



## MNF Voyage Highlights and Summary

Voyage #:	IN2025_V01
Voyage title:	Collaborative Australian Postgraduate Sea Training Alliance Network (CAPSTAN)
Mobilisation:	Hobart, Thursday, 6 March 2025 - Friday, 7 March 2025
Depart:	Hobart, Saturday, 8 March 2025
Return:	Hobart, Monday, 17 March 2025
Demobilisation:	Science: Upon Return MNF: Hobart, Tuesday, 18 March 2025
Voyage Manager:	Dr Ben Arthur & David Flynn
Chief Scientist:	Dr Georgia Nester,
Affiliation:	University of Western Australia
Principal Investigators:	Dr Pier van der Merwe, Dr Ben Arthur, A/Professor Stephen Gallagher, Dr Nicole Hellessey, and Annika Oetjens.
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# Voyage Highlights

## The Chief Scientist

Dr Georgia Nester is a molecular ecologist specialising in marine genomics and environmental DNA (eDNA) at the Minderoo OceanOmics Centre within the UWA Oceans Institute at the University of Western Australia. Her research focuses on using genomic tools to characterise biodiversity, monitor species, and explore ecological patterns in complex and often remote marine environments.

Georgia is particularly interested in applying genomic approaches to deepen our understanding of deep-sea ecosystems, and in developing and testing novel methodologies to enhance biodiversity detection in data-limited regions. Her work now focuses primarily on deep-sea environments, though she has also worked across Antarctic and coastal systems. She takes a multidisciplinary approach to ecological challenges, leveraging cutting-edge molecular tools. This is her first voyage as chief scientist.



## Title

IN2025\_V01 CAPSTAN - A multidisciplinary circumnavigation of Tasmania to uncover marine biodiversity patterns through CAPSTAN

## Purpose

The voyage aimed to explore marine biodiversity patterns around Tasmania while delivering a unique vessel-based educational experience through CAPSTAN. This initiative focused on developing a national curriculum for marine science and research-based training, fostering collaboration among national stakeholders, and enhancing postgraduate education. It also offered students valuable opportunities to engage in innovative marine research. The key objectives of the voyage were:

- Provide postgraduate students with opportunities to engage in cutting-edge marine research and foster collaboration among national stakeholders through CAPSTAN.
- Investigate the biodiversity of deep-sea environments, specifically in the Tasman Fracture Marine Park and the Bass Canyon.
- Collect surface and deep-sea eDNA to analyse broad marine biodiversity, alongside Continuous Plankton Recorder (CPR) samples and Multinet trawls to target smaller zooplankton, small fish, and gelatinous colonies or swarms.
- Combine oceanographic data with biodiversity analysis to understand environmental influences on species distribution and ecosystem dynamics.

Use Box Corer and a Smith-Macintyre Grab to sample seabed sediment and biota, enabling the analysis of geological, palaeontological, and ecological characteristics of the seabed surrounding Tasmania.

## Contribution to the nation

The CAPSTAN voyage provided a comprehensive, vessel-based tertiary education experience, drawing on national expertise and resources to create a dynamic learning environment for postgraduate students. In collaboration with national stakeholders, the voyage contributed to the development of a standardised curriculum for marine science education, aligning with new technologies, data collection tools, and the Marine National Facility RV *Investigator*. Students were exposed to a multidisciplinary marine science research survey incorporating core disciplines such as oceanography, ecology, geosciences, biology, and hydrochemistry.

The voyage also supported national education and training priorities through the CAPSTAN program, which provides hands-on seagoing experience for postgraduate students. This initiative fosters a highly skilled marine science workforce by training the next generation of researchers in modern, multidisciplinary techniques onboard the RV *Investigator*. The program strengthens collaborations across universities, government agencies, and research institutions, building national capacity in ocean science.

The data and insights generated through this voyage will be valuable for a range of end-users, including environmental managers, policymakers, and marine park authorities such as Parks Australia. Improved baseline information on biodiversity and ecosystem dynamics will support evidence-based decision-making, contribute to the monitoring and management of Australia's marine protected areas, and provide a reference point for detecting future environmental changes. These findings can also inform fisheries management and environmental assessments, supporting sustainable use and long-term conservation of Australia's marine resources.

