MNF Voyage Highlights and Summary

Voyage #:	**IN2021_E01**
Voyage title:	Trials and Calibrations (Coring #1)
Mobilisation:	Friday 29 October – Monday 1 November, Hobart PW04, 0800hrs
Depart:	Wednesday 10 November 2021, Hobart PW04, 1000hrs
Return:	Sunday, 14 November 2021, Hobart PW04, 1400hrs
Demobilisation:	Monday, 15 November 2021, Hobart PW04, 0800hrs
Voyage Manager:	John Hooper
Technical Lead:	Jason Fazey
Affiliation:	CSIRO

PART A – Voyage Highlights

This voyage's primary aims were to:

- Trial and test the new deep sea core pipe handler and Giant Piston Corer to determine how they performed using the existing onboard deep corer and auxiliary winches; and
- Successfully test improvements in safe handling, construction, deployment and retrieval of piston barrels and piston cores.

This was also the first training and familiarity opportunity with this new equipment for one swing of crew, as well as our first voyage in ~100 days alongside during our extended Long Maintenance Period.

It was discovered early in the voyage that the deep corer winch had a technical fault that resulted in the premature return of the voyage and cessation of more planned piston coring. This fault was repaired and tested prior to (and during) the following voyage IN2021_E02 where Original Equipment Manufacturer (OEM) technicians worked with ship crew to calibrate all winches. This fault also meant that planned piston core deployments into the sea floor could not be achieved, and subsequently these activities were reassigned to the later coring voyage (IN2021_E03 - Coring #2).

Collaboration opportunities were also realised between CSIRO/MNF and the Australian Antarctic Division (AAD), as part of the Centre for Antarctic and Southern Ocean Technology in Tasmania (CAST). The MNF's Geophysical Survey & Mapping (GSM) team provided training and insight into onboard acoustics technology to two AAD acousticians, as these systems were similar to their new vessel RSV *Nuyina*.

MNF support staff were successful in many planned and opportunistic tasks and projects. These included:

- GSM performing oceanic mapping and interagency cross-training, as well as detailed substrate mapping to support coring equipment safety.
- Seagoing Instrumentation Team (SIT) performed Sea Surface Temperature Radiometer testing and other systems support.
- Data Acquisition and Processing (DAP) team performed PABX Phone Upgrade tests, server maintenance and staff cross-training.
- Field Operations (FO) team performed new Giant Piston Corer and new Box Corer (KC 80.250.50) trials and commissioning.

The outcomes of these projects will allow *Investigator* to continue to support multi-disciplinary research on behalf of the nation.

Voyage Highlights

Technical Lead

Jason Fazey is the MNF's Science Technology Coordinator and has many years' experience onboard RV Investigator. Jason was also involved in the early project management, scoping, assessment and procurement of the Giant Piston Corer and Core Handler systems prior to this voyage.

Title

IN2021_E01 Trials and Calibrations (Coring #1)

Purpose

The purpose of this Marine National Facility (MNF) voyage was to calibrate and commission new, upgraded, and existing critical equipment (with sea trials and personnel training) onboard *Investigator* for upcoming voyages in the 2022 schedule and beyond. The primary objectives for this voyage were testing the new piston coring system and performing annual GSM equipment calibrations.

The voyage consisted of four main projects with the following objectives:

- Test the new Giant Piston Corer and Core Handler.
- Calibrate multi beam echo sounder (MBES) systems onboard
- Increase collaboration with AAD team members through CAST
- Maintain, repair, test & report on other ship systems after significant time alongside.

Contribution to the nation

The outcomes of these projects together are of significance to the Australian community because they provide the MNF and therefore the nation with confidence of ship systems onboard *Investigator*.

As a result of this voyage

1. We have a better understanding of ship systems performance and constraints (e.g. giant piston coring function and sea state limitations >25 knots).
2. Additional vessel time per each GPC deployment may be required than predicted.
3. We have mapped approximately 620-line kilometres (335 nautical miles) using approximately 7 oceanic acoustic profiling devices onboard.

Voyage Summary

Objectives and brief narrative of voyage

The purpose of this Marine National Facility (MNF) voyage was to calibrate and commission new, upgraded, and existing critical equipment (with sea trials and personnel training) onboard *Investigator* for upcoming voyages in the 2022 schedule and beyond. The primary objectives for this voyage were testing the new piston coring system and performing annual GSM equipment calibrations.

Scientific objectives

Scientific objectives of retained cores from piston coring and seafloor mapping previously unmapped areas were targeted, however, the testing and calibration of these news systems were a priority.

