RV *Investigator* Voyage Plan

VOYAGE #:	**IN2026_T02**		
Version Number:	Final		
Voyage title:	CAPSTAN 5		
Mobilisation:	MNF: Hobart, 4-5 March 2026		
	Science Party: Fremantle, Wednesday 22 April 2026		
Depart:	Fremantle, 1400 Thursday 23 April 2026		
Return:	Hobart, 0800 Tuesday 5 May 2026		
Demobilisation:	Science Party: Monday 5 May 2026		
	MNF: 5 May 2026		
Voyage Delivery Coordinator:	John Hooper		
Voyage Manager:	Ben Arthur		
Alt. Voyage Manager:	John Hooper		
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Scientific objectives

The Collaborative Australian Postgraduate Sea Training Alliance Network (CAPSTAN) is a maritime education and training initiative of CSIRO, the University of Tasmania's Institute for Marine and Antarctic Studies (IMAS) and the Australian and New Zealand International Scientific Drilling Consortium (ANZIC). The Program is supported by grants of sea time on RV *Investigator* (RVI) from the CSIRO Marine National Facility and through funding from the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS).

There are no specific scientific objectives for this voyage, however the CAPSTAN platform aims to:

- Develop and provide an effective vessel-based tertiary education experience involving national stakeholders and post-graduate students, by pooling national tertiary teaching expertise and personnel resources.
- Develop a national curriculum to standardise teaching protocols/methods and learning outcomes in conjunction with the new data collection equipment and facilities of the CSIRO research vessel RVI, the Integrated Marine Observatory System and external stakeholders, and.
- Provide and test a multi-disciplinary research-based teaching module for marine science postgraduates with opportunities for student mobility and national network development.

In addition to CAPSTAN's core training objectives, this multidisciplinary voyage will explore:

1. **Repeat sampling and survey of selected sites in the Bremer Canyon Region that were examined during the first Capstan voyage in 2017.**

It is envisioned that this will include at least one deployment of the CTD, and acoustic data to provide a broad range of data that enables training activities relevant to the disciplinary interests of the students participating in the voyage. The sampling will also allow comparison with upwelling regions to be sampled near South Australia (SA).

The collection of a sediment core using the Kasten Corer from an appropriate site along the ship's transit track and outside the Marine Parks and other sites of national significance. A site would ideally be located on the upper continental slope of Southern Australia at a water depth between 1000 m and 1500 m.

2. **Oceanographic properties offshore of a persistent harmful algal bloom (HAB) in SA coastal waters.**

This component of the voyage will investigate oceanographic conditions offshore of a persistent harmful algal bloom (HAB) in South Australian coastal waters. This bloom involves *Karenia cristata*, a cold-water dinoflagellate that responds to deep nutrient upwelling. While most study efforts to date have focused within the SA gulfs, questions remain about potential offshore source grounds or seed banks. By analogy to the well-studied *Florida Karenia brevis, K. cristata* are slow-growing dinoflagellates that can potentially accumulate over months to years before being delivered inshore. Current understanding suggests that *Karenia* are extremely sparse offshore but likely always present. What remains poorly understood is how intense upwelling events that bring new nitrogen into the system drive larger-than-normal diatom blooms, which upon their demise create an organic nutrient-rich environment (regenerated forms of nitrogen) that allows the sparse *Karenia* inoculum to proliferate within the confines of the Gulf systems. Dense *Karenia* blooms have not yet been observed offshore.

Therefore, the focus of this component will be on understanding how offshore upwelling and nutrient dynamics may influence the initiation and maintenance of current HABs in South Australia, contributing to a national priority effort. Building on a planned SARDI cruise that includes five cross-shelf transects (10 stations between 200 m and 20 m depth), this voyage will extend two key transects from the inner shelf to the shelf

break: one off Kangaroo Island and one near the Bonney Upwelling. These transects have been prioritized because:

- they align with National Reference Stations.\
- they encompass the Bonney Upwelling, which has high connectivity to the region and is likely to supply nutrients that support phytoplankton productivity, facilitating the proliferation of the sparse offshore *Karenia* inoculum.

Sampling will include CTD stations between 400–1000 m depth along these transects, a triaxus tow, hydrochemistry measurements, and water collection for nutrient analysis and fluorescence profiling. A piggyback eDNA project may also aid in the *Karenia* detection. Overall, efforts will focus on offshore-inshore connectivity and the environmental conditions that support bloom initiation.

This component will provide valuable insight into the physical and chemical drivers of HABs in South Australian waters while offering students firsthand experience in multidisciplinary oceanographic sampling and analysis within a high national priority context. It also showcases strong collaboration between institutions: by leveraging the available ship-time of the RVI to complement SARDI's *RV Ngerin* sampling, the voyage will capture a snapshot of offshore conditions that would not be possible using a smaller vessel.

3. Underwater Cultural Heritage (UCH) Surveys

In consultation with the Australian Underwater Cultural Heritage Program (DCCEEW), the voyage will optimise its track and timings to facilitate the collection of data relating to several shipwrecks. This will assist with the aims of the UCH program in addition to providing an opportunity for students to plan and deliver a wreck survey. Surveys will either comprise a dedicated survey with allocated time or passing over a pre-identified target location during transit. Vessel speed for surveys is 2-4knots.

Wreck Name	Latitude	Longitude	Description
Shipwrecks considered for dedicated survey (one of two options)			
Pericles (first priority)	-34.422	115.137	Ocean Liner, 152.6m x 19.0m x 12.0m. Sank 1910. Location -34.42216667, 115.137333. Information suggests the site is 170m long x 70m wide and the wreck sits in ~35m water depth approximately 5.6k south of the Cape Leeuwin lighthouse. Wreckage is likely scattered across the site. No modern survey of the protected wreck has been undertaken. UCH recommends a detailed multi-beam survey of the site and surrounding seabed. A drop camera would be beneficial.
Nyora	-36.865	138.834	Nyora – Steel tug, 41.1m. Sank 1917. Location -36.8654, 138.8347, 12 miles SW of Cape Jaffa.
Passover Surveys			

Wreck Name	Latitude	Longitude	Description
Freak	-40.17	142.76	Sailing Vessel. Sunk 1834. Location estimated.
St Therese	-43.35	145.37	Sailing Vessel. Sunk 1988. Depth approx. 1100m.
Noeline 1	-43.42	145.58	Fishing Vessel (20t). Sunk 1996. Depth approx. 600m.
Tasman Enterprise	-43.75	146.91	Sunk 1995
Imlay Star	-43.73	146.95	Sunk 1990
Queen of the South	-43.58	147.24	Sunk 1877. Two transects were undertaken during IN2025_T01 c. 3nm off historic Bruny Island lighthouse. New transit lane should build off or be distinct from existing survey data.

4. Collection of samples for the AusCPR program using the Continuous Plankton Recorder.

The Continuous Plankton Recorder will be deployed from vessel during long transits between Hood Canyon and Hobart. Maximum deployment distance is 400nm before instrument is required to be recovered, reloaded, and redeployed.

