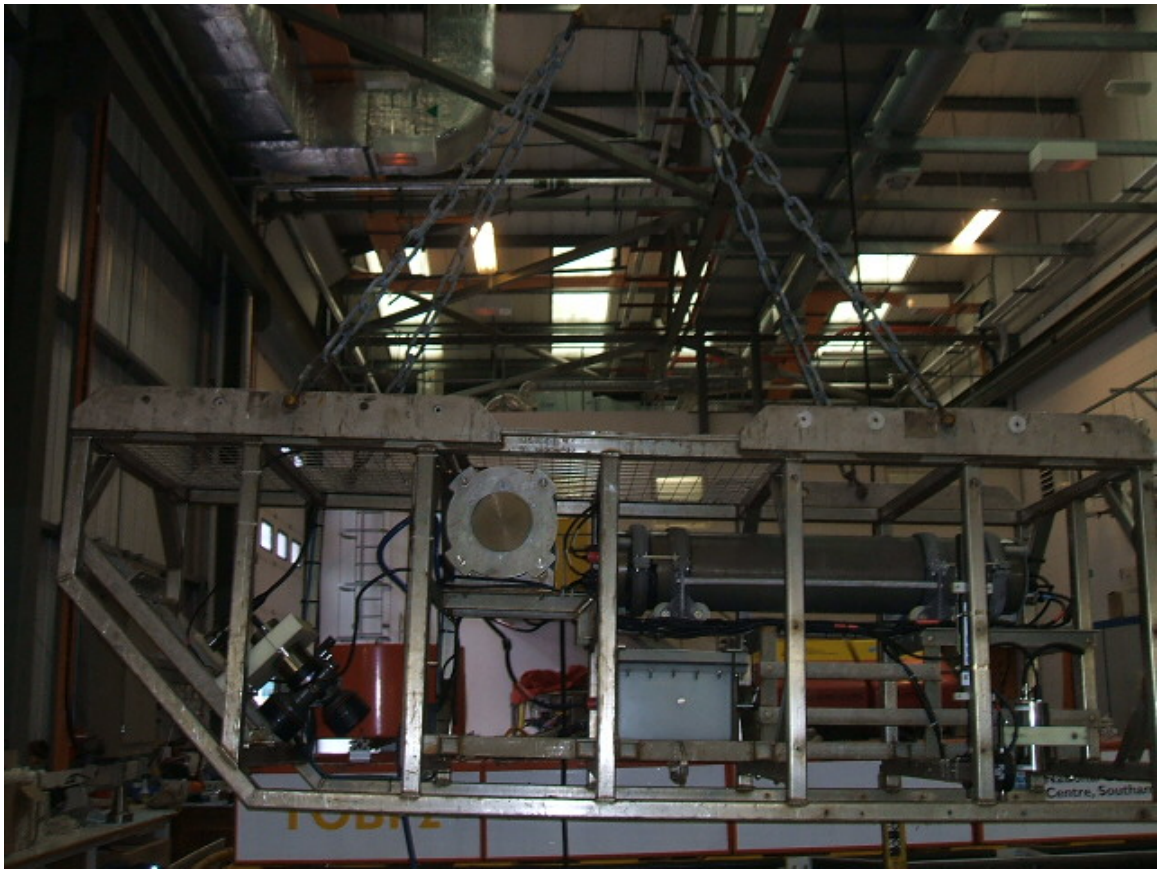
The top-side control centre was established in the Main Lab aboard RRS James Cook, on the starboard side, towards the aft and next to the high-voltage bulk-head connections. This minimised the length of trailing high-voltage leads across the lab. The vehicle's primary control box was supplemented with additional monitors and a relay of the USBL navigation screen. A video-extended Cat5 cable was used to relay the forward-looking camera's video stream to a 42 inch flat screen on the forward bulkhead of the main lab to enable group viewing. A dedicated GPS aerial was mounted on an out-rigger over the starboard side and provided a continuously recorded GPS string to the Garmin GPS navigation system in the control box. Winch controls were established adjacent to the vehicle pilot's position, allowing synchronisation between winch operator and pilot.

Video was recorded digitally as DV and AVI formats on 2Tb hard-discs. All three cameras (forward and downward SD and forward HD) were recorded continuously in standard definition. The forward looking camera with vehicle attitude data overlain was also recorded on DVDs of about one hour length. Full HD video (1080i, PAL, 30fps, AVCHD format) was down-loaded from the vehicle's HD camera after the dives at each of the 5 seamounts were completed and copied to another 2Tb hard drive provided. Back-ups of all dive data and videos were then made on regular intervals. All GPS navigation data were recorded on the top-side command unit and copied to a USB portable drive. Time codes were all set and synchronised to UTC.

Acoustic navigation was provided by the Sonardyne USBL system aboard the RRS James Cook and a Super-sub mini transponder on the HyBIS vehicle. Tracking was generally good although transponder battery conditions deteriorated with time. All available USBL navigation data were recorded by the Sea Systems computing representative onboard.

Prior to the first deployment, a lockable enclosure had to be built in order to comply with UK high-voltage regulation. The 1500V HyBIS power supply, and also the SHRIMP power pack, were placed within a steel cage, inaccessible to unauthorised personnel. HV safe working procedures were followed, which meant that power would be cut to HyBIS and SHRIMP during deployment and recovery. All procedures were communicated to and agreed with the crew. HV working permits were issued and signed off for each deployment. In addition, the lab entrance from the deck side was closed off after power up of the HV equipment to limited access to the area.

*2.4 **SHRIMP video sled** (James Cooper, NMF-SS)*



The SHRIMP video sled

JC67 instrumentation

Video/Data: Focal 901 video/data multiplexer

Cameras: 1 x Insite Pacific video camera (from *Isis*) on pan-and-tilt mount
1 x Bowtech LC3 video camera (rear-facing, at an angle)
1 x Imenco combined video and digital stills camera with flash and internal light
1 x Mini Zeus (from *Isis*) HD 1080i high definition camera, downward facing

Lights: 1 x Deep sea power and light 400Watt HID lamps (downward)
2 x 250W halogen lamps (downward)
1 x 250W equivalent LED lamp on pan-and-tilt mount

JC67 operation notes

1) The Imenco stills camera was damaged on the second dive of JC66 and was not operational for the remainder of JC66/67.
2) 0.1 m scaling lasers were fitted during JC66, prior to JC67, and are visible in the HD video feed
3) Power supply noise was present, in particular on the forward looking Insite Pacific camera. The best quality images were recorded on the HD system, which was installed from salvaged Isis components.
4) Recording was realised using 3 x short play (1h per disk) DVD recorders and an HD tape deck.

2.5 Shipboard systems

For details of the shipboard meterological and underway systems logging data during JC67, please refer to the Cruise Report for JC66. All ship system data (meterological data and other underway sensor data) are archived with BODC in the data files for JC66 (data for "bolt on" JC67 days are 27-30 November within the records for JC66).

3 SCIENCE LOG

During the 72 hours of science time for JC67 (0100 UTC 27 November to 0100 UTC 30 November 2011), no time was lost to poor weather. In total, deep platforms (*Kiel6000* ROV, *HyBIS*, *SHRIMP*) spent ~40 hours working on the seafloor (55% of science time), and ~19 hours travelling to / from the seafloor.

The *Kiel6000* ROV undertook three dives, with a total bottom time of ~22 hours. *HyBIS* and *SHRIMP* completed ~29 hours of operations. Overall, ~61 hours (86%) were spent with equipment deployed from the ship, and ~11 hours (14%) were spent on ship movements and deck work such as wire changes.

Specific science activities during the 72 hours of JC67 consisted of:
1 x CTD deployment (JC67 Station 1)
3 x Kiel6000 ROV dives (JC67 Stations 2, 6, 8)
4 x HyBIS dives (JC67 Stations 3, 4, 5, 9)
1 x SHRIMP dive (JC67 Station 7)

Waypoints provided to the Bridge and ROV for navigational reference during JC67 operations were as follows:

Waypoint	*Latitude*	*Longitude*	*Approx depth*
JC67 WP 1	37º 47.022' S	49º 38.942' E	~2780 m
JC67 WP 2	37º 47.068' S	49º 38.894' E	~2830 m
JC67 WP 3	37º 47.016' S	49º 38.980' E	~2740 m
JC67 WP 4	37º 47.041' S	49º 38.968' E	~2780 m
JC67 WP 5	37º 46.848' S	49º 38.900' E	~2760 m
JC67 WP 6	37º 46.700' S	49º 38.900' E	~2750 m
JC67 WP 7	37º 46.985' S	49º 39.051' E	~2725 m

3.1 NARRATIVE LOG (all times and dates UTC)

27th November 2011

00:47	Ship arrived at Dragon Vent Field, SW Indian Ridge: 37º 47.027' S 49º 39.000' E, water depth 2777 m. Ship manoeuvring on DP to JC67 WP 1 for CTD deployment.
00:54	Ship on station at JC67 WP 1: 37º 47.022' S 49º 38.942' E.
01:00	JC67 Station 1: CTD in water, with SVP to calibrate USBL for deep platforms navigation, LSS to confirm presence of vent plume, and Niskin bottles to collect water samples for physical oceanography and

	microbiology.
02:02	CTD downcast completed; profile maximum depth 2780 m.
03:16	CTD on deck, after collecting water samples on upcast; JC67 Station 1 completed.
03:18	Ship manoeuvring to JC67 WP 2 for ROV launch.
03:31	On station at JC67 WP 2: 37º 47.068' S 49º 38.894' E.
03:45	Processed SVP uploaded to USBL system.
04:44	JC67 Station 2: *Kiel6000* ROV in water.
06:03	ROV arrived on seafloor at 37º 47.055' S 49º 38.913' E, depth 2800 m.
07:59	ROV sampling at first sampling location of dive: 37º 47.029' S 49º 38.965' E, depth 2770 m.
08:37	ROV sampling completed at first sampling location.
09:37	ROV commenced HD video mosaicing of vent chimney at 37º 47.026' S 49º 38.963' E, depth 2763 m.
10:05	ROV completed HD video mosaicing of vent chimney.
10:30	ROV sampling at second sampling location of dive: 37º 47.027' S 49 º 38.963' E, depth 2783 m.
11:35	ROV sampling completed at second sampling location.
12:33	ROV left seafloor at 37º 47.029' S 49º 38.950' E, depth 2756 m.
13:45	ROV on deck; JC67 Station 2 completed.
14:35	JC67 Station 3: *HyBIS* launched at JC67 WP 3: 37º 47.016' S 49º 38.980' E.
15:30	*HyBIS* recovered to deck at 37 47.046' S 49 38.964' E to investigate HD camera fault; end of JC67 Station 3.
16:02	JC67 Station 4: *HyBIS* launched at 37º 47.046' S 49º 38.963' E.
17:28	*HyBIS* arrived on seafloor at 37º 47.026' S 49º 38.916' E, depth 2796 m.
20:17	Forward camera view lost from *HyBIS*.
20:54	*HyBIS* hauled from seafloor to fix light and camera at 37º 47.001' S 49º 38.939' E, depth 2747 m.
22:14	*HyBIS* on deck at 37 46.982' S 49 38.994' E; end of JC67 Station 4.
22:55	JC67 Station 5: *HyBIS* launched at 37º 47.024' S 49º 38.972' E.

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00:17	*HyBIS* arrived on seafloor at 37º 46.993' S 49º 38.926' E, depth 2753 m.
02:46	*HyBIS* hauled from seafloor; dive time complete, at 37º 46.996' S 49º 38.956' E, depth 2747 m.
04:09	*HyBIS* secured on deck at 37º 46.976' S 49º 38.998' E; JC67 Station 5 completed.

04:35	JC67 Station 6: *Kiel6000* ROV launched at 37 47.112' S 49 38.929' E.
05:49	ROV arrived on seafloor at 37º 47.018' S 49º 38.930' E, depth 2771 m.
08:51	ROV commenced HD video mosaicing of vent chimney at 37º 47.004' S 49º 38.967' E, depth 2736 m.
09:25	ROV completed HD video mosaicing of vent chimney.
10:39	ROV sampling at first sampling location of dive: 37º 47.003' S 49º 38.948' E, depth 2781 m.
11:59	ROV completed sampling at first location.
12:56	ROV sampling at second sampling location of dive: 37º 47.006' S 49º 38.973' E, depth 2758 m.
13:05	ROV completed sampling at second location.
13:08	ROV left seafloor at 37º 47.007' S 49º 38.974' E, depth 2738 m.
14:25	ROV secured on deck at 37º 47.025' S 49º 38.953' E; JC67 Station 6 completed.
14:30	Ship move started to JC67 WP 5.
17:02	JC67 Station 7: *SHRIMP* launched at 37º 46.847' S 49º 38.890' E.
18:26	*SHRIMP* arrived on seabed at 37 46.855' S 49 38.849' E, depth 2767 m.

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01:00	*SHRIMP* hauled from seabed, dive time complete, At 37º 47.104' S 49º 39.313' E, depth 2684 m.
02:13	*SHRIMP* secured on deck at 37º 47.144' S 49º 39.258' E; JC67 Station 7 completed.
02:15	Ship move started to JC67 WP 1 for ROV launch.
04:00	Ship on station at JC67 WP 1: 37 47.126' S 49 38.948' E.
05:02	JC67 Station 8: *Kiel6000* ROV in water.
06:22	ROV arrived on seafloor at 37º 47.024' S 49º 38.939' E, depth 2761 m.
11:08	ROV commenced HD video mosaicing of vent chimney at 37º 47.029' S 49º 38.954' E, depth 2759 m.
11:28	ROV completed HD video mosaicing of vent chimney.
12:28	ROV sampling at 37º 47.030' S 49º 38.967' E, depth 2785 m.
13:23	Power cut to dirty supply in main lab; HD recording in main lab interrupted, preventing finalisation of video file on hard drive.
13:29	Power restored to dirty supply in main lab.
13:35	Second power cut to dirty supply in main lab.
13:45	HD video recorded restarted on clean supply in main lab.
14:10	ROV sampling completed.
14:31	ROV left bottom for ascent at 37º 47.031' S 49º 38.965' E, depth 2761 m.
15:50	ROV secured on deck; JC67 Station 8 completed.

16:30	JC67 Station 9: *HyBIS* launched at 37º 46.984' S 49º 38.934' E.
17:47	*HyBIS* arrived on seabed at 37º 46.987' S 49º 38.893' E, depth 2795 m.
23:30	*HyBIS* left seabed; dive time complete, at 37º 46.677' S 49º 38.962' E, depth 2729 m.

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00:46	*HyBIS* secured on deck at 37º 46.767' S 49º 39.034' E; JC67 Station 9 completed.
00:50	Ship underway from Dragon Vent Field; end of JC67.

