

RV Investigator Voyage Plan

Voyage #:	IN2018_V04		
Voyage title:	Constraining external iron inputs and cycling in the southern extension of the East Australian Current.		
Mobilisation:	Hobart, 0800 Tuesday, 11 September 2018		
Depart:	Hobart, 1300 Tuesday, 11 September 2018		
Return:	Hobart, 0800 Monday, 08 October 2018		
Demobilisation:	Hobart, Monday, 08 October 2018		
Voyage Manager:	Max McGuire	Contact details:	Max.mcguire@csiro.au
Chief Scientist:	Michael Ellwood		
Affiliation:	Australian National University	Contact details:	Michael.ellwood@anu.edu.au
Principal Investigators:	April Abbott		
Project name:	As above		
Affiliation:	Macquarie University	Contact details:	april.abbott@mq.edu.au

Scientific objectives

The East Australian Current (EAC) is a major western boundary current that moves southward along the eastern margin of Australia. This current is climatically and biologically important as it exercises control over heat and nutrient distribution. The EAC is nutrient depleted to the north, but as it travels south, it entrains iron from a variety of sources – including riverine, sediment resuspension, eddies, lateral exchange of shelf waters, frontal jets and atmospheric dust inputs thereby elevating the concentration of dissolved iron. When the EAC reaches its southern extent, it breaks up to form eddy-like structures that become incorporated into the Subtropical Front (STF). The STF forms the boundary between warmer nutrient-depleted subtropical water and cool nutrient-rich Southern Ocean water. The waters southwest of Tasmania are nutrient-rich but depleted in dissolved iron, which is a typical characteristic of High Nutrient Low Chlorophyll (HNLC) regions within the Southern Ocean. In springtime, large phytoplankton blooms can be seen associated with a mingling of nutrient-depleted EAC waters with nutrient-rich, but iron depleted Southern Ocean waters in the vicinity of the STF east of Tasmania. Therefore, changes to the EAC caused by climatic shifts will have implications on elemental cycling, production, and local climate. We will assess the relationships between production and nutrient supply in the modern ocean while simultaneously improving our interpretations of past ocean records from the region.

The aims of this voyage are to:

- Assess the sources of external iron to the southern extension of the EAC
- Compare and contrast the biogeochemistry of EAC waters with HNLC waters located southwest of Tasmania;
- Determine the role of ‘new’ (externally sourced iron) versus ‘recycled’ iron in regulating springtime productivity across the STF;
- Test the sensitivity of neodymium and thorium isotope sedimentary records to local sedimentary processes;

Voyage objectives

This primary objective of the voyage is to characterise the sources and biogeochemical cycling of iron and associated nutrients and their impact on productivity southwest, southeast and northeast of Tasmania. This will require various deployments at a number of process and transit stations.

Mesoscale and sub-mesoscale physics and biogeochemistry

TRIAXUS: This will provide high-resolution real-time data acquisition on upper ocean (1-200 m) physics (mixed layer depth) and biology (chlorophyll fluorescence, transmissivity). We will survey each process station by conducting a transect across each station, ‘figure-eight’ type survey if possible for 10-12 hours, and tow the Triaxus between process stations 1, 2 and 3. These datasets will be complemented by those from underway sampling (including nutrient concentrations, bio-optics, Fast Repetition Rate Fluorometry (FRRF, a measure of phytoplankton ‘health’), trace metal concentrations using a trace-metal clean tow-fish to sample at 5 m.

SADCP/LADCP: Continuous measurements of velocity will be collected along the ships track using the 75 kHz and 150 kHz shipboard ADCPs. A lowered ADCP (LADCP) will collect horizontal velocity measurements at each station from the CTD package.