Voyage objectives

The training objectives of the 2026 CAPSTAN 05 Voyage are to:

- Enable national access to the RVI to postgraduate students enrolled in Australian tertiary institutions.
- Provide hands-on training experiences with standard modern sampling equipment used in marine research, encompassing geological, biological, chemical, physical oceanographic and atmospheric equipment.
- Establish a national network of a new generation of marine scientists.
- Involve a diverse number of national trainers and students in the program.
- Provide trainers with the opportunity to gain experience as PI/Chief Scientist/Co Chief Scientist and demonstrators.

We aim to deliver a program that encompasses the following:

- Plan and participate in a multidisciplinary marine science research survey focusing on the core disciplines of e.g. oceanography, ecology, geosciences, biology, hydrochemistry, and atmospheric sciences.
- Evaluate the physical, chemical, and biological factors that influence the productivity of waters in the vicinity of a harmful algal bloom persisting in the Spencer Gulf region of SA.
- Demonstrate the application and operation of various scientific sampling equipment and instrumentation on board the RVI.
- Acquire, process, and analyse quantitative and qualitative samples.
- Perform data analysis, quality control, interpretation, and integration.

- Prepare a final voyage report.
- Prepare and present an element of the final cruise report to peers and crew.
- Master the skills required to operate and conduct oneself safely in the marine environment including specific MNF sea–survival skills and laboratory safety.
- Foster collaboration and communication by guiding participants in preparing and presenting voyage findings to peers and crew.
- Prepare and learn about science communication to present research to a wider audience.

Activity plan for first 24-48 hours of voyage

Date	Time	Activity
22/04/2026	1400 Hrs	Science Party Boards 24 hours prior to departure.
22/04/2026	1530 Hrs	Seagoing Inductions
23/04/2026	0900 Hrs	Laboratory Inductions / Laboratory Set Up
23/04/2026	1100 Hrs	Voyage Manager Briefing
23/04/2026	1230 Hrs	Muster
23/04/2026	1400 Hrs	Departure
23/04/2026	1800 Hrs	CTD Lab Inductions / CTD Test Cast Perth Canyon)

After MNF inductions are completed, we will steam to the CTD test cast location and complete the test. After successful completion, we will move to the location of the SS *Pericles* shipwreck survey to complete this mapping exercise. This plan allows time for inexperienced student participants to get their sea legs and become familiar with the Investigator and its standard operating procedures. If the weather is sufficiently poor to inhibit mapping activities, we will continue to steam to the first CTD station at Hood Canyon.

Piggyback projects

Global Marine Biodiversity Observations (GLOMBO): Autonomous Genomic Sampling Systems

Principal Investigator: Sahan Jayasinghe (CSIRO)

Environmental DNA (eDNA) is transforming marine biology by enabling large-scale, cost-effective biodiversity assessments that are far less resource-intensive than traditional survey methods. By analysing eDNA,

scientists can gain a more comprehensive understanding of species distribution, abundance, and ecosystem health.

The current project aims to develop and deploy an autonomous eDNA sampling system that can be seamlessly integrated into the RVI's underway seawater system. The onboard will be supporting the project during the voyage.

Voyage Leads: Seagoing Instrumentation Team

Recovery and Deployment of Argo floats including Australian core, deep, and BGC, and floats from international partners.

The International Argo program aims to monitor subsurface ocean properties of the global ocean – delivering data in real-time to support operational services, and in delayed-mode to underpin climate research. Argo Australia collaborates with over 30 other countries to implement and maintain this global ocean observing program. Argo Australia is a major player, maintaining 10% of the global array.

During CAPSTAN one standard Argo float will be deployed in the vicinity of the centre of the Great Australian Bight. There is potential to recover a problematic new NKE Arvor V2 Argo float in the vicinity of offshore of the Esperance Canyon subject to floats position and timing with the voyage route.

