Southampton Oceanography Centre
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CRUISE REPORT No. 51

RRS *CHARLES DARWIN* CRUISE 150
22 AUG - 15 SEP 2003

Benthic ecology and biogeochemistry
of the Pakistan Margin

Principal Scientist
B J Bett

Cruise Report

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2004

George Deacon Division for Ocean Processes
Southampton Oceanography Centre
University of Southampton
Waterfront Campus
European Way
Southampton
Hants SO14 3ZH
UK

Tel: +44 (0)23 8059 6355
Fax: +44 (0)23 8059 6247
Email: bjb@soc.soton.ac.uk

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ABSTRACT

RRS *Charles Darwin* cruise 150 forms part of a larger programme of research ("Benthic processes in the Arabian Sea: interrelationships between benthos, sediment, biogeochemistry and organic matter cycling", NER/A/S/2000/01280), focusing on the benthic biogeochemistry of the Pakistan Margin, that includes four cruises in total (CD145, 146, 150 and 151). The primary objectives of the present cruise were: a) to revisit a series of five previously established study sites (A140, A300, A950, A1200 and A1850) spanning the Arabian Sea oxygen minimum zone (OMZ) as it impinges on the seabed at the Pakistan Margin; b) to assess the chemical oceanography of the water column overlying these sites, through CTD sensor profiles and chemical determinations on water bottle samples from both the CTD and BBLS; c) to initiate a programme of detailed seabed sampling at these sites to determine a suite of biological, chemical and biogeochemical parameters using a Megacorer and a multicorer; d) to assess and sample the megabenthos of these sites by the combined use of trawling (Agassiz trawl) and seabed photography (WASP); e) as possible, to carry out similar operations at a site located at a depth between A300 and A950; f) as possible, to provide additional general characterization of the seabed in the area of these sites using acoustic remote sensing (EM12 and 3.5 kHz) and seabed imagery (WASP).

The cruise successfully achieved all of the planned objectives. The effort of assessing the science of the cruise will take many months of work ashore. Of those parameters that could be initially assessed onboard there was little indication of major change between cruises 145 and 150, other than in the OMZ itself. Minimum oxygen values encountered during cruise 145 were around 400m, but during the present cruise were in the 150-200m range. If a value of 0.5 ml/l is used as a boundary, then it had shallowed from c. 180m (CD145) to c. 80m (CD150). There also appeared to be some elevation of the lower boundary of the OMZ, although this was less marked.

KEYWORDS

Agassiz trawl, Arabian Sea, bathymetry, benthic communities, benthos, biochemistry, biogeochemistry, *Charles Darwin,* continental slope, cruise 150, CTD, foraminifera, geochemistry, Indus Margin, Indian Ocean, megabenthos, megacorer, meiobenthos, multiple corer, organic matter, oxygen minimum zone, Pakistan Margin, protozoa, seabed, sulphate reduction

ISSUING ORGANISATION

Southampton Oceanography Centre
Empress Dock
European Way
Southampton SO14 3ZH UK

Copies of this report are available from: **National Oceanographic Library, SOC** *PRICE*:
Tel: +44(0)23 80596116 Fax: +44(0)23 80596115 Email: nol@soc.soton.ac.uk

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1. SCIENTIFIC PERSONNEL

Brian Bett (PS)	SOC-George Deacon Division
Ben Boorman	SOC-George Deacon Division
Janne Kaariainen	SOC-George Deacon Division
Rachel Jeffreys	University of Liverpool
Gareth Law	Scottish Association for Marine Science
Tim Brand	Scottish Association for Marine Science
Martyn Harvey	Scottish Association for Marine Science
Tracy Shimmield	Scottish Association for Marine Science
Peter Lamont	Scottish Association for Marine Science
Cheryl Haidon	Scottish Association for Marine Science
Terrie Sawyer	Scottish Association for Marine Science
Samina Kidwai	National Institute of Oceanography, Pakistan
Jeff Benson	SOC-Ocean Engineering Division
Liz Rourke	SOC-Ocean Engineering Division
Darren Young	SOC-Ocean Engineering Division
Steve Whittle	SOC-Ocean Engineering Division

2. SHIP'S PERSONNEL

Peter Sarjeant	Master
Pete Newton	Chief Officer
Malcolm Graves	Second Officer
Titus Owoso	Extra Second Officer
Ian Mcgill	Chief Engineer
Alex Greenhorn	Second Engineer
Derek Ardern	Third Engineer
Keith Conner	Third Engineer
Dennis Jakobaufderstroht	Electrical-Technical Officer
Tiny Pook	Bosun
Bob Johnston	Bosun's Mate
Phil Allison	Seaman
Stu Cook	Seaman
Garry Crabb	Seaman
Martin Harrison	Seaman
Iain Thomson	Seaman
Keith Pringle	Motorman
Clive Perry	Ship's Catering Manager
John Haughton	Chef
Andy Duncan	Assistant Chef
Pete Robinson	Steward

3. ITINERARY

Sailed Muscat, Oman	22 August 2003
Arrive Pakistan Margin work area	24 August
Depart Pakistan Margin work area	12 September
Docked Muscat, Oman	15 September 2003

4. OBJECTIVES

RRS *Charles Darwin* cruise 150 forms part of a larger programme of research (*"Benthic processes in the Arabian Sea: mechanistic relationships between benthos, sediment, biogeochemistry and organic matter cycling"*), focusing on the benthic biogeochemistry of the Pakistan Margin, that includes four cruises in total (CD145, 146, 150 and 151). The primary objectives of the present cruise are:

a) to revisit a series of five previously established study sites (A140, A300, A950, A1200 and A1850) spanning the Arabian Sea oxygen minimum zone[1] as it impinges on the seabed at the Pakistan Margin.
b) to assess the chemical oceanography of the water column overlying these sites, through CTD sensor profiles and chemical determinations on water bottle samples from both the CTD[2] and BBLS[3].
c) to initiate a programme of detailed seabed sampling at these sites to determine a suite of biological, chemical and biogeochemical parameters using a Megacorer and a multicorer.
d) to assess and sample the megabenthos of these sites by the combined use of trawling (Agassiz trawl) and seabed photography (WASP).
e) as possible, to carry out similar operations at a site located at a depth between A300 and A950.
f) as possible, to provide additional general characterization of the seabed in the area of these sites using acoustic remote sensing (EM12[4] and 3.5 kHz[5]) and seabed imagery (WASP[6]).

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[1] An oxygen depleted (<0.5 ml/l) water layer
[2] Conductivity Temperature Depth probe
[3] Benthic Boundary Layer Sampler
[4] Hull mounded 12 kHz swath bathymetry system
[5] 3.5 kHz surface towed seabed profiling system
[6] SOC Wide-Angle Seabed Photography vehicle

5. NARRATIVE

5.1 Diary (see charts 1 and 2)
Wednesday 20 August.
PSO and some other members of the scientific party visit the vessel to begin preparations.

Thursday 21 August.
PSO and scientific party join the vessel and continue preparations. Safety briefing and vessel familiarization carried out at 15:00 (all narrative times are given as local, i.e. GMT+4).

Friday 22 August.
Pakistani observer (Kidwai, NIOP) joins the vessel in the early hours. Following final stowing and securing the vessel sails Muscat 09:00. Science meeting held at 15:00. Emergency muster and boat drill held at 16:15.

Saturday 23 August.
Continuing on passage towards work site. General operations meeting held with ship's department heads. Meeting of the Officers' Bar committee.

Sunday 24 August.
Continuing on passage towards work site. Arrive at site A1850 at 08:00. Deploy CTD as station (stn) 56001#1 for a successful full depth cast (just one water bottle misfire). Deploy Megacore (Mega08; 8 tubes fitted) as stn 56001#2, it returns 7/8 good cores. Redeploy Mega08 as stn 56001#3, it returns 6/8 rather short cores. Three multicore weights are added to the coring head and the corer redeployed as stn 56001#4. Corer returns 8/8 good full length cores. Relocate to site A1200.

At site A1200 deploy WASP (Wide-Angle Seabed Photography vehicle) as stn 56002#1 for 1 hour tow at the seabed. Good tow, 63mins of video run and full run of film. Relocate to site A1850.

Monday 25 August.
At site A1850 deploy WASP as stn 56004#1 for a 1 hour tow at the seabed. Good tow, 63mins of video run and full run of film. Relocate to site D1820.

At site D1820 deploy Agassiz trawl as stn 56004#1, it returns empty bar a few midwater fish, showing no signs of having been on the bottom at all (no pinger bottom echo was visible until mwo < depth during recovery – more wire and pinger higher up the wire next time). Relocate to site A1850.

At site A1850 deploy Benthic Boundary Layer Sampler (BBLS) as stn 56005#1, it fires at the seabed, all bottles closed and holding on recovery, but lower three bottles are cloudy and the water discarded. Mega08 then deployed as stn 56005#2, it returns 8/8 good cores. The Mega08 is redeployed as stn 56005#3, it again returns 8/8 good cores. The Mega08 is redeployed again as stn 56005#4 and again returns 8/8 good cores. Relocate to site A950.

Tuesday 26 August.
At site A950 deploy WASP as stn 56006#1. There is no camera activation at the seabed and the tow is aborted after two minutes. On recovery the system is shut down and then restarted, but the flash does not fire (cause established later is a film jam in the still camera). Switch to multicore operations; during craning of corer, hydraulic hose bursts taking crane out of action for some hours. Deploy MC as stn 56006#2, but it returns untriggered. The trigger is wired up and the corer redeployed as 56006#3, it returns 9/12 good cores (one taken for Larkin). The MC is deployed again as stn 5006#4, returning 12/12 good cores (one taken for Larkin). Relocate to site A1200.

At site A1200 deploy Mega08 as stn 56007#1, getting swell bouncy as the corer bottomed, returning 8/8 cores but all cloudy and discarded. Redeploy corer as 56007#2, it returns 8/8 good cores. Mega08 redeployed as stn 56007#3, it returns 8/8 good cores. Mega08 again redeployed, as stn 56007#4, and again it returns 8/8 good cores. Relocate to site A300.

At site A300 deploy WASP as stn 56008#1 for a 1 hour run at the seabed, a good steady tow, giving a full run of video and film. The video shows the presence of both orange and white bacterial mats. Relocate to site A950.

At site A950, deploy WASP as stn 56009#1 for a 1 hour tow at the seabed. Good tow, full run of video. Relocate to site C1200.

Wednesday 27 August.
At site C1200 deploy Agassiz trawl as stn 56010#1. But again it does not touch bottom and returns only some midwater natants. This trawl certainly fishes differently to that used during CD145; it is a longer net, with presumably more drag. Relocate to site A1200.

At site A1200 deploy MC as stn 56011#1, it returns 12/12 good cores, one of which is sampled for Larkin. The CTD is then deployed as stn 56011#2 for a full depth cast. The Mega08 is then deployed as stn 56011#3, it returns 7/8 fair cores. Relocate to siteA950.

At site A950 deploy Mega08 as stn 56012#1, it returns 7/8 overfull cores that are all discarded. Top plate ballast and 8 inner leads are removed before redeploying Mega08 as stn 56012#2, it returns 5/8 good, if long, cores. All ballast removed and the Mega08 redeployed as stn 56012#3, returning just 3/8 good cores. Relocate to site A140.

At site A140, deploy WASP as stn 56013#1 for a 1 hour tow at the seabed; good tow. Relocate to site C1200.

Thursday 28 August.
At site C1200, deploy Agassiz trawl as stn 56014#1 and at last manage to hit bottom. The trawl returns a large fish catch (rattails, eels, notocanth, smoothead and sole) with the invertebrates dominated by worm tubes and anemones. Relocate to site A950.

At site A950, deployMega10 as stn 56015#1, it returns 5/10 good cores. Redeploy Mega12 as stn 56015#2, returning 8/12 good cores. And deploy Mega12 again as stn 56015#3, again it returns 8/12 good cores. Relocate to site A140. During operations at site A950 a meeting of the ship's safety committee is held, there are no significant issues for or concerning the scientific party of CD150.

At site A140, deploy Mega08 (fully ballasted as per CD146 suggestion) as stn 56016#1, it returns with 5/8 cores that are all overfull and are all discarded. Mega08 redeployed (with top lead plates and 8 inner weights removed as stn 56016#2, it returns with only one good core, the others overfull or bubbled. Try again as stn 56016#3 with all ballast removed, it returns 8/8 good cores. Mega08 redeployed as stn 56016#4, returning 8/8 cores, but all are cloudy and all are discarded. Try again as 56016#5, with the Mega08 returning 2/8 good cores. Relocate to site A1850.

Friday 29 August.
At site A1850 deploy sound velocity probe (SVP) as stn 56017#1 (using Megacorer as ballast). Profile to 10mab successfully completed, but no data recovered in SVP unit – cause unknown. Relocate to site D1750.

At site D1750 deploy WASP as stn 56018#1, a good tow with full run of film and video. Relocate to site D1820.

At site D1820, deploy Agassiz trawl as stn 56019#1, it returns a "small but perfectly formed" catch including 2 x *Benthothuria cristatus*, a good diverse set of crustaceans, other holothurians, a large brisingiid and asteroid. Relocate to site A950.

At site A950, deploy CTD as stn 56020#1, for a successful full depth cast. Relocate to site A300.

At site A300, deploy Mega08 as stn 56021#1, it returns 8/8 good cores. Relocate to site A350.

At site A350, deploy WASP as stn 56022#1 for a half-hour run at the seabed. Good tow, film and video run. Relocate to site A400.

At site A400, deploy WASP as stn 56023#1 for a half-hour (extended for additional photographs) at the seabed. Good tow, film and video run. Relocate to site C1000.

Saturday 30 August.
At site C1000, deploy Agassiz trawl as stn 56024#1. It returns a good catch, with plenty of fish and ophiuroids; also a number of *Encephaloides armstrongi*. Relocate to site A300.

At site A300, deploy MC as stn 56025#1, it returns not fired. Try again as stn 56025#2, but again it returns unfired. Switch to Megacoring programme and deploy Mega10 as stn 56025#3, it returns 9/10 good cores. Deploy Mega10 again as stn 56025#4 and again it returns 9/10 good cores. Mega10 then deployed as stn 56025#5, returning only 3/10 good cores this time. Try again with Mega10 as 56026#6, but again it only returns 3/10 good cores. Make a final attempt with Mega09 as stn 56025#7 and this time recover7/9 good cores, completing the day’s requirement for cores. Deploy the 3.5 kHz fish and attempt to profile from A300 to A140. However, there appears to be no signal from the fish. Make for a position at c. 200m in the “C” area and make a trial of the EM12 running down the line of detailed transect stations established during CD146. Complete the line and make for site C1000.

At site C1000 deploy WASP as stn 56026#1 for a successful 1-hour tow at the seabed. Relocate to site C1400.

At site C1400 deploy Agassiz trawl as stn 56027#1.

Sunday 31 August.
Recover trawl, with a good catch, including large quill worms. Relocate to site A300.

At site A300, deploy CTD as stn 56028#1 for a successful full depth cast. Relocate to site A250.

At site A250, deploy WASP as stn 56029#1 for a successful 30-minute tow at the seabed. Relocate to site A200.

At site A200 deploy WASP as stn 56030#1 for a 30-minute tow at the seabed; video runs but still camera does not (likely a “false start” at initial power up). Relocate to site A140.

At site A140, deploy Mega09 as stn 56031#1, but it bounces on landing and it is dragged out by the ship’s motion; all cores disturbed and discarded. Redeploy Mega08 as stn 56031#2, it returns7/8 good cores. Redeploy Mega10, it returns 10/10 good cores. End coring operations for the day and begin a brief swath survey.

Head from site A140 to the “C” area slope break and make two contour parallel swath tracks on the upper slope. End swath survey and relocate to site A900.

At site A900, deploy WASP as stn 56032#1 for a 1-hour tow at the seabed.

Monday 1 September.
Recover WASP (stn 56032#1), full film and video run. Reposition for Agassiz trawl, echo-sounding up intended track. Track appears “safe”; deploy trawl as stn 56032#2. It produces a ‘novel’ catch – no obvious fauna, but vertebrae, teeth, bones, etc and several slabs of cemented sediment slabs. The slabs are laminated, easily broken and strongly smelling of hydrogen sulphide. Relocate to site A140.

At site A140, deploy MC as stn 56033#1, it returns 12/12 good cores (one sampled for Larkin, two for NIOP). Deploy Mega10 as stn 56033#2, but it bounces and all cores are discarded. Redeploy Mega10 as stn 56033#3, it returns 9/10 good cores. Redeploy Mega09 as stn 56033#4, it returns 8/9 good cores. Then deploy Mega08 as stn 56033#5, it returns 6/8 good cores. End coring operations and begin a swath survey.

Run an offshore line down a missing lane to the west of area “C” and then three alongslope lines in the deeper reaches of area “C”. Then relocate to site C1400.

At site C1400 deploy WASP as stn 56034#1 for a 1-hour tow at the seabed, altimeter traces is rather intermittent, but a good tow none the less.

Tuesday 2 September.
Recover WASP (stn 56034#1) and relocate to site C1730.

At site C1730 deploy Agassiz trawl as stn 56035#1. trawl returns with the rope tensioners on the net parted and almost no catch to speak of. Relocate to site A140.

At site A140, deploy CTD as stn 56036#1 for a successful full depth cast. Then deploy MC as stn 56036#2, but it does not trigger and is redeployed as stn 56036#3 without recovering to deck, but #3 does not trigger either. Four broomsticks fitted between the legs and the MC deployed as stn 56036#4. It returns with 12/12 good cores, one of which is sampled for Larkin. Relocate to site A300.

At site A300, deploy MC (trigger wired to frame and three broomsticks on feet) as stn 56037#1, it returns 12/12 good cores, one of which is sampled for Larkin. Relocate to site A1100.

At site A1100, deploy WASP as stn 56038#1 for a 1-hour tow at the seabed.

Wednesday 3 September.
Recover WASP (stn 56038#1) and relocate to site C1550.

At site C1550, deploy Agassiz trawl as stn 56039#1, however, we miss the bottom again! Relocate to site A300.

At site A300 begin a day of bacterial mat hunting attempts. The Mega10 is deployed 15 times (stn 56040#1-15) at and around site A300. The first two dips (#1 and #2) are sampled for other purposes, the remainder (#3-#15) either fail or return no bacterial mat material and are discarded (quick estimate from WASP video suggests a 1 in 150 chance of hitting a mat!). Relocate to site C950.

At site A950, deploy Mega10 as stn 56041#1 in search of the white layer present in cores from site A950; it returns 9/10 good cores which confirm the presence of the white layer. Relocate to site C700.

Thursday 4 September.
At site C700, deploy WASP as stn 56042#1 for a 1-hour tow at the seabed (in the area of swath high backscatter – as a possible site of the trawled hard ground). Relocate to site A500.

At site A500, deploy CTD as stn 56043#1 for a successful full depth cast. Relocate to site A1200.

At site A1200, deploy mega10 as stn 56044#1, it returns 9/10 good cores. Redeploy Mega10 as stn 56044#2 and it returns 10/10 good cores. Deploy CTD as stn 56044#3 for a successful full depth cast. Make for a 3.5kHz survey track.

Run a single 3.5kHz survey line down through the CD146 transect sites A600-A1100. Relocate to site C1550.

Friday 5 September.
At site C1550, deploy Agassiz trawl as stn 56045#1, but it fails to bottom. Relocate to site A700.

At site A700, deploy Mega10 as stn 56046#1, it returns 6/10 good cores. Redeploy Mega10 as stn56046#2, it returns 7/10 good cores. Redeploy again as stn 56046#3, but it returns only1/10 good cores having landed oddly (some strings had not pulled out). Deploy once more as stn 56046#4, this time returning 9/10 good cores. Relocate to site A140.

At site A140 deploy Agassiz trawl as stn 56047#1, it returns a rather muddy catch, rich in molluscs. Relocate to site A300.

At site A300, deploy Agassiz trawl as stn 56048#1, returning a clean catch of fish (3 spp.), some natants but no megabenthic invertebrates, also some cetacean (?) vertebrae and baleen. Relocate to site D1750.

At site D1750, deploy Agassiz trawl as stn 56049#1, but the trawl does not ground. Make for a short echo-sounding run across channel to check location of subsequent WASP (site E1400).

Saturday 6 September.
At site E1400, deploy WASP as stn 56050#1 for a 1-hour tow at the seabed in the thalweg of the channel. Video indicates rippled seabed with some megabenthos not previous recorded during CD145/150 to date. Make an echo-sounding run out in to deeper water to check location of meandering channel below area “C” slope. Relocate to site A700.

At site A700, deploy WASP as stn 56051#1 for a 1-hour tow at the seabed. Relocate to site D1750 for another attempt at getting the trawl to bottom in deep water.

At site D1750, deploy Agassiz trawl as stn 56052#1.

Sunday 7 September.
The recovery of the trawl (stn 56052#1) brings a catch at last! Relocate to site A700.

At site A700, deploy CTD for a full depth cast as stn 56053#1, successfully completed, but profile data subsequently found to be corrupted. Deploy Mega10 as stn 56053#2, it returns 10/10 perfect cores. Redeploy Mega10 as stn 56053#3, this time returning only 4/10 good cores. Relocate to site

A950.

At site A950, deploy Mega10 as stn 56054#1, it returns 8/10 good cores. Relocate to site A500.

At site A500, deploy WASP as stn 56055#1 for a 1-hour run at the seabed; good tow, full run of video. Relocate to site C1550.

At site C1550 deploy Agassiz trawl as stn 56056#1.

Monday 8 September.
Recover trawl (stn 56056#1), it returns a good catch. Relocate to site E1200.

After a brief echo-sound of the channel deploy WASP at site E1200 as stn 56057#1; good tow, full run of video. Relocate to site A700.

At site A700, deploy Mega10 as stn 56058#1, but it returns with no units fired, although several strings had pulled. Redeploy Mega10 as stn 56058#2, it returns 5/10 good cores (one subsampled with an MC tube for Larkin). Deploy Mega10 again as stn 56058#3, it returns only 3/10 good cores. Make for the start of a 3.5kHz profiling line.

Attempt brief 3.5kHz line along the Agassiz trawl track that recovered the rock slabs (stn 56032#2), during which GPS is lost causing the 3.5kHz paper drive to more-or-less stop. Heave to at the end of the line and carry out a static load test on the reterminated CTD cable. Repeat the 3.5kHz line on the reverse course – successfully this time. However, there is still no obvious indication of a hard ground site on the line. Relocate to site A950.

At site A950, deploy Mega10 as stn 56059#1, it returns 6/10 good cores. Redeploy Mega10 as stn 56059#2, but it only recovers 2/10 good cores, both of which bubble and are discarded. Relocate to site C1500.

At site C1500, deploy Agassiz trawl as stn 56060#1

Tuesday 9 September.
Recover trawl (stn 56060#1), it returns a good catch. Relocate to site E1000.

At site E1000, deploy WASP as stn 56061#1 for a 1-hour tow at the seabed in a channel thalweg; good tow, full run of video. Relocate to site A1200.

At site A1200, deploy Mega10 as stn 56062#1 (with SVP on the wire above it), it returns 10/10 disturbed cores that are all discarded. Redeploy Mega10 as stn 56062#2, it returns 8/10 good cores. And deploy mega10 once more as stn 56062#3, it returns 9/10 good cores. Relocate to site A1850.

At site A1850, deploy Mega10 as stn 56063#1, it returns 10/10 good cores. Relocate to site D1700.

At site D1700 deploy WASP as stn 56064#1 for a 1-hour tow at the seabed; good tow, full run of video.

Wednesday 10 September.
Deploy Agassiz trawl at site D1700 as stn 56064#2, returning a good catch. Relocate to site A1850.

At site A1850, deploy CTD as stn 56065#1 for a successful full depth cast. Deploy Mega10 as stn56065#2, it returns 9/10 good cores. Relocate to site A950.

En route to site A950 an emergency muster, drill and call to boat stations are undertaken.

At site A950 deploy Mega10 as stn 56066#1. Problems are encountered with the winch control system. Hauling and veering trials are carried out to test the system for c. 1 hour. The deployment is then completed with 6/10 good cores eventually recovered.

On advice from the ship's engineers all further coring winch operations are cancelled pending further work on the winch control system. Make for site A1850.

Thursday 11 September.
Begin a 3.5 and 10kHz survey line through sites A1850, A1200, A300 and A140. Extend line to new site A100.

At site A100 deploy CTD as stn 56067#1 for a profile only cast. Continue the line further inshore.

At site A90, deploy CTD as stn 56068#1 for a profile only cast. Make back offshore.

At site "A100b", deploy CTD for a profile only cast as stn 56069#1. Continue further offshore.

At site A125, deploy CTD as stn 56070#1 for a profile only cast. Relocate to site A140.

At site A140, deploy Mega10as stn 56071#1, it returns 10/10 good cores. Relocate to site A300.

At site A300, deploy Mega10 as stn 56072#1, it returns 6/10 good cores. Relocate to site E800.

At site E800, deploy WASP as stn 56073#1 for a 30-minute tow at the seabed.

Friday 12 September.
Recover WASP (stn 56073#1); good tow. Relocate to site E600.

At site E600, deploy WASP as stn 56074#11 for a 30-minute tow at the seabed; good tow. Relocate to A140.

At site A140, deploy Agassiz trawl as stn 56075#1, again at this site it returns a muddy catch. Make a second attempt as stn 56075#2, but the weight of mud in the bag bursts the net out through the knot. Deploy CTD as stn 56075#3 for a profile only cast. Relocate to site A200.

At site A200, deploy CTD as stn 56076#1 for a profile only cast. Relocate to site A300.

At site A300, deploy CTD as stn 56077#1 for a profile only cast. There being insufficient time for any further scientific operations, the 10kHz fish is recovered and the vessel set course for Muscat.

Saturday 13 September.
Continuing on passage to Muscat.

Sunday 14 September.
Continuing on passage to Muscat.

Monday 15 September.
Docked Muscat c. 07:30, ending RRS Charles Darwin cruise 150.

Brian Bett

5.2 Conclusions

- Successfully revisited a series of five previously established study sites (A140, A300, A950, A1200 and A1850) spanning the Arabian Sea oxygen minimum zone as it impinges on the seabed at the Pakistan Margin.
- Successfully assessed the chemical oceanography of the water column overlying these sites (and others), through CTD sensor profiles and chemical determinations on water bottle samples from the CTD. BBLS operations were suspended pending further work on the water bottles planned for CD151.
- Successfully carried out a programme of detailed seabed sampling at these sites (and others) to determine a suite of biological, chemical and biogeochemical parameters using a Megacorer and a multicorer (noted only limited multicorer operations were undertaken as a result of the sea state).
- Successfully assessed and sampled the megabenthos of these sites (and others) by the combined use of trawling (Agassiz trawl) and seabed photography (WASP).
- Successfully sampled and surveyed an additional site (A700).
- Undertook additional general characterization of the seabed in the area of these sites using acoustic remote sensing (EM12 and 3.5 kHz) and seabed imagery (WASP). In addition, swath survey data collected during CD146 was processed onboard.

Most of the work in assessing the science of the cruise will take many months of work ashore. Of those parameters that could be assessed onboard there was little indication major change between CD145 and CD150, other than in the OMZ its self (see **9.8 Variation in the OMZ CD145-CD150**).

Brian Bett

5.3 Acknowledgements

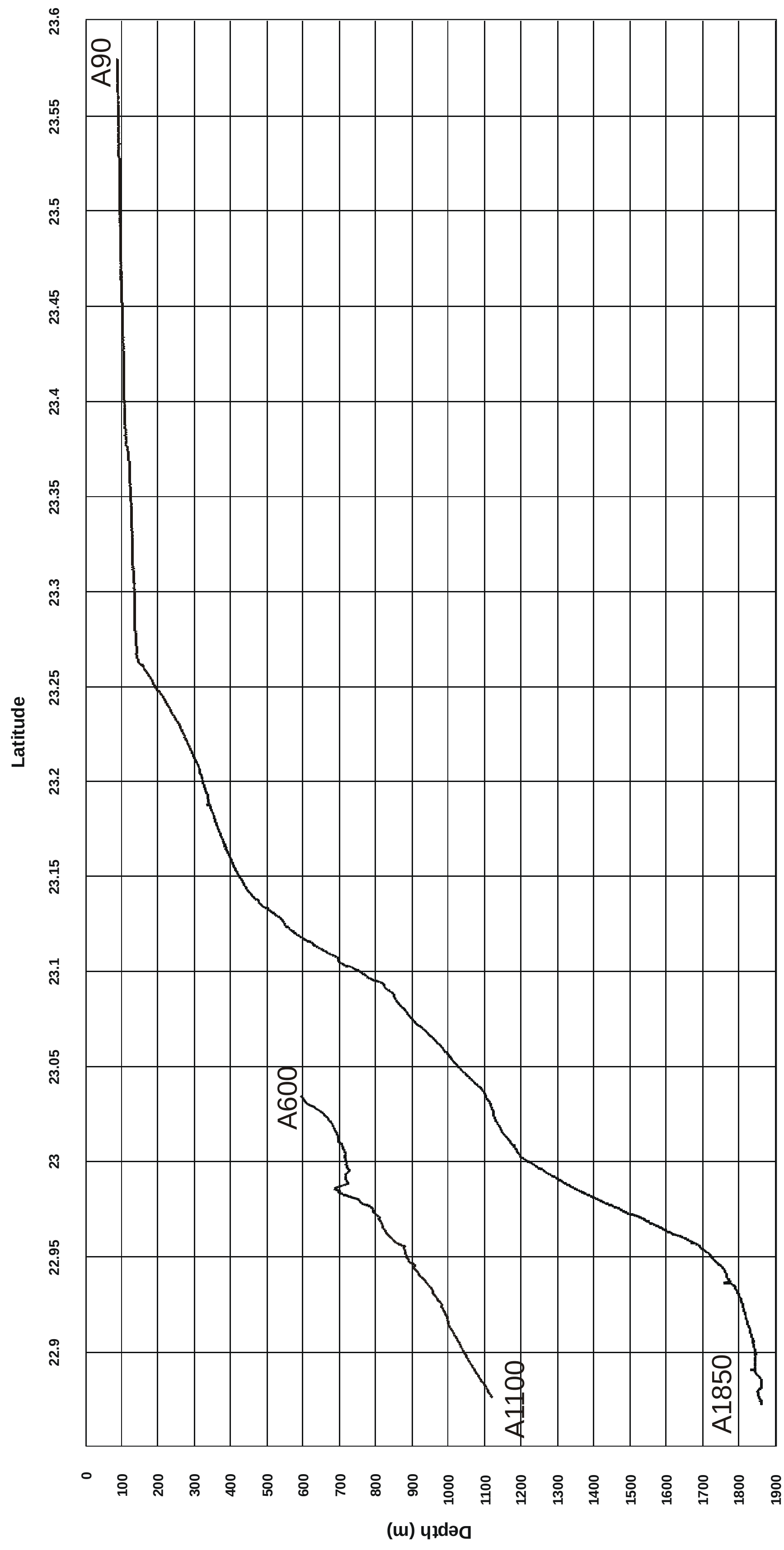
The long steam in to the Seychelles offered the chance to write a more fulsome acknowledgement. Here I will be brief as I can see the Oman coast! This has been a very peaceful, pleasant and productive cruise – in other communications I have even gone on to say “stress free” and verging on the “relaxing”. For some of that we are in the lap of the gods – for the rest my hearty thanks to all aboard for all their efforts and ditto for the many ashore too. I hope the luck holds for all on CD151, BB.

6. SURVEY DESIGN

The primary sites of the cruise – A140, A300, A950, A1200 and A1850 – were all successfully sampled and surveyed by coring, WASP and CTD. Trawling was also undertaken in the vicinity of sites A140 and A300. An additional primary site – A700 – was also successfully sampled and surveyed by coring, WASP and CTD. Other coring activities were limited to only one site – C950 – on the open slope region of area "C" to establish whether the conspicuous white band evident in cores from site A950 was present (it was). WASP was additionally operated at numerous sites (see below) from c. 200 to 1750m, with three sites located in the thalweg of one of the main channels in the area (E1000, E1200 and E1400). Additional CTD casts were made at site A500 (a main site occupied during CD145) and on a line of sites running up on to the shelf (A90-A200). Trawling operations were mainly carried out in deeper waters (c. 900-1820m).

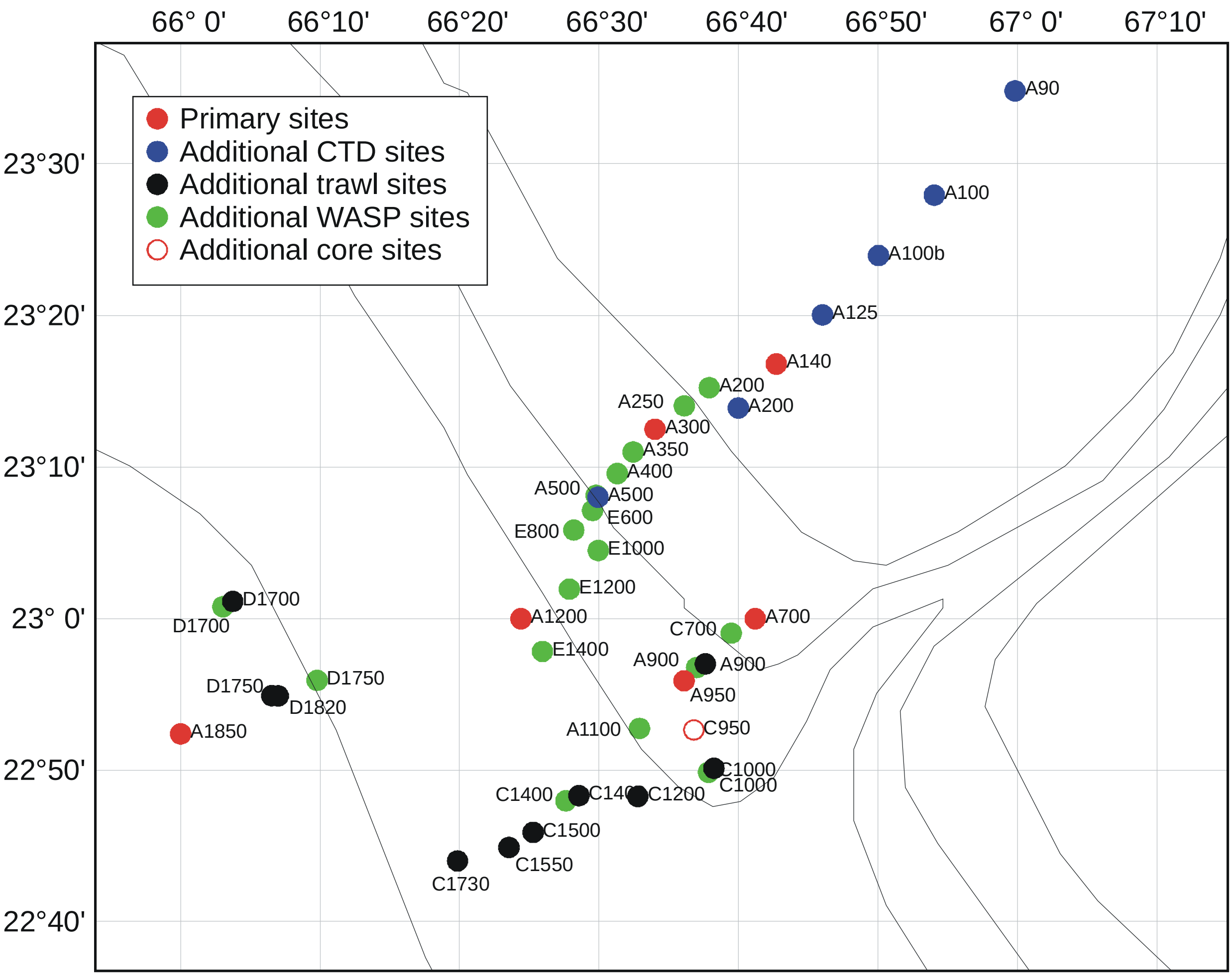
Site	Core	WASP	CTD	Trawl
A140	X	X	X	X
A300	X	X	X	X
A700	X	X	X	
A950	X	X	X	
A1200	X	X	X	
A1850	X	X	X	
A90			X	
A100			X	
A100b			X	
A125			X	
A200		X	X	
A250		X		
A350		X		
A400		X		
A500		X	X	
E600		X		
C700		X		
E800		X		
A900		X		X
C950	X			
C1000		X		X
E1000		X		
A1100		X		
E1200		X		
C1200				X
C1400		X		X
E1400		X		
C1500				X
C1550				X
D1700		X		X
C1730				X
D1750		X		X
D1820				X

Tabular summary of CD150 operation by site



Bathymetric profiles of main transect lines

During the course of CD150, bathymetric profiles were run through the two main transects of sites – see above (note topographic high in vicinity of A700 location). Corresponding 3.5kHz data is available for these two tracks.



CD150 work sites (see station list for full details)

Brian Bett

7. SAMPLING PROTOCOLS

7.1. Macrobenthos

A total of 97 Megacores were collected and fixed in ten percent formalin for later analysis of macrofauna (see sample catalogue). Twenty nine of these were fine-sliced down core into 0.5, 0.5, 1, 1, 2, 5 and 10 cm for assessment of downcore dispersion at the primary sites of 140, 300, 950, 1200 and 1850 metres water depth. Three additional cores were fine sliced from replicate deployments at 700 m. The remaining 55 cores were sectioned at 0-10 and 10-20 cm sediment depth horizons. One 20-30 cm section was taken from the A1200 m site as a check on burrows possibly extending deeper than 20 cm (56007#03 core XII). These samples provide, per primary site, three replicates of between four and six cores per deployment for bulk analysis and between five and seven replicate cores for downcore dispersion.

From the above, a 63 micron fraction was obtained for meiofauna from each of the slices from the first two centimetres of three replicate fine-sliced cores from the five primary sites. These are detailed in the sample list for NIO, Pakistan. It is intended that the 300 micron fractions to be examined at the SAMS will be treated on a 63 micron mesh, when subsequently washed in freshwater and transferred to alcohol, in order that any retained meiofauna will not be lost from the final tally of fauna.

In addition, a number of cores were sorted for fresh macrofauna and the fauna extracted to vials (a spreadsheet of the vial listing will be appended to the electronic copy of this cruise report). Three well plates containing weighed tin boats were also used for fresh specimens mainly intended for stable isotope analysis. Vial listings for these refer to the tray number and boat well co-ordinates e.g. “3D6” refers to tray 3, well D6. The majority of these specimens were photographed against a 2 m scale before placing in vials or boats.

Example photographs of the macrobenthos

Left: Bivalve indet., 56015#1, site A950. Right: Aplacophoran indet., 56062#3, site A1200

Peter Lamont

7.2. Geochemistry

The geochemistry objectives for the cruise were to obtain samples of solid phase and pore water to analyse for a range of constituents both organic and inorganic. These results will then be combined with the benthic results to ascertain the role of the benthos in the burial efficiency of carbon and the resultant impact on the biogeochemical cycling of trace elements in the oxygen minimum zone of the Arabian Sea off the Pakistan coast.

At each station five cores were collected. Two of these cores were sliced and bagged to be used for trace element and radionuclide analysis. The three remaining cores were processed in a glove bag under nitrogen to preserve the *in-situ* oxygen free conditions.

One core was processed for trace metal analysis. This core was sliced at 0.5 cm resolution to a depth of 10cm, 1 cm to a depth of 10cm and 2cm until the bottom of the core. The last sample was discarded. These samples were processed as detailed in the CD145 cruise report. Pore water was collected for trace metal analysis, nutrient analysis and sulphide analysis. Sediment was collected for the assessment of porosity, trace elements, CHN and particle size analysis.

The second core was processed for DIC analysis. This core was sectioned at 0.5 cm resolution to 2 cm, 1cm to 10cm and 2cm until the bottom of the core. The last sample was discarded.

The pore water extraction method for this core was as described in CD145 for trace metal analysis however final sampling and treatment of the pore water was different. After centrifugation the pH was taken in the centrifuge tube (details below). The pore water was transferred to a 2 ml crimp top vial and the remaining pore water was placed in a 6ml head space vial with a screw cap. 100 microlitres of saturated mercuric chloride was added to each vial before sealing. The vials were sealed before removing from the glove bag.

The third core was processed to obtain samples for DOC analysis. This core was sectioned at the same frequency as the DIC core. After centrifugation of the sediment to obtain pore water the samples were filtered outside of the glove bag. Each sample was filtered through a 13mm diameter Whatman GF/F (0.7mm pore size) filter. 3ml was transferred to a glass ampoule for DOC analysis, 5ml to a 5ml glass vial for amino acid analysis and finally a second vial for DOC was filled with any remaining pore water.

The remaining two cores were sliced at 0.5 cm resolution to a depth of 10cm, 1 cm to a depth of 10cm and 2cm until the bottom of the core. The sections were sealed in plastic bags and placed in the cold room at 4^{o}C.

The first three samples from the radionuclide core were placed in plastic pots and counted using Canberra LEGI germanium detector. Unfortunately due to the high humidity experienced at Muscat, Oman, ice formed in the dewar which required the dismantling of the detector. It took one week to defrost and dry out the dewar before it could be filled and the detector made operational. Any remaining CD150 samples will be counted on CD151.

At site A700 three cores were taken from each of three drops to process for trace metals, DOC and DIC to a depth of 15cm. A further 2 cores from 2 drops (i.e. 1 core per drop) were taken and processed to a depth of 15cm. This was to investigate the homogeneity between cores within and between deployments of the mega-corer.

Finally DIC processing was repeated at sites A1850 and A1200 as the protocol for sampling was only finalized after these two stations were initially sampled.

As stated above all protocols are as CD145, however the DIC method was modified slightly and details are given below.

pH Measurement

pH values for all geochemistry sites were determined aboard the vessel, being measured from pore waters liberated from the DIC cores. All pH measurements were completed under a nitrogen atmosphere to elevate possible pH changes due to re-equilibrium with the laboratory atmosphere. The method used is as follows:

1. After the centrifugation stage all samples from the DIC core were transferred to the nitrogen glove bag.
2. Before the pore waters for DIC analysis were transferred to their respective vials, the pH was measured by inserting the electrode into the water so that the electrode was immersed in at least 2cm of solution.
3. The pH electrode remained immersed until the meter read a stable signal, upon which the meter was removed and the reading noted down.
4. Before the pH electrode was introduced to the next sample it was thoroughly washed with deionised water.

Geochemistry stations A1850, A1200, A950, A300 and A140 were all measured using the ‘Russell model RL100 portable pH meter.’ Unfortunately the electrode for this pH meter was broken during measurements at the A700a site. As a result SAMS supplied a ‘Hanna Instruments HI 9024C pH meter,’ with a ‘K series combination electrode and temperature probe.’ This allowed pH measurements to be conducted at stations A700B, A700C, A700D, A700E, A1200rpt and A1850rpt.

Both pH meters were calibrated daily using the supplied pH buffers of pH 7.01 and pH 10.01. This allowed for a two point (dual) calibration, allowing greater instrument accuracy. All pH measurements are temperature compensated by the respective meters, according to a user defined temperature which was manually inputted. This value was determined from the Edinburgh supplied electronic temperature gauge. A number of samples were measured in triplicate in order to determine the respective pH meters accuracies.

The main objectives of the cruise were met and all samples required were collected processed and stored. The samples will be returned to SAMS at the end of CD151 for final analysis.

For nutrient pore water results please see the appropriate section in the cruise report.
The initial results obtained for the A700 site, nutrient and pH, suggest good agreement within and between drops of the mega- corer. Further analyses will be required to determine the degree of variation between these cores.

Tracy Shimmield, Terrie Sawyer, Cheryl Haidon and Gareth Law

7.3. Sulphate reduction

The protocol followed for the preparation of the radiolabel, collection of samples, core processing, injection of radiolabel and incubation were the same as those followed on CD145 and so are detailed in the CD145 cruise report.

The 35S-sulphate solution was made up so that the activity of 5µl working solution contained (on 01/09/2003) 29.942kBq 35S.

Details of the degree of replication etc are contained in the data table.

The samples in 20ml vials were refrigerated in the ship's core store, for return to the UK under refrigeration at the end of CD151.

Martyn Harvey

7.4. Biochemistry

Protocol 1: Solid phase analysis of lipids, amino acids and carbohydrates

For details of this protocol see CD145 cruise report and the following amendments:

Amendment 1: This protocol only stands for lipids and not for amino acids and carbohydrates.
Amendment 2: Place all of the samples in glass jars and not foil-lined Petri dishes.
Amendment 3: Replace the DCM rinse with a methanol rinse.
Amendment 4: Freeze the lipid samples at -70˚C for 24hours then transfer to -20˚C.

Protocol 2: Solid phase analysis of lipids and pigments

For details of this protocol see CD145 cruise report and the following amendment:

Amendment 1: Place all of the samples in glass jars and not foil-lined Petri dishes.

Amendment 2: A DCM rinse is no longer required; instead use a methanol (MeOH) rinse.
Amendment 3: Freeze the lipid samples at -70˚C for 24hours then transfer to -20˚C, keep the pigment
samples frozen at -70˚C.

Protocol 3: Pore water analysis for DOM and DFAA

For details of this protocol see CD145 cruise report and the following amendment:
Amendment 1: Retain the sediment in the centrifuge tubes after filtration and place in the appropriate labelled bag for Clare Woulds (Ed) amino acid and carbohydrate analysis. Note only one core per site is required.