Process and transit station deployments determine iron supply and cycling

CTD rosette: Profiles of temperature, salinity, and oxygen through the upper ocean at transit stations and full ocean depth at process stations. Water samples collected with the 36-bottle rosette will be analysed on board for salinity, oxygen, nutrients. LADCP data will also be collected from the CTD deployments

TMR and ISP deployments: An autonomous 12 bottle trace metal-clean rosette (TMR) system and 6 *in situ* pumps (ISPs) will be used to collect trace element and isotope samples in dissolved and particulate phases. Clean sampling and analytical container laboratories will allow for shipboard processing, experiments and some near real-time analyses of iron at sea. The majority of the analyses will take place ashore after the voyage using sophisticated instrumentation not suited for shipboard use.

In situ primary production: Primary production experiments will be conducted at each process station. The experiments will require radiolabeling samples with ^{55}Fe and ^{14}C in the Radiation van and then incubated in the deck-board incubators.

Incubations: Some incubations may be conducted at each process station. The experiments will require the changes in light, nutrient and or trace metal conditions. Samples will then be incubated in the deck-board incubators or the ones in the dry lab.

Multicorer deployment: Surface sediment cores (0 to 30 cm) will be collected on and off the Tasmanian shelf and at the three process stations. Cores will be evaluated for integrity upon recovery, sectioned inside a nitrogen-filled glove bag, and centrifuged to extract pore fluid for trace metal and rare-earth analysis.

Kasten gravity corer: Longer sediment cores (0 to 4 m) will be collected at the three process stations. Cores will be evaluated for integrity upon recovery and subsampled for shore-based analyse. These will complement multicorer deployments. We hope to obtain one core at each of the process stations. Core barrels will 4 m in length.

EZ net: The EZ net provides the means to obtain stratified samples over the water column, for example between 100 and 200m. In contrast conventional bongo nets provide no means to control the depth strata that are sampled. Stratified sampling for mesozooplankton provides invaluable detail on diel vertical migration (capturing the daytime deep water residing animals), and/or the presence of seasonally-migrating mesozooplankton – that characterise subantarctic waters but not subtropical. Given the nature of this voyage, the EZ net would provide a great opportunity to characterise differences in the spring mesozooplankton communities across the subtropical convergence, and the relative strength of diurnal migration. This would be a major step up in our knowledge base and would add to the detailed characterisation of the spring condition in these water masses.

Operational Risk Management

Over the side operations include deployment of the CTD, Trace Metal Rosette, in-situ pumps, multicoring, Kasten gravity corer and TRIAXUS. All of these activities have been performed on *Investigator* before, and standard safety protocols will be followed.

Transit Station #5: ASP has confirmed that no approvals are required when entering an Exploration Rig area or a Traffic Separation Zone.

Transit Stations 8 and 9: There will be no coring at these sites. Water column sampling will be to 200m above the seafloor. ASP advised 1km exclusion zone to be adhered to at cable locations.

