

RV Investigator Voyage Plan

Voyage #:	IN2018_T02		
Voyage title:	Harmful Algal Blooms and their long term sediment record in East Coast Tasmanian waters		
Mobilisation:	Hobart 03 April & Brisbane 11 May 2018		
Depart:	08:00 Brisbane, Monday 14 May 2018		
Return:	08:00 Hobart, Monday 21 May 2018		
Demobilisation:	Hobart, Monday 21 May 2018		
Voyage Manager:	Stephen Thomas	Contact details:	canbeyan@gmail.com
Chief Scientist:	Prof Gustaaf Hallegraeff		
Affiliation:	Institute for Marine and Antarctic Studies (IMAS)	Contact details:	Gustaaf.hallegraeff@utas.edu.au
Principal Investigators:	Prof Gustaaf Hallegraeff, Dr Eric Woehler, Emlyn Jones		
Project name:	(1) Harmful Algal Blooms and their long term sediment record in East Coast Tasmanian waters (2) Spatial and temporal variability in the distribution and abundance of seabirds. (3) Remote-ROAM: mobile modelling sea trials		
Affiliation:	Dr Eric Woehler (Birdlife Australia)	Contact details:	Eric.woehler@gmail.com
	Emlyn Jones (CSIRO)		Emlyn.jones@csiro.au

Scientific objectives

Prof Gustaaf Hallegraeff (IMAS)

Unprecedented toxic dinoflagellate blooms occurred off east coast Tasmania in 2012 and 2015, 2016 and 2017. These events led to a global shellfish product recall (AUD23M loss), lengthy (4 months) closures of mussel, oyster, scallop, and rock lobster fisheries, and 4 human hospitalisations (Paralytic Shellfish Poisoning). While the causative *Alexandrium* dinoflagellate had been previously detected, genetic evidence suggests that blooms represent a cryptic genotype newly stimulated by climate-driven increased water column stratification. We seek to characterize expected recurrent blooms in relation to Maria Island NRS hydrological conditions, and compare this with the long time (1000+ yr) ancient DNA sediment record.

Supplementary Projects

(1) Dr Eric Woehler (Birdlife Australia)

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

Seabirds are distributed patchily over the oceans, both in space and in time. The deployment of tracking devices on seabirds provides an initial insight into at-sea movements, but do not report on non-breeding or juvenile birds. The survival of these life stages can have dramatic impacts on population dynamics. The documentation of at-sea distributions of seabirds around Australia can facilitate a better understanding of seabird dynamics in the marine environment. The proposed study using at-sea observations collected alongside oceanographic data will improve our understanding of seabirds and the way in which they relate to our changing ocean environments.

(2) Emlyn Jones (CSIRO)

(3) Remote-ROAM: mobile modelling sea trials

The aim of this work is to operationally test the Bluelink mobile oceanographic modelling system (referred to as Remote-ROAM) that has been developed by CSIRO and BoM for use by the Royal Australian Navy (RAN). The goal of this system is to provide enhanced situational awareness for surface (ships) and subsurface (submarines) platforms. This will be the first time this system has been deployed at sea and the project will focus on testing the modelling system and associated data feeds, along with an assessment of the forecast skill against deployed XBT's and the ships flow-through system.

Voyage objectives

- (1) The key operational activity of IN2018_T02 is to collect multicorer (60cm) and additional gravity corer (3m+) sediment samples in the Maria Island/ Spring Bay Tasmanian area, with an additional gravity corer trial off Port Hacking (where shorter multicorer sediments were collected previously by Investigator voyage) IN2016_V04.
- (2) Supplementary bird observations (Woehler) and en-route XBT deployments but which do not require the ship to stop.
- (3) The Triaxus will to be towed from Port Hacking to Eden (Emlyn Jones).
- (4) Two NOAA drifter buoys will be deployed between 32-32.5°S to coincide with the Newcastle radar (for Farhan Rizwi)

- (5) The continuous plankton recorder (CPR) will be towed from Brisbane to Newcastle/Port Hacking and from Bass Strait to Maria Island, allowing for calibration between CPR and en-route subsurface water samples collected with the en-route seawater ship flow-through system (CSIRO Ruth Eriksen).
- (6) Observers will be on board from AFMA to participate in the seabird monitoring.
- (7) Participants from the Woodbridge Discovery Centre will be participating in on-board phytoplankton observations and specimen collections for display.