3.1.1 Total time allocations to activities during JC67

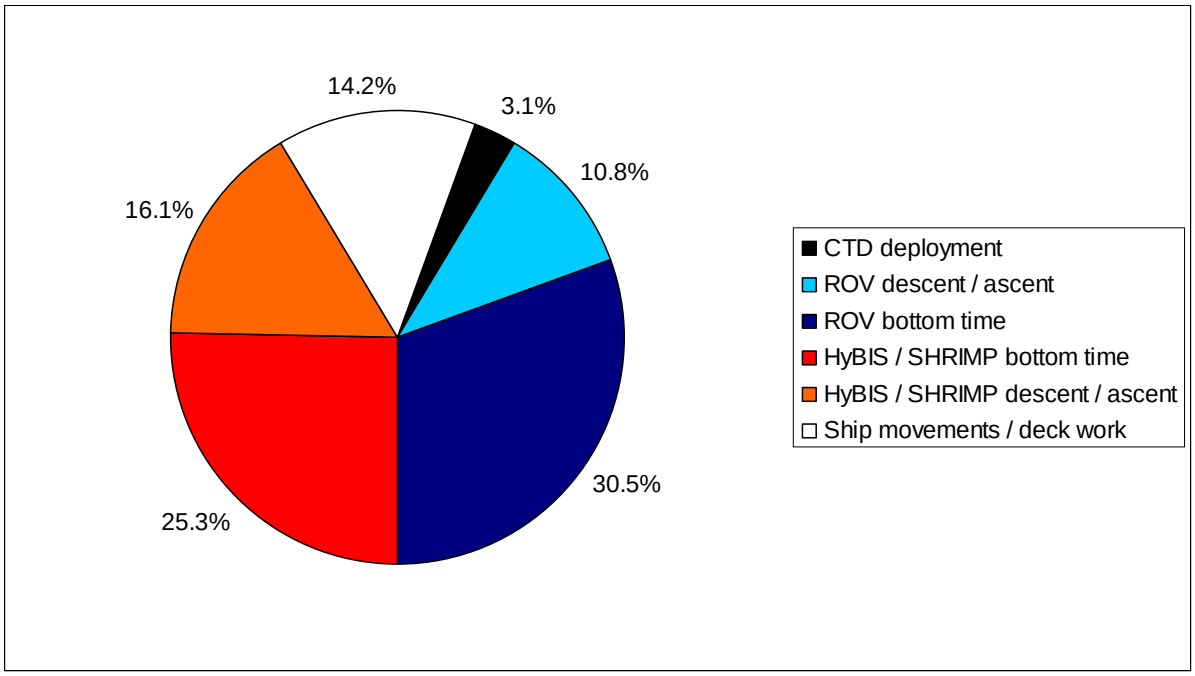
Total science time: 72 hours
Time lost to poor weather: none (0%)

Total CTD deployment time: 2 h 16 min (3.1%)

Total *Kiel6000* ROV deployment time: 29 h 44 min (41.3%)
Total *Kiel6000* ROV bottom time: 21 h 58 min (30.5%)
Total *Kiel6000* ROV descent / ascent time: 7 h 46 min (10.8%)

Total *HyBIS* / *SHRIMP* deployment time: 29 h 48 min (41.4%)
Total *HyBIS* / *SHRIMP* bottom time: 18 h 12 min (25.3%)
Total *HyBIS* / *SHRIMP* descent / ascent time: 11 h 36 min (16.1%)

Total bottom time for deep platforms: 40 h 10 min (55.8%)
Total time with equipment deployed from ship: 61 h 48 min (85.8%)
Total time on ship movements / deck work: 10 h 12 min (14.2%)



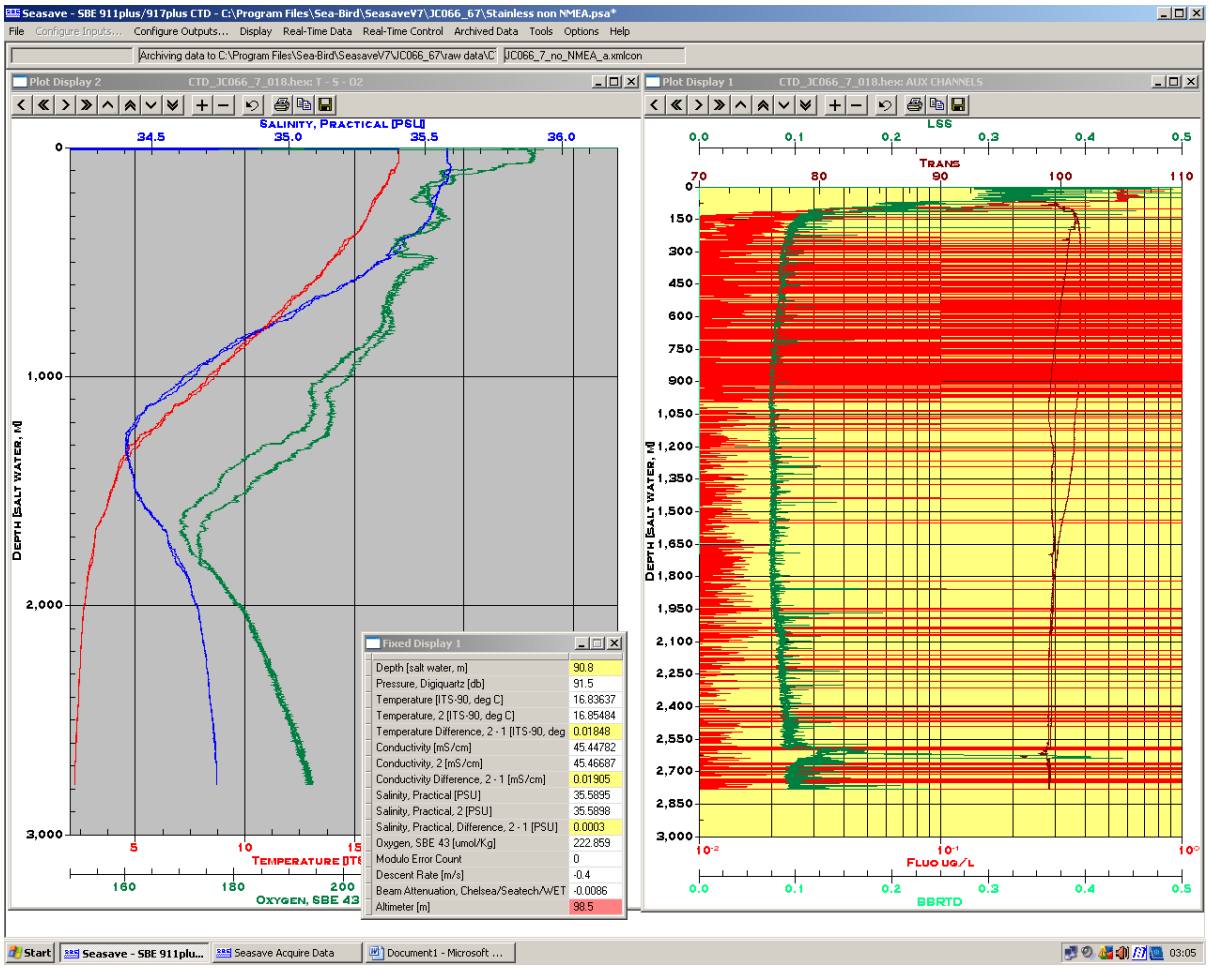
Activity allocation during JC67 science time

3.2 STATION LOG

3.2.1 JC67 Station 1

CTD deployment, with Sound Velocity Probe (SVP), Light-Scattering Sensor (LSS), and 24 Niskin bottles, 27 November 2011 (Julian Day 331).

00:54 UTC: Ship on station at 37º 47.022' S 49º 38.942' E, ~2780 m.
01:00 UTC: CTD deployed in water.
Maximum profile depth 2780 m (15 m altimeter reading).
24 Niskin bottles fired for water samples during upcast:
3 bottles at 2780 m (maximum depth)
3 bottles at 2600 m (strongest LSS plume signal)
3 bottles at 2500 m
3 bottles at 2000 m
3 bottles at 1700 m
3 bottles at 1300 m
3 bottles at 200 m
3 bottles at 40 m
03:16 UTC: CTD secured on deck.
03:45 UTC: Processed SVP profile uploaded into USBL system.



CTD profile screenshot.

3.2.2 JC67 Station 2

ROV *Kiel6000* JC67 Dive 1, 27 November 2011 (Julian Day 331).

03:31 UTC: On station at 37º 47.170' S 49º 38.913' E, ~2813 m
(ship position ~200 m south of JC67 WP 2, to put ROV on WP at dive point).
04:44 UTC: ROV deployed in water.
04:52 UTC: ROV left surface for descent.
06:03 UTC: ROV arrived in visual range of seabed at
37º 47.055' S 49º 38.913' E, depth 2800 m.
07:59 - 0837 UTC: Faunal samples collected at
37º 47.029' S 49º 38.965' E, depth 2770 m.
09:37 - 10:05 UTC: HD video mosaicing of vent chimney undertaken at
37º 47.026' S 49º 38.963' E, depth 2763 m.
10:30 - 11:35 UTC: Faunal samples collected at
37º 47.027' S 49 º 38.963' E, depth 2783 m.
12:33 UTC: ROV left seabed for ascent at
37º 47.029' S 49º 38.950' E, depth 2756 m.
13:45 UTC: ROV secured on deck.

ROV dive bottom time: 6 hours 30 minutes.

3.2.3 JC67 Station 3

HyBIS dive #77, 27 November 2011 (Julian Day 331).

13:45 UTC: *HyBIS* launched at 37º 47.016' S 49º 38.980' E.
HyBIS recovered to investigate HD camera problem.
15:30 UTC: *HyBIS* secured on deck at 37 47.046' S 49 38.964' E.

3.2.4 JC67 Station 4

HyBIS dive #78, 27 November 2011 (Julian Day 331).

16:02 UTC: *HyBIS* launched at 37º 47.046' S 49º 38.963' E.
17:28 UTC: *HyBIS* arrived on seafloor at
37º 47.026' S 49º 38.916' E, depth 2796 m.
20:17 UTC: video feed lost from *HyBIS* forward-looking camera.
20:54 UTC: *HyBIS* hauled from seafloor to investigate camera problem at
37º 47.001' S 49º 38.939' E, depth 2747 m.
22:14 UTC: *HyBIS* secured on deck at 37 46.982' S 49 38.994' E.

3.2.5 JC67 Station 5

HyBIS dive #79, 27-28 November 2011 (Julian Day 331-332).

22:55 UTC: *HyBIS* launched at 37º 47.024' S 49º 38.972' E.
00:17 UTC: *HyBIS* arrived at seafloor at
37º 46.993' S 49º 38.926' E, depth 2753 m.

02:46 UTC: *HyBIS* hauled from seafloor, dive complete, at
37º 46.996' S 49º 38.956' E, depth 2747 m.
04:09 UTC: *HyBIS* secured on deck at 37º 46.976' S 49º 38.998' E.

3.2.6 JC67 Station 6

ROV *Kiel6000* JC67 Dive 2, 28 November 2011 (Julian Day 332).

04:35 UTC: ROV launched at 37 47.112' S 49 38.929' E.
05:49 UTC: ROV arrived on seafloor at
37º 47.018' S 49º 38.930' E, depth 2771 m.
08:51 UTC: HD video mosaicing of vent chimney at
37º 47.004' S 49º 38.967' E, depth 2736 m.
10:39 - 11:59 UTC: Faunal samples collected at
37º 47.003' S 49º 38.948' E, water depth 2781 m.
12:56 - 13:05 UTC: Faunal samples collected at
37º 47.006' S 49º 38.973' E, water depth 2758 m.
13:08 UTC: ROV left seafloor for ascent at
37º 47.007' S 49º 38.974' E, depth 2738 m.
14:25 UTC: ROV secured on deck at 37º 47.025' S 49º 38.953' E.

ROV dive bottom time: 7 hours 19 minutes.

3.2.7 JC67 Station 7

SHRIMP camera sled deployment, 28-29 November 2011
(Julian Day 332-333).

17:02 UTC: *SHRIMP* launched at 37º 46.847' S 49º 38.890' E.
18:26 UTC: *SHRIMP* arrived on seabed at
37 46.855' S 49 38.849' E, depth 2767 m.
01:00 UTC: *SHRIMP* hauled from seabed, dive complete, at
37º 47.104' S 49º 39.313' E, depth 2684 m.
02:13 UTC: *SHRIMP* secured on deck at 37º 47.144' S 49º 39.258' E;

3.2.8 JC67 Station 8

ROV *Kiel6000* JC67 Dive 3, 29 November 2011 (Julian Day 333).

04:00 UTC: Ship arrived on station at JC67 WP 1: 37 47.126' S 49 38.948' E.
05:02 UTC: ROV launched.
06:22 UTC: ROV arrived on seafloor at
37º 47.024' S 49º 38.939' E, depth 2761 m.
11:08 - 11:28 UTC: HD video mosaicing of vent chimney at
37º 47.029' S 49º 38.954' E, depth 2759 m.
12:28 - 14:10 UTC: Faunal samples collected at
37º 47.030' S 49º 38.967' E, depth 2785 m.
13:23 - 13:45 UTC: Main Lab power cut interrupted HD video recording.
14:31 UTC: ROV left bottom for ascent at

37º 47.031' S 49º 38.965' E, depth 2761 m.
15:50 UTC: ROV secured on deck.

ROV dive bottom time: 8 hours 09 minutes.

3.2.9 JC67 Station 9

HyBIS dive #80, 29-30 November 2011 (Julian Day 333-334).

16:30 UTC: *HyBIS* launched at 37º 46.984' S 49º 38.934' E.
17:47 UTC: *HyBIS* arrived at seabed at
37º 46.987' S 49º 38.893' E, depth 2795 m.
23:00 UTC: *HyBIS* left seabed, dive time complete, at
37º 46.677' S 49º 38.962' E, depth 2729 m.
00:46 UTC: *HyBIS* secured on deck at 37º 46.767' S 49º 39.034' E.

3.3 DIVE LOGS

3.3.1 Kiel6000 JC67 Dive 1 (JC67 Station 2, 27 November 2011)

ROV dive 1 objectives:
- survey sulfide structures in vent field area corresponding to "S zone" defined by Tao *et al.* (2012)
- conduct video mosaic of sulfide structure
- sample sulfide structure to characterise vent fauna

Log of key dive events:
06:03 UTC: ROV arrived in visual range of seabed at
37º 47.055' S 49º 38.913' E, depth 2800 m.
07:59 - 0837 UTC: Faunal samples collected at
37º 47.029' S 49º 38.965' E, depth 2770 m.
09:37 - 10:05 UTC: HD video mosaicing of vent chimney undertaken at
37º 47.026' S 49º 38.963' E, depth 2763 m.
10:30 - 11:35 UTC: Faunal samples collected at
37º 47.027' S 49 º 38.963' E, depth 2783 m.
12:33 UTC: ROV left seabed for ascent at
37º 47.029' S 49º 38.950' E, depth 2756 m.

Dive narrative:

04:44 - ROV launched at 37º 47.170' S 49º 38.913' E.

06:03 - ROV arrived at seafloor at 37º 47.055' S 49º 38.913' E, depth 2800 m. Seafloor of basalt rubble and old pillows, with pelagic sediment dusting. Occasional macrourid fish. Vehicle heading 045º towards JC67 WP 1.

06:32 - ROV examining extinct sulfide structure, ~20 m high. Some shimmering water evident, with microbial mats, occasional *Munidopsis*-type squat lobster and anemone. Branching ?hydroids on pillar at top of structure. Occasional swimming polynoid polychaetes in water column.

06:23 (ROV positional data not recording until 06:30)

06:31: 37º 47.0316' S 49º 38.931' E,
view 351º, depth 2800 m, vehicle height 10.0 m.

06:33: 37º 47.031' S 49º 38.936' E,
view 020º, depth 2794 m height 19 m.

06:39 - ROV headed 071º towards bed of mussel shells and live *Phymorhynchus*-type whelks. Climbed slope towards base of sulfide edifice.

06:39: 37º 47.033' S 49 38.937' E,
view 071º, depth 2799 m, height 8.5 m.

06:49 - Encountered active flange of beehive diffusers on side of sulfide edifice, occupied by mussels, dark-coloured gastropods, occasional *Mirocaris*-type shrimp, and some clumps of Eolepadid stalked barnacles.

06:49: 37º 47.028' S 49º 38.945' E,
view 135º, depth 2786 m, height 10.4 m.

06:53 - At top of sulfide edifice, with two distinct inactive pinnacles, and coverage of stalked barnacles, with occasional whelks and anemones. Structure named "Knucker's Gaff".

06:53: 37º 47.0286' S 49º 38.950' E,
view 114º, depth 2778 m, height 16.2 m.

06:54 - ROV moving to the west of "Knucker's Gaff", and heading ~070º, past a flat-topped inactive edifice.

06:54: 37º 47.028' S 49º 38.946' E,

view 070º, depth 2780 m, height 19.7 m.

06:58 - ROV passing a small inactive column, heading ~072º.

06:58: 37º 47.013' S 49º 38.955' E,
view 062º, depth 2776 m, height 8.4 m.

07:00 - ROV climbing another sulfide edifice. Platform at top, with beehive diffusers and thin dendritic chimney structure. Platform occupied by mussels, gastropods, stalked barnacles. Structure named "Ryugu-jo".

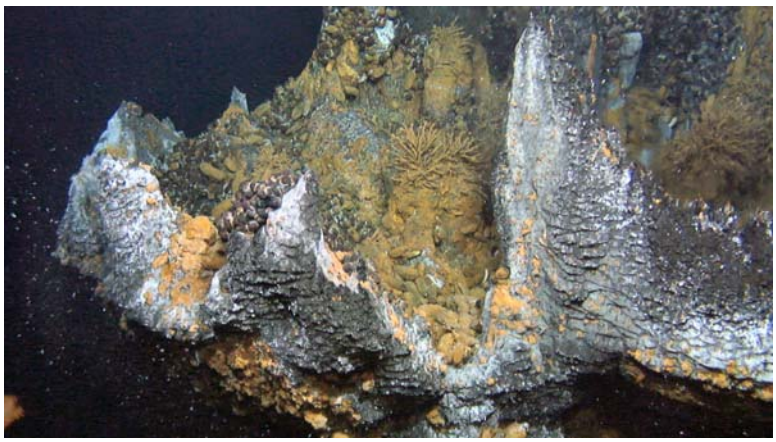
07:04: 37º 47.007' S 49º 38.968' E,
view 069º, depth 2755 m, height 16.5 m.