Protocol 4: Collection of Megafauna from Agassiz Trawls for Lipid and SIA

For this protocol see CD 145 cruise report, there are no amendments.

Protocol 5: Sampling of water from the CTD for lipid analysis.
12 samples were taken from each CTD cast at each station.

Collection of water samples from the CTD/rosette.

1. Label 12 1L glass bottles 1-12 (please note the bottles have been rinsed in Milli-q ® water, dried in the drying oven at 60˚C and then placed in the muffle furnace for 4 hours at 400˚C). Glass bottle number 1 corresponds to CTD rosette bottle number 2, the deepest water sample.
2. Place silicon tubing on the CTD rosette bottles 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24.
3. Open the valve at the top of the rosette bottle and open the tap at the bottom, fill the glass bottle with ~ 200 ml of sample water. Turn off the tap and give the glass bottle a good shake, then discard the sample water. Now open the tap again and this time fill the glass bottle to the brim. Place a piece of baked foil over the top of the bottle and cap. Repeat this for all the samples.
4. Place the samples in the fridge until you are ready to filter.

Filtration of samples from the CTD/rosette.

5. Label up 12 foil-lined Petri dishes with: cruise number, station number, site, date, analysis (PLFA) and sample water depth.
6. Switch on the Millipore ® pump and wait until it reaches -70 KPa. Using a clean forceps place a pre-fired 47 mm GFF on the filter unit base, next secure the filtration cup. Pour 250 ml of sample water into the cup and pull through the vacuum. Repeat until 1 L of sample has been filtered. Wash the filter free of salt by pulling 100 ml of Milli-q ® through the vacuum. Place the filter using clean forceps in the corresponding Petri dish.
7. Rinse the filter unit after each sample with 300 ml of Milli-q ® by pulling through the vacuum. After **each** sample discard the waste filtrate water in the Erlenmeyer flask. Repeat step 6 for all samples.

8. Store the samples in and upright position at -70˚C.

Cleaning of the filtration unit equipment.

9. Rinse the base and cup in Milli-q ® wrap in pre-baked foil, and then dry in the drying oven at 60˚C.
10. Rinse all of the glass bottles in Milli-q ® place a piece of baked foil over the lid and dry in the drying oven for 4 hours at 60˚C, then place in the muffle furnace for 4 hours at 400˚C.

Rachel Jeffreys

7.5. Meiobenthos (NIOP)

Selected sampling sites: A140, A300, A950, A1200 and A1850

There were two sets of samples obtained:

a) The first set of samples were taken by a megacorer (refer to section Lamont *et al.* this report). One sample each from three different drops was randomly selected. The top 3 intervals: 0-0.5, 0.5-1.0, 1.0-2.0 cm of the megacores were then sieved through a 63 µm mesh and preserved in 10% formalin, for carrying back to the National Institute of Oceanography Pakistan, for further investigation/analysis. (total = 45 samples)

b) The second set was sampled through a multicorer or subsampled from megacorer. Two corers from two different drops of the multicorer (sites A140-56033#1, A300-56036#4, 56037#1). Two cores from the megacorer, at the other sites (A950, A1200, A1850). Samples from A700 were also obtained, following the similar procedure. The top 2 cm was sliced at intervals: 0-0.5, 0.5-1.0, 1.0-2.0 cm and preserved in 10% formalin, for further investigation/analysis at the National Institute of Oceanography, Pakistan. (total = 72 samples).

Samina Kidwai & Peter Lamont

7.6. Meiobenthos (SOC)

Some meiobenthos sampling was undertaken fro Kate Larkin (SOC). Replicate multiple core samples were requested from all of the primary sampling sites; however, it was not possible to collect all of the required material during the cruise. Sea state conditions (particularly roll) made the multiple corer difficult to launch and recover, and its operation was eventually suspended in the hope of better weather. Samples were successfully obtained from the following deployments:

56006#3	A950
56006#4	A950
56011#1	A1200

56033#1	A140
56036#4	A140
56037#1	A300

In each of these cases the core was sectioned: 0-0.5, 0.5-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, 8-9, 9-10cm and the material preserved in 10% formalin (see sample catalogue).

In addition, subcoring of a Megacore sample was also trailed; i.e. a multiple core tube was slowly inserted into a Megacore sample (56058#2; A700. This appeared to work well, with little or no core compression. The resultant subcore was sampled and preserved as above.

Janne Kaariainen & Brian Bett

7.7. Water column and sediment chemistry parameters

<u>Phytoplankton photosynthetic pigments and degradation products.</u>

Objective
Identification and quantification of algal pigments from within the photic zone and to examine their subsequent degradation products within the water column down to the sediment surface.

Method
Samples were collected from the Seabird CTD 24 bottle rosette using the 10l Seabird bottles. The algal maxima depth was identified from the fluorescence trace from the Seabird software. The samples were initially collected in 5l polythene bottles and then transferred to approx 1.2l polycarbonate bottles for use on the SAMS vacuum water filtration rig. The rig uses the ship's compressed air via a pneumatically operated Seimens venturi pump to provide the vacuum. Samples were filtered through 25mm dia. Whatman GF/F filters and the filters stored frozen in 15ml polypropylene vials.

<u>Water column particulate organic carbon and nitrogen.</u>

Objective
Quantification of the POC and PON from the water column and examination of the stable isotopic signature (δC^{13} and δN^{15}) to determine organic carbon provenance and nitrogen cycling

Method
Samples were collected from the Seabird CTD rosette using 10l Seabird bottles. The samples were initially collected in 5l polythene bottles and then transferred to polycarbonate bottles for use on the SAMS vacuum water filtration rig. Samples were filtered through pre-ignited 25mm dia. Whatman GF/F filters and the filters stored frozen in pre-ignited 2ml glass vials.

Water column total dissolved nitrogen (TDN) δN^{15}.

Objective
Evaluation of nitrogen cycling within the water column by stable isotopic analysis of the dissolved nitrogen component. This will compliment the stable isotopic data obtained from the particulate fraction

Method
Samples were collected from the Seabird CTD rosette using 10l Seabird bottles. The samples were initially collected in 5l polythene bottles and then transferred to polycarbonate bottles for use on the SAMS vacuum water filtration rig. The filtration rig allows for the collection of the filtered sample in an enclosed chamber thus removing potential airborne contamination. Samples were filtered through pre-ignited 25mm dia. Whatman GF/F filters. The filtrate was collected in acid-washed 500ml polythene bottles. The filtrates were then spiked with 500µl of conc. hydrochloric acid for preservation. The filters were used for the POC/N analysis described above.

Water column particulate and dissolved manganese and iron analysis

Objective
Iron and manganese are intimately linked to benthic carbon cycling in sub and anoxic conditions. Both are used as terminal electron acceptors by bacteria and undergo reduction to soluble reduced species (Fe^{2+}, Mn^{2+}) from particulate oxidised forms (Fe^{3+}, Mn^{4+}). The soluble reduced forms diffuse from the sediment surface and oxidise within the water column. The presence of an OMZ may dramatically slow the water column oxidation step. Using published rate equations and by including the water column oxidation concentration it is possible to calculate the oxidation rate of both iron and manganese.

Method
Samples were collected from the Seabird CTD rosette using 10l Seabird bottles. The samples were initially collected in 5l polythene bottles and then transferred to polycarbonate bottles for use on the SAMS vacuum water filtration rig. Samples were filtered through 25mm dia. Whatman nucleopore 0.4µm filters. The filter was stored in 10ml polypropylene vials and filtrate was collected in acid washed 25ml polypropylene bottles.
Water column dissolved nutrients (ammonium, phosphate, silicate, nitrate and nitrite)

Objective
Dissolved water column nutrients play a large role in phytoplankton production and biomass. They are actively sequestered in the photic zone and released in deep waters from the remineralisation of the phytodetritus.

Method

Samples were collected from the Seabird CTD rosette using 10l Seabird bottles. The samples were initially collected in 5l polythene bottles and then transferred to polycarbonate bottles for use on the SAMS vacuum water filtration rig. Samples were filtered through 25mm dia. Whatman GF/F filters (filters used for pigment analysis described above) and the filtrate initially collected in 250ml polythene bottles. The dissolved nutrients were analysed on a Lachate model flow injection autoanalyser. The instrument uses flow injection modifications of classic colorimetric methods. Ammonium, phosphate, silicate and nitrate were analysed on all samples collected. By removal of the cadmium-copper reduction column in the nitrate line some samples (see below for details) were also analysed for nitrite. All samples were analysed in triplicate.

Operational amendment

The ammonium concentration in the water column is very low and there is a relatively large negative blank effect due to the refractive properties of the saltwater sample in the deionised water carrier stream. Post CD145 and prior to CD150 the method of salt correction for all nutrients was changed. The salinity correction use to be performed by running nutrient poor seawater or artificial seawater blanks as part of the standard calibration and subtracting this from the final result. The artificial seawater compound that was made up for CD145 was found to be contaminated with ammonium and so blank correction on board was not possible. Post CD145 the method of salt correction was changed to running a representative sample of the water column sample batch, i.e. not a surface sample that may have a low salinity, in triplicate through the instrument but using deionised water in place of the nutrient colour reagents. This proved successful for all nutrients. However it was uncertain how much of a refraction effect the colour reagents would cause and thus contribute to the overall salinity refraction blank. As a result of this consideration some reagents for each nutrient analysis were run during the salt correction. The reagents run as part of the salt correction were those that were in the highest concentration. In the case of nitrate and nitrite the sulphanilamide/NED solution was replaced with just the sulphanilamide solution with no NED added.

	Reagent used	Reagent line replaced with DI water
Ammonium line	Sodium hydroxide/phenol Sodium hypochlorite Sodium EDTA	Sodium nitroprusside
Phosphate line	Ammonium molybdate	Ascorbic acid
Silicate	Ammonium molybdate Oxalic acid	Stannous (tin II) chloride/ hydroxyl ammonium HCl
Nitrate	Sulphanilamide without NED Imidazole Cadmium column	
Nitrite	Sulphanilamide without NED	

Water column dissolved organic carbon and nitrogen, DOC, DON

Objective

Dissolved water column organic carbon and nitrogen play a large role in the oceanic carbon and nitrogen pools. They are actively recycled in the photic zone between the different trophic levels and released in deep waters from the remineralisation of the phytodetritus.

Method

Samples were collected from the Seabird CTD rosette using 10l Seabird bottles. A glass syringe was used to extract water directly from the CTD bottle spigot. The sample was pushed through a pre-fired GF/F filter in a Swinnex filter holder prior to collection in a pre-fired glass ampoule. The glass ampoules had been pre-dosed with 30µl of conc. phosphoric acid. One ampoule was collected per sample. The ampoules were sealed by flame shortly after collection.

<u>Sediment column parameters</u>

Pore water nutrients

Objective

Sediment pore-water nutrient profiles reflect degree of organic and siliceous (diatom frustrales) matter remineralisation within the sediment column. Nitrate and nitrite are used as terminal electron acceptors (oxidising agents) in the absence of oxygen by bacteria and their profiles reflect the redox conditions of the sediment. Concentration gradients of the nutrients can be used to calculate the effusive fluxes of the nutrients from the sediment surface into the overlying water.

Pore waters were collected from centrifuge sediment slices at ambient sea floor temperature and under nitrogen. See Shimmield (this report) for full protocol. Pore water volume was normally between 1 and 2mls. This was split in two volumes and diluted to between 100 and 200 times to yield approximately two 8ml volumes. The first volume was used for NH_4, PO_4, SiO_3 and NO_3 analysis and the second volume was used for NO_2 analysis.

Tim Brand

8. SURVEY EQUIPMENT

8.1. Ship's Computing and data logging systems

Data Logging: Data was logged from the following instruments using MkII Level As to the Level B. The data was then parsed to the Level C data files. The following data was logged during the cruise:

Receiver	MarkII Level A
Trimble 4000 DL	GPS_4000
	GPS_NMEA
Fugro SeaStar	GPS_G12
Simrad EA500D	EA500D1
Chernikeef Log	LOG_CHF
CLAMS Winch	WINCH
SurfaceMet System	SURFMET
Ashtec ADU	GPS_ASH
Ships Gyro	GYRONMEA

Level B: There was one level B master clock jump on day 243. Reset of the level B system on day 252 at 20:00 (GMT).

Navigation Data: Several times during the cruise, all GPS receivers failed to pick up any satellites. Similar problems were also experienced with the ships GPS system on the bridge. This caused some level of disruption during surveys.

Processed Data: Navigation (relmov, bestnav and bestdrf), depth (prodep) and salinity (protsg) data were processed throughout the cruise. Depth data and navigation data were combined into a single data file (navdep). containing interpolated depths. Postscript files of the WASP surveys were produced during the cruise along with position and depth data (ascii1: true depths for navigation time, and ascii2 files containing interpolated depths). All processed data were written to CD and a copy was given to the PSO at the end of the cruise.

EM12 Multibeam: The SIMRAD EM12 multibeam was run during the cruise. Data from CD146 was processed during the cruise using a 50 x 50 metre grid with a standard deviation of 3. A contour plot was produced using the grid display window on the Neptune software. No calibration lines were run during CD150. Data was also processed for the six survey lines on CD150. Binary and ASCII xyz files were produced for blocks processed. A final colour plot of the contours was produced using the Neptune software.

Copies of the CD146 and CD150 data were given to the PSO at the end of the cruise and a copy was left on board to be used on the CD151, if required.

Seabird 9/11 + CTD: The seabird CTD was used and the data processed on board.

Network: The wireless network provided access to the network in the main lab, aft deck and cabins on the portside and starboard side. No problems with the wireless network were observed.

Printers: Problems with the hp1220C printer were resolved by rebooting the printer using the web access page.

Email: No problems encountered with email.

Liz Rourke

8.2. Ship's fitted instrumentation

Chernikeeff EM Log. The same coefficients were used from 12 March 2003, as the recent calibration from CD147T was done whilst the transducer face was fouled. (The sensor was cleaned by divers during the inport prior to sailing on CD149.) A calibration run is needed, as the vessel speed reported at full RPM's is approximately 1.5 to 2 knots slower than GPS data indicates.

EA500 Echo Sounder. The hull mounted transducer and PES "fish" were utilised throughout the cruise. Winch vibration and noise contributes to difficulty in detecting Bottom Tracking in rapidly changing bottom conditions whilst operating in the hull mounted mode, as the power packs for the winch system are located near to the transducer. Noise was a problem affecting the PES "fish" as well, during full ship's speed transits involving heavy weather and deep, rapidly changing bathymetry. The cleaning of the transducer faces in port was done in Oman prior to CD150.

The SurfMet system. The system's computer failed during the first few days of the cruise, and a replacement could not be successfully installed until 29 August. Intermittent 'spikes' to values of 99999 in the Met data, as well as occasional program failures, are attributed to Windows 98 operating system on the replacement computer. Periodic flushing with Triton-X solution was required to clean the fluorometer and transmissometer of algae build-up. This was undertaken approximately every 5 days, or whenever the data graph indicated unexpected drift in the measurable signal. The installed orientation of the wind direction has been physically repositioned to north=stern, (bow=180 degrees) as wind direction is not typically positioned from aft whilst on station.

SurfMet configuration was as follows:

Surface instrumentation:
Falmouth Scientific International Ocean Temperature Module (remote location), s/n 1379
Falmouth Scientific International Ocean Temperature Module (housing location), s/n 1361
Falmouth Scientific International Ocean Conductivity Module (housing location), s/n 1358
WetLABS fluorometer, s/n WS3S-134

SeaTech 20cm path transmissometer, s/n T-1019D

(NB---Salinity calculations were made using the housing located sensors.)

Meteorological instrumentation:
Vaisala PTB100A Barometric Pressure sensor, s/n S3440009
Vaisala HMP44L Temperature/Humidity sensor, s/n S5040004
Vaisala WAA Anemometer, s/n S22306
Vaisala WAV Wind Vane, s/n S21213
Didcot/ELE DRP-5 PAR sensor, port, s/n 5144
Didcot/ELE DRP-5 PAR sensor, starboard, s/n 5143
Kipp & Zonen TIR (Pyranometer), port, s/n 962276
Kipp & Zonen TIR (Pyranometer), starboard, s/n 962301

Portasal salinometer. A total of 31 CTD and 21 SurfMet salinity samples were taken and analysed throughout the cruise, in order to calibrate and verify the performance of the respective conductivity sensors.

EM12. The SWATH system was operated on a limited basis during the cruise, for a total of 6 lines. Sound velocity profiles were obtained from both CTD casts and SVP deployments.

3.5KHz. A replacement computer for the 3.5 system was installed prior to sailing; the original computer was not functioning properly when in operation for more than a few hours. New configuration files were loaded, and GPS was added to the data to provide accurate clock/time stamps. The system was deployed for limited surveys.

Jeff Benson

8.3. CTD and Sound Velocity Probe

A total of 16 CTD casts were undertaken on the cruise, using the cast configuration as follows for the 24-way stainless steel CTD frame:

Sea-Bird 9/11 *plus* CTD system	24 by 10L X-type Niskin bottles
Sea-Bird 43 Oxygen sensor	Benthos PSA-916T Altimeter
10KHz beacon s/n B11	Chelsea Aquatracka MKIII Fluorometer
Chelsea Alphaltracka MKII Transmissometer	WETLabs Light Scattering Sensor

The Sea-Bird CTD configuration was as follows:

SBE 9 *plus* Underwater unit s/n 09P-32460-0720
Frequency 0—SBE 3P Temperature sensor s/n 03P-2880 (primary)
Frequency 1—SBE 4C Conductivity sensor s/n 04C-2450 (primary)
Frequency 2—Digiquartz temperature compensated pressure sensor s/n 90573

Frequency 3—SBE 3P Temperature sensor s/n 03P-4301 (secondary)
Frequency 4—SBE 4C Conductivity sensor s/n 04C-2841 (secondary)
SBE 5T submersible pump s/n 05T-3002 (primary)
SBE 5T submersible pump s/n 05T-3195 (secondary)
General Oceanics 1016 Intelligent Pylon s/n 1532
SBE 1016 Battery Pack s/n 0015
SBE 11 *plus* deck unit s/n 11P-24680-0587

The auxiliary A/D output channels were configured as below:

V0---SBE 43B Oxygen s/n 43B-0076
V2---Benthos PSA-916T Altimeter s/n 876
V3---SeaTech Light Scattering sensor s/n 339 (low gain, 33 mg/l full scale range)
V6---Chelsea MKIII Aquatracka Fluorometer s/n 088241
V7--- Chelsea MKII Alphatracka Transmissometer s/n 161047 (25cm path)

A total of 1 SVP cast was undertaken on the cruise, with probe s/n 3126, by clamping the probe on the trawl warp. The configuration set-up logged in one metre increments, outputing real data to an ASCII file. The profile was utilised to update the EM12 system after the drop.

Jeff Benson

8.4. Multiple corer

The SOC-GDD supplied SMBA-pattern multiple corer was used during the cruise. Only a limited number of deployments were undertaken (11 in total); the sea state was generally such that handling of the corer on deck was somewhat problematic; i.e. there is little free deck space and the corer tends to catch its “feet” under the ship’s rails during launch and recovery. The corer can be reluctant to trigger in the very soft muds encountered at sites A140, A300 and A950. Wiring the trigger collar to the corer frame (see CD145 cruise report for details) and adding “broomsticks” between some of the legs will generally cure this problem. As noted above, multicorer occupies most of the available deck space below the starboard gantry, it is therefore **most important that no personnel are positioned inboard of the corer during launch and recovery** (until the corer is swung out board and lowered to allow removal of the “pin”).

Brian Bett

8.5. Megacorer

The SOC-GDD Megacorer performed well during the cruise, with 73 deployments made in total. The overall success rate was somewhat reduced on that achieved during CD145 as a result of the increased sea state of the current cruise. No modifications other than varying the ballast load and number of tubes deployed were required to recover good quality cores from all sites sampled.

<u>Recommended set up for RRS *Charles Darwin* cruise 151 operations:</u>

> **Sites A140, A300, A700 and A950** – *no ballast (all weights removed), 10-12 tubes (some units may not trigger in these soft muds, this is normal, though do check units move freely on the pins if you get repeated failures of a particular unit) – ultra soft mud, bottom bungs must be held in at all times! – beware tendency of cores to bubble – use of core "slipping" technique for removal of core tubes should be normal practice at all of these site.*
>
> **Site A1200 and A1850** – *full ballast, 8-12 tubes – no particular problems.*

As with the multicorer it is **most important that no personnel are positioned inboard of the corer during launch and recovery**, therefore ensure that the head locking latch is turned to face either fore or aft at deployment / recovery.

Brian Bett

8.6 WASP

The SOC-GDD WASP (Wide-Angle Seabed Photography) system was used throughout the cruise in its standard configuration without any need for modifications or repairs etc. For details of the system see CD145 cruise report. For all deployments made during CD150, the still camera was loaded with 30m of Kodak Vision 250D and the video camera loaded with a 63 minute MiniDV tape.

Despite being overseas in transit or storage since autumn 2002, the WASP system was fully function from the outset and performed very well for the duration of the cruise, making 24 deployments:

Station	Site	Depths	Comment
56013#1	A140	137-135m	Good tow
56030#1	A200	207-215m	No film run
56029#1	A250	259-264m	Good tow
56008#1	A300	307-318m	Good tow
56022#1	A350	351-354m	Good tow
56023#1	A400	401-413m	Good tow
56055#1	A500	505-535m	Good tow
56074#1	E600	593-616m	Good tow
56042#1	C700	689-750m	Good tow
56051#1	A700	716-669m	Good tow
56073#1	E800	805-825m	Good tow
56032#1	A900	901-906m	Good tow
56006#1	A950	937-937m	Haul aborted
56009#1	A950	952-964m	Good tow
56061#1	E1000	992-956m	Good tow
56026#1	C1000	996-1008m	Good tow
56038#1	A1100	1115-1108m	Good tow
56057#1	E1200	1200-1135m	Good tow
56002#1	A1200	1202-1210m	Good tow
56050#1	E1400	1396-1421m	Good tow
56034#1	C1400	1398-1410m	Poor altimeter trace
56064#1	D1700	1713-1719m	Good tow
56018#1	D1750	1806-1808m	Battery leak
56003#1	A1850	1859-1861m	Good tow

The first deployment at site A950 was aborted shortly after arrival at the seabed when the telemetry indicated the still camera was not running. This proved to be a simple film jam that was ready cleared, the vehicle latter redeployed at this site and the tow successfully completed. The still camera also failed to run on the deployment at site A200, this appears to have resulted from a “poor” initial power up sequence. Two of the WASP batteries leaked during the tow at site D1750, one was repaired, from the other the cells scrapped. Altimeter telemetry was rather intermittent during the tow at site C1400, this was likely the result of low voltage.

As per CD145, the only other point of note relates to the lack of a Waterfall display during this cruise (the unit supplied never functioned), this necessitated the use of the Simrad EA500 screen as a display. This proved to be no inconvenience – other than perhaps cricking the neck looking sideways at the screen – and indeed was a bonus in that active echo-sounding could be run simultaneously without interference to the WASP “traces”.

Brian Bett

8.7. Agassiz trawl

The Agassiz trawl (supplied by UKORS) was used in conjunction with the WASP camera system to characterise megabenthic communities on the Pakistan Margin of the Arabian Sea. The dimensions of the frame measured at approximately 0.5 m x 3.0 m and the length of the net at approximately 3.5 m.

The Agassiz trawl being recovered

The trawl was typically lowered to the seabed with a 10 kHz pinger attached at a suitable position up the wire (generally c. 200m for the deeper stations) and was towed on the seabed for an hour at a speed of c. 1.5 knots. If the net was found to contain a large amount of mud on recovery, it was hosed down before bringing it on the deck. The catch was emptied into plastic buckets, filled with seawater of approximately the same temperature as that of the bottom water, and sorted to major taxonomic groups either on deck or in the temperature-controlled laboratory. The samples were preserved (10% formalin), fixed (ethanol) and frozen (-70°C) for taxonomic, molecular and biochemical research.

During the cruise, 19 Agassiz trawls were attempted with samples obtained from 13 stations varying in depth from 133 to 1839 uncorrected meters. The unsuccessful attempts were largely due to the problems encountered with the pinger traces that failed to convey any useful information concerning the position of the net in relation to the seabed. Consequently the ratio between the amount of wire paid out and the actual water depth was used instead. The ratio was found to be approximately 1.7 but varied somewhat between the stations, possibly due to local currents within the water column and near the seabed. This resulted in the trawl not landing on the bottom during several deployments.

Trawl stations where successful samples were obtained

Station	Depth (ucm)
56014#1	1108-1188
56019#1	1827-1839
56024#1	953-1014
56027#1	1256-1430
56032#2	812-920
56035#1	1724-1792
56047#1	136-138
56048#1	317-332
56052#1	1810-1832
56056#1	1607-1707
56060#1	1418-1537
56064#2	1697-1712
56075#1	133-134

Janne Kaariainen & Ben Boorman

8.8. Benthic Boundary Layer Sampler (BBLS)

The BBLS was used once at the start of the cruise at station A1850. It was evident upon retrieval and after nutrient analysis that a number of the bottles had back-flushed with water during hauling. The three lower bottles, (bottles 1, 2 and 3) had captured sediment as a result of the release mechanism being somewhat sticky to the degree of corrosion. As a result the bottles had fired once a large amount of sediment had been disturbed. This was not considered to be a problem however bottles 1 and 3 showed evidence that the collected mud had been continually stirred during hauling whereas the mud in bottle number 2 was overlain with clear water. Furthermore the temperature of the water in bottle 2 was considerable less than in bottles 1 and 3 such that once on board condensation formed on bottle 2 and not on bottles 1 and 3. Water was collected for analysis from bottles 4 and 5 and bottle 4 appeared to have nutrient concentrations quite different to bottle 5 but quite similar to concentrations higher up the water column. It was concluded by the UKORS technicians that the bottles could not be adequately sealed to prevent back flush without re-machining of the pistons. It was agreed that fixing of the instrument would be only attempted during CD151 (PSO Cowie, September/October 2003).

Tim Brand

8.9. Mechanical handling

<u>CTD deployments</u>

Sixteen deployments to a maximum depth of 1870m (wire out) were carried out using the starboard gantry and CTD winch. No problems were encountered. At the end of cruise CD149 a temporary wire run was put in place to try and rectify an ongoing problem with the CTD load read-out on the winches Clam display. The read-out worked without problem for the entire cruise.

BBLS, Multicore, Megacore and WASP

One deployment of the BBLS was carried out at the beginning of the cruise. The returned samples were found to be no good, since water mixing had occurred during recovery. On investigation it was found that the rear ‘O’ rings fitted to the bottles would not seal around the piston’s as they should after firing because: 1, various different sized chamfers on the ends of each piston. 2, the pistons were supposed to seal almost on their ends. The ‘O’ ring could be seated further down the bottle so that pistons pass through the ring and has a much better chance of making a seal. 3, if the pistons used a sealing ring instead of the scraper rings fitted you would not have to have an ‘O’ ring at the end of bottles, because no water could pass to the other side of the piston seal. Other observations. Because the firing weight is at one end of the frame as the frame strikes the bottom it will always fall forward and this could be a possible reason why the bottom 2 or 3 bottles usually come back with sediment mixed with the water. If the weight was balanced or had a larger footprint it might not topple over as it strikes the seabed. It also needs some kind of stand, so it can be cocked, secured and moved around on deck easily and safely.

A total of 108 deployments of WASP, Megacorer and Multicorer were carried out using the Coring warp over the Starboard side with a maximum wire out of 1890 metres. During the cruise it was noticed on several occasions that the winch would jump up in speed quite dramatically, e.g. winch hauling in at 50m/m would suddenly jump up to 78m/m. This fault was trace to a loose connection on the supply wiring to the main winch pump controller. It was re-terminated and no further speed jumping problems were encountered during the cruise. On one other occasion the winch would not pay out more than 20m/m. This problem turned out to be with the Solenoid valve that controls the Core winch brake. It appeared that the brake was not coming fully off and this was holding the winch back. The solenoid coil was found to be loose on the end of the valve and slightly damaged. It was re-secured and the winch ran without this problem for the remainder of the cruise.

Agassiz Trawl deployments

Trawling operations were carried out using the Coring warp with a 200 metre pennant wire attached. A total of 16 trawls were carried out with a maximum wire out of 3600 metres. No problems were encountered.

Darren Young & Steve Whittle

8.10. Laboratory facilities

Liquid Nitrogen generator

The Helium compressor unit was moved at the start of the cruise from its usual place in the airgun annex. It was re-sited just inside the main Laboratory to facilitate better cooling for the unit. The unit never tripped out once on high temperature during the cruise. The level gauge on the Liquid Nitrogen Dewar worked for most of the cruise, but did seem a little temperamental, occasionally dropping to zero while the dewar was known to be full. The system worked very well during the cruise, with no internal freezing, which has been a common problem with the dewar in the past.

Clean Chemistry Container Laboratory

The air conditioning unit kept tripping out on high pressure at the beginning of the cruise and would not run for more than a few minutes at a time. It was initially thought that the heat exchanger coil within the unit might possibly be fouled up or partially blocked. The coil was flushed with an acid cleaner and left for several hours. The unit was than flushed through and put back on line. It ran for several days without tripping out and we thought it was cured. But the same fault returned. After investigation it was found that the AC outlet pipe was blocked at the bulkhead fitting where the output water comes through the container side. This fitting was removed and a piece of hose passed through the remaining hole. The unit ran for the remainder of the cruise without any trouble.

Radio Nuclide Container Laboratory

No problems were reported during the cruise concerning this container lab.

Millipore Water Purifiers

Two RO12 units were used during the cruise. One in the Chemistry Container and the other in the ships wet lab. The system in the wet lab was used the most and went through 5 pre-filters and one RO pack during the cruise. No problems encountered.

Flake Ice Maker Machine

The Ice maker was fitted in the wet lab and worked without problem during the cruise

Sensair 20 Fume Cupboard

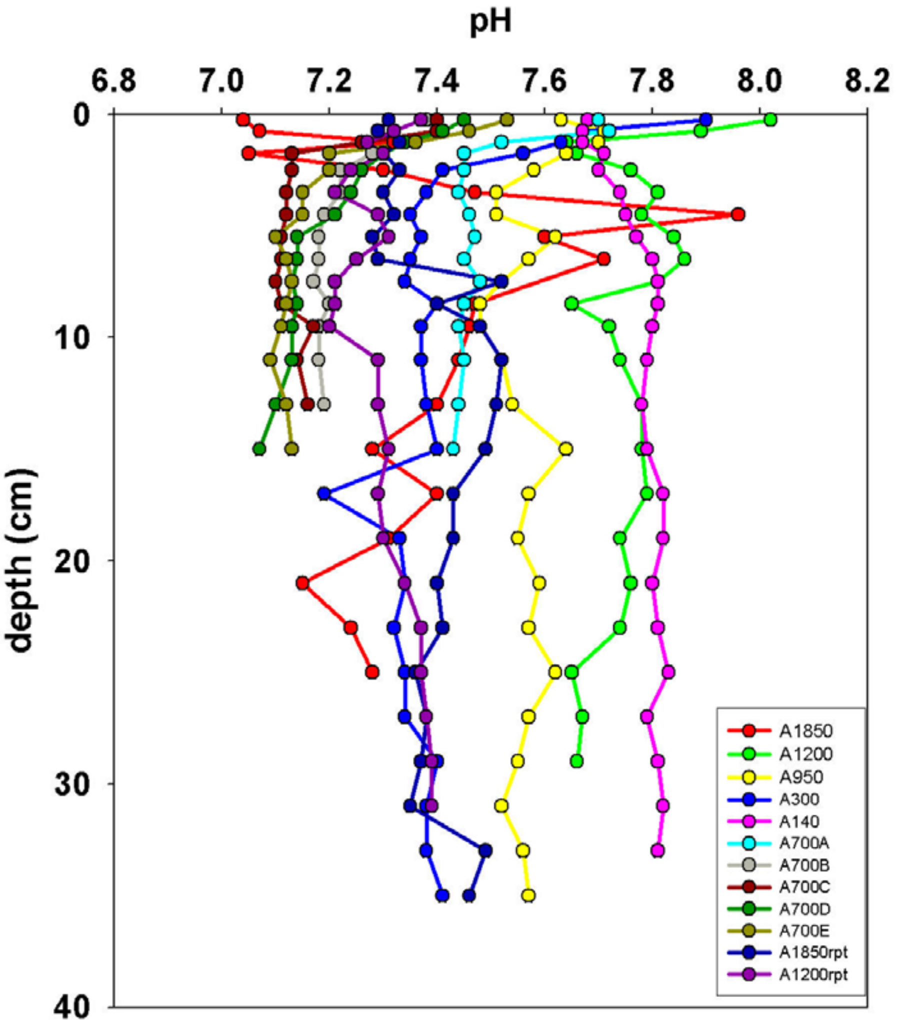
The fume cupboard was installed in the main lab and worked well apart from frequent low airflow alarms which are due to the units position in the main lab.

Darren Young & Steve Whittle

9. PRELIMINARY OBSERVATIONS

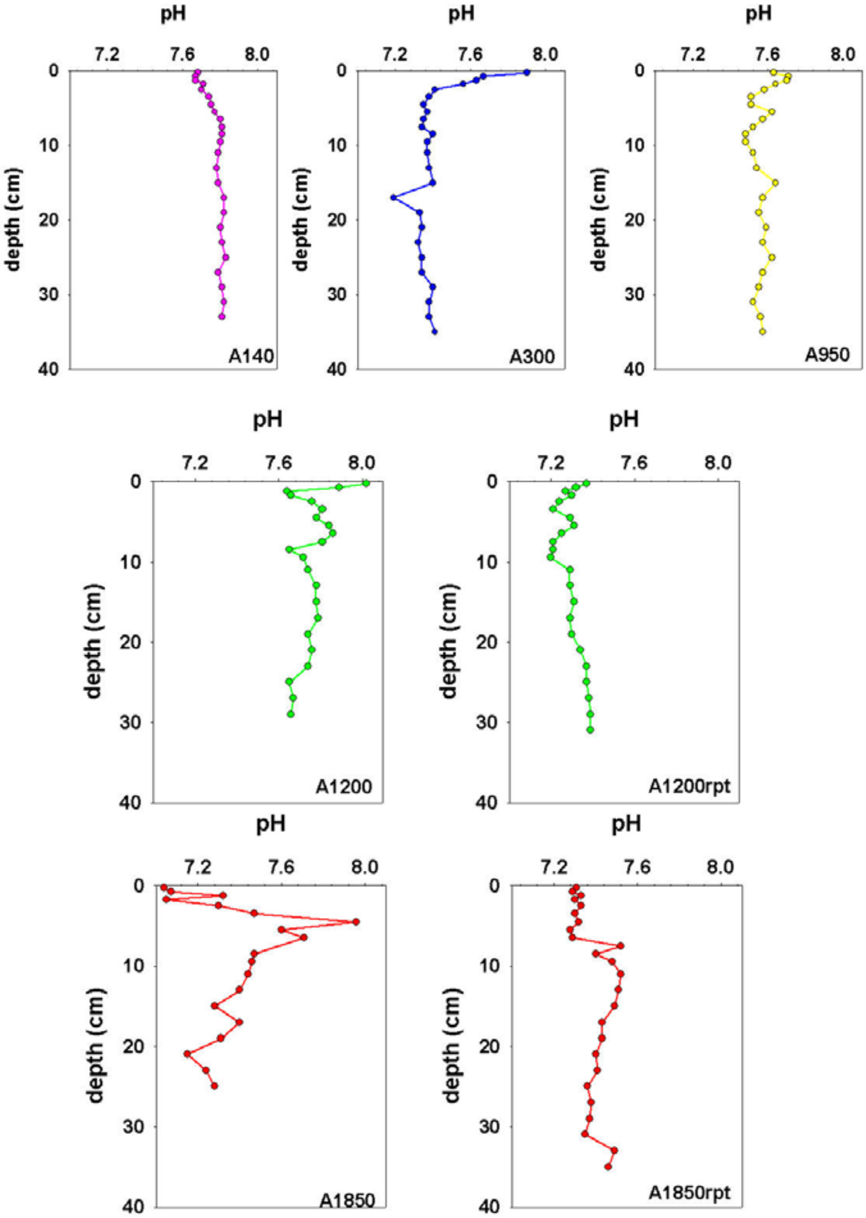
9.1. Geochemistry

Pore water pH



Note – A700 B-E, A1850rpt and A1200rpt were measured with the different pH meter

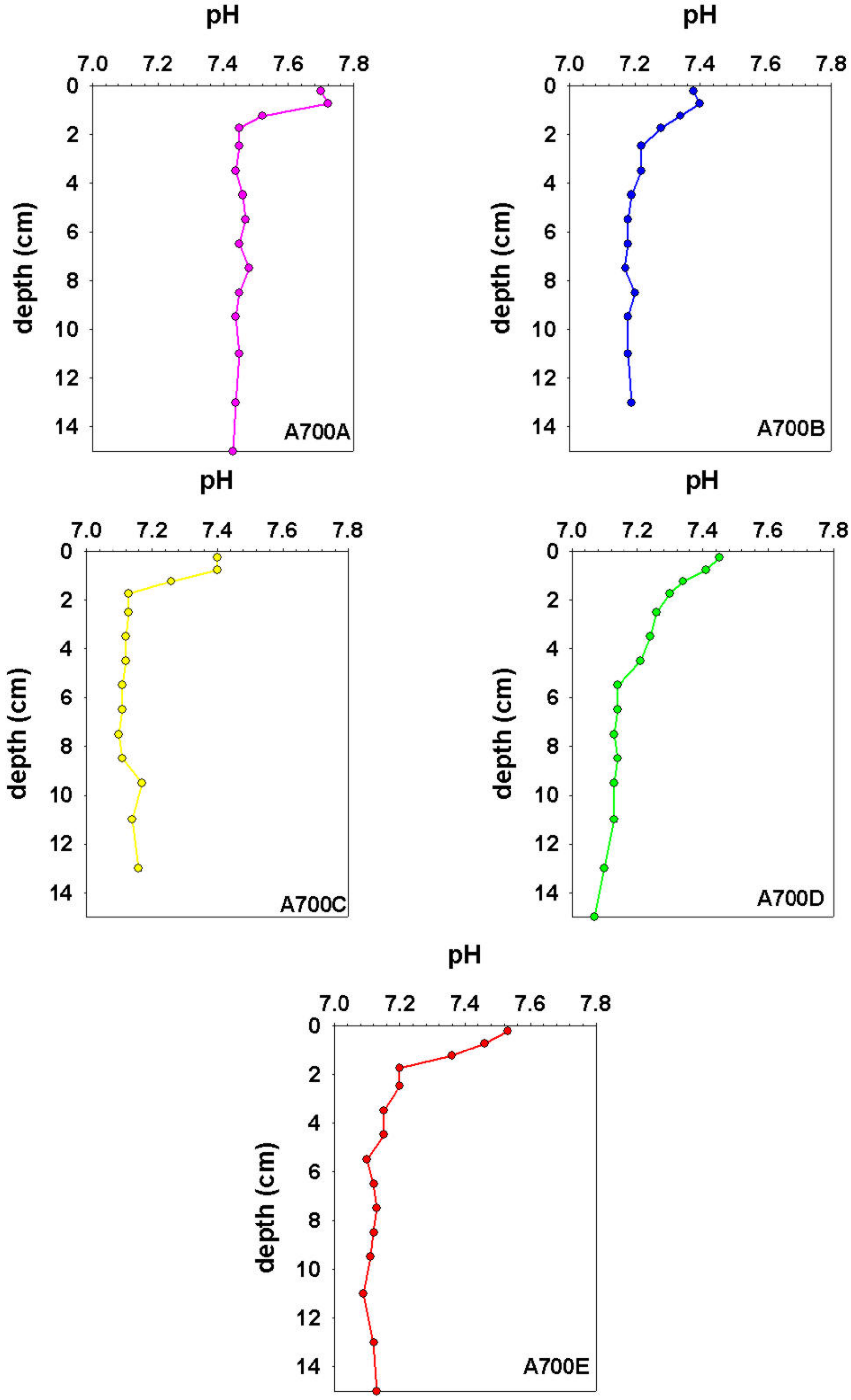
Pore water pH



Note A1200rpt and 1850rpt were carried out using a different pH meter

Pore water pH

Repeat cores to a depth of 15cm from site A700



9.2. Sulphate Reduction

Sediment sulphate reduction rates found within the OMZ during cruise CD145 appear to be low and very variable, with no regular profile being established in the top ~40cm sediment (the maximum core length achievable with the megacorer). The absolute magnitude of the rates cannot be determined until pore water sulphate concentrations and sediment porosity data become available. Total reduced inorganic sulphur (TRIS) levels were also low.

The cores collected during the present cruise showed a similar appearance to those from CD145, with no apparent sulphide formation, so sulphate reduction rates and TRIS are expected to be similar to those found previously.

Appreciable levels of nitrate have been found downcore at all sites (Tim Brand, pers. comm.) and it is likely that this is being used as the principal terminal electron acceptor in the breakdown of organic material in the sampled sediment, in preference to sulphate.

Martyn Harvey

9.3. Biochemistry - preliminary observations

Sediments: visual observations.

Below the OMZ: Site A1850
These sediments are characterised by a thick layer ~1-2 cm of orange/brown flocculent material over light grey clays. The sediments here are heavily bioturbated down to ~10 cm as can be seen in fig. 2a (translocation of the orange/brown flocculent material to depth). There were also many burrows present see fig 2b.

OMZ Boundary: Site A1200
These sediments were characterised by a 1 cm layer of light brown flocculent material overlying brown uniform sediments below. There were also some large polychaete burrows within the cores and a few of the polychaetes were recovered. At station 56044#02 there was one core that showed evidence of sulphate reduction shown in fig. 2c, this was probably a result of the death of some of the infauna. Two cores at this station also had holothurian faeces on the surface of the cores (fig. 2d).

OMZ Transition Zone: Site A950
Once again these sediments had a fine flocculent layer ~0.5-1 cm overlying brown sediments. Between 3 -5 cm there was a fine layer of clay see fig 2e. Other than this clay band the cores were uniform in appearance. Some of the cores had ophiuroids and sabellid polychaetes at the surface there were also burrows present.

Core of the OMZ: Site A300

A 1-2 cm flocculent brown layer overlies olive homogeneous mud at this site. Within the flocculent layer there is an iron/manganese layer in the top cm as shown in fig 2f. There was little/no evidence of burrows.

Above the OMZ: Site A140

These cores were characterised by a 0.5 cm layer of flocculent material overlying homogeneous brown sediments. Deeper down in the core ~ 15 cm the mud became 'gritty' and a few gastropod shells were found.

Differences between CD145/146 and CD150.

The main difference between the sediments in this cruise (CD150) was that there were very few foraminifera found on the sediment surfaces of the megacores sampled. There were a few *Pelosina* sp. found on core tops at A300, but the *Pelosina* sp. were not present in the same densities as seen during CD145. During CD145, *Pelosina* sp. were found on the tops of cores at A150, A300, A500 and A1200. In addition to this observation, there were also few gromiids observed on the surface sediments. During CD 145, gromiids had been found on the surface of cores at A1200 and A1850, on CD 150 only one or two gromiids were found at A1200.

<u>Figures to Accompany the Sediment Visual Observations.</u>

Figure 2a: A core from A1850 showing bioturbation.

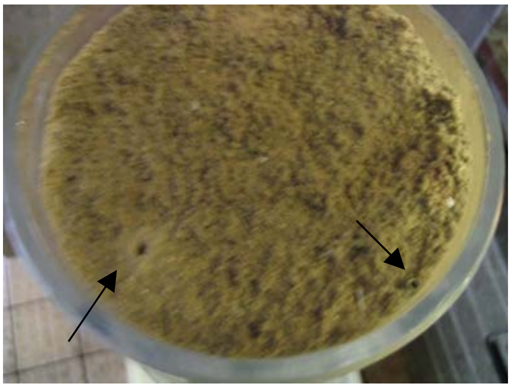


Figure 2b: A core surface from A1850 showing burrows.

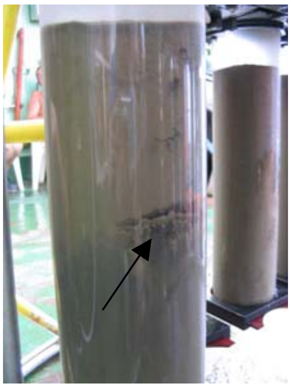


Figure 2c: Core from A1200 showing sulphate reduction.

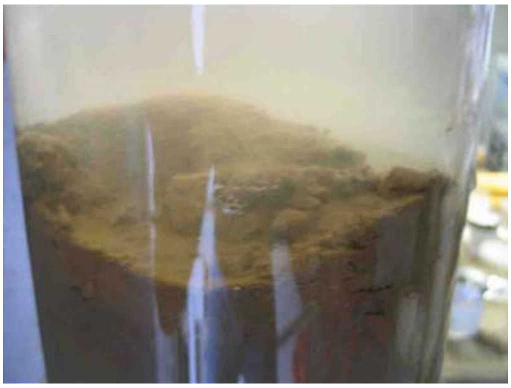


Figure 2d: Core from A1200 with holothurian faeces on the surface.

Figure 2e: Core from A950 showing clay band.

