

RV Investigator Voyage Plan

Voyage #:	IN2018_V03		
Voyage title:	Integrated Marine Observing System: monitoring of East Australian Current property transports at 27°S		
Mobilisation:	Hobart, Wednesday 04 April – Thursday 05 April, 2018 Brisbane, Wednesday 18 April, 2018		
Depart:	Brisbane, 0800 Thursday 19 April, 2018		
Return:	Brisbane, 1200 Thursday, 10 May 2018		
Demobilisation:	Brisbane, Friday, 11 May 2018		
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Project name:	N/A		
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Scientific objectives

The East Australian Current (EAC) is a complex and highly energetic western boundary system of the South Pacific Ocean off eastern Australia. It closes the South Pacific subtropical gyre, transporting heat, salt and other nutrients southward and onto the continental shelf. Off Brisbane (27°S) the EAC, is north of the high eddy variability region, approaches its maximum strength and is relatively uniform and coherent. The mooring array is located near the existing long-term XBT transect and satellite altimetry ground tracks. The aim of this observing system is to capture the mean and time-varying flow of the EAC.

This EAC mooring array is a component of IMOS. These observations will provide an intensive reference set of measurements of the EAC over a sustained period for improved understanding of the relationship of EAC with the basin-scale South Pacific gyre, its impact of the coastal marine ecosystem, and validation and interpretation of the current system in numerous climate and ocean models.

Voyage objectives

This voyage will recover and re-deploy an array of six full-depth current meter and property (temperature, salinity and pressure) moorings from the continental slope to the abyssal waters off Brisbane (27°S). The observing system is designed to capture the mean and time-varying flow of the EAC. In order to resolve interannual and decadal signals we aim to maintain multi-year deployments of the array.

We will also undertake CTD/O₂ and numerous Triaxus and ship ADCP sections across the EAC mooring line and to the north and south of the mooring line. These operations will occur in between the mooring operations and at the completion of the mooring operations. We will also undertake a number of CTD cast to test the performance of a new induction salinity sensor. These sensors (2000 m) and (6000 m) depth rated instrument are self contained instruments and will be strapped to the rosette frame in a location closest to the seabird 9+ sensor unit.

We will use the 24-bottle rosette with the lowered ADCPs (150 kHz and 300 kHz) attached. We will collect salinity and oxygen samples for calibration of the CTD salinity and oxygen sensors, and nutrient (silicate, phosphate and nitrate) samples.

The following specific objectives will be performed:

1. Recover and deploy moorings at appropriate locations
2. Complete CTD/rosette stations at each mooring location, with LADCP
3. Complete a number of Triaxus and Ship ADCP sections along the mooring line
4. Complete a SADCPC/triaxus bow survey surrounding the mooring array.
5. Complete approximately 10-15 2000 m and full-stations to assess a new conductive salinity sensor. These stations will be completed at mooring locations during non-mooring operations days and at the eastern corners of the box survey.

	EAC_500 (M1)	EAC_2000 (M2)	EAC_3200 (M3)	EAC_4200 (M4)	EAC_4700 (M5)	EAC_4800 (M6)
Longitude	153.8989 (153° 53.931'E)	154.0017 (154° 0.101' E)	154.1367 (154° 8.201' E)	154.2910 (154° 17.461' E)	154.6451 (154° 38.703' E)	155.2876 (155° 17.256' E)
Latitude	-27.3291 (27° 19.748' S)	-27.3175 (27° 19.048' S)	-27.2839 (27° 17.036' S)	-27.2391 (27° 14.344' S)	-27.2089 (27° 12.533' S)	-27.1069 (27° 6.414' S)
Depth	536	1879	3180	4266-10	4778	4788

Table 1. Location of moorings to be recovered.

	EAC_500 (M1)	EAC_2000 (M2)	EAC_3200 (M3)	EAC_4200 (M4)	EAC_4700 (M5)	EAC_4800 (M6)
Longitude	153.8993 (153° 53.958'E)	154.0026 (154° 0.156' E)	154.1356 (154° 8.136' E)	154.2971 (154° 17.8260' E)	154.6471 (154° 38.826' E)	155.2993 (155° 17.958' E)
Latitude	-27.327 (27° 19.620' S)	-27.3157 (27° 18.942' S)	-27.2853 (27° 17.118' S)	-27.2498 (27° 14.988' S)	-27.2086 (27° 12.516' S)	-27.102 (27° 6.120' S)
MNF Swath Depth (m) - correction	541	1887	3187-30	4266-10	4777-10	4791-10
Build depth	541	1887	3157	4256	4767	4781

Table 2. Location of mooring to be deployed

	Latitude	Longitude
In-shore	-27.33 (27° 19.8' S)	153.8 (153° 48' E)
Off-shore	-27.10 (27° 6'S)	155.35 (155° 21' E)

Table 3. On-shore and off-shore locations of SADCP/Triaxus line along the mooring line

	Latitude	Longitude
Southwest corner	-28.0 (28° 0'S)	153.75 (153° 45'E)
Southeast corner	-27.9 (27° 54'S)	155.3 (155° 18'E)
Northeast corner	-26.5 (26° 30'S)	155.3 (155° 18'E)
Northwest corner	-26.35 (26° 21'S)	153.75 (153° 45'E)

Table 4. On-shore and off-shore locations of SADCP/Triaxus line along the mooring line