07:10 - ROV continuing past JC67 WP 3; encountering basalts, so turning back to WP 3 and then south towards JC67 WP 4.

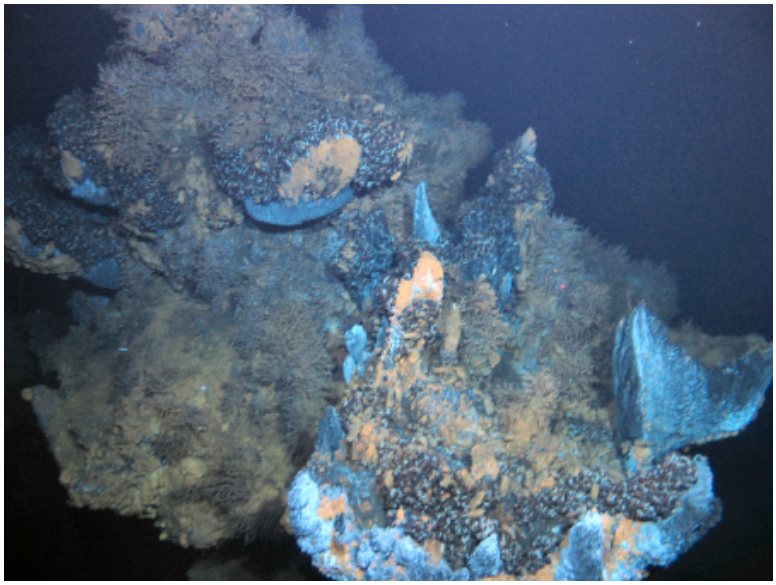
07:24 - ROV examining another extinct structure, and turning west towards a bed of mussel shells.

07:24: 37º 47.030' S 49º 38.982' E,
view 227º, depth 2787 m, height 3.3 m.

07:30 - ROV climbing sulfide edifice above mussel shell bed. Edifice top consists of wide cauldron-like platform around central pinnacles. Diffuse venting from rim of beehive diffuser on SW corner of platform. Platform inhabited by aggregations of black and brown gastropods, with patches of mussels, and stalked barnacles on inactive spires. Occasional shrimp and white polynoid polychaetes among gastropod aggregations. Sulfide structure named "Tiamat".



07:30: 37º 47.027' S 49º 38.969' E,
view 284º, depth 2780 m, height 10.1 m.



08:54: 37º 47.028' S 49º 38.970' E,
view ~300º, depth 2779 m, height 12.2 m.

07:59 - ROV set down for sampling at 37º 47.029' S 49º 38.965' E, depth 2770 m, on small ledge on south side of "Tiamat", just below main platform. ROV CTD reading 3.3 to 4.5 ºC; ROV temperature lance inaccurate (reading 9 ºC in shimmering water, 10 ºC in background water). Stalked barnacles sampled by manipulator into port front biobox, along with net of mussels. Gastropods collected by suction sampler into suction chamber 2 (gravel from previous dives suspected in chamber 1, so chambers rotated). Plastic suction tube broken off hose, but could still sample directly into flexible hose. Additional gastropods sampled into suction chamber 3. Pump cycled to clear blockages in suction sampler hose, but loss of suction sampler hydraulic pressure noted. Sampling finished 08:37.

09:19 - After circling "Tiamat" for reconnaissance, ROV setting up for HD video mosaicing of north face of platform at 37º 47.026' S 49º 38.963' E, depth 2763 m. Camera view 171º, running vertical lines on DVL, stepping 0.2 m to right between lines. Final mosaic run of north face of "Tiamat" recorded 09:37 to 10:05.

10:12 - Examining fauna on ledge below NW corner of "Tiamat": holothurians, hanging chains of brown gastropods, *Kiwa*.

10:30 - Set down to sample fauna on ledge at 37º 47.027' S 49º 38.963' E, depth 2783 m. Suction sample of *Kiwa* and gastropods taken into suction chamber 4. Triangle scoops of gastropods and associated fauna into starboard front biobox, including scoop of dark-coloured gastropods from side of beehive diffuser structure. *Chorocaris* observed on HD video 11:05. Net of hanging brown gastropod chains also collected into starboard front biobox. Sampling completed 11:35.

11:40 - Moving ROV on heading ~270º towards JC67 WP 1 to join earlier dive track.

11:49 - ROV passed close by another sulfide edifice west of the sampled platform, and arrived at "Knucker's Gaff", seen earlier on dive at 06:53.

11:49: 37º 47.031' S 49º 38.955' E,
view 312º, depth 2777 m, height 16.7 m.

12:12 - Returned to extinct structure seen initially on dive at 06:33.

12:12: 37º 47.027' S 49º 38.943' E,
view 299º, depth 2790 m, height 9.9
(cf. view at 06:33).

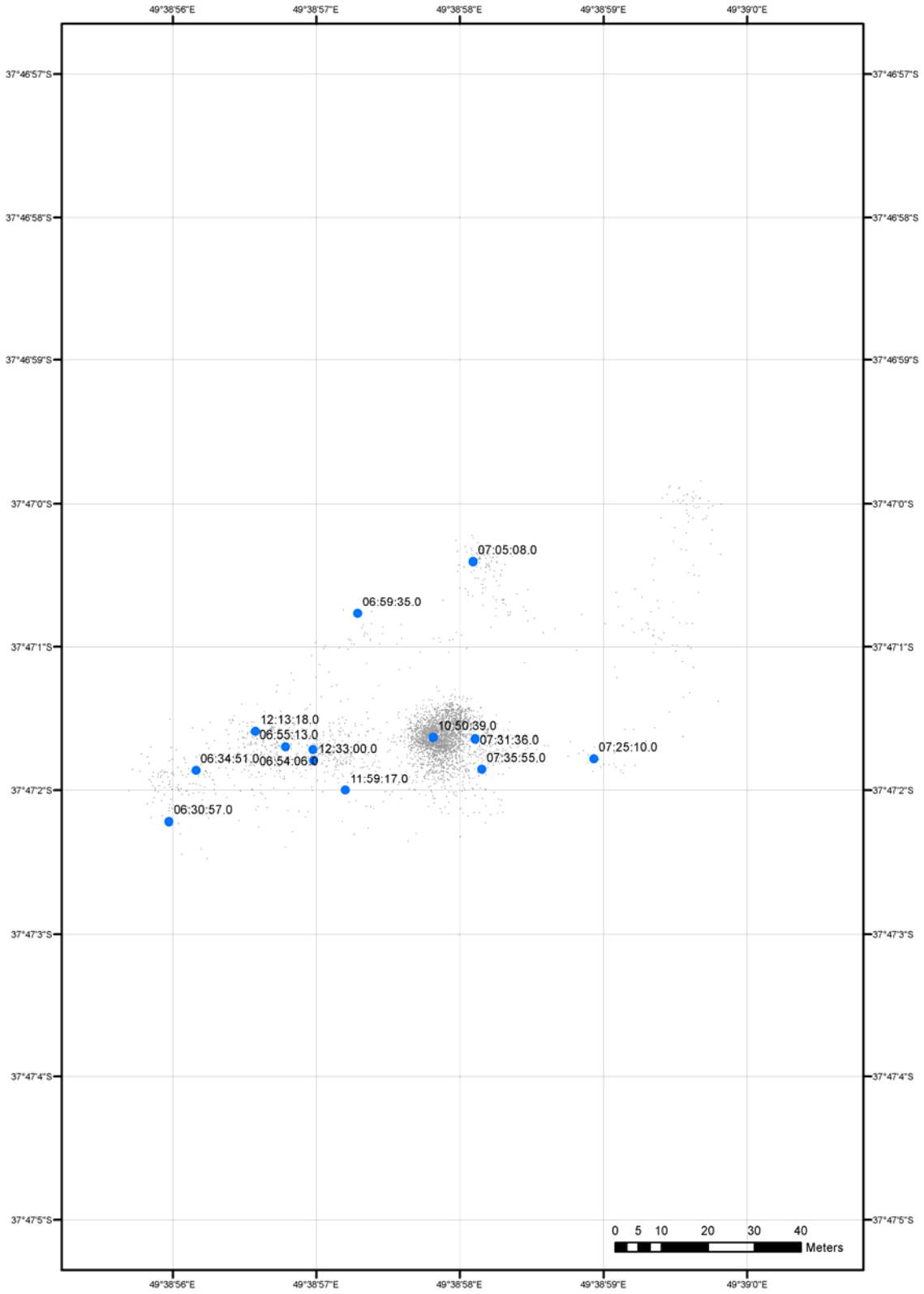
12:33 - ROV left bottom at 37º 47.029' S 49º 38.950' E, depth 2756 m, tracking to the north during initial ascent.

12:35 - ROV in black smoke at height 80 m above seafloor.

13:45 - ROV secured on deck.

Total ROV bottom time: 6 hours 30 minutes
Total ROV descent / ascent time: 2 hours 31 minutes
Total ROV dive time: 9 hours 01 minutes

ROV dive 1 USBL track (times shown are UTC)



3.3.2 Kiel6000 JC67 Dive 2 (JC67 Station 6, 28 November 2011)

ROV dive 2 objectives:
- locate "black smoker" source from plume encountered at end of Dive 1
- conduct video mosaic of high-temperature vent chimney
- sample fauna from high-temperature vent chimney

Log of key dive events:
05:49 UTC: ROV arrived on seafloor at
37º 47.018' S 49º 38.930' E, depth 2771 m.
08:51 UTC: HD video mosaicing of vent chimney at
37º 47.004' S 49º 38.967' E, depth 2736 m.
10:39 - 11:59 UTC: Faunal samples collected at
37º 47.003' S 49º 38.948' E, water depth 2781 m.
12:56 - 13:05 UTC: Faunal samples collected at
37º 47.006' S 49º 38.973' E, water depth 2758 m.
13:08 UTC: ROV left seafloor for ascent at
37º 47.007' S 49º 38.974' E, depth 2738 m.

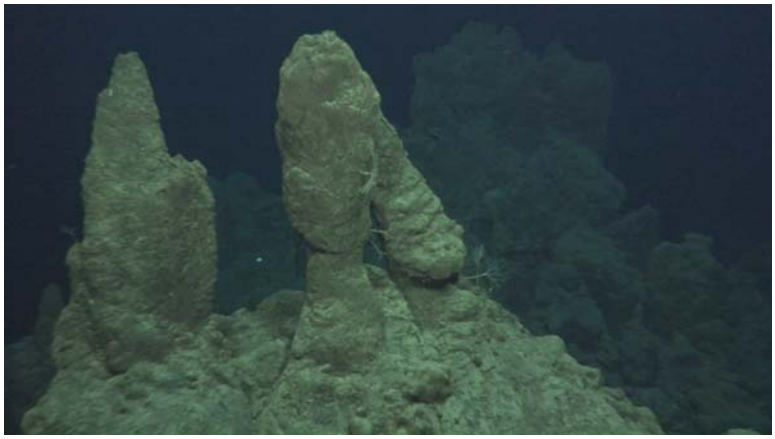
Dive narrative:

04:35 - ROV launched at 37 47.112' S 49 38.929' E.

05:49 - Arrived on seafloor at 37º 47.018' S 49º 38.930' E, depth 2771 m.

06:08 - ROV moving on heading ~065º up slope.

06:11 - Encountered extinct sulfide edifice, with ?hydroids.



06:11: 37º 47.013' S 49º 38.957' E,
view 026º, depth 2778 m, height 5.7 m.

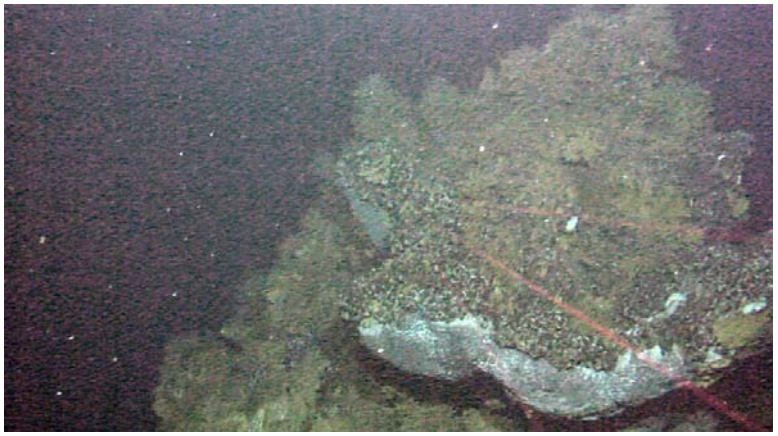
06:16 - ROV moving on heading ~190º.

06:21 - At sulfide edifice "Knucker's Gaff", seen on Dive 1 06:53 and 11:49.

06:21: 37º 47.025' S 49º 38.953' E,
view 124º, depth 2778 m, height 12.7 m.

06:23 - ROV moving on heading 124º

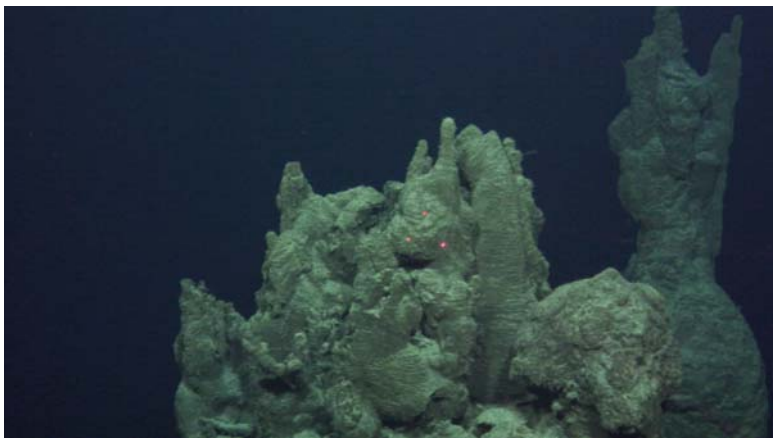
06:24 - Passing "Tiamat" edifice, seen on Dive 1 at 07:34 (sampled and mosaiced)



06:24: 37º 47.024' S 49º 38.967' E,
view 106º, depth 2778 m, height 10.7 m.

06:29 - ROV turning through N to heading 240º.

06:33 - Observed another extinct sulfide edifice.



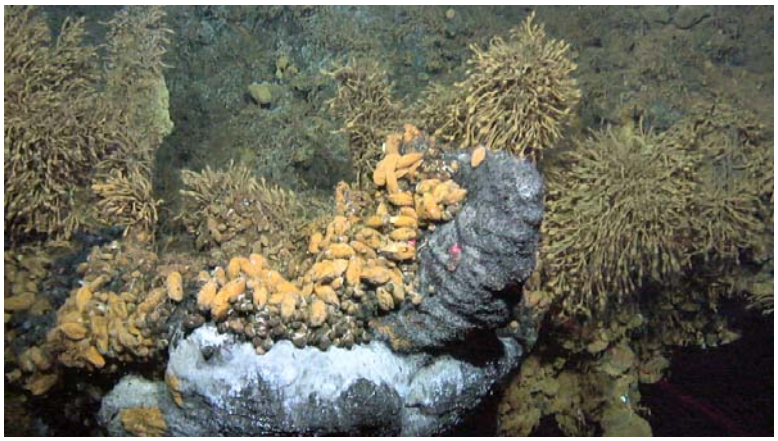
06:34: 37º 47.037' S 49º 38.951' E,
view 292º, depth 2799 m, height 8.2 m.

06:37 - ROV turning through S to heading ~100º, moving to JC67 WP 4.

06:41 - Arrived at WP 4; basaltic seafloor. Turning to heading ~014º up basalt slope.

06:43 - Observed mussel shells and *Munidopsis*. Turning to follow bed of mussel shells upslope along heading ~345º.

06:47 - At top of another platform-morphology sulfide edifice, between "Tiamat" and "Knucker's Gaff". Depth of platform is 10 m deeper than at "Tiamat". Structure named "Jiaolong's Palace".



06:47: 37º 47.032' S 49º 38.972' E,
view 326º, depth 2787 m, height 8.3 m.

06:59 - Have circled "Jiaolong's Palace", now climbing NW side of "Tiamat", heading ~100º, passing Sampling Location 2 from Dive 1.

07:00: 37º 47.025' S 49º 38.969' E,
view 097º, depth 2779 m, height 8.8 m.

07:08 - ROV moving on heading 079º, from north face of "Tiamat".