Voyage objectives

Voyage objectives were to complete the planned scope of works. Specifically, work focussed on the seagoing testing and trials of MNF's new Giant Piston Corer with 24m maximum barrel length capability, principally supported by the Geophysical Survey and Mapping (GSM) team and marine geoscientists from UTAS and Geoscience Australia.

Results

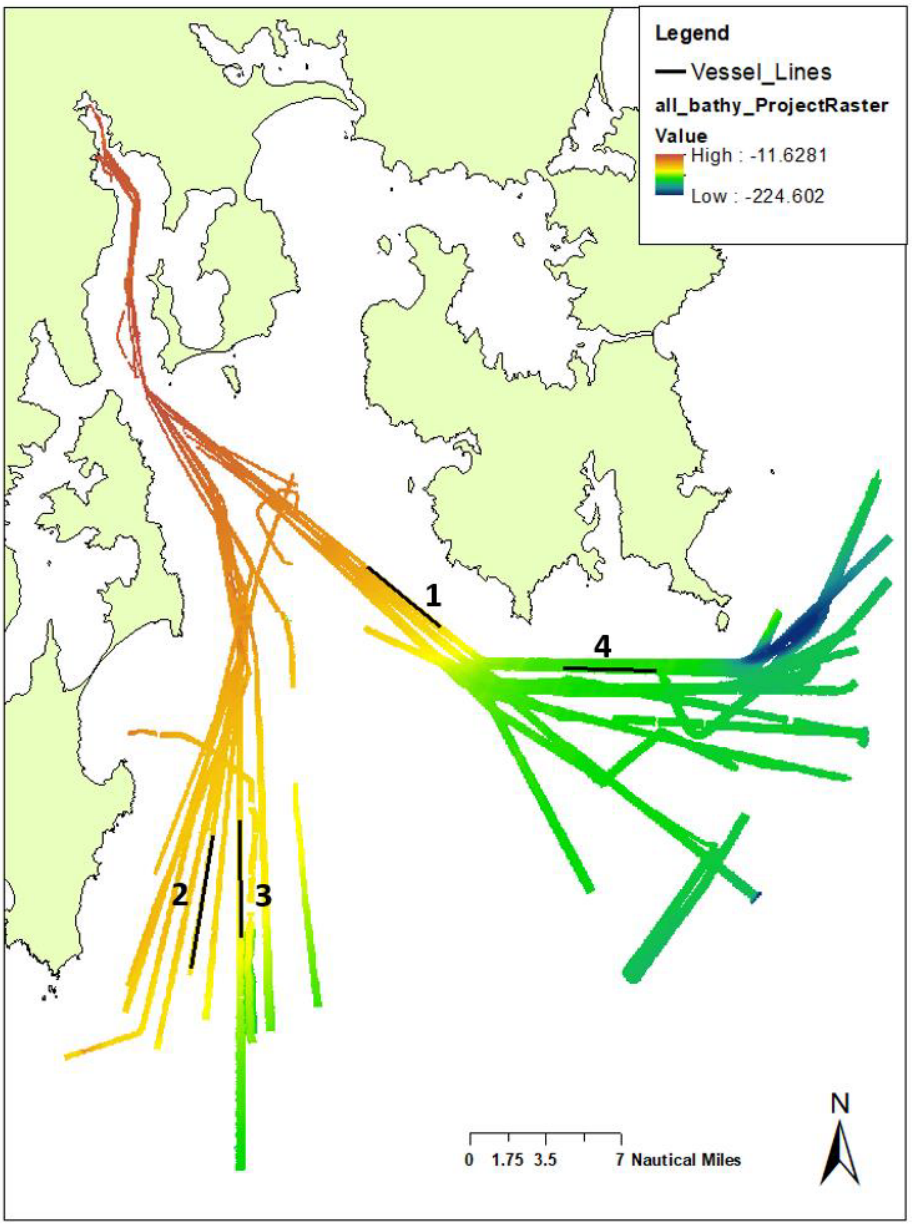
Field Operations and crew were successful in trailing and calibrating the giant piston corer for the purposes of the seagoing acceptance testing, however, a technical fault was discovered in the deep corer winch that resulted in the premature return of the voyage and cessation of more planned piston coring. This fault was repaired and tested prior to (and during) the following voyage (IN2021_E02) where Original Equipment Manufacturer (OEM) technicians worked with ship crew to calibrate all winches. This fault with the deep corer winch also meant that planned piston core deployments into the sea floor could not be undertaken, therefore, seafloor deployments were postponed to the later coring voyage IN2021_E03 (Coring #2).

