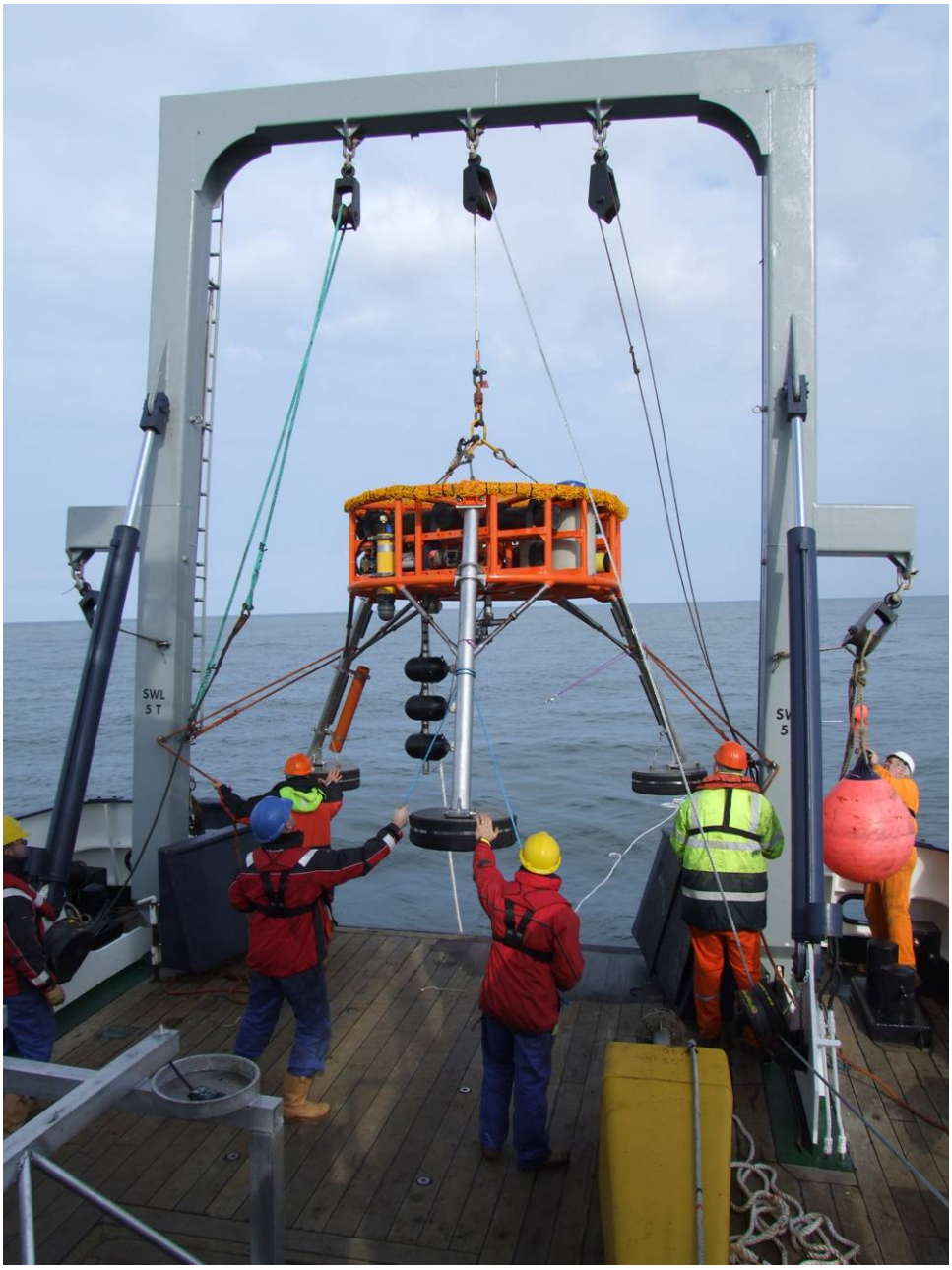
River Dee Estuary deployment cruise report
March 2007



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Contents.

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1.0 - Introduction.

