D374 Cruise Report

17-20 March 2012

Contents

Scientific personnel: Adrian Glover (Natural History Museum (NHM), London) (PSO), Diva Amon (NHM, National Oceanography Centre (NOC)), Alex Meier (NOC)

Technical personnel: John Wynar (NOC)

Background: D374 was a short cruise to recover two moorings in the Cayman trough deployed on JC044 in Mar-Apr 2010. Apart from the mooring recovery, no other scientific activities were planned. The 2 moorings contain scientific instruments collecting oceanographic data (CTD), biofouling experiments and biodegradation experiments (whale bone and wood) designed to look for the enigmatic *Osedax* bone-eating worm and *Xylophaga* shipworm.

Mooring positions:

Mooring 2 (MOO2) depl 15 Apr 2010: 18°22.57N, 081°40.34W [pos from JC44 ship log] [depth 4773m]

Mooring 3 (MOO3) dep 19 Apr 2010: 18°32.704N, 081°43.321W [pos from JC44 ship log] [depth 4970m]

1. Log

16 March 2012

1830 Embark ship in Montego Bay, Jamaica. Scientist Kate Stansfield taken ill on outward journey and not able to join the cruise, so only 3 scientists on D374.

17 March

0830 Attempting to locate Alex Meier's air freight which is missing. Sorting out locations of moorings. MOO3 position is different in JC044 cruise report compared to JC044 ship log. Airfreight located and released, delaying sailing by about 3 hrs.

1200 Ship sails. Plan to head to MOO2 first. ETA 0750.

18 March

Sunny, fairly calm weather. Some shipping in area of MOO2.

0800 On station.

0811 Mooring released.

0902 Mooring surfaced.

1130 Mooring on deck. Collecting instruments and samples.

19 March

Sunny, calm

0800 On station. Mooring released. Should be on surface 0900.

0850 Mooring sighted on surface.

1130 Mooring on deck. Collecting instruments and samples.

20 March

Return to Montego Bay

2. Instrument data – John Wynar (NMFSS)

JC044/033MOO002 Mooring Recovery 18th March 2012
18° 22.57'N; 81° 40.33'W

On site at 13:00 GMT and attempted interrogating release with TT301 (s/n: 56) through hull transducer with no response. Communication achieved using the over-side transducer and a range of 4974m obtained in a water depth of 4888m (uncorrected) with the echo sounder turned off and ship's thrusters not operating. Release command sent at 13:11 GMT and response returned indicating execution of the command. Subsequent ranges received confirmed that the mooring had released and was ascending at a rate of approximately 85m/min. Mooring sighted on the surface at 13:58 and all instruments recovered by 16:21.

RBR XR-420 CTD s/n: 17024

Recovered showing damage to conductivity cell. Apparent that unit had flooded at depth. No data retrieval possible.

Nortek Aquadopp DW s/n: AQD6244

On deck:	14:35
Time logging stopped :	20:54:20 GMT on 18 March 2012
Computer time:	21:00:03
Instrument time:	21:00:45
File name:	AQD6244

SBE 37IM s/n: 3280

On deck: 15:20
No response from instrument, presumably due to exhausted battery.

Nortek Aquadopp DW s/n: AQD6260

On deck:	15:20
Time logging stopped :	20:30:55 GMT on 18 March 2012
File name:	AQD6260

RBR XR-420 CTD s/n: 09656

On deck: 15:56
No response from instrument, presumably due to exhausted battery.

RCM11 s/n:646

On deck: 15:56
TIME INTERVAL: 20 min.
TEMPERATURE RANGE: WIDE
CHANNELS: 8
DSU TYPE: 2990E; #13861
Time of last record: UNKNOWN
Number of words on DSU: 182715
File name: Unable to download data from DSU
DSU time difference: 4 min 27 sec fast

SBE 37IM s/n: 3279

On deck: 16:06
No response from instrument, presumably due to exhausted battery.

RCM11 s/n:400

On deck: 16:06
TIME INTERVAL: 20 min.
TEMPERATURE RANGE: WIDE
CHANNELS: 8
DSU TYPE: 2990E; #2376
Time of last record: UNKNOWN
Number of words on DSU: 22137
File name: RCM_400
DSU time difference: 12 min 9 sec slow

JC044/033MOO003 Mooring Recovery 19th March 20
18° 32.72'N; 81° 43.32'W

Interrogated release with TT301 (s/n: 56) with over-side transducer and received ranges of 5064m and 5063m obtained in a water depth of 4809m (uncorrected) with the echo sounder turned off and ship's thrusters not operating. Release command sent at 12:48 GMT and response returned indicating execution of the command. Subsequent ranges received confirmed that the mooring had released and was ascending at a rate of approximately 80m/min.