## As a result of this voyage

1. We have improved our understanding of biodiversity and ecosystem structure across pelagic and deep-sea habitats in marine parks around Tasmania, including the Tasman Fracture, Freycinet, and Flinders Marine Parks.
2. We have mapped key oceanographic features and seabed habitats in underexplored regions off southeast Australia to support future monitoring and management
3. We have delivered comprehensive at-sea training for 21 postgraduate students from across Australia, equipping the next generation of marine scientists with practical, multidisciplinary research experience
4. We have improved bathymetric data and sub-seafloor profiles related to seabed geomorphology geology around Tasmania and across Bass Strait

## Next steps

Post-voyage efforts will focus on the processing and quality control (QC) of the biological and environmental datasets collected across Tasmania's marine parks. Initial work will include QC of data and metadata through the Marine National Facility (MNF) prior to further analyses and archiving. This will be followed by the analysis of samples collected using environmental DNA (eDNA), the Continuous Plankton Recorder (CPR), multi-nets, CTD casts, and box-cores. These combined efforts will provide a clearer picture of biodiversity patterns across pelagic and deep-sea habitats, and how these vary across Tasmanian bioregions.

For the eDNA component, the OceanOmics Centre (UWA) will employ both the Leray COI and MiFish-U/E metabarcoding assays across all samples to capture broad metazoan and fish-specific diversity. These samples will be sequenced to generate high-resolution biodiversity data across Tasmania's marine parks. A core objective is to explore changes in community composition across different bioregions and assess how these patterns align with current spatial management boundaries. We will also compare eDNA-derived biodiversity patterns with those detected via the CPR. This work will form the basis of a student-led research paper by participants from the voyage. eDNA data will be uploaded to the Ocean Biodiversity Information System and the Minderoo OceanOmics data dashboard. Raw sequencing reads and bioinformatic & analyses code will be available upon publication

Two continuous plankton recorder tows were planned during CAPSTAN, but additional third tow was able to be undertaken crossing the Bass Strait from East to West, as well as the two planned tows going along the eastern and western sides of Tasmania. The silks from these CPR tows are currently being processed by the AusCPR team at CSIRO Hobart (Dr Ruth Eriksen and Dr Felicity McEnnulty) and data will be available of the species seen, abundances, distribution and pigment colour index (PCI) on the Australian Ocean Data Network (AODN). CPR data will be made available on the Australian Ocean Data Network (AODN).

Both the underway chlorophyll and nutrient data are now available to support interpretation of other data sets collected during CAPSTAN 2025. These data are critical to understand the productivity of the water column and forms the basis of further interpretation. Oceanographic profile data were also collected throughout the voyage and are available to support interpretation of physical conditions during CAPSTAN 2025. These data provide important context for understanding patterns observed in other biological and environmental datasets.

Seabed samples were collected via one box core deployment and several Smith Macintyre grabs, then water sieved for their microfauna. Further work at the University of Melbourne School of Earth Sciences will form a basis for comparisons to ancient fossil faunas. The sediments in the box core and grabs will also form a modern analogue for pre-existing sediment cores in the region of Maria Island off eastern Tasmania. Several grabs were obtained from offshore Gippsland as part of a piggyback project from the University of Melbourne Australian Centre for Offshore Wind Energy. The grabs sampled crushable carbonate sediments that may cause geotechnical challenges in designing

the anchors or foundations for the offshore wind turbines in the region. The Australian Centre for Offshore Wind Energy will subsequently determine the geotechnical properties of these carbonate sediments to establish an accessible database for the research community. Two additional grabs were obtained south of Cloudy Bay these will also be analysed for the microfaunas by University of Melbourne School of Earth Sciences for modern analogue studies.

The majority of the ship track was tracked by sub bottom profiling using a Kongsberg/Simrad EM712 multibeam echo sounder to determine subsurface features that may be related to the glacial and interglacial sea level changes beneath the shelf and shelf margins. A particular focus was Bass Strait. Over 18,000 years ago Bass Strait was land and may have had a large lake. In the absence of coring on this region, the subsurface sub bottom profile obtained across Bass Strait will provide important insights into the long-term history glacial and interglacial history of the "Bass Lake". These data will be investigated by Stephen Gallagher and Professor Simon Haberle (Australian National University) and will be used to determine the potential of retrieving a core from these deposits at some point in the future. This research will be of interest from the Palawa indigenous community in Tasmania to better understand the nature of the Bassian Plain when their ancestors were walking across that country.

This voyage provided opportunities for student-led research and cross-disciplinary collaboration, helping to explore the potential of linking physical, chemical, and biological data to better understand patterns in marine biodiversity.