Looking for Karenia: a multi-disciplinary approach to HAB species identification

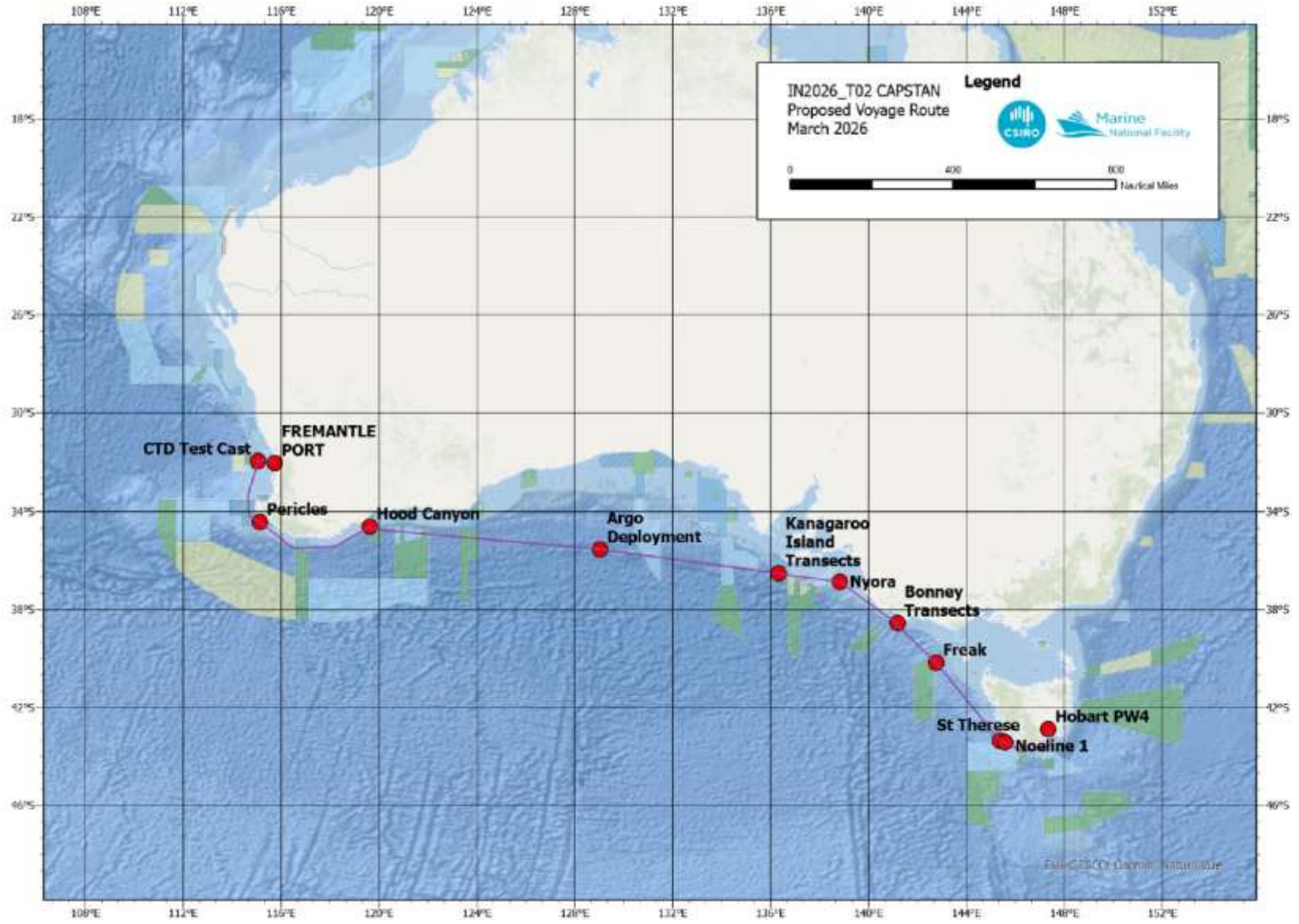
Principal Investigator: Ruth Eriksen

Detection of Harmful Algal Bloom (HAB) species in Australian marine waters is dependent on complimentary sampling and analysis methods that combined, provide information on diversity, ecology, toxicology, and phenology of causative species.

The CAPSTAN voyage IN2026_T02 provides an opportunity to extend routine sampling at the IMOS National Reference Station, Bonney Upwelling and AusCPR transects for HAB detection. By sampling the phytoplankton community using a novel method developed onboard RVI for the SEA-MES voyages ("CHUMBUCKET") we will be able to correlate community composition by microscopy with allied measurements planned as part of CAPSTAN (AusCPR, eDNA, underway sensors, remote sensing etc). These measurements will contribute to several observation programs in the region, to enhance our understanding of this complex genus of dinoflagellates, and the broader phytoplankton community composition.

Voyage Leads: Ben Arthur / Pier Van der Merwe

Voyage track example.