Operational Risk Management

- Mooring deployment and recovery
The planned operations with moorings have been identified as potentially high risk work and will therefore trigger MNF procedures for potentially high risk operations including toolbox meeting before each operation, operational summary meeting immediately following each operation. Moorings will include a rehearsal of high risk activities and will carry out all moorings operations in alignment with the Moorings Procedure.
- CTD operations
Support staff and ASP crew involved in the CTD operations have completed risk assessments of this work, and will be signing onto deck Job Safety Analysis and Safe Work Instructions, specific for this task.
- Triaxus tows (Tow speed 6-8 knots)
Due to the level of risk associated of towing the Triaxus (Lines under tension), main deck access will be restricted during periods of Triaxus towing. As a result, Triaxus operations have been scheduled between 1800 – 0700, on completion of daily moorings operations, in addition, main deck exclusion zones will be demarked to allow for auxiliary mooring operations (i.e. Cleaning/ maintenance) as required, during Triaxus towing periods.

Overall activity plan including details for first 24 hours of voyage

The general plan is a staged recovery and redeployment of the six EAC moorings along the mooring deployment line. We will undertake a CTD stations prior to recovery of moorings and after a mooring deployment and a few additional stations (approximately 15 CTDs). We will also undertake a number (approximately 10-15) CTD stations to test a new conductive salinity sensors. Therefore, there we will undertake at approximately 30-35 CTD stations on the voyage. We will also complete a number of Triaxus and ship ADCP sections along the mooring line during the voyage and complete a closed box survey once mooring operations have been completed.

First 24 hours

Steam from Brisbane to pilot stations and then steam directly to the location of the first mooring operation, EAC_4800 recovery site (M6_R) -27.1069 S, 155.2876 E. During the transit to the mooring recovery site we will undertake a rehearsal of mooring operations (for example anchor and syntactic sphere movements and lifts) and training for science personnel undertaking water sampling. We will also continue to setup the deck, mooring gear and instruments. We will undertake a CTD station at the location of EAC_4800 recover site (M6_R) prior to beginning our first mooring recovery operation.

Voyage track example

Figure 1: Voyage track including location of moorings, CTD stations, SADCPC/Triaxus line along mooring array, and Triaxus/SADCP box survey surrounding the mooring array. Additional instrument sensor evaluation stations will occur at specific mooring sites and at the eastern corners of the box survey.

Waypoints and stations



Table 2. List of waypoints, ship ADCP line, mooring operations (recover (_R) and deploy (_D)) and CTD stations at mooring locations. The time given is the time for each operation. Please refer to Table 3 (Time Estimates) for actual planned daily schedule as mooring operations will be conducted between the hours of 0600 and 1700hrs. Transit times are based on a steaming speed of 10 knots, Triaxus/SADCP lines are based on tow speed of 6-8 knots. Triaxus/SADCP and SADCP sections will be undertaken between mooring operations, and Triaxus operations will be between 1600-0600 hours to ensure no one is working below the live tow-wire.

	Decimal Latitude	Decimal Longitude	Distance (nm)	Total Distance (nm)	Steaming/ CTD/ mooring time (hrs)	Total time (hrs)
Brisbane	-27.48	153.13	0	0	0	0
Colandra	-26.8	153.5	45.3	45.3	6	6
Transit EAC_4800 recovery site (M6_R)	-27.107	155.288	97.4	152.7	9.7	15.7
CTD @ EAC_4800 (M6_R)	-27.107	155.288	0	152.7	3.9	19.6
Recover EAC_4800 (M6_R)	-27.107	155.288	0	152.7	8.0	27.6
Transit EAC_4700 recovery site (M5_R)	-27.209	154.645	35.4	188.1	3.5	11.5

	Decimal Latitude	Decimal Longitude	Distance (nm)	Total Distance (nm)	Steaming/CTD/ mooring time (hrs)	Total time (hrs)
CTD @ EAC_4700 (M5_R)	-27.209	154.645	0	188.1	3.9	15.4
Transit EAC_4200 recovery site (M4_R)	-27.239	154.291	18.8	206.9	1.9	17.3
CTD @ EAC_4200 recovery site (M4_R)	-27.239	154.291	0	206.9	1.9	19.2
Transit CTD station	-27.158	154.939	36.2	243.1	4.0	23.2
CTD @ location	-27.158	154.939	0	243.1	3.5	26.7
Transit EAC_4800 deploy site (M6_D)	-27.102	155.299	17.7	260.8	2.0	28.7
Deploy EAC_4800 (M6_D)	-27.102	155.299	0	260.8	10.0	38.7
CTD @ EAC_4800 (M6_D)	-27.102	155.299	0	260.8	3.9	42.6
Transit EAC_4700 (M5_R)	-27.209	154.645	35.4	296.2	3.5	46.1
Recovery EAC_4700 (M5_R)	-27.209	154.645	0	296.2	8.0	54.1
Transit to offshore beginning of SADCP line and begin SACP line	-27.10	155.35	38.4	334.6	4.7	58.5
End SADCP line	-27.33	153.8	83.8	418.1	10.5	69.3
Transit to EAC_4700 (M5_D) deployment site	-27.209	154.647	39.6	457.7	4.7	74.0
Deploy EAC_4700 (M5_D)	-27.209	154.647	0	457.7	10.0	84.0
CTD @ EAC_4700 (M5_D)	-27.209	154.647	0	457.7	3.9	87.9
Transit to EAC_4200 (M4_R)	-27.239	154.291	18.8	476.5	2.0	89.9
Instrument sensor evaluations CTDs	-27.239	154.291	0	476.5	10.0	99.9
Recover EAC_4200 (M4_R)	-27.239	154.291	0	476.5	8.0	107.9
Transit to inshore beginning of Triaxus/SADCP line and begin Triaxus/SACP line	-27.33	153.8	26.9	503.4	2.8	110.7
End Triaxus/SADCP line and recover Triaxus	-27.10	155.35	83.8	587.2	10.5	121.2
Transit to EAC_4200 (M4_D) deploy site	-27.249	154.297	54.2	641.4	5.5	129.7