# Voyage Summary

## Executive summary

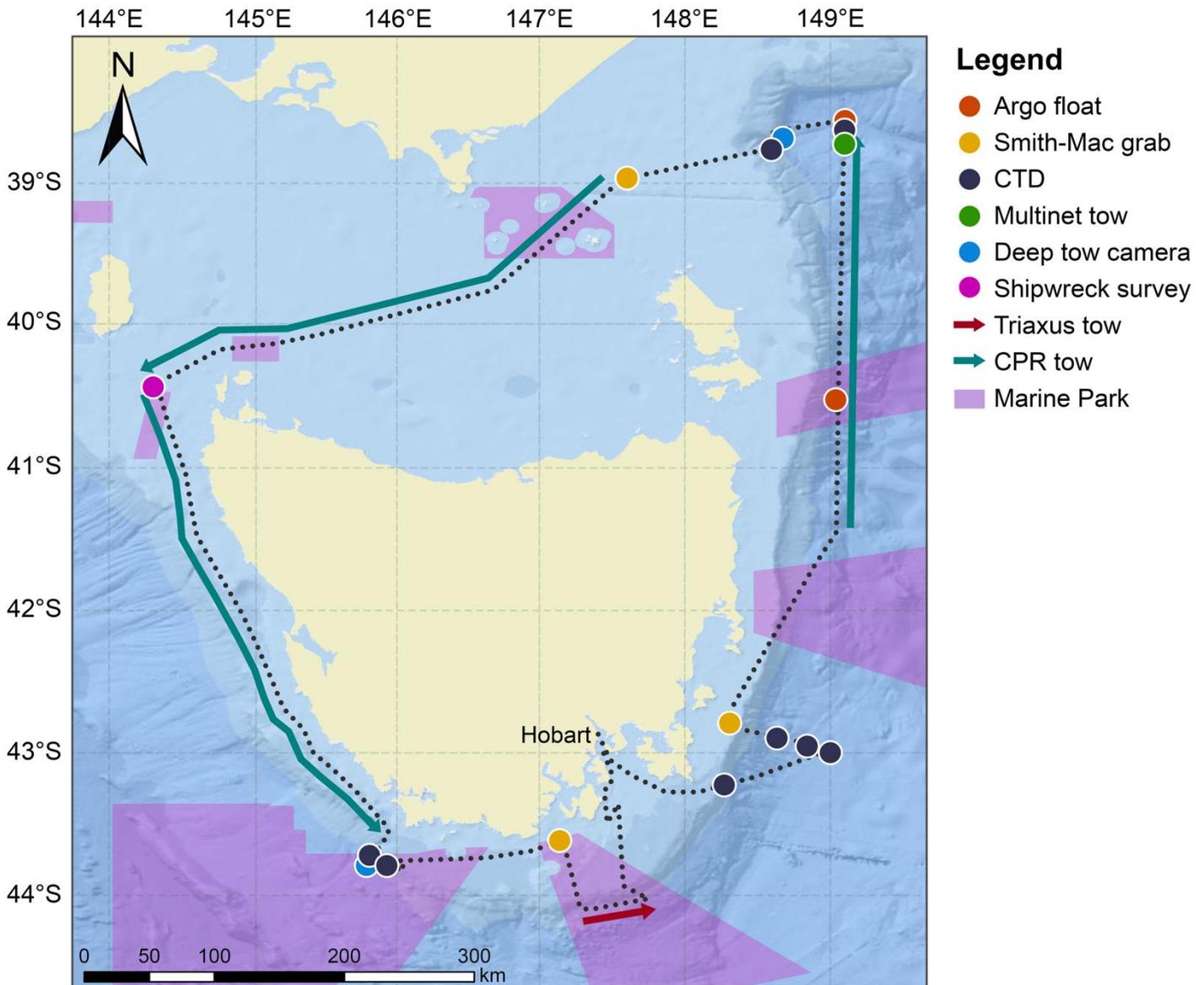
The 2025 CAPSTAN voyage aboard RV Investigator provided immersive, multidisciplinary marine science training to 21 postgraduate students from institutions across Australia. The voyage focused on three key regions: East Australian Current (EAC) extension eddies southeast of Tasmania, the deep Tasman Fracture Marine Park to the south, and the biologically significant Bass Canyon to the north. Across these sampling locations (Figure 1), students engaged in intensive data collection, including CTD profiling to 3000 m depth, eDNA and hydrochemistry sampling, multinet tows, deep-tow camera deployments, and sediment sampling using Smith-Mac grabs and box corers.

A comprehensive suite of continuous underway sampling—including chlorophyll and nutrient measurements, eDNA filtration, and seabird and marine mammal surveys—complemented station work. Three Continuous Plankton Recorder (CPR) tows were conducted along extensive transects on the eastern, western, and northern margins of Tasmania (indicated by teal lines in Fig. 1), capturing broad-scale patterns in plankton biodiversity and community structure. Additional activities included Argo float deployments, shipwreck mapping in Bass Strait, and geological sub-bottom profiling, providing insights into Quaternary sedimentation and past sea-level changes.

Throughout the voyage, students received hands-on experience in deploying and operating oceanographic instruments, interpreting biological and physical data, and collaborating on real-world research tasks. Each team contributed to daily operations, sample analysis, and data interpretation, culminating in final group presentations that integrated multiple disciplines and highlighted key findings.