Operational Risk Management

New Staff in Training: This transit is being used as an opportunity to train several new CSIRO Support Teams on board the vessel. As a result, there will be some exposure to risks involved in unfamiliar work environment, inexperience with equipment etc. The deployment activities these staff will be involved with are:

- Preparing and deployment of coring equipment
- Preparation of and deployment of the TRIAXUS
- Deployment of the Constant Plankton Recorder (CPR)

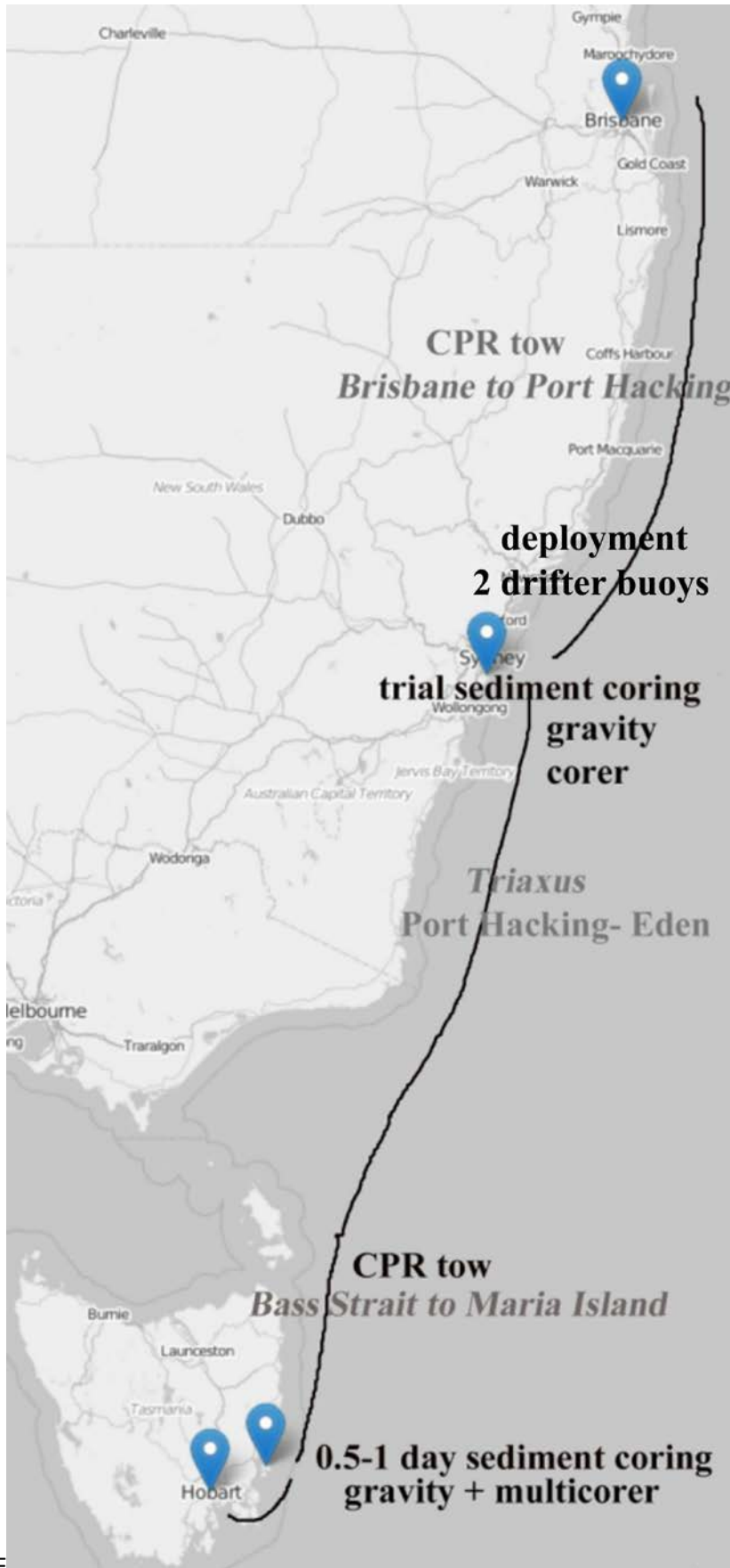
Walk in Freezers and Cool Rooms: The science teams will be utilising both the Walk-in Cool rooms and Walk-in Freezers. Science parties will ensure they have read and signed onto relevant SWI and are fully aware of the Safety procedures involved with using these spaces.