07:12 - Arrived at basalt seafloor; turning north upslope, sulfide rubble appearing.

07:15 - Turning to heading 335º to examine sulfide structure.

07:15: 37º 47.006' S 49º 38.984' E,
view 336º, depth 2762 m, height 3.7 m.

07:17 - At actively-smoking chimney, designated "Jabberwocky", ~5.3 m high, constructed from beehive diffusers, with yellow dendritic projections, and red colouration on sides of chimney.

07:17: 37º 47.002' S 49º 38.985' E,
view ~320º, depth 2757 m.

08:51 - ROV commencing high-definition video mosaicing of "Jabberwocky" vent chimney at 37º 47.004' S 49º 38.967' E, depth 2736 m. View 338º, 6.0 m vertical moves on DVL, 0.2 m step to right between vertical lines. 13 lines run: mosaiced area 2.6 m wide by 6.0 m high.

09:25 - ROV completed HD video mosaicing of "Jabberwocky" vent chimney. Turned to heading 276º, to examine neighbouring larger sulfide edifice.

09:27 - At top of sulfide structure; recognised as "Ryugu-jo" structure seen on Dive 1 at 07:04.

09:27: 37º 47.004' S 49º 38.976' E,
view 282º, depth 2756 m, height 8.9 m
(cf. Dive 1, 07:04).

09:31 - Circling sulfide edifice to south side.

09:39 - ROV moving on heading ~270º.

09:42 - Sonar target to our right; changing heading to ~295º.

09:45 - Visible black smoke.

09:48 - Dropped to seafloor, ring of black smoker chimneys ahead, formation named "Hydra".

09:50: 37º 47.008' S 49º 38.951' E,
view 339º, depth 2779 m, height 3.9 m.

10:04 - Passing extinct edifice next to active smokers of "Hydra", in attempt to approach chimneys from upcurrent side.

10:09 - ROV has dropped over smokers to approach "Hydra" from other side.

10:09: 37º 47.003' S 49º 38.950' E,
view 146º, depth 2781 m, height 4.2 m.

10:39 - ROV set down for sampling at 37º 47.003' S 49º 38.948' E, water depth 2781 m. Net of 2 x large *Phymorhynchus*-type gastropods and gastropod eggs, from sulfide surface below chimneys, placed in port forward biobox. ROV repositioned slightly forwards to reach base of chimneys with suction sampler. Alvinocaridid shrimp (predominantly *Mirocaris*-type with occasional *Chorocaris*) sampled into chambers 1 and 2, with few white polynoid polychaetes.

11:59 - ROV completed sampling at first location.

12:03 - Moving off from sampling, examining "Hydra" chimneys close-up.

12:05: 37º 47.005' S 49º 38.947' E,
view 123º, depth 2780 m, height 4.3 m.

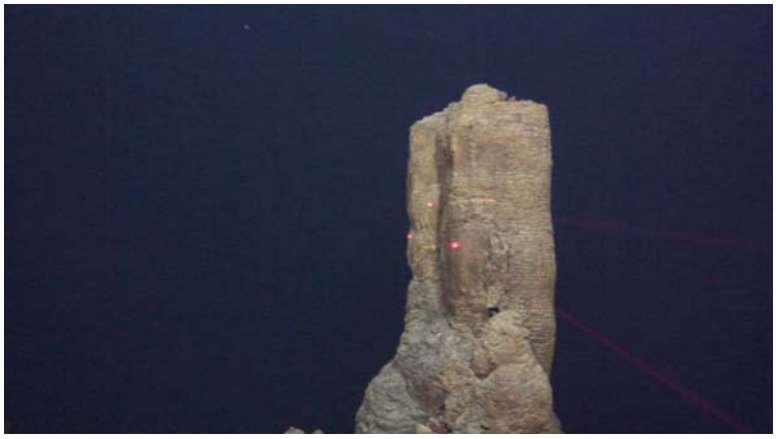
12:16 - Examining ring of five active and inactive chimneys at "Hydra" to map their orientation.

12:16: 37º 47.005' S 49º 38.952' E,
view 029º, depth 2780 m, height 3.3 m.

12:23 - ROV moving on heading 087º.

12:25 - Climbing sulfide edifice.

12:27 - At top of edifice; two peaks: smaller one topped by three fingers, larger one topped by flat-topped pillar. ?Hydroids visible on smaller pillars.



12:28: 37º 47.011' S 49º 38.948' E,
view 172º, depth 2776 m, height 7.2 m.

12:40 - ROV moving on heading 090º, climbing sulfide rubble slope, passing mussel shells, occasional *Munidopsis*-type anomuran. Slope becomes sheer side of sulfide edifice.

12:42 - Stopping to examine *Chiridota*-type holothurians on side of structure visited at 09:27; visible diffuse flow and bacterial mat nearby.

12:56 - ROV tray set against side of chimney to sample holothurians at 37º 47.006' S 49º 38.973' E, depth 2758 m. One specimen suction sampled into chamber 3. Two specimens collected by manipulator into starboard forward biobox.

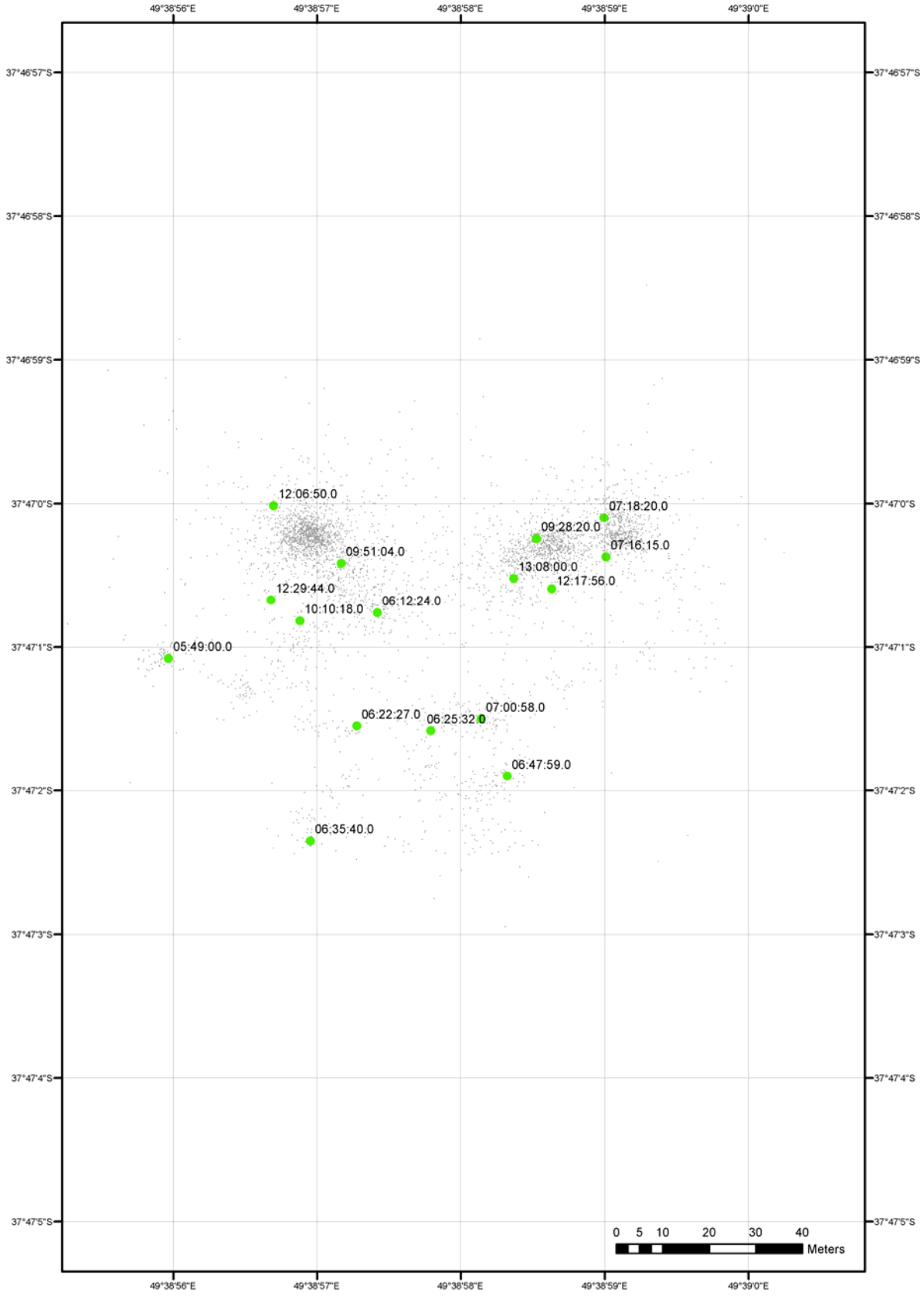
13:05 - ROV completed sampling at second location.

13:08 - ROV left seafloor at 37º 47.007' S 49º 38.974' E, depth 2738 m.

14:25 - ROV secured on deck.

Total ROV bottom time: 7 hours 19 minutes
Total ROV descent / ascent time: 2 hours 36 minutes
Total ROV dive time: 9 hours 55 minutes

ROV dive 2 USBL track (times shown are UTC)



3.3.3 Kiel6000 JC67 Dive 3 (JC67 Station 8, 29 November 2011)

ROV dive 3 objectives:
- conduct video mosaic of less-active sulfide structure in vent field area corresponding to "S zone" defined by Tao *et al.* (2012)
- sample fauna from less-active sulfide structure in vent field
- survey vent field to locate and examine additional structures seen during HyBIS and SHRIMP dives

Log of key dive events:
06:22 UTC: ROV arrived on seafloor at
37º 47.024' S 49º 38.939' E, depth 2761 m.
11:08 - 11:28 UTC: HD video mosaicing of vent chimney at
37º 47.029' S 49º 38.954' E, depth 2759 m.
12:28 - 14:10 UTC: Faunal samples collected at
37º 47.030' S 49º 38.967' E, depth 2785 m.
13:23 - 13:45 UTC: Main Lab power cut interrupted HD video recording.
14:31 UTC: ROV left bottom for ascent at
37º 47.031' S 49º 38.965' E, depth 2761 m.

Dive narrative:

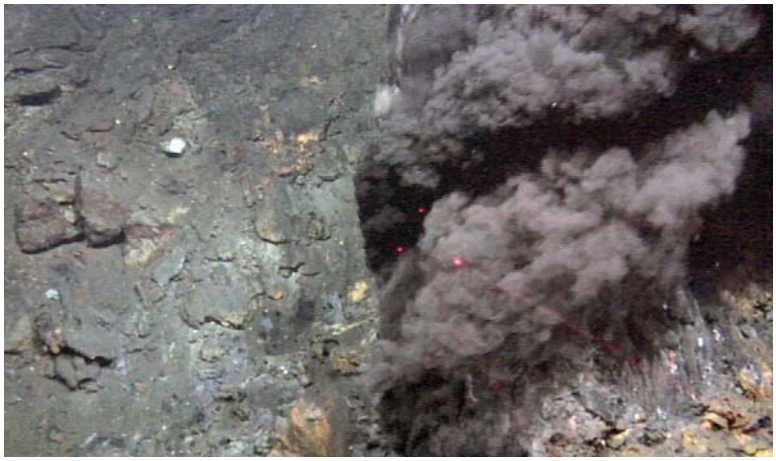
05:02 - ROV launched at JC67 WP 1: 37 47.126' S 49 38.948' E.

06:22 - ROV on seafloor at 37º 47.024' S 49º 38.939' E, depth 2761 m. Moving on heading 052º towards "Hydra" smokers from Dive 2.

06:40 - Looking at an extinct chimney above a source of vigorous black smoke.

06:40: 37º 47.011' S 49º 38.940' E, view 304º, depth 2783 m, height 4.9 m.

06:59 - Examining source of black smoke: small chimney against sulfide wall. Anemones present on sulfides around chimney, and few alvinocaridid shrimp. Black smoke source named "Fucanglong's Furnace".



06:59: 37º 47.010' S 49º 38.938' E,
view 089º, depth 2789 m, height 3.8 m.

07:06 - ROV moving on heading 085º, towards "Hydra", over landscape of oxidised sulfide rubble.

07:08 - Encountered bed of mussel shells, with aggregations of *Phymorhynchus*-type gastropods, and some few stalked barnacles. Gastropod eggs apparent on sulfides.

07:11: 37º 47.006' S 49º 38.944' E,
view 128º, depth 2788 m, height 1.2 m.

07:16 - Climbing slope of sulfides, with occasional *Kiwa*, possibly below "Hydra".

07:21 - In smoke, ROV moving on heading 055º past "Hydra".

07:23 - Out of smoke, now flying over fractured basalts.

07:28 - Climbing slope of basalts, ROV moving on heading ~015º, towards chimney target found on SHRIMP dive.

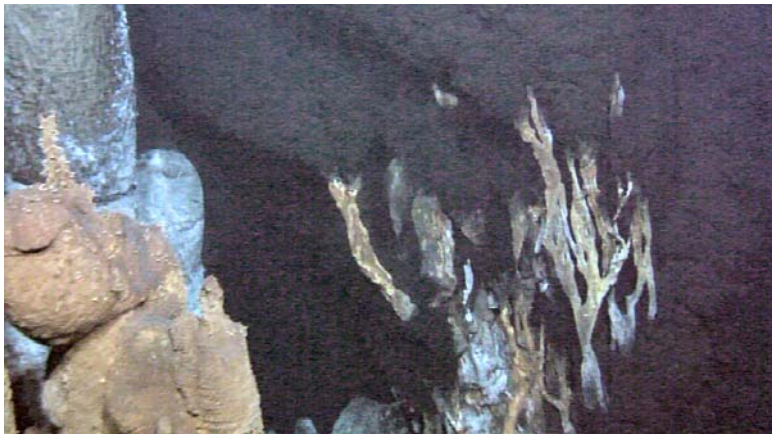
07:31 - Now seeing sulfide talus.

07:36 - Climbing sulfide pillar, heading 008º.

07:37 - Passing active black smoker sources and beehive diffusers on sides of sulfide pillar, with occasional anemones on sulfide surfaces.

07:39 - Three structures at top of pillar: large active beehive diffuser, with few alvinocaridid shrimp; inactive sulfide pinnacle with small stalked barnacles; and assembly of narrow chimney pipes actively venting black smoke. Structure named "Ruyi Jingu Bang" ("pillar holding down the ocean").

07:40: 37º 46.955' S 49º 38.958' E,
view 341º, depth 2743 m, height 13.9 m.



07:46: 37º 46.957' S 49º 38.957' E,
view 321º, depth 2743 m, height 10.1 m.

07:45 - ROV examining top of active beehive at "Ruyi Jingu Bang"; vehicle height reading 15.6 m.

08:05 - Dropping down to base of "Ruyi Jingu Bang" structure. Additional black smoker sources towards base of structure, e.g. depth 2750 m. Few alvinocaridid shrimp and beehive diffusers.

08:26 - Returned to top of "Ruyi Jingu Bang".

08:31 - ROV moving away from structure on heading ~045º, flying over large altered pillow basalts.

08:36 - ROV turning to move along heading ~090º.

08:38 - ROV flying through smoke, 37º 46.928' S 49º 38.979' E, depth 2752 m, vehicle height 2.3 m.

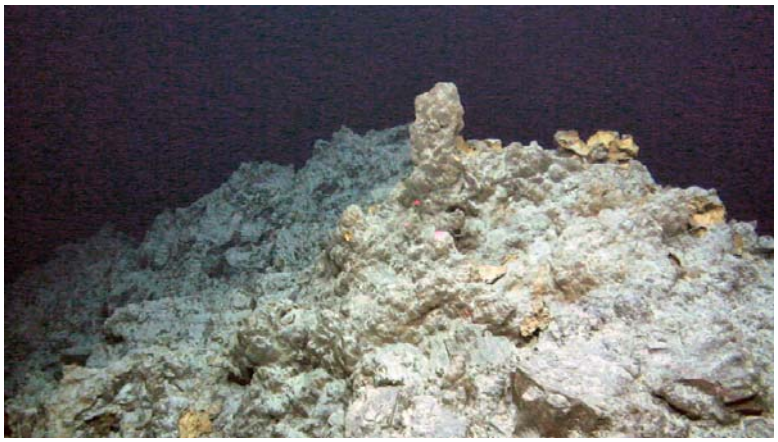
08:39 - ROV flying over fractured basalts.

08:47 - Climbing to top of basalt slope.

08:52 - ROV moving on heading 194º.

08:55 - ROV turning onto head 223º to climb another basalt slope.