Results from the voyage include successful collection of 280 eDNA samples, deployment of multiple Argo floats, visualisation of glacial sedimentary horizons via sub-bottom profiling, and new insights into zooplankton communities from CPR and multinet surveys. Despite minor setbacks, including a delayed Triaxus tow and one lost multinet sample, most objectives were achieved, with data now feeding into national repositories and piggyback research projects.

CAPSTAN 2025 successfully combined research and education at sea, delivering a nationally coordinated, research-intensive training program that provided students with authentic, hands-on experience in live marine science operations and fostered collaboration across institutions and disciplines.



**Figure 1:** CAPSTAN 2025 voyage track and sampling locations around Tasmania, showing core study regions and activities including CTDs, CPR tows, sediment grabs, eDNA collection points, and piggyback survey areas.

## 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 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 Marine National Facility RV Investigator, 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 and survey significant marine environments surrounding Tasmania, including the Tasman Fracture Zone, the Bass Canyon, and an East Australian Current (EAC) eddy, to address key gaps in our understanding of these systems.

## Voyage objectives

From the Voyage Plan.

The training objectives of the 2025 CAPSTAN Voyage are to:

- Enable national access to the RV Investigator 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, eDNA, 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:

1. 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.
2. Evaluate the physical, chemical and biological factors that influence the biodiversity and productivity of deep-sea environments, with a focus on the Tasman Fracture Marine Park and the Bass Canyon
3. Demonstrate the application and operation of various scientific sampling equipment and instrumentation on-board the RV Investigator.
4. Acquire, process and analyse quantitative and qualitative samples.

5. Perform data analysis, quality control, interpretation and integration.
6. Prepare a final voyage report.
7. Prepare and present an element of the final cruise report to peers and crew.
8. Master the skills required to operate and conduct oneself safely in the marine environment including specific MNF sea-survival skills and laboratory safety.
9. Foster collaboration and communication by guiding participants in preparing and presenting voyage findings to peers and crew

To address the scientific objectives, the voyage will conduct comprehensive sampling and observations across the Tasman Fracture Marine Park, the Bass Canyon, and an EAC eddy, providing students with hands-on experience in multidisciplinary marine science techniques. At each site, we will perform a suite of activities to characterize biological, geological, and physical oceanographic features. These activities will take place across 9 sites with approximately 10 hours per site.

In the Tasman Fracture Marine Park and Bass Canyon system, planned activities include deploying the deep-tow camera with eDNA sampler to capture imagery of benthic habitats and characterise bottom water biodiversity using eDNA. During deep camera tows, the acoustic EK80 could be deployed to estimate the midwater biomass and observe swarm depths, location and types. Further biological sampling will deploy multinet trawls to collect and sort plankton into taxonomic groups and collect abundance data, with the possibility to trawl for benthic biodiversity and concurrent CPR tows for zooplankton and phytoplankton distributions. The 36-bottle CTD rosette will also be implemented across a depth gradient for eDNA sampling, and to obtain general water properties (nutrients, DO, fluorescence, salinity, turbidity, PAR, etc). The use of the CTD will be combined with the Lowered Acoustic Doppler Current Profiler (LADCP; 150 kHz and 300 kHz) to characterise the oceanographic environment and ambient environmental conditions at each site.

We will also deploy the Smith Macintyre Grab and Box corer at these sites for seabed sediment and biota sampling of these deep-sea locations. Collecting cores or grabs from these sites after seabed imaging and sub-bottom profiling, will give insights into subsurface features from the Last Glacial Maximum and allow sampling of sediments deposited during the Holocene sea-level transgression, during which the sea level rose 125 m. At the EAC eddy site, activities will transect across an eddy and prioritise multiple CTD yo-yo dips and possible Triaxus tows. Incorporating LADCP, underway measurements, and eDNA sampling via the CTD rosette will allow us to analyse the physical, chemical and biological properties, mass/heat budget, and biodiversity across the eddy.

Continuous activities that will not disrupt ship transit include eDNA underway sampling, Chla sampling (pending availability), nutrient analysis and seabird and marine mammal surveys. If time permits, two additional projects have been proposed: one involves deploying the Smith Macintyre Grab to collect a large sediment sample (25 kg), and the other involves deploying two Argo floats—one at the northernmost and one at the southernmost point of the trip, both in waters deeper than 2000 m. Mapping the seafloor using RV Investigator's full suite of Multibeam Echosounders will support safe deployments, while developing a further understanding of larger themes in geology and

oceanography. It will also reveal sub-bottom seabed features related to the Quaternary history of the transect, including shorelines and rivers in shelf regions, submarine canyons, and mass transport deposits in deeper slope areas. Sub-bottom profiling of the Tasman Fracture Zone will reveal likely complex structural features related to Southern Ocean rifting and breakup.

