

# MNF Voyage Highlights and Summary

Voyage #:	IN2021_E03
Voyage title:	Trials and Calibrations (Coring #2)
Mobilisation:	Monday, 29 November 2021, Hobart PW04
Depart:	Wednesday, 1 December 2021, Hobart PW04, 1000hrs
Return:	Wednesday, 8 December 2021, Hobart PW04, 0800hrs
Demobilisation:	Wednesday 8 to Friday 10 December 2021, Hobart PW04
Voyage Manager:	Tegan Sime
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.
- CTD #2 Winch calibration.

This voyage was supported by two scientists onboard from UTAS Marine Geology department, as well as planning and remote assistance from Alix Post, Scott Nichol, and others from Geoscience Australia.

The deep corer winch performed well on auto-spool mode during piston coring operations, although additional time was spent by the crew and electrician to monitor and adjust some spooling to maintain proper spooling. A snag of the piston coring trigger mechanism 'arm' with the deployed vertical core pipe handler resulted in the trigger arm lost at sea. A shoreside engineering solution was made and delivered to the ship, which allowed the vessel to continue planned operations. All bar one piston core deployment was successful in retaining seafloor sediment samples. Hydraulic locking of the piston and barrel limited volume of sediment recovery in each barrel; this is suspected to be the cause of the first deployment retaining no sediment, however, adjustments to equipment on each deployment improved sediment retention each time.

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

- Geophysical Survey & Mapping (GSM) team performing oceanic mapping and Surface Reference Checks (EM122 & EM710), as well as detailed substrate mapping to support coring equipment safety.
- Seagoing Instrumentation Team (SIT) performed Sea Surface Temperature Radiometer testing & further Deep Towed Camera trials on HOTS cable.
- Data Acquisition and Processing (DAP) team performed PABX Phone Upgrade tests, server maintenance and staff cross-training.
- Field Operations (FO) team were fully occupied with new Giant Piston Corer 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\_E03 Trials and Calibrations (Coring #2).

#### 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 complete remaining tests and calibrations of equipment that could not be achieved on IN2021\_E01 and IN2021\_E02.

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

- Test the new Giant Piston Corer and Core Handler.
- Test the new Kasten Coring system using the same Core Handler (modified rollers etc).
- Calibrate multi beam echo sounder (MBES) systems onboard.
- 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. New Giant Piston Corer has excellent performance however, is limited to <25 knots wind to hold dynamic positioning).
- 2. Field Ops now have a good indication of GPC coring timing, from setup to completion and reset for next core (approx. 12hrs each).
- 3. We have mapped approximately 1355 kilometres (731.6 nautical miles). using approximately 7 oceanic acoustic profiling devices onboard.
- 4. We successfully performed Giant Piston Coring commissioning using two of the five possible 4.8m barrels (9.6m tested length). Retained sediment samples were obtained on all deployments except the first deployment. Careful consideration of substrate type, pilot core trigger wire length, spring back calculations and other components improved core retention however, further trials and calibrations are required to build confidence in sediment recovery of longer core lengths.
- 5. We were not able to complete Kasten Coring using the new system.

# 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 here were to complete the planned scope of works. Specifically, work will focus 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 team and marine geoscientists from UTAS and Geoscience Australia.

#### Results

- Field Operations and ASP Ship Management/Crew were successful in trailing and calibrating the giant piston corer for the purposes of the seagoing acceptance testing.
- ASP and Original Equipment Manufacturer (OEM) technicians were successful in calibrating the last winch onboard remaining (CTD #2).
- We successfully performed Giant Piston Coring commissioning using two of the five possible 4.8m barrels (9.6m tested length). Retained sediment samples were obtained on all deployments except the first deployment. Careful consideration of substrate type, pilot core trigger wire length, spring back calculations and other components improved core retention however, further trials and calibrations are required to build confidence in sediment recovery of longer core lengths.

#### Voyage narrative

Departing from Hobart on Wednesday, 1 December 2021, voyage activities started with crew performing core pipe handler practice, this required multiple IRs controlling winches and articulation points on the vessel simultaneously as a team. Crew preparation was completed within the planned 12hr timeframe at White Rock within the Derwent Estuary to ensure smooth waters. With overnight transit to station and subbottom profiling, next voyage activities moved into Giant Piston Coring deployments due East of Tasman Island off the continental shelf.

Piston core #001 deployment performed well in regard to safety of operations, however on recovery about 30m below the surface the piston core trigger 'arm' snagged with the core pipe handler, which resulted in the trigger arm lost at sea. A shoreside engineering solution was made and delivered to the ship the next

morning. Furthermore, extrusion of this core revealed that the piston and barrel had fully hydraulically locked therefore no sediment was retained.

Piston core #002 deployment was successful in obtaining a seafloor sediment sample from our southeastern location "GA/GSM Option A" as per their joint scientific assessment of sub-bottom profile data obtained on IN2021\_E01.

Due to poor weather, the ship relocated for piston cores #003 and #004 to south west of Bathurst Harbour. Each of these cores were successful in retrieving more seafloor sediment samples than previous deployments, however hydraulic locking of the barrel still occurred on both deployments.

Throughout the voyage, the Geophysical Survey & Mapping (GSM) team and science party supported and refined site selection, as well as performed surface reference checks and calibrations on multi-beam echosounders in varied weather conditions.

The Seagoing Instrumentation Team (SIT) also completed trials, calibrations and training on deployment of the Deep Tow Camera, connected to the new HOTS cable onboard our General Purpose winch.

Backscatter checks and calibrations of the EM710 were performed underway when transiting through sites #1, #4 and #2 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.

#### Summary

The voyage was successful in achieving the planned scope of works for trials and calibrations, as well as some previously postponed activities. 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

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# Summary of data and samples collected

unit should be identified in plain text under 'UNITS'.

					DESCRIPTION
ltem Name, Identifier (e.g. serial number)	Principal Investigator (see Title Page)	NO (see above)	UNITS (see above)	DATA TYPE Enter code(s)	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_E03 Piston Core #002	Martin Jutzeler & Acacia Clark	Cores	1	G04	
IN2021_E03 Piston Core #003	Martin Jutzeler & Acacia Clark	Cores	1	G04	
IN2021_E03 Piston Core #004	Martin Jutzeler & Acacia Clark	Cores	1	G04	

## Track Chart

Clearly show the area of operation and the *actual* voyage track. The figure should feature a map showing the entire voyage track, and adjacent coastline showing major towns or cities so that readers can see at a glance where *Investigator* was relative to well-known features. You are required to annotate the track chart to illustrate the route followed and the points where data and/or samples were collected. The figure can be shown here (if small) or as an A4 attachment.



#### 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 Martin Jutzeler and Acacia Clark who joined the voyage eagerly at short notice.

Thanks also to the voyage's Technical Lead, Jason Fazey, Voyage Manager, Tegan Sime, and the Engineering and Technology team members who were supportive, understanding and flexible during the MNF's 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 (eg transmissometer)
H17	Optics (eg underwater light levels)
H73	Geochemical tracers (eg freons)
D01	Current meters
D71	Current profiler (eg 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 (eg chlorophyll, fluorescence)
B71	Particulate organic matter (inc POC, PON)
B06	Dissolved organic matter (inc DOC)
B72	Biochemical measurements (eg 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

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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	РН
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