	Decimal Latitude	Decimal Longitude	Distance (nm)	Total Distance (nm)	Steaming/ CTD/ mooring time (hrs)	Total time (hrs)
Instrument sensor evaluations CTDs	-27.249	154.297	0	641.4	10	139.7
Deploy EAC_4200 (M4_D)	-27.249	154.297	0	641.4	10	149.7
CTD @ EAC_4200	-27.249	154.297	0	641.4	3.6	153.3
Transit to EAC_3200 (M3_R) recovery site	-27.283	-154.137	8.9	650.3	1	154.3
CTD @ EAC_3200 recovery site	-27.283	-154.137	0	650.3	3.0	157.3
Recover EAC_3200 (M3_R)	-27.283	-154.137	0	650.3	7.0	164.3
Transit to off-shore edge of SADCP line and begin SADCP transect	-27.10	155.35	63.1	704.5	6.5	170.8
End SADCP transect	-27.33	153.8	83.8	788.3	10.5	181.3
Transit to EAC_500 (M1_R) recovery site	-27.329	153.898	3	791.3	0.5	181.8
CTD @ EAC_500 (M1_R)	-27.329	153.898	0	791.3	1.4	182.2
Transit to EAC_2000 (M2_R) recovery site	-27.318	154.001	5.5	796.8	0.7	182.9
CTD @ EAC_2000 (M2_R)	-27.318	154.001	0	796.8	2.2	185.1
Transit to EAC_3200 (M3_D) deployment site	-27.285	154.136	7.3	804.1	0.8	185.9
Deploy EAC_3200 (M3_D)	-27.285	154.136	0	804.1	8.0	193.9
CTD @ EAC_3200 (M3_D)	-27.285	154.136	0	804.1	3.0	196.9
Transit EAC_2000 (M2_R) recovery site	-27.318	154.001	7.3	811.4	0.8	197.7
Recover EAC_2000 (M2_R)	-27.318	154.001	0	811.4	6.0	203.7
Transit to EAC_500 (M1_R) recovery site	-27.329	153.898	5.5	816.9	0.5	204.2
Recover EAC_500 (M1_R)	-27.329	153.898	0	816.9	3.0	207.2
Transit to in-shore edge of Triaxus/SADCP line and begin Triaxus/SADCP transect	-27.33	153.8	3	819.9	0.5	207.7
End Triaxus/SADCP transect	-27.10	155.35	83.8	903.7	10.5	218.2
Transit to EAC_2000 (M2_D) deployment location	-27.316	154.002	75.3	979.0	10	228.2
Deploy EAC_2000 (M2_D)	-27.316	154.002	0	979.0	6.0	234.2
CTD@ EAC_2000 (M2_D)	-27.316	154.002	0	979.0	2.2	236.4

	Decimal Latitude	Decimal Longitude	Distance (nm)	Total Distance (nm)	Steaming/CTD/ mooring time (hrs)	Total time (hrs)
SADCP overnight			X	979.0+X	T	236.4+T
Transit to EAC_500 (M1_D) deployment site	-27.327	153.899	Y	979.0+X+Y	TZ	236.4+T+T Z
Deploy EAC_500 (M1_D)	-27.327	153.899	0	979.0+X+Y	3.0	239.4+T+T Z
CTD @ EAC_500 (M1_D)	-27.327	153.899	0	979.0+X+Y	1.4	240.8+T+T Z
Transit to southwest corner of Triaxus/SADCP box	-28.0	153.75	41.2	1020.2+X+ Y	4.0	244.8+T+T Z
Begin southern edge of Triaxus/SADCP box	-28.0	153.75	0	1020.2+X+ Y	0	244.8+T+T Z
End southern edge of Triaxus/SADCP box	-27.9	155.3	96	1116.2+X+ Y	12	256.8+T+T Z
Instrument sensor evaluations CTDs	-27.9	155.3	0	1116.3+X+ Y	9	265.8+T+T Z
Begin eastern edge of box	-27.9	155.3	0	1116.2+X+ Y	0	265.8+T+T Z
End eastern edge of box	-26.5	155.3	78	1194.2+X+ Y	10	275.8+T+T Z
Instrument sensor evaluations CTDs	-26.5	155.3	0	1194.2+X+ Y	9	284.8+T+T Z
Begin northern edge of box	-26.5	155.3	0	1194.2+X+ Y	0	284.8+T+T Z
End northern edge of box	-26.75	153.75	96	1290.2+X+ Y	12	296.8+T+T Z
<u>IF TIME PERMITS</u>						
Transit to inshore location of mooring line Triaxus/SADCP line	-27.33	153.8	58.8		6	
Start Triaxus/SADCP or SADCP line	-27.33	153.8	0		0	
End Triaxus/SADCP or SADCP line	-27.1	155.35	83.8		10.5	
Transit to Pilot station at Colandra	-26.8	153.5	?		?	
Transit Brisbane	-27.48	153.13	45.3		4.5	

Time estimates

The following time estimates are based on a steaming speed of 11 knots.