The MNF's new box corer (KC 80.250.50) was commissioned by Field Operations and ASP.

Voyage narrative

Departing from Hobart on Wednesday, 10 November 2021, voyage activities started with the GSM team performing sphere calibrations of the multibeam echo sounders EK60 and EK80. These were successfully completed at White Rock within the Derwent Estuary to ensure smooth waters during the activity.

Backscatter checks and calibrations of the EM710 were also performed underway when transiting through sites #1 and #4 as pictured below.



After this, core pipe handler tests were conducted where Field Operations and crew rehearsed safely rigging, checking and lowering the handler into the water (horizontal) and articulating it to a vertical operational position. This was also a training opportunity for crew and support staff as not all had seen or used the old piston coring system.

Throughout the voyage routine underway data collection was performed using the ship's echosounders, underway seawater (including calibration of new PC02 sensor), gravity meter, sea surface temperature ratiometer and Sound Velocity profiles.

A technical fault of the deep corer winch wire out counting system meant that deployment to the seafloor for the Giant Piston Corer could not be completed. The counter sensor was subsequently fixed at next port period and the next voyage (IN2021_E02) took on more focused calibration and re-spooling for the deep corer winch.

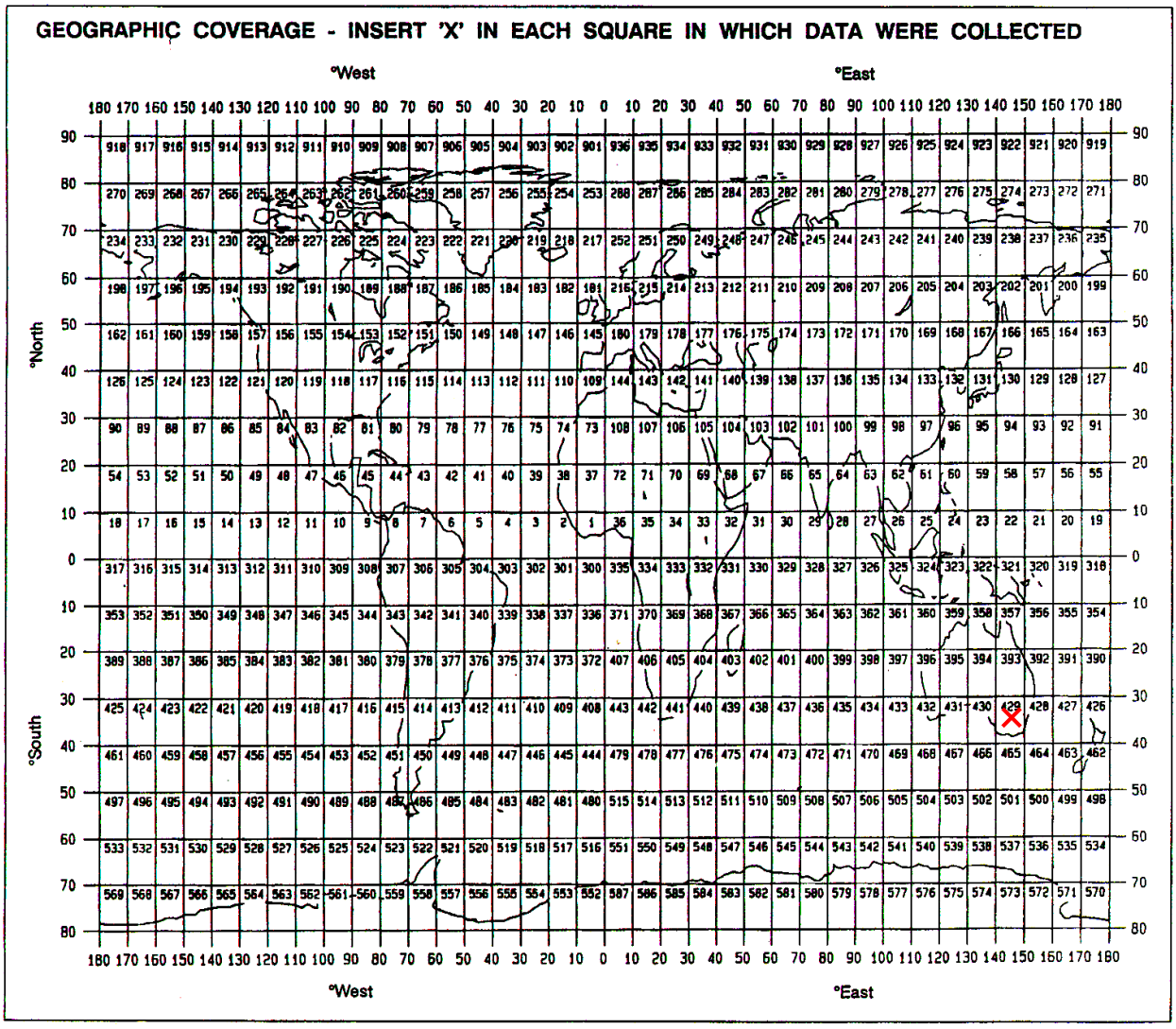
Summary

This voyage was successful in achieving the majority of the planned scope of works for trials and calibrations. The planning and delivery of this voyage was highly compressed, facing many challenges such as an altered port and areas of operation.

Considering the context of these challenges, the problems uncovered (many resolved onboard) and the volume of work completed and feedback of participants, many consider this voyage a positive and important restart to operations for the MNF following from the extended Long Maintenance Period of 2021.