09:02 - At small weathered sulfide pillar on top of basalt slope.



09:02: 37º 46.966' S 49º 39.002' E,
view 240º, depth 2723 m, height 5.6 m.

09:10 - ROV moved back to east and resuming moving on heading ~180º.

09:20 - ROV turned to move on heading ~270º, in line for "Jabberwocky" and "Ryugu-jo" chimneys.

09:23 - Encountered extinct weathered sulfide structure, seen on Dive 2 at 07:15.

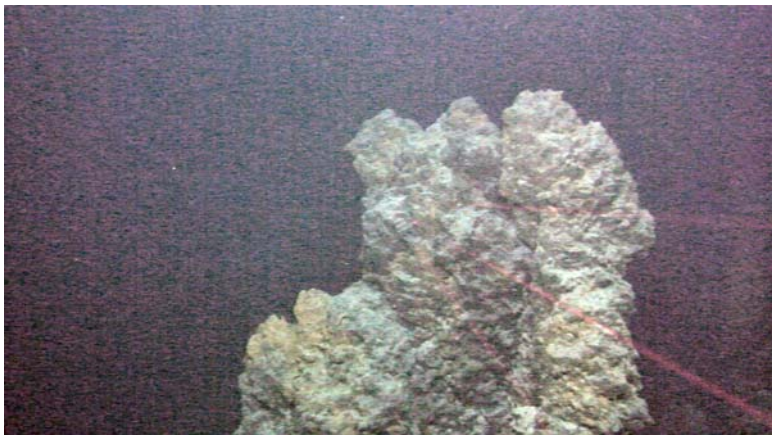
09:23: 37º 47.006' S 49º 38.981' E,
view 335º, depth 2761 m, height 4.4 m
(cf. Dive 2, 07:15).

09:25 - At base of "Jabberwocky" chimney found on Dive 2.

09:27 - Circled through N to move on heading 090º.

09:30 - Turning to ~180º to resume survey line to S.

09:36 - Turned to W towards "Tiamat" and "Knucker's Gaff"; encountered extinct structure "Extinct 5", found on Dive 1 at 07:24.



09:37: 37º 47.031' S 49º 38.989' E,
view 280º, depth 2786 m, height 4.9 m
(cf. Dive 1, 07:24)

09:39 - Passing another extinct structure nearby (Extinct 13)

09:39: 37º 47.033' S 49º 38.993' E,
view 273º, depth 2787 m, height 4.2 m.

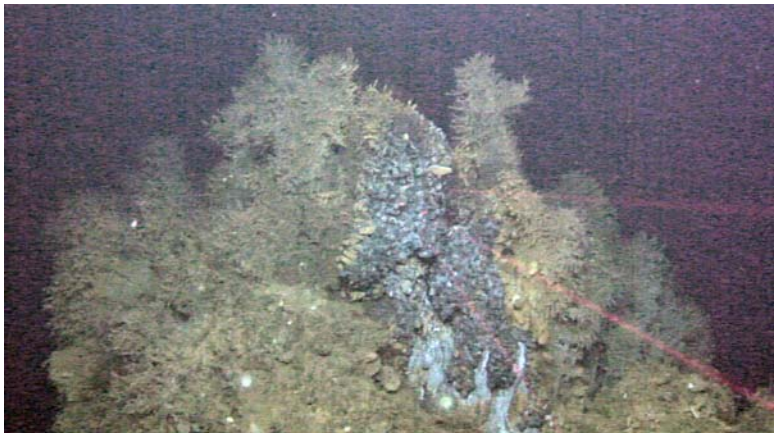
09:51 - At "Extinct 7", seen on Dive 2 at 06:34.

09:51: 37º 47.042' S 49º 38.939' E,
view 016º, depth 2798 m, height 16.8 m
(cf. Dive 2, 06:34).

09:54 - Turning to move on heading ~056º towards "Knucker's Gaff".

09:56 - At mussel shell bed below "Knucker's Gaff", seen on Dive 1 at 06:39.

10:02 - Examining "Jiaolong's Palace", between "Knucker's Gaff" and "Tiamat".



10:02: 37º 47.029' S 49º 38.961' E,
view 134º, depth 2783 m, height 8.7 m.

10:24 - "Jiaolong's Palace" platform less amenable to vertical mosaicing; moving ROV on heading ~270 to "Knucker's Gaff" for mosaicing.

10:28 - At top of "Knucker's Gaff".

10:28: 37º 47.031' S 49º 38.958' E,
view 288º, depth 2778 m, height 12.8 m.

11:08 - After setting up, ROV commenced HD video mosaicing of "Knucker's Gaff" at 37º 47.029' S 49º 38.954' E, depth 2759 m. Camera view 012º, vertical displacement 3.0 m on lines, with 0.2 m step to right between lines. Some loss of Doppler bottom lock on irregular slope terrain below, requiring repeating of some lines.

11:27 - ROV completed HD video mosaicing of "Knucker's Gaff" vent chimney.

[11:28 onwards - HD video file unretrievable from Ki-Pro drive following power out in Main Lab at 13:23; will require specialist data recovery service ashore. Some HD footage recorded instead by *Kiel6000* team to their drive in ROV van during this period.]

11:45 - ROV moving on heading ~105º to return to "Tiamat" for additional spatial / microhabitat sampling.

12:15 - Further reconnaissance at "Tiamat" shows sheer vertical face on northern side; can only set down to sample in same locations as Dive 1. Therefore moving west to "Jiaolong's Palace" for sampling.

12:28 - ROV set down for sampling on "Jiaolong's Palace" platform at 37º 47.030' S 49º 38.967' E, depth 2785 m. Alvinocaridid shrimp, including *Rimicaris*, collected by suction sampler into chambers 1 and 2, until clogging of filter by shrimp prevented further use of suction sampler. Net samples of scaly-foot gastropods and *Kiwa* collected into port forward biobox.

13:23 - Power cut to dirty supply in main lab; HD recording in main lab interrupted, preventing finalisation of video file on hard drive.

13:29 - Power restored to dirty supply in main lab.

13:35 - Second power cut to dirty supply in main lab.

13:45 - HD video recorded restarted on clean supply in main lab.

14:10 - ROV sampling completed.

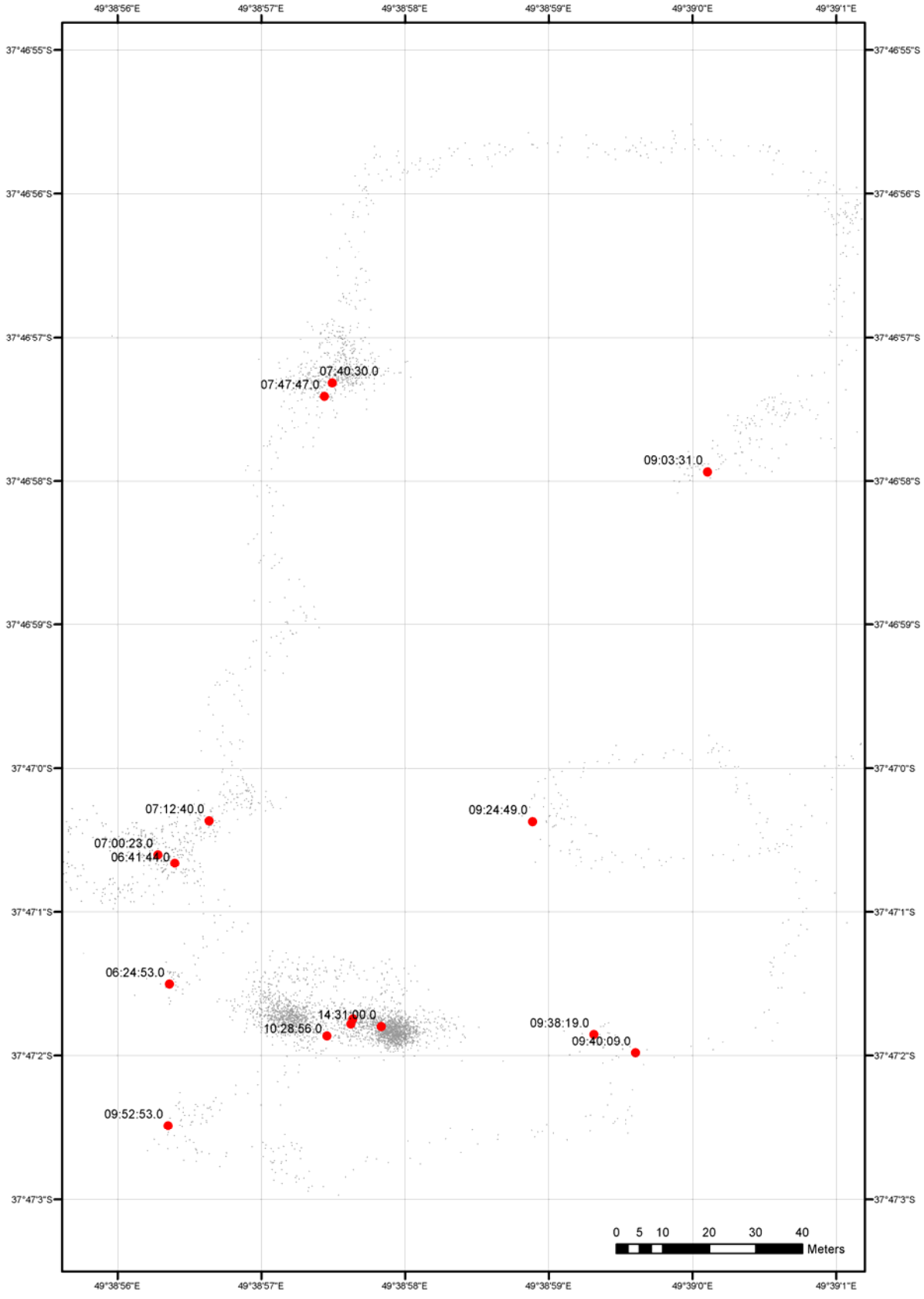
14:13 - HD video closeups of faunal interaction among scaly-foot gastropods, with *Kiwa* and *Rimicaris*.

14:31 - ROV left bottom for ascent at 37º 47.031' S 49º 38.965' E, depth 2761 m.

15:50 - ROV secured on deck.

Total ROV bottom time: 8 hours 09 minutes
Total ROV descent / ascent time: 2 hours 39 minutes
Total ROV dive time: 10 hours 48 minutes

ROV dive 3 USBL track (times shown are UTC)



3.3.4 HyBIS JC67 Dive 1 (JC67 Station 3, 27 November 2011)

HyBIS dive 1 objectives:
- survey vent field visually with "S zone" defined by Tao *et al.* (2012) for additional active sulfide structures, to identify further targets for subsequent ROV dives

Log of key dive events:
13:45 UTC: *HyBIS* launched at 37º 47.016' S 49º 38.980' E.
HyBIS recovered to investigate HD camera problem.
15:30 UTC: *HyBIS* secured on deck at 37 47.046' S 49 38.964' E.

Dive narrative:

After power up during descent, it was noted that the HD camera signal from the vehicle was lost. Attempts to revive the signal through communication from the ship failed. It was decided to stop the winch and haul in the wire to recover HyBIS. The HD camera was fixed within a few minutes.

3.3.5 HyBIS JC67 Dive 2 (JC67 Station 4, 27 November 2011)

HyBIS dive 2 objectives:
- identical to dive 1, above

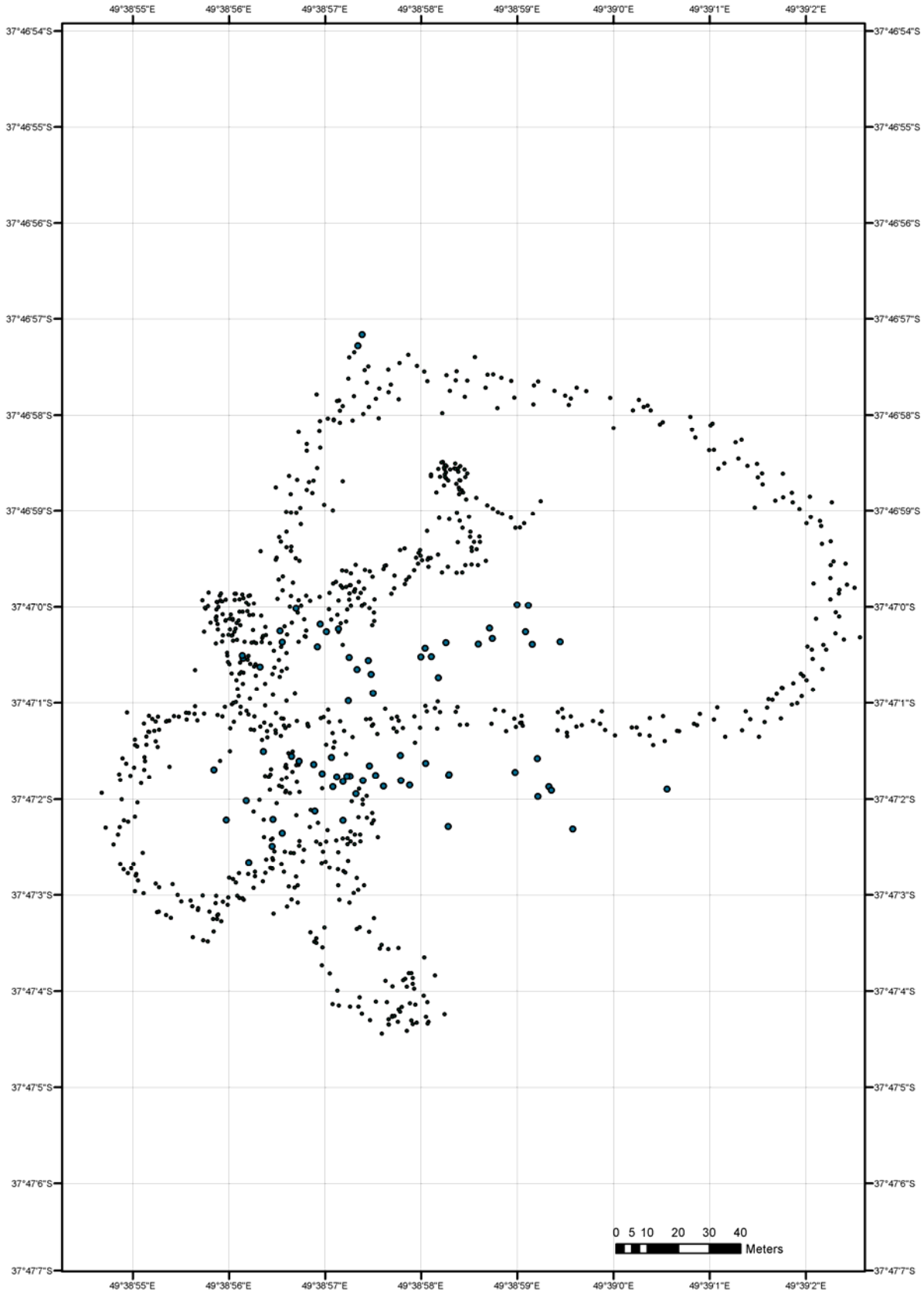
Log of key dive events:
16:02 UTC: *HyBIS* launched at 37º 47.046' S 49º 38.963' E.
17:28 UTC: *HyBIS* arrived on seafloor at
37º 47.026' S 49º 38.916' E, depth 2796 m.
20:17 UTC: video feed lost from *HyBIS* forward-looking camera.
20:54 UTC: *HyBIS* hauled from seafloor to investigate camera problem at
37º 47.001' S 49º 38.939' E, depth 2747 m.
22:14 UTC: *HyBIS* secured on deck at 37 46.982' S 49 38.994' E.

Dive narrative:

After resolving the HD camera issue from dive 1, HyBIS was redeployed. Three hours into the seabed survey, however, the forward looking camera signal was lost. The survey continued for another 30 minutes using the forward looking HD camera only, but was then abandoned for investigation of the camera fault. Upon recovery it was noted that the camera cable was damaged while being jammed against the top cage. The cable was replaced and the camera feed reinstated. While HyBIS was on deck, the entire system was checked before re-deployment.

HyBIS dive 2 USBL track

Larger blue-filled circles show locations of ROV dive events for comparison



3.3.6 HyBIS JC67 Dive 3 (JC67 Station 5, 27-28 November 2011)

HyBIS dive 3 objectives:
- identical to dive 1, above

Log of key dive events:
22:55 UTC: *HyBIS* launched at 37º 47.024' S 49º 38.972' E.
00:17 UTC: *HyBIS* arrived at seafloor at
37º 46.993' S 49º 38.926' E, depth 2753 m.
02:46 UTC: *HyBIS* hauled from seafloor, dive complete, at
37º 46.996' S 49º 38.956' E, depth 2747 m.