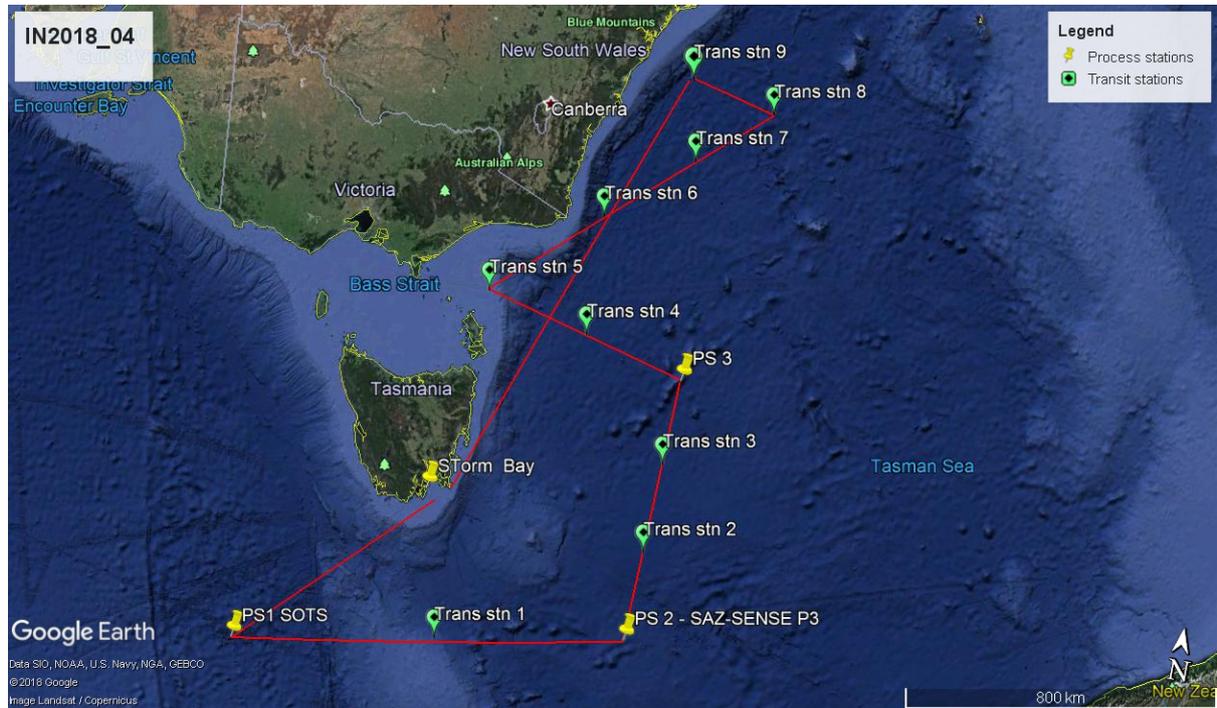
Transit Station #9 – As part of ASP’s procedures, they will inform the Navy of the ship entering the Jervis Bay military zone 7 days prior to the operation.

Overall activity plan including details for first 24 hours of voyage

The first 24 hours of the voyage will involve a transit from Hobart to the Transit Station #5 site.

11	Sept	1300: Depart
12	Sept	Transit to Transit Station 5

Voyage track example



Waypoints and stations

	Decimal Latitude	Decimal Longitude	Distance (nm)	Total Distance (nm)	Steaming time (hrs)	Total Steam (hrs)
Hobart	42°52.2	147°21.0				
Storm Bay	43°19.8	147°21.54	28	28	2.5	2.5
Transit station 5	39°11.75	148°19.25	194	222	17.6	20.1
Transit station 6	37°23	150°54	163	385	14.8	35.0
Transit station 7	35°57	152°53	129	513	11.7	46.7
Transit station 8	34°40	154°33	112	626	10.2	56.9
Transit station 9	34°18	152°28	105	731	9.6	66.5
Transit station 4	39°46.5	150°58.75	339	1070	42.4	108.8
Process station 3	40°20.5	153°36	125	1195	11.4	120.2
Transit station 3	42° 03	153°34.75	103	1298	12.8	133.0
Transit station 2	43°51	153°33.5	108	1406	13.5	146.5
Process station 2	45°44	153°31	113	1519	14.1	160.7
Transit station 1	46°20	148° 05.5	229	1748	28.6	189.3
Process station 1	46°54	141°53	258	2006	32.3	221.6
Storm Bay	43° 19.8	147° 21.54	316	2322	28.7	250.3
Hobart	42° 52.2	147° 21.0	28	2349	2.5	252.8

Time estimates

The following time estimates are based on a steaming speed of 11 knots and 8 knots if towing Triaxus.

Note: This voyage track is dependent on a good seven-day weather forecast. If the weather is terrible then we will look at doing the reverse of the voyage track. The main activities at each station are listed in the table. The exact timing of each deployment activity is indicative. Timings may vary depending on sea-state, the success of each activity and observations on station.