This is a brief report covering the major preparation and deployment work for the River Dee estuary cruise during March 2007. During this deployment, mini-STABLE (formerly F1 from LEACOAST2) and the new STABLE3 frames were deployed. Between these two frames more of POL's instrumentation was deployed c.f. LEACOAST2 and is the most instrumentation deployed at anyone time in the last few years.

In this report the equipment deployed on mini-STABLE and STABLE3 is described, along with problems encountered, instrumentation configurations, physical positions etc.

2.0 - Cruise Diary.

12/3/2007.
Left POL for Menai, arriving at approx 12:30pm. When hired lorry arrived at Menai with rest of POL equipment, Prince Madog was loaded up. Mini-STABLE was reconstructed on the aft deck of the Madog. ADV's and SyncGen3 set to start at 6:00am GMT 13/3/2007. ABS3 previously set to start at 6:00am GMT 13/3/2007 back in POL lab. Equipment preparations etc finished at approx 6:30pm.

13/3/2007.
Madog sailed from Menai at 6:30am for the River Dee Estuary Welsh channel station point. Recovered CEFAS SMART buoy and POL telemetry buoy en-route. Side scan sonar tracks taken to locate site to deploy mini-STABLE. Bottom frame and mini-STABLE deployed in the Welsh channel before taking up 25hour station position at approx 3:00pm. CTD sampling started at 30minute intervals with people working on 6hour shift rotations. SMART and telemetry buoys cleaned during this period. Note taken of chaffing on SMART buoy cable and unexpected number of barnacles growing on bottom of both toroid buoys.

14/3/2007.
CTD station work finished at 3:30pm. Madog left station, sailing for the Vittoria Docks to pick ip STABLE3 and other equipment. Arrived Vittoria Docks between 6 and 7pm and STABLE3 plus Triaxis wavebuoy loaded on-board. Joined by other POL staff for the STABLE3 deployment tomorrow.

15/3/2007.
Sailed, 5:00am for Hilbre channel arriving on site at 8:30am. Triaxis buoy deployed and then side scan sonar tracks taken to locate suitable site for STABLE3. STABLE3 deployed at approx 10:08am with CTD station work starting at 11:00am using 6 hour rotation shifts.

16/3/2007.
CTD station measurements finished at 12:00pm. Madog left station at 12:30pm and sailed back to Menai, arriving at around 4:30pm. All equipment etc loaded up in to POL vehicles. POL staff left Menai at around 6:30pm to meet up at the Vittoria Docks for around 8:00pm. POL staff left Vittoria Docks at around 8:15pm for homes.

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3.0 - Mini-STABLE.

3.1 - Overview.

Mini-STABLE is the deployment frame formerly known as F1, deployed three times during the LEACOAST2 project in 2006. For this deployment in the Welsh channel of the River Dee estuary, it is equipped with the following :-

1. Sontek ADV G412+B331
2. Sontek ADV G258+B233
3. Sontek ADV G250+B252
4. POL ABS3
5. SyncGen3
6. Marine Electronics line scan ripple profiler with external battery pack.
7. RDI ADCP 1200KHz with external battery pack.
8. LISST100-ST configured as plain LISST100.
9. UEA sediment trap, courtesy of Dr John Bacon of UEA.

3.2 - Equipment preparations.

Prior to deployment all three ADV's plus ABS3 were bench tested at POL to check operation. The ADV's all trigger on receipt of a sync pulse but ABS3 wouldn't trigger. The problem was traced to the logger electronics but couldn't be rectified in time for the deployment. ABS3 however does record OK so will be deployed unsynchronised.

Beam checks were carried out on all three ADV's as a precaution against damage to the transducer arms (example result in Figure 1). No problems were found.