Marsden Squares

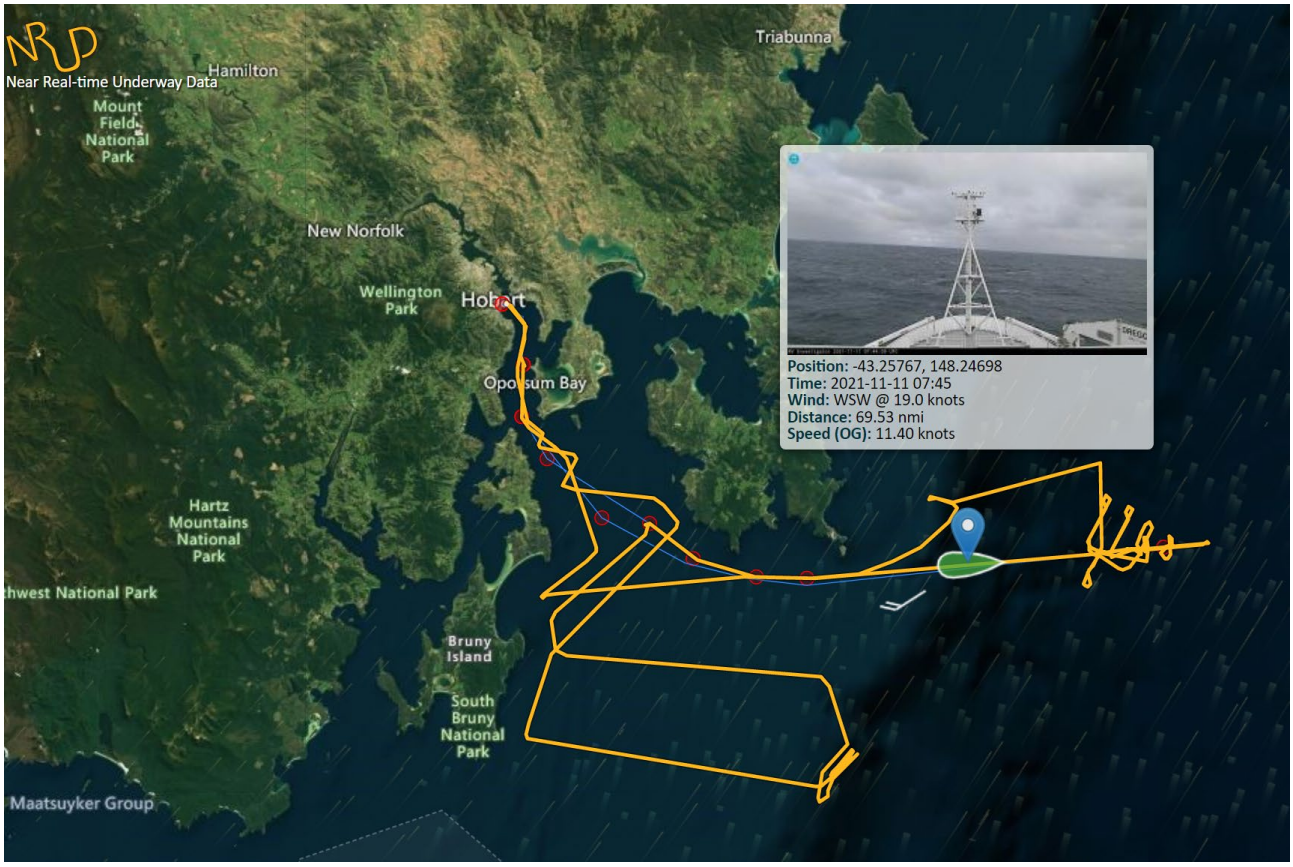
× × × × ×



Summary of data and samples collected

Item Name, Identifier (e.g. serial number)	Principal Investigator (see Title Page)	NO (see above)	UNITS (see above)	DATA TYPE Enter code(s) from list in Appendix A	DESCRIPTION Identify, as appropriate, the nature of the data and of the instrumentation/sampling gear and list the parameters measured. Include any supplementary information that may be appropriate e.g. vertical or horizontal profiles, depth horizons, continuous recording or discrete samples, etc. For samples taken for later analysis on shore, an indication should be given of the type of analysis planned, i.e. the purpose for which the samples were taken.
IN2021_E01 Box Corer Sample #1	Martin Jutzeler & Acacia Clark	Cores	1	G04	

Track Chart



Acknowledgements

Acknowledgement and thanks to Alix Post, Scott Nichol and Michal Wenderlich from Geoscience Australia, who were instrumental in supporting piston coring site selection and for the final voyage plan and to Acacia Clark from UTAS.

Thanks also to the voyage's Technical Lead, Jason Fazey, Voyage Manager, John Hooper, and the Engineering and Technology team members who were supportive, understanding and flexible during uncertain timeline of return to operations.

Signature

Your name:	David Flynn
Title:	Voyage Delivery Coordinator
Signature:	(insert signature)
Date:	05/01/2022

Appendix A – CSR/ROSCOP Parameter Codes

	METEOROLOGY
M01	Upper air observations
M02	Incident radiation
M05	Occasional standard measurements
M06	Routine standard measurements
M71	Atmospheric chemistry
M90	Other meteorological measurements

	PHYSICAL OCEANOGRAPHY
H71	Surface measurements underway (T,S)
H13	Bathythermograph
H09	Water bottle stations
H10	CTD stations
H11	Subsurface measurements underway (T,S)
H72	Thermistor chain
H16	Transparency (e.g. transmissometer)
H17	Optics (e.g. underwater light levels)
H73	Geochemical tracers (e.g. freons)