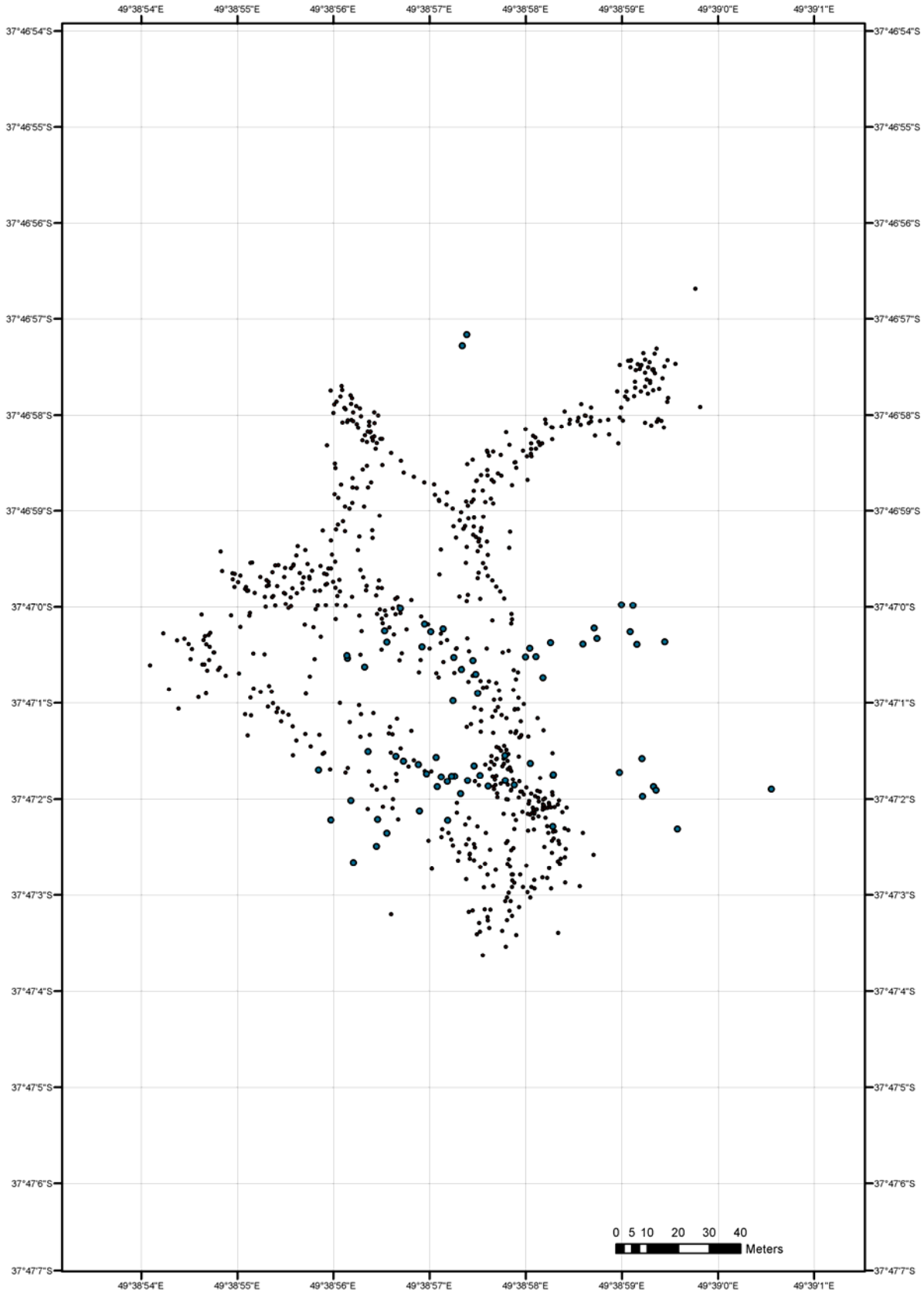
Dive narrative:

HyBIS continued the survey started in dive 2. The downward-looking camera signal was lost about an hour before the end of the dive, after ship motion resulted in a heavy impact between the vehicle and the rocky seafloor. This contact disconnected the video cable on the MUX board inside the electronics pod, and blew one of the downward lights, which in return blew the fuse on the light relays.

Overall, the rugged terrain of inactive and active sulfide structures within the vent field was challenging for HyBIS operations, requiring close coordination of winch control and ship movements to avoid collisions with the seafloor. However, HyBIS dives 2+3 identified several sulfide edifices in addition to those encountered during ROV dive 1, providing further targets for investigation on subsequent ROV dives.

HyBIS dive 3 USBL track

Larger blue-filled circles show locations of ROV dive events for comparison



3.3.7 HyBIS JC67 Dive 4 (JC67 Station 9, 29-30 November 2011)

HyBIS dive 4 objectives:
- reconnoitre area north of "known" vent field, into "M zone" defined by Tao *et al.* (2012), to identify any additional sites of hydrothermal activity to those seen during ROV dives 1, 2, 3.

Log of key dive events:
16:30 UTC: *HyBIS* launched at 37º 46.984' S 49º 38.934' E.
00:46 UTC: *HyBIS* secured on deck at 37º 46.767' S 49º 39.034' E.

Dive narrative:

After a day of system repairs and a full vehicle check up, no further problems were encountered on this dive.

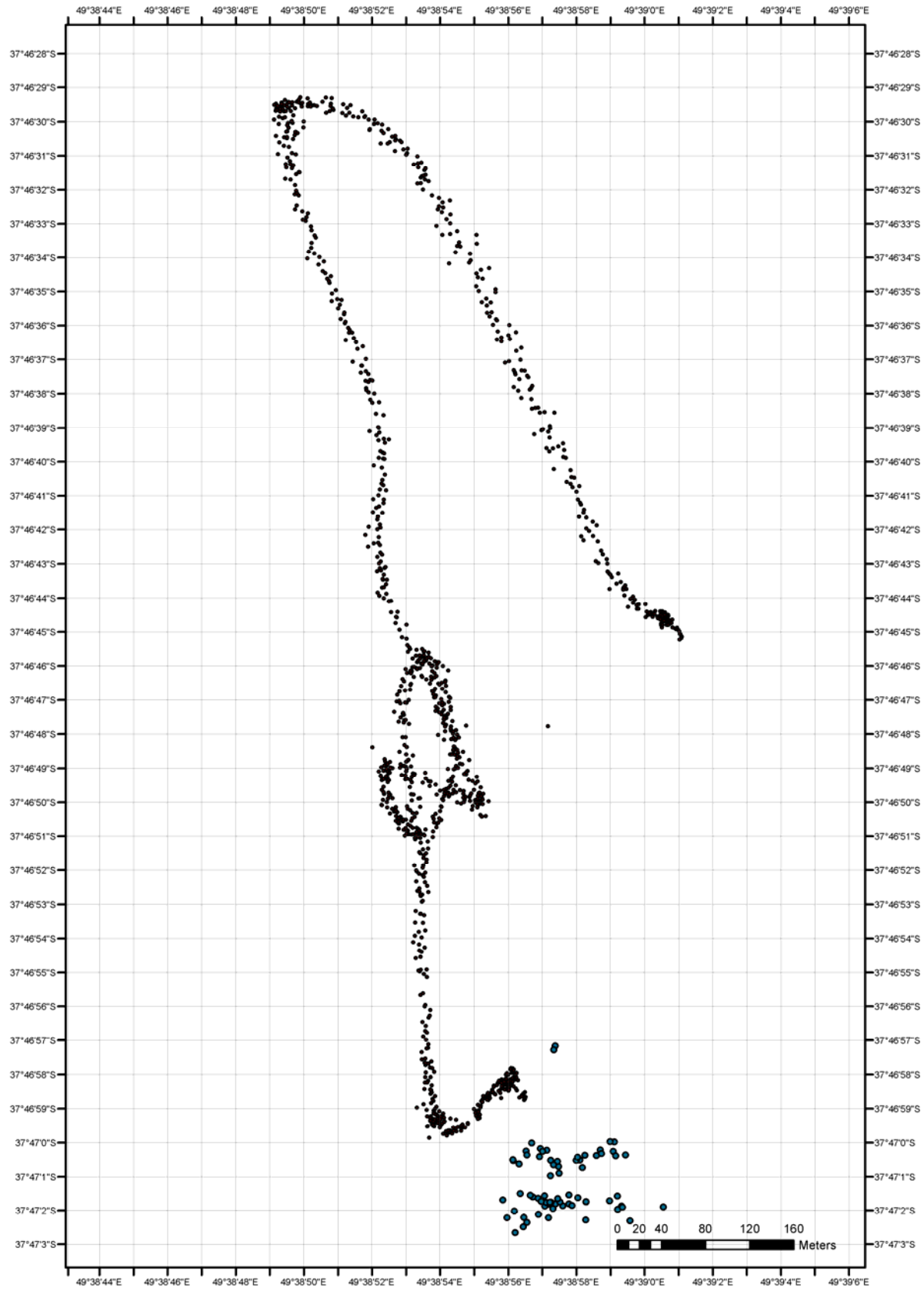
The survey to the north of the "known" vent area confirmed further sites of "black smoker" venting, with observations of vent-endemic fauna, in the "M zone" previously described by Tao *et al.* (2012).

At the end of the dive, no evidence of hydrothermal activity was found further north at the edge of "N zone" defined by Tao *et al.* (2012).

As HyBIS dive 4 (JC67 Station 9) was the last activity of JC67, it was not possible to investigate the vent sources of the northern area with further ROV dives.

HyBIS dive 4 USBL track

Larger blue-filled circles show locations of ROV dive events for comparison



3.3.8 SHRIMP JC67 Dive 1 (JC67 Station 7, 28-29 November 2011)

SHRIMP dive 1 objectives:
- reconnoitre area north and east of "known" vent field (corresponding to "S zone" defined by Tao *et al.*, 2012) to identify any additional sites of hydrothermal activity to those encountered during ROV dives 1 and 2

Log of key dive events:
17:02 UTC: *SHRIMP* launched at 37º 46.847' S 49º 38.890' E.
18:26 UTC: *SHRIMP* arrived on seabed at
37 46.855' S 49 38.849' E, depth 2767 m.
01:00 UTC: *SHRIMP* hauled from seabed, dive complete, at
37º 47.104' S 49º 39.313' E, depth 2684 m.
02:13 UTC: *SHRIMP* secured on deck at 37º 47.144' S 49º 39.258' E.

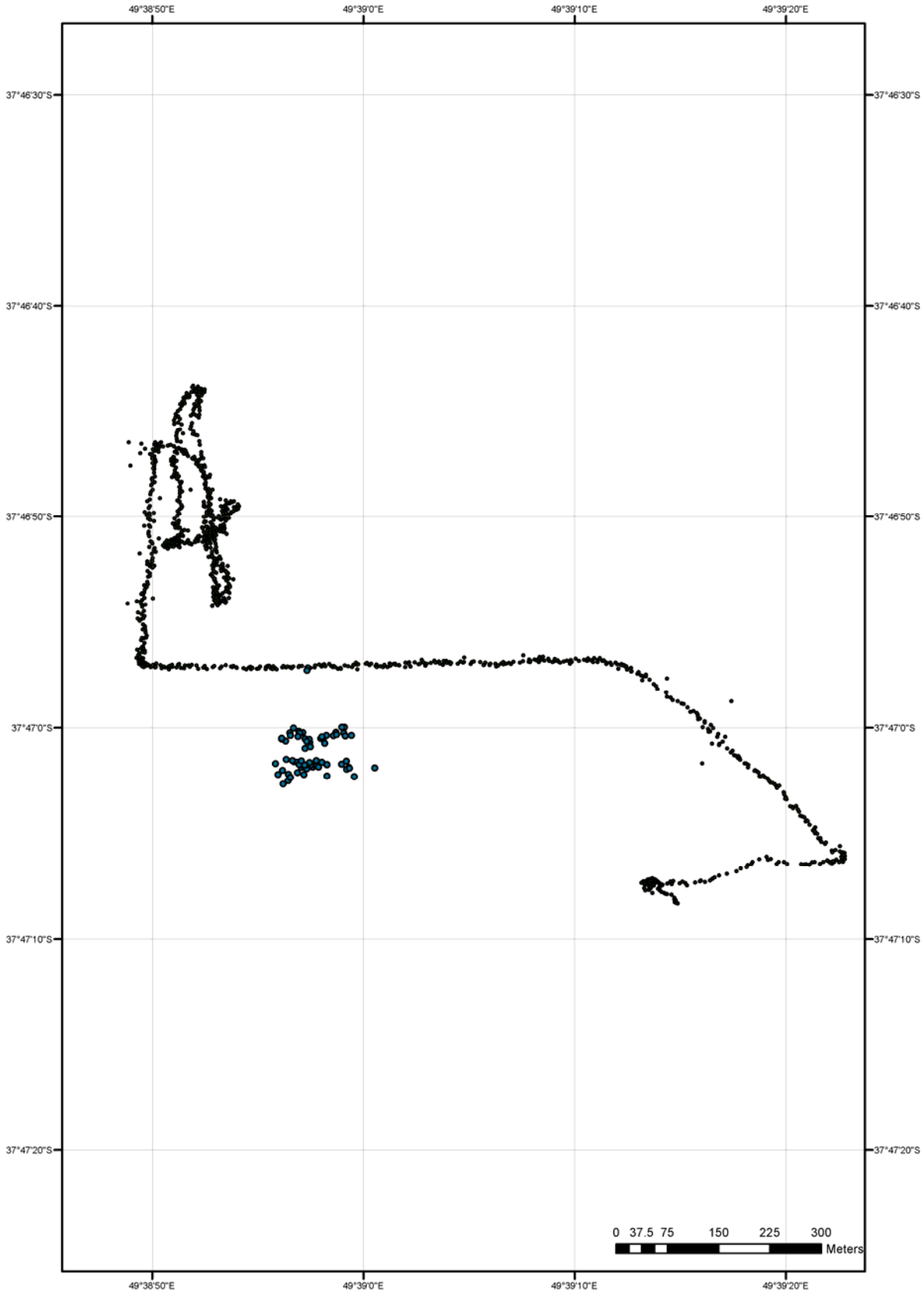
Dive narrative:

SHRIMP initially explored the area north of the "known" vent field, observing extensive extinct sulfides on the seafloor. Limited "black smoker" vent sources, and some vent-endemic fauna, were observed in this area, which corresponds to the "M zone" defined by Tao *et al.* (2012).

During the subsequent transit line to the east, SHRIMP also encountered a large (>20 m high) actively venting sulfide edifice immediately north of the "known" vent field area. This target was subsequently investigated during ROV dive 3, and this active chimney named "Ruyi Jingu Bang" (see ROV dive 3, ~07:39).