Date	Time	Activity																																																								
04-05 April	0800-1700	Load shipping containers on the back deck. Setup CSIRO mooring winch and test working order. Setup back deck for mooring operations and unload instruments into dirty wet lab and sheltered science area. The specific working order for the mobilisation day for crane lifts is:																																																								
		<table border="1"> <thead> <tr> <th>Task/Equipment</th> <th>Weight</th> <th>Number of lifts</th> <th>Estimated Time (min)</th> </tr> </thead> <tbody> <tr> <td>Load Mooring weights x 18</td> <td>1.5 T</td> <td>18</td> <td>120</td> </tr> <tr> <td>Load Pallets of SBE37s x 2</td> <td>425 kg</td> <td>2</td> <td>60</td> </tr> <tr> <td>Land shipping container</td> <td>3.5T</td> <td>1</td> <td>25</td> </tr> <tr> <td>Landing open half height container x 2</td> <td>4.5T</td> <td>2</td> <td>60</td> </tr> <tr> <td>Land shipping container</td> <td>2.4T</td> <td>1</td> <td>25</td> </tr> <tr> <td>Land anchor container on ship deck</td> <td>8.5T</td> <td>1</td> <td>25</td> </tr> <tr> <td>Load Syntatic floatation sphere with current meters installed x 9</td> <td>550 kg</td> <td>9</td> <td>100</td> </tr> <tr> <td>Load Syntatic floatation sphere x 2</td> <td>450 kg</td> <td>2</td> <td>30</td> </tr> <tr> <td>Load cube rack</td> <td>600 kg</td> <td>1</td> <td>25</td> </tr> <tr> <td>Load pallet of releases</td> <td>600 kg</td> <td>1</td> <td>25</td> </tr> <tr> <td>Load spoolers x 3</td> <td>200 kg</td> <td>3</td> <td>45</td> </tr> <tr> <td>Load Pallet of spools x 3</td> <td>350 kg</td> <td>3</td> <td>45</td> </tr> <tr> <td></td> <td></td> <td>Total time (hrs)</td> <td>9.75</td> </tr> </tbody> </table>	Task/Equipment	Weight	Number of lifts	Estimated Time (min)	Load Mooring weights x 18	1.5 T	18	120	Load Pallets of SBE37s x 2	425 kg	2	60	Land shipping container	3.5T	1	25	Landing open half height container x 2	4.5T	2	60	Land shipping container	2.4T	1	25	Land anchor container on ship deck	8.5T	1	25	Load Syntatic floatation sphere with current meters installed x 9	550 kg	9	100	Load Syntatic floatation sphere x 2	450 kg	2	30	Load cube rack	600 kg	1	25	Load pallet of releases	600 kg	1	25	Load spoolers x 3	200 kg	3	45	Load Pallet of spools x 3	350 kg	3	45			Total time (hrs)	9.75
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		Full containers will be loaded onto the vessel, as per the deck plan (see figure 2). Syntatic spheres will be loaded onto the deck and moved to storage positions. We will also hand carry on a number																																																								

Date	Time	Activity
18 April (Mobilisation Brisbane)	0800- 1700	<p>of instrument boxes. Instrument will be secured on tables in the dirty wet lab and sheltered science area.</p> <p>Science crew will unload, store and secure equipment.</p> <p>Test mooring winch is in working order. If required, reorganise back deck. Secure all gear. Completed equipment load and setup</p>
19 April (Day 1)	0800 1400	<p>Depart Brisbane</p> <p>Offload pilot at Colandra and transit to beginning Ship ADCP transect.</p> <p>During transit to EAC_4800 (M6) mooring recovery site. Enroute continue to setup the back deck and undertake a rehearsal of mooring operations</p>
20 April (Day 2)	0300 0700 0730 1600 2000	<p>Arrive at EAC_4800 (M6_R) recovery site and begin CTD 1 at mooring site</p> <p>Complete the CTD station and hold the mooring toolbox in preparation for mooring recovery</p> <p>Begin mooring recovery operation (M6_R)</p> <p>Complete mooring recovery operations. Clean back deck and instruments. Begin transit to EAC_4700 (M5_R) recovery site</p> <p>Arrive EAC_4700 (M5_R) recovery site and begin CTD 2</p>
21 April (Day 3)	0200 0500 0900 1300 1700 2100 2300	<p>Complete CTD 2 at EAC_4700 (M5_R). Begin transit to EAC_4200 (M4_R) recovery site</p> <p>Arrive EAC_4200 (M4_R).</p> <p>Begin CTD 3 at EAC_4200 (M4_R) recovery site.</p> <p>End CTD 3 at EAC_4200 (M4_R) recovery site. Begin transit to CTD 4 (-27.158, 154.939, mid-point between M6 and M5)</p> <p>Arrive CTD 4 station. Begin CTD</p> <p>End CTD 4. Transit to EAC_4800 (M6_D) deployment site</p> <p>Arrive EAC_4800 (M6_D) deployment site. Assess weather and current condition and plan vessel setup for mooring operations.</p> <p>During the day the mooring and deck crew will spool-off the recovered EAC_4800 mooring lines and spool-on the EAC_4800 deployment line. They will clean and prepare deck for next</p>