The top buoyancy was sighted on the surface at 13:57 and the ship manoeuvred for grappling the mooring. The recovery line could not be seen so another suitable place for grappling was chosen. It then became apparent that the recovery line had become entangled with the top buoyancy package after the recovery sphere had imploded. This complication led to the mooring line becoming tangled somewhere at the stern of the ship and below the water line. Slack line was pulled in and tied off, then one side cut which then allowed the other end to be hauled free and recovery commenced. Even with this time lost all instruments were recovered and all inboard by 15:55.

RBR XR-420 CTD s/n: 17274

On deck: 14:30
No response from instrument, presumably due to exhausted battery.

Nortek Aquadopp DW s/n: AQD6262

On deck: 14:30
Time logging stopped : 17:56:00 GMT on 19 March 2012
File name: AQD6262
Instrument time: 6 min 48 sec fast

RBR XR-420 CTD s/n: 09657

On deck: 15:30

No response from instrument, presumably due to exhausted battery.

RCM11 s/n:644

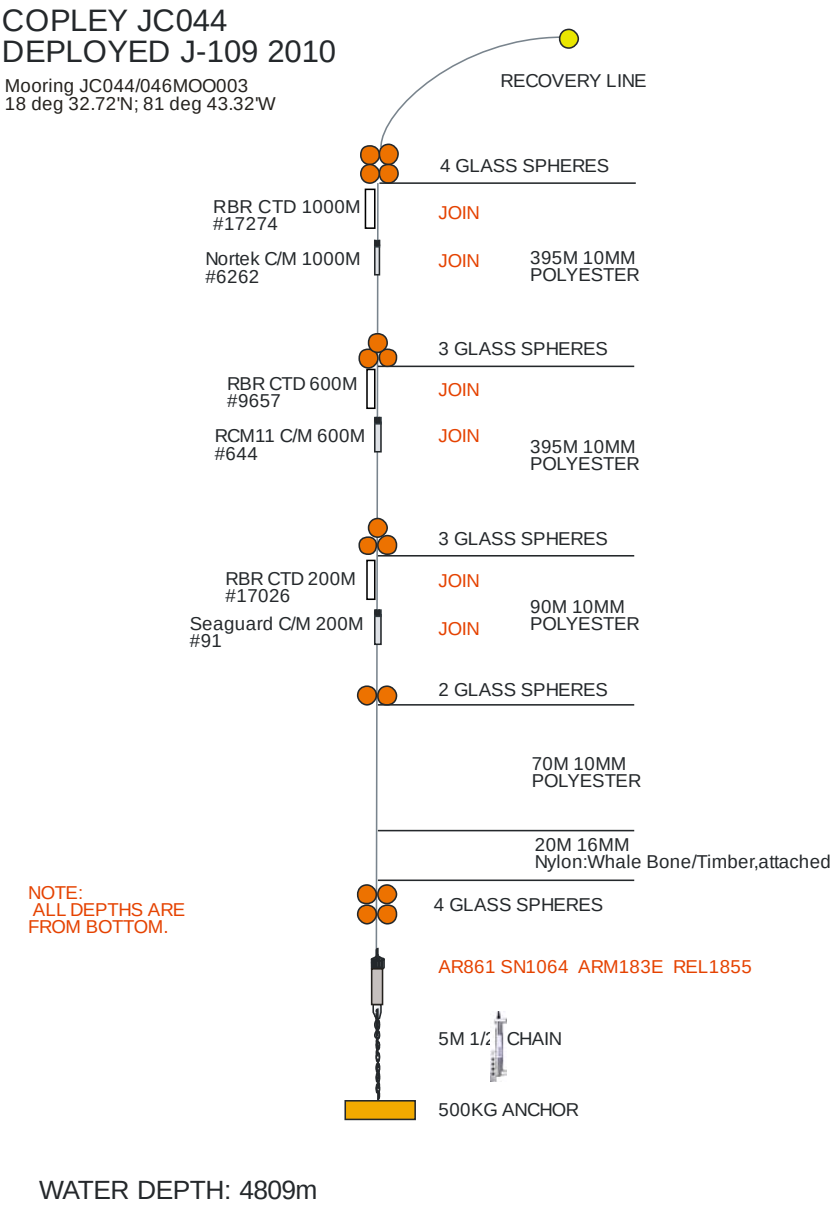
On deck:	15:30
TIME INTERVAL:	30 min.
TEMPERATURE RANGE: WIDE	
CHANNELS:	8
DSU TYPE:	2990E; #15726
Time of last record:	UNKNOWN
Number of words on DSU:	262127
Filename(s):	RCM_644
DSU time difference:	14 min 55 sec slow

RBR XR-420 CTD s/n: 17026

On deck: 15:40
No response from instrument, presumably due to exhausted battery.