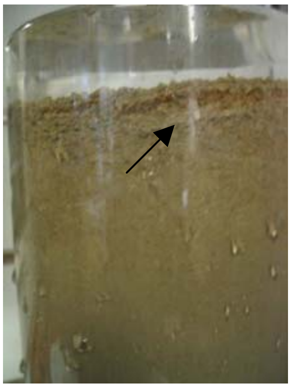


Figure 2f: A core from A300 showing iron/manganese layer.

9.4. Water and sediment chemistry

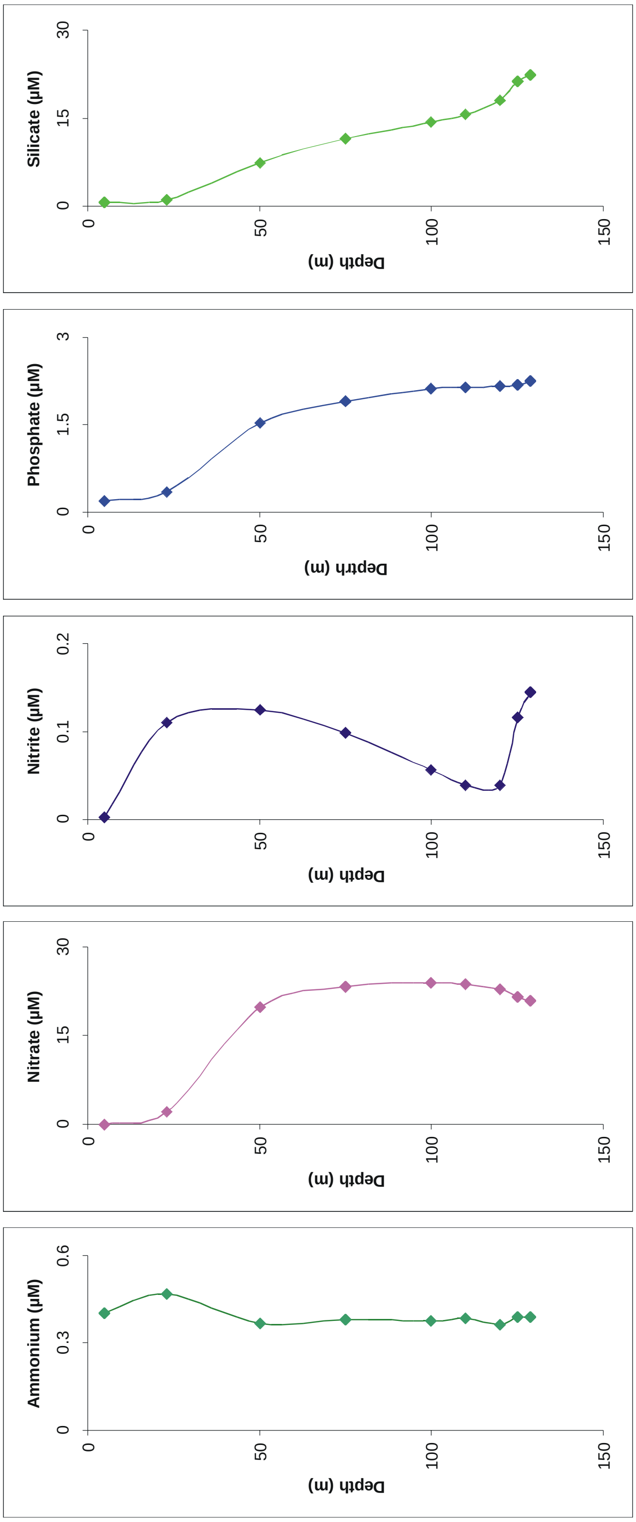
Water column

Water column nutrient data was achieved from 7 CTD stations, A140, A300, A500, A700, A950 A1200 and A1850. An auto-analyser instrument failure was encountered during the analysis of ammonium from station A1200 and so the station was revisited, more samples was collected and analysed successfully for ammonium. The method of salt correction was also adjusted during the cruise so a second series of samples were collected from station A1850 and the modified salt correction procedure was used.

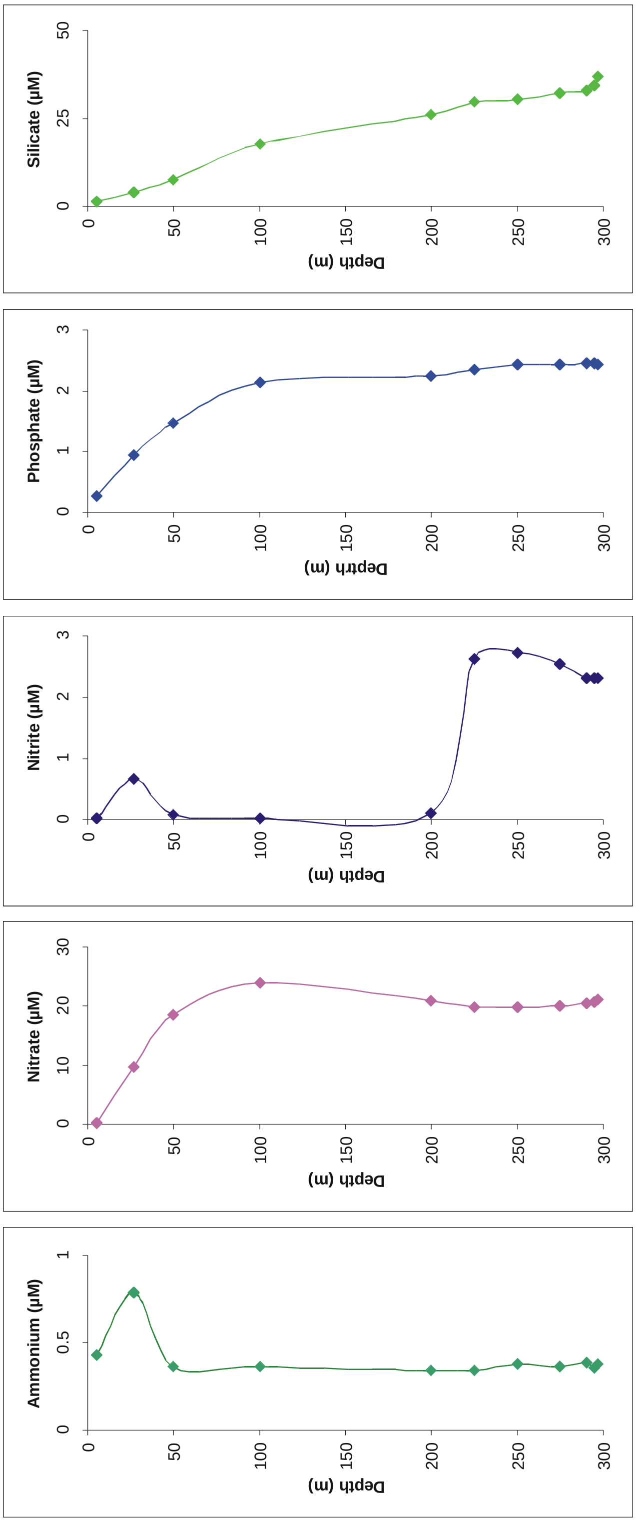
Fluorescence data from the Seabird CTD revealed a chlorophyll A/fluorescence maxima often occurring between 20 and 30m. Most CTD profiles were taken during mid to late morning. After periods of freshening winds and accompanying sea state a chlorophyll A/fluorescence maxima was less obvious.

Temperature and salinity data from the Seabird CTD reveal a well-mixed, warm, saline layer of water approximately 50m deep sitting on cooler, fresher water below. Below this upper layer, which was fully oxygenated, the oxygen concentration plummeted to less than 5% saturation at about 100m, signalling the top of the OMZ. This is approximately 100m higher than the top of the OMZ during CD145. The bottom of the OMZ (for convenience identified by the 10μM dissolved oxygen contour) has risen by approximately the same amount suggesting an overall upward movement of the main water mass, probably the result of monsoon driven upwelling.

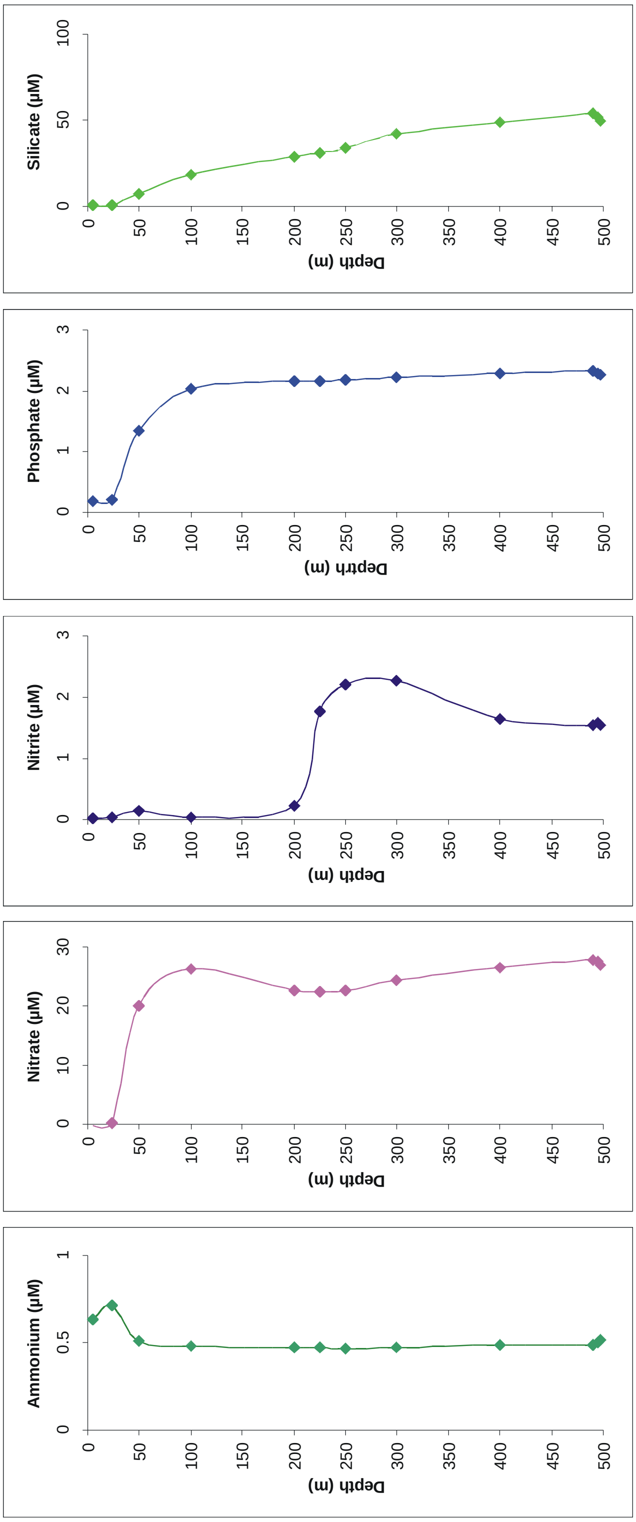
Nitrate, phosphate and silicate all reveal higher concentrations in the surface water compared to those encountered on CD145 and with the exception of silicate show generally higher concentrations throughout the water mass. From the CD150 data there appear to be differences in the direction of concentration gradient between the three nutrients. Phosphate increases in concentration with depth until about 1600m and then stabilises. It also increases in concentration seaward. Silicate increases in concentration throughout the depth of the water but appears to increase in a landward direction. Nitrate increases with depth without any landward or seaward bias but shows a depleted concentration depth range roughly corresponding to the zone of maximum mid-water nitrite concentration within the OMZ.


Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
Depth (m)

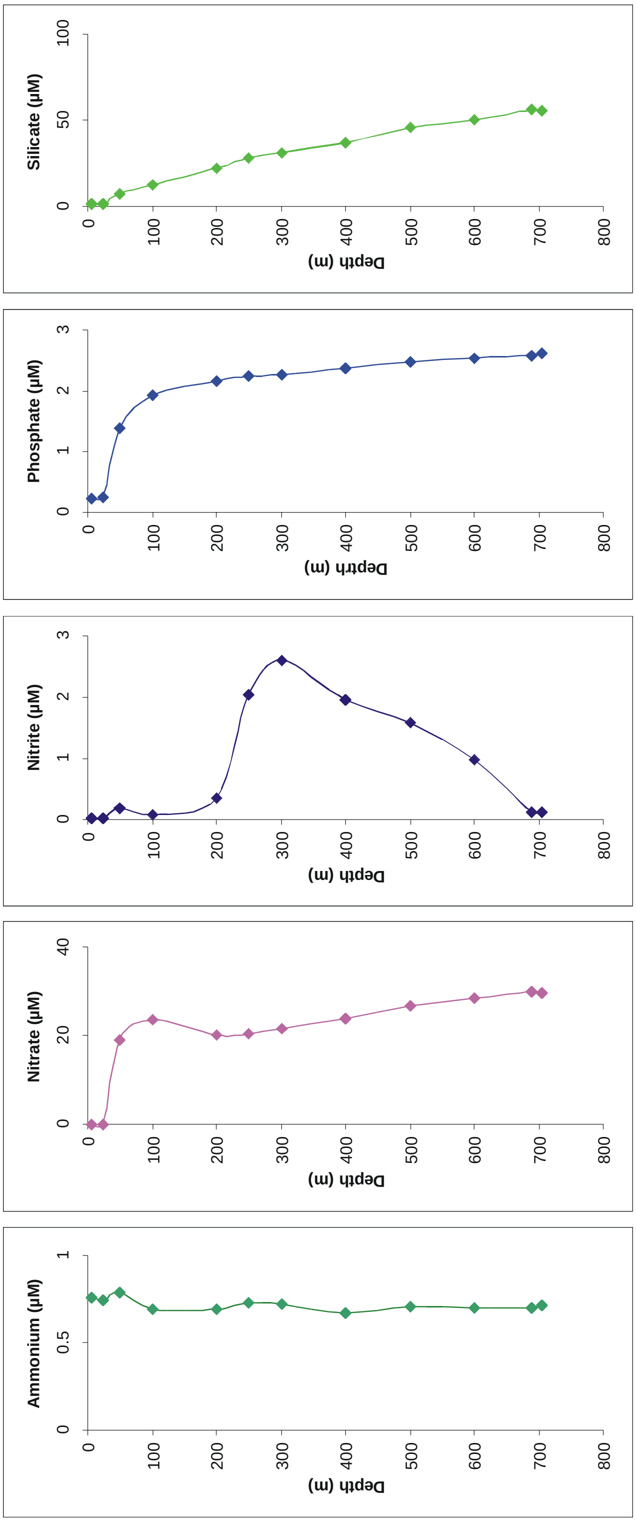
Site A140


Silicate (µM)
Depth (m)
Phosphate (µM)
Depth (m)
Nitrite (µM)
Depth (m)
Nitrate (µM)
Depth (m)
Ammonium (µM)
Depth (m)

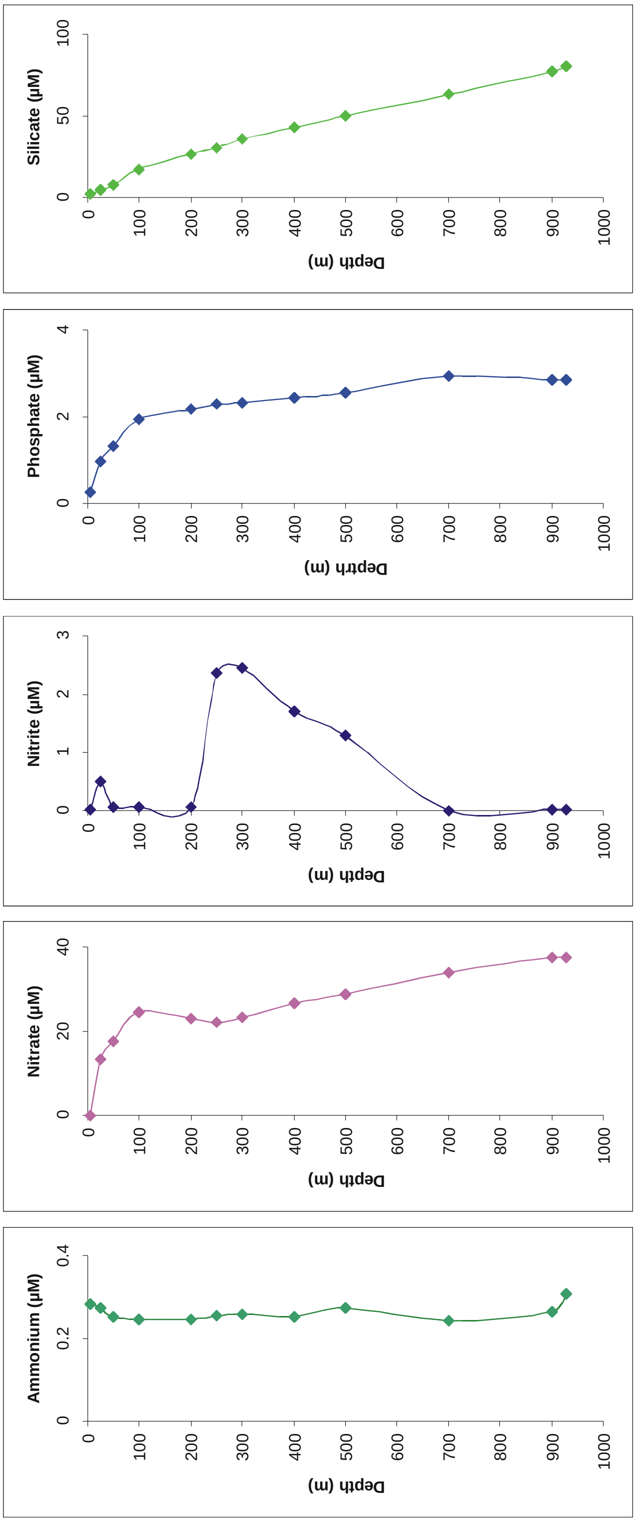
Site A300


Silicate (µM)
Depth (m)
Phosphate (µM)
Depth (m)
Nitrite (µM)
Depth (m)
Nitrate (µM)
Depth (m)
Ammonium (µM)
Depth (m)

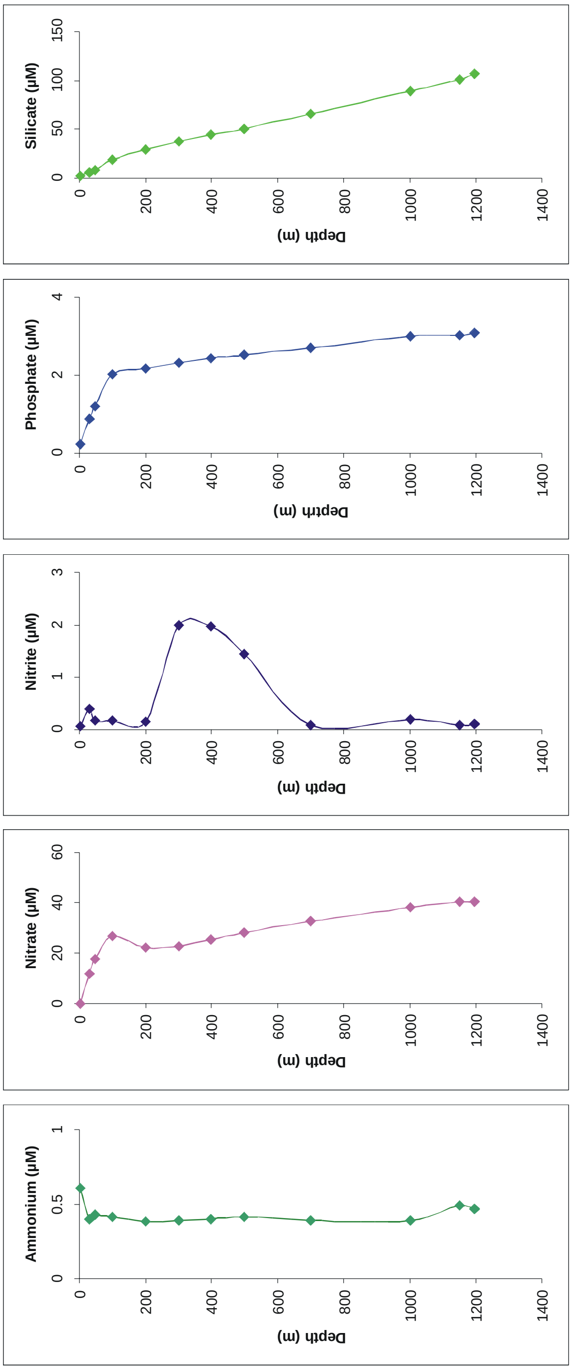
Site A500


Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
Depth (m)

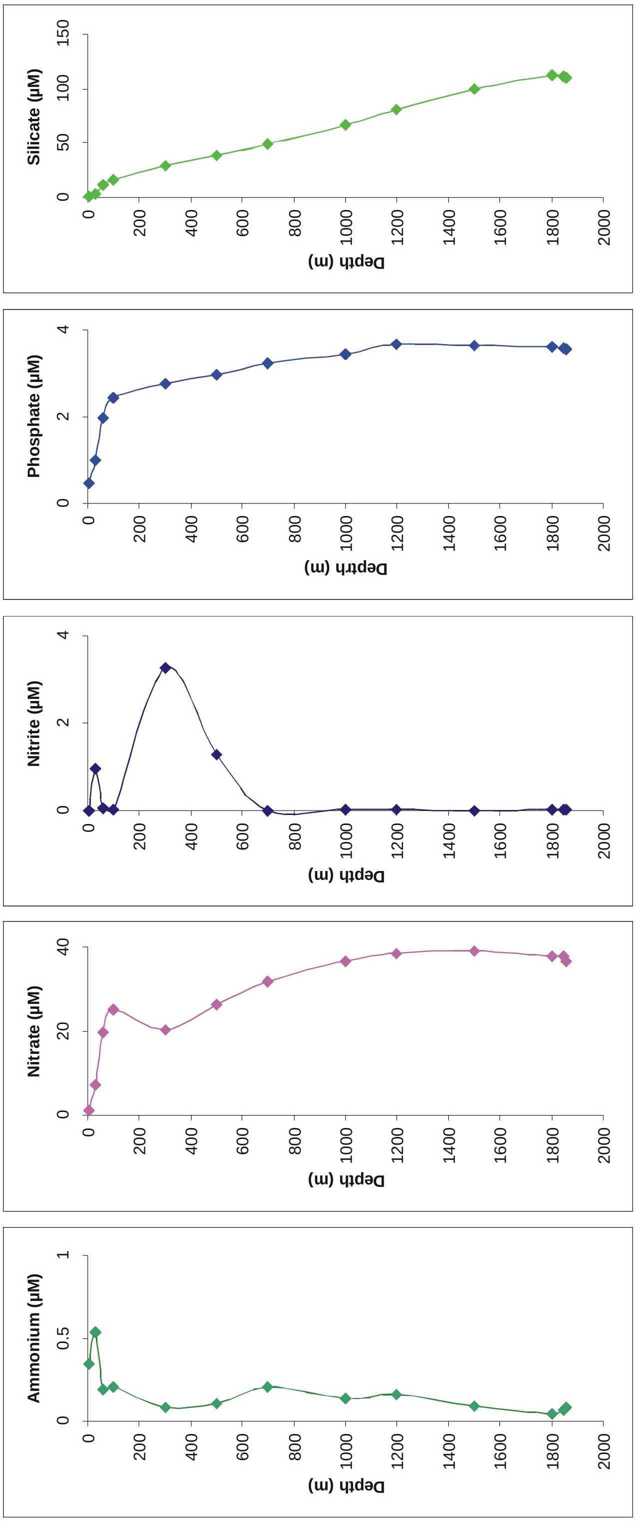
Site A700


Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
Depth (m)
0
100
200
300
400
500
600
700
800
900
1000

Site A950

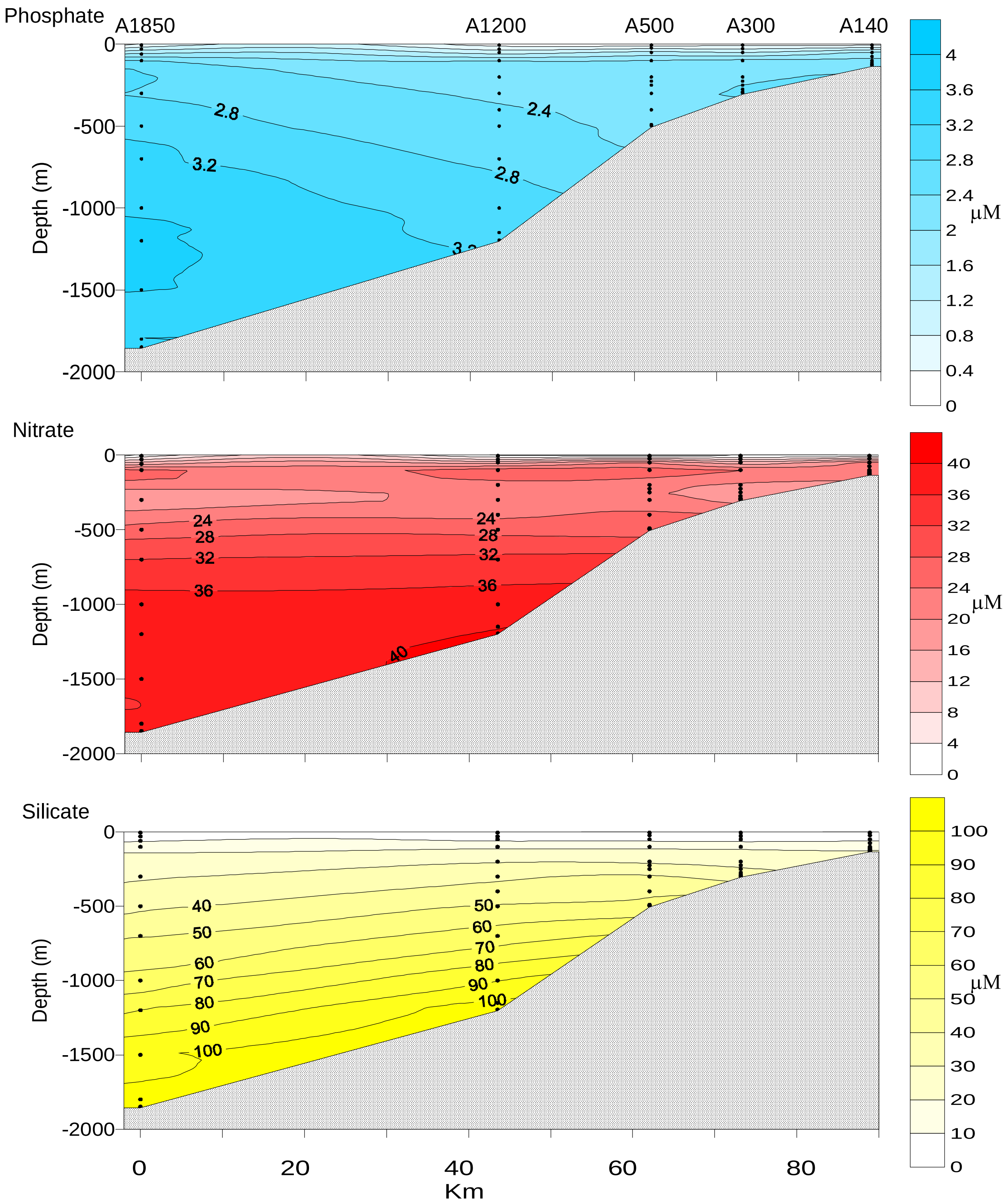

Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
Depth (m)

Site A1200

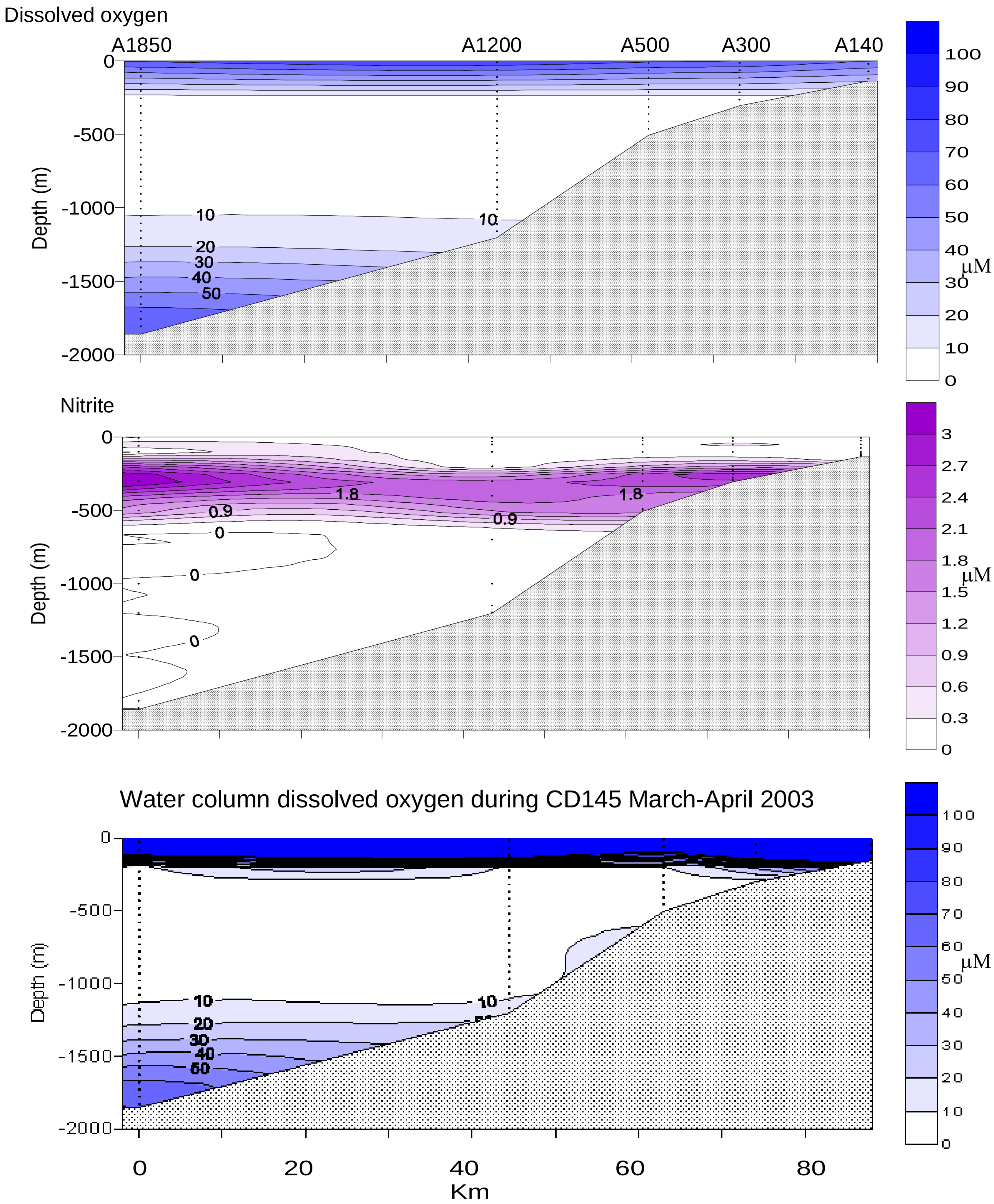

Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
Depth (m)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Site A1850

Water column nutrient (phosphate, nitrate and silicate) concentrations on the Pakistan margin during cruise CD150 August-September 2003



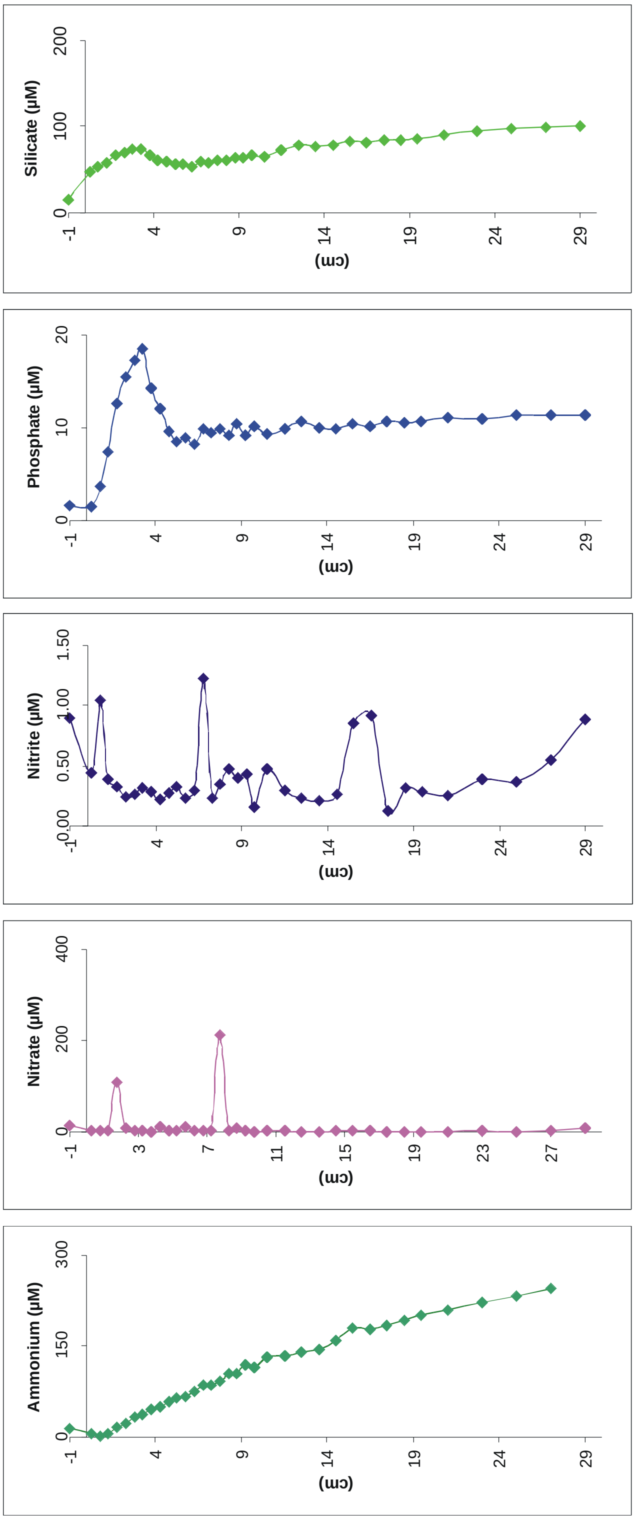
Water column dissolved oxygen and nitrite concentrations on the Pakistan margin during CD150 August-September 2003



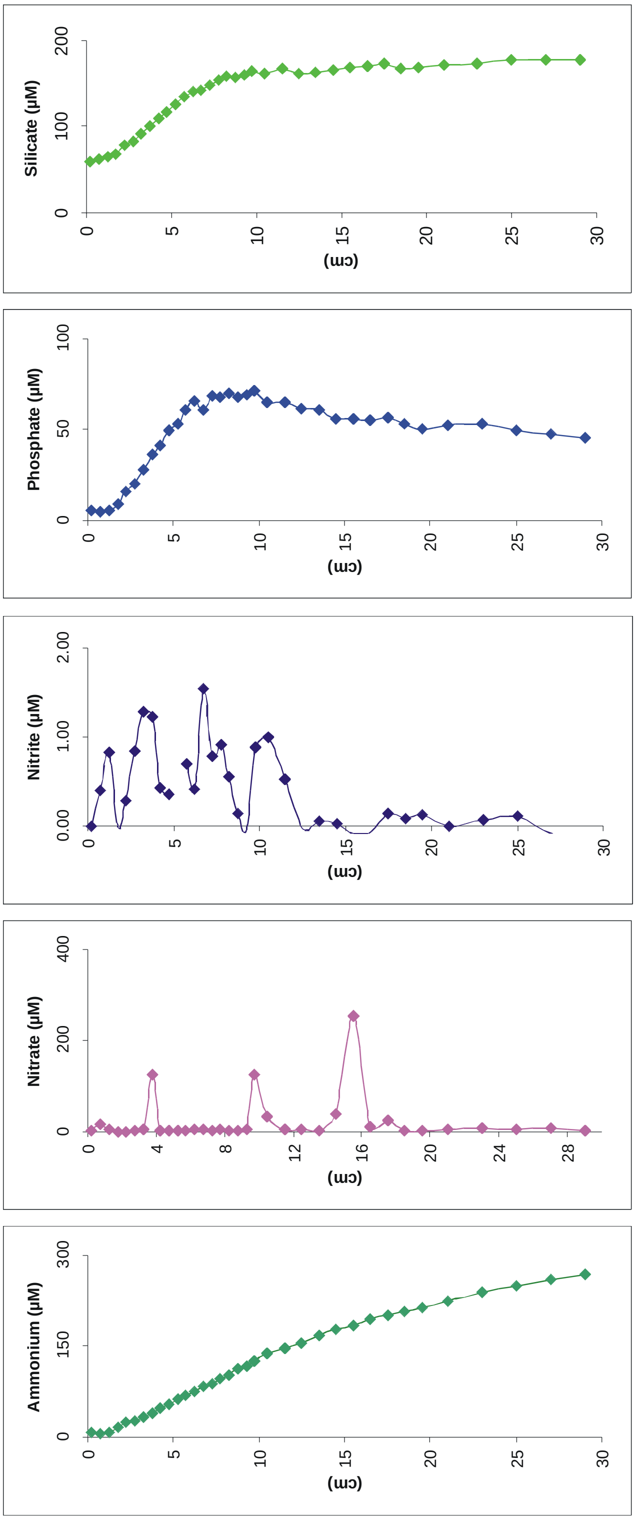
Sediment pore water

Pore water was collected from cores from 6 coring SITES (A140, A300, A700, A1200, A950 and A1850) and analysed for ammonium, phosphate, silicate, nitrate and nitrite. 5 cores were analysed from station A700, three cores from the same mega core deployment and a core each from two further deployments.

Ammonium shows an increase in concentration throughout the cores with the highest concentrations recorded at station A300 and the lowest at station A1850. At the replicated station A700 ammonium concentrations all show very good agreement. With the exception of core A1850 all cores show very irregular nitrate. The profiles often exhibiting peaks of high concentration. With the exception of cores A140 and A300 nitrate rises towards the surface of the core and, where taken, rises into the overlying water. Nitrite concentrations show steep increases towards the core tops with highest concentration recorded in core from A1850. Core A300 shows higher concentrations between the surface and 12 cm depth. The replicated cores from station A700 show good agreement in the position and magnitude of the nitrite peak at the surface of the cores. Phosphate shows highest concentration at station A700 and throughout the cores sites exhibits a decreasing gradient towards the sediment surface although the magnitude of the gradient is quite variable. Silicate also exhibits decreasing concentration towards the surface of the cores with similar variability between the gradients.