Date	Time	Activity
		mooring operation. The science team will begin to download data and clean instruments. Recovered cleaned instruments will be packed and stored.
22 April (Day 4)	0700 0800 1800 2200	Mooring toolbox meeting Begin to Deploy EAC_4800 (M6_D) Complete mooring deployment operation. Triangulate mooring position and begin CTD 5 Complete CTD. Transit to EAC_4700 (M5_R) recovery site.
23 April (Day 5)	0700 0800 1600 2000	Mooring recovery toolbox meeting Begin recovery of EAC_4700 (M5_R) Complete recovery of EAC_4700 (M5_R). Begin transit to offshore location of Triaxus/SADCP line. Arrive offshore locations, deploy Triaxus and begin Triaxus/SADCP line
24 April (Day 6)	0800 1800	End Triaxus/SADCP line. Recover Triaxus. Begin transit to EAC_4700 (M5_D) deployment location Arrive EAC_4700 (M5_D) deployment location. Assess weather and current conditions and plan vessel setup for mooring operations. During the day the mooring and deck crew will spool-off the recovered EAC_4700 mooring lines and spool-on the EAC_4700 deployment line. They will clean and prepare deck for next mooring operation. The science team will begin to download data and clean instruments. Recovered cleaned instruments will be packed and stored.
25 April (Day 7)	0700 0800 1800 2200	Mooring deployment toolbox meeting Begin deployment of EAC_4700 (M5_D) Complete mooring deployment operation. Triangulate mooring position and begin CTD 6 Complete CTD 6. Transit to EAC_4200 (M4_R) recovery site.
26 April (Day 8)	0300 0800 - 1800	Arrive EAC_4200 (M4_R) recovery site Numerous instruments sensor test CTD casts

Date	Time	Activity
		During the day the mooring and deck crew will rearrange the back deck and prepare deck for next mooring operations. The science team will complete data downloads, instrument cleaning and storage of recovered instruments.
27 April (Day 9)	0400 0700 0800 1600 1900	Assess weather and current conditions and plan vessel setup for mooring operations. Mooring recovery toolbox meeting Begin recovery of EAC_4200 (M4_R) Complete recovery of EAC_4200 (M4_R). Begin transit to inshore location of Triaxus/SADCP line. Arrive inshore location of Triaxus/SADCP line. Deploy triaxus and begin line
28 April (Day 10)	0700 1300 1330- 2000	End Triaxus/SADCP line. Recover Triaxus. Begin transit to EAC_4200 (M4_D) deployment location Arrive EAC_4200 (M4_D) deployment location Numerous instruments sensor test CTD casts During the day the mooring and deck crew will spool-off the recovered EAC_4200 mooring lines and spool-on the EAC_4200 deployment line. They will clean and prepare deck for next mooring operation. The science team will begin to download data and clean instruments. Recovered cleaned instruments will be packed and stored.
29 April (Day 11)	0400 0700 0800 1600	Assess weather and current conditions and plan vessel setup for mooring operations. Mooring deployment toolbox meeting Begin deployment of EAC_4200 (M4_D) Complete mooring deployment operation. Triangulate mooring position and begin CTD 7. Move to EAC_3200 (M3_R) recovery location.
30 April (Day 12)	0200 0500 0700	Arrive EAC_3200 (EAC3_R) recovery location. Assess weather and current conditions and plan vessel setup for mooring operations. Begin CTD 8 at EAC_3200 (EAC3_R) site. Mooring recovery toolbox

Date	Time	Activity
	0800 0900 1600	Complete CTD 8 Begin recovery of mooring Complete mooring recovery. Transit to off-shore edge SADCP line.
1 May (Day 13)	0100 1100 1300 1530	Arrive off-shore edge of SADCP line. Begin SADCP line at 8 knots End SADCP line. Transit to EAC_500 (M1_R) recovery site and begin CTD 9 End CTD 9. Transit to EAC_2000 (M2_R) recovery site and begin CTD 10 End CTD 10. Begin transit to EAC_3200 (M3_D) deployment location During the day the mooring and deck crew will spool-off the recovered EAC_3200 mooring lines and spool-on the EAC_3200 deployment line. They will clean and prepare deck for next mooring operation. The science team will begin to download data and clean instruments. Recovered cleaned instruments will be packed and stored.
2 May (Day 14)	0200 0700 0800 1600	Arrive EAC_3200 (M3_D) deployment location. Assess weather and current conditions and plan vessel setup for mooring operations. Mooring deployment toolbox meeting Begin deployment of EAC_3200 (M3_D) Complete mooring deployment operation. Triangulate mooring position and begin CTD 11. Transit to EAC_2000 (EAC2_R) location
3 May (Day 15)	0200 0600 0700 1300 1400 1800	Arrive EAC_2000 (EAC2_R) recovery location. Assess weather and current conditions and plan vessel setup for mooring operations. Mooring recovery toolbox Begin recovery of mooring Complete mooring recovery operation. Move to EAC_500 (EAC1_R) recovery location. Begin recovery of EAC_500 (EAC1_R)