DATE	ACTIVITY
10	Sept Mobilise: 1. Load trace element lab vans (old white van, new blue van, TMR deck box, spare TMR) - Load sediment trap van – this must be loaded before new blue van, as it is overstacked with new blue clean van 2. Load rad van 3. Load lab equipment and begin internal labs setup 4. Load Triaxus 5. Load coring container and various components 6. Load EZ net
11	Sept Mobilise: 1. Load scientific party equipment 2. Load UTas equipment – mainly small boxes etc. 3. Load ANU equipment – 3 bins and a couple of pallets 4. Load Macquarie Uni equipment - mainly small boxes etc. 5. Depart 13:00.
12	Sept <i>Steam to Transit station 5</i>

DATE		ACTIVITY
		1200-1500 CTD 1500 m 1500-1800 Kasten corer 1800-2100 TMR rosette 1500 m 2100-0000 multi-corer
13	Sept	0000 leave site steam to transit station 6 1500 arrive transit station 6 1500-1800 CTD – 1500 m 1800-2100 TMR cast to 1500 m 2100-0000 CTD – deep
14	Sept	0000-0300 TMR cast to deep 0000 leave site steam to transit station 7 1200 arrive transit station 7 1200-1500 CTD – 1500 m 1500-1800 TMR cast to 1500 m 1800-2100 CTD – deep 2100-0000 TMR cast to deep / ISP cast 0000 leave site steam to Transit Station 8
15	Sept	0900 arrive Transit Station 8 0900-1200 CTD – 1500 m 1200-1500 TMR cast to 1500 m 1500-1800 CTD – deep 1800-2100 TMR cast to deep 2100-0000 ISP cast 0000 leave site steam to Transit Station 9
16	Sept	0900 arrive Transit Station 9 0900-1200 CTD – 1500 m 1200-1500 TMR cast to 1500 m 1500-1800 CTD – deep 1800-2100 TMR cast to deep 2100 leave site steam to Transit Station 4 towing triaxis?
17	Sept	0900-1200 – stop check Triaxus, re-deploy 1800-2100 – stop check Triaxus, re-deploy
18	Sept	1200 arrive Transit Station 4 1200-1500 CTD – 1500 m 1500-1800 TMR cast to 1500 m 1800-2100 CTD – deep 2100-0000 TMR cast to deep
19	Sept	0000 leave site steam to Process Station 3 1200 arrive Process station 3
20	Sept	0000 Arrive Process station 3 0000-0300 CTD cast to 1500m 0300-0600 TMR cast to 500m – primary production cast 0600-1200 ISP cast to 500m 1200-1500 Trace metal fish – incubations / Kasten gravity corer / multicorer 1500-1800 Trace metal fish – incubations / Kasten gravity corer / multicorer 1800-2100 CTD cast to deep 2100-2400 Multicorer / Kasten gravity corer / EZ or surface
21	Sept	0000-0300 nets