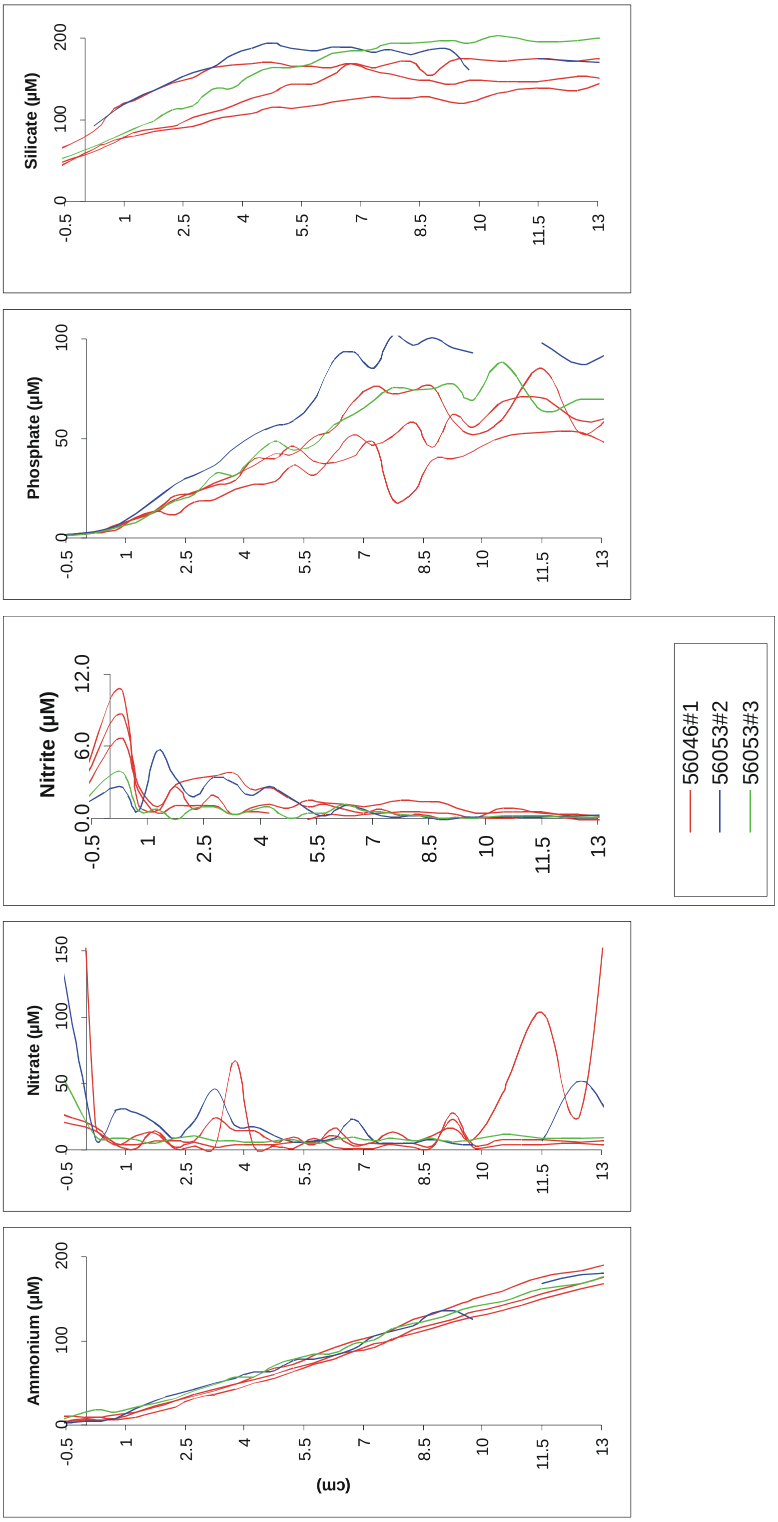

Silicate (µM)
(cm)
Phosphate (µM)
(cm)
Nitrite (µM)
(cm)
Nitrate (µM)
(cm)
Ammonium (µM)
(cm)

Site A140



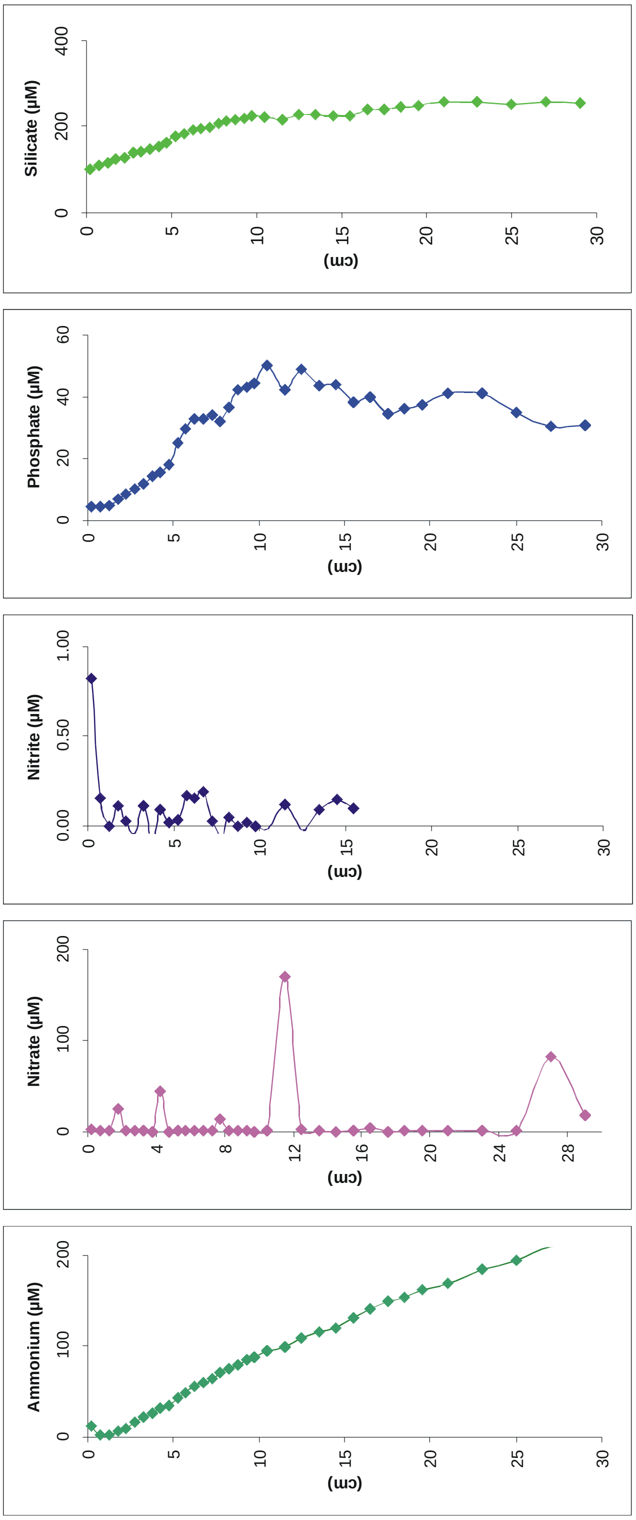
Silicate (μM)
(cm)
Phosphate (μM)
(cm)
Nitrite (μM)
(cm)
Nitrate (μM)
(cm)
Ammonium (μM)
(cm)

Site A300

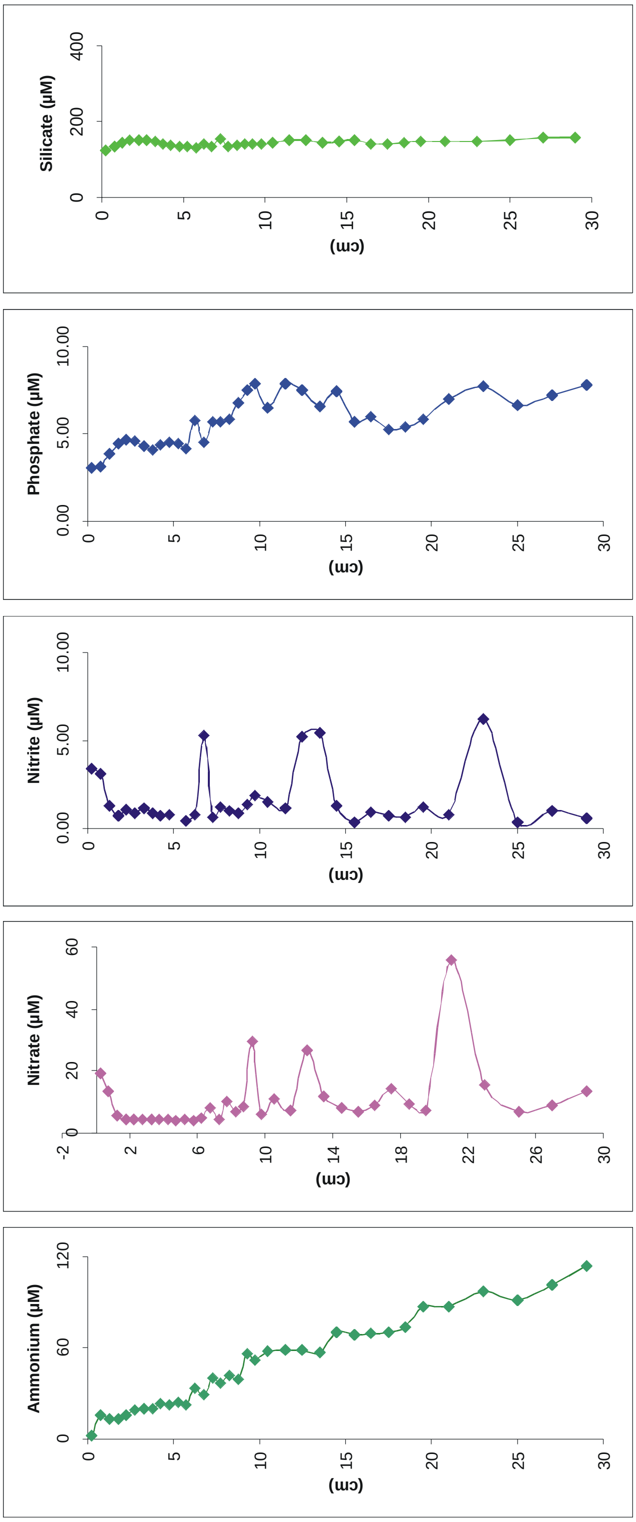


Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
(cm)
56046#1
56053#2
56053#3

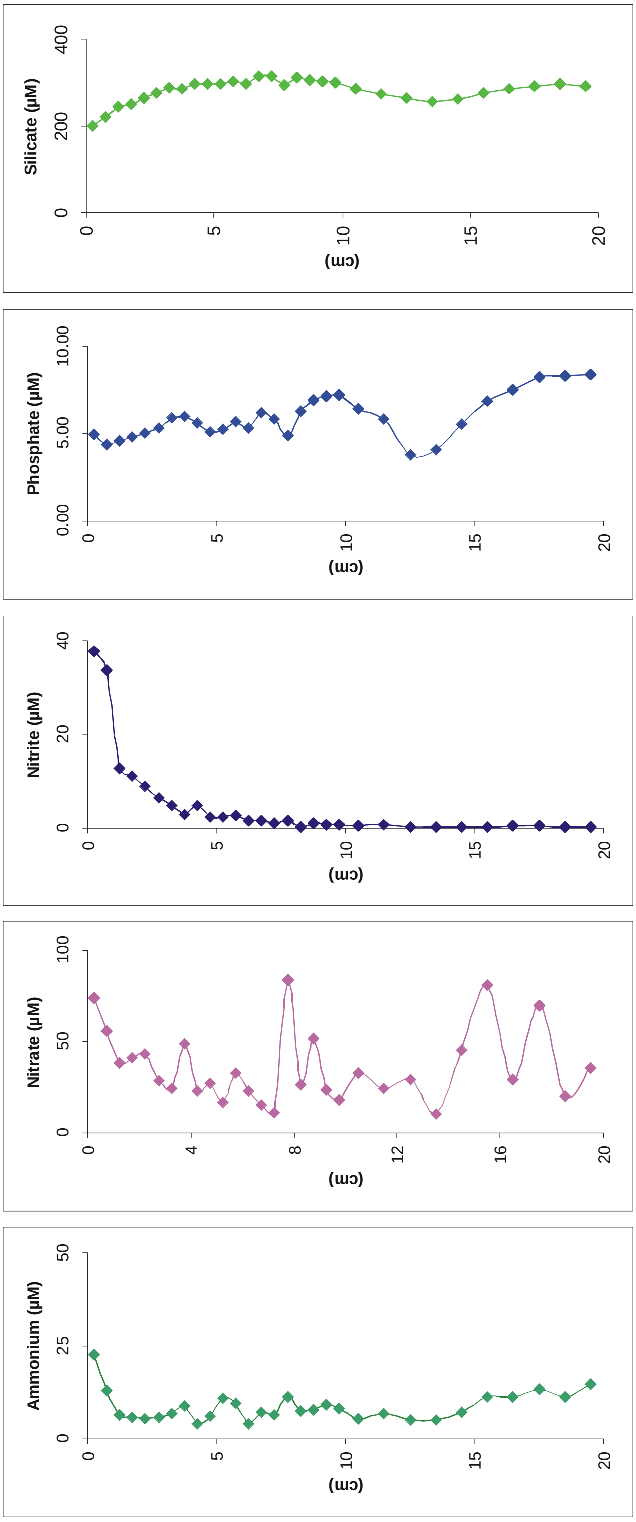
Site A700


Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
(cm)

Site A950


Silicate (μM)
(cm)
Phosphate (μM)
(cm)
Nitrite (μM)
(cm)
Nitrate (μM)
(cm)
Ammonium (μM)
(cm)

Site A1200


Silicate (µM)
Phosphate (µM)
Nitrite (µM)
Nitrate (µM)
Ammonium (µM)
(cm)

Site A1850

9.5. Megabenthos

The Agassiz trawls carried out during CD145 and CD146 were frequently characterised by small sample volumes. This was also a typical feature of the trawl catches recovered during CD150. As with the previous surveys in the area, trawling was complemented with video footage obtained during the WASP deployments. The tapes invariably showed not only the scarcity of metazoan epifauna in the area but also the presence of extensive burrow systems on the seabed. The trawl catches closely reflected these observations in being small in terms of volume and organisms caught. At most stations relatively large numbers of crustaceans (*Munida* spp., *Polycheles* spp. and thalassinds) were found and these are believed to account for at least some of the burrows.

The high number of gromids and foraminiferans that were present at the deeper stations during CD145 and CD146 were not recorded this time. It is likely that these organisms still exist at similar densities at these stations but were not recovered on the trawls during CD150 due to a larger mesh-size net being used. With the exception of gromids and foraminiferans, the general composition of the trawl catches between the different cruises was similar.

One remarkable feature of the CD 145 was the presence of the holothurian *Benthothuria* sp. in the catch at the 1800 m station. This species had last been encountered in the 1890's and no preserved specimens were known to exist. During the present survey several more specimens were obtained from similar water depths, suggesting that this particular holothurian may be relatively common in the northern part of the Arabian Sea. Also a few specimens of the spider crab, *Encephaloides armstrongi*, were found at the 1000m station. This species was encountered in extremely high densities on the lower boundary of the OMZ on the Oman margin during the 1994 cruise and these specimens provided first evidence of its presence on the Pakistan margin of the Arabian Sea.

Station 56014#01; Site C1200; Depth: 1108-1188 m
One trawl was conducted here near the base of the OMZ. This catch was good and dominated by a variety of fish and anemones. The small forms of the actinarians *Actinoscyphia* sp. and *Actinauge* sp. (see fig. 1a) were prevalent. Other invertebrates noted in the catch included the small squat lobster, probably *Munida scrobina,* cirripedia, polychaetes and pennatulids. The fish included; elasmobranchs, notocanths, deep-sea sole, alepocephalids and macruirids. Also present in the catch were a number of mid-water crustaceans.

Station 56019#01; Site D1820; Depth: 1827-1839 m
This was a small but "perfectly formed" catch from below the OMZ. A wide range of crustaceans were present including the squat lobster *Munida scrobina*, *Glyphocrangon* sp., *Polycheles* sp, *Thalassina* sp., and an isopod. In addition mid-water crustacean were present. Also present was an asteroid and a large but not intact specimen of a brisingiid. Holothurians present included *Benthodytes* and two intact specimens of *Benthothuria cristatus* (fig.1b). This holothurian was also found at the same depth during CD145 but the last seen specimen before CD145 was in the late 1890s! It would now appear that it is common on the Pakistan Margin. The fish at this station consisted of alepocephalids and macruirids.

Station 56024#01; Site C1000; Depth: 961-1022 m

The trawl conducted here at the base of the OMZ produced a catch that was quite muddy! However, this catch was varied and contained a number of porifera, gastropods, many small ophiuroids (~ three species), pennatulids (a different species from that found in 56014#01), numerous sorberaceans previously found in CD145 (55811#01). The catch also contained the crustaceans *Munida scrobina* and the spider crab *Encephaloides armstrongi*, found in high densities on the Oman Margin, see fig. 1c. Also present were a number of small holothurians possibly *Molpadia* sp., five octopoda and some gromiids. The fish included: elasmobranchs, notocanths and eels. A number of polychaetes and mid water crustacea were also present.

Station 56027#01; Site C1400; Depth: 1246-1438 m

This was a good and varied catch at the bottom OMZ boundary that included larger specimens of the actinaria *Actinauge* sp. and *Actinoschyphia* sp. There were two species of holothurians present, *Benthodytes* and an unidentified holothurian. The echinoid *Echinothuridae* sp. was also present. *Hyalinoecia* sp. (quill worms) were also abundant at this depth. The crustacean *Polycheles* sp. was also present as well as an isopod and an amphipod. Molluscs included bivalves (possibly Tellinacea) and gastropods. A variety of fish shown in figure 1d, were also present notably notocanths, tripod fish, eels, alepocephalids and macruirids.

Station 56032#02; Site A900; Depth: 819-928 m

This trawl contained no animals. There was a strong smell of sulphur and many bones, squid beaks and rocks. The rocks were laminated slabs, easily broken, the exposed surfaces being blackened and strongly smelling of hydrogen sulphide – this material is though to represent “hard ground”.

Station 56047#01; Site A140; Depth: 136-138 m

One medium sized catch from above the OMZ shown in figure 1e. A very muddy catch with lots of small invertebrates. Invertebrates included many species of gastropod, hermit crabs, few small crabs, infaunal actinaria, polychaetes, solitary scleractinia polyps, three *Astropecten* asteroids and a few bivalves. Also present were three small fish. Of particular interest and not found on CD145 was the single specimen of *Tibia* sp. commonly found on the Oman Margin above the OMZ.

Station 56048#01; Site A300; Depth: 317-332 m

This trawl was dominated by fish and the catch was small, see figure 1f. There were three species of fish and several prawns present. No invertebrates were present; this may be indicative of the OMZ core.

Station 56052#01; Site D1750; Depth: 1817-1839 m

A small perfectly formed haul with a very diverse crustacean catch, including *Polycheles* sp., *Glyphocrangon* sp., *Munida scrobina*, cumaceans, amphipods, isopods a mysid and several different species of prawns including thalassinids. The holothurian *Benthodytes* sp. was present in large numbers. Two asteroids, several round ophiuroids and several brisingiid arms were also present. There were also several gastropod species, some very small scallops and a few bivalves. The fish included alepocephalids, macruirids, an eel, a synaphobranchid eel. There was also some tree bark in the catch as well as sponge spicules varying in length from ~1-10 cm.

Station 56056#01; Site C1550; Depth: 1607-1707 m

This catch was a small but significant catch with two species of holothurian. There were several *Molpadia* sp. present (fig. 1g) as well as two specimens of *Benthothuria cristatus*, one of which was damaged. Also present from the Echinodermata were two species of ophiuroid, the round species and a purple species (fig. 1h). The crustaceans included isopods, prawns, *Glyphocrangon* sp., the squat lobster *Munida scrobina* and *thalassinids*. Present from mollusca were a few bivalves and gastropods. The polychaetes included *"Arenicola"-type*, *Hyalinoecia* and another unidentified species. There were two species of sipunculid worm present one possibly being *Golfingia-like*. The fish included alepocephalids, macruirids, a large botrulid and two unidentified species.

Station 56060#01; Site C1500; Depth: 1418-1537 m

This was a good catch, small but perfectly formed with a variety of invertebrates and fish. The fish included notocanths, tripods and macruirids. The invertebrates included the crustaceans; *Polycheles* sp., *thalassinids*., *Glyphocrangon* sp., shrimps, mid water prawns and *Munida scrobina*. Also present were the holothurians *Molpadia* sp., round ophiuroids, polychaetes, sipunculids (fig. 1i), the actinarian *Actinoscyphia*, some bivalves including scallops, gastropods, a large 'jelly ball' gromiid and a jelly fish. *Munida scrobina* and the sipunculids were noted to be carrying eggs.

Station 56064#02; Site D1700; Depth: 1697-1712 m

This was a good haul and included a wide range of invertebrates. There were several polychaetes, possibly *"Arenicola"-type* sp., *Hyalinoecia* sp. and their tubes. Present from the echinoderms were the holothurians, *Molpadia* sp. and *Benthothuria cristatus*. The ophiuroids included the round ophiuroid as well as the purple species. There was also one specimen of *Echinothuridae* sp. which had been damaged. The crustaceans included; *Munida scrobina*, *Polycheles* sp., *Glyphocrangon* sp., *thalassinids*. (fig. 1k), mid water crustaceans, isopods and amphipods, all shown in figure 1j. A parasitic isopod was present on a notocanth's head. The fish included an eel, notocanth, fish species B, fish species D, a juvenile botrulid, an alepocephalid and a macruirid. Also present were bivalves, gastropods, scaphopods, an infaunal actinarian and sipunculid worms.

Station56075#01; Site A140; Depth: 133-134 m

This was a large muddy haul. The catch was dominated by molluscs, many of them gastropods. Two specimens of *Tibia* were found although they were not living. Also present was a single cowrie. There were a few small bivalves present. From the crustaceans there were hermit crabs and prawns. Infaunal actinaria were also common as were solitary scleractinians. Two specimens of *Astropecten* sp.were also present. Several polychaetes were also present. There were several species of fish including an eel.

Figures to Accompany Agassiz Trawl Observations

Figure 1a: *Actinauge* sp. from C1200

Figure 1b: *Benthothuria cristatus* and *Benthodytes* sp. from D1820.

Figure 1c: *Encephaloides armstrongi* from C1000.

Figure 1d: Fish from C1400.

Figure 1e: Representative catch from A140.

Figure 1f: Representative catch from A300.

Figure 1g: *Molpadia* sp. from C1550.

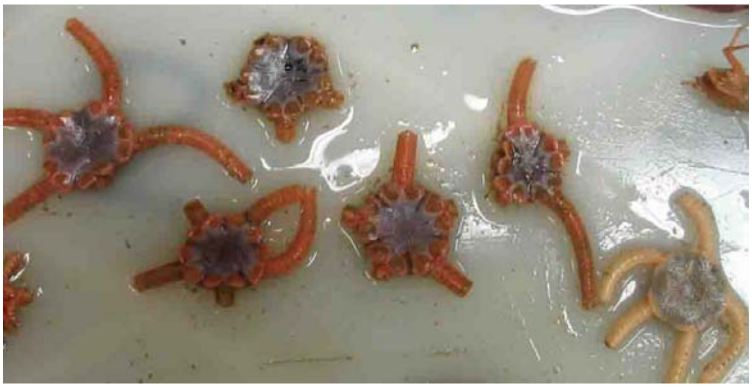


Figure 1h: Ophiuoroids (purple and round) from C1550.

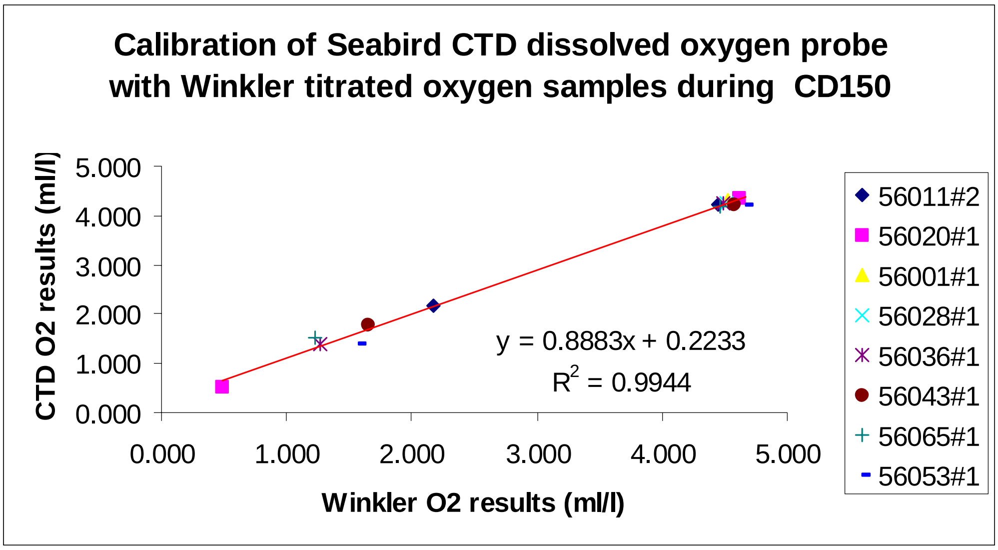
Figure i: Sipunculid worms from C1500.

Figure 1i: Crustaceans from D1700.

Figure 1j: *Thalassina* sp. from D1700.

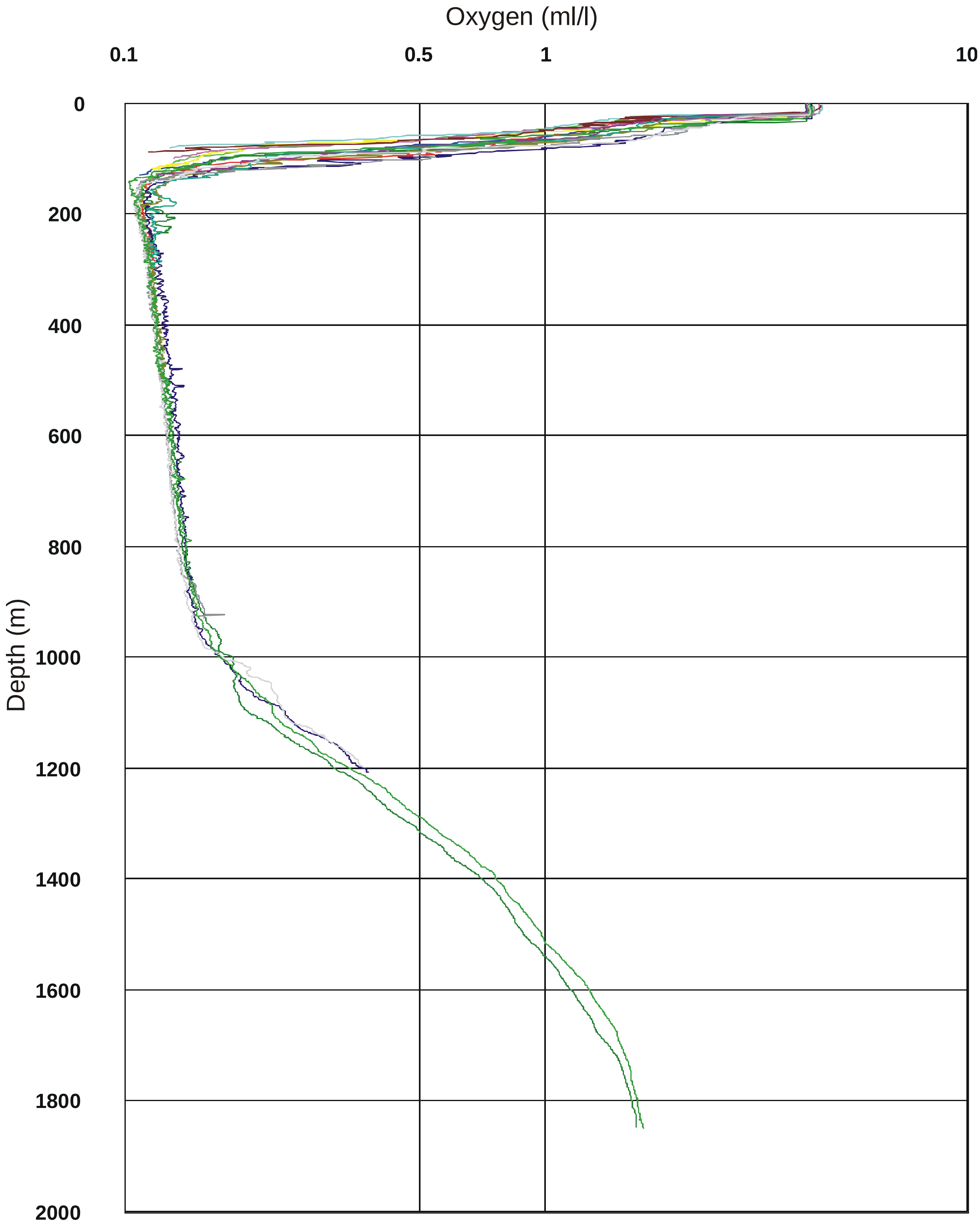
Janne Kaariainen & Rachel Jeffreys

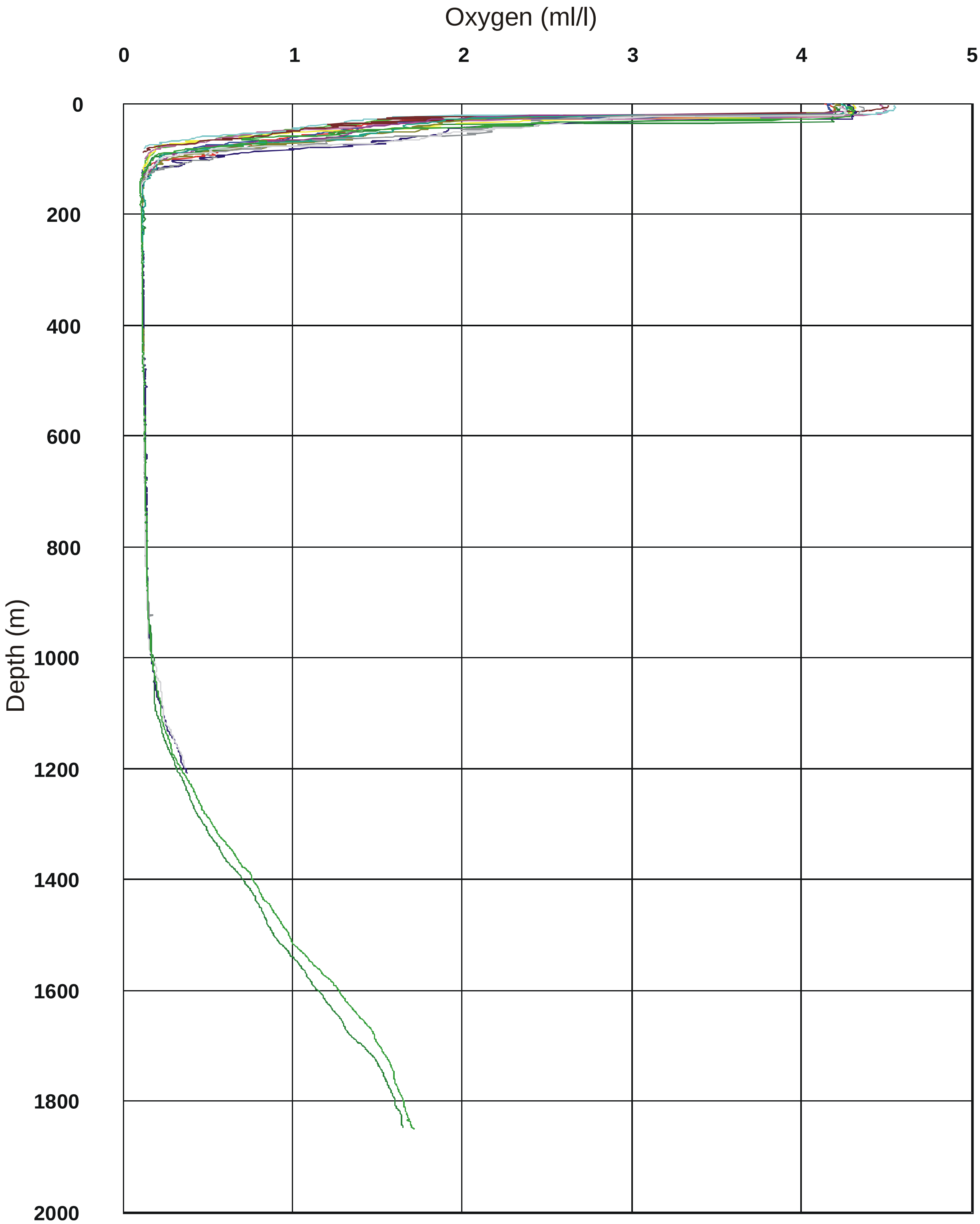
9.6. Oxygen titration results

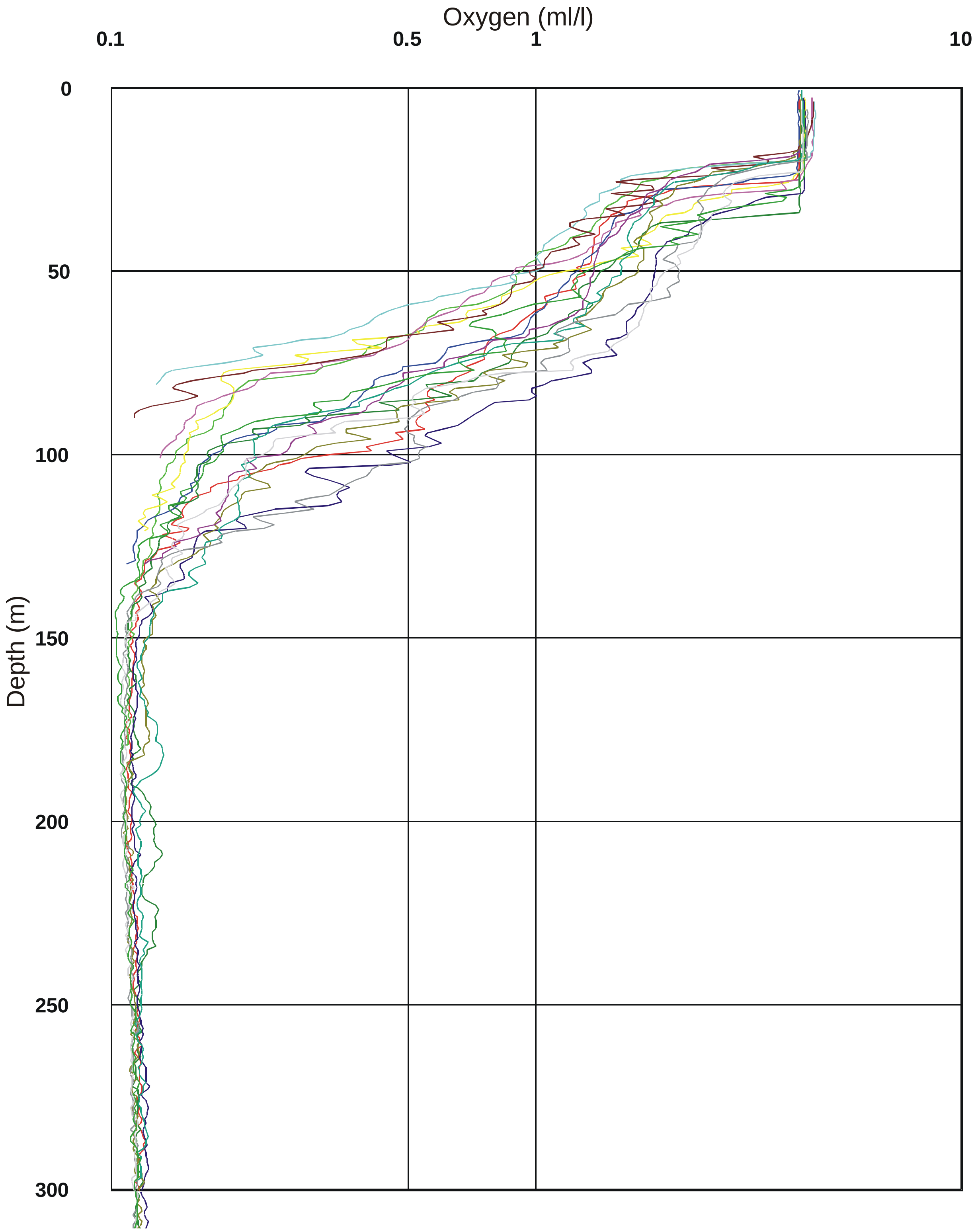


Martyn Harvey & Tim Brand

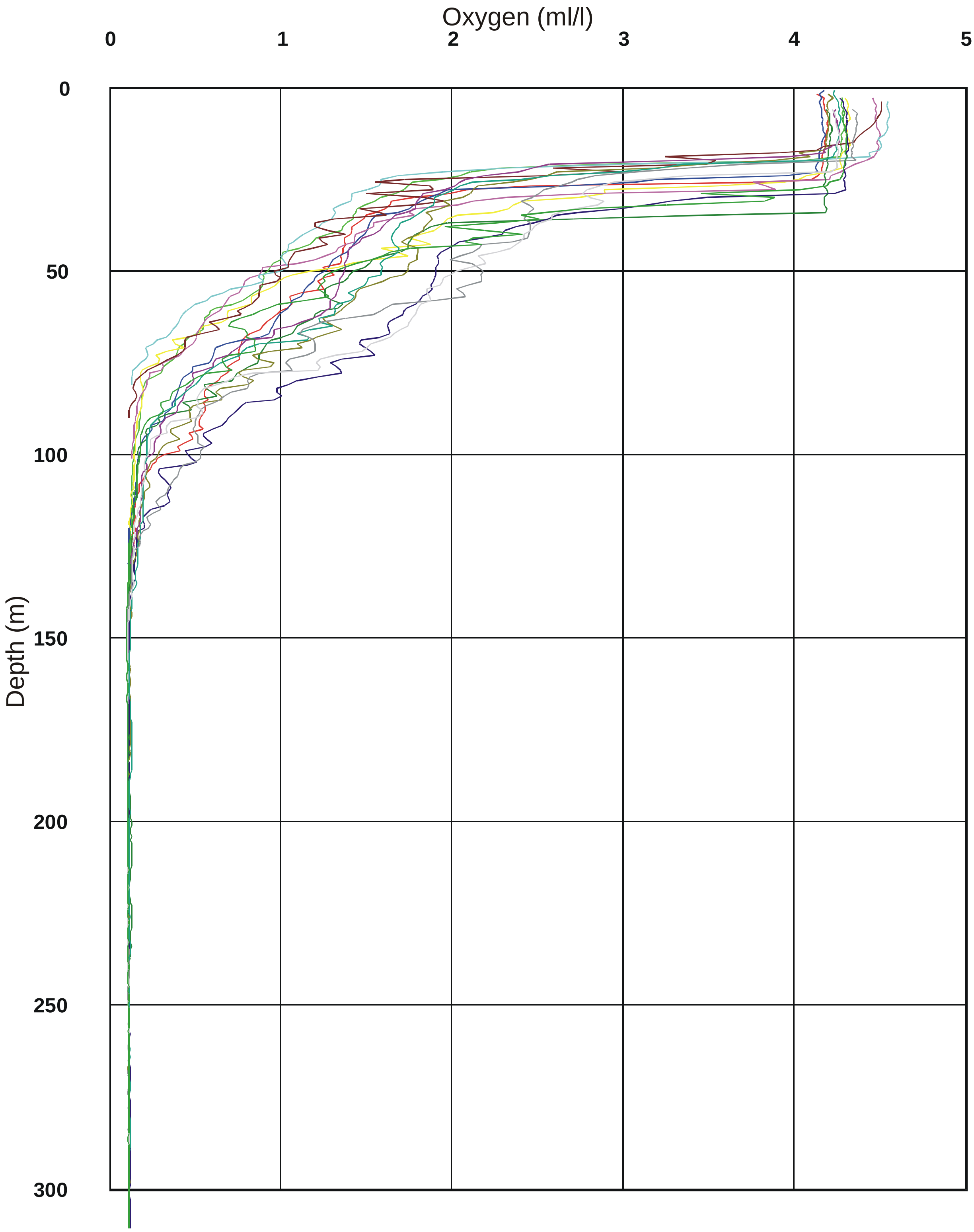
9.7. CTD oxygen profiles

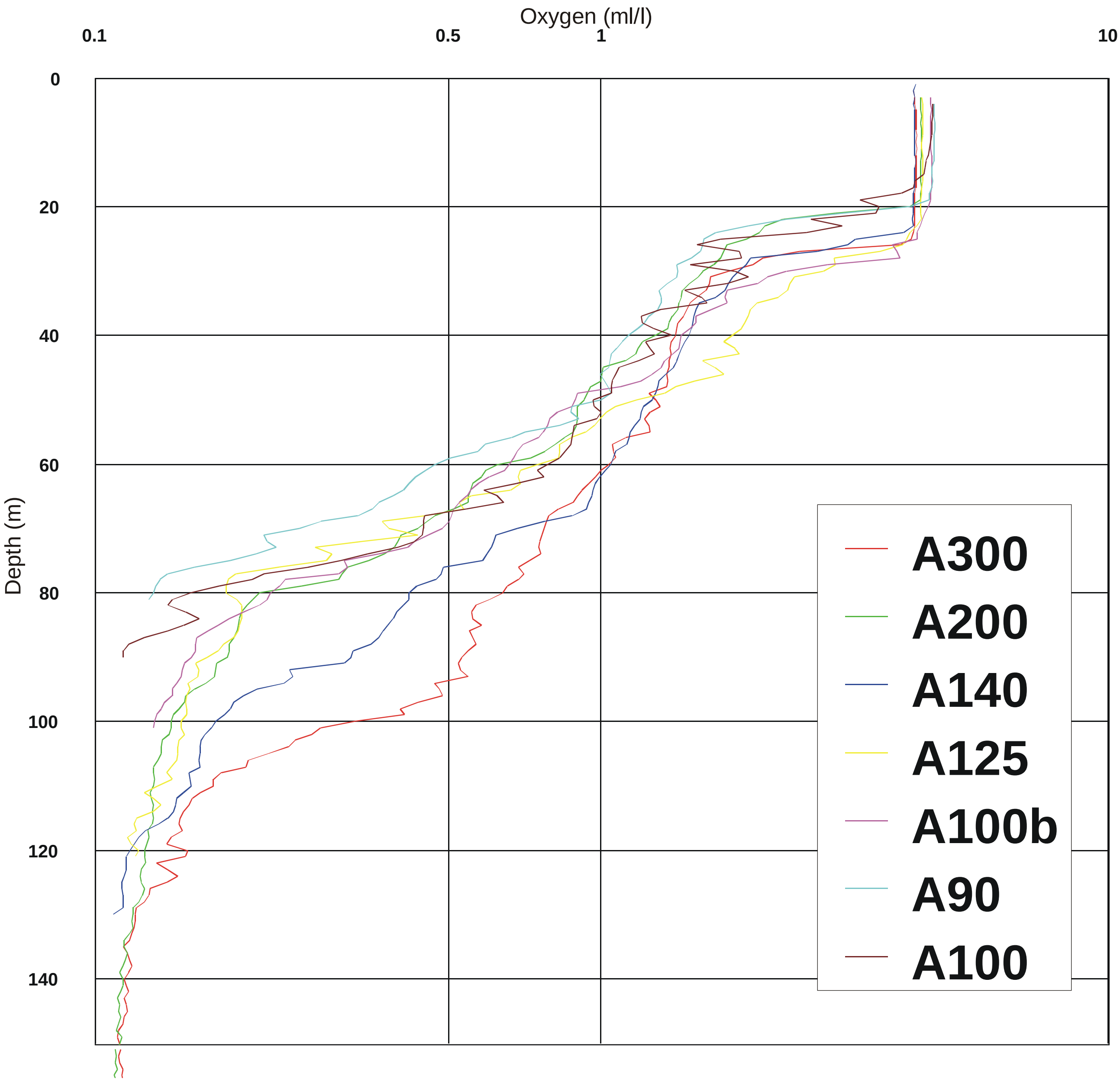



Oxygen (ml/l)
0
1
2
3
4
5
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Depth (m)



Oxygen (ml/l)
0.1
0.5
1
10
Depth (m)
0
50
100
150
200
250
300

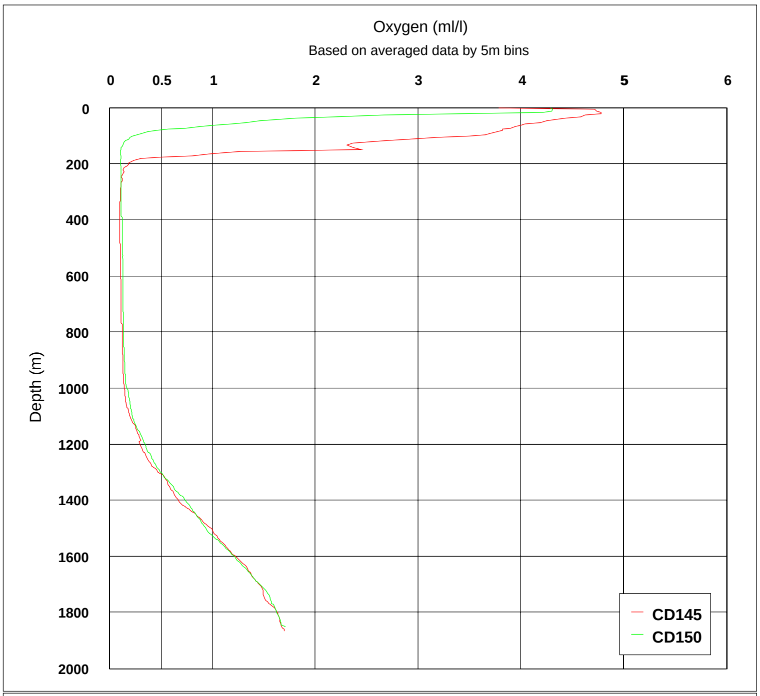

Oxygen (ml/l)
0
1
2
3
4
5
0
50
100
150
200
250
300
Depth (m)

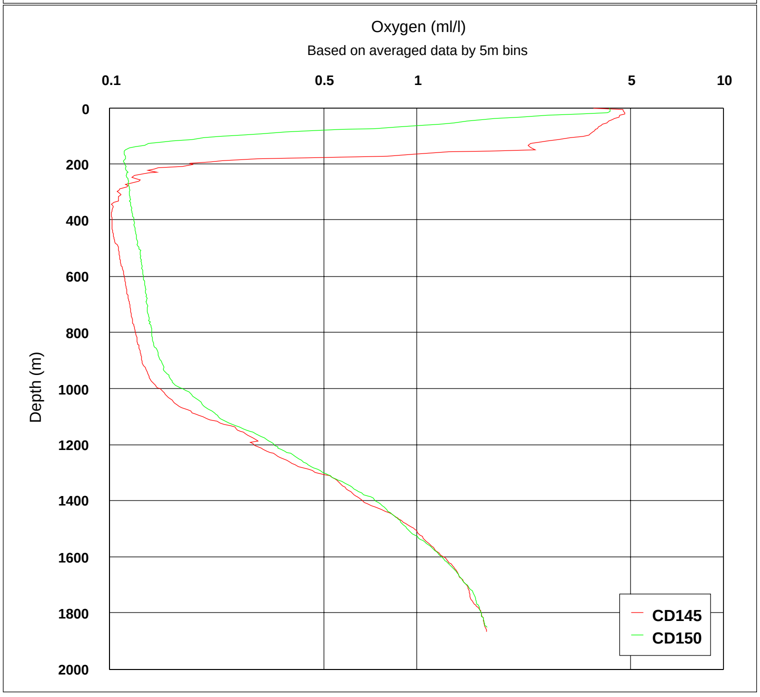

Oxygen (ml/l)
0.1
0.5
1
10
0
20
40
60
80
100
120
140
Depth (m)
A300
A200
A140
A125
A100b
A90
A100

Brian Bett

9.8. Variation in the OMZ CD145-CD150

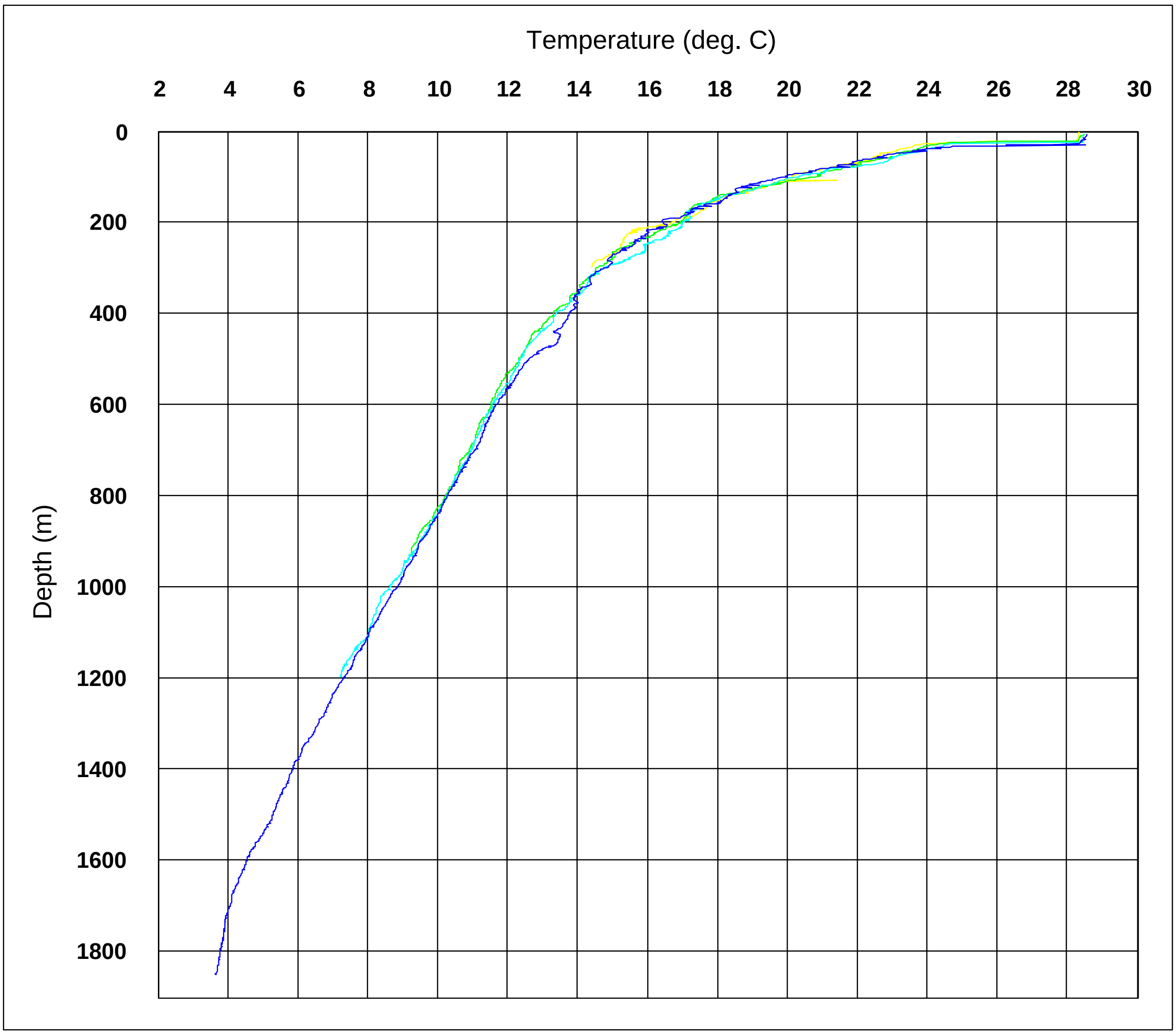
One of the most notable features of CTD profiles during CD150 has been the obvious shallowing of the upper boundary of the OMZ by comparison to the situation observed during CD145. Minimum oxygen values encountered during CD145 were around 400m, but during the present cruise were in the 150-200m range. If a value of 0.5 ml/l is used as a boundary, then it has shallowed from c. 180m (CD145) to c. 80m (CD150). There also appears to be some elevation of the lower boundary of the OMZ, although this is less marked and best seen on a logarithmic plot of oxygen with depth.