Date	Time	Activity
	1830	<p>Complete mooring recovery. Transit to in-shore end of Triaxus/SADCP line.</p> <p>Deploy triaxus and begin triaxus/SADCP line</p>
4 May (Day 16)	0800 1800	<p>End Triaxus/SADCP line. Recover Triaxus. Begin transit to EAC_2000 (M2_D) deployment location</p> <p>Arrive EAC_2000 (EAC2_D) deploy site</p> <p>During the day the mooring and deck crew will spool-off the recovered EAC_2000 and EAC_500 mooring lines and spool-on the EAC_2000 and EAC_500 deployment line. They will clean and prepare deck for next mooring operation. The science team will begin to download data and clean instruments. Recovered cleaned instruments will be packed and stored.</p>
5 May (Day 17)	0400 0700 0800 1400 1430	<p>Arrive EAC_2000 (EAC2_D) deployment location. Assess weather and current conditions and plan vessel setup for mooring operations.</p> <p>Mooring deployment toolbox</p> <p>Begin deployment of mooring</p> <p>Complete mooring deployment operation. Triangulate mooring position and complete CTD 12.</p> <p>Ship ADCP section along the mooring line. Plan length such that back at EAC_500 (EAC1_D) deployment location for mooring operations by 0400 6 May</p>
6 May (Day 18)	0500 0700 0800 1400 1800	<p>Arrive EAC_500 (EAC1_D) deployment location. Assess weather and current conditions and plan vessel setup for mooring operations.</p> <p>Mooring deployment toolbox</p> <p>Begin deployment of mooring</p> <p>Complete mooring deployment operation. Triangulate mooring position and complete CTD 13. Transit to southeast corner of Triaxus/SADCP box survey</p> <p>Start southern edge of Triaxus/SADCP box</p>
7 May (Day 19)	0700	Complete southern box line. Recover

Date	Time	Activity
	0800-1700	Numerous instruments sensor test CTD casts
	1800	Being eastern edge of Triaxus/SADCP of box
8 May (Day 20)	0400	Arrive north-eastern corner of Triaxus/SADCP box. Recover Triaxus
	0700-1700	Numerous instruments sensor test CTD casts
	1800	Deploy Triaxus and begin northern edge of Triaxus/SADCP box
	2200	Complete northern edge of box.
9 May (Day 21)	0600	End northern edge of Triaxus/SADCP box. Recover triaxus. Transit to inshore edge of triaxus/SADP line.
	1200	Arrive inshore location
		Complete a final Triaxus/SADCP tow or SADCP section along the mooring line beginning at the inshore location (-27.33, 153.8) to offshore (-27.10, 155.35) or as far along line as possible given time available.
10 May (Day 22)	0600	Arrive pilot station, Pick up pilot, begin transit to Brisbane
	1200	Arrive Brisbane

Piggy-back projects (if applicable)

NA

Investigator equipment (MNF)

Trawl Deck Equipment and Support

- MNF netdrum spooling gear for mooring recovery – requires 4 m³ drum storage, minimum 500kg lifting capacity.
- Net drum large diameter drum dividers fitted to the net drum, (back up to CSIRO winch)
- Stern-ramp cover (“dance-floor”) without overhanging lip on aft surface installed with gap protectors and mounts for user-supplied Bull Horns fairlead.
- A-frame utility winches refitted with non-elastic polymer cables and light weight heads and lifting hooks for safe working conditions.
- Tagging line cleat attachment points fitted.
- 2 container slots free for installation of user-supplied containers and deck clear for installation

CTD Equipment and Support for 30-35 CTD stations (not all station will require full hydrochemistry analysis)

- 36-bottle CTD-rosette with 12L Niskin bottles.
- Lowered ADCP with all heads working and logging
- CTD voltage inputs calibrated to correctly log sensor inputs
- MNF supplied Hydrochemists to carry out at salinity, oxygen and nutrient analyses.
- GO-SHIP compliant CTD data processing and output files to be provided, including error estimates for oxygen and nutrient parameters
- Working winch heave compensation system

Over-the-Side Equipment

- Triaxus with various sensors (CTD, Fluorometer)