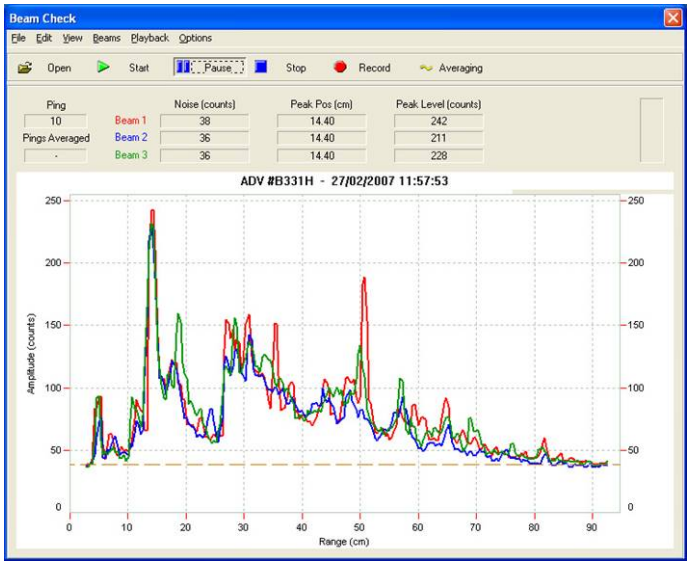

Figure 1 - Example beam check result for probe head B331

New battery packs were fitted prior to deployment and all o-rings plus sealing faces cleaned, checked for damage and then regreased using Dow Corning silicon grease. No problems were encountered although the compasses on G250+B252 and G258+B233 needed reorienting for sideways mounting. Compass checks were carried out prior to deployment and the necessary offsets corrected.

ABS3 was fitted with a new battery pack and apart from the sync problem mentioned above, worked OK when bench tested. Ben Moate et-al carried out the post-LEACOAST2 / pre-

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Dee07 calibrations in the Sediments Tower. Three sizes of ballotini 115um, 157um and 163um radii at concentrations of 60gm, 120gm and 240gm were used. Note that ABS3 is using transducer set s/n102@1MHz, s/n108@2MHz and s/n109@4MHz. ABS3 was upgraded with a new aluminium casing and end-cap replacing the plastic case used during LEACOAST2. This should prevent the leakage problem of ABS2 which destroyed that system. All o-rings and sealing faces were lightly greased using Vaseline.

SyncGen3 is to be used as the central timing clock to trigger the ADV's and ABS3 on mini-STABLE. The system was tested on the bench prior to deployment and found to be working OK. The second ABS sync connection is still producing the extended sync period pulse for one of the ripple profilers. As this connection is not to be used, there was no point in modifying system software. A new battery pack was fitted even though there was still some life left in the old unit from LEACOAST2, just as a precaution. SyncGen3 was also upgraded to use an aluminium casing and end-cap, replacing the plastic versions used during LEACOAST2. All o-rings and sealing faces were lightly greased using Vaseline.

The ADCP and UEA-sediment trap were both handled by Mike Smithson. He set both systems up to run on mini-STABLE and handled issues like battery pack installation.

The ripple profiler is line-scan (2-D) type and was handled by Paul Bell. He was responsible for it's cabling, connectors, battery pack (upgraded to aluminium casing post-LEACOAST2) etc.

The LISST100-ST is a change of unit. Originally the LISST100 was to have been deployed but that was needed to replace the LISST100X on STABLE3 due to damage to LISST100X's optical system received during LEACOAST2. The LISST100-ST was set up as a LISST100 by Alex Sousa who also fitted it with a new battery pack and then programmed it's deployment parameters.

3.3 - Deployment.

The ADV's were all installed on mini-STABLE as shown in Figure 2. All three were set for 16Hz recording, 20minute bursts, each hour on the hour using an external sync pulse from SyncGen3. Recording was set to start at 6:00am (GMT) 13/3/2007 after the real-time clocks were corrected manually using a radio-clock. All three systems were set to record using ENU coordinates not the normal XYZ, at Alex Sousa's request.

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ABS3 was set-up in the lab at POL to save time setting up mini-STABLE on the Madog's aft-deck. It was also set to start recording (albeit un-sync'd) at 6:00am (GMT) 13/3/2007. The recording rate is locked in software and hardware to 128Hz PRF, averaged over 32 profiles to 4Hz recorded, 1cm bins, three frequencies (1, 2, 4MHz) for 22 minute bursts set at 1 hour intervals.