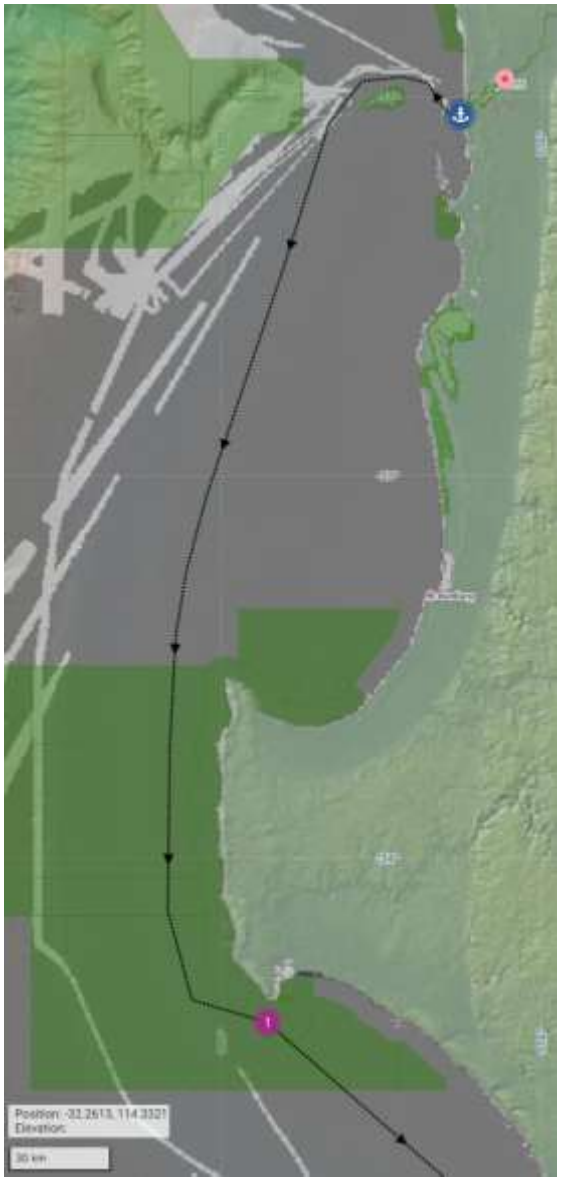


Figure 2: Pericles shipwreck survey site and track

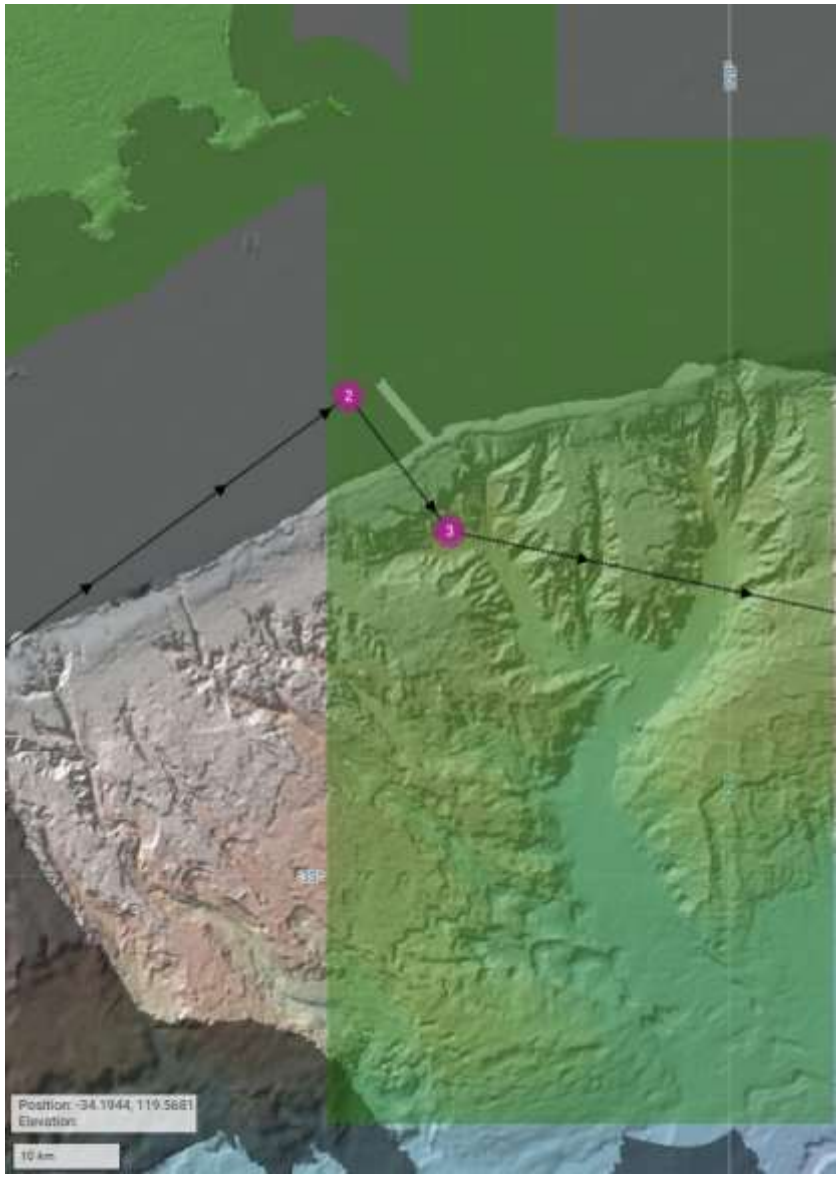


Figure 3: Bremer Canyon stations

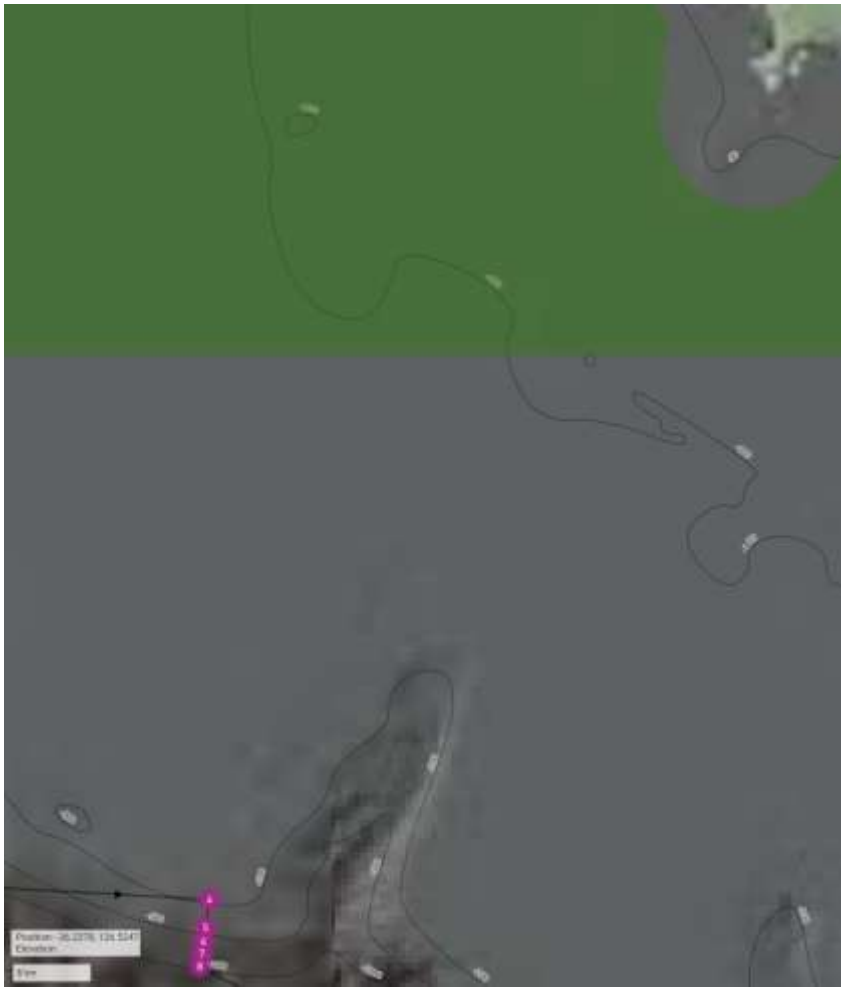


Figure 4: KI transect supporting SARDI HAB monitoring effort.

Figure 5: Bonney transect supporting SARDI HAB monitoring effort.

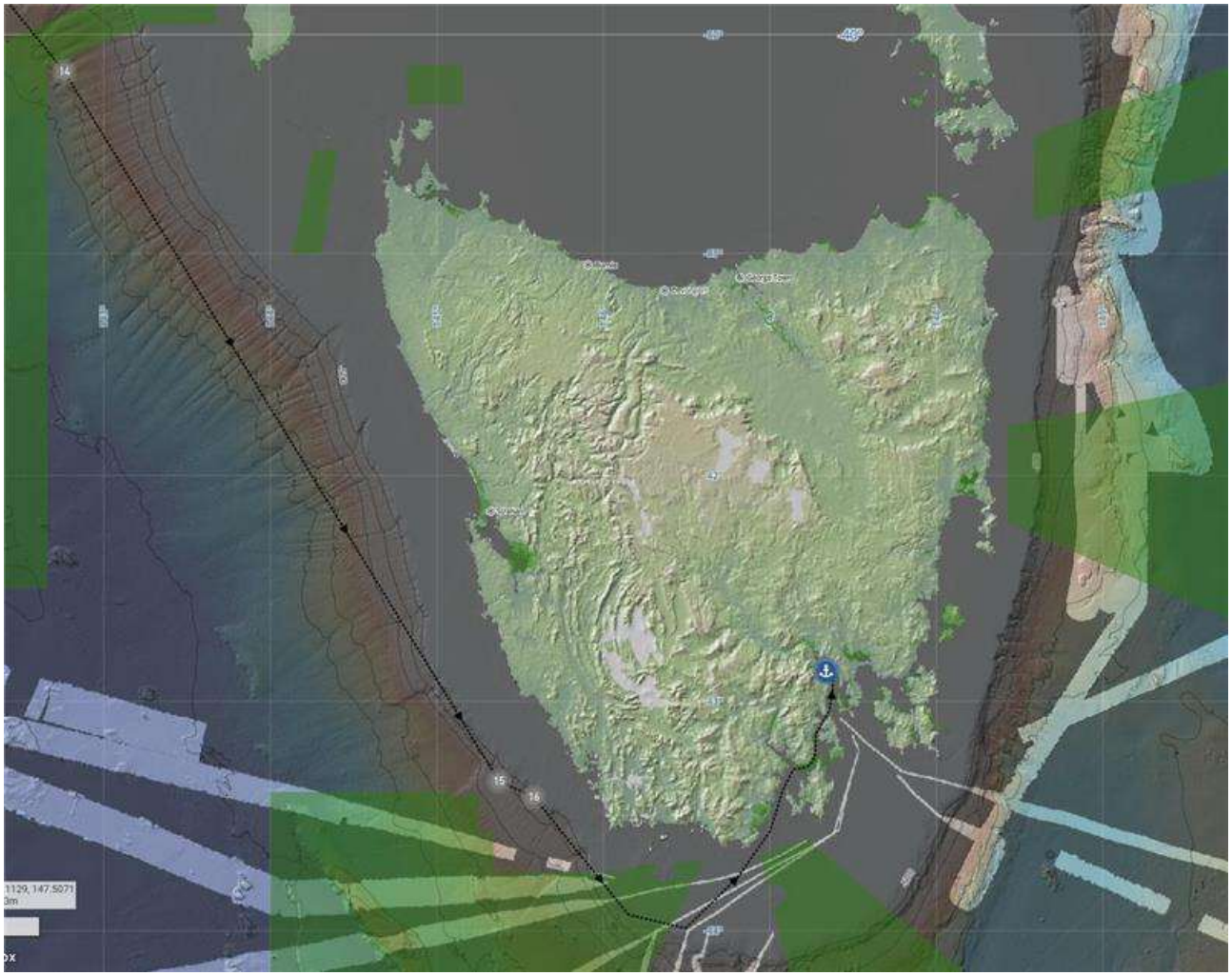


Figure 6: Shipwreck flyover sites along ship track to Hobart.