Constant Plankton Recorder (CPR): The CPR recording cassette is charged with formaldehyde prior to inserting the cassette into the CPR Frame. Personnel handling the Formaldehyde are to ensure they have read and understood the SWI, SDS and operating procedure prior to commencing works.

Overall activity plan including details for first 24 hours of voyage

The first 24 hrs at sea will be non-stop steaming from Brisbane southwards with no stops required, except for the deployment of the Continuous Plankton Recorder from offshore Brisbane, QLD to Newcastle, NSW. Bird observations and XBT deployments will be conducted en-route.

Voyage track



Waypoints and stations

	Decimal Latitude	Decimal Longitude	Distance (nm)	Total Distance (nm)	Steaming time (hrs)	Total Steam (hrs)
Brisbane	-27.5000	153.0000	0	0	0	0
Newcastle	-32.926696	152.0000	400	400	36	36
Port Hacking	-34.14181	151.36463	77	477	7	43
Eden	-37.0632	150.0000	194	671	25 @ 8 knots	68
Maria Island	-42.66318	148.21747	349	1,020	38	106
Hobart	-42.9000	147.3000	85	1,105	8	114

Time estimates

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

Date	Time	Activity
Mo 14 May	3 days	Brisbane to Newcastle steaming (5hrs leaving Brisbane port); CPR tow
Wed 16 May pm	2 x 30min	Retrieve CPR; Deployment of 2 NOAA drifter buoys off Newcastle
Thu 17 May (daylight)	1-3 hrs	<i>Gravity coring</i> at Port Hacking 100m station
Thu 17 May	1.5-2 days	Port Hacking to Eden steaming @ 8 knots - <i>Triaxus tow</i>
Sat 18 May	0.5 day	Eden to Maria Island <i>CPR tow</i> and steaming
Sunday 20 May (daylight)	0.5 day	<i>Sediment coring</i> in Spring Bay/Maria Island area
Sunday 20 May	0.5 day	Maria Island to Hobart steaming
Monday 21 May		Hobart return

Piggy-back projects (if applicable)

Claire Wallis (AFMA)

- (1) Collaborate with Eric Woehler on developing an appropriate long term methodology to update ISMP bird abundance counts preferably using a methodology that is in alignment with other studies doing offshore bird counts at this time and in the past; and
- (2) Collaborate with Eric Woehler about approaches to future mitigation trials in terms of including bird abundance data in device efficiency tests, and other experimental and statistical approaches.

Ruth Eriksen (CSIRO-AusCPR)

Deploy the CPR Continuous Plankton Recorder from Brisbane to Port Hacking and from Bass Strait to Maria Island, and compare phytoplankton community with that of on-board seawater tap samples, and the most recent Port Hacking and Maria Island national reference station samples.

Dr Ben Arthur (CSIRO), Chloe Simons, Andrew Walsh (Marine Discovery Centre)

Demonstration of plankton sampling, microscopic on-board observations and specimen collection for display.

Dr Ben Arthur (CSIRO)

CSIRO Educator on Board is a professional development program for Australian STEM (science, technology, engineering and mathematics) school teachers. Two teachers will sail on board *Investigator* for short (<2 week) voyages. Participants will: observe and assist alongside scientists and contribute to the national collaborative marine research effort, update their own STEM content knowledge, conduct and coordinate educational and outreach activities including live video broadcasts from the ship, develop curriculum linked resources, such as lesson plans, to be shared with other teachers, and promote *RV Investigator* and its research efforts.

Drone deployment by Wild Pacific Media

During the voyage, a production team (2 pers) from Wild Pacific Media will be filming and deploying a (camera) drone to capture vision of the ship and underway science. All filming and drone deployments will be planned in consultation with the Chief Scientist, Voyage Manager and/or Ship Master via daily toolbox meetings to ensure that activities are conducted safely, in accordance with the relevant guidelines and without disruption to science and/or ship operations.

The point of contact for the production team during the voyage will be Chris Gerbing, Oceans & Atmosphere Communications Manager. Chris Gerbing will be responsible for overseeing all activities of the Wild Pacific Media production team during the voyage.