SyncGen3 was set to start generating sync pulses at 6:00am (GMT) 13/3/2007 to match the other instruments.

The ripple profiler, LISST100-ST, ADCP and UEA sediments trap settings are kept by the different people who set them up. None of these instruments uses sync pulses from SyncGen3 for timing.

4.0 - STABLE3.

4.1 - Overview.

This is the first field deployment of the new replacement for STABLE2.5. It can carry more equipment than it's predecessors and on this occasion is equipped with the following :-

1. Sontek ADV G365 with B281 replacing A824 as probe head.
2. Sontek ADV G355+B285.
3. Sontek ADV G358+B292.
4. POL ABS1.
5. SyncGen1.

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6. Marine Electronics 3-D ripple profiler with external battery pack.
7. AML CT logger with three external CT probes on own cables and external battery pack.
8. Paros Digiquartz pressure sensor.
9. Two D&A Instruments OBS3+ model OBS sensors set for 500NTU measurement range.
10. RDI ADCP on a gimbal mount.
11. Andera ADCP with external battery pack, on-loan to POL.
12. LISST100.

4.2 - Equipment preparations.

Like with mini-STABLE, the three ADV's were tested on the bench at POL as a functionality check. Sync testing was carried out using SyncGen1 and all three triggered with no problems. Beam checks were carried out in case of damage to the transducer arms with no problems found. New battery packs were fitted with all o-ring seals and sealing faces cleaned then lightly regreased using Dow Corning 111 silicon grease. The memory card in G355 was replaced with a 1GByte device c.f. to the 512MByte fitted during LEACOAST2. ADV G365 was reprogrammed in-situ on STABLE3 to use probe head B281 left by the damaged G350 system. This was necessary so the protective cowl could be fitted properly. G365 did complain that it could not find a compass when it was tested in-situ but reported back that it would record data OK if XYZ coordinates are used. This is probably due to a dip-switch needing setting inside the main electronics canister but was too late to do this. G358 was set-up to record from the digi-quartz pressure sensor. It needed to be specifically instructed that it had a digi-quartz sensor attached before the system software would acknowledge it's existence. No digi-quartz calibration file was available at the time, for upload into G358. The necessary files have now been located and will have to be uploaded prior to data download on recovery of STABLE3 during April2007.

ABS1 was sync tested with SyncGen1 at the same time as the ADV's and also triggered with no problem. Post-LEACOAST2 / pre-Dee07 calibrations were carried out in the Sediments Tower by Ben Moate et-al. The system was shown to be working OK using transducer set s/n103@1MHz, s/n109@2MHz and s/n111@4MHz. The system was fitted with a new battery pack and all o-rings plus sealing faces, cleaned then checked for damage before being lightly regreased using Vaseline. ABS1 was electronically deployed in the POL lab to make deployment of STABLE3 later, more simple.

SyncGen1 required one of it's sync output connectors replacing due to damage incurred on recovery during LEACOAST2. Apart from this the system was bench tested and shown to be working correctly. Like with ABS1, it was refitted with a new battery pack and all o-rings plus sealing faces checked for damage, cleaned and regreased using Vaseline.

The digiquartz pressure sensor couldn't be checked in time for the deployment. It was on loan to Sontek/OSIL so the replacement ADV for G350 could be set-up properly. We only received the sensor back a couple of days before deployment itself.

Each ADV should have also had one of the OBS sensors attached. Only two could be fitted to STABLE3 this time around as ADV G365 was not equipped with an external sensors connector. G355 and G358 were set-up to accept the remaining two OBS sensors. One issue discovered shortly before the Dee07 cruise was that when Sontek built the cable harnesses to accept the OBS3+ sensors, it was when these sensors came with an Impulse XSJ series connector. Between that point in time and when the OBS sensors were bought by POL, D&A Instruments changed the connector to Impulse MCBH series, but didn't widely advertise it's intentions. Hence interface adapters had to be built for the OBS sensors. These consisted of a small plastic box, the required mating connectors and poly-urethane potting compound. A 150gm bag was just about enough to make up three such adapters. Testing the adapters with the OBS's on the bench using a bench power supply and voltmeter to check sensor analogue output, showed they all worked OK. The adapters were wired for 500NTU measurement range on the OBS sensors.