Waypoints and stations

*Sites denoted in *italics* are notional waypoints used for distance/time estimates only

SITE	DDM LATITUDE	DDM LONGITUDE	DIST. (NM)	TOTAL DIST (NM)	STEAM TIME (HRS)	TOTAL STEAM (HRS)
FREMANTLE PORT	32° 02.909 S	115° 44.632 E		0	0	0
Outbound1	*32° 03.247 S*	*115° 44.324 E*	*0.4*	*0.4*	*0.04*	*0.04*
Inner Hbr Ent	*32° 03.466 S*	*115° 42.226 E*	*1.8*	*2.2*	*0.18*	*0.22*
Hbr Approach	*32° 02.506 S*	*115° 41.590 E*	*1.1*	*3.3*	*0.11*	*0.33*
Outbound3	*32° 00.668 S*	*115° 41.079 E*	*1.6*	*4.9*	*0.16*	*0.49*
Outbound4	*31° 56.448 S*	*115° 36.009 E*	*6.1*	*11*	*0.61*	*1.1*
Outbound5	*31° 54.066 S*	*115° 28.964 E*	*6.3*	*17.3*	*0.63*	*1.73*
CTD Test Cast	31° 58.440 S	115° 03.360 E	21.9	39.2	2.19	3.92
Naturalist	*33° 18.901 S*	*114° 39.927 E*	*83.1*	*122.3*	*8.31*	*12.23*
Freycinet1	*33° 59.797 S*	*114° 40.560 E*	*40.9*	*163.2*	*4.09*	*16.32*
Freycinet2	*34° 09.716 S*	*114° 41.695 E*	*9.5*	*172.7*	*0.95*	*17.27*
Pericles Shipwreck	34° 25.550 S	115° 08.400 E	27.5	200.2	2.75	20.02
Needles	*35° 30.041 S*	*116° 30.393 E*	*92.8*	*293.1*	*9.28*	*29.3*
Peak	*35° 25.642 S*	*118° 12.452 E*	*83.6*	*376.7*	*8.36*	*37.66*
Hood Canyon (Shal	34° 36.600 S	119° 37.200 E	84.4	461.1	8.44	46.1
Hood Canyon (Deep	34° 43.200 S	119° 43.200 E	8.4	469.4	0.84	46.94
Argo	35° 32.044 S	129° 01.438 E	460.8	930.3	46.08	93.02
KI 200m	36° 30.960 S	136° 19.360 E	359.2	1289.4	35.92	128.94
KI 400m	36° 31.890 S	136° 19.200 E	1.5	1290.9	0.15	129.09
KI 600m	36° 32.340 S	136° 19.110 E	0.4	1291.4	0.04	129.13
KI 800m	36° 32.740 S	136° 19.050 E	0.4	1291.8	0.04	129.17
KI 1000 m	36° 33.170 S	136° 18.960 E	0	1291.8	0	129.17
Nyora	36° 51.900 S	138° 50.040 E	122.8	1414.6	15.35	144.52
Cape Banks	*37° 57.517 S*	*140° 18.193 E*	*96.3*	*1511*	*12.037*	156.56
Bonney 200 m	38° 32.960 S	141° 11.200 E	54	1565	5.4	161.96
Bonney 400m	38° 34.920 S	141° 10.020 E	2.7	1567.7	0.27	162.23
Bonney 600m	38° 35.950 S	141° 09.420 E	1.1	1568.8	0.11	162.34
Bonney 800m	38° 36.900 S	141° 08.850 E	1	1569.8	0.1	162.44
Bonney 1000m	38° 37.680 S	141° 08.460 E	0.3	1570.1	0.03	162.47
Freak	40° 10.200 S	142° 45.600 E	119.6	1689.7	11.96	174.43
St Therese	43° 21.000 S	145° 22.200 E	223.6	1913.3	22.36	196.79

SITE	DDM LATITUDE	DDM LONGITUDE	DIST. (NM)	TOTAL DIST (NM)	STEAM TIME (HRS)	TOTAL STEAM (HRS)
Noeline 1	43° 25.200 S	145° 34.800 E	10.3	1923.6	1.03	197.82
Maatsuyker	*43° 47.034 S*	*146° 16.532 E*	*37.1*	*1960.7*	*3.71*	201.53
SE Cape	*43° 41.693 S*	*147° 06.661 E*	*36.8*	*1997.5*	*3.68*	205.21
GSM Cal Lin 2 Sta	43° 30.630 S	147° 26.616 E	18.1	2015.6	1.81	207.02
GSM Cal Lin 2 End	43° 24.468 S	147° 27.942 E	6.5	2022.1	0.65	207.67
Bull Bay	*43° 09.362 S*	*147° 28.605 E*	*14.9*	*2037*	*1.49*	209.16
Iron Pot	*43° 04.461 S*	*147° 24.522 E*	*5.9*	*2042.9*	*0.59*	209.75
Inbound1	*42° 59.712 S*	*147° 22.384 E*	*4.9*	*2047.8*	*0.49*	210.24
Inbound2	*42° 56.246 S*	*147° 23.039 E*	*3.5*	*2051.3*	*0.35*	210.59
Inbound3	*42° 54.891 S*	*147° 22.502 E*	*1.4*	*2052.7*	*0.14*	210.73
Inbound4	*42° 53.322 S*	*147° 20.906 E*	*1.8*	*2054.5*	*0.18*	210.91
Hobart PW4	42° 53.192 S	147° 20.364 E	0.7	2055.3	0.07	210.98
Weather Contingency of (12 Hours)						222.98

*Sites denoted in *italics* are notional waypoints used for distance/time estimates only

Time estimates

The following time estimates are based on a steaming speed of 10 knots with the exception of the transit between the Kangaroo Island (KI) sites and the Bonney sites where 8 knots is applied to ensure arrival at the Bonney location during daylight hours.