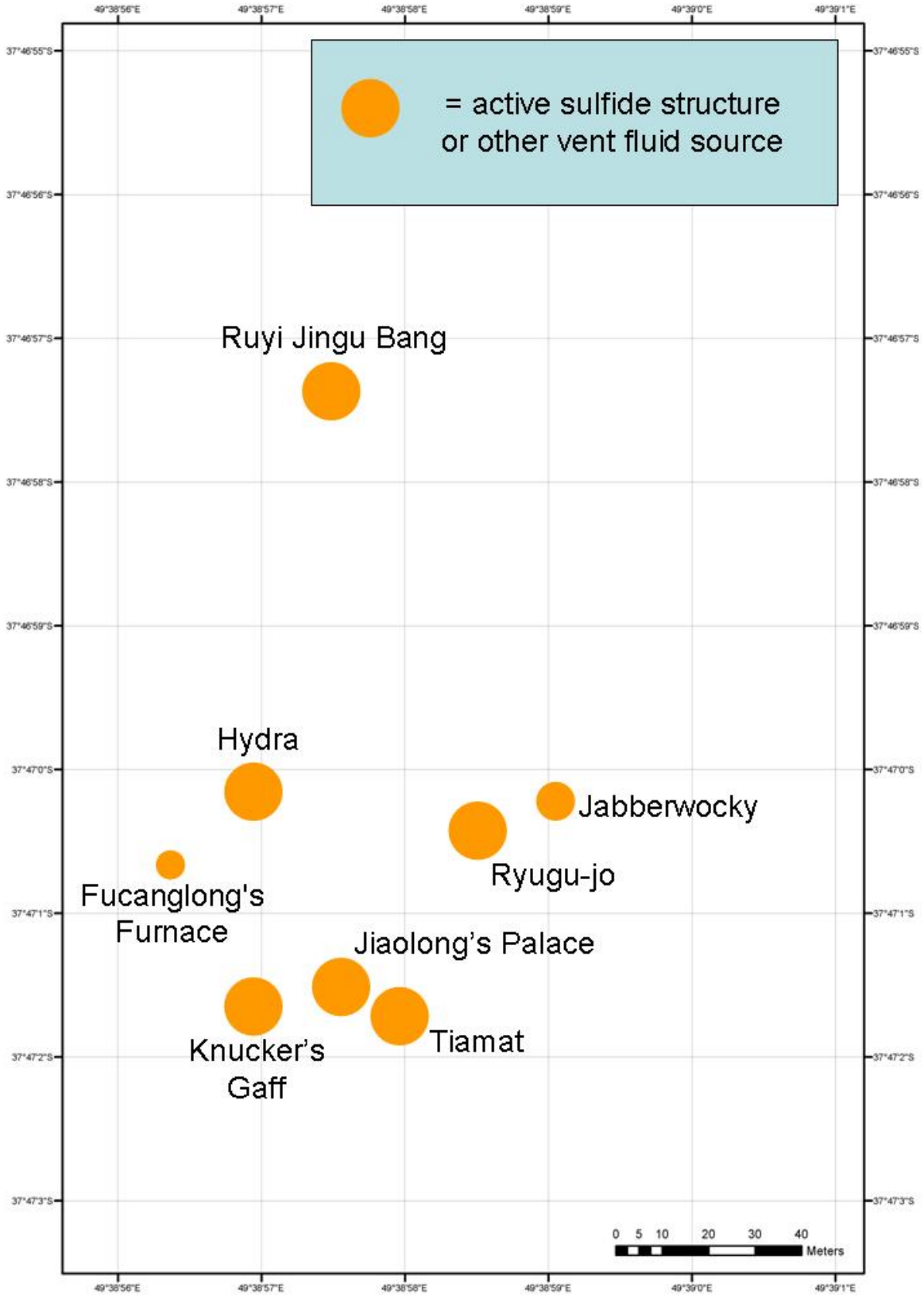
SHRIMP dive 1 USBL track

Larger blue-filled circles show locations of ROV dive events for comparison



3.4 Dragon Vent Field summary map

Location of feature names defined in individual dive reports.



4 SAMPLE AND DATA INVENTORY

4.1 Ship's system data

All ship system data (meterological data and other underway sensor data) are archived with BODC in the data files for JC66 (data for "bolt on" JC67 days are 27-30 November within the records for JC66).

4.2 CTD data

The CTD data file from the single cast for JC67 (JC67 Station 1) is archived with BODC.

4.3 Kiel6000 ROV USBL navigation, digital imagery, and video data

Archived by the PSO at the University of Southampton.

4.4 SHRIMP & HyBIS USBL navigation and video data

Archived by the PSO at the University of Southampton.

4.5 Sample coding

Samples collected during JC67 consisted of either water from Niskin bottles during the single CTD cast, or faunal samples collected by the Kiel6000 ROV during its three dives. Each sample was allocated to a subproject and processed as follows:

Macrofaunal samples:

JC67-**F**-[three-digit sample number]/[subproject code]
(e.g. JC67-F-001/1a)

Subproject codes:
1a - morphological taxonomy (fixed in 10% seawater formalin)
1b - molecular phylogenetics (fixed in 100% EtOH)
2 - life-history biology (fixed in 10% seawater formalin)
3 - population genetics (fixed in 100% EtOH)
4a - epibiont biogeography (*Rimicaris* only; -80 frozen)
4b - shell microgrowth (bivalves only; air-dried)
5 - stable isotopes (-80°C frozen)
6 - tissue metal content (-80°C frozen)
8 - RNA expression (-80°C frozen)
9 - Biodiscovery (-80°C frozen)

Geological samples (includes preserved sediment for meiofauna):

JC67-**G**-[three-digit sample number]/[sample type code]
(e.g. JC67-G-014/3)

Sample type code:
2 - chimney sulfide (air-dried)
3 - biobox washings (each sample split for preservation by DESS / formalin / 100% EtOH / -80°C frozen)

Microbiology and water samples:
JC67-**M**-[three-digit sample number]/[sample type code]
(e.g. JC67-M-002/1)

Sample type codes:
1 - CTD water sample for microbiology (filtered for POC, 3.0 um, 0.2 um; filters -80°C frozen)
3 - CTD water sample for oxygen (onboard Winkler titration)
4 - CTD water sample for nutrients (-20°C frozen)
5 - CTD water sample for salinity (onboard salinometery)

4.6 SAMPLE LOG

Table 4.6.1: Sample inventory, listed by JC67 station.

Sample number	Station	Date	Time	Gear	Location	Depth	Sample description	Sample size	Recipient	Project(s)	Preservation
JC67-G-001/3,4,5	1	27/11/2011	02:02 - 03:1	CTD	37 deg 47.022' S 49 deg 38.942' E	2780	Water from Niskin bottle 1	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-M-002/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2780	Water from Niskin bottle 2	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-003/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2780	Water from Niskin bottle 3	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-004/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2600	Water from Niskin bottle 4	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-M-005/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2600	Water from Niskin bottle 5	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-006/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2600	Water from Niskin bottle 6	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-007/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2500	Water from Niskin bottle 7	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-M-008/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2500	Water from Niskin bottle 8	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-009/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2500	Water from Niskin bottle 9	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-010/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2000	Water from Niskin bottle 10	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-M-011/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2000	Water from Niskin bottle 11	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-012/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2000	Water from Niskin bottle 12	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-013/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1700	Water from Niskin bottle 13	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen

JC67-M-014/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1700	Water from Niskin bottle 14	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-015/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1700	Water from Niskin bottle 15	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-016/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1300	Water from Niskin bottle 16	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-M-017/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1300	Water from Niskin bottle 17	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-018/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1300	Water from Niskin bottle 18	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-019/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	200	Water from Niskin bottle 19	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-M-020/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	200	Water from Niskin bottle 20	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-021/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	200	Water from Niskin bottle 21	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-022/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	40	Water from Niskin bottle 22	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-M-023/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	40	Water from Niskin bottle 23	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-024/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	40	Water from Niskin bottle 24	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-F-028/1b	2	27/11/2011	07:59 - 08:37	ROV	36 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-028/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-028/4b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus* shell	18	Copley / Marsh	Shell microgrowth	Air dried
JC67-F-028/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	5	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-028/6	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	4	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-M-028/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	3	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-029/2	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	120	Copley / Marsh	Life-history biology	4% buffered sw formalin

JC67-F-029/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	120	Copley / Marsh	Population genetics	100% ethanol
JC67-F-029/6	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	18	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-F-029/9	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	18	Copley / Marsh	Biodiscovery	Frozen minus 80 deg C
JC67-F-030/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Scaly-foot gastropod	2	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-031/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	20	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-031/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	20	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-031/2	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	60	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-031/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	60	Copley / Marsh	Population genetics	100% ethanol
JC67-F-031/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	10	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-M-031/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	10	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-033/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Red polynoid polychaete (commensal from mussel)	7	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-033/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Red polynoid polychaete (commensal from mussel)	6	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-034/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile smooth brown gastropod	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-034/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile smooth brown gastropod	20	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-034/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile smooth brown gastropod	30	Copley / Marsh	Population genetics	100% ethanol
JC67-F-036/2	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	65	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-036/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	65	Copley / Marsh	Population genetics	100% ethanol
JC67-F-036/5,6,8,9	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	20	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-037/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile alvinocaridid shrimp	4	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-038/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	?Capitellid polychaete	12	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-038/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	?Capitellid polychaete	12	Copley / Marsh	Molecular phylogeny	100% ethanol

JC67-G-076/3	2	27/11/2011	07:59 - 08:37	ROV	36 deg 47.029' S 49 deg 38.965' E	2770	Port biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-F-025/1a	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Kiwa*	6	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-025/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Kiwa*	7	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-M-025/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Kiwa*	1	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-026/1a	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-026/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-026/2	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	60	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-026/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	59	Copley / Marsh	Population genetics	100% ethanol
JC67-M-026/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	4	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-027/1a	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-027/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-027/2	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	80	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-027/2b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	25	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-027/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	80	Copley / Marsh	Population genetics	100% ethanol
JC67-F-027/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	25	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-027/6	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-F-027/8	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	RNA expression	Frozen minus 80 deg C
JC67-F-027/9	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Biodiscovery	Frozen minus 80 deg C
JC67-M-027/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	4	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-039/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Juvenile smooth brown gastropod	20	Copley / Marsh	Population genetics	100% ethanol
JC67-F-040/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Lepetodrilus*	3	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-041/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	White polynoid polychaete (free-living)	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-042/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	White polynoid polychaete (free-living)	1	Copley / Marsh	Molecular phylogeny	100% ethanol

JC67-F-043/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Ampharetid polychaete	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-044/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Small unident polychaete	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-045/1b	2	27/11/2011	10:30 - 11:35	ROV	38 deg 47.027' S 49 deg 38.963' E	2783	Unident polychaete	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-046/9	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Faunal residue	1	Copley / Marsh	Biodiscovery	Frozen minus 80 deg C
JC67-F-047/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Small gastropod (commensal from mussels)	3	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-G-077/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Starboard biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-F-048/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Chorocaris*	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-049/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	26	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-049/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-049/5	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	10	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-M-049/5	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	2	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-050/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Juvenile alvinocaridid shrimp	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-051/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Unident anemone 1	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-052/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	White polynoid polychaete (free-living)	2	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-052/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	White polynoid polychaete (free-living)	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-053/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Bathymodiolus* juveniles	9	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-055/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Juvenile black gastropod	20	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-055/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Juvenile black gastropod	20	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-056/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Phymorhynchus*	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-056/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Phymorhynchus*	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-057/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Small polynoid polychaete	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-058/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	?Phymorhynchus egg case	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin

JC67-F-058/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	?Phymorhynchus egg case	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-099/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Unident anemone 2	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-G-078/3	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Port biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-F-054/1a	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Chiridotid holothurian	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-054/1b	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Chiridotid holothurian	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-054/5,6	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Chiridotid holothurian	1	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-G-079/3	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Starboard biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-F-059/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	5	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-059/1b	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	5	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-059/4	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	4	Copley / Marsh	Epibiont biogeography	Frozen minus 80 deg C
JC67-F-059/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	1	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-060/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	33	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-060/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-060/4	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	5	Copley / Marsh	Epibiont biogeography	Frozen minus 80 deg C
JC67-F-060/6	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	5	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-F-061/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Kiwa*	3	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-061/1b	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Kiwa*	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-061/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Kiwa*	1	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-062/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Bathymodiolus*	7	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-062/5,6	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Bathymodiolus*	5	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-068/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	30	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-068/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	50	Copley / Marsh	Population genetics	100% ethanol

JC67-F-068/6	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	20	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-M-068/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	10	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-069/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Nephtid polychaete	12	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-069/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Nephtid polychaete	12	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-069/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Nephtid polychaete	12	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-070/X	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	80	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-070/X	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	80	Copley / Marsh	Population genetics	100% ethanol
JC67-F-070/X	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	80	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-M-070/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	6	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-F-071/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	?Capitellid polychaete	9	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-072/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Juvenile black gastropod	15	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-073/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Smooth brown gastropod	50	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-073/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Smooth brown gastropod	50	Copley / Marsh	Population genetics	100% ethanol
JC67-M-073/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Smooth brown gastropod	1	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-074/4	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Sulfide with microbial mat	10	Rogers / Djurhuus	Microbiology	Frozen minus 80 deg C
JC67-G-075/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Chimney sulfide	2	Copley / Marsh	Geology	Air dried
JC67-G-080/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Port biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen

Table 4.6.2: Sample inventory, listed by recipient subproject.

Sample number	Station	Date	Time	Gear	Location	Depth	Sample description	Sample size	Recipient	Project(s)	Preservation
JC67-F-028/1b	2	27/11/2011	07:59 - 08:37	ROV	36 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-031/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	20	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-033/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Red polynoid polychaete (commensal from mussel)	7	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-034/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile smooth brown gastropod	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-038/1a	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	?Capitellid polychaete	12	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-025/1a	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Kiwa*	6	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-026/1a	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-027/1a	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-048/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Chorocaris*	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-049/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	26	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-052/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	White polynoid polychaete (free-living)	2	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-053/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Bathymodiolus* juveniles	9	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-055/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Juvenile black gastropod	20	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-056/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Phymorhynchus*	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-057/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Small polynoid polychaete	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-058/1a	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	?Phymorhynchus egg case	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-054/1a	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Chiridotid holothurian	1	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-059/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	5	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-061/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Kiwa*	3	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-062/1a	8	29/11/2011	12:28 -	ROV	37 deg 47.030' S	2785	*Bathymodiolus*	7	Copley /	Morphological	4% buffered

			14:10		49 deg 38.967' E				Marsh	taxonomy	sw formalin
JC67-F-069/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Nephtid polychaete	12	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-071/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	?Capitellid polychaete	9	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-072/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Juvenile black gastropod	15	Copley / Marsh	Morphological taxonomy	4% buffered sw formalin
JC67-F-028/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-031/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	20	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-033/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Red polynoid polychaete (commensal from mussel)	6	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-034/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile smooth brown gastropod	20	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-037/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile alvinocaridid shrimp	4	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-038/1b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	?Capitellid polychaete	12	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-025/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Kiwa*	7	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-026/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-027/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-040/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Lepetodrilus*	3	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-041/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	White polynoid polychaete (free-living)	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-042/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	White polynoid polychaete (free-living)	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-043/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Ampharetid polychaete	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-044/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Small unident polychaete	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-045/1b	2	27/11/2011	10:30 - 11:35	ROV	38 deg 47.027' S 49 deg 38.963' E	2783	Unident polychaete	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-047/1b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Small gastropod (commensal from mussels)	3	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-049/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	10	Copley / Marsh	Molecular phylogeny	100% ethanol

JC67-F-050/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Juvenile alvinocaridid shrimp	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-051/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Unident anemone 1	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-052/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	White polynoid polychaete (free-living)	2	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-055/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Juvenile black gastropod	20	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-056/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Phymorhynchus*	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-058/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	?Phymorhynchus egg case	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-054/1b	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Chiridotid holothurian	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-099/1b	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Unident anemone 2	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-059/1b	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	5	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-060/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	10	Copley / Marsh	Genetics	100% ethanol
JC67-F-061/1b	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Kiwa*	1	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-069/1a	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Nephtid polychaete	12	Copley / Marsh	Molecular phylogeny	100% ethanol
JC67-F-029/2	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	120	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-031/2	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	60	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-036/2	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	65	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-026/2	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	60	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-027/2	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	80	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-027/2b	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	25	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-060/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	33	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-068/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	30	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-070/X	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	80	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-073/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Smooth brown gastropod	50	Copley / Marsh	Life-history biology	4% buffered sw formalin
JC67-F-029/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	120	Copley / Marsh	Population genetics	100% ethanol

JC67-F-031/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	60	Copley / Marsh	Population genetics	100% ethanol
JC67-F-034/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Juvenile smooth brown gastropod	30	Copley / Marsh	Population genetics	100% ethanol
JC67-F-036/3	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	65	Copley / Marsh	Population genetics	100% ethanol
JC67-F-026/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	59	Copley / Marsh	Population genetics	100% ethanol
JC67-F-027/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	80	Copley / Marsh	Population genetics	100% ethanol
JC67-F-039/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Juvenile smooth brown gastropod	20	Copley / Marsh	Population genetics	100% ethanol
JC67-F-068/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	50	Copley / Marsh	Population genetics	100% ethanol
JC67-F-070/X	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	80	Copley / Marsh	Genetics	100% ethanol
JC67-F-073/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Smooth brown gastropod	50	Copley / Marsh	Population genetics	100% ethanol
JC67-F-028/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	5	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-030/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Scaly-foot gastropod	2	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-031/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	10	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-036/5,6,8,9	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	20	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-027/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	25	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-049/5	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	10	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-054/5,6	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Chiridotid holothurian	1	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-059/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	1	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-061/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Kiwa*	1	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-062/5,6	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Bathymodiolus*	5	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-069/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Nephtyid polychaete	12	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-070/X	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	80	Copley / Marsh	Stable isotopes	Frozen minus 80 deg C
JC67-F-028/6	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	4	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-F-029/6	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	18	Copley / Marsh	Tissue metals	Frozen minus 80 deg C