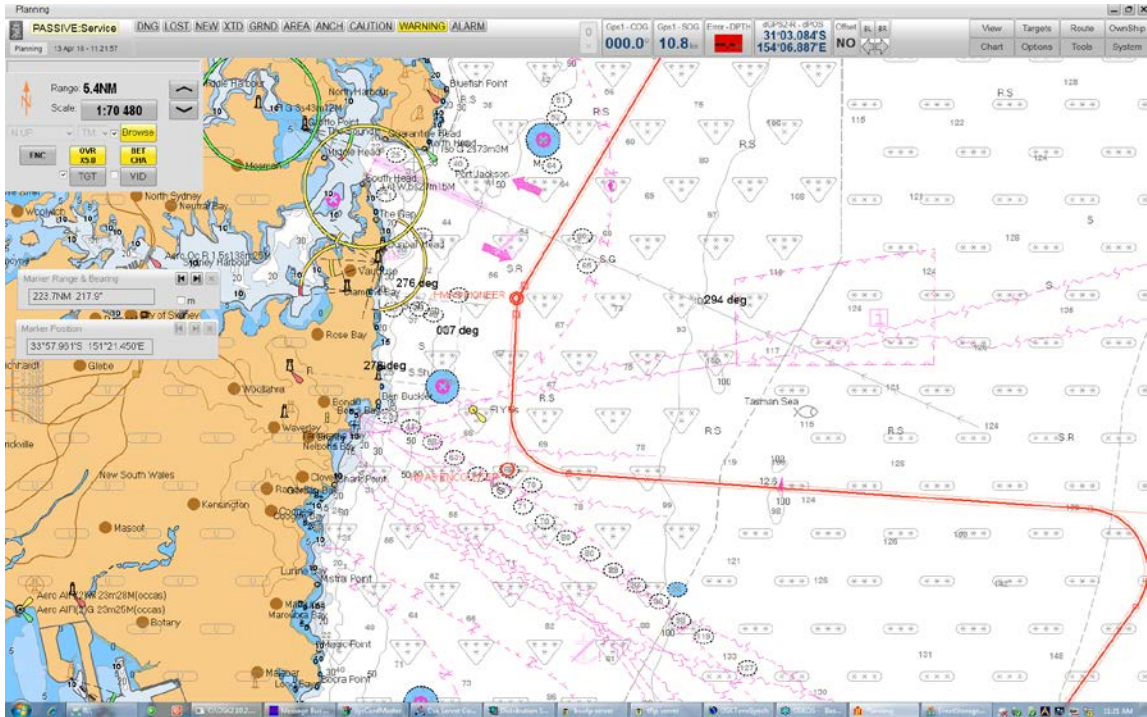
In the event of any changes to planned activities or an intent to obtain opportunistic footage via use of the drone (specifically), Chris Gerbing will ensure that the Voyage Manager is first consulted and the appropriate approvals have been obtained PRIOR to any activity proceeding.

All relevant approvals, permits and certifications have been obtained for conduct of drone deployment during the voyage. Note that filming will not be undertaken within port boundaries in Brisbane or Hobart (and no approval has been obtained to do so).

RAN Hydrographic Office

HMAS Encounter	HMAS Pioneer
33 54.620'S	33 51.850'S
151 19.670'E	151 19.843'E

Names and positions of wrecks to be investigated for an hour each running lines with the multibeam if time permitting.



RV Investigator equipment (MNF)

As per below list on page 10.

User Equipment

Item name	Supporting information
2 NOAA Drifter Buoys	Organized by Farhan Rizwi CSIRO
1 research microscope + digital camera	Organised by Ruth Ericksen CSIRO
1-2 plastic crates with 100-200 plastic 1 litre sample bottles + Lugol fixative	Organised by Gustaaf Hallegraef IMAS
2 small plastic boxes + 1 medium plastic box with culturing and genetics equipment	Organised by Chris Bolch IMAS

Special Requests

MNF Support staff and ASP Crew are required for the operation of sediment coring equipment, CPR, Triaxus and deployment of two NOAA buoys

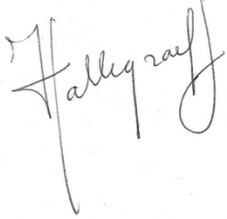
Permits

None required as no activities are planned in the following Commonwealth Marine Reserves (CMR) that *RV Investigator* will pass near or through during this southbound voyage: Solitary Islands, Hunter, Jervis, East Gippsland, Flinders & Freycinet.