DATE		ACTIVITY
		0300-0600 TMR cast deep (to near seafloor) 0600-1200 TMR cast deep / Trace metal fish / EZ or surface 1200-1500 CTD cast / ISP cast to 500m 1500-1800 ISP cast to 500m / Kasten gravity corer / multi corer 1800-2100 Kasten gravity corer / Triaxus 2100-2400 Triaxus / nets
22	Sept	0000-0300 nets / shallow CTD 0300-0600 TMR cast to 500m – primary production cast 0600-1200 ISP cast to 1500m / EZ or surface <i>1200 - Leave site to transit to Transit Station 3 towing Triaxus</i>
23	Sept	<i>Weather day</i>
24	Sept	2100 – stop check Triaxus, re-deploy <i>0300 Arrive Transit station 3 retrieve Triaxus</i> 0300-0600 CTD – 1500 m 0600-0900 TMR cast to 1500 m 900-1200 CTD – deep 1200-1500 TMR cast to deep <i>1500 - Leave site to transit to Transit station 2 towing Triaxus</i> 2100 – stop check Triaxus, re-deploy
25	Sept	<i>0300 Arrive Transit station 2 retrieve Triaxus</i> 0300-0600 CTD – 1500 m 0600-0900 TMR cast to 1500 m 900-1200 CTD – deep 1200-1500 TMR cast to deep <i>1500 - Leave site to transit to Process station 2 towing Triaxus</i>
26	Sept	<i>Weather day</i>
27	Sept	0000-0600 – stop check Triaxus, re-deploy <i>1200 Arrive Process station 2</i> 1200-1500 CTD cast to 1500m 1500-1800 Trace metal fish - incubations 1800-2100 Kasten gravity corer / multi corer 2100-0000 nets
28	Sept	0000-0300 nets / shallow CTD / Triaxus 0300-0600 TMR cast to 500m – primary production cast 0600-0900 Multicorer / Kasten gravity corer 0900-1200 Deep CTD 1200-1800 TMR cast to deep / Trace metal fish /EZ or surface 1800-2100 TMR cast to deep 2100-2400 Multicorer / Kasten gravity corer / EZ or surface
29	Sept	0000-0300 shallow CTD 500 0300-0600 TMR cast to 500m – primary production cast 0600-1200 ISP cast to 1500m 1200-1500 ISP cast to 1500m/CTD 1500-1800 Trace metal fish / Nets to 100m 1800-2100 Multicorer / Kasten gravity corer
30	Sept	<i>0000 - Leave site to steam to Transit Station 1 towing Triaxus</i> 0900-1200 – stop check Triaxus, re-deploy 1800-2100 – stop check Triaxus, re-deploy

DATE		ACTIVITY
1	Oct	0300 Arrive Transit station 1 0300-0600 CTD – 1500 m 0600-0900 TMR cast to 1500 m 0900-1200 CTD – deep 1200-1500 TMR cast to deep / ISP cast 1500 - Leave site to steam to Process Station 1 towing Triaxus
2	Oct	0000-0300 – stop check Triaxus, re-deploy 1200-1500 – stop check Triaxus, re-deploy
3	Oct	0000 Arrive Process station 1 0000-0300 CTD cast to 1500m 0300-0600 TMR cast to 500m – primary production cast 0600-1200 ISP cast to 500m 1200-1500 Trace metal fish – incubations / Kasten gravity corer / multicorer 1500-1800 Trace metal fish – incubations / Kasten gravity corer / multicorer 1800-2100 CTD cast to deep 2100-2400 Multicorer / Kasten gravity corer / EZ or surface
4	Oct	0000-0300 nets 0300-0600 TMR cast deep (to near seafloor) 0600-1200 TMR cast deep / Trace metal fish / EZ or surface 1200-1500 CTD cast / ISP cast to 500m 1500-1800 ISP cast to 500m / Kasten gravity corer / multi corer 1800-2100 Kasten gravity corer / Triaxus 2100-2400 Triaxus / nets
5	Oct	0000-0300 nets / shallow CTD 0300-0600 TMR cast to 500m – primary production cast 0600-1200 ISP cast to 1500m / EZ or surface 1200 - Leave site to transit to Transit Station 1 towing Triaxus
6	Oct	Transit to Hobart towing CPR
7	Oct	Weather day
8	Oct	Retrieve CPR in Storm Bay Arrive Hobart 08:00 Demobilisation

Triaxus towing timetable between stations:

Station to station	Triaxus tow distance (nautical miles)	Tow time (hours at 8 knots)	Number of stops on transit required to check Triaxus (allowing for 8 to 12 hours tow time between checks)	Assume 3 hours stop check and re-deploy Triaxus - check time (hours)	Total time (hours)
Transit 9 to Transit 4	339	42	3	9	54
Process 3 to Transit 3	103	13	1	3	16
Transit 3 to Transit 2	108	14	1	3	17
Transit 2 to Process 2	113	14	1	3	17

Station to station	Triaxus tow distance (nautical miles)	Tow time (hours at 8 knots)	Number of stops on transit required to check Triaxus (allowing for 8 to 12 hours tow time between checks)	Assume 3 hours stop check and re-deploy Triaxus - check time (hours)	Total time (hours)
Process 2 to Transit 1	229	29	3	8	37
Transit 1 to Process 1	258	32	3	9	41

Supplementary project

Spatial and temporal variability in the distribution and abundance of seabirds.