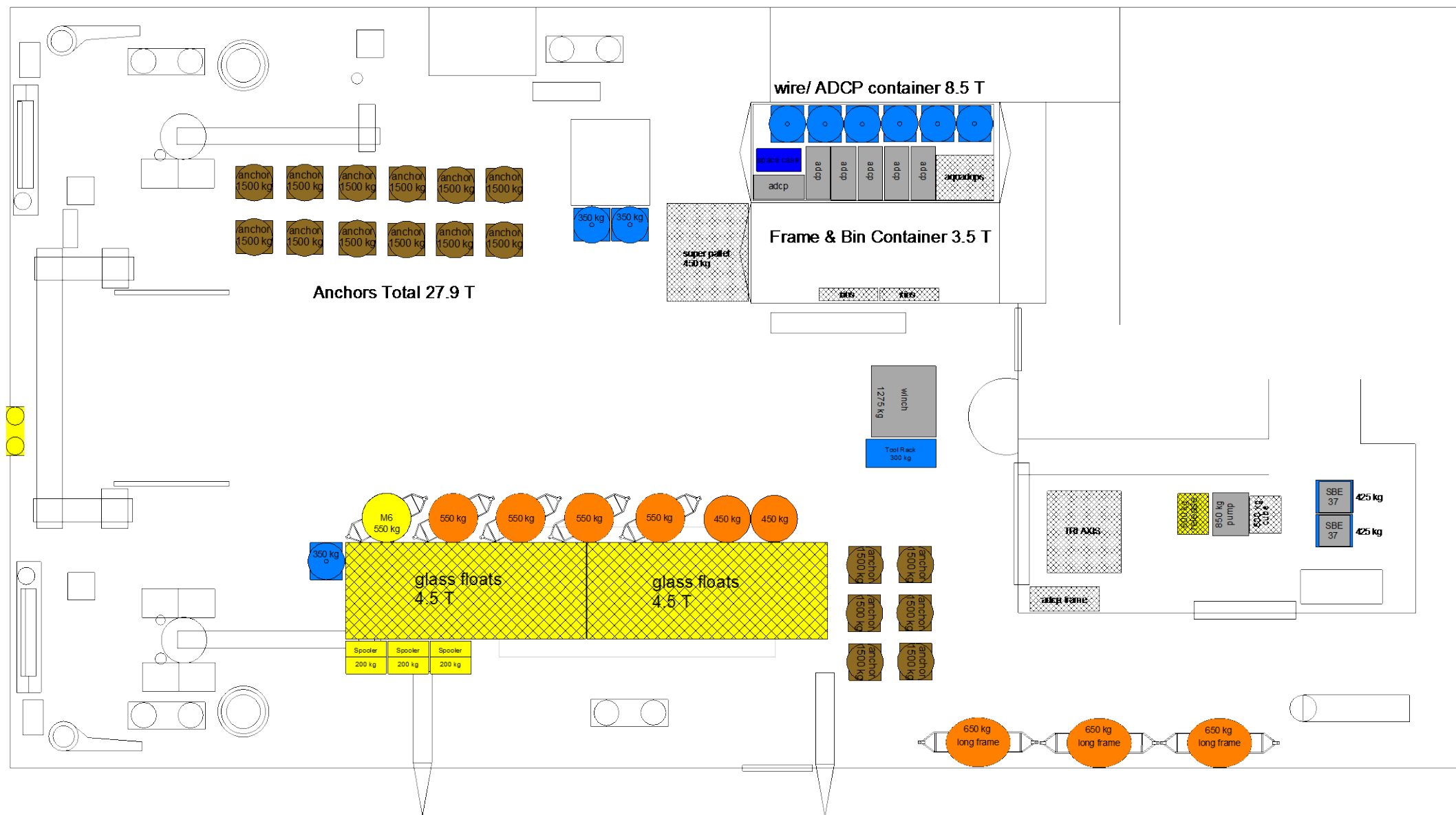
Underway Equipment and Support

- Working and logging underway echo sounder with bottom detection and real-time display
- Working and logging underway ADCP (75 KHz and 150 kHz), with real-time display
- Working and logging underway Thermosalinograph and Fluorometer and real-time display
- Working hull mounted 12 kHz transducer for use with acoustic release deck unit
- Working drop keel for Thermosalinograph
- Working and logging meteorological instruments

User Equipment

For Installation on Trawl Deck (see deck loading plan)

- Bullhorn mooring fairlead to be mounted on ship stern.
- CSIRO mooring winch - requires hydraulic leads to power supply installed in shelter-shed
- MNF net drum winch spooling gear for mooring recovery,
- 2 x half-height open-top containers to hold mooring equipment
- 2 Full height container for mooring equipment
- 18 mooring anchor stacks totalling 27t
- ~6 cage pallets of mooring equipment
- Handheld and deck mounted pneumatic line throwers (“grappling guns”)
- Video cameras installed on trawl deck
- Numerous assorted instruments (velocity, temperature, and salinity instruments)
- RBR Salinity Sensor to be mounted on 36 bottle rosette for testing.
- 150kHz Mooring ADCP to be mounted to the drop keel for real-time data collection/ display (Prior to mobilisation).



EAC 2018	Changes Initial Issue		Date 29-11-17
	Scale	Format A3	Drawn J.D
Ex Hobart & Brisbane	MPS no		App Date
	Drawing no	Revision	Projection
	Sheet: 1/1		

Figure 2. Deck plan for voyage. All user equipment will be loaded in Hobart.

Permits

Post Voyage - Mooring locations and buoy marking details will be provided to AMSA for notice to mariners.

Personnel List

List all scientific participants, their affiliation and role on the voyage (up to 40 berths).

Please list Students as Student/role.


1.	Stephen McCullum	Voyage Manager	CSIRO MNF
2.	Rod Palmer	SIT Support	CSIRO MNF
3.	Will Ponsonby	SIT Support	CSIRO MNF
4.	Jay McGlashan	SIT Support	CSIRO MNF
5.	Dave Watts	GSM Support	CSIRO MNF
6.	Steve Van Graas	DAP Support	CSIRO MNF
7.	Karl Malakoff	DAP Support	CSIRO MNF
8.	Christine Rees	Hydrochemistry Support	CSIRO MNF
9.	Julie Janssens	Hydrochemistry Support	CSIRO MNF
10.	Bernadette Sloyan	Chief Scientist	CSIRO
11.	Bec Cowley	Mooring Data Analyst	CSIRO
12.	Jim Laduke	Mooring Instrument Tech	CSIRO
13.	Jamie Derrick	Mooring Mechanical Tech	CSIRO
14.	Curt Chalk	Mooring Mechanical Tech	CSIRO
15.	Bea Pena-Molino	CTD watch stander/moorings	CSIRO
16.	Carly Tozer	CTD watch stander/moorings	CSIRO

Please note: The MNF support staff numbers in this table are the absolute minimum and the numbers will increase depending on the activities being undertaken on the voyage. It may include Hydrochemists in addition to the other groups.