Brian Bett

9.9. CTD profile temperatures



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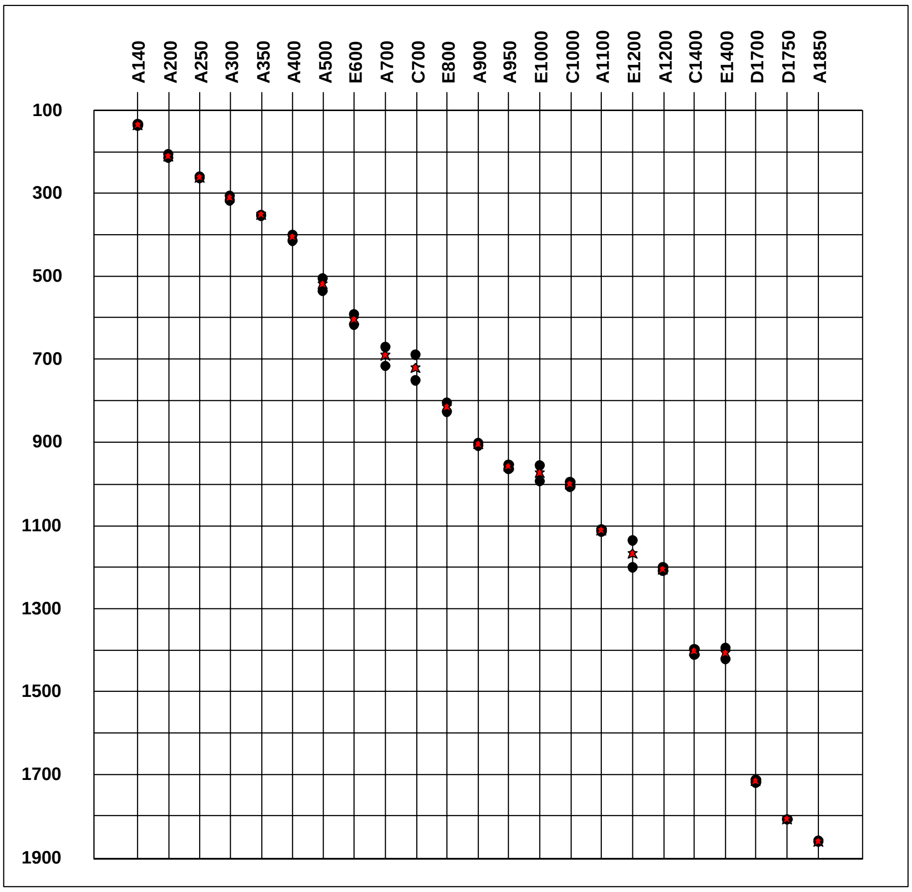
9.10. WASP observations



Graphic summary of CD150 WASP deployments by depth

A comprehensive set of WASP deployments were undertaken giving good coverage of the depth span of the oxygen minimum. The video footage was not fully reviewed onboard (and VHS copies have been left aboard for CD151 participants to examine), only a few features will be noted here.

- No obvious differences between CD145 and CD150 were noted.
- Invertebrate megabenthos are largely absent from the heart of the OMZ.
- However, fish may be abundant in the OMZ (see e.g. site A300).
- Megabenthos appears to be is more abundant in the channel studied than at corresponding depths on the open slope (contrast C1000-E1000; A1200-E1200; C1400-E1400).
- Bacterial mats were again noted at site A300 (note: back of the envelope calculations suggest a probability of coring a mat in this are as c. 1:150).
- Bacterial mats were also noted at site E600, the seabed here is very similar to that of A500 (symmetric low amplitude mud waves).
- Site E600 is also notable for unusual organic debris (?), accumulations of globular / spherical objects are seen in the wave troughs, they are readily resuspended and drift / roll along the wave troughs.

Brian Bett

10. SAMPLE AND DATA CATALOGUE

10.1. Biochemistry samples

Core samples

Affiliation of samples: Pigments = Edinburgh, Lipids = Liverpool, ^{234}Th = SAMS, CBIO = ED, LIV and SOC but will be stored in the UK initially at SOC.

Site	Station #	Core	Horizon (cm)	Gear	Type of Analysis	Preservation State
A1850	56001#04	III	28	Mega08	Lipids	Frozen
A1850	56005#02	XII	30	Mega08	Lipids and pigments	Frozen
A1850	56005#03	VI	10	Mega08	CBIO	Frozen
A1850	56005#04	?	30	Mega08	Lipids and pigments	Frozen
A1200	56007#02	I	30	Mega08	Lipids	Frozen
A1200	56007#03	III	32	Mega08	Lipids and pigments	Frozen
A1200	56007#04	IX	10	Mega08	CBIO	Frozen
A1200	56007#04	I	30	Mega08	Lipids and pigments	Frozen
A950	56012#02	VI	10	Mega08	CBIO	Frozen
A950	56012#03	IX	25	Mega08	Lipids and pigments	Frozen
A950	56015#02	II	30	Mega08	Lipids	Frozen
A950	56015#03	II	30	Mega08	Lipids and pigments	Frozen
A300	56021#01	VII	10	Mega08	CBIO	Frozen
A300	56025#05	III	30	Mega10	Lipids	Frozen
A300	56025#04	I	30	Mega10	Lipids and pigments	Frozen
A300	56025#06	II	30	Mega10	Lipids and pigments	Frozen
A140	56016#03	IV	10	Mega08	CBIO	Frozen
A140	56016#03	XII	30	Mega08	Lipids	Frozen
A140	56031#03	VI	30	Mega10	Lipids and pigments	Frozen
A140	56033#04	X	30	Mega09	Lipids and pigments	Frozen
A1200	56044#02	III, VIII & XII	5	Mega10	Lipids	Frozen
A1200	56062#02	III	Surface	Mega10	Lipids & 234Th	Frozen & fridge
A1200	56062#03	IX	3	Mega10	Lipids & 234Th	Frozen & fridge
A1200	56062#03	III, IV & X	5	Mega10	Pigments	Frozen

Water samples

CTD Samples						
Site	Station #	Depth (m)	Volume (ml)	Analysis	Preservation	Affiliation
A1850	56001#01	5	850	Lipids (PLFA)	Frozen	LIV
		30	950	Lipids (PLFA)	Frozen	LIV
		60	900	Lipids (PLFA)	Frozen	LIV
		100	850	Lipids (PLFA)	Frozen	LIV
		300	1000	Lipids (PLFA)	Frozen	LIV
		500	900	Lipids (PLFA)	Frozen	LIV
		700	875	Lipids (PLFA)	Frozen	LIV
		1000	1000	Lipids (PLFA)	Frozen	LIV
		1200	875	Lipids (PLFA)	Frozen	LIV
		1500	900	Lipids (PLFA)	Frozen	LIV
		1800	1000	Lipids (PLFA)	Frozen	LIV
		1849	750	Lipids (PLFA)	Frozen	LIV

A1200	56011#02	5	1000	Lipids (PLFA)	Frozen	LIV
		30	900	Lipids (PLFA)	Frozen	LIV
		50	1000	Lipids (PLFA)	Frozen	LIV
		100	950	Lipids (PLFA)	Frozen	LIV
		200	1000	Lipids (PLFA)	Frozen	LIV
		300	900	Lipids (PLFA)	Frozen	LIV
		400	1000	Lipids (PLFA)	Frozen	LIV
		500	900	Lipids (PLFA)	Frozen	LIV
		700	1000	Lipids (PLFA)	Frozen	LIV
		1000	900	Lipids (PLFA)	Frozen	LIV
		1150	1000	Lipids (PLFA)	Frozen	LIV
		1196	900	Lipids (PLFA)	Frozen	LIV
A950	56020#01	5	1000	Lipids (PLFA)	Frozen	LIV
		25	1000	Lipids (PLFA)	Frozen	LIV
		50	1000	Lipids (PLFA)	Frozen	LIV
		100	1000	Lipids (PLFA)	Frozen	LIV
		200	1000	Lipids (PLFA)	Frozen	LIV
		250	1000	Lipids (PLFA)	Frozen	LIV
		300	1000	Lipids (PLFA)	Frozen	LIV
		400	1000	Lipids (PLFA)	Frozen	LIV
		500	1000	Lipids (PLFA)	Frozen	LIV
		700	1000	Lipids (PLFA)	Frozen	LIV
		900	1000	Lipids (PLFA)	Frozen	LIV
		928	1000	Lipids (PLFA)	Frozen	LIV
A300	56028#01	5	1000	Lipids (PLFA)	Frozen	LIV
		27	1000	Lipids (PLFA)	Frozen	LIV
		50	1000	Lipids (PLFA)	Frozen	LIV
		100	800	Lipids (PLFA)	Frozen	LIV
		200	975	Lipids (PLFA)	Frozen	LIV
		225	1000	Lipids (PLFA)	Frozen	LIV
		250	1000	Lipids (PLFA)	Frozen	LIV
		275	1000	Lipids (PLFA)	Frozen	LIV
		290	1000	Lipids (PLFA)	Frozen	LIV
		295	1000	Lipids (PLFA)	Frozen	LIV
		297	1000	Lipids (PLFA)	Frozen	LIV
A140	56036#01	5	1000	Lipids (PLFA)	Frozen	LIV
		23	1000	Lipids (PLFA)	Frozen	LIV
		50	975	Lipids (PLFA)	Frozen	LIV
		75	1000	Lipids (PLFA)	Frozen	LIV
		100	1000	Lipids (PLFA)	Frozen	LIV
		110	1000	Lipids (PLFA)	Frozen	LIV
		120	1000	Lipids (PLFA)	Frozen	LIV
		125	1000	Lipids (PLFA)	Frozen	LIV
		129	1000	Lipids (PLFA)	Frozen	LIV
BBLS samples						
A1850	56005#01	2 mab	300	Lipids (PLFA)	Frozen	LIV
		2.5 mab	350	Lipids (PLFA)	Frozen	LIV

Trawl samples

Site	Station	Taxon	No. of	Type of Sample	Analysis	Preservation	Affiliation
C1200	56014#01	*Actinoscyphia* sp.	15	Whole organism	Lips & SIA	Frozen	LIV
		Actinauge sp.	15	Whole organism	Lips & SIA	Frozen	LIV
		Pennatulids	4	Whole organism	Lips & SIA	Frozen	LIV
		Munida scrobina	4	Whole organism	Lips & SIA	Frozen	LIV
		Cirripedia	5	Whole organism	Lips & SIA	Frozen	LIV
		Elasmobranch	3	Tissue piece	Lips & SIA	Frozen	LIV
		Aleapocaephalids	2	Tissue piece	Lips & SIA	Frozen	LIV
		Macruirids	5	Tissue piece	Lips & SIA	Frozen	LIV
		Notocanth	1	Tissue piece	Lips & SIA	Frozen	LIV
D1820	56019#01	*Munida scrobina*	5	Whole organism	Lips & SIA	Frozen	LIV
		Benthodytes sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Glyphocrangon sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Aleapocaephalids	1	Tissue piece	Lips & SIA	Frozen	LIV
		Macruirid	1	Tissue piece	Lips & SIA	Frozen	LIV
		Polycheles sp.	1	Whole organism	Lips & SIA	Frozen	LIV
		Brisingiid sp.	1	Tissue piece	Lips & SIA	Frozen	LIV
		Benthothuria sp.	1	Tissue piece	Lips & SIA	Frozen	LIV
C1000	56024#01	Notocanth	5	Tissue piece	Lipds & SIA	Frozen	LIV
		Gastropod	5	Whole organism	Lipds & SIA	Frozen	LIV
		Eel	4	Tissue piece	Lipds & SIA	Frozen	LIV
		Elasmobranch	5	Tissue piece	Lipds & SIA	Frozen	LIV
		Octopoda	5	Tissue piece	Lipds & SIA	Frozen	LIV
		Encephaloides armstrongi	5	Whole organism	Lipds & SIA	Frozen	LIV
		Jelly Ball/gromiid	3	Whole organism	Lipds & SIA	Frozen	LIV
		Pentagonal ophiuroid	5	Whole organism	Lipds & SIA	Frozen	LIV
		Round ophiuroid	5	Whole organism	Lipds & SIA	Frozen	LIV
		Sorberaceans	5	Whole organism	Lipds & SIA	Frozen	LIV
		Munida scrobina	2	Whole organism	Lipds & SIA	Frozen	LIV
		Porifera	5	Whole organism	Lipds & SIA	Frozen	LIV
		Pennatulids	5	Whole organism	Lipds & SIA	Frozen	LIV
		Molpadia sp.	5	Whole organism	Lipds & SIA	Frozen	LIV
C1400	56027#01	*Echinothuriiae* sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Actinoscyphia sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Actinouge sp.	1	Body wall	Lips & SIA	Frozen	LIV
		Benthodytes sp.	2	Body wall	Lips & SIA	Frozen	LIV
		Holothurian sp.	3	Body wall	Lips & SIA	Frozen	LIV
		Hyalinoecia sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Polycheles sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Bivalve	5	Whole organism	Lips & SIA	Frozen	LIV
		Scallop	3	Whole organism	Lips & SIA	Frozen	LIV
		Notocanth	5	Tissue piece	Lips & SIA	Frozen	LIV
		Tripod	1	Tissue piece	Lips & SIA	Frozen	LIV
		Eel	2	Tissue piece	Lips & SIA	Frozen	LIV
		Macruirid	1	Tissue piece	Lips & SIA	Frozen	LIV
		Aleapocaephalids	1	Tissue piece	Lips & SIA	Frozen	LIV

A140	56047#01	Scleractinians	4	Whole organism	Lips & SIA	Frozen	LIV
		Gastropod sp.A	1	Whole organism	Lips & SIA	Frozen	LIV
		Gastropod sp.B	5	Whole organism	Lips & SIA	Frozen	LIV
		Gastropod sp.C	5	Whole organism	Lips & SIA	Frozen	LIV
		Astropectenids	2	Whole organism	Lips & SIA	Frozen	LIV
		Epibenthic prawns	4	Whole organism	Lips & SIA	Frozen	LIV
A300	56048#01	Prawns	5	Whole organism	Lips & SIA	Frozen	LIV
		Fish sp.A	5	Whole organism	Lips & SIA	Frozen	LIV
		Fish sp.B	5	Whole organism	Lips & SIA	Frozen	LIV
		Fish sp.C	5	Whole organism	Lips & SIA	Frozen	LIV
D1750	56052#01	*Benthodytes* sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Munida scrobina	5	Whole organism	Lips & SIA	Frozen	LIV
		Glyphocrangon sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Polycheles sp.	3	Whole organism	Lips & SIA	Frozen	LIV
		Prawns	3	Whole organism	Lips & SIA	Frozen	LIV
		Thalassina sp.	3	Whole organism	Lips & SIA	Frozen	LIV
		Asteroid	2	Tissue piece	Lips & SIA	Frozen	LIV
		Brisingiid sp.	1	Tissue piece	Lips & SIA	Frozen	LIV
		Round ophiuroid	3	Whole organism	Lips & SIA	Frozen	LIV
		Bivalve	1	Whole organism	Lips & SIA	Frozen	LIV
		Gastropods	4	Whole organism	Lips & SIA	Frozen	LIV
		Macruirid	3	Whole organism	Lips & SIA	Frozen	LIV
		Aleapocaephalids	1	Tissue piece	Lips & SIA	Frozen	LIV
		Eel	1	Tissue piece	Lips & SIA	Frozen	LIV
		Synaphobranchid eel	1	Tissue piece	Lips & SIA	Frozen	LIV
C1550	56056#01	*Benthothuria cristatus*	2	Tissue piece	Lips & SIA	Frozen	LIV
		Molpadia sp.	3	Tissue piece and guts	Lips, SIA, 234Th, pigments	Frozen	LIV & SAMS
		Round ophiuroid	3	Whole organism	Lips & SIA	Frozen	LIV
		Purple ophiuroid	3	Whole organism	Lips & SIA	Frozen	LIV
		Munida scrobina	5	Whole organism	Lips & SIA	Frozen	LIV
		Glyphocrangon sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Thalassina sp.	1	Whole organism	Lips & SIA	Frozen	LIV
		Golfingia sp.*?*	1	Tissue piece and guts	Lips, SIA, 234Th, pigments	Frozen	LIV & SAMS
		Botrulid	1	Tissue piece	Lips & SIA	Frozen	LIV
		Fish species D	3	Tissue piece and whole organism	Lips & SIA	Frozen	LIV
C1500	56060#01	*Polycheles* sp.	1	Whole organism	Lips & SIA	Frozen	LIV
		Munida scrobina	5	Whole organism	Lips & SIA	Frozen	LIV
		Glyphocrangon sp.	3	Whole organism	Lips & SIA	Frozen	LIV
		Molpadia sp.	5	Whole organism and guts	Lips, SIA, 234Th, pigments	Frozen	LIV & SAMS
		Sipunculids	2	Whole organism and guts	Lips, SIA, 234Th, pigments	Frozen	LIV & SAMS
		Round ophiuroids	2	Whole organism	Lips & SIA	Frozen	LIV

		Actinoscyphia sp.	1	Whole organism	Lips & SIA	Frozen	LIV
		Bivalve	1	Whole organism	Lips & SIA	Frozen	LIV
		Macruirids	3	Tissue piece	Lips & SIA	Frozen	LIV
		Tripods	2	Tissue piece	Lips & SIA	Frozen	LIV
		Notocanths	2	Tissue piece	Lips & SIA	Frozen	LIV
D1700	56064#02	Bivalves	3	Whole organism	Lips & SIA	Frozen	LIV
		Scaphopods	4	Whole organism	Lips & SIA	Frozen	LIV
		Purple ophiuroids	5	Whole organism	Lips & SIA	Frozen	LIV
		Molpadia sp.	5	Whole organism and guts	Lips, SIA, 234Th, pigments	Frozen	LIV & SAMS
		Benthothuria cristatus	1	Tissue piece	Lips & SIA	Frozen	LIV
		Arenicola sp.	4	Whole organism and guts	Lips, SIA, 234Th, pigments	Frozen	LIV & SAMS
		Munida scrobina	5	Whole organism	Lips & SIA	Frozen	LIV
		Glyphocrangon sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Polycheles sp.	3	Whole organism	Lips & SIA	Frozen	LIV
		Thalassina sp.	5	Whole organism	Lips & SIA	Frozen	LIV
		Notocanth	1	Tissue piece	Lips & SIA	Frozen	LIV
		Eel	1	Tissue piece	Lips & SIA	Frozen	LIV
		Fish species B	1	Tissue piece	Lips & SIA	Frozen	LIV
		Fish species D	4	Whole organism	Lips & SIA	Frozen	LIV
A140	56075#01	Prawns	5	Whole organism	Lips & SIA	Frozen	LIV
		Scleratinian	6	Whole organism	Lips & SIA	Frozen	LIV
		Gastropod sp. B	7	Whole organism	Lips & SIA	Frozen	LIV
		Gastropod sp. C	8	Whole organism	Lips & SIA	Frozen	LIV

Rachel Jeffreys

10.2. Geochemistry

The following tables indicate the station, positions, water depths and length of core obtain for the analyses described above. The pH results from each site are given in tables and graphs below.

Trace metal core processed for pore water

Station	Site	Core length	Depth processed	Comments
56033#3	A140	38cm	32cm (35cm)	
56025#3	A300	41cm	34cm (39cm)	Visible orange /Fe in top 3cm
56015#2	A950	36.5cm	32cm (32.5cm)	Distinct clay layer at 6cm depth
56007#2	A1200	39cm	34cm (36cm)	Worm tube to surface of core
56001#2	A1850	28cm	24cm (26cm; final compacted length)	No sample for sulphide at 4.25, 5.25, 6.25, 7.75 and 8.25 cm. Burrow at 12-13cm
56046#1	A700		15cm	Fe rich surface, clay banding, laminated, Core A
56046#1	A700		15cm	Fe rich surface, clay banding, laminated, Core B
56046#1	A700		15cm	Fe rich surface, clay banding, laminated, Core C
56053#2	A700		15cm	At 5cm depth the sediment was similar to surface sediment Core D
56053#3	A700		15cm	Core E

DOC core processed for pore water

Station	Site	Core length	Depth processed	Comments
56033#3	A140	47cm	38cm (44cm)	Shells from 26cm down
56025#5	A300	36cm	28cm (30.5)	
56015#3	A950	39cm	36cm (39cm)	Distinct clay layer at 6-7cm depth
56007#2	A1200	39.5	36cm (38cm)	All seds bagged and frozen at -70°C for Edin
56001#2	A1850	29cm	24cm (26cm; final compacted length)	All seds bagged and frozen at -70°C for Edin
56046#4	A700		15cm	Core A
56046#4	A700		15cm	Core B
56046#4	A700		15cm	Core C
56053#2	A700		15cm	Core D
56053#3	A700		15cm	Core E

DIC core processed for pore water

Station	Site	Core length	Depth processed	Comments
56033#3	A140	38cm	34cm (36.5)	Shell 7-8cm,22-24 worm tube??fluid black sed. From 28cm down shelly
56025#3	A300	43cm	40cm (41.5cm)	Small glass fiber like strands
56015#2	A950	40cm	38cm (39cm)	Distinct clay layer at 6-7cm depth
56007#2	A1200	42cm	32cm (39cm)	

56062#2	A1200	36cm	32cm (34cm)	
56001#2	A1850	32cm	28cm (30.5cm; final compacted length)	20-22cm worm hole?
56065#2	A1850	40cm	36cm (38cm)	
56046#2	A700		15cm	Core A
56046#2	A700		15cm	Core B
56046#2	A700		15cm	Core C
56053#2	A700		15cm	Core D
56053#3	A700		15cm	Core E

Radionuclide core

Station	Site	Core No.	Core length	Depth processed	Comments
56033#4	A140	IX	40cm	To end of core (38cm)	Shell at 12-13cm
56025#4	A300	III	42cm	To end of core (40cm)	Layer at 0.5mm
56053#2	A700	VI	40.5cm	To end of core	
56015#3	A950	IV	36.5cm	To end of core (34cm)	White 1 cm thick layer at 5.5-6.5 cm depth
56007#2	A1200		42cm	To end of core (40cm; final sample)	
56001#2	A1850		27cm	To end of core	

Solid phase core spare

Station	Site	Core No.	Core length	Depth processed	Comments
56033#4	A140	VIII	39cm	To end of core (38cm)	
56025#4	A300	VIII	41cm	To end of core (38cm)	
56053#2	A700	III	40.5cm	To end of core	
56015#3	A950	VIII	39cm	To end of core (37cm)	White 1 cm thick layer at 5.5-6.5 cm depth
56007#3	A1200		38cm	To end of core (36cm; final sample)	
56001#2	A1850			To end of core	

Pore water pH

Depth (cm)	A1850	A1200	A950	A300	A140	A1850rpt	A1200rpt
0.25	7.04	8.02	7.63	7.90	7.68	7.31	7.37
0.75	7.07	7.89	7.71	7.67	7.67	7.29	7.32
1.25	7.32	7.64	7.70	7.63	7.67	7.33	7.27
1.75	7.05	7.66	7.64	7.56	7.71	7.30	7.30
2.5	7.30	7.76	7.58	7.41	7.70	7.33	7.24
3.5	7.47	7.81	7.51	7.38	7.74	7.30	7.21
4.5	7.96	7.78	7.51	7.35	7.75	7.32	7.29
5.5	7.60	7.84	7.62	7.37	7.77	7.28	7.31
6.5	7.71	7.86	7.57	7.35	7.80	7.29	7.25
7.5		7.81	7.52	7.34	7.81	7.52	7.21
8.5	7.47	7.65	7.48	7.40	7.81	7.40	7.21

9.5	7.46	7.72	7.48	7.37	7.80	7.48	7.20
11	7.44	7.74	7.52	7.37	7.79	7.52	7.29
13	7.40	7.78	7.54	7.38	7.78	7.51	7.29
15	7.28	7.78	7.64	7.40	7.79	7.49	7.31
17	7.40	7.79	7.57	7.19	7.82	7.43	7.29
19	7.31	7.74	7.55	7.33	7.82	7.43	7.30
21	7.15	7.76	7.59	7.34	7.80	7.40	7.34
23	7.24	7.74	7.57	7.32	7.81	7.41	7.37
25	7.28	7.65	7.62	7.34	7.83	7.36	7.37
27		7.67	7.57	7.34	7.79	7.38	7.38
29		7.66	7.55	7.40	7.81	7.37	7.39
31			7.52	7.38	7.82	7.35	7.39
33			7.56	7.38	7.81	7.49	7.37
35			7.57	7.41		7.46	
37							
39							

Please note due to the breakage of the pH electrode during the cruise a different pH meter was used to measure A1200rpt and A1800rpt. There is an obvious offset which maybe related to temperature compensation. During CD151 a number of cores will be assessed using both setups to allow a correct pH to be calculated.

Pore water pH

Depth (cm)	A700A	A700B	A700C	A700D	A700E
0.25	7.70	7.38	7.40	7.45	7.53
0.75	7.72	7.40	7.40	7.41	7.46
1.25	7.52	7.34	7.26	7.34	7.36
1.75	7.45	7.28	7.13	7.30	7.20
2.5	7.45	7.22	7.13	7.26	7.20
3.5	7.44	7.22	7.12	7.24	7.15
4.5	7.46	7.19	7.12	7.21	7.15
5.5	7.47	7.18	7.11	7.14	7.10
6.5	7.45	7.18	7.11	7.14	7.12
7.5	7.48	7.17	7.10	7.13	7.13
8.5	7.45	7.20	7.11	7.14	7.12
9.5	7.44	7.18	7.17	7.13	7.11
11	7.45	7.18	7.14	7.13	7.09
13	7.44	7.19	7.16	7.10	7.12
15	7.43			7.07	7.13

Please note due to the breakage of the pH electrode during the cruise a different pH meter was used to measure A700 B, C, D and E. There is an obvious offset which maybe related to temperature compensation. During CD151 a number of cores will be counted using both setups to allow a correct pH to be calculated.

10.3. Macrobenthos samples

SAMS No.	Discovery No.	Gear	Nominal depth (m)	Notes
1050	56001#02	MGC	1850	IX@0.5,0.5,1,1,2,5,10 cm
1051	56001#03	MGC	1850	XII@0.5,0.5,1,1,2,5,10; IV@0.5,0.5,1,1,2
1052	56001#04	MGC	1850	VI@0.5,0.5,1,1,2,5; XII for fresh@1,1,1,1
1053	56005#02	MGC	1850	IV@0.5,0.5,1,1,2,5,10; VII, IX, VII, III, XI @ 10,10
1054	56005#03	MGC	1850	IV@0.5,0.5,1,1,2,5,10; I, X, XII, VII, IX @10,10
1055	56005#04	MGC	1850	X@0.5,0.5,1,1,2,5,10; I, IV, VII @10,10
1056	56007#02	MGC	1200	XII@0.5,0.5,1,1,2,5,10; IV for fresh @5,5,5
1057	56007#03	MGC	1200	I@0.5,0.5,1,1,2,5,10; XII@10,10,10; IX, IV@10,10
1058	56007#04	MGC	1200	X@0.5,0.5,1,1,2,5,10; III, VI, IV, VII@10,10
1059	56011#03	MGC	1200	VI@0.5,0.5,1,1,2,5,10; I, IV, X, XII@10,10
1060	56012#02	MGC	950	IV@0.5,0.5,1,1,2,5,10; VII, IX, X@10,10
1061	56012#03	MGC	950	VI@0.5,0.5,1,1,2,5,10; I, IV, X@10,10
1062	56015#01	MGC	950	VI@0.5,0.5,1,1,2,5,10; XII, VII, V, IX@10,10
1063	56015#02	MGC	950	III@0.5,0.5,1,1,2,5,10; I@5,5 for fresh
1064	56015#03	MGC	950	I@0.5,0.5,1,1,2,5,10
1065	56016#02	MGC	140	VII@0.5,0.5,1,1,2,5,10
1066	56016#03	MGC	140	I@0.5,0.5,1,1,2,5,10; VI, III, X, IX@10,10
1067	56016#05	MGC	140	VI@0.5,0.5,1,1,2,5,10; IV for fresh
1068	56021#01	MGC	300	VI@0.5,0.5,1,1,2,5,10; IX, X, XII, I@10,10
1069	56025#03	MGC	300	III@0.5,0.5,1,1,2,5,10
1070	56025#07	MGC	300	IV@0.5,0.5,1,1,2,5,10; VII, XII, X, IX@10,10;
1071	56031#02	MGC	140	XII@0.5,0.5,1,1,2,5,10; X, IX, VII, I @ 10,10
1072	56031#03	MGC	140	III@0.5,0.5,1,1,2,5,10; II, VII, IV, VIII @ 10,10
1073	56031#04	MGC	140	IV@0.5,0.5,1,1,2,5,10
1074	56040#01	MGC	300	VII@0.5,0.5,1,1,2,5,10; X, II, III, VI @ 10,10
1075	56040#02	MGC	300	IX@0.5,0.5,1,1,2,5,10
1076	56044#01	MGC	1200	XII@0.5,0.5,1,1,2,5,10; IV, VIII @ 10,10
1077	56044#02	MGC	1200	II@0.5,0.5,1,1,2,5,10
1078	56046#01	MGC	700	VIII@0.5,0.5,1,1,2,5,10
1079	56046#01	MGC	700	II@0.5,0.5,1,1,2,5,10
1080	56053#02	MGC	700	I@0.5,0.5,1,1,2,5,10

NOTE: from additional cores fauna was sorted to vials for either reference or analyses and are listed in a spreadsheet file “Vial freeze dried sample record.xls” that will be appended to the electronic version of this cruise report. Numerous photographs of the macrobenthos material were also taken, see the author for details.

Peter Lamont

10.4. Multiple core samples

Samples retained in 10% formalin for Kate Larkin (SOC). Note that samples from stn 56058#2 are subsamples from Megacores.

Station	Gear	Depth (ucm)	Sample	Container
56006#3	MC	949	meiofauna 0-0.5 cm	500 ml
56006#3	MC	949	meiofauna 0.5-1 cm	500 ml
56006#3	MC	949	meiofauna 1-2 cm	500 ml
56006#3	MC	949	meiofauna 2-3 cm	500 ml
56006#3	MC	949	meiofauna 3-4 cm	500 ml
56006#3	MC	949	meiofauna 4-5 cm	500 ml
56006#3	MC	949	meiofauna 5-6 cm	500 ml
56006#3	MC	949	meiofauna 6-7 cm	500 ml
56006#3	MC	949	meiofauna 7-8 cm	500 ml
56006#3	MC	949	meiofauna 8-9 cm	500 ml
56006#3	MC	949	meiofauna 9-10 cm	500 ml
56006#4	MC	955	meiofauna 0-0.5 cm	500 ml
56006#4	MC	955	meiofauna 0.5-1 cm	500 ml
56006#4	MC	955	meiofauna 1-2 cm	500 ml
56006#4	MC	955	meiofauna 2-3 cm	500 ml
56006#4	MC	955	meiofauna 3-4 cm	500 ml
56006#4	MC	955	meiofauna 4-5 cm	500 ml
56006#4	MC	955	meiofauna 5-6 cm	500 ml
56006#4	MC	955	meiofauna 6-7 cm	500 ml
56006#4	MC	955	meiofauna 7-8 cm	500 ml
56006#4	MC	955	meiofauna 8-9 cm	500 ml
56006#4	MC	955	meiofauna 9-10 cm	500 ml
56011#1	MC	1193	meiofauna 0-0.5 cm	500 ml
56011#1	MC	1193	meiofauna 0.5-1 cm	500 ml
56011#1	MC	1193	meiofauna 1-2 cm	500 ml
56011#1	MC	1193	meiofauna 2-3 cm	500 ml
56011#1	MC	1193	meiofauna 3-4 cm	500 ml
56011#1	MC	1193	meiofauna 4-5 cm	500 ml
56011#1	MC	1193	meiofauna 5-6 cm	500 ml
56011#1	MC	1193	meiofauna 6-7 cm	500 ml
56011#1	MC	1193	meiofauna 7-8 cm	500 ml
56011#1	MC	1193	meiofauna 8-9 cm	500 ml
56011#1	MC	1193	meiofauna 9-10 cm	500 ml
56033#1	MC	134	meiofauna 0-0.5 cm	500 ml
56033#1	MC	134	meiofauna 0.5-1 cm	500 ml
56033#1	MC	134	meiofauna 1-2 cm	500 ml
56033#1	MC	134	meiofauna 2-3 cm	500 ml
56033#1	MC	134	meiofauna 3-4 cm	500 ml
56033#1	MC	134	meiofauna 4-5 cm	500 ml
56033#1	MC	134	meiofauna 5-6 cm	500 ml
56033#1	MC	134	meiofauna 6-7 cm	500 ml
56033#1	MC	134	meiofauna 7-8 cm	500 ml
56033#1	MC	134	meiofauna 8-9 cm	500 ml
56033#1	MC	134	meiofauna 9-10 cm	500 ml
56036#4	MC	137	meiofauna 0-0.5 cm	500 ml

56036#4	MC	137	meiofauna 0.5-1 cm	500 ml
56036#4	MC	137	meiofauna 1-2 cm	500 ml
56036#4	MC	137	meiofauna 2-3 cm	500 ml
56036#4	MC	137	meiofauna 3-4 cm	500 ml
56036#4	MC	137	meiofauna 4-5 cm	500 ml
56036#4	MC	137	meiofauna 5-6 cm	500 ml
56036#4	MC	137	meiofauna 6-7 cm	500 ml
56036#4	MC	137	meiofauna 7-8 cm	500 ml
56036#4	MC	137	meiofauna 8-9 cm	500 ml
56036#4	MC	137	meiofauna 9-10 cm	500 ml
56037#1	MC	301	meiofauna 0-0.5 cm	500 ml
56037#1	MC	301	meiofauna 0.5-1 cm	500 ml
56037#1	MC	301	meiofauna 1-2 cm	500 ml
56037#1	MC	301	meiofauna 2-3 cm	500 ml
56037#1	MC	301	meiofauna 3-4 cm	500 ml
56037#1	MC	301	meiofauna 4-5 cm	500 ml
56037#1	MC	301	meiofauna 5-6 cm	500 ml
56037#1	MC	301	meiofauna 6-7 cm	500 ml
56037#1	MC	301	meiofauna 7-8 cm	500 ml
56037#1	MC	301	meiofauna 8-9 cm	500 ml
56037#1	MC	301	meiofauna 9-10 cm	500 ml
56058#2	Mgc-MC	716	meiofauna 0-0.5 cm	300ml
56058#2	Mgc-MC	716	meiofauna 0.5-1 cm	300ml
56058#2	Mgc-MC	716	meiofauna 1-2 cm	500ml plastic jar
56058#2	Mgc-MC	716	meiofauna 2-3 cm	500ml plastic jar
56058#2	Mgc-MC	716	meiofauna 3-4 cm	500ml plastic jar
56058#2	Mgc-MC	716	meiofauna 4-5 cm	500ml plastic jar
56058#2	Mgc-MC	716	meiofauna 5-6 cm	500ml plastic jar
56058#2	Mgc-MC	716	meiofauna 6-7 cm	500ml plastic jar
56058#2	Mgc-MC	716	meiofauna 7-8 cm	500ml plastic jar
56058#2	Mgc-MC	716	meiofauna 8-9 cm	500ml
56058#2	Mgc-MC	716	meiofauna 9-10 cm	300ml

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10.5. National Institute of Oceanography, Pakistan

Megacore samples
(Meiofauna – intervals 0.0.5,0.5-1.0,1.0-2.0 cm)
A140 56016#3/ I, VII; 56031#2,XII
A300 56021#1,VI; 56025#7, IV; 56040#1,VII
A950 56012#2,IV; #3,VI; 56015#1,VI
A1200 56007#2,XII; #3,I; #4,X
A1850 56001#3,XII; 56005#3,IV, #4,VIII

Multicore samples / subcores from Megacores
(Meiofauna -intervals 0.0.5,0.5-1.0,1.0-2.0 cm)
A140 56033#1, 56071#1(2 core/drop)
A300 56036#4, 56037#1 (2 cores/drop)
A950 56059#1, 56066#1 (2 cores/drop)
A1200 56062#2, #3 (2 cores/drop)
A1850 56063#1, 56065#2 (2 cores/drop)
A700 56058#2 #3 (2 cores/drop)

Fish samples from Agassiz trawls
D1820 56004#1: 5 myctophids 5 other midwater fish
D1820 56019#1: 5 myctophids, 2 other midwater fish
C1550 56039#1: 4 myctophids and 4 other (not very good condition)
D1750 56049#1: 2 midwater fish
D1700 56064#2: 3 midwater, 4 other fish un-id. midwater species

All of the above frozen at –70 °C

Other material retained
One small rat-tail and 4 other fish (C1500; stn 56060#1) unwashed and water sample (250 ml) from 1854 m rossette bottle sampler (A1850; 56065#1), and preserved at 4 °C fridge only.

Samina Kidwai

10.6. Sulphate reduction

Inc. time = 24h. Activity per syringe on 1/9/03 = 29.942 kBq.

Date 03	Site	Station	Core #	Core type	Depth (cm)	Syringe # + vial #	Jar #	Inj start time	Inj end time	Inc start time date	Inc end time date	Inc temp (°C)	Type	Dilution #
24/08	A1850	56001#2	I	Mega	0-1	501	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	1-2	502	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	2-3	503	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	3-4	504	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	4-5	505	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	5-6	506	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	6-7	507	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	7-8	508	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	8-9	509	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	9-10	510	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	10-11	511	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	11-12	512	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	12-13	513	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	13-14	514	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	14-15	515	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	15-16	516	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	16-17	517	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	17-18	518	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	18-19	519	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	19-20	520	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	20-21	521	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	21-22	522	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	22-23	523	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	23-24	524	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	24-25	525	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	25-26	526	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#2	I	Mega	26-27	527	1	0912	0924	0918 24/8	0918 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	0-1	528	2	0928	0944	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	1-2	529	2	1312	1332	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	2-3	530	2	1312	1332	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	3-4	531	2	1312	1332	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	4-5	532	2	1312	1332	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	5-6	533	2	1312	1332	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	6-7	534	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	7-8	535	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	8-9	536	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	9-10	537	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	10-11	538	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	11-12	539	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	12-13	540	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	13-14	541	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	14-15	542	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	15-16	543	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	16-17	544	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	17-18	545	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	18-19	546	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	19-20	547	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	20-21	548	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	21-22	549	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	22-23	550	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A

24/08	A1850	56001#4	I	Mega	23-24	551	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	24-25	552	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	25-26	553	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	26-27	554	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	27-28	555	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	28-29	556	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	29-30	557	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	30-31	558	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	31-32	559	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	32-33	560	2	1344	1400	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	33-34	561	2	1408	1416	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	I	Mega	34-35	562	2	1408	1416	0936 24/8	0936 25/8	4	Sample	103/2A
24/08	A1850	56001#4	X	Mega	0-1	563	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	2-3	564	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	4-5	565	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	6-7	566	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	8-9	567	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	10-11	568	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	12-13	569	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	14-15	570	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	16-17	571	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	18-19	572	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	20-21	573	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	22-23	574	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	24-25	575	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	26-27	576	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	28-29	577	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	30-31	578	3	-	-	-	-	-	Blank	103/2A
24/08	A1850	56001#4	X	Mega	32-33	579	3	-	-	-	-	-	Blank	103/2A
26/08	A1200	56007#2	VI	Mega	0-1	580	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	1-2	581	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	2-3	582	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	3-4	583	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	4-5	584	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	5-6	585	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	6-7	586	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	7-8	587	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	8-9	588	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	9-10	589	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	10-11	590	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	11-12	591	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	12-13	592	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	13-14	593	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	14-15	594	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	15-16	595	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	16-17	596	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	17-18	597	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	18-19	598	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	19-20	599	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	20-21	600	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	21-22	601	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	22-23	602	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	23-24	603	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	24-25	604	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	25-26	605	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	26-27	606	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	27-28	607	1	0812	0830	0821 27/8	0821 28/8	7	Sample	103/2B

26/08	A1200	56007#2	VI	Mega	28-29	608	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	29-30	609	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	30-31	610	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	31-32	611	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	32-33	612	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	33-34	613	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	34-35	614	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	36-37	615	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	37-38	616	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	38-39	617	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	39-40	618	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#2	VI	Mega	40-41	619	1	0812	0830	0821	27/8	0821	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	0-1	620	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	1-2	621	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	2-3	622	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	3-4	623	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	4-5	624	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	5-6	625	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	6-7	626	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	7-8	627	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	8-9	628	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	9-10	629	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	10-11	630	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	11-12	631	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	12-13	632	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	13-14	633	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	14-15	634	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	15-16	635	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	16-17	636	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	17-18	637	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	18-19	638	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	19-20	639	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	20-21	640	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	21-22	641	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	22-23	642	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	23-24	643	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	24-25	644	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	25-26	645	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	26-27	646	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	27-28	647	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	28-29	648	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	29-30	649	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	30-31	650	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	31-32	651	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	32-33	652	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	33-34	653	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	34-35	654	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	36-37	655	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
26/08	A1200	56007#3	VI	Mega	37-38	656	2	0834	0853	0844	27/8	0844	28/8	7	Sample	103/2B
28/08	A950	56015#2	XI	Mega	0-1	655	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	1-2	656	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	2-3	659	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	3-4	660	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	4-5	661	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	5-6	662	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	6-7	663	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	7-8	664	1	0818	0833	0826	29/8	0826	30/8	9	Sample	103/2C

28/08	A950	56015#2	XI	Mega	8-9	665	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	9-10	666	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	10-11	667	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	11-12	668	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	12-13	669	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	13-14	670	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	14-15	671	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	15-16	672	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	16-17	673	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	17-18	674	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	18-19	675	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	19-20	676	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	20-21	677	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	21-22	678	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	22-23	679	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	23-24	680	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	24-25	681	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	25-26	682	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	26-27	683	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	27-28	684	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	28-29	685	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	29-30	686	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	30-31	687	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	31-32	688	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#2	XI	Mega	32-33	689	1	0818	0833	0826 29/8	0826 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	0-1	655	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	1-2	656	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	2-3	692	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	3-4	693	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	4-5	694	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	5-6	695	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	6-7	696	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	7-8	697	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	8-9	698	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	9-10	699	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	10-11	700	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	11-12	701	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	12-13	702	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	13-14	703	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	14-15	704	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	15-16	705	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	16-17	706	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	17-18	707	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	18-19	708	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	19-20	709	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	20-21	710	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	21-22	711	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	22-23	712	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	23-24	713	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	24-25	714	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	25-26	715	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	26-27	716	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	27-28	717	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	28-29	718	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	29-30	719	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	30-31	720	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	31-32	721	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C

28/08	A950	56015#3	VII	Mega	32-33	722	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	33-34	723	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	34-35	724	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	VII	Mega	35-36	725	2	0838	0852	0845 29/8	0845 30/8	9	Sample	103/2C
28/08	A950	56015#3	III	Mega	0-1	726	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	2-3	727	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	4-5	728	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	6-7	729	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	8-9	730	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	10-11	731	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	12-13	732	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	14-15	733	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	16-17	734	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	18-19	735	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	20-21	736	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	22-23	737	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	24-25	738	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	26-27	739	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	28-29	740	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	30-31	741	3	-	-	-	-	-	Blank	103/2C
28/08	A950	56015#3	III	Mega	32-33	742	3	-	-	-	-	-	Blank	103/2C
30/08	A300	56025#3	VII	Mega	0-1	743	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	1-2	744	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	2-3	745	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	3-4	746	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	4-5	747	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	5-6	748	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	6-7	749	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	7-8	750	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	8-9	751	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	9-10	752	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	10-11	753	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	11-12	754	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	12-13	755	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	13-14	756	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	14-15	757	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	15-16	758	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	16-17	759	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	17-18	760	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	18-19	761	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	19-20	762	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	20-21	763	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	21-22	764	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	22-23	765	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	23-24	766	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	24-25	767	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	25-26	768	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	26-27	769	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	27-28	770	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	28-29	771	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	29-30	772	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	30-31	773	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	31-32	774	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	32-33	775	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	33-34	776	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	34-35	777	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	35-36	778	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D

30/08	A300	56025#3	VII	Mega	37-38	779	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	38-39	780	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#3	VII	Mega	39-40	781	1	0822	0837	0830 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	0-1	782	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	1-2	783	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	2-3	784	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	3-4	785	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	4-5	786	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	5-6	787	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	6-7	788	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	7-8	789	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	8-9	790	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	9-10	791	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	10-11	792	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	11-12	793	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	12-13	794	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	13-14	795	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	14-15	796	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	15-16	797	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	16-17	798	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	17-18	799	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	18-19	800	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	19-20	801	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	20-21	802	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	21-22	803	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	22-23	804	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	23-24	805	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	24-25	806	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	25-26	807	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	26-27	808	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	27-28	809	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	28-29	810	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	29-30	811	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	30-31	812	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	31-32	813	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	32-33	814	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	33-34	815	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	34-35	816	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	35-36	817	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	37-38	818	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	38-39	819	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	39-40	820	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
30/08	A300	56025#4	IX	Mega	40-41	821	2	0842	0859	0851 31/8	0830 1/9	16	Sample	103/2D
01/09	A140	56033#3	VII	Mega	0-1	822	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	1-2	823	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	3-4	824	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	4-5	825	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	5-6	826	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	6-7	827	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	7-8	828	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	8-9	829	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	9-10	830	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	10-11	831	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	11-12	832	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	12-13	833	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	13-14	834	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	14-15	835	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B