Principal Investigator: Dr Eric Woehler

Scientific and voyage objectives:

Collect data to describe the variability in the distribution and abundance of seabirds and animals in the oceans around Australia.

Project fits into the time estimates:

This Supplementary project does not require extra voyage time or require instruments to be deployed during the voyage.

Investigator equipment (MNF)

For a list of MNF Supplied Equipment see [here](#).

CTD Equipment and Support

- 36-bottle CTD-rosette with 12L Niskin bottles and MNF-O₂, MNF-PAR, MNF-transmissometer sensors mounted.
- Lowered ADCP with all heads working and logging
- CTD voltage inputs calibrated to correctly log sensor inputs
- MNF supplied hydrochemists to carry out oxygen sensor calibrations analyses at sea, as well as salinity and nutrient analyses.
 - Approximately 28 CTDs requiring approximately 12-24 nutrient samples per cast (336-500 samples). And appropriate number of salinity and dissolved oxygen samples to calibrate CTD sensors.
 - Approximately 18 TMR casts with 12 nutrient samples per cast (216 samples)
 - Incubation and sediment pore-water experiments of up to 400 nutrient samples
 - Total nutrients – 900 nutrients and perhaps 300 salt and oxygen samples – MNF to advise if this number of salt and oxygen samples is appropriate and feasible for calibrating CTD sensors.
- Hydrochemistry support:
 - This voyage requires ~ 1200 oxygen, salinity, and nutrient analyses – as above.
- WOCE/Go-Ship compliant CTD data processing and output files to be provided, including error estimates for oxygen and nutrient parameters

TRIAXUS Equipment and Support

- Triaxus towed body and towed body winch, equipped with:
 - MNF supplied electronics, data display and logging, and piloting support
 - MNF dual CTs with oxygen electrodes
 - MNF-LOPC
 - User-supplied SUNA and FIRE sensors – the will be borrowed from Tom Trull
- Triaxus may need to be re-terminated at process stations 1, 2 and 3 stations and at Transit station 1

Underway Equipment and Support

- Multibeam/Multifrequency bio-acoustic system, with MNF, supplied electronics, computing, and operational support
- Working and logging underway echosounder with bottom detection and real-time display
- Working and logging underway ADCP, with real-time display
- Working and logging underway thermosalinograph and fluorometer and real-time display
- Working drop keel for thermosalinograph and ADCP data gathering
- Working and logging meteorological instruments including ISAR SST radiometer

TMR Equipment and Support

- Calibrated CTD for autonomous profiling
- TMR Deck Box installed on trawl deck (to house the TMR).

MNF Radvan

MNF Nets (Surface and EZ)

Support for deployment of Nets

MNF deck board incubation platform

MNF Trace Metal Rosette and Dyneema line

Working MNF TMR and Dyneema line on the associated winch. Note some of the TMR casts at the process and transit stations will be to near the sea bottom so 4000+ m of Dyneema is required. A USBL beacon may be required for these deep-water casts so that the MNF TMR does not hit the sea bottom. Switch the anode to magnesium as on IN2018_V01. Ruggardised laptop required for TMR.

MNF In Situ Pumps (ISP) and Support

- Support for deployment of ISPs and weights
- Batteries for ISPs will be provided by the users and users will change batteries and prepare pump heads etc for the collection of samples.