Site	Date	Time	Activity
Fremantle	23/04/2026	14:00	Leave Fremantle.
Perth Canyon	23/04/2026	18:00	CTD Test Cast (1.5 hours)
	23/04/2026	19:30	Transit
Pericles	24/04/2026	11:30	Pericles Survey (MBE +/- Drop Cam – 4 hours)
	24/04/2026	15:30	Transit to Hood Canyon
Hood Canyon Shallow	25/05/2026	17:00	CTD
	25/05/2026	19:00	Transit slow ahead to Hood Deep.
Hood Canyon Deep	26/04/2026	06:00	12 hours - CTD, hydrophone. Transit WEST outside Marine Park and complete a Kasten Core at ~1000m isobath.
	26/04/2026	18:00	Deploy CPR and Transit
Argo	28/04/2026	16:00	Recover CPR, Argo Deployment
	28/04/2026	17:00	Deploy CPR and Transit
	30/04/2026	04:30	Recover CPR
	30/04/2026	05:00	Triaxus (2-3 hours)
KI 200m	30/04/2026	07:30	CTD (1 hour) and transit (1 nm)
KI 400m	30/04/2026	08:30	CTD (1 hour) and transit (0.5nm)
KI 600m	30/04/2026	09:30	CTD (2 hour) and transit (0.5nm)

Site	Date	Time	Activity
KI 800m	30/04/2026	11:30	CTD (2 hour) and transit (0.5nm)
KI 1000m	30/04/2026	13:30	Smith Macintyre Grab + 0ther. Finish with CTD within 6 hours of allocated available time.
	30/04/2026	19:30	Deploy CPR and Transit (at 8 knots)
Nyora Wreck	01/05/2026	10:55	Pass over Nyora Wreck Site (at 8 knots)
	02/05/2026	04:30	Recover CPR
Bonney 200m	02/05/2026	04:30	Triaxus (3 hours)
Bonney 200m	02/05/2026	07:00	CTD (1 hours) and transit (2nm)
Bonney 400m	02/05/2026	08:00	CTD (2 hours) and transit (1 nm)
Bonney 600m	02/05/2026	10:30	CTD (2 hours) and transit (1 nm)
Bonney 800m	02/05/2026	12:30	CTD (2 hours) and transit (1 nm)
Bonney 1000m	02/05/2026	14:30	6 hours - Smith Macintyre Grab finish with CTD
	02/05/2026	20:30	Deploy CPR and Transit
Freak	03/05/2026	08:40	Pass Over Freak UCH site
St Therese	04/05/2026	06:45	Pass over St Therese UCH site
Noeline	04/05/2026	07:50	Pass over Noeline UCH Site
Storm Bay	04/05/2026	17:00	Enter Storm Bay
Hobart PW4	05/05/2026	08:00	Activities and arrival time account for ~12 hours weather contingency.

Permits

Australian Marine Parks

This voyage will traverse through the following Marine Parks which RVI is permitted to operate under PA2020-00041-1 South-east Network and PA2020-00041-2 South-west Network:

- Perth Canyon
- South-west Corner
- Bremer
- Eastern Recherche
- Great Australian Bight
- Western Eyre
- Zeehan
- Tasman Fracture
- Huon

No XBTs are permitted in Marine Parks, however Rapid Cast operations are permitted.

The vessel has a Standard Operating Procedure (SOP) to manage interactions with cetaceans, which will impact the collection of data associated with the ship's acoustic systems. All cetacean sightings within Marine Parks must be documented and reported back to Marine Parks as part of the post voyage notification.

Voyage Activities within marine parks:

Area	Activity
Perth Canyon	CTD
Bremer	CTD x 2
Eastern Recherche	CPR
Great Australian Bight	CPR
Western Eyre	CPR
Zeehan	CPR
Tasman Fracture	CPR

Traditional Owner Engagement

Prior to the voyage CSIRO engaged with the Esperance Tjaltjraak Native Title Aboriginal Corporation. Several opportunities were explored and the voyage may facilitate:

- live cross to Senior Cultural Advisors and project team to present key outcomes of the Wudjari Ancient Coastlines Program
- opportunistic strategic mapping of Sea Country east of Bremer Canyon (if operationally feasible).

Signature

Your name	Dr Pier van der Merwe
Title	CAPSTAN Director and Lead Principal Investigator
Signature	
Date:	17/04/2026

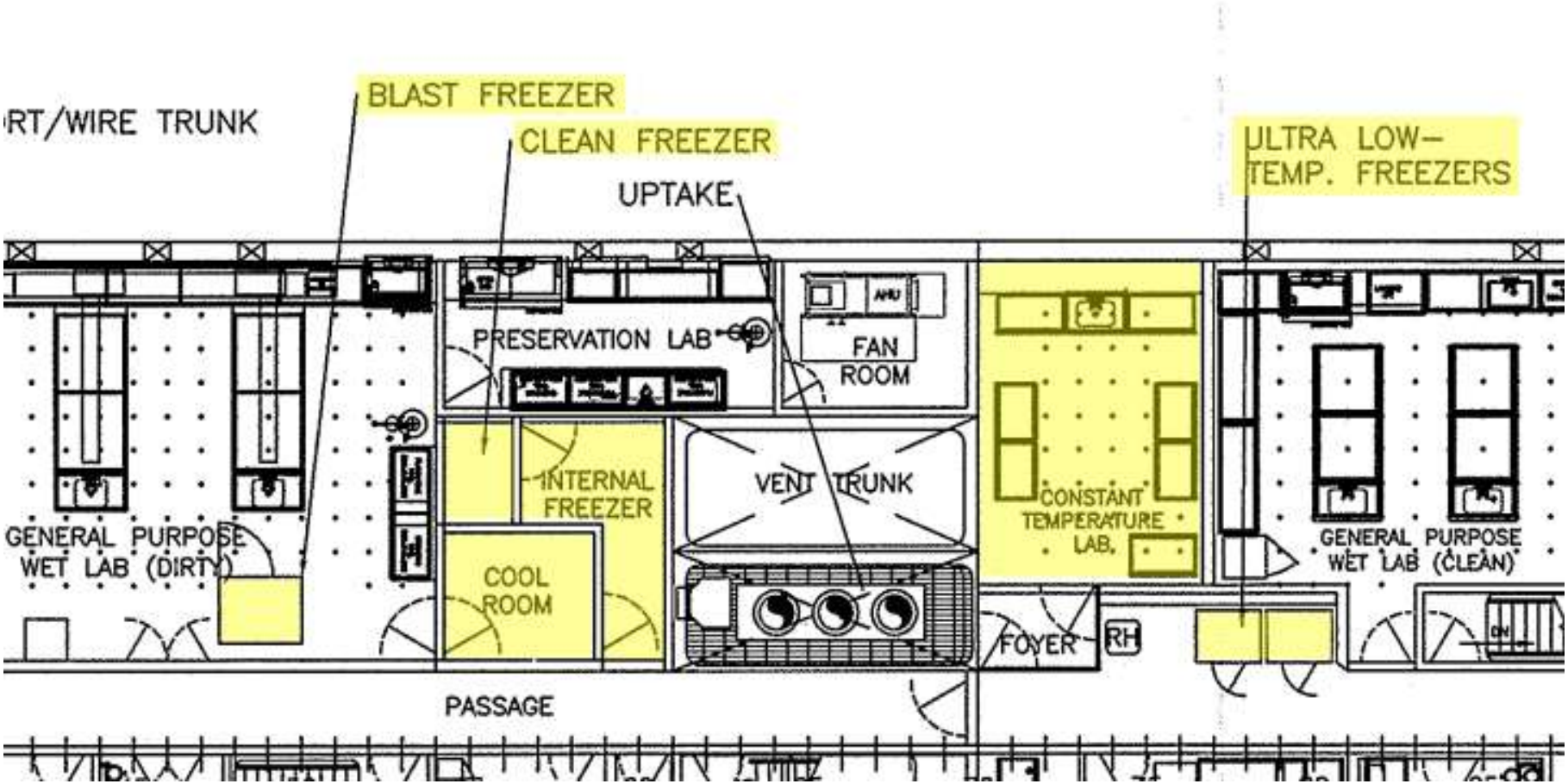
Appendix A

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.