01/09	A140	56033#3	VII	Mega	15-16	836	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	16-17	837	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	17-18	838	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	18-19	839	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	19-20	840	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	20-21	841	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	21-22	842	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	22-23	843	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	23-24	844	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	24-25	845	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	25-26	846	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	26-27	847	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	27-28	848	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	28-29	849	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	29-30	850	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	30-31	851	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	31-32	852	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	32-33	853	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	33-34	854	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	34-35	855	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#3	VII	Mega	35-36	856	1	0820	0834	0827 1/9	0827 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	0-1	857	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	1-2	858	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	3-4	859	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	4-5	860	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	5-6	861	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	6-7	862	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	7-8	863	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	8-9	864	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	9-10	865	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	10-11	866	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	11-12	867	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	12-13	868	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	13-14	869	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	14-15	870	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	15-16	871	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	16-17	872	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	17-18	873	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	18-19	874	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	19-20	875	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	20-21	876	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	21-22	877	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	22-23	878	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	23-24	879	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	24-25	880	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	25-26	881	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	26-27	882	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	27-28	883	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	28-29	884	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	29-30	885	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	30-31	886	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	31-32	887	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	32-33	888	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	33-34	889	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	34-35	890	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#4	VI	Mega	35-36	891	2	0838	0852	0845 1/9	0845 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	0-1	892	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B

01/09	A140	56033#5	VI	Mega	1-2	893	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	2-3	894	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	3-4	895	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	4-5	896	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	5-6	897	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	6-7	898	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	7-8	899	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	8-9	900	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	9-10	901	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	10-11	902	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	11-12	903	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	12-13	904	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	13-14	905	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	14-15	906	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	15-16	907	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	16-17	908	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	17-18	909	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	18-19	910	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	19-20	911	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	20-21	912	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	21-22	913	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	22-23	914	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	23-24	915	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	24-25	916	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	25-26	917	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	26-27	918	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	27-28	919	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	28-29	920	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	29-30	921	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	30-31	922	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	31-32	923	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	32-33	924	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	33-34	925	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	34-35	926	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
01/09	A140	56033#5	VI	Mega	35-36	927	3	0856	0910	0903 1/9	0903 2/9	23	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	0-1	928	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	1-2	929	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	2-3	930	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	3-4	931	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	4-5	932	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	5-6	933	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	6-7	934	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	7-8	935	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	8-9	936	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	9-10	937	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	10-11	938	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	11-12	939	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	12-13	940	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	13-14	941	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	14-15	942	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	15-16	943	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	16-17	944	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	17-18	945	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	18-19	946	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	19-20	947	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	20-21	948	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	21-22	949	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B

03/09	A300	56040#1	XII	Mega	22-23	950	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	23-24	951	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	24-25	952	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	25-26	953	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	26-27	954	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	27-28	955	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	28-29	956	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	29-30	957	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	30-31	958	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	31-32	959	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	32-33	960	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	33-34	961	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	34-35	962	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	35-36	963	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#1	XII	Mega	36-37	964	1	0826	0846	0836 4/9	0836 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	0-1	965	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	1-2	966	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	2-3	967	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	3-4	968	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	4-5	969	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	5-6	970	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	6-7	971	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	7-8	972	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	8-9	973	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	9-10	974	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	10-11	975	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	11-12	976	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	12-13	977	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	13-14	978	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	14-15	979	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	15-16	980	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	16-17	981	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	17-18	982	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	18-19	983	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	19-20	984	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	20-21	985	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	21-22	986	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	22-23	987	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	23-24	988	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	24-25	989	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	25-26	990	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	26-27	991	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	27-28	992	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	28-29	993	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	29-30	994	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	30-31	995	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	31-32	996	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
03/09	A300	56040#2	III	Mega	32-33	997	2	0850	0906	0858 4/9	0858 5/9	16	Sample	103/2A+B
05/09	A700	56046#1	IX	Mega	0-1	998	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	1-2	999	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	2-3	1000	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	3-4	1	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	4-5	2	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	5-6	3	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	6-7	4	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	7-8	5	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	8-9	6	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D

05/09	A700	56046#1	IX	Mega	9-10	7	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	10-11	8	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	11-12	9	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	12-13	10	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	13-14	11	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	14-15	12	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	15-16	13	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	16-17	14	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	17-18	15	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	18-19	16	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	19-20	17	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	20-21	18	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	21-22	19	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	22-23	20	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	23-24	21	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	24-25	22	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	25-26	23	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	26-27	24	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	27-28	25	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	28-29	26	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	29-30	27	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	30-31	28	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	31-32	29	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	33-34	30	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	34-35	31	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	35-36	32	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	36-37	33	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	37-38	34	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	38-39	35	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#1	IX	Mega	39-40	36	1	0842	0856	0849 6/9	0849 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	0-1	37	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	1-2	38	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	2-3	39	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	3-4	40	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	4-5	41	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	5-6	42	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	6-7	43	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	7-8	44	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	8-9	45	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	9-10	46	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	10-11	47	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	11-12	48	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	12-13	49	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	13-14	50	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	14-15	51	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	15-16	52	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	16-17	53	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	17-18	54	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	18-19	55	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	19-20	56	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	20-21	57	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	21-22	58	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	22-23	59	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	23-24	60	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	24-25	61	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	25-26	62	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	26-27	63	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D

05/09	A700	56046#2	II	Mega	27-28	64	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	28-29	65	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	29-30	66	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	30-31	67	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	31-32	68	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	33-34	69	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	34-35	70	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	35-36	71	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	36-37	72	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	37-38	73	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	38-39	74	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	39-40	75	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#2	II	Mega	40-41	76	2	0900	0917	0909 6/9	0909 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	0-1	77	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	1-2	78	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	2-3	79	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	3-4	80	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	4-5	81	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	5-6	82	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	6-7	83	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	7-8	84	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	8-9	85	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	9-10	86	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	10-11	87	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	11-12	88	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	12-13	89	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	13-14	90	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	14-15	91	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	15-16	92	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	16-17	93	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	17-18	94	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	18-19	95	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	19-20	96	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	20-21	97	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	21-22	98	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	22-23	99	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	23-24	100	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	24-25	101	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	25-26	102	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	26-27	103	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	27-28	104	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	28-29	105	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	29-30	106	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	30-31	107	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	31-32	108	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	33-34	109	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	34-35	110	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	35-36	111	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	36-37	112	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	37-38	113	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	38-39	114	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	39-40	115	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	III	Mega	40-41	116	3	0922	0938	0930 6/9	0930 7/9	11	Sample	103/2C+D
05/09	A700	56046#4	IX	Mega	0-1	117	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	2-3	118	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	4-5	119	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	6-7	120	4	-	-	-	-	11	Blank	103/2C+D

05/09	A700	56046#4	IX	Mega	8-9	121	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	10-11	122	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	12-13	123	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	14-15	124	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	16-17	125	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	18-19	126	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	20-21	127	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	22-23	128	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	24-25	129	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	26-27	130	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	28-29	131	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	30-31	132	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	32-33	133	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	34-35	134	4	-	-	-	-	11	Blank	103/2C+D
05/09	A700	56046#4	IX	Mega	35-36	135	4	-	-	-	-	11	Blank	103/2C+D
07/09	A950	56054#1	II	Mega	0-1	136	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	1-2	137	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	2-3	138	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	3-4	139	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	4-5	140	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	5-6	141	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	6-7	142	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	7-8	143	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	8-9	144	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	9-10	145	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	10-11	146	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	11-12	147	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	12-13	148	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	13-14	149	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	14-15	150	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	15-16	151	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	16-17	152	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	17-18	153	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	18-19	154	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	19-20	155	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	20-21	156	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	21-22	157	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	22-23	158	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	23-24	159	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	24-25	160	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	25-26	161	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	26-27	162	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	27-28	163	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	28-29	164	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	29-30	165	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	30-31	166	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	31-32	167	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	33-34	168	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
07/09	A950	56054#1	II	Mega	34-35	169	1	0820	0837	0829 8/9	0829 9/9	9	Sample	103/2A+B
09/09	A1200	56062#2	III	Mega	0-1	170	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	1-2	171	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	2-3	172	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	3-4	173	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	4-5	174	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	5-6	175	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	6-7	176	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	7-8	177	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D

09/09	A1200	56062#2	III	Mega	8-9	178	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	9-10	179	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	10-11	180	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	11-12	181	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	12-13	182	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	13-14	183	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	14-15	184	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	15-16	185	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	16-17	186	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	17-18	187	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	18-19	188	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	19-20	189	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	20-21	190	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	21-22	191	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	22-23	192	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	23-24	193	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	24-25	194	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	25-26	195	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	26-27	196	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	27-28	197	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	28-29	198	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	29-30	199	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	30-31	200	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	31-32	201	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	33-34	202	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
09/09	A1200	56062#2	III	Mega	34-35	203	1	1452	1508	1500 9/9	1500 10/9	7	Sample	103/2C+D
10/09	A1850	56065#2	III	Mega	0-1	204	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	1-2	205	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	2-3	206	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	3-4	207	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	4-5	208	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	5-6	209	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	6-7	210	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	7-8	211	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	8-9	212	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	9-10	213	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	10-11	214	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	11-12	215	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	12-13	216	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	13-14	217	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	14-15	218	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	15-16	219	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	16-17	220	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	17-18	221	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	18-19	222	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	19-20	223	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	20-21	224	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	21-22	225	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	22-23	226	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	23-24	227	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	24-25	228	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	25-26	229	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	26-27	230	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	27-28	231	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	28-29	232	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	29-30	233	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	30-31	234	2	1526	1543	1535 10/9	1535 11/9	4	Sample	103/2ABCD

10/09	A1850	56065#2	III	Mega	31-32	235	2	1526	1543	1535	10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	33-34	236	2	1526	1543	1535	10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	34-35	237	2	1526	1543	1535	10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	35-36	238	2	1526	1543	1535	10/9	1535 11/9	4	Sample	103/2ABCD
10/09	A1850	56065#2	III	Mega	36-37	239	2	1526	1543	1535	10/9	1535 11/9	4	Sample	103/2ABCD

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10.7. Trawl catch samples

Station	Depth (ucm)	Sample	Pres.	Container
56014#1	1108-1188	general catch	10% formalin	5 l
56014#1	1108-1188	polychaeta	10% formalin	5 l
56014#1	1108-1188	pisces 1/2	10% formalin	5 l
56014#1	1108-1188	pisces 2/2	10% formalin	5 l
56019#1	1827-1839	Crustacea & Misc.	10% formalin	5 l
56019#1	1827-1839	Echinodermata (ex-holothuroidea)	10% formalin	5 l
56019#1	1827-1839	Fish & Holothuroidea	10% formalin	5 l
56019#1	1827-1839	Benthothuria cris. Sp a	10% formalin	250 ml
56019#1	1827-1839	Benthothuria cris. Sp b	10% formalin	250 ml
56024#1	953-1014	cephalopoda	10% formalin	5l
56024#1	953-1014	Fish	10% formalin	5l
56024#1	953-1014	Echinodermata	10% formalin	5l
56024#1	953-1014	Crustacea	10% formalin	5l
56024#1	953-1014	Residue	10% formalin	5l
56027#1	1256-1430	Pisces	10% formalin	5l
56027#1	1256-1430	general catch	10% formalin	5l
56027#1	1256-1430	Echinodermata	10% formalin	5l
56027#1	1256-1430	Holothuria	10% formalin	5l
56027#1	1256-1430	Actinaria	10% formalin	5l
56032#2	812-920	stones	no pres.	5l
56035#1	1724-1792	general catch	10% formalin	5l
56047#1	136-138	Larger misc.	10% formalin	5l
56047#1	136-138	Small misc.	10% formalin	5l
56047#1	136-138	Tibia??	frozen -70	
56048#1	317-332	Fish& natants	10% formalin	5l
56052#1	1810-1832	general catch	10% formalin	5l
56052#1	1810-1832	Crustacea	10% formalin	5l
56052#1	1810-1832	Holothuria	10% formalin	5l
56052#1	1810-1832	Fish	10% formalin	5l
56056#1	1607-1707	Fish	10% formalin	5l
56056#1	1607-1707	general catch	10% formalin	5l
56060#1	1418-1537	Fish	10% formalin	5l
56060#1	1418-1537	Crustacea	10% formalin	5l
56060#1	1418-1537	General Catch	10% formalin	5l
56064#2	1697-1712	Fish	10% formalin	5l
56064#2	1697-1712	Crustacea	10% formalin	5l
56064#2	1697-1712	general catch	10% formalin	5l
56075#1	133-134	Fish	10% formalin	5l
56075#1	133-134	General catch	10% formalin	5l
56075#1	133-134	Crustacea	10% formalin	5l
56075#1	133-134	Mollusca	10% formalin	5l
56075#1	133-134	Actinaria	10% formalin	5l

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10.8. Trawl samples, Ethanol preserved samples (genetics)

Station	Depth (m)	Vial	Sample
56014#1	1108-1188	500	rat tail
56014#1	1108-1188	499	black spiny shark
56014#1	1108-1188	498	eel
56014#1	1108-1188	496	eel
56014#1	1108-1188	495	smooth head
56014#1	1108-1188	494	deep-sea sole
56014#1	1108-1188	493	nothacanth
56019#1	1820	401	Benthothuria sp b
56019#1	1820	402	Benthothuria sp b
56019#1	1820	403	Benthothuria sp b
56019#1	1820	404	Benthothuria sp a
56019#1	1820	405	Benthothuria sp a
56019#1	1820	406	Benthothuria sp a
56024#1	1000	492	Encephaloides armstrongi
56024#1	1000	491	octopus
56024#1	1000	490	octopus
56024#1	1000	489	eel
56027#1	1400	488	tripod-fish
56027#1	1400	487	actinaria
56027#1	1400	486	holothuria
56027#1	1400	485	polycheles
56027#1	1400	484	scallop
56027#1	1400	483	benthodytes
56027#1	1400	482	quill worm
56027#1	1400	481	quill worm

Station	Depth (m)	Vial	Sample
56052#1	1810-1832	480	Fish sp A
56052#1	1810-1832	479	polycheles
56052#1	1810-1832	478	Munida sp
56052#1	1810-1832	477	Shrimp sp A
56052#1	1810-1832	476	Benthodytes
56052#1	1810-1832	475	Ophiurida
56056#1	1600-1700	474	Benthothuria
56056#1	1600-1700	473	Molpadia
56056#1	1600-1700	472	Sipunculid
56056#1	1600-1700	471	Polychaeta a
56056#1	1600-1700	470	Polychaeta b
56056#1	1600-1700	469	Fish sp A
56056#1	1600-1700	468	Fish sp B (fat fish)
56060#1	1410-1530	467	Molpadia
56060#1	1410-1530	466	Sipunculid
56060#1	1410-1530	465	polycheles
56060#1	1410-1530	464	nothacanth
56060#1	1410-1530	463	tripod-fish
56060#1	1410-1530	462	actinaria
56060#1	1410-1530	461	Munida sp
56064#2	1697-1712	460	Polycheles
56064#2	1697-1712	459	Munida sp
56064#2	1697-1712	458	Thalassinid
56064#2	1697-1712	457	Benthothuria
56064#2	1697-1712	456	Molpadia
56064#2	1697-1712	455	Polychaeta
56064#2	1697-1712	454	actinaria
56064#2	1697-1712	453	nothacanth
56064#2	1697-1712	452	eel

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10.9. Water samples

Station Name	Station number	Gear	Depths sampled	Analysis
A1850	56001#1	CTD	5	Nuts, Chl.A, POC/N, Diss.N, Mn, DOC
			30	Nuts, Chl.A, POC/N, Diss.N, Mn, DOC
			60	Nuts, Chl.A, POC/N, Diss.N, Mn, DOC
			100	Nuts, Chl.A, POC/N, Diss.N, Mn ,DOC
			300	Nuts, Chl.A, POC/N, Diss.N, Mn, DOC
			500	Nuts, Chl.A, POC/N, Diss.N, Mn, DOC
			700	Nuts, Chl.A, POC/N, Diss.N, Mn, DOC
			1000	Nuts, Chl.A, POC/N, Diss.N, Mn, DOC
			1200	Nuts, Chl.A, POC/N, Diss.N, Mn DOC
			1500	Nuts, Chl.A, POC/N, Diss.N, Mn DOC
			1800	Nuts, Chl.A, POC/N, Diss.N, Mn DOC
			1849	Nuts, Chl.A, POC/N, Diss.N, Mn DOC
A1850	55802#2	BBLS	0.165mab	Nuts, Chl A, Bacterial lipids DOC
			0.555mab	Nuts, Chl A, Bacterial lipids DOC
			1.01mab	No sample taken
			1.560mab	No sample taken
			2.12mab	No sample taken
A1200	56011#2	CTD	5	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			30	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			50	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			100	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			200	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			300	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			400	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			500	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			700	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			1000	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			1150	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			1196	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
A950	56020#1	CTD	5	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			25	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			50	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			100	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			200	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			250	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			300	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			400	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			500	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			700	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			900	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			928	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
A300	56028#1	CTD	5	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			27	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			50	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			100	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			200	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			225	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			250	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			275	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			290	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			295	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			297	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
A140	56036#1	CTD	5	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			23	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			50	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC

			75	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			100	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			110	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			120	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			125	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			129	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
A500	56043#1	CTD	5	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			23	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			50	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			100	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			200	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			225	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			250	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			300	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			400	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			490	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			495	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			497	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
A700	56053#1	CTD	5	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			23	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			50	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			100	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			200	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			250	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			300	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			400	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			500	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			600	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			695	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
			705	Nuts, Chl.A, POC/N, Diss.N, Mn,DOC
A1200	56044#3	CTD	5	Nuts
			30	Nuts,
			50	Nuts,
			100	Nuts
			200	Nuts,
			300	Nuts,
			400	Nuts,
			500	Nuts,
			700	Nuts,
			1000	Nuts,
			1150	Nuts
A1850	560675#1	CTD	5	Nuts
			30	Nuts,
			50	Nuts,
			100	Nuts
			200	Nuts,
			300	Nuts,
			400	Nuts,
			500	Nuts,
			600	Nuts,
			1000	Nuts,
			1600	Nuts,
			1848	Nuts,

Key:

BBLS	Benthic boundary layer sampler
Nuts	Nutrients
Chl A	Chlorophyll, other pigments and degradation products
POC/N	Particulate organic carbon and nitrogen including stable isotopes del C^{15} and del N^{15}
Diss N	Dissolved nitrogen del N^{15}
Mn	Dissolved and particulate manganese
DOC	Dissolved organic carbon and nitrogen

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10.10. WASP Materials

Station	Site	Video (mins)	Film (m)
56013#1	A140	60	14
56030#1	A200	30	0
56029#1	A250	30	7
56008#1	A300	60	14
56022#1	A350	30	7
56023#1	A400	30	7
56055#1	A500	60	14
56051#1	A700	60	14
56032#1	A900	60	14
56009#1	A950	60	14
56006#1	A950	4	0
56038#1	A1100	60	14
56002#1	A1200	60	14
56003#1	A1850	60	14
56026#1	C1000	60	14
56034#1	C1400	60	14
56042#1	C700	60	14
56064#1	D1700	60	14
56018#1	D1750	60	14
56061#1	E1000	60	14
56057#1	E1200	60	14
56050#1	E1400	60	14
56074#1	E600	30	7
56073#1	E800	30	7

WASP footage retained: Video – MiniDV, Film - KODAK Vision 250D colour negative.

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10.11. 10kHz, 3.5kHz and EM12 swath records

Hard copy of the Simrad EA500 10 kHz echo-sounder was printed more-or-less continuously during the cruise, this paper record was retained by the Principal Scientist. Grayscale paper records from the 3.5 kHz profiler and the Simrad EM12 swath bathymetry system were also retained by the Principal Scientist. The logged data from the 3.5 kHz profiler and the Simrad EM12 swath bathymetry system were transferred to CD-ROMs and retained by the Principal Scientist.

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11. STATION LIST

Station list abbreviations and notes

Station	Unique deployment identification number
Site	Site name
Gear	Equipment used (see listing below)
Start	Start of sampling operation
Date	Date of operation
03	2003
Time	Time of operation
(utc)	utc / Greenwich meantime
Position	Ship's position (or estimated net position for trawls)
DN	Degrees north
MN	Minutes north
DE	Degrees east
ME	Minutes east
Depth	Depth of sampling operation
(m)	Metres (corrected)
End	End of sampling operation
Sounding	Mean sounding during sampling operations
Comment	Results etc.

Gear abbreviations and acronyms

AT	Agassiz trawl
BBLS	Benthic boundary layer sampler (water bottles)
CTD	Conductivity, temperature, depth probe (with oxygen, fluorescence, transmission) and water bottles
SVP	Sound velocity probe
MC	Multiple corer
MEGAxx	Megacorer (xx core tubes deployed)
WASP	Wide-angle Seabed Photography system (video and still photography)

RRS *Charles Darwin cruise* 150 Station List

			Start							End								
Station	Site	Gear	Date	Time	Position				Depth	Date	Time	Position				Depth	Sound	Comment
			03	(utc)	DN	MN	DE	ME	(m)	03	(utc)	DN	MN	DE	ME	(m)	ing (m)	
56001#1	A1850	CTD	24/08	04:25	22	52.34	65	59.85	0	24/08	06:32	22	52.24	65	59.97	1849	1864	Successful full depth cast.
56001#2	A1850	MEGA08	24/08	09:13	22	52.38	65	59.99	1862								1862	7/8 good cores
56001#3	A1850	MEGA08	24/08	11:10	22	52.58	65	59.86	1860								1860	6/8 short cores.
56001#4	A1850	MEGA08	24/08	13:10	22	52.55	65	59.93	1860								1860	8/8 good cores
56002#1	A1200	WASP	24/08	17:31	22	59.98	66	24.42	1202	24/08	18:38	22	59.9	66	24.21	1210	1206	Good tow
56003#1	A1850	WASP	24/08	23:49	22	52.55	66	0.22	1859	25/08	00:56	22	52.51	65	59.87	1861	1860	Good tow
56004#1	D1820	AT	25/08	03:15	22	55.5	66	10.1	na	25/08	06:27	22	54.45	66	4.37	na	1830	Missed seabed !
56005#1	A1850	BBLS	25/08	09:11	22	52.18	65	59.84	1864								1864	Fired at seabed, 2/5 bottles good.
56005#2	A1850	MEGA08	25/08	11:42	22	52.52	66	0.11	1860								1860	8/8 good cores
56005#3	A1850	MEGA08	25/08	13:25	22	52.6	65	59.99	1859								1859	8/8 good cores
56005#4	A1850	MEGA08	25/08	15:27	22	52.26	65	59.8	1864								1864	8/8 good cores
56006#1	A950	WASP	25/08	21:00	22	56.11	66	36.56	937	25/08	21:02	22	55.9	66	36.6	937	937	No camera activation, haul aborted
56006#2	A950	MC	25/08	22:56	22	55.72	66	36.21	949								949	Not triggered
56006#3	A950	MC	26/08	00:09	22	55.38	66	36.05	957								957	9/12 good cores
56006#4	A950	MC	26/08	02:00	22	56.04	66	36.13	963								963	12/12 good cores
56007#1	A1200	MEGA08	26/08	05:28	22	59.85	66	24.41	1206								1206	8/8 cores cloudy discarded
56007#2	A1200	MEGA08	26/08	06:41	22	59.76	66	24.24	1215								1215	8/8 good cores
56007#3	A1200	MEGA08	26/08	08:05	22	59.91	66	24.41	1205								1205	8/8 good cores
56007#4	A1200	MEGA08	26/08	09:40	22	59.78	66	24.49	1203								1203	8/8 good cores
56008#1	A300	WASP	26/08	13:05	23	12.4	66	34.06	307	26/08	14:06	23	12.17	66	33.17	318	312	Good tow
56009#1	A950	WASP	26/08	17:29	22	55.8	66	36.19	952	26/08	18:36	22	55.81	66	35.97	964	958	Good tow
56010#1	C1200	AT	26/08	21:00	22	48.6	66	33.9	na	26/08	23:48	22	46.5	66	29	na	1180	Missed seabed !
56011#1	A1200	MC	27/08	02:38	23	0.01	66	24.41	1201								1201	12/12 good cores
56011#2	A1200	CTD	27/08	04:23	22	59.99	66	24.36	0	27/08	06:04	22	59.97	66	24.24	1197	1210	Full depth cast, all bottles fired
56011#3	A1200	MEGA08	27/08	08:03	22	59.98	66	24.43	1202								1202	7/8 fair cores
56012#1	A950	MEGA08	27/08	10:49	22	55.8	66	36.27	947								947	7/8 overfull, discarded
56012#2	A950	MEGA08	27/08	12:02	22	55.9	66	36.16	951								951	5/8 good cores
56012#3	A950	MEGA08	27/08	13:24	22	55.84	66	36.1	956								956	3/8 good cores
56013#1	A140	WASP	27/08	17:05	23	16.66	66	42.69	137	27/08	18:12	23	16.26	66	42.7	135	136	Good tow
56014#1	C1200	AT	28/08	00:08	22	48.64	66	33.92	1108	28/08	01:10	22	47.87	66	31.64	1188	1148	Good catch

56015#1	A950	MEGA10	28/08	04:40	22	56.17	66	36.11	962								962	5/10 good cores
56015#2	A950	MEGA12	28/08	06:05	22	55.9	66	36.12	958								958	8/12 good cores
56015#3	A950	MEGA12	28/08	07:34	22	55.88	66	36.09	960								960	8/12 good cores
56016#1	A140	MEGA08	28/08	11:21	23	16.54	66	42.61	135								135	5/8, overfull, discarded
56016#2	A140	MEGA08	28/08	11:59	23	16.51	66	42.29	135								135	1/8 good core
56016#3	A140	MEGA08	28/08	12:38	23	16.92	66	42.74	134								134	8/8 good cores
56016#4	A140	MEGA08	28/08	13:12	23	16.96	66	42.75	134								134	8/8, all cloudy, discarded
56016#5	A140	MEGA08	28/08	13:35	23	17	66	42.81	133								133	2/8 good cores
56017#1	A1850	SVP	28/08	20:07	22	52.44	66	0.03	0	28/08	21:14	22	52.52	65	59.88	1845	1861	No data recovered
56018#1	D1750	WASP	29/08	00:09	22	5605	66	9.67	1806	29/08	01:17	22	55.8	66	9.91	1808	1807	Good tow
56019#1	D1820	AT	29/08	04:20	22	55.15	66	7.53	1827	29/08	05:10	22	54.67	66	5.53	1839	1833	Good catch
56020#1	A950	CTD	29/08	10:30	22	55.82	66	36.34	0	29/08	11:57	22	55.25	66	36.57	930	939	Full depth cast
56021#1	A300	MEGA08	29/08	15:15	23	12.51	66	34.04	307								307	8/8 good cores
56022#1	A350	WASP	29/08	16:51	23	11.08	66	32.5	351	29/08	17:21	23	10.92	66	32.39	354	352	Good tow
56023#1	A400	WASP	29/08	18:24	23	9.75	66	31.37	401	29/08	19:11	23	9.4	66	31.25	413	407	Good tow
56024#1	C1000	AT	29/08	23:00	22	50.52	66	39.61	961	30/08	00:15	22	49.72	66	36.87	1022	992	Good catch
56025#1	A300	MC	30/08	04:52	23	12.42	66	33.99	308								308	Not fired
56025#2	A300	MC	30/08	05:32	23	12.45	66	34.25	305								305	Not fired
56025#3	A300	MEGA10	30/08	06:49	23	12.41	66	33.9	312								312	9/10 good cores
56025#4	A300	MEGA10	30/08	07:37	23	12.48	66	34.02	310								310	9/10 good cores
56025#5	A300	MEGA10	30/08	08:49	23	12.54	66	34.03	307								307	3/10 good cores
56025#6	A300	MEGA10	30/08	09:36	23	12.21	66	33.88	314								314	3/10 good cores
56025#7	A300	MEGA09	30/08	10:28	23	12.53	66	34.18	305								305	7/9 good cores
56026#1	C1000	WASP	30/08	18:22	22	50	66	38.02	996	30/08	19:29	22	49.73	66	37.67	1008	1002	Good tow
56027#1	C1400	AT	30/08	22:50	22	48.77	66	30.04	1264	30/08	23:58	22	47.83	66	27.06	1438	1351	Good catch
56028#1	A300	CTD	31/08	04:55	23	12.36	66	33.98	311	31/08	05:48	23	1247	66	34.17	307	309	Full depth cast
56029#1	A250	WASP	31/08	07:58	23	14.19	66	36.15	259	31/08	08:28	23	13.89	66	36.08	264	262	Good tow
56030#1	A200	WASP	31/08	09:23	23	15.4	66	37.93	207	31/08	09:54	23	15.08	66	37.88	215	211	Good tow
56031#1	A140	MEGA09	31/08	12:02	23	16.66	66	42.62	135								135	0/8 cores
56031#2	A140	MEGA08	31/08	12:25	23	16.56	66	42.51	136								136	7/8 good cores
56031#3	A140	MEGA10	31/08	13:07	23	16.52	66	42.4	134								134	10/10 good cores
56032#1	A900	WASP	31/08	19:20	22	56.92	66	37.05	901	31/08	20:27	22	56.62	66	36.94	906	904	Good tow
56032#2	A900	AT	31/08	23:30	22	57.38	66	38.68	819	01/09	00:49	22	56.65	66	36.55	928	974	Rock slabs "no" life
56033#1	A140	MC	01/09	04:40	23	16.84	66	42.76	134								134	12/12 good cores
56033#2	A140	MEGA10	01/09	05:46	23	16.76	66	42.56	135								135	Bounced; all discarded
56033#3	A140	MEGA10	01/09	06:17	23	16.78	66	42.62	136								136	9/10 good cores

56033#4	A140	MEGA09	01/09	07:17	23	16.76	66	42.64	136								136	8/9 good cores
56033#5	A140	MEGA08	01/09	08:05	23	16.61	66	42.59	136								136	6/8 good cores
56034#1	C1400	WASP	01/09	19:34	22	48.01	66	27.74	1398	01/09	21:41	22	47.92	66	27.52	1410	1404	Intermittent altimeter trace
56035#1	C1730	AT	02/09	00:02	22	44.36	66	21.55	1731	02/09	01:18	22	43.63	66	18.15	1799	1765	Approx. no catch
56036#1	A140	CTD	02/09	07:20	23	16.82	66	42.76	0	02/09	07:56	23	16.83	66	42.74	136	136	Full depth cast
56036#2	A140	MC	02/09	09:12	23	16.43	66	42.65	136								136	Not triggered
56036#3	A140	MC	02/09	09:27	23	16.31	66	42.6	136								136	Not fired
56036#4	A140	MC	02/09	10:04	23	15.96	66	42.58	137								137	12/12 good cores
56037#1	A300	MC	02/09	14:17	23	12.42	66	34.13	306								306	12/12 good cores
56038#1	A1100	WASP	02/09	19:06	22	52.9	66	32.77	1115	02/09	20:13	22	52.61	66	33.02	1108	1112	Good tow
56039#1	C1550	AT	02/09	22:18	22	46.21	66	27.9	na	03/09	01:53	22	44.38	66	19.05	na	1630	Missed the bottom !
56040#1	A300	MEGA10	03/09	06:09	23	12.54	66	34.1	306								306	8/10 good cores
56040#2	A300	MEGA10	03/09	06:57	23	12.52	66	34.07	307								307	8/10 good cores
56040#3	A300	MEGA10	03/09	07:50	23	12.28	66	33.92	313								313	No mats, discarded
56040#4	A300	MEGA10	03/09	08:29	23	12.23	66	33.94	314								314	No mats, discarded
56040#5	A300	MEGA10	03/09	09:08	23	12.21	66	34.09	313								313	No mats, discarded
56040#6	A300	MEGA10	03/09	09:47	23	12.11	66	34.11	313								313	Swivel hung up, no cores
56040#7	A300	MEGA10	03/09	10:24	23	11.96	66	34.08	316								316	No mats, discarded
56040#8	A300	MEGA10	03/09	11:13	23	11.89	66	33.67	322								322	No mats, discarded
56040#9	A300	MEGA10	03/09	11:48	23	11.82	66	33.81	323								323	No mats, discarded
56040#10	A300	MEGA10	03/09	12:37	23	11.63	66	33.31	331								331	No mats, discarded
56040#11	A300	MEGA10	03/09	13:11	23	11.44	66	33.29	334								334	No mats, discarded
56040#12	A300	MEGA10	03/09	14:18	23	10.82	66	33.4	343								343	No mats, discarded
56040#13	A300	MEGA10	03/09	14:50	23	10.59	66	33.29	348								348	No mats, discarded
56040#14	A300	MEGA10	03/09	15:21	23	10.27	66	33.14	356								356	No mats, discarded
56040#15	A300	MEGA10	03/09	15:50	23	9.98	66	33.01	363								363	Not triggered
56041#1	C950	MEGA10	03/09	19:17	22	52.65	66	36.79	966								966	4/10 good cores
56042#1	C700	WASP	04/09	00:28	22	59.03	66	39.81	689	04/09	01:35	22	59.07	66	39.15	750	720	Good tow
56043#1	A500	CTD	04/09	04:10	23	8.01	66	29.95	0	04/09	05:16	23	8.04	66	29.88	500	511	Full depth cast
56044#1	A1200	MEGA10	04/09	08:52	23	0.07	66	24.45	1198								1198	9/10 good cores
56044#2	A1200	MEGA10	04/09	10:15	23	0.13	66	24.37	1200								1200	10/10 good cores
56044#3	A1200	CTD	04/09	11:50	22	59.92	66	24.06	0	04/09	13:25	22	59.65	66	23.73	1211	1219	Full depth cast
56045#1	C1550	AT	04/09	20:20	22	46.51	66	27.89	na	05/09	00:05	22	43.31	66	18.93	na	1620	Missed the bottom !
56046#1	A700	MEGA10	05/09	03:32	23	0	66	41.11	717								717	6/10 good cores
56046#2	A700	MEGA10	05/09	04:39	23	0.04	66	40.8	689								689	7/10 good cores
56046#3	A700	MEGA10	05/09	05:59	23	0.02	66	41.05	711								711	1/10 good cores

56046#4	A700	MEGA10	05/09	06:48	23	0.02	66	41.01	708								708	9/10 good cores
56047#1	A140	AT	05/09	09:50	23	16.83	66	42.49	136	05/09	10:17	23	16.68	66	41.87	138	137	Fair catch
56048#1	A300	AT	05/09	12:34	23	12.2	66	33.61	317	05/09	13:08	23	11.88	66	32.79	332	324	Nice clean catch
56049#1	D1750	AT	05/09	16:50	22	57.13	66	12.4	na	05/09	21:20	22	52.6	66	1.3	na	1830	Missed bottom !
56050#1	E1400	WASP	06/09	02:06	22	57.96	66	26.21	1396	06/09	03:13	22	57.71	66	25.68	1421	1408	Good tow
56051#1	A700	WASP	06/09	12:55	23	0.08	66	41.6	716	06/09	14:12	23	0.15	66	40.8	669	692	Good tow
56052#1	D1750	AT	06/09	20:45	22	55.5	66	8.39	1817	06/09	22:15	22	54.28	66	5.62	1839	1828	Good catch (at last !)
56053#1	A700	CTD	07/09	04:53	22	59.99	66	41.22	0	07/09	06:17	23	0	66	41.19	704	719	Full depth cast
56053#2	A700	MEGA10	07/09	07:40	22	59.94	66	41.16	721								721	10/10 good cores
56053#3	A700	MEGA10	07/09	08:53	22	59.84	66	41	721								721	4/10 good cores
56054#1	A950	MEGA10	07/09	10:52	22	55.62	66	36.05	960								960	8/10 good cores
56055#1	A500	WASP	07/09	14:14	23	8.23	66	30.07	505	07/09	15:19	23	8.08	66	29.5	535	520	Good tow
56056#1	C1550	AT	07/09	21:00	22	45.26	66	24.45	1607	07/09	21:55	22	44.48	66	22.62	1707	1657	Good catch
56057#1	E1200	WASP	08/09	03:40	23	1.93	66	28.06	1200	08/09	04:45	23	1.99	66	27.69	1135	1168	Good tow
56058#1	A700	MEGA10	08/09	07:49	23	0.02	66	41.23	718								718	0/10 cores; fell over?
56058#2	A700	MEGA10	08/09	08:40	22	59.89	66	41.23	723								723	5/10 good cores
56058#3	A700	MEGA10	08/09	09:50	22	59.62	66	41.37	741								741	3/10 good cores
56059#1	A950	MEGA10	08/09	14:43	22	55.76	66	35.98	964								964	6/10 good cores
56059#2	A950	MEGA10	08/09	15:55	22	55.92	66	36.11	962								962	2/10, both bubbled, discarded
56060#1	C1500	AT	08/09	21:00	22	46.07	66	27.41	1418	08/09	22:00	22	45.68	66	23.14	1537	1478	Good catch
56061#1	E1000	WASP	09/09	02:53	23	4.38	66	30.02	992	09/09	03:58	23	4.62	66	29.85	956	974	Good tow
56062#1	A1200	MEGA10	09/09	07:05	22	0.02	66	24.43	1202								1202	10/10 disturbed, all discarded
56062#2	A1200	MEGA10	09/09	08:26	23	0.02	66	24.44	1200								1200	8/10 good cores
56062#3	A1200	MEGA10	09/09	09:58	22	59.81	66	24.46	1204								1204	9/10 good cores
56063#1	A1850	MEGA10	09/09	15:18	22	52.42	66	0	1862								1862	10/10 good cores
56064#1	D1700	WASP	09/09	18:53	23	0.97	66	3.01	1713	09/09	19:58	23	0.6	66	3.06	1719	1716	Good tow
56064#2	D1700	AT	09/09	23:47	23	1.3	66	5	1697	10/09	00:18	23	1	66	2.5	1712	1704	Good catch
56065#1	A1850	CTD	10/09	04:30	22	52.46	66	0.02	0	10/09	07:00	22	52.39	65	59.89	1847	1862	Full depth cast
56065#2	A1850	MEGA10	10/09	08:56	22	52.41	65	59.74	1863								1863	9/10 good cores
56066#1	A950	MEGA10	10/09	15:24	22	55.84	66	36	964								964	6/10 good cores
56067#1	A100	CTD	11/09	07:59	23	27.91	66	54.04	0	11/09	08:12	23	27.93	66	54.04	90	98	Profile only cast
56068#1	A90	CTD	11/09	09:34	23	34.78	66	59.82	0	11/09	09:48	23	34.78	66	59.82	80	86	Profile only cast
56069#1	A100b	CTD	11/09	12:11	23	23.98	66	50.07	0	11/09	12:26	23	23.92	66	50	100	105	Profile only cast
56070#1	A125	CTD	11/09	13:19	23	20.03	66	46.05	0	11/09	13:40	23	20.05	66	45.98	120	125	Profile only cast
56071#1	A140	MEGA10	11/09	14:43	23	16.87	66	42.76	135								135	10/10 good cores
56072#1	A300	MEGA10	11/09	16:54	23	12.51	66	34.02	308								308	6/10 good cores
56073#1	E800	WASP	11/09	19:41	23	5.9	66	28.26	805	11/09	20:11	23	5.82	66	28.1	825	815	Good tow

56074#1	E600	WASP	11/09	21:31	23	7.28	66	29.59	593	11/09	22:08	23	7.03	66	29.47	616	604	Good tow
56075#1	A140	AT	12/09	01:24	23	17.1	66	43.98	133	12/09	01:55	23	16.91	66	43.22	134	134	Muddy catch
56075#2	A140	AT	12/09	02:32	23	16.8	66	42.81	134	12/09	02:55	23	16.81	66	42.25	136	135	No catch, net burst open
56075#3	A140	CTD	12/09	04:30	23	16.81	66	42.74	0	12/09	04:45	23	16.8	66	42.68	130	135	Profile only cast
56076#1	A200	CTD	12/09	05:46	23	13.98	66	40.02	0	12/09	06:06	23	13.83	66	39.97	190	194	Profile only cast
56077#1	A300	CTD	12/09	07:20	23	12.5	66	34.02	0	12/09	07:47	23	12.48	66	33.99	303	308	Profile only cast

12. CHARTS

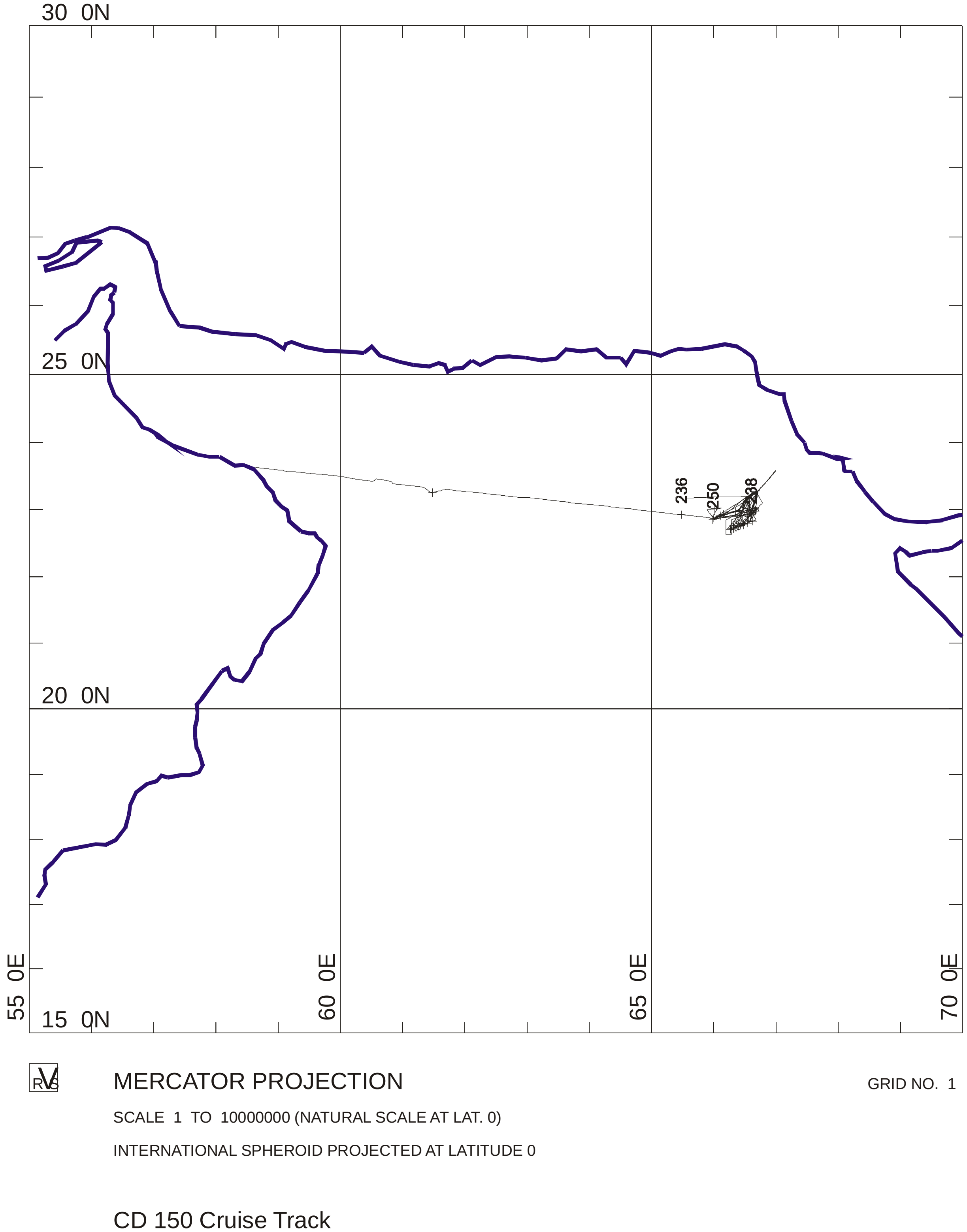
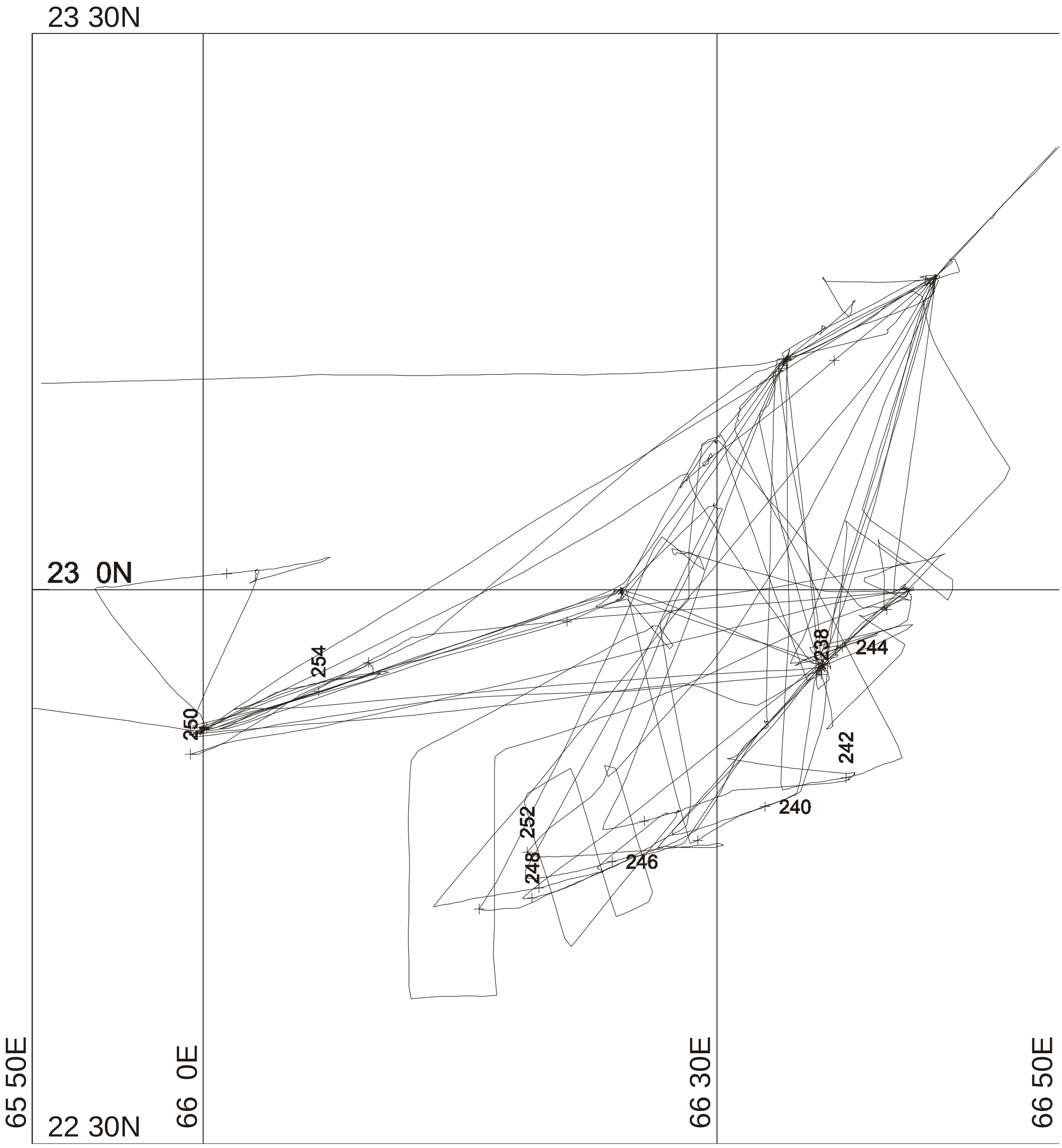