The following specific activities and student training will be conducted:

1. Deep-towed camera: Training on operating and interpreting imagery to assess benthic biology, seafloor composition, and geomorphology;
2. eDNA collection: Instruction on sampling protocols, preservation techniques, and downstream molecular workflows for biodiversity analysis;
3. CTD, LADCP, and Triaxus tows: Hands-on experience in deploying and retrieving equipment and processing oceanographic data;
4. Multinet trawls in conjunction with EK80 acoustics to target zooplankton, small fish, and gelatinous colonies or swarms. Training on net operation, species sorting, acoustic data interpretation, and linking biological findings to acoustic signatures;
5. Smith Macintyre Grab and Box Corer for (sub) seabed sediment and biotic sampling. Guidance on sediment coring techniques and sample preparation for geological, palaeontological and biotic analysis;
6. Underway seawater analysis for nutrients and chlorophyll concentration: Training in real-time nutrient and chlorophyll measurement techniques, including data calibration and interpretation;
7. Argo floats at the northernmost and southernmost sites: Instruction on float preparation and deployment protocols;
8. Seabird and marine mammal surveys: training on visual survey techniques, species identification, and behavioural observation recording.
9. Underway sub-bottom profiling to investigate Quaternary geological features. Allowing training in interpretation of the geology of modern seabed and Quaternary sub-surface features.

## Results

**CAPSTAN training objectives:** All training objectives of the 2025 CAPSTAN voyage were successfully met. A total of 21 postgraduate students from across Australian institutions participated in a multidisciplinary research program spanning oceanography, biology, geosciences, eDNA, and hydrochemistry. Students received hands-on training with marine sampling equipment, including CTDs, plankton nets, sediment corers/grabs, and water samplers. Data were acquired, processed, and analysed under the guidance of a national team of trainers, with students actively contributing to daily operations, sample processing, and data interpretation. Safety training, both at-sea and lab, was completed early in the voyage. Students worked in rotating teams and completed both individual and group tasks, including data collection and mini-projects, culminating in a final group

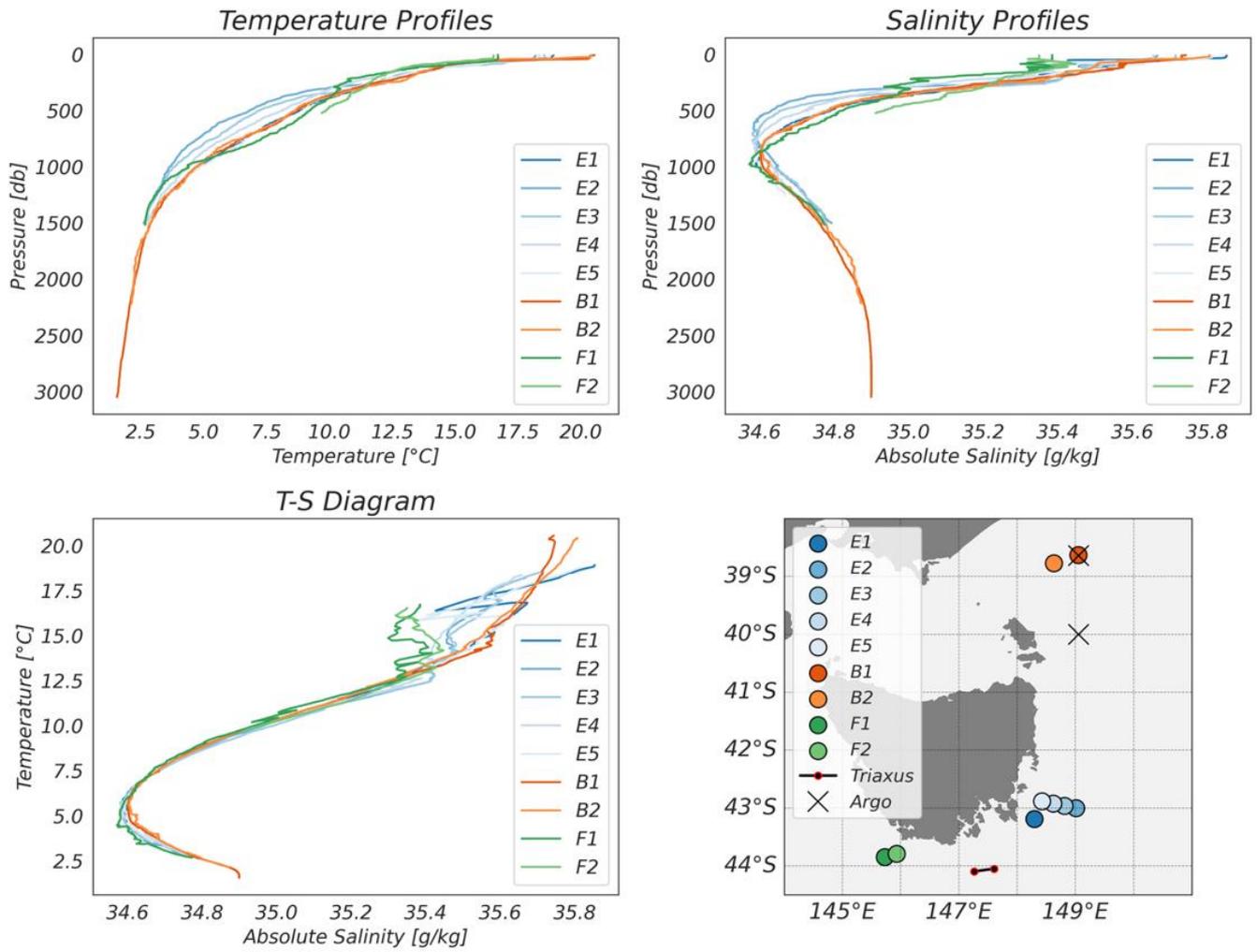
presentation. The program fostered cross-disciplinary collaboration, communication skills, and professional development for both students and trainers.