STANDARD LABORATORIES AND FACILITIES		
NAME	**REQUIRED**	**NOTES/COMMENTS**
Aerosol Sampling Lab		•
Air Chemistry Lab		•
Preservation Lab	X	• **Sediment Core Description, Photography and Analysis (Fume Hood required for Carbonate Content Analysis of Sediment Samples)**
Constant Temperature Lab (Min temp: ~4°C / Max temp ~35°C)		•
Underway Seawater Analysis Laboratory		• **Collection of underway seawater. No bench space is needed in this lab. Other outlets for underway seawater in other labs may also be suitable locations to collect underway seawater samples.**
GP Wet Lab (Dirty)		• **Sediment core processing**
GP Wet Lab (Clean)	X	• **Geotechnical Properties Determination and Grainsize Analysis of Sediment Samples and (One Bench Required)**
GP Dry Lab (Clean)	X	• **Underway seawater filtration and analysis for chlorophyll a extraction.**
Sheltered Science Area		•
Observation Deck 07 Level		• **Marine mammal observations**

STANDARD LABORATORIES AND FACILITIES		
NAME	**REQUIRED**	**NOTES/COMMENTS**
Internal Freezer (Dirty Wet lab) (Min temp -25°C / Max temp 0°C) Volume: >20m^3		
Clean Freezer (Dirty Wet lab) (Min temp -25°C / Max temp 0°C) Volume: >2.5m^3 Co-located within the Internal freezer and separated by a door		
Blast Freezer (Dirty Wet lab) (Min temp -30°C / Max temp 0°C) Internal volume >1.5m^3 Capable of reducing the temperature of 150kg of water from +20C to -30C in one hour.		
Cool Room (Dirty Wet lab) (Min temp 0°C / Max temp 10°C)	X	• **Storage of sediment cores** • **4 deg C**
Ultra-Low Temperature Freezers x2 (Main Deck) Min temp -80°C / Max temp -80°C)	X	
YODA Freezers (x2) (Clean Dry lab) (Min temp -20°C / Max temp 10°C)		


RT/WIRE TRUNK
BLAST FREEZER
CLEAN FREEZER
UPTAKE
ULTRA LOW–
TEMP. FREEZERS
PRESERVATION LAB
AHU
FAN
ROOM
INTERNAL
FREEZER
VENT TRUNK
CONSTANT
TEMPERATURE
LAB.
GENERAL PURPOSE
WET LAB (DIRTY)
COOL
ROOM
FOYER
RH
GENERAL PURPOSE
WET LAB (CLEAN)
PASSAGE

STANDARD SAMPLING EQUIPMENT			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS**
Continuous Plankton Recorder (CPR)	X		

SPECIALISED SAMPLING EQUIPMENT			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)**
TRIAXUS – Underway Profiling CTD	X		Triaxus is a pilotable towed vehicle capable of carrying a variety of instrumentation. Constant depth towing or undulating profiles (e.g. cyclic depth pattern from the surface to 200m) are possible. Towing speed depends on the tow profile, instrumentation payload, and prevailing conditions. Typically, undulations from the surface to 200m are possible at 8knt, with slower speeds for deeper profiles and faster for constant-depth towing. Maximum achievable depth typically 300m to a distance of approximately 1.5km from the ship. Triaxus is normally configured with the following sensors as a minimum: • **Dual temperature, conductivity, and dissolved oxygen (SBE9plus and dual pumped temperature/conductivity/dissolved oxygen circuits)** • **PAR** • **Chlorophyll-A, CDROM, optical backscatter (Eco-triplet – 2000m Max)** • **Transmissometer** Contact MNF for further details on other instrumentation and capability.
Desired towing profile:			
Additional instrumentation: (please supply, make, and model and datasheets and a contact person for discussion on integration)			

SPECIALISED SAMPLING EQUIPMENT			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)**
Piston Coring System			
Gravity Coring System			
Multi Corer			
Kasten Corer	X		**Sediment Coring Hood & Bonney Canyon Deep Stations (~1000 m deployment)**
Smith Mac Grab	X		**Sediment Sampling (Shallow Water <400 m)**
Rock Dredges			
Rock Saw			
Seaspy Magnetometer			
Portable Pot Hauler			
Equipment to measure seawater sound velocity/CTD:			
XBT System	x		2 per day provided if requested
Valeport Rapid SV			
Valeport Rapid CTD			
Valeport SVX2			
Trace Metal Rosette and Bottles			
Trace Metal In-situ Pumps (x6)			•
Deep Towed Camera			
Drop Camera	X		For investigation of successful shipwreck survey sites

SPECIALISED SAMPLING EQUIPMENT			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)**
Sherman Epibenthic Sled			Stern ramp must be removed to operate this system.
Brenke Sled			
Hydro-Bios MultiNet (Mammoth) (1m x 1m)			Please specify 100-micron, 335-micron, or 500-micron mesh Can be used in a vertical or horizontal operations
Surface Net (1m x 1m)	X		335-micron, 500-micron
Bongo Net			750mm frame, 500-micron mesh net and 335-micron cod end
Beam Trawl			
MIDOC			Multiple opening/closing net system with cod ends- suitable for pelagic trawls
Pelagic Trawl System (net, doors)			Contact MNF to discuss net and mesh dimensions
Demersal Trawl System (net, doors)			Contact MNF to discuss net and mesh dimensions
RMT-8 (Rectangular Midwater Trawl) Utilises a single warp so can be deployed on the general-purpose towing wire in self-contained mode. Must be deployed with stern ramp covered.			8m2 mouth area Tow speed ≤2 knots
RMT-16 (Rectangular Midwater Trawl) Utilises a single warp so can be deployed on the general-purpose towing wire in self-contained mode. Must be deployed with stern ramp covered.			16m2 mouth area Tow speed ≤2 knots
Trawl Monitoring Instrumentation (ITI) (2,000m depth limit)			MNF to identify this need, dependent on pelagic or demersal trawling requirement

SPECIALISED SAMPLING EQUIPMENT			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)**
Stern ramp		**INSTALLED**	MNF to identify this requirement