Multicorer Equipment and Support

- Support for deployment of multicorer and retrieval
- Approximately 1-2 deployments per process station – obviously weather dependent

Kasten gravity Gravity corer Equipment and Support

- Support for deployment of Kasten gravity core and its retrieval
- Movable concertina roller table
- Corer barrel will be 4 m in length
- Users will supply core liners for sub-sampling of Kasten corer
- Approximately 1-2 deployments per process station – obviously weather dependent. The aim is to collect 1 good core from each process station.

Other

- Space for the MNF radiation van, MNF deck board platform beside rad van, two MNF trace metal vans and Aerosol Sampling Lab.
- Support for, including deployment winch for, MNF in-situ pumps, MNF TM rosette, user-supplied trace metal CTD rosette, Multicorer, Kasten gravity corer.
- Zooplankton nets will be deployed off the winch on the starboard side at midships. UTAS will supply some nets and others from MNF may be required.
- Batteries for ISPs will be provided by the users.

User Equipment

Owner	Item name	Supporting information
Ellwood	Trace Metal clean fish	Will be deployed mid-ship off the starboard side. We will require the ship’s compressor to drive the air pumps, and the forward boom is required along to tow the fish.
Boyd	Zooplankton nets	Will be deployed off the winch on the starboard side at midships. UTAS will supply some nets and others from MNF will be required.
Ellwood	Spare Trace Element Rosette	For storage on Trawl Deck.
Ellwood	Sediment trap container	On loan from Tom Trull. Electrical connection/services required.
Ellwood/Abbot	Core tubes	Used to sample Kasten corers
Bowie	Air Sampling Pump Controller (from MNF)	Sector control switch used to switch vacuum pumps on/off and enable sampling of air only when the ship is in a ‘clean’ sector (i.e., prevents contamination of samples by sampling air impacted by the ship’s exhaust); requires Ethernet data feed of ship’s met data
Bowie	Aerosol sampling system (UTAS/CSIRO)	Includes pumps, flow meters, tubing and filtration holders
Bowie	Laminar flow hood (UTAS)	For clean sampling and sample handling in aerosol lab
Bowie	Sampling bottles and filters (UTAS)	Seawater, aerosol and precipitation sampling
Bowie	Laboratory ware and equipment	For experiments and sample processing at sea

Owner	Item name	Supporting information
Bowie	Precipitation (Rain) Sampler	Polyethylene funnel and collection bottle, to be installed on 05 level outside of bridge equipment room (no power required), and opened manually during rain events
Bowie	Iron analyser	Benchtow flow injection analyser for near real-time analysis of iron(II) in seawater (to be housed in blue clean container TM1)
Bowie	Hydrogen peroxide analyser	Benchtow flow injection analyser for near real-time analysis of H ₂ O ₂ in seawater (to be housed in tbc (lab or container)
Trull	FLBB-RTD dual chlorophyll fluorescence and 700nm optical backscatter sensor	Rated to 6000m

Special Requests

Support staff/crew are requested for the deployment and retrieval of multicorer and Kasten gravity corer.

Permits

- Collection of seawater, sediment trap and multicore sediment samples for return to Hobart under IMAS Quarantine permit.
- Collection of seawater, sediment trap and multicore sediment samples for return to Hobart under ANU Quarantine permit. Current until 8 June 2019.
- Permit to conduct research activities within Commonwealth Marine Reserves. An application has been submitted to conduct research Commonwealth Marine Reserves.