RV Investigator Crew List

Rank	Surname	Given Names
Master	Highton	John
1st Mate	Nagra	Gurmukh
2nd Mate	Eakin	Brenden
3rd Mate	Edwards	Samuel
C/Engineer	Minness	Christopher
1st/Engineer	Benson	Samuel
2nd/Engineer	Sinclair	Michael
3rd/Engineer	Wright	Damien
Elec Engineer	Kinsey	Robert
CIR	Hogg	James
IR 1	Schmierer	Matthew
IR 2	Langford	Paul
IR 3	Langham	Roderick
IR 4	Bassi	Dennis
IR 5	Taylor	Peter
IR 6	Morse	Daniel
C/Caterer	Hall	Gary
C/Cook	Lade	Kyra
2nd Cook	Hughes	Adrian
2nd Caterer	Stanley	Paul

Signature

Your name	Bernadette Sloyan
Title	Chief Scientist
Signature	
Date:	28 Feb 2018

Scientific equipment and facilities provided by the Marine National Facility

Some equipment items on the list may not be available at the time of sailing. Applicants will be notified directly of any changes.

Indicate what equipment and facilities you require from the Marine National Facility by placing an X in the relevant box.

(i) Standard laboratories and facilities

Name	Essential	Desirable
Aerosol Sampling Lab		
Air Chemistry Lab		
Preservation Lab		
Constant Temperature Lab		
Underway Seawater Analysis Laboratory		
GP Wet Lab (dirty)	x	
GP Wet Lab (Clean)	x	
GP Dry Lab (Clean)	x	
Sheltered Science Area	x	
Observation deck 07 level		
Walk in Freezer		
Clean Freezer		
Blast Freezer		
Ultra-Low Temperature Freezer		
Walk in Cool Room		

(ii) Specialised laboratory and facilities

May require additional support

Name	Essential	Desirable
Modular Radiation Laboratory		
Modular Trace Metal Laboratories		
Modular Hazchem Locker		
Deck incubators		
Stabilised Platform Container		

(iii)

(iv) Standard laboratory and sampling equipment

Name	Essential	Desirable
CTD - Seabird 911 with 36 Bottle Rosette	x	
CTD -Seabed 911 with 24 Bottle Rosette		
LADCP	x	
Sonardyne USBL System		
Milli -Q System		
Laboratory Incubators		
Heavy Duty Electronic Balance		
Medium Duty Electronic Balance		
Light Duty Electronic Balance		
Surface Net		
Bongo Net		
Smith Mac grab		
Dissecting Microscopes		

(v) Specialised laboratory and sampling equipment (NOTE: May require additional support)

Name	Essential	Desirable
TRIAXUS – Underway Profiling CTD	x	
Continuous Plankton Recorder (CPR)		
Deep tow camera		
Piston Coring System		
Gravity Coring System		
Multi Corer		
XBT System		
Trace Metal Rosette and Bottles		
Sherman epibenthic sled		
Trace- metal in-situ pumps		
LADCP		
Rock Dredges		
EZ Net		
Rock saw		
Portable pot hauler		
Beam Trawl		
Trawl doors (pelagic or demersal)		
Stern Ramp		
Trawl monitoring instrumentation (ITI)		
Radiosonde		

(vi) Equipment and sampling gear requiring external support (NOTE: May require additional support)

Name	Essential	Desirable
Seismic compressors		
Seismic acquisition system		

(vii) Underway systems

Acoustic Underway Systems

Name	Essential	Desirable
75kHz ADCP	x	
150kHz ADCP		
Multi Beam echo sounder EM122 12kHz (100m to full ocean depth)	x	
Multi Beam echo sounder EM710 70-100kHz (0-1000m approx.)	x	
Sub-Bottom Profiler SBP120		
Scientific Echo Sounders EK60 (6 bands, 18kHz-333kHz)		
Gravity Meter		
Trace metal clean seawater supply		

Atmospheric Underway Sensors

Name	Essential	Desirable
Nephelometer		
MAAP (multi angle absorption photometer)		
SMPS (scanning mobility particle sizer)		
Radon detector		
Ozone detector		
Manifold instrumentation (intake temperature and humidity)		
Picarro spectrometer (analysis of CO ₂ /CH ₄ /H ₂ O)		
Aerodyne spectrometer (analysis of N ₂ O/CO/H ₂ O)		
O ₂ analyser		
Manifold instrumentation (intake temperature and humidity)		
CCN (Cloud Condensation Nuclei)		
MOUDI (Micro-Orifice Uniform Deposit Impactors)		
NO _x monitor		
Polarimetric Weather Radar		

Underway Seawater Instrumentation

Name	Essential	Desirable
Thermosalinograph	x	
Fluorometer	x	
Optode	x	
PCO2	x	