RESEARCH SUPPORT INFRASTRUCTURE			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS**
Saltwater Ice Machine (Dirty Wet lab)			
Radiosonde Receiver System			
Laboratory Incubators (Clean Dry lab)		X	Drying of Sediment Samples (40 to 50 degrees Celsius overnight)
Deck Incubators			Temperature controlled deck incubators
Milli-Q System	X		Needed for rinsing labware for underway sample collection
Sonardyne USBL System			

SCIENTIFIC / SAMPLE ANALYSIS SYSTEMS				
MICROSCOPES:				**NOTES/COMMENTS**
BRAND / MODEL	**TYPE**	**ESSENTIAL**	**DESIRABLE**	
Leica / M80	Dissecting	x		Biological and Sediment Sample Examination
Leica / M80	Dissecting	X		Biological and Sediment Sample Examination
Leica /MZ6	Dissecting	X		Biological and Sediment Sample Examination
Olympus / CH	Compound			
Olympus /CH	Compound			
Leica / MTU282	Camera tube			

SCIENTIFIC / SAMPLE ANALYSIS SYSTEMS				
MICROSCOPES:				**NOTES/COMMENTS**
Adapters for tube / Nikon	Pentax			
Ring Light *2 / MEB121	LED			
Heavy Duty Electronic Balance (80kg)				
Medium Duty Electronic Balance (15kg/5g resolution)				
Light Duty Electronic Balance (3kg/1g resolution)		X		Sediment grainsize analysis and geotechnical properties determination

Underway systems

ACOUSTIC UNDERWAY SYSTEMS			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS**
75kHz ADCP			
150kHz ADCP			
Multi Beam Echo Sounder EM2040-MKII 200-700kHz (0 – 250m approx.)	X		Underway Bathymetric Mapping
Multi Beam Echo Sounder EM124 12kHz (100m to full ocean depth)	X		Underway Bathymetric Mapping
Multi Beam Echo Sounder EM712 70-100kHz (0 –1000-m approx.)	X		Underway Bathymetric Mapping
Sub-Bottom Profiler SBP29	X		Underway Geophysical Profiling of the seafloor
Scientific Narrowband/Broadband Echo Sounders EK80 (6 bands, 18kHz-333kHz)			EK80s will be used in narrowband mode unless otherwise requested.

ACOUSTIC UNDERWAY SYSTEMS			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS**
			Quantitative measurements from scientific echosounders requires sphere calibration in the watermass of sampling
Multibeam Scientific Echo Sounder ME70 (70100 kHz)			
Omnidirectional Echo Sounder SH90			
Gravity Meter		X	Underway Geophysical Profiling

UNDERWAY SEAWATER SYSTEMS AND INSTRUMENTATION			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS**
Thermosalinograph		X	In between main stations
Fluorometer		X	In between main stations
Optode			
pCO2			

SEAWATER SYSTEMS			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS**
Trace metal clean seawater supply			
Scientific clean seawater supplied to laboratories	X		For underway seawater sample collection

SEAWATER SYSTEMS			
NAME	**ESSENTIAL**	**DESIRABLE**	**NOTES/COMMENTS**
Raw seawater available on deck and in laboratories			

CTD Configuration (delete this section if not intended to be used)

- **Plan for the following maximum rate of analyses based on 2 Hydrochemists:**
- **48 nutrients, 48 dissolved oxygen, 48 salinity analyses per 24 hours; OR**
- **72 nutrient, 36 dissolved oxygen, 36 salinity analyses per 24 hours; OR**
- **160 nutrient analyses (only) per 24 hours.**

	PLEASE SELECT:
Fundamentals	
Which CTD rosette to be used for this voyage (24 or 36 Niskin bottles):	24 or 36
Likely total number of casts:	10
Likely maximum depth of deepest cast:	2000 m
Standard CTD Configuration - Instrumentation (maximum 6 auxiliary channels plus 2 x DO) 6000m	
1 x SBE9+ (CTD) 2 x SBE3P Temperature Sensors 2 x SBE4C Conductivity Sensors 2 x SBE5T pumps	Yes
2 x SBE43 Dissolved Oxygen Sensors	Yes
1 x Tritech PA200/500 Altimeter	Yes/No
1 x Biospherical QCP2300HP PAR Sensor	Yes
1 x Wetlabs C-Star 25cm Transmissometer	Yes
1 x Wetlabs ECO FLCDRTD Fluorometer – CDOM (370/460nm)	Yes
1 x Wetlabs ECO FLBBRTD Fluorometer – Chlorophyll-a & Backscatter (2 x channels - 470/695nm)	Yes
Alternative Instruments (Instruments highlighted in grey can be substituted from standard configuration)	
Seapoint Turbidity Meter – Nephelometer	
Seabird SUNA – Ultraviolet Nitrate Analyzer (**Serial Connection - 2000m**)	
Standard LADCP Configuration – Instrumentation: 6000m	
1 x Teledyne 300 kHz LADCP (Slave - Up) 1 x Teledyne 150 kHz LADCP (Master - Down) 1 x 48V Deep Sea Battery	Yes
Alternative LADCP Configuration - Instrumentation: 6000m	
1 x Teledyne 300 kHz LADCP (Slave - Up) 1 x Teledyne 300 kHz LADCP (Master - Down) 1 x 48V Deep Sea Battery	No
Hydrochemistry Analyses	
Salinity	Yes
Dissolved Oxygen	Yes

	PLEASE SELECT:
Nutrients: Nitrate	Yes
Nutrients: Phosphate	Yes
Nutrients: Silicate	Yes
Nutrients: Nitrite	Yes
Nutrients: Ammonia	Yes

Please note any special requests – such as special sampling that is intended to be performed by the science party (e.g. sampling for dissolved gases, radioisotopes, etc.); or any user-supplied instrumentation to be fitted to the CTD frame; etc.

Appendix B

User Supplied Equipment

The table below will include information provided by the Chief Scientist / Principal Investigators in the '*Equipment Manifest-user supplied voyage specific'* document. The Chief Scientist will co-ordinate the completion of this Manifest with all PIs and forward the completed document to the Voyage Operations Manager.

NOTE: User supplied equipment will remain the responsibility of the science party throughout the voyage. The MNF technicians and ship's crew endeavour to assist wherever possible, however the MNF take no responsibility for the pre-deployment checks or repairs and maintenance of this equipment.

This information will also be used for the mobilisation list and deck plan for the voyage.

Owner	Item name	Weight	Dimensions	Location on Vessel
University of Sydney (Tom Hubble)	Geotechnical and Sediment Test Equipment (Sediment Sieves, Carbonate Content Test Device, mini shear-vane, compressive test device)	80 kg	01.0 cubic metre boxed	GP Wet Lab - Dirty
IMAS (Pier van der Merwe	Turner Fluorometer 10-AU	15kg	1m x 0.3m x 0.3m	GP Wet Lab Clean
Whales and Climate Program (Olaf Meynecke)	Soundtrap HF ST300 or 600 Hydrophone	2 kg	50cm x 10cm	GP Wet Lab - Dirty