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The AML CT logger measures just conductivity and temperature from it's three sensor heads. This system provided some fun and games trying to get it work properly on the work bench at POL prior to it being fitted to STABLE3. Firstly, the system would power-up and record correctly using real-time deployment and a bench power supply. But when set for autonomous deployment using battery power it would not even turn on. The problem was eventually traced to incorrect internal wiring left over from when the system was last at OSIL for a system upgrade (post-Dee06 deployment). After a number of telephone conversations and several e-mails, OSIL accepted blame. The wiring was correct here at POL and bench testing showed the system to working OK in autonomous mode using SyncGen1 to supply timing triggers. The CT logger was also set-up to accept power from a POL designed external alkaline battery pack instead of it's normal internal and external lithium cell battery packs. The lithium D-cells making up these two packs are over £15 per cell and need to be bought in quantities of 100 or more making them too expensive to be replacing after each deployment. The internal lithium battery pack was removed for safety and recycling as were the cells in the external battery pack. The existing short aluminium cased external battery pack used for the old STD12plus CT logger (non-functional), was adapted to power this newer CT logger as a direct replacement for the lithium external battery pack. This meant having a new shorting/system enable shorting plug built by PDM-Neptec, plus new interface cabling etc. Testing on the bench prior to install on STABLE3 showed it worked OK with one of the spare ABS battery packs providing power.

The two ADCP's, LISST100 and ripple profiler were all handled by other people. The RDI ADCP was handled by Mike Smithson, the Andera ADCP handled by John Kenny, LISST100 by Alex Sousa and the ripple profiler by Paul Bell. The only other information known is that the LISST100 battery pack was replaced by a new unit prior to deployment.

4.3 - Deployment.

All of the ADV's plus SyncGen1 and ABS1 were set to start recording at 6:00am (GMT) 15/3/2007. The LISST100 was set to start using it's own internal clock by Alex Sousa. Deployment times for the other instruments are recorded separately by the people deploying the units.

STABLE3 was built up and instruments installed, at the Vittoria Docks site (Figure 3).