Seaguard s/n:91

On deck:	15:40
Last record:	Unknown
Switched off:	19:27:00 on 19 March 2012
File/dir name:	RCM_91_20100419_0300

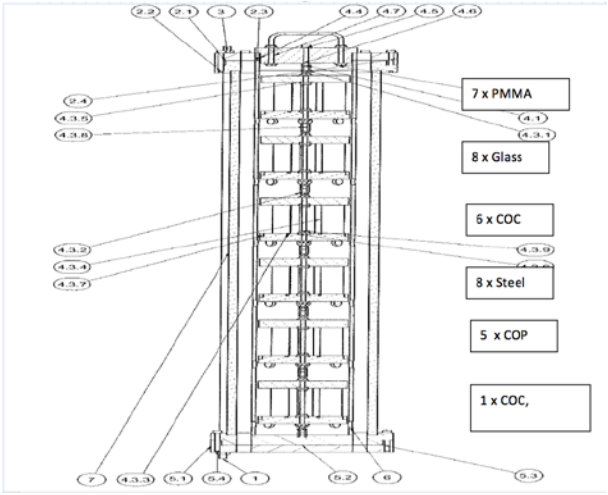


3. Biofouling experiment – Alex Meier

Mooring #2

Consisted of a biofouling tube and sample box.

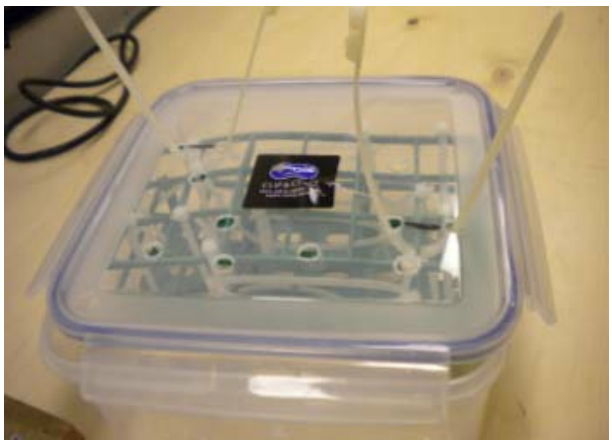
Tube sample list



Box Sample List:

- 9 x Copper; 0.9mm thick; 1 x COC above Copper
- 7 x PMMA / Acrylic; 1.5mm thick; 1 x COP above PMMA
- 9 x DELRIN / Acetal; 2mm thick
- 4 x Glass slides
- 3 x Copper
- 8 x Delrin
- 10 x Glass

All samples were fixed with Ethanol (100%), airdried and stored @4˚C for later microscopic and DNA analysis.



Sample Box

Mooring #3

Consisted of a sample box only:

All samples were fixed with Ethanol (100%), airdried and stored @4˚C for later microscopic and DNA analysis.

5. Bone/wood biodegradation experiment – Diva Amon & Adrian Glover

Mooring #2

We arrived at the first mooring site (MOO002) after 21 hours steam – 18°22.57N, 81°40.34W. The mooring was released at 08:11am local time after having intermittent contact with the mooring prior. MOO002 was located at the surface to the forward port of the ship at 09:02am. Include about various bits of mooring coming up and being washed and stored. MOO002 was completely on deck at 11:30am, after approximately three hours washing time at the surface.

The bones and wood package from MOO002 initially appeared completely clean. There was no obvious degradation of either substrate. The bones were picked clean of meat apart from in the trabeculae holes and various other indentations on the bone. There was still a lot of cartilage left on the bones. There appeared to be a few black (possibly sulphidic?) patched on the bones and wood.

On closer inspection of the bone recovered from MOO002 (a humerus, a vertebrae and an ulna), the only biology present were very thin sparse bacterial mats in patches and between two of the planks of wood. There was no other life or Osedax present. All bone surfaces were very hard and not compromised, however the surface layer of the wood was supple and easily scraped (probably due to waterlogged-nature). In areas covered by thin bacterial mat, the bone surface was slightly softer.