**Environmental DNA:** Underway water samples (2L) were collected, filtered, and preserved for eDNA analysis from 36 sites around Tasmania. Water samples were also successfully filtered and preserved from 8 CTD casts, from depths up to 3000 m. These samples will be run through the metabarcoding workflow using the Leray COI and the MiFish assays, targeting broad metazoan and fish diversity respectively. In total, 280 eDNA samples were collected.

**Biology:** Three continuous plankton recorder (CPR) tows were completed during CAPSTAN 2025: two along the eastern and western margins of Tasmania as originally planned, and a third opportunistic tow crossing the Bass Strait from east to west. The CPR silks are currently being processed by the Australian Continuous Plankton Recorder (AusCPR) team at CSIRO Hobart. Once complete, data on species composition, abundance, distribution, and pigment colour index (PCI) will be made available via the Australian Ocean Data Network (AODN) to support interpretation of spatial and temporal patterns in plankton communities.

Multinet samples were processed onboard for coarse scale resolution of phyla present at different tow depths. Only one (1) multinet tow was completed despite two (2) planned tows due to inclement weather. The completed tow at the Bass Canyon had all cod ends sorted by students onboard with estimates of total abundance for different phyla and classes made, and some specimens identified down to species level. Samples were returned to the Institute for Marine and Antarctic Studies (IMAS) to be processed through ZooScan but were unfortunately lost due to a miscommunication. The high-level data is still available and can be cross referenced with the CPR tow data, eDNA data and deep tow camera data which were all also collected at the Bass Canyon site.

**Oceanography:** CTD stations from diverse sites around Tasmania show the presence of different water masses and mixing regimes (Figure 2, Table 1). We sampled three regions of interest: an EAC eddy (Stations E1-E5), Bass Canyon (Stations B1,B2) and the Tasman Fracture Zone (Stations F1, F2). In combination with hydrochemical and biological measurements the data can be used to analyse the interplay of different physical drivers in each regime. As part of a piggyback project, Argo floats WMO 5905601 and WMO 5905602 were successfully deployed. Additionally, the Triaxus was towed over a thermal front south of Tasmania, capturing the transition across a temperature gradient. However, due to technical issues, the tow was aborted before the front was fully crossed.



**Figure 2:** Temperature, Salinity profiles for all CTD stations. Map shows locations of all CTD stations, Triaxus tow and Argo deployments.