Personnel List

	NAME	ROLE	ORGANISATION
1.	Max McGuire	Voyage Manager	CSIRO MNF
2.	Rod Palmer	SIT Support	CSIRO MNF
3.	Trevor Goodwin	SIT Support	CSIRO MNF
4.	Amy Nau	GSM Support	CSIRO MNF
5.	Bernadette Heaney	GSM Support	CSIRO MNF
6.	Francis Chui	DAP Support	CSIRO MNF
7.	Steve van Graas	DAP Support	CSIRO MNF
8.	Christine Rees	Hydrochemist	CSIRO MNF
9.	Stephen Tibben	Hydrochemist	CSIRO MNF
10.	Kendall Sherrin	Hydrochemist	CSIRO MNF
11.	Jay McGlashan	Triaxus support	CSIRO MNF
12.	Shanon Palmer	Field Operations	CSIRO MNF
13.	Mark Lewis	Field Operations	CSIRO MNF
14.	Michael Ellwood	Chief Scientist	ANU
15.	Pamela Barrett	TMR/ISP sampling	ANU
16.	Robin Grun	TMR sampling	ANU

	NAME	ROLE	ORGANISATION
17.	Prayna Maharaj	ISP sampling/ Incubations/CTD sampling	ANU
18.	Riteshma Devi	CTD sampling	ANU
19.	Sarah Andrew	CTD sampling	ANU
20.	Hanneloor Heynderickx	Student	University of Otago
21.	Svenja Halfter	Zooplankton	UTAS
22.	Phil Butterworth	plankton	UTAS
23.	Robert Strzepek	Primary production	UTAS
24.	April Abbott	PI – Multicorer sampling/Kasten coring	Macquarie University
25.	Hannah Kumar	Multicorer sampling	Macquarie University
26.	Hannah Wilson	Multicorer sampling	Macquarie University
27.	Annabel Payne	Multicorer sampling	Macquarie University
28.	Kelly-Anne Lawler	ISP/Kasten coring	Macquarie University
29.	Dave Janssen	TMR sampling	Uni of Bern
30.	Helene Aflenzer	aerosols, student	UTAS
31.	Pauline Latour	Iron(II) and peroxide chemistry	UTAS
32.	Eric Woehler	Piggyback PI – Bird watching	Birdlife Tasmania
33.	Kelly Woolerton	Bird watching	Birdlife Tasmania (AusIndustry Innovation Program)
34.	Ms Zhichun Liu	Bird watching	Birdlife Tasmania (IMAS)

Signature

Your name	Michael Ellwood
Title	Chief Scientist
Signature	
Date:	12 September 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	X	
Air Chemistry Lab		
Preservation Lab		
Constant Temperature Lab	X	
Underway Seawater Analysis Laboratory	X	
GP Wet Lab (dirty)	X	
GP Wet Lab (Clean)	X	
GP Dry Lab (Clean)	X	
Sheltered Science Area	X	
Observation deck 07 level	X	
Walk in Freezer	X	
Clean Freezer	X	
Blast Freezer	X	
Ultra-Low Temperature Freezer	X	
Walk in Cool Room	X	

(ii) Specialised laboratory and facilities

(May require additional support)

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

(iii) Standard laboratory and sampling equipment

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

(iv) Specialised laboratory and sampling equipment

(May require additional support)

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

Name	Essential	Desirable
Stern Ramp - covered	x	
Trawl monitoring instrumentation (ITI)		
Radiosonde		

(v) Equipment and sampling gear requiring external support

(May require additional support from applicants)

Name	Essential	Desirable
Seismic compressors		
Seismic acquisition system		

(vi) Underway systems

Acoustic Underway Systems

Name	Essential	Desirable
75kHz ADCP	x	
150kHz ADCP	x	
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	x	
Scientific Echo Sounders EK60 (6 bands, 18kHz-333kHz)	x	
Gravity Meter		
Trace metal clean seawater supply	x	

Atmospheric Underway Sensors

Name	Essential	Desirable
Nephelometer	x	
MAAP (multi angle absorption photometer)	x	
SMPS (scanning mobility particle sizer)	x	
Radon detector	x	
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)		
Manifold instrumentation (intake temperature and humidity)	x	
CCN (Cloud Condensation Nuclei)		
Polarimetric Weather Radar		

Underway Seawater Instrumentation

Name	Essential	Desirable
Thermosalinograph	x	
Fluorometer	x	
Optode	x	
PCO2	x	