Personnel List

1.	Stephen Thomas	Voyage Manager	CSIRO MNF
2.	Brett Muir	SIT Support	CSIRO MNF
3.	Trevor Goodwin	SIT Support	CSIRO MNF
4.	Matt Boyd	GSM Support	CSIRO MNF
5.	Phil Vandenbossche	GSM Support	CSIRO MNF
6.	Peter Shanks	DAP Support	CSIRO MNF
7.	Anoosh Sarraf	DAP Support	CSIRO MNF
8.	Hugh Barker	DAP Support	CSIRO MNF
9.	Jason Fazey	Mechanical Technician	CSIRO MNF
10.	Shanon Palmer	Mechanical Technician	CSIRO MNF
11.	Damian Pretzman	Mechanical Technician	CSIRO MNF
12.	Prof Gustaaf Hallegraeff	Chief Scientist	IMAS / UTAS
13.	Prof Andrew McMinn	Alternative Chief Scientist	IMAS / UTAS
14.	Craig Woodward	Scientist	ANSTO, Lucas Heights
15.	Dr Chris Bolch	Scientist	IMAS / UTAS
16.	Dr Eric Woehler	Lead Principal investigator	Birds Tasmania
17.	Dani Harmshaw	student	Birds Tasmania
18.	Zara King	student	Birds Tasmania
19.	Farhan Rizwi	Supplementary LPI	CSIRO
20.	Uwe Rosebrock	Supplementary	CSIRO
21.	Paul Sandery	Supplementary	CSIRO
22.	Annalise Pearson	Supplementary	RAN
23.	Dr Ruth Eriksen	Investigator (CPR)	CSIRO
24.	Dr Ben Arthur	Outreach	CSIRO
25.	Chloe Simons	Outreach STEM	Woodbridge Marine Discovery Centre (WMDC)
26.	Andrew Walsh	Outreach STEM	WMDC
27.	Stephen Reid	Outreach STEM	WMDC
28.	Chris Gerbing	Communications Officer	CSIRO
29.	Mark Rowland	HSE	CSIRO
30.	Greta Creed	Educator on Board program	North Lakes State College
31.	Christie Evans	Educator on Board program	Seaview Downs Primary School
32.	Callum Hollingsworth	Educator on Board program	Rosny College
33.	Nick Robinson	COMMS IMAX	Wild Pacific Media
34.	Caspar Mazzotti	COMMS IMAX	Wild Pacific Media
35.	Emily Jateff	COMMS	ANMM
36.	Rhiannon Shine	COMMS Journalist	ABC News

Signature

Your name	Gustaaf Hallegraeff
Title	Chief Scientist
Signature	
Date:	1/03/2018

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)		
GP Wet Lab (Clean)		
GP Dry Lab (Clean)	+	
Sheltered Science Area		
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) Standard laboratory and sampling equipment

Name	Essential	Desirable
CTD - Seabird 911 with 36 Bottle Rosette		
CTD - Seabed 911 with 24 Bottle Rosette		
LADCP		
Sonardyne USBL System		
Milli -Q System	+	
Laboratory Incubators		

Name	Essential	Desirable
Heavy Duty Electronic Balance		
Medium Duty Electronic Balance		
Light Duty Electronic Balance		
Surface Net		
Bongo Net		
Smith Mac grab		
Dissecting Microscopes	+	

(iv) Specialised laboratory and sampling equipment

(May require additional support)

Name	Essential	Desirable
TRIAXUS – Underway Profiling CTD	+	
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		

(v) Equipment and sampling gear requiring external support

(May require additional support from applicants)

Name	Essential	Desirable
Seismic compressors		
Seismic acquisition system		

Underway systems

Acoustic Underway Systems

Name	Essential	Desirable
75kHz ADCP		
150kHz ADCP		
Multi Beam echo sounder EM122 12kHz (100m to full ocean depth)		
Multi Beam echo sounder EM710 70-100kHz (0-1000m approx.)		

Name	Essential	Desirable
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		+
Fluorometer		+
Optode		
PCO ₂		