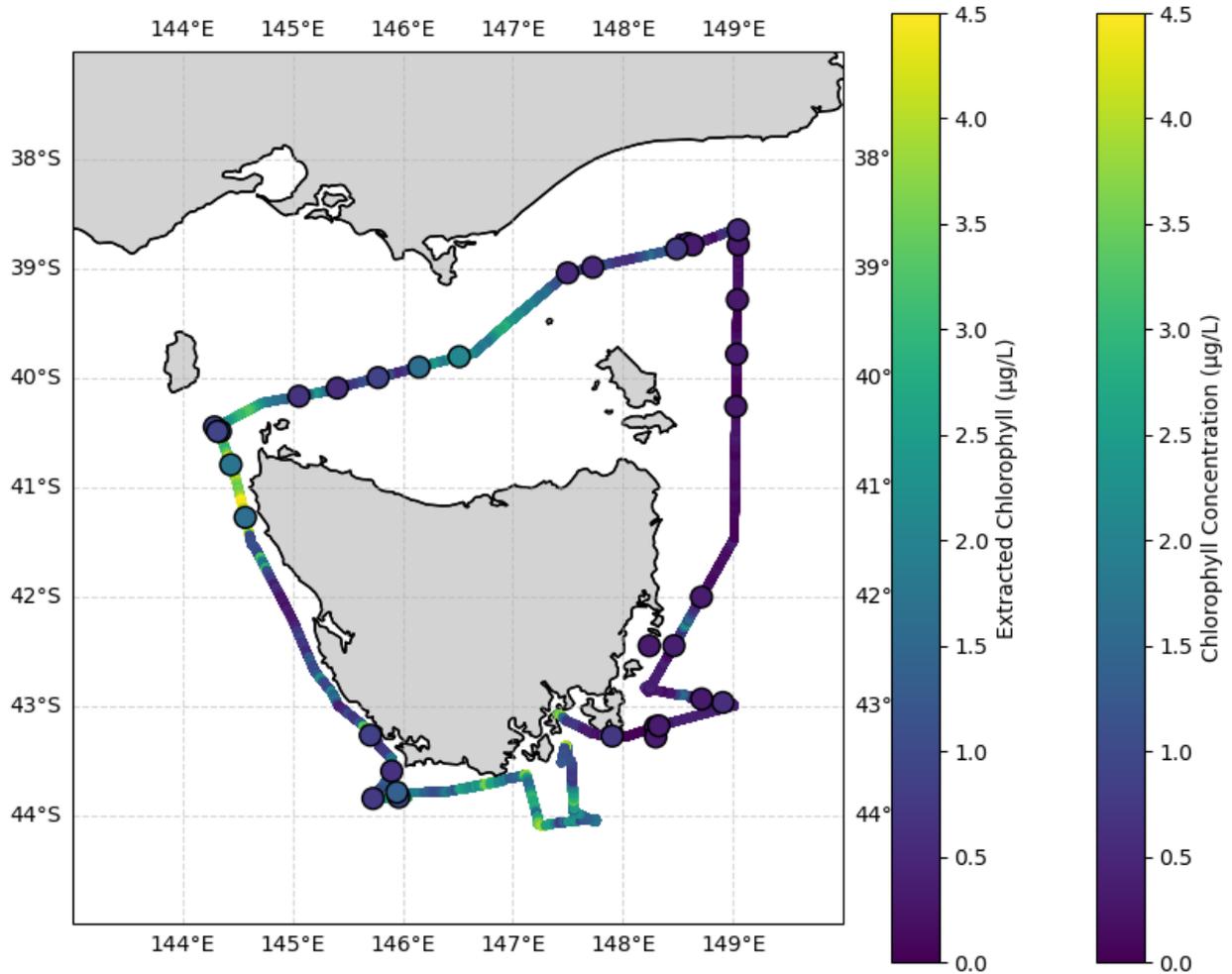
**Table 1:** Summary of CTD stations from CAPSTAN 2025

Station name	Latitude [deg N]	Longitude [deg E]	Time [UTC]	Depth [dbar]	Notes
Station 1: Eddy 1	-43.1897	148.2987	Mar 08 2025 05:51:31	1006	Test CTD
Station 2: Eddy 2	-42.9993	149.0082	Mar 08 2025 12:56:30	1503	
Station 3: Eddy 3	-42.961	148.8143	Mar 08 2025 15:52:11	1510	
Station 4: Eddy 4	-42.9235	148.6182	Mar 08 2025 18:29:31	1501	
Station 5: Eddy 5	-42.883	148.4283	Mar 08 2025 21:04:32	1254	
Station 6: Bass Canyon 1	-38.6318	149.049	Mar 10 2025 06:34:51	3049	
Station 7: Bass Canyon 2	-38.773	148.632	Mar 10 2025 22:03:11	2216	
Station 8: Fracture Zone 1	-43.8475	145.7295	Mar 14 2025 02:50:06	1517	
Station 9: Fracture Zone 2	-43.792	145.933	Mar 14 2025 08:40:01	523	

**Hydrochemistry:** Underway sampling was completed for chlorophyll analysis with associated nutrient samples collected and given to the hydrochemistry team for analysis. This data was used to identify the extent of production by phytoplankton in the water masses that we transited through and to give the students experience with independently managing continuous sampling during a research voyage. The purpose of collecting hydrochemistry samples during this voyage was to make these available as a teaching tool for the students onboard. The students used this data to interpret trends in chlorophyll and identify properties of the various water masses that were encountered. These data were then incorporated into the student led presentations that were given at the conclusion of the voyage. The nutrient samples were unfortunately unavailable in time for the student presentations, so these samples were not included in the interpretation. In future CAPSTAN voyages, the nutrient sampling will finish earlier, leaving enough time for the hydrochemistry team to finalise the results for the student presentations. Figure 3 below shows the results of periodic