Chart 1. Track chart RRS Charles Darwin *cruise 150 (see narrative for further details).*



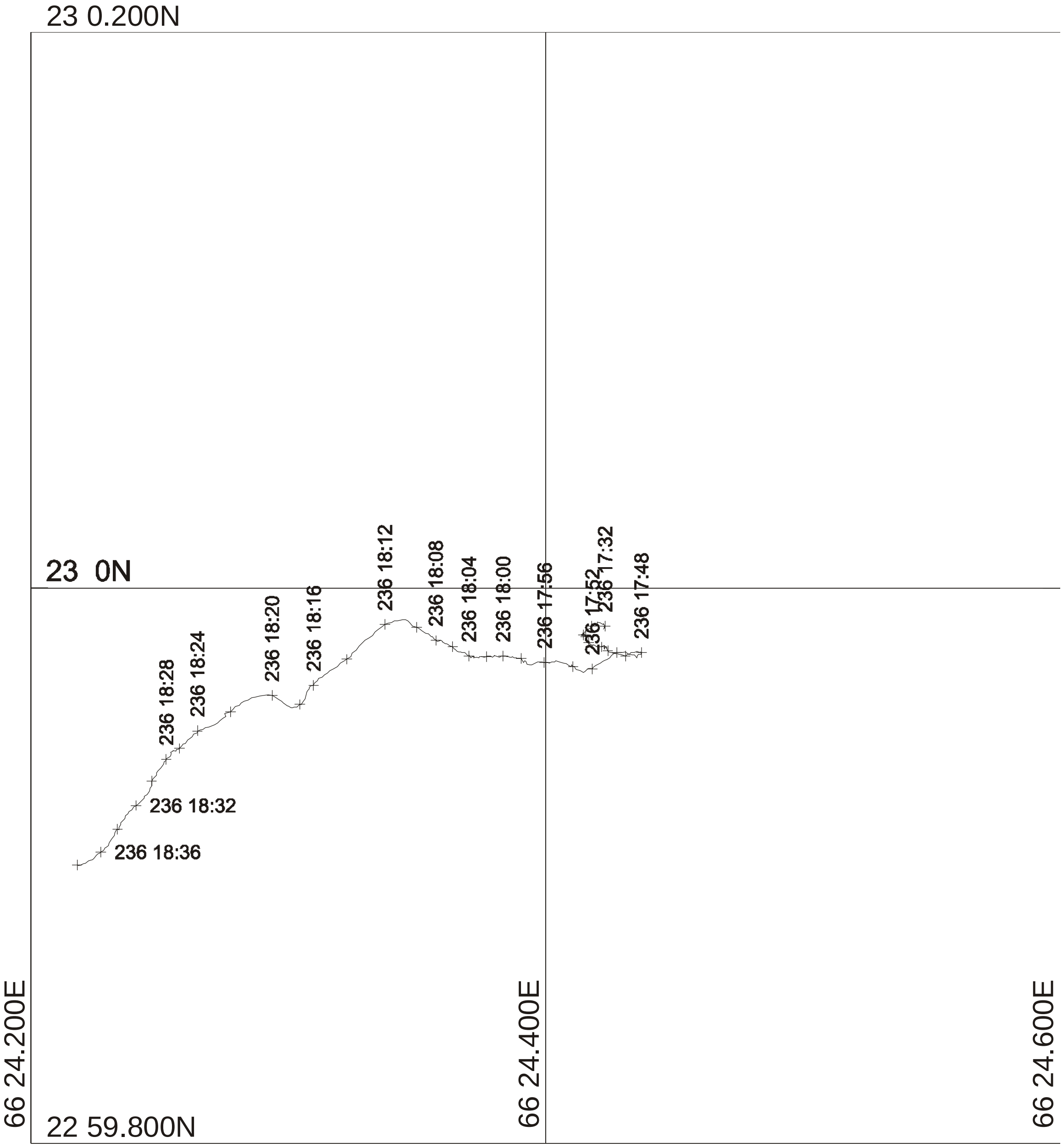
MERCATOR PROJECTION

SCALE 1 TO 750000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

CD 150 Cruise Track: Work Area

Chart 2. Track chart RRS Charles Darwin *cruise 150, showing detail of work area.*



MERCATOR PROJECTION

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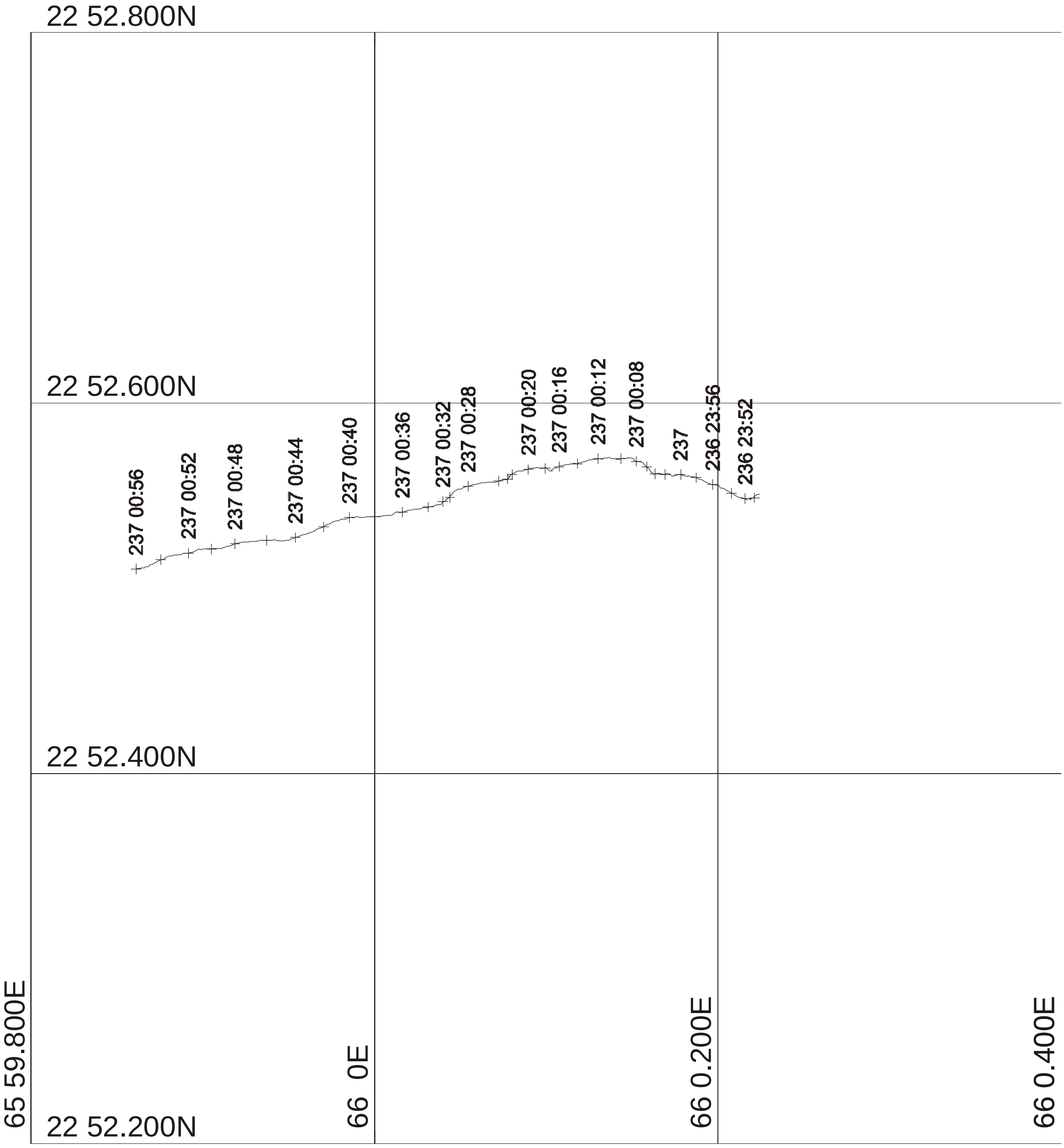
WASP SURVEY 56002#1



MERCATOR PROJECTION

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INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

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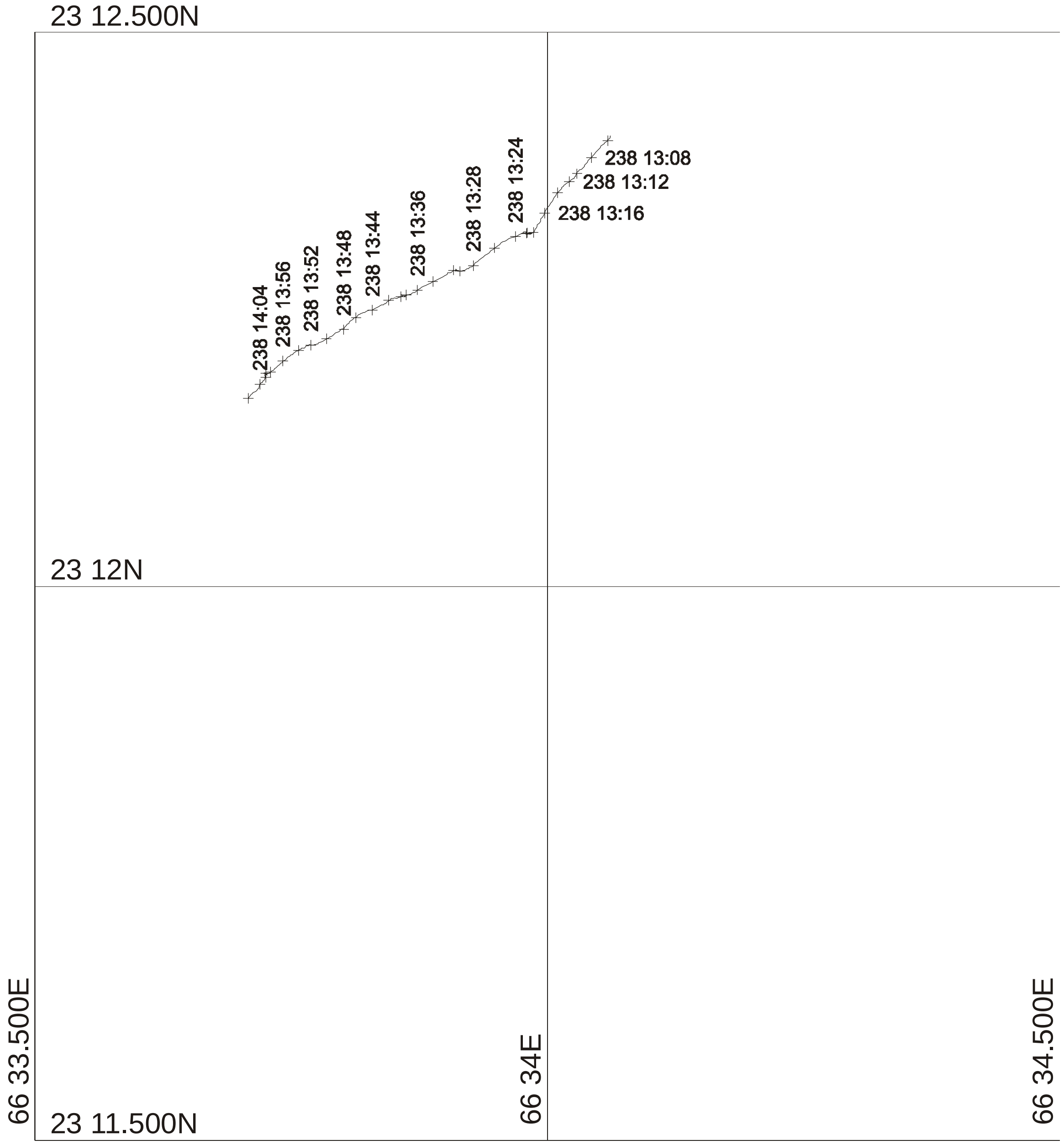
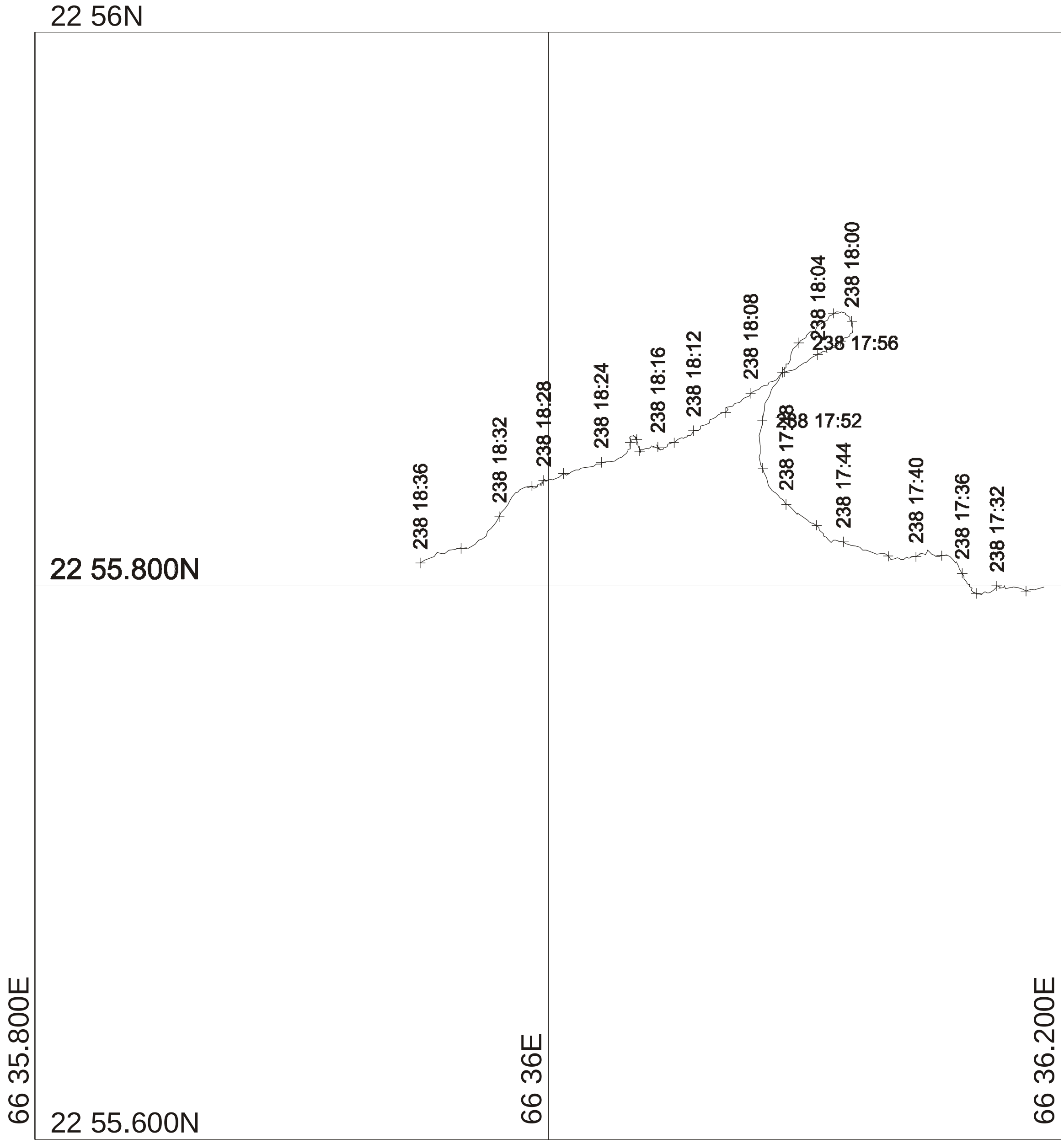


MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVERY 56008#1



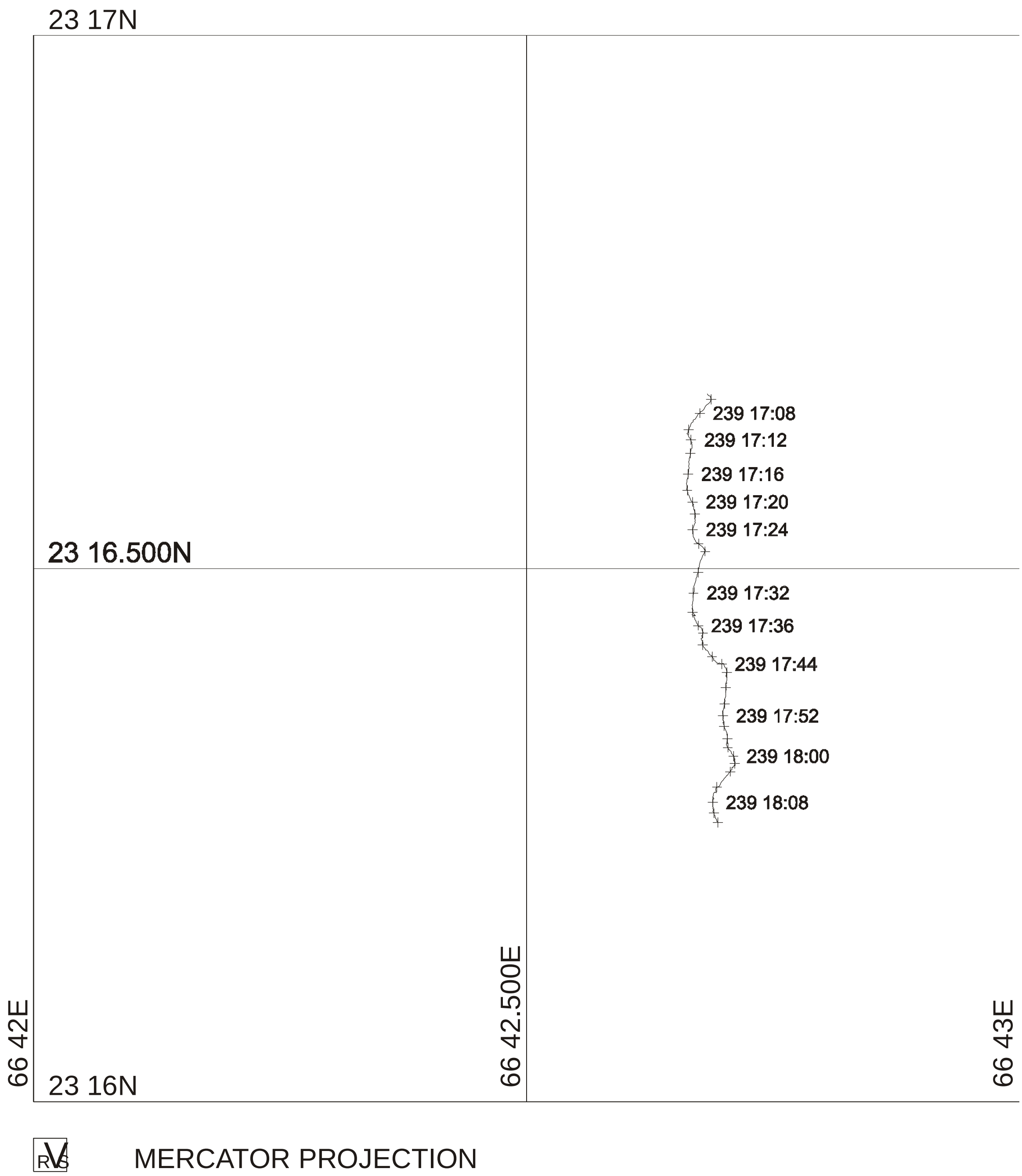
RVS

MERCATOR PROJECTION

SCALE 1 TO 5000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56009#1



MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

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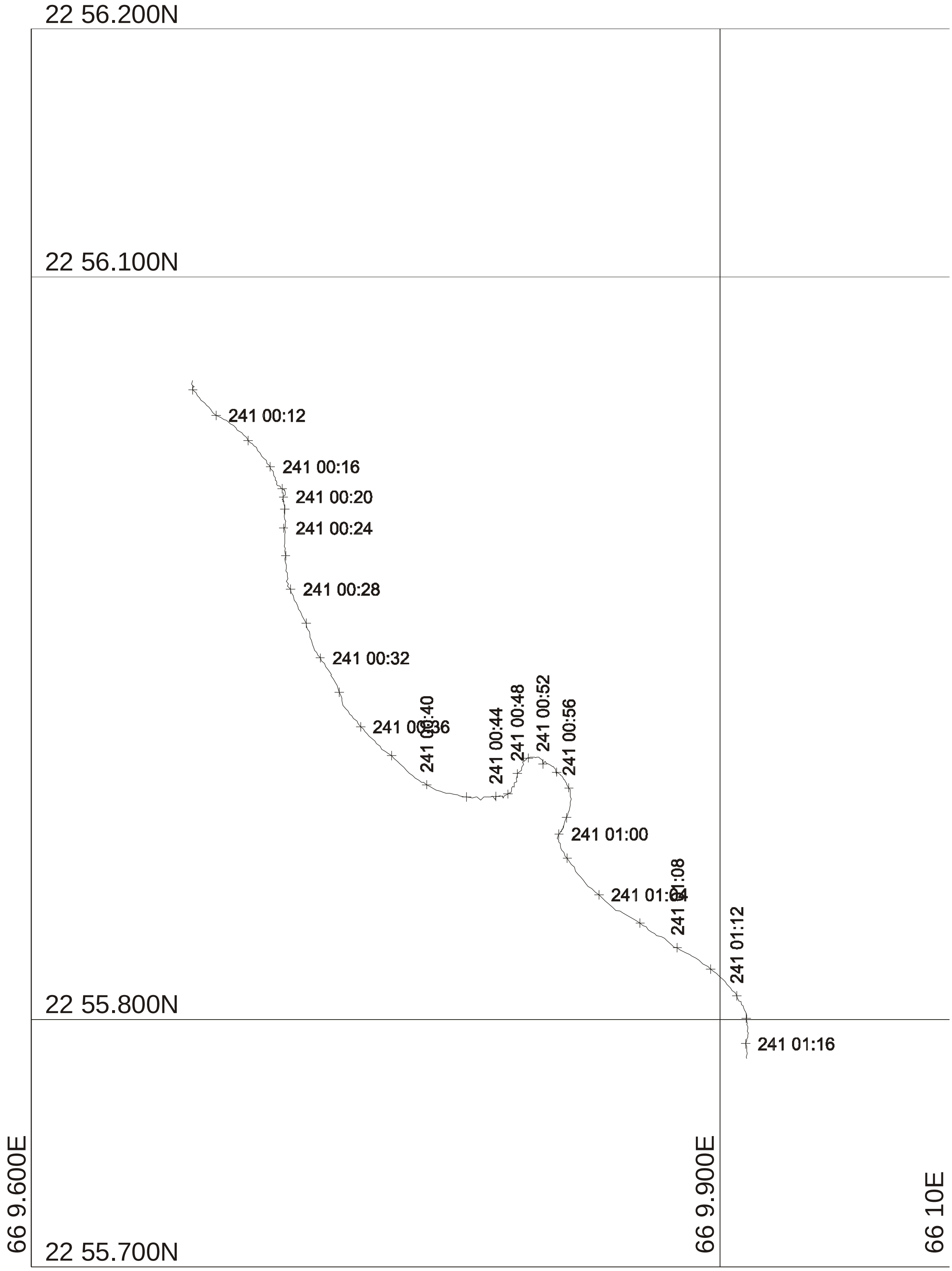
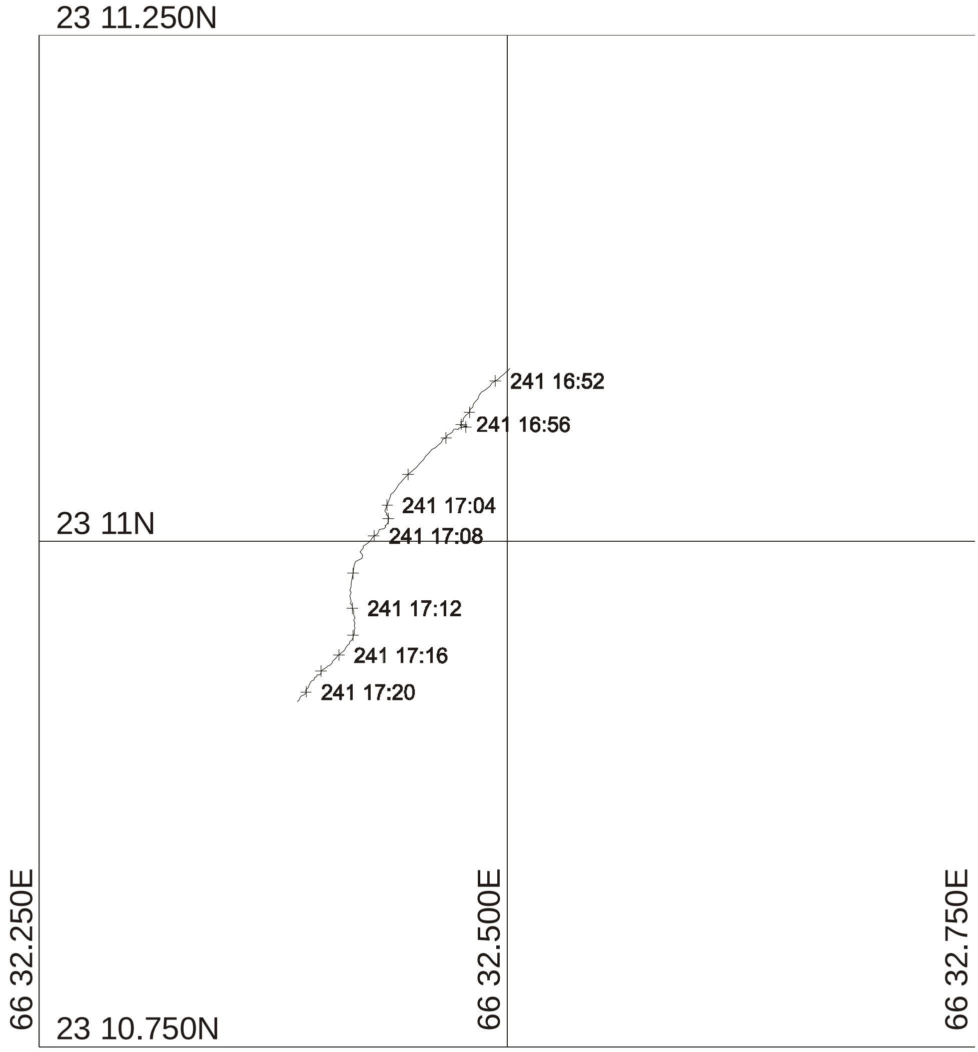


RVS MERCATOR PROJECTION

SCALE 1 TO 5000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP STATION: 56018#1



MERCATOR PROJECTION

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INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

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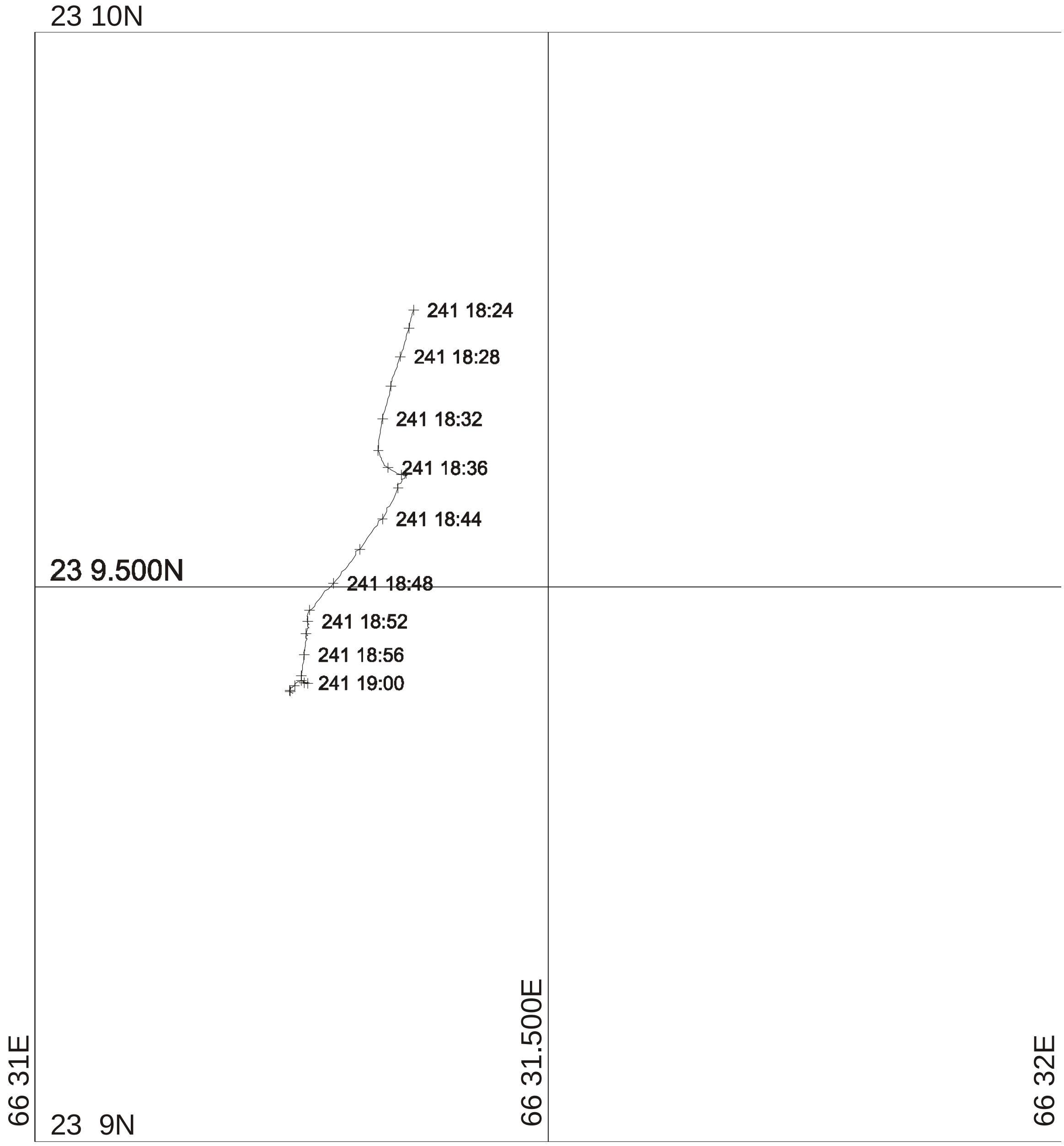

MERCATOR PROJECTION

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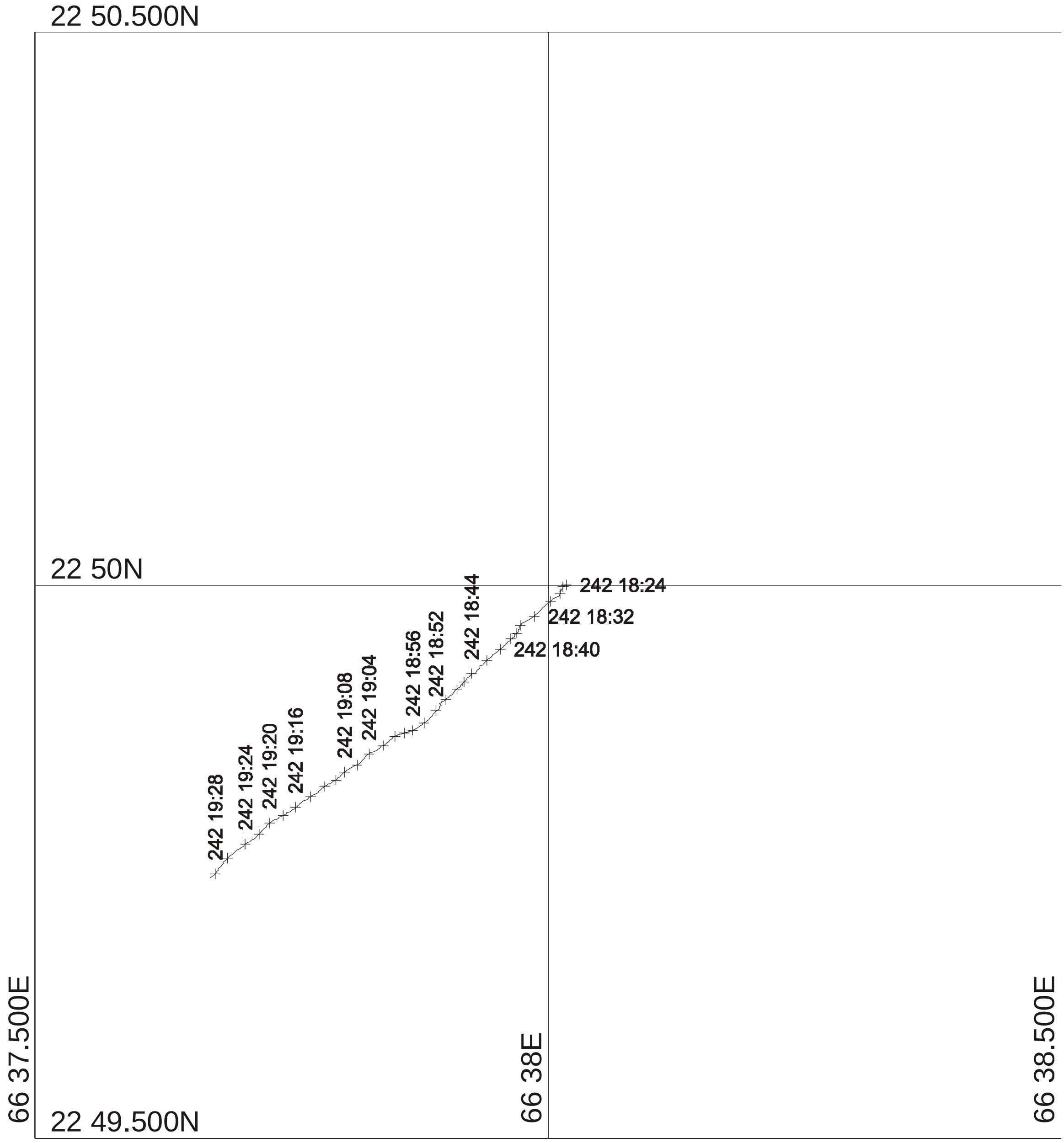
INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVERY: 56023#1