D01	Current meters
D71	Current profiler (e.g. ADCP)
D03	Currents measured from ship drift
D04	GEK
D05	Surface drifters/drifting buoys
D06	Neutrally buoyant floats
D09	Sea level (incl. Bottom pressure & inverted echosounder)
D72	Instrumented wave measurements
D90	Other physical oceanographic measurements

	MARINE BIOLOGY/FISHERIES
B01	Primary productivity
B02	Phytoplankton pigments (e.g. chlorophyll, fluorescence)
B71	Particulate organic matter (inc POC, PON)
B06	Dissolved organic matter (inc DOC)
B72	Biochemical measurements (e.g. lipids, amino acids)
B73	Sediment traps
B08	Phytoplankton
B09	Zooplankton
B03	Seston
B10	Neuston
B11	Nekton
B13	Eggs & larvae
B07	Pelagic bacteria/micro-organisms
B16	Benthic bacteria/micro-organisms
B17	Phytobenthos
B18	Zoobenthos
B25	Birds
B26	Mammals & reptiles
B14	Pelagic fish
B19	Demersal fish
B20	Molluscs
B21	Crustaceans
B28	Acoustic reflection on marine organisms
B37	Taggings
B64	Gear research
B65	Exploratory fishing

H21	Oxygen
H74	Carbon dioxide
H33	Other dissolved gases
H22	Phosphate
H23	Total - P
H24	Nitrate
H25	Nitrite
H75	Total - N
H76	Ammonia
H26	Silicate
H27	Alkalinity
H28	PH
H30	Trace elements
H31	Radioactivity
H32	Isotopes
H90	Other chemical oceanographic measurements

	MARINE CONTAMINANTS/POLLUTION
P01	Suspended matter
P02	Trace metals
P03	Petroleum residues
P04	Chlorinated hydrocarbons
P05	Other dissolved substances
P12	Bottom deposits
P13	Contaminants in organisms
P90	Other contaminant measurements

	MARINE GEOLOGY/GEOPHYSICS
G01	Dredge
G02	Grab
G03	Core - rock
G04	Core - soft bottom
G08	Bottom photography
G71	In-situ seafloor measurement/sampling
G72	Geophysical measurements made at depth
G73	Single-beam echosounding
G74	Multi-beam echosounding
G24	Long/short range side scan sonar
G75	Single channel seismic reflection
G76	Multichannel seismic reflection
G26	Seismic refraction
G27	Gravity measurements
G28	Magnetic measurements
G90	Other geological/geophysical measurements