JC67-F-027/6	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-F-060/6	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	5	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-F-068/6	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	20	Copley / Marsh	Tissue metals	Frozen minus 80 deg C
JC67-F-027/8	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	RNA expression	Frozen minus 80 deg C
JC67-F-029/9	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Smooth brown gastropod	18	Copley / Marsh	Biodiscovery	Frozen minus 80 deg C
JC67-F-027/9	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	10	Copley / Marsh	Biodiscovery	Frozen minus 80 deg C
JC67-F-046/9	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Faunal residue	1	Copley / Marsh	Biodiscovery	Frozen minus 80 deg C
JC67-F-059/4	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Rimicaris*	4	Copley / Marsh	Epibiont biogeography	Frozen minus 80 deg C
JC67-F-060/4	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	*Mirocaris*	5	Copley / Marsh	Epibiont biogeography	Frozen minus 80 deg C
JC67-F-028/4b	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus* shell	18	Copley / Marsh	Shell microgrowth	Air dried
JC67-G-076/3	2	27/11/2011	07:59 - 08:37	ROV	36 deg 47.029' S 49 deg 38.965' E	2770	Port biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-G-077/3	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Starboard biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-G-078/3	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	Port biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-G-079/3	6	28/11/2011	12:56 - 13:05	ROV	37 deg 47.006' S 49 deg 38.973' E	2758	Starboard biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-G-080/3	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Port biobox & fauna washings	-	Fererro / Woodall	Meiofauna	DESS / Formalin / 100% ethanol / -80 frozen
JC67-M-028/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	*Bathymodiolus*	3	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-031/5	2	27/11/2011	07:59 - 08:37	ROV	37 deg 47.029' S 49 deg 38.965' E	2770	Eolepadid stalked barnacle	10	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-025/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	*Kiwa*	1	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C

JC67-M-026/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Scaly-foot gastropod	4	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-027/5	2	27/11/2011	10:30 - 11:35	ROV	37 deg 47.027' S 49 deg 38.963' E	2783	Smooth brown gastropod	4	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-049/5	6	28/11/2011	10:35 - 11:59	ROV	37 deg 47.003' S 49 deg 38.948' E	2781	*Mirocaris*	2	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-068/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Eolepadid stalked barnacle	10	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-070/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Scaly-foot gastropod	6	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-073/5	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Smooth brown gastropod	1	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-M-074/4	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Sulfide with microbial mat	10	Rogers / Djurhuus	Epibiont microbiology	Frozen minus 80 deg C
JC67-G-075/2	8	29/11/2011	12:28 - 14:10	ROV	37 deg 47.030' S 49 deg 38.967' E	2785	Chimney sulfide	2	Copley / Marsh	Geology	Air dried
JC67-M-002/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2780	Water from Niskin bottle 2	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-003/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2780	Water from Niskin bottle 3	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-005/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2600	Water from Niskin bottle 5	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-006/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2600	Water from Niskin bottle 6	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-008/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2500	Water from Niskin bottle 8	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-009/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2500	Water from Niskin bottle 9	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-011/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2000	Water from Niskin bottle 11	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-012/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2000	Water from Niskin bottle 12	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-014/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1700	Water from Niskin bottle 14	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-015/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1700	Water from Niskin bottle 15	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen

JC67-M-017/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1300	Water from Niskin bottle 17	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-018/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1300	Water from Niskin bottle 18	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-020/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	200	Water from Niskin bottle 20	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-021/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	200	Water from Niskin bottle 21	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-023/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	40	Water from Niskin bottle 23	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-M-024/1	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	40	Water from Niskin bottle 24	10 litres	Rogers / Djurhuus	Microbiology: POC, 3.0 um, 0.2 um filters	Filters frozen
JC67-G-001/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2780	Water from Niskin bottle 1	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-G-004/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2600	Water from Niskin bottle 4	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-G-007/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2500	Water from Niskin bottle 7	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-G-010/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	2000	Water from Niskin bottle 10	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-G-013/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1700	Water from Niskin bottle 13	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-G-016/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	1300	Water from Niskin bottle 16	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-G-019/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	200	Water from Niskin bottle 19	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen
JC67-G-022/3,4,5	1	27/11/2011	02:02 - 03:10	CTD	37 deg 47.022' S 49 deg 38.942' E	40	Water from Niskin bottle 22	10 litres	Read	Oxygen, nutrients, salinity	Nutrients frozen

5 JC67 PUBLIC ENGAGEMENT ACTIVITIES

5.1 Online outreach

A bespoke set of webpages were created for JC67 as a subsite of www.TheseAreTheVoyages.net to provide background information on the cruise, and daily blog posts including pictures. Between 25 November 2011 and 31 January 2012, the site received >12 000 total visits.

In February 2012, the blog posts from JC67 were incorporated in the free eBook "Ocean Life: Expeditions & Essays Exploring the Abyss", distributed via outlets including BarnesAndNoble.com, WHSmith.co.uk and iTunes.

During JC67, the PSO and XSO also posted regular updates on the Twitter microblogging site. On return to the UK, a compilation of video highlights was posted on the "expeditionlog" YouTube channel, receiving >1000 views.

5.2 Media engagement

On return to the UK, the research cruise and its initial findings were covered as an exclusive by BBC News Online (reporter Rebecca Morelle), accompanied by video highlights, and specimen photographs kindly made available by photographer David Shale. The BBC News Online article received more than 750 000 page views on 28 December 2011, making it the third most-read news article of the BBC News website on that day.

In addition, the PSO gave media interviews as follows on 28 December 2011:
World Update, BBC World Service, 28 Dec 2011
BBC Radio Somerset, 28 Dec 2011
BBC Radio Wales (live), 28 Dec 2011
BBC Radio Scotland (live), 28 Dec 2011
Drivetime, BBC Radio Solent (live), 28 Dec 2011
Drive, BBC Radio 5 Live, 28 Dec 2011
Six O'Clock News, BBC One, 28 Dec 2011
World Tonight, BBC Radio 4, 28 Dec 2011
Up All Night, BBC Radio 5 Live, 28 Dec 2011
BBC News Channel (live), 28 Dec 2011

Extensive follow-on coverage by other media outlets included:
The Daily Mail online, 28 Dec 2011
The Daily Telegraph online, 28 Dec 2011
The Guardian, 29 Dec 2011, p 18
The Times, 29 Dec 2011, p 17
Southern Daily Echo, 29 Dec 2011, p 3
Macleans magazine, Canada, 11 Jan 2012
The Ecologist, 21 Feb 2012

6 ACHIEVEMENT OF OBJECTIVES

6.1 Assessment of project outcomes

The scientific objectives of the funded grant for JC67 were as follows, with assessment of the extent to which they have been achieved:

(1) Characterise vent fauna from the SWIR, collecting the first-ever directed samples of the dominant fauna for taxonomic identification and phylogenetic analysis.

Extent achieved: ~80%. Characterising SWIR vent fauna requires identifying and sampling the different microhabitats of the vent field, and also collecting environmental data to characterise those microhabitats. Restrictions in ROV bottom time and sampling capability (see below) prevented a complete achievement of this objective.

(2) Test the hypothesis that the lower incidence of hydrothermal venting along ultraslow-spreading ridges imposes a filter on the life-history biology of vent species.

Extent achieved: 50%. Acquiring suitable samples to investigate the life-history biology of vent species requires several spatially discrete collections for each taxon, to address possible effects of spatial variation on reproductive development in the heterogeneous vent environment. Restrictions in ROV bottom time and sampling capabilities hampered achievement of this objective, hence its only partial fulfilment.

(3) Determine the interannual variability of faunal microdistribution for the first time at a vent site on an ultraslow-spreading ridge, by comparing imagery from this proposal with that from the AUV dives in 2007.

Extent achieved: 20%. ROV dives undertook HD video mosaicing of single faces of three vent chimneys, but this was only 25% of original expectation because of restrictions in ROV bottom time. In addition, downward-looking video surveying could only be achieved by SHRIMP and HyBIS, rather than the ROV. Although those platforms achieved useful reconnaissance of the wider vent field, revealing the extent of active vent activity over a wide area, their limited manoeuverability compared with an ROV prevented collection of imagery for comparison with the AUV survey of 2007. Consequently, objective (3) was barely addressed overall.

Taken together, JC67 therefore achieved ~50% of its scientific objectives (~80% objective 1; ~50% objective 2; ~20% objective 3). The restriction of Kiel6000 ROV operations to less than 12 hours per day had a major impact on achieving the scientific objectives of the cruise.

6.2 Assessment of Kiel6000 ROV performance

The operational restrictions in using the Kiel6000 ROV compared with the Isis ROV for which the grant had been devised, were as follows:

Restricted ability to collect samples. The Kiel6000 ROV is equipped with two manipulators, but one is an industrial tool incapable of most biological sampling tasks. Only having one suitable manipulator on one side of the vehicle therefore limits the area that can be reached for sampling once the vehicle is set down for sampling. These restrictions limited the choice of sampling sites for the spatial sampling.

The suction sampler of the Kiel6000 ROV suffered loss of hydraulic pressure on each dive, limiting the length of time it could be used. Unfortunately the efforts of the ROV team, with help from NMF technicians, were unable to resolve the issue. The suction sampler was able to collect specimens into a maximum of 3 out of 8 sampling chambers during a dive, which limited the ability to take spatially discrete samples.

Overall, restricted ability to collect samples impacted the achievement of scientific objectives (1) and (2) above.

Restrictions for vent fluid sampling. Collecting samples of high-temperature vent fluids was a stated objective of the funded grant, to characterise vent geochemistry. The Isis and Jason-2 ROVs achieve this using titanium syringe samplers, picked up from and stowed in the tool tray. Two syringe samples are required for the geochemical analysis, and both can be collected during one dive by those ROVs. On the Kiel6000 ROV, however, the titanium syringe sampler has to be physically attached to the arm for the whole dive, only allowing one syringe sample to be collected per dive, and preventing any other sampling tasks from being undertaken. To collect vent fluid samples during JC67 would therefore have meant dedicating two out of three dives solely to fluid sampling, which was unacceptable. This impacted the achievement of scientific objective (1) above.

Restrictions in acquisition of HD video and digital still imagery. The HD video camera of the Kiel6000 ROV is not mounted on a full pan-and-tilt mount. Although it can be tilted, panning can only be achieved by changing vehicle heading. This restricts the ability to acquire footage of necessary quality to document faunal assemblages and vent structures. Furthermore, the digital stills camera, although mounted on a pan-and-tilt mount unlike the HD video camera, only achieves acceptable results when the vehicle is stationary on the seafloor, which is similarly restrictive.

Restrictions for downward-looking video surveying. The single HD video camera of the Kiel6000 ROV can be mounted in a downward-looking mode, but when mounted in that position, the vehicle cannot land on the seafloor, and therefore cannot collect any samples on that dive. Undertaking downward-looking video surveys, required for scientific objective (3), would

therefore have required sacrificing sampling capability from a whole dive at least.

An alternative downward-looking digital stills camera, the "Megacam", was available, but this requires mounting in place of the starboard bioboxes, with wiring looms that then prevent the manipulator arm from reaching the port biobox. This therefore restricts sampling on Megacam dives to suction samples on the starboard side of the vehicle only. The Megacam can also only acquire images while the vehicle is moving forwards at no greater than 0.05 ms^{-1} (unlike HD video surveying, which can be performed at moderate ROV speed). These restrictions therefore made use of the Megacam undesirable, given the need to achieve other objectives. Consequently, no downward-looking video survey work was undertaken by ROV during JC67.

Lack of a multibeam sonar system. Multibeam sonar would have saved considerable time during dives by enabling high-resolution mapping of the operational area at the start of the first dive. Instead, time had to be spent on all three ROV dives undertaking visual mapping of the vent field, in addition to trying to achieve sampling and videographic survey objectives.

Poor communications link between the ROV van and the Main Lab. Only two scientists can work in the Kiel6000 control van, sitting at some distance from the small (<30") HD video screens. The view for scientists on the larger screens in the Main Lab is actually superior to that in the control van, and scientists in the Main Lab were often able to spot features that could not be seen by scientists in the ROV van. Communication between lab and van was therefore important to avoid targets for sampling and surveying being missed. However, the ROV team would not permit scientists to use a phone link installed in the van for communications with the Main Lab, even with a science observer using a headset with microphone to avoid disturbing pilots.

To provide some communications, a text chat facility was helpfully improvised by the NMF IT technician, but this solution was a poor alternative to audio: it distracted scientists in the van from their primary observation task, and the wifi signal to the van was occasionally interrupted by interference from the ROV winch. As a result of the poor HD screens in the ROV van and limited comms with the Main Lab, a "black smoker" target was missed during the third ROV dive. Overall, this restriction impacted the achievement of scientific objectives (1) and (3) above.

Limited HD video recording. The Kiel6000 ROV does not routinely record all video footage from its HD camera. Instead, the HD recording facility in the ROV control van is used by pilots to record "highlights", and has a limited volume capacity. But as hard disk storage is no longer prohibitively expensive, this arrangement does not make full use of the potential of the ROV.

An HD video feed was therefore provided from the ROV control van to the Main Lab aboard the RRS James Cook, in the form of a cable passing through

a bulkhead doorway. In the Main Lab, this feed was connected to an AJA Ki-Pro solid-state recorder, and the cartridges of this recorder were routinely copied onto hard drives during dives using a Mac Desktop system in the Main Lab. However, the interruption to the power supply in the Main Lab during ROV dive 3 resulted in loss of footage for several minutes from this system.

Overall: the reader can perhaps sense the frustration of the PSO at some of the limitations that resulted from using the Kiel6000 ROV for JC67. The full consequences of that situation, and an account of the decisions that led to it, have been summarised in the Post-Cruise Assessment document for JC67, available separately. It is now clear that Kiel6000 ROV is operated in a very different way to the Isis ROV, which was the platform around which the grant for JC67 was designed (written and funded in 2009, prior to the Isis accident).

Within the constraints of its operating procedure, however, the Kiel6000 ROV did acquire useful samples and data during JC67. The efforts of the Kiel6000 personnel were appreciated, particularly in adapting to tasks such as video mosaicing with which they were not previously familiar. The constraints resulted from the operating procedures that the Kiel6000 has to follow, not from the ROV team. Many of those procedures only became apparent after embarking on JC66/67, and the work of the ROV team was appreciated in adapting as far as possible at sea to the requirements of JC67.

The Kiel6000 is used in a similar fashion to a manned submersible: dive operations are of less than 12 hours duration and only carried out in daylight, and the two scientists in the ROV van are expected to work in isolation. This approach, although capable of achieving results, does not use the full potential of an ROV as a platform for science. Its restrictions are also greatest in deeper water where ascent/descent times per dive are longer, and for projects that have limited shiptime. **It is important that future science users are aware of these differences**, now that the Kiel6000 ROV is potentially available to the UK science community through OFEG barter arrangements.

6.3 Assessment of non-ROV activities

With more than 20 hours of dive time, HyBIS dives formed an important component in the science activities for JC67, as a result of the time-limitations of the Kiel6000 ROV. Minor technical glitches with the video cameras and a MUX connection fault were resolved without major delay. Thruster malfunction (mainly of the port thruster) occurred on some dives, but this malfunction had limited impact on survey activities for JC67.

HyBIS received excellent support from James Cooper, John Wynar and Russell Locke during JC67. These NMF-SS technicians assisted in several ways, from watch-keeping and small vehicle maintenance to junction box change-over;

hence the HyBIS success was very much a team effort, led with dedication by Veit Hühnerbach.

SHRIMP provided a valuable alternative to HyBIS for reconnaissance during HyBIS maintenance, and its dive provided useful targets for subsequent ROV work. SHRIMP also received excellent support from NMF-SS technicians aboard, ably led by James Cooper.

The single CTD cast during JC67 was prepared and run with flawless professionalism by John Wynar. Further support of Kiel6000 operations by TLO Dave Edge and Russell Locke was also appreciated, along with preparation of additional sampling tools for the ROV by NMF-SS technician Neil Sloan. The Main Lab power cut during ROV dive 3 was quickly resolved, and UPS installed to prevent loss of HD recording in future.

Shipboard IT systems performed well during JC67; and in particular, the event logging system developed by Leighton Rolley was extremely valuable. Leighton Rolley also provided an invaluable service by processing USBL navigation data after ROV dives, which enabled rapid mapping of the vent field and efficient planning of further dive operations. With no multibeam sonar available from the Kiel6000 ROV to map the vent field, this was greatly appreciated to make the most of the limited time available for ROV dives during JC67.

Overall, the ship's personnel--from bridge officers and engineers to deck crew and stewarding staff--performed with the high level of professionalism and competence that makes the RRS James Cook a world-class facility for marine science.

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