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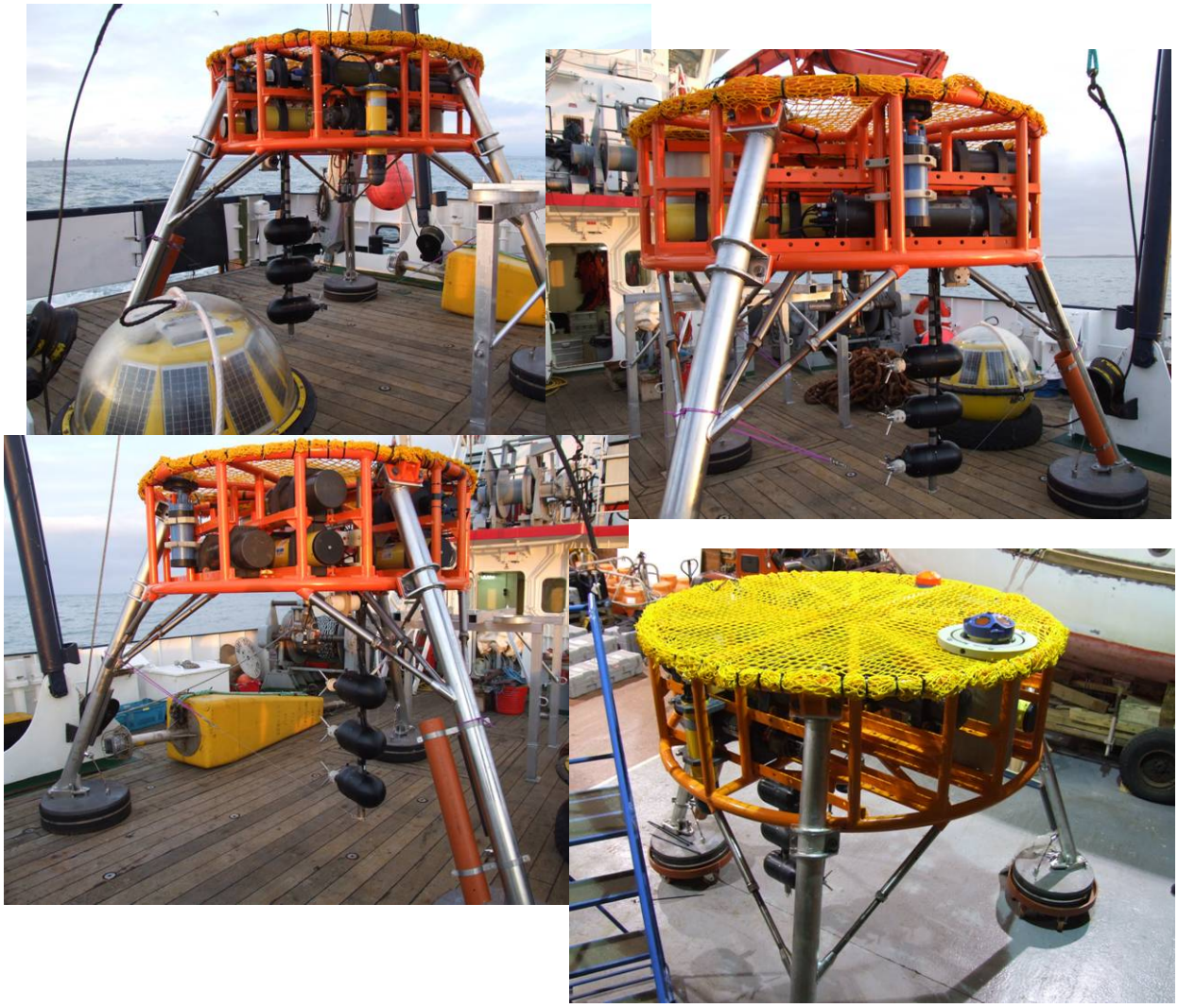

Figure 3 - deployment of STABLE3

It was loaded on-board the Prince Madog on 14th March, shortly around 7:00pm and was deployed in the Hilbre channel around 10am 15/3/2007.

The Sontek ADV's were set for 8Hz recording to match the CT logger. It had to be set to 8Hz due to a min response time for the temperature sensors of 0.1seconds. The ADV's were set for 20minute bursts at hourly intervals using an external sync pulse trigger from SyncGen1 and recording using XYZ coordinates.

ABS1 was locked by hardware and software to record 128Hz PRF, averaged over 32 profiles to 4Hz recorded, with 128bins recorded at 1cm bin lengths.

5.0 - Other Items.

The CEFAS-SMART buoy and the POL Telemetry buoy were both recovered 13/3/2007, covered in a heavy layer of black marine growth/slime. This needed to be jet-washed off before items of instrumentation could be removed. The POL telemetry gear looked to be OK. The UoL metal-ion probe was recovered and found to have recorded about 2.5 days of data before shutting down. The lead-acid battery packs were down to 2.17volts c.f. 6v(nom) 6.6v (with full charge). This means they are in a deep-discharge state and may not be recoverable – a limit of lead-acid technology. The ion-probe was found to have stopped recording as a result of file I/O problems to

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it's memory card. The system software needs to be modified to cope with this type of hiccup more intelligently rather than just shutdown the system. The good news is that the protective cage Conrad Chapman put around the sensor head appears to have worked and is intact. The CEFAS-SMART buoy equipment seems to have suffered some cable chafing on one instrument (Figure 4). This cable needs to be replaced.

Figure 4 - UoL metal ion probe head and chaffing on CEFAS instrument

Otherwise the SMART buoy looks to be OK. POL's equipment on the telemetry buoy was removed and packed away for return to POL. Mike Smithson is handling the CEFAS instruments.

The POL pop-up frame was handled by Mike Smithson and John Kenny.