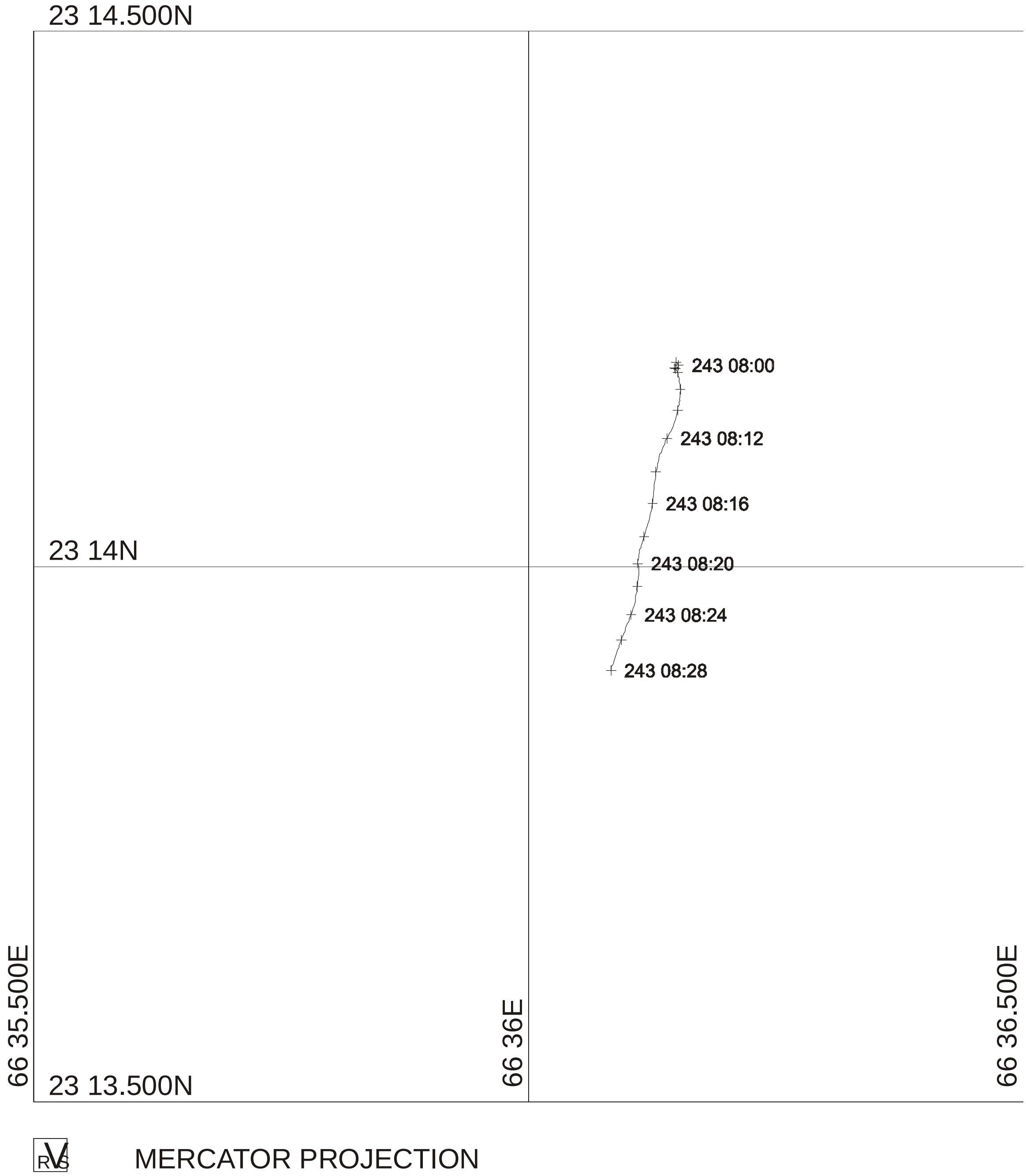


MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56026#1

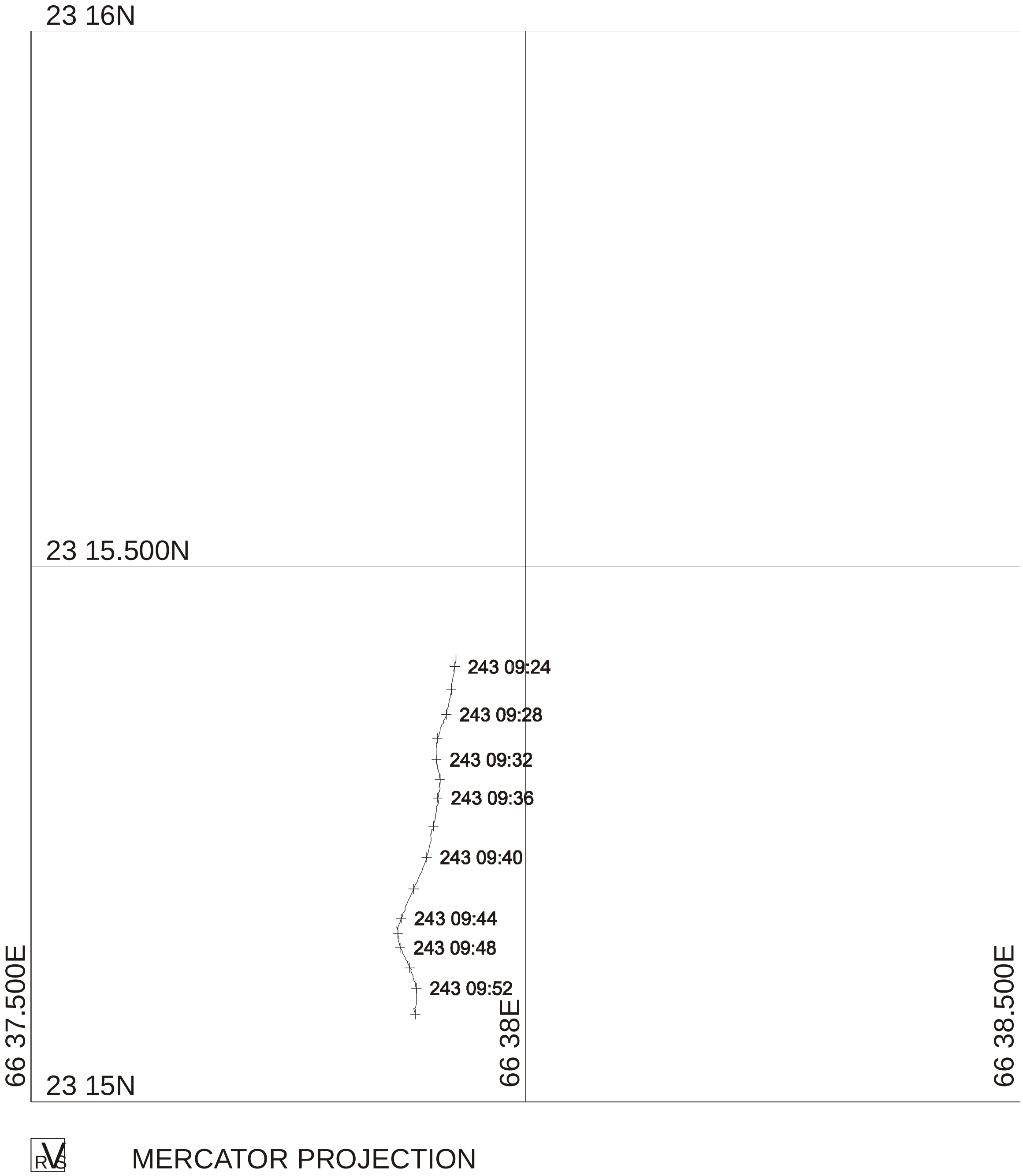


MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVERY 56029#1



MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

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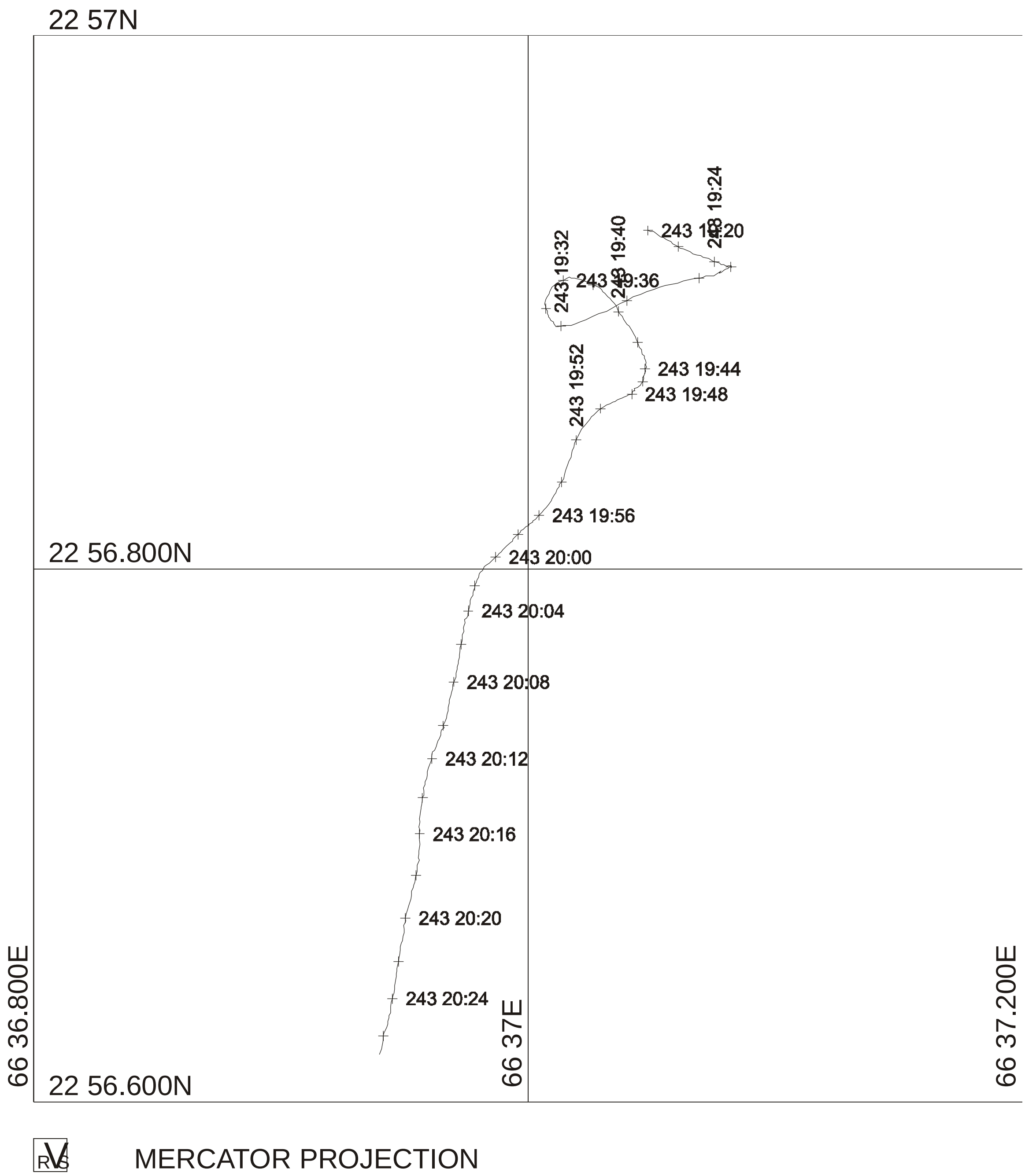
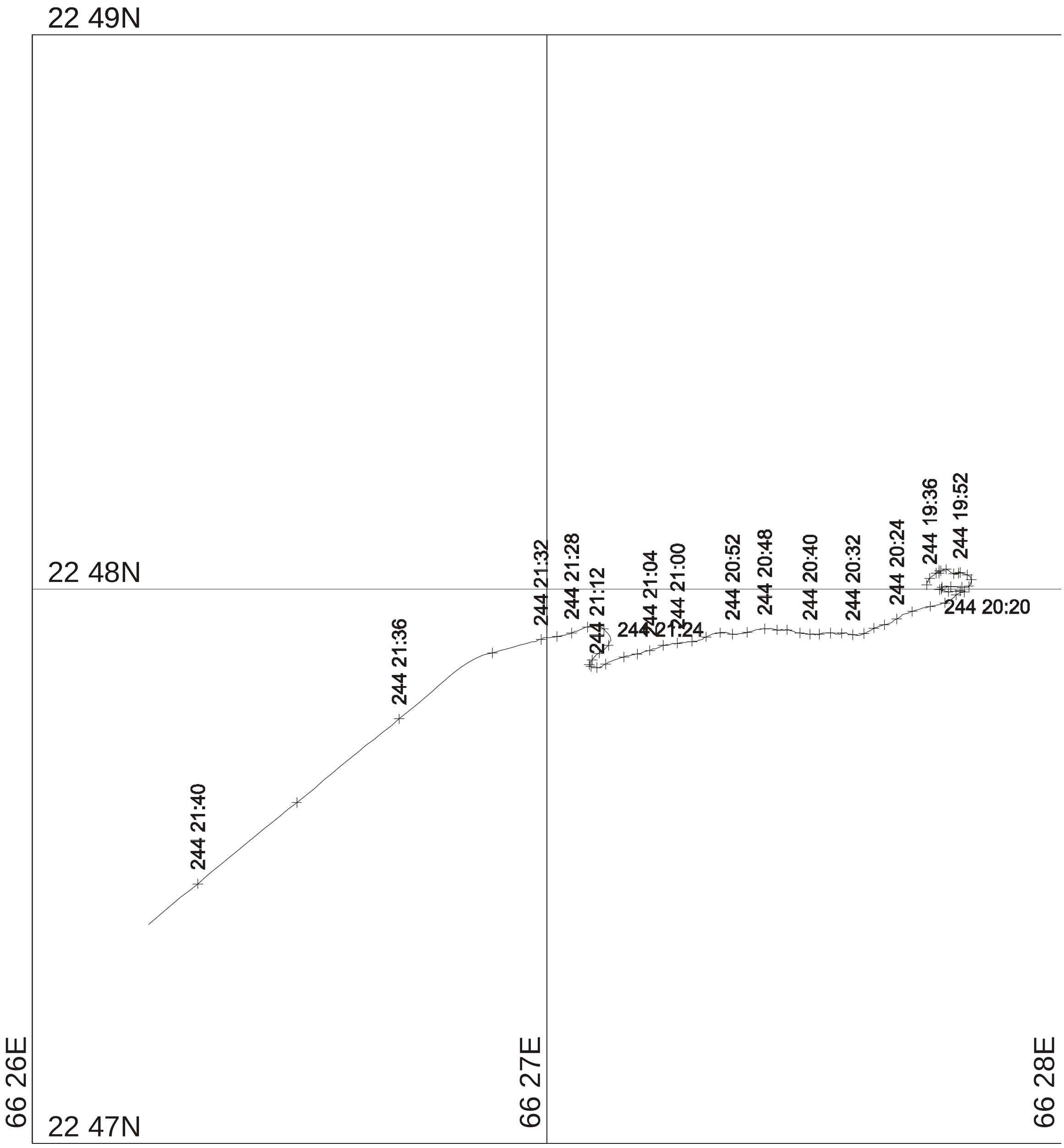


MERCATOR PROJECTION

SCALE 1 TO 5000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY: 56032#1

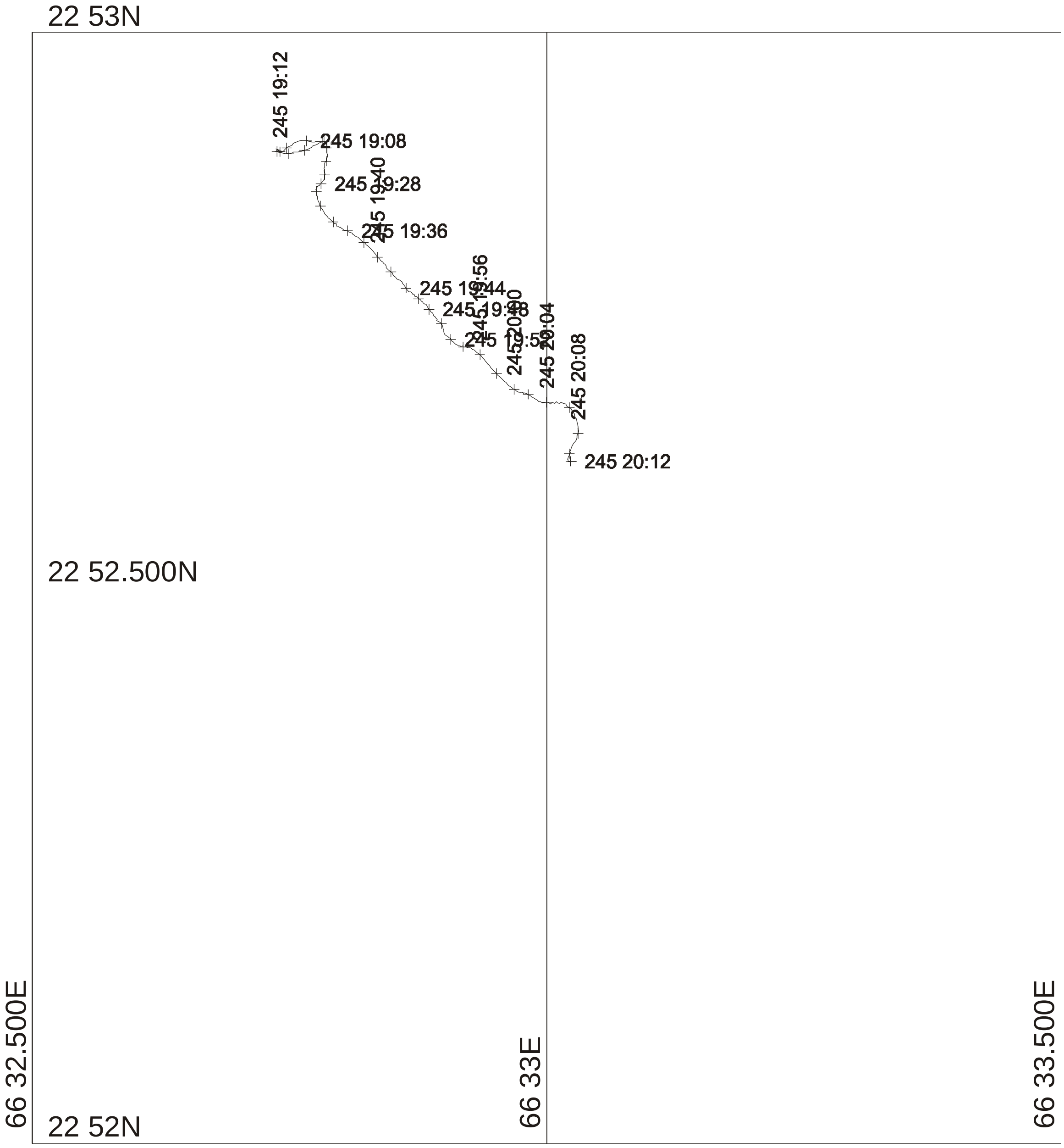


MERCATOR PROJECTION

SCALE 1 TO 25000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY: 56034

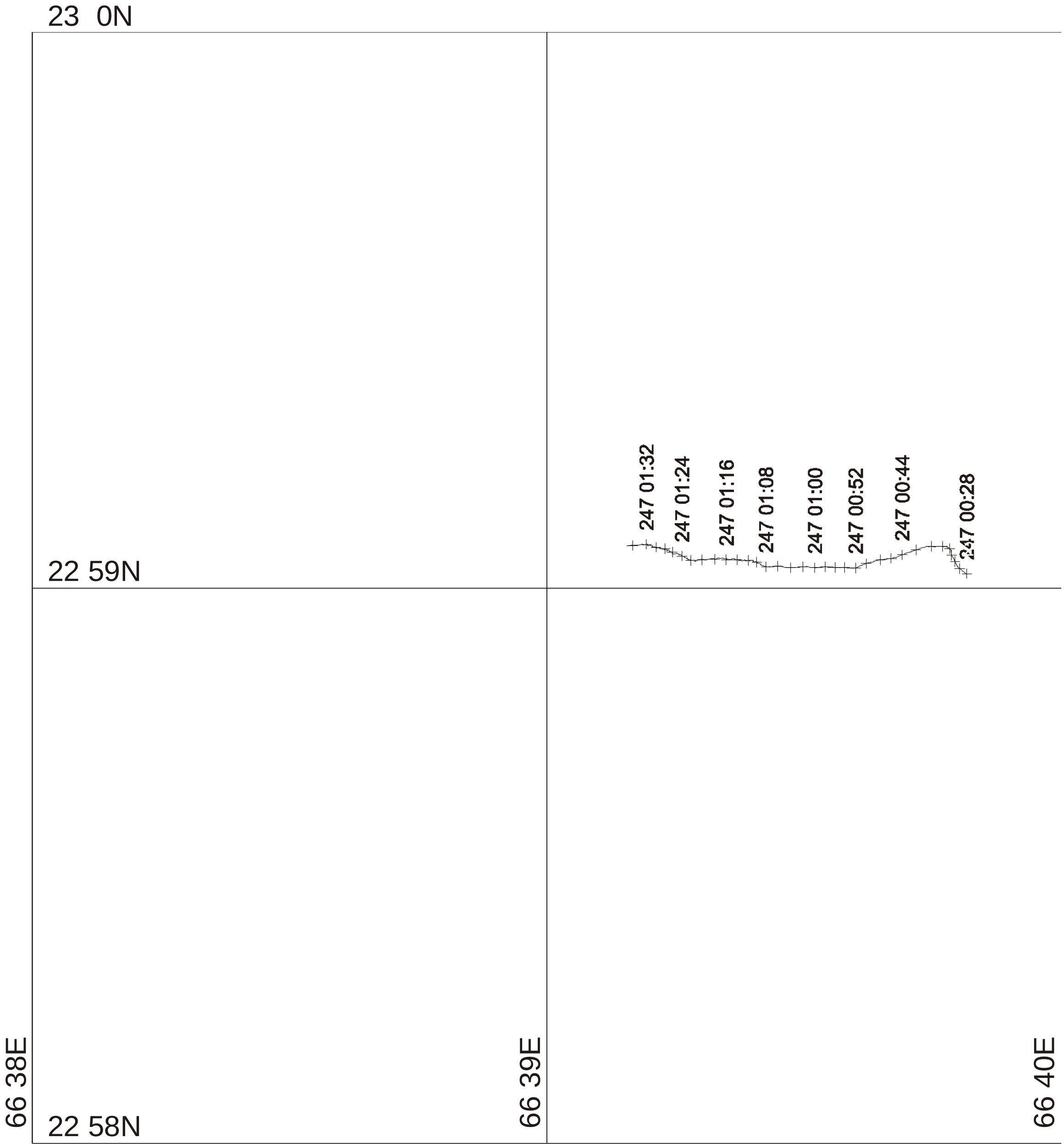


MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY: 56038

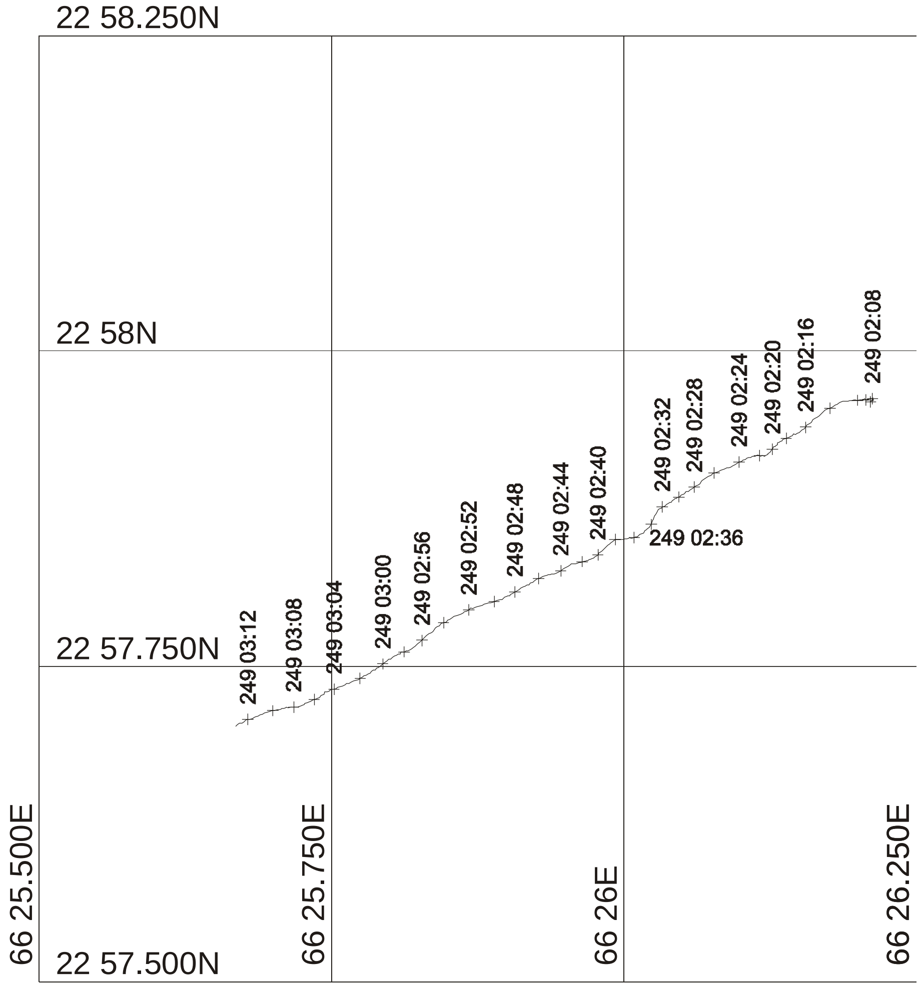


MERCATOR PROJECTION

SCALE 1 TO 25000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY: 56042

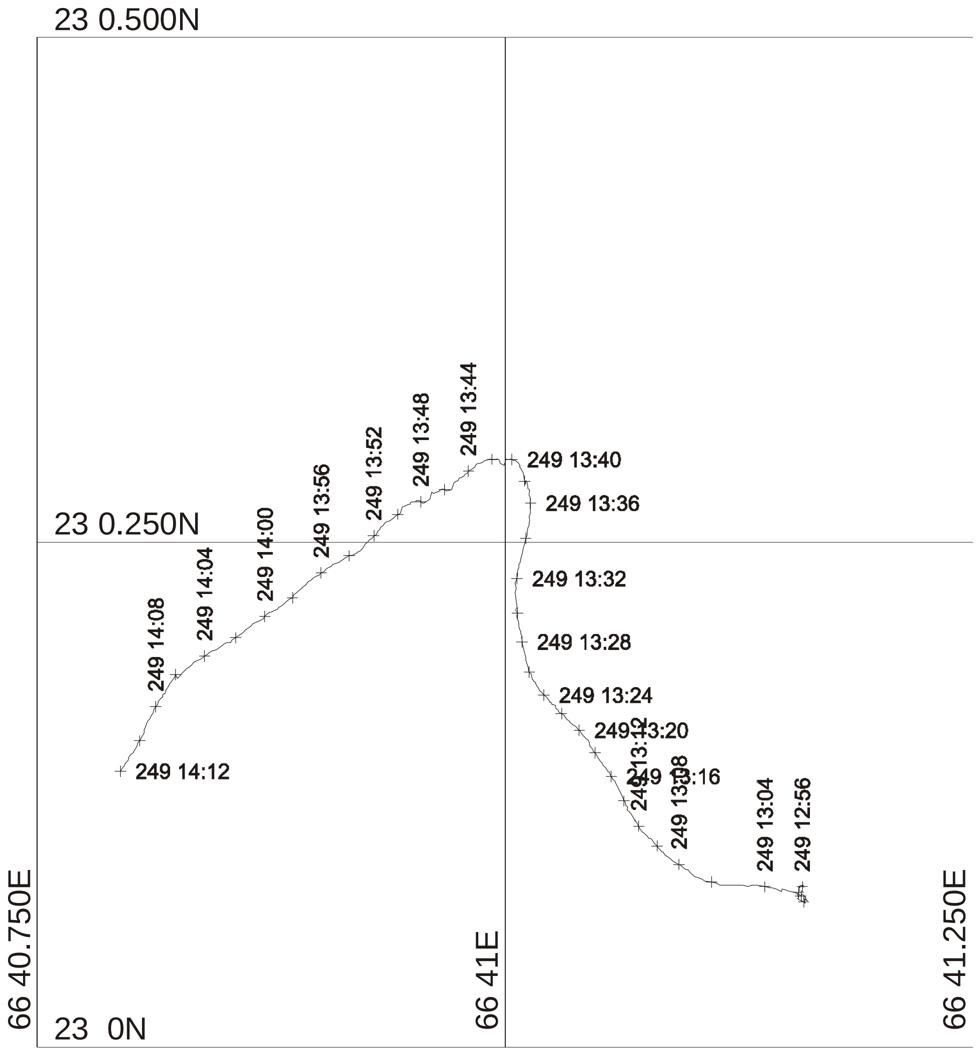


MERCATOR PROJECTION

SCALE 1 TO 12000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56050

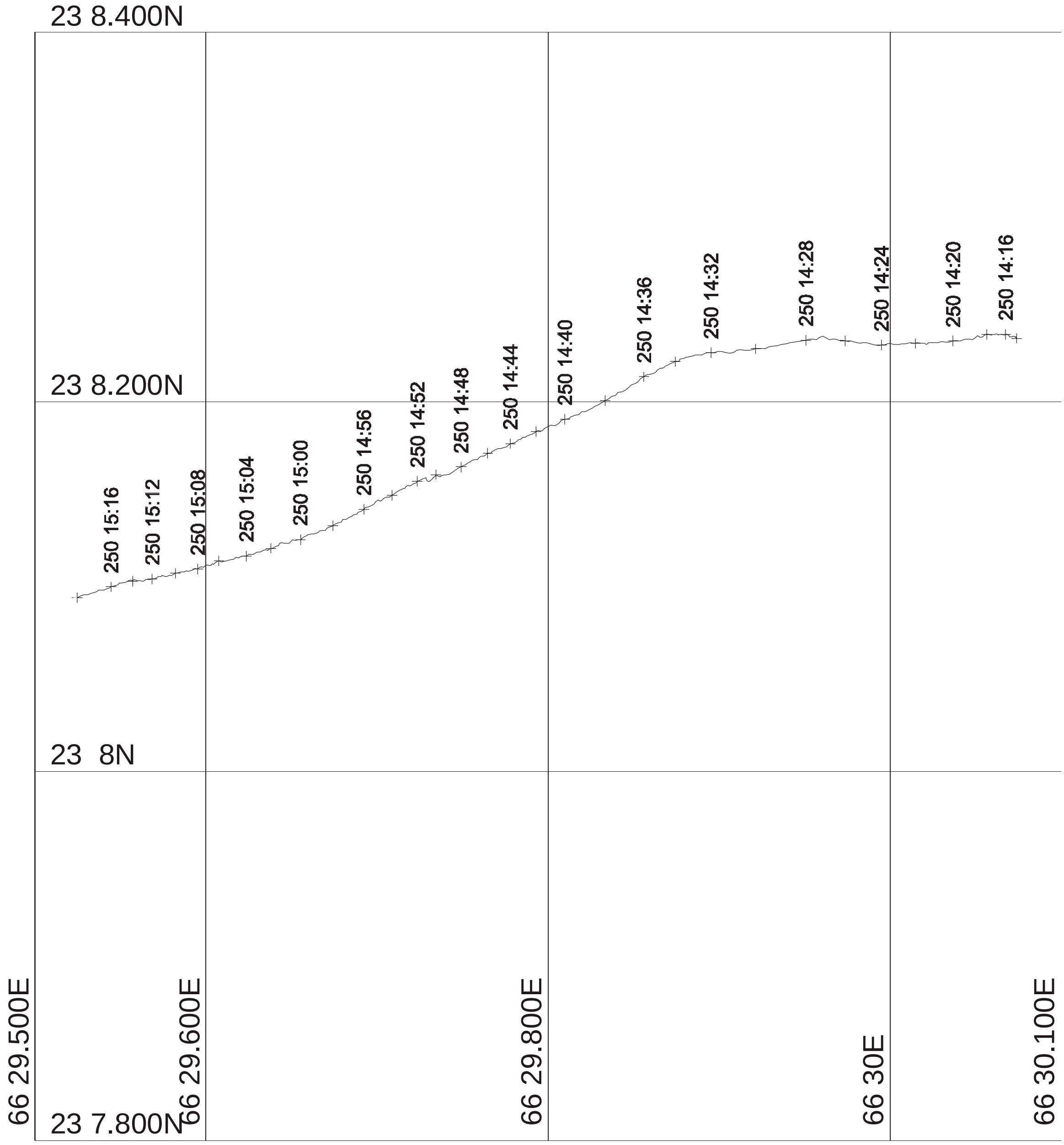


MERCATOR PROJECTION

SCALE 1 TO 7500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP_SURVEY 56051

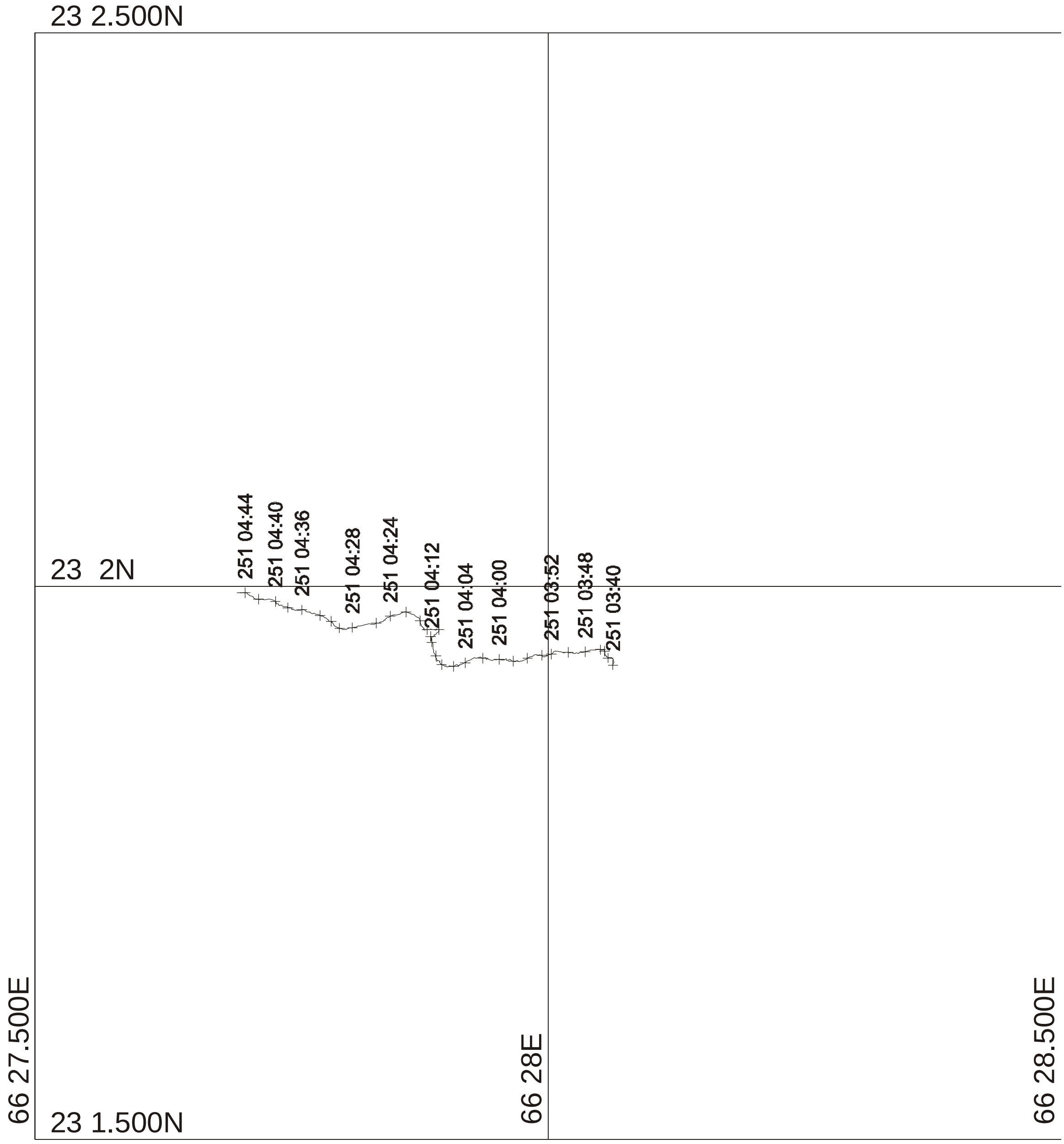


MERCATOR PROJECTION

SCALE 1 TO 7500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56055



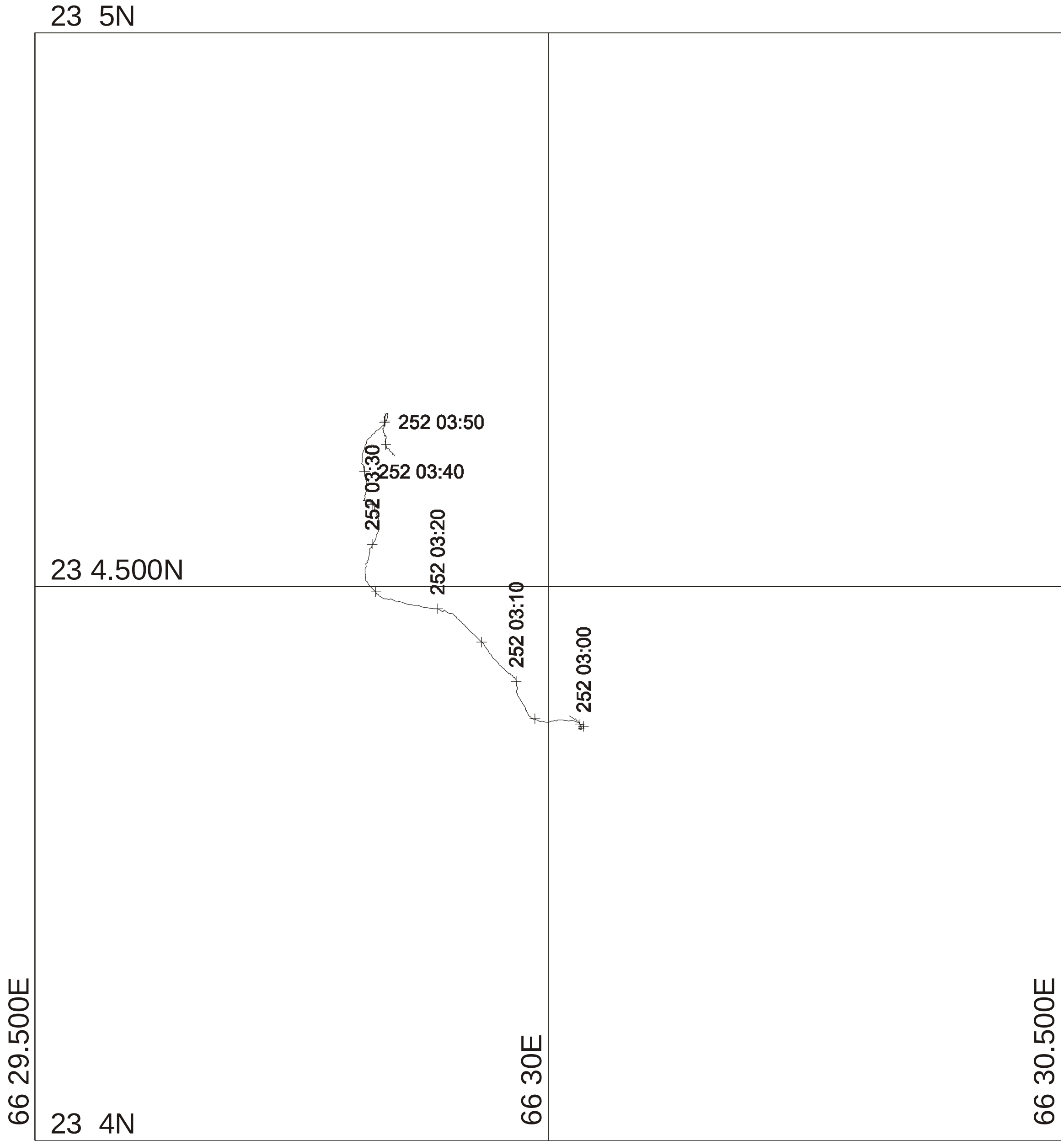
RVS

MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVERY 56057

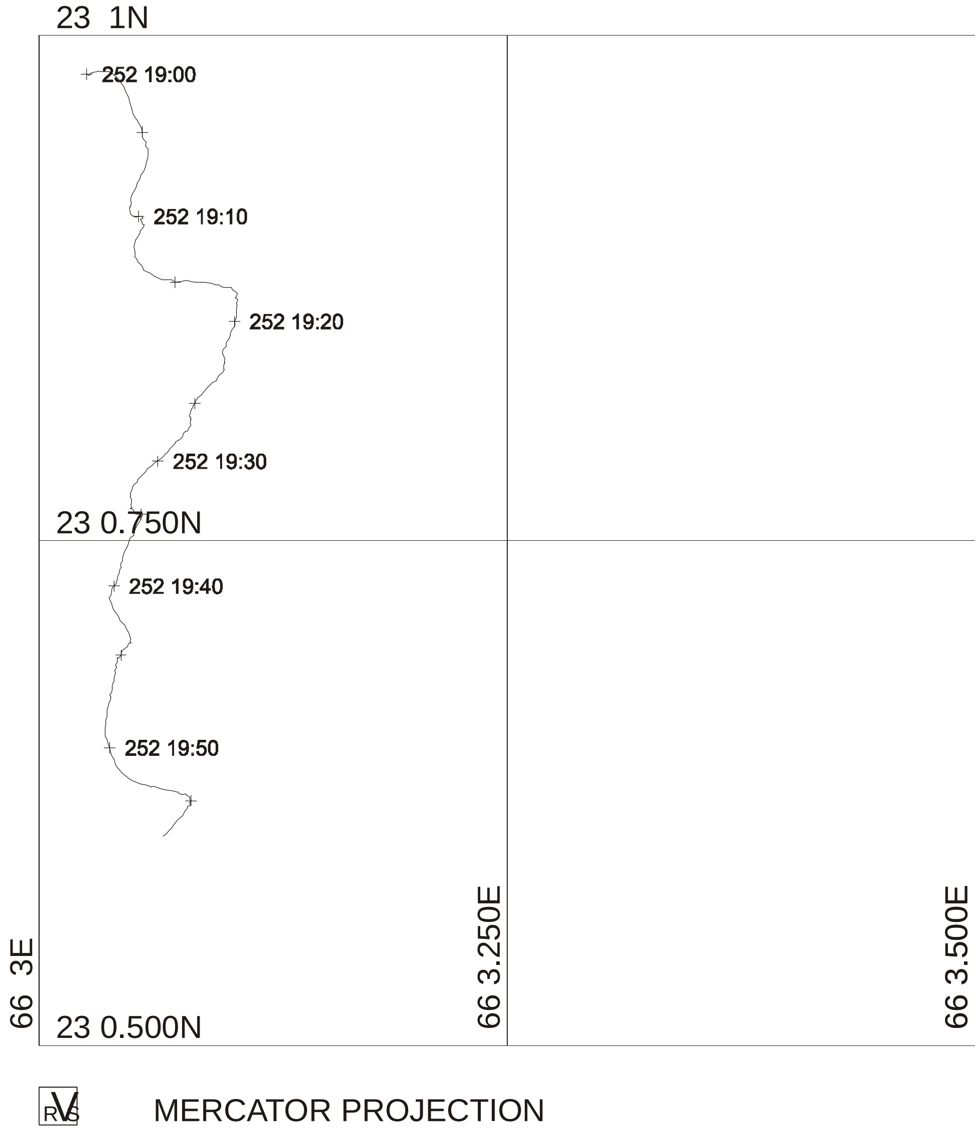


MERCATOR PROJECTION

SCALE 1 TO 12500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56061#1

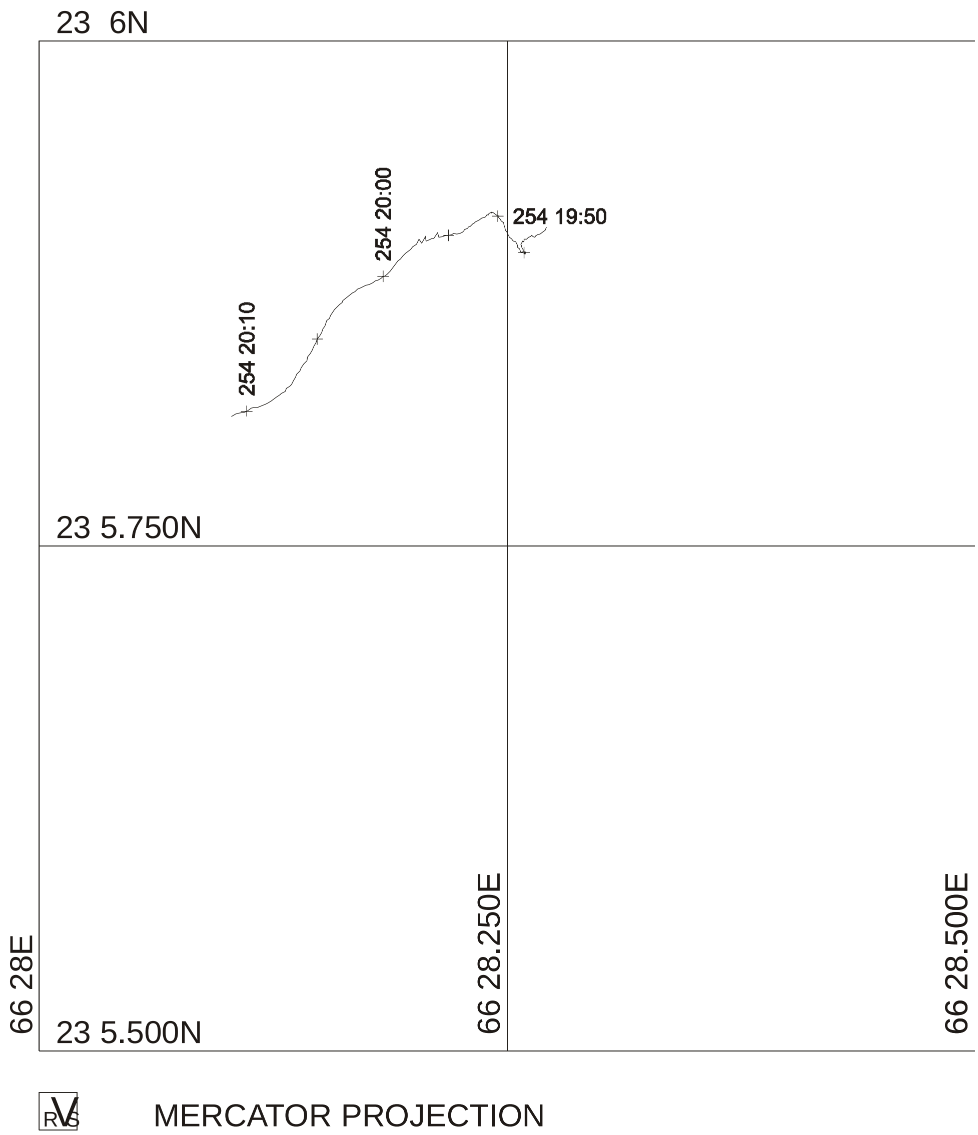


MERCATOR PROJECTION

SCALE 1 TO 7500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56064#1

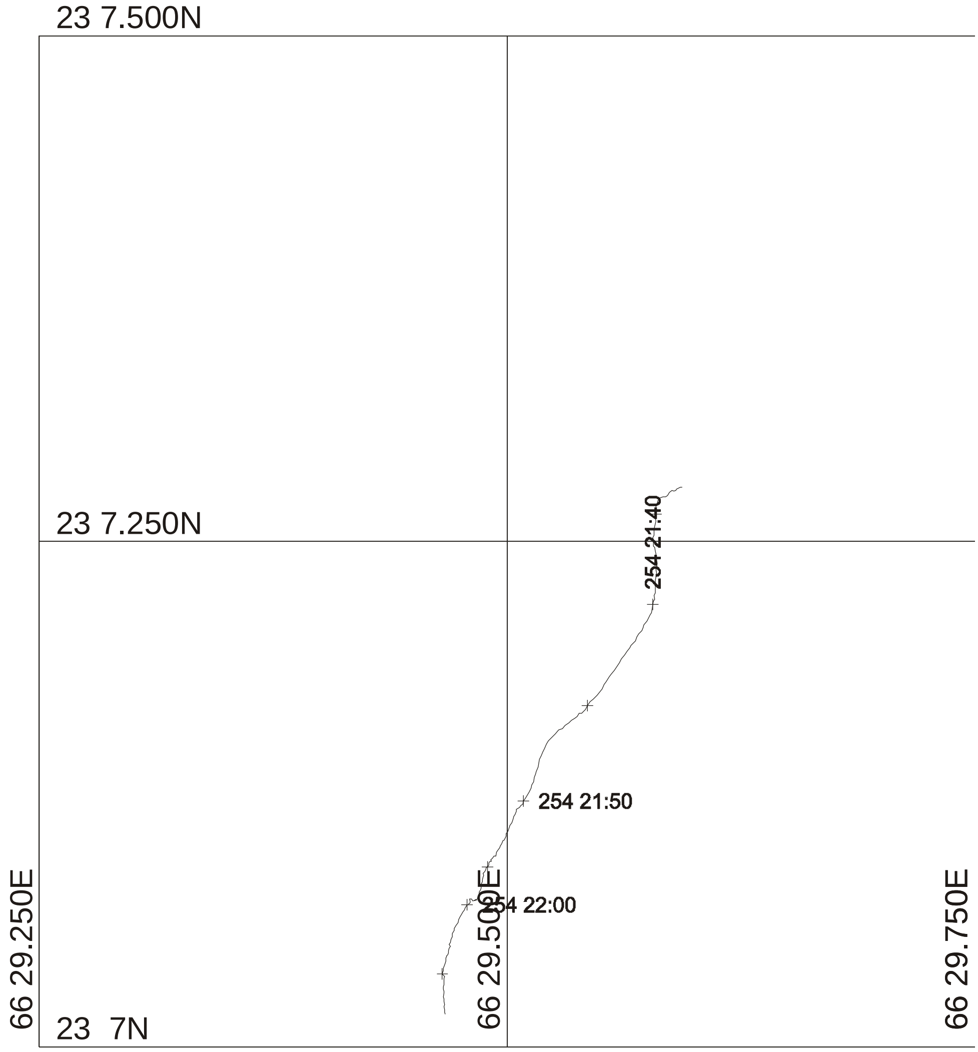


MERCATOR PROJECTION

SCALE 1 TO 7500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56073#1



MERCATOR PROJECTION

SCALE 1 TO 7500 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

WASP SURVEY 56074#1

13. And Finally

Bacterial Mat
(by Bo Thruster, copyright 2003 etc etc)

This might be the tale of Bacterial Mat
Who walked round the ship in a yellow hard hat
But if said character proves too elusive
And if the audience doesn't get too abusive
It will become a big thankyou
To the Master, the Officers and all the Crew
Who took us where we wanted to go
Through waves and wind and whirling snow
(Sorry, but I don't think its a crime
To bend the truth for the sake of a rhyme)

Subject: Charles Darwin CD one five oh,
Object: Please tell me I really don't know.
We've been bouncing around on the Indian Ocean
For day after day, with scarcely a notion
Of what's coming next, is it trawling or coring
Or CTD? Well, its never been boring;
With Brian to tell us what to do next
There's been no time at all for us to get vexed.
Its been up to the shallows and down to the deep
And there's been enough mud to make a man weep,
But we've found our solace up in the bar
Though it has to be said, you cannot get far
On three units a day; I've been feeling dry
But Malcolm's salts have kept me quite spry:
That and the mountain of food that I ate -
I must go on a diet before its too late.

(I should add here, if you're female I fear
That two units is all you will get.
I'm so glad I'm a man so there's one extra can -
I need it just to make my mouth wet).

There've been quiet moments, and times that were frantic
And the sea has been more like the north east Atlantic
But things settled down to a kind of routine -
Breakfast, lunch, dinner, some work in between.
And when the sun came out it was hard to beat
As we froze in the cold room and baked in the heat.

We watched out for wildlife over the rail
But hardly saw so much as a turtle's tail
Going by the ship. For many a day,
There were just flying fish, and we got quite blasé
About them; till the dolphins appeared
And swam at the bows as the watchers cheered.
And when Mars was high and the moon was low
We looked in vain for that phosphorescent glow.
But scarcely a sparkle disturbed the seas dark
So back to the bar, and enough of that lark.

So Rachel and Gareth, I hope the next leg
Won't drive you to drink, though it might 'cause its Greg.
As the rest of us fly away into the West
We'll salute the ship's company, say 'All the best'
For when all's said and done I've got nothing to lose
If I say that its been one helluva cruise -
I do mean that in the best possible way.
And that's just about all that I have to say ...

... But you may start to wonder what this has to do
With Bacterial Mat. If you're asking the noo,
'What of that hero'? Well, if you insist,
Bacterial Mat ... just doesn't exist.

Southampton Oceanography Centre
Waterfront Campus
European Way
Southampton SO14 3ZH
United Kingdom
Tel: +44(0) 23 8059 6666
Fax: +44(0) 23 8059 6667