There was corrosion of the bolt holding together the three pieces of the wood, leaving rust stains around the bolt on the wood. The wood also had various patches of bacterial mats. There was only one possible boring hole of xylophaga and some unknown black circular dots (CBBs) shallowly embedded in the wood surface on all sides. These could possibly be metallic deposits or the egg capsules of an unknown organism. There were also possible faecal pellets or egg capsules that were light brown in colour, held together in mucus patches and appeared to contain either eggs or wood shavings found in the water sieved from the bucket containing the wood.

The following samples were taken from the wood and whale bones recovered from MOO002:

D374	MOO2	vert between process joints - slightly mucousy scrape	963
D374	MOO2	vert between process joints - slightly mucousy scrape	964
D374	MOO2	bone pieces cut to expose bacterial mats in 964 and 963	965
D374	MOO2	whole vertebrae	966
D374	MOO2	radius	967

D374	MOO2	humerus	968
D374	MOO2	black epifauna (CBBs) - 4 loose	969
D374	MOO2	black epifauna (CBBs) - in wood fragments	970
D374	MOO2	3 pine wood blocks cut from orginial - 1 with xylophaga boring	971
D374	MOO2	3 original large wood blocks (rest of package)	972
D374	MOO2	Black epifauna (CBBs) - 4 loose	973
D374	MOO2	faecal blobs	974

Please refer to Adrian Glover's whale worm database spreadsheet for further information regarding these samples. The samples were either frozen to -20degC or preserved in 100% ethanol.


Mooring #2 Bone sample


Mooring #2 Wood sample

Mooring #3

Arrival on site for the recovery of MOO003 occurred on the morning of the 19th March 2012. Contact was made with MOO003 at 7:46am at a distance of 5064m. The mooring began ascent at 7:48am at 80m per minute approximately. MOO003 was sighted on the surface on the port site of the RRS Discovery at 8:48am. The entire mooring was recovered by 10:45am.

Again the bone and wood package looked relatively intact and very clean. The vertebral bone still had a lot of flesh and cartilage present. A smaller piece of the vertebral bone was still joined onto the larger bone by flesh. There was thin sparse bacterial mat present – some were white in colour but others resembled mucous. There was no other life on the bones.

The wood showed no evidence of xylophaga and there was not much bacterial mat. The wood like at MOO002 was very heavy and not easily penetrated by the forceps. One white, slightly-transparent limpet (possibly Osteopeltidae) was found at the outer edge between two of the planks of wood. There were again many of the black balls (CBBs) present on all exposed surfaces of wood.

The following samples were taken from the wood and whale bones recovered from MOO003:

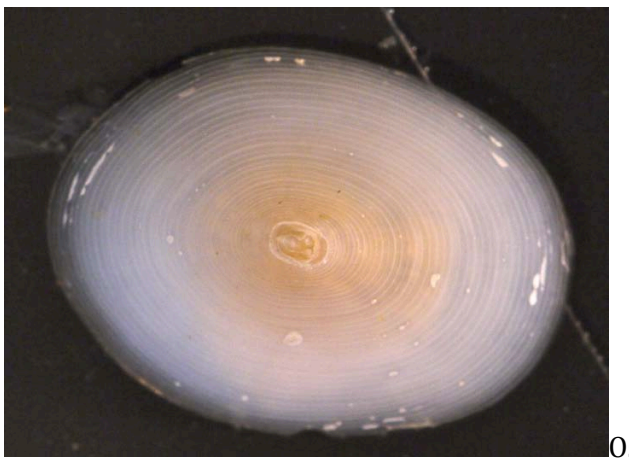
D374	MOO3	vertebrae plus small bone piece	975
D374	MOO3	limpet found inbetween two wood planks in package	976
D374	MOO3	Black epifauna (CBBs) - in wood fragments	977
D374	MOO3	3 original large wood blocks	978
D374	MOO3	Black epifauna (CBBs)	979

Please refer to Adrian Glover's whale worm database spreadsheet for further information regarding these samples. The samples were either frozen to -20degC or preserved in 100% ethanol.

The presence of flesh on the bones after two hours points to very slow rates of decay, microbial and otherwise. Also, possibly scavengers were not present at these depths or were demersal in nature and not able to reach the mooring from the seabed. The same theory can apply to the absence of Xylophaga and Osedax – the larvae are demersal or perhaps there was not enough entrainment to allow the settlement of larvae or the area is completely oligotrophic or these animals are restricted bathymetrically.


Mooring #3 Bone Sample


Mooring #3 Wood Sample


Osteopeltidae limpet recovered from MOO3 wood


Unknown black epifauna (CBB) on both wood samples