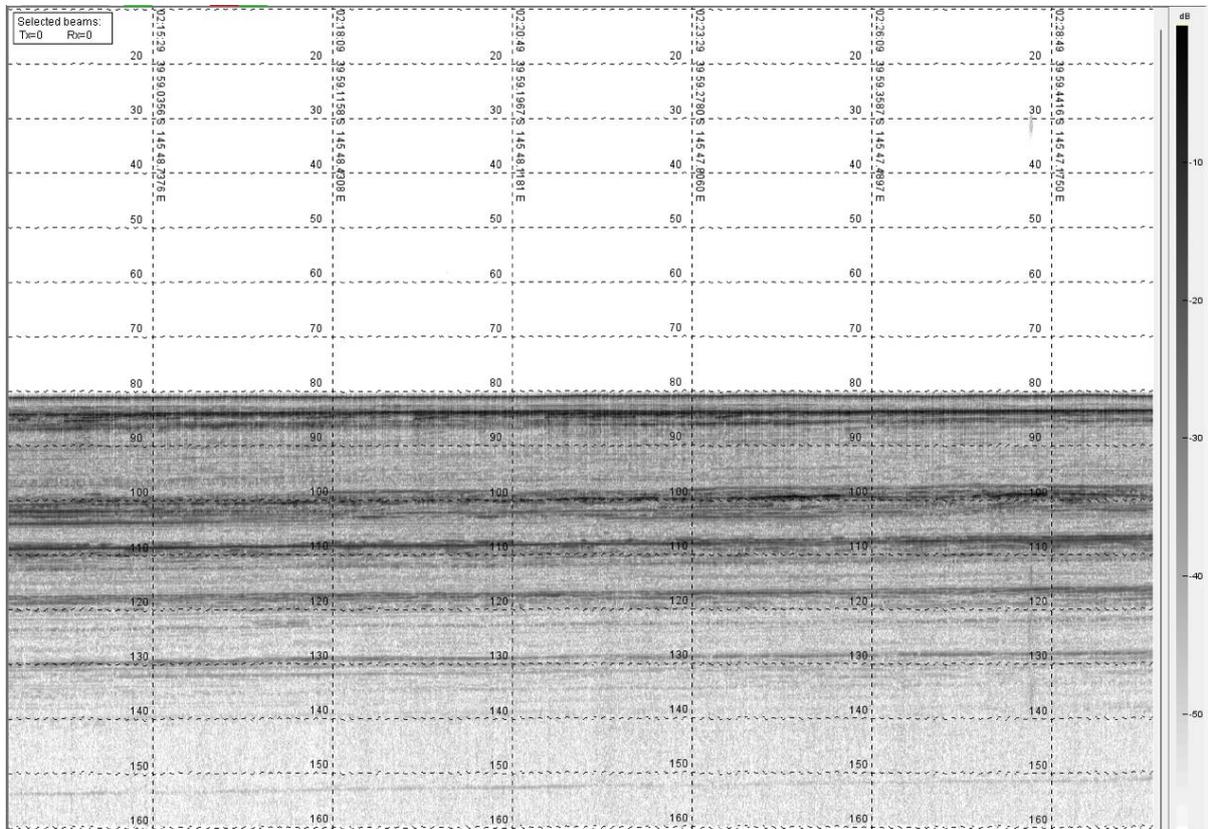
underway chlorophyll sampling atop chlorophyll concentration estimated via continuous fluorometric measurements.

### Chlorophyll concentration (in situ vs extracted) during CAPSTAN 2025



**Figure 3:** Spatial distribution of chlorophyll concentrations around Tasmania during CAPSTAN 2025. The map shows underway fluorometric estimates of chlorophyll-a ( $\mu\text{g/L}$ ) collected continuously during the voyage (right colour scale), overlaid with periodic extracted chlorophyll samples (left colour scale). These data were used by students to assess phytoplankton productivity across different water masses and oceanographic regimes encountered during the voyage.

**Paleogeology and seafloor structure:** The Kongsberg/Simrad EM712 multibeam echo sounder (70kHz - 100kHz) revealed five horizons of interest the subsurface in our traverse across Bass Strait (Figure 4). It is likely the major reflector horizons are related to periods when the region was land during glacial maxima and the section visualises more than 600,000 years of glacial/interglacial history. This is particularly clear as most modern depths in Bass Strait are less than 80 m, therefore a sea level fall of 125 m during a glacial event would likely produce significant terrestrial sedimentary horizons (Figure 5). The data suggest a core of 4 to 5m long in the centre of the basin would likely sample the Holocene (<10,000 years ago) sea level rise marine sediments underlain by terrestrial sediments and possibly the “Bass Lake”. While sediment sampling during this voyage was limited and largely focused on the Gippsland offshore Windfarm piggyback project, subsurface geology student training was made possible using a loaned 4 metre core from the Maria Island region (from UTas). Ensuring access to coring equipment on future voyages would enable deeper engagement with palaeogeological features and further strengthen hands-on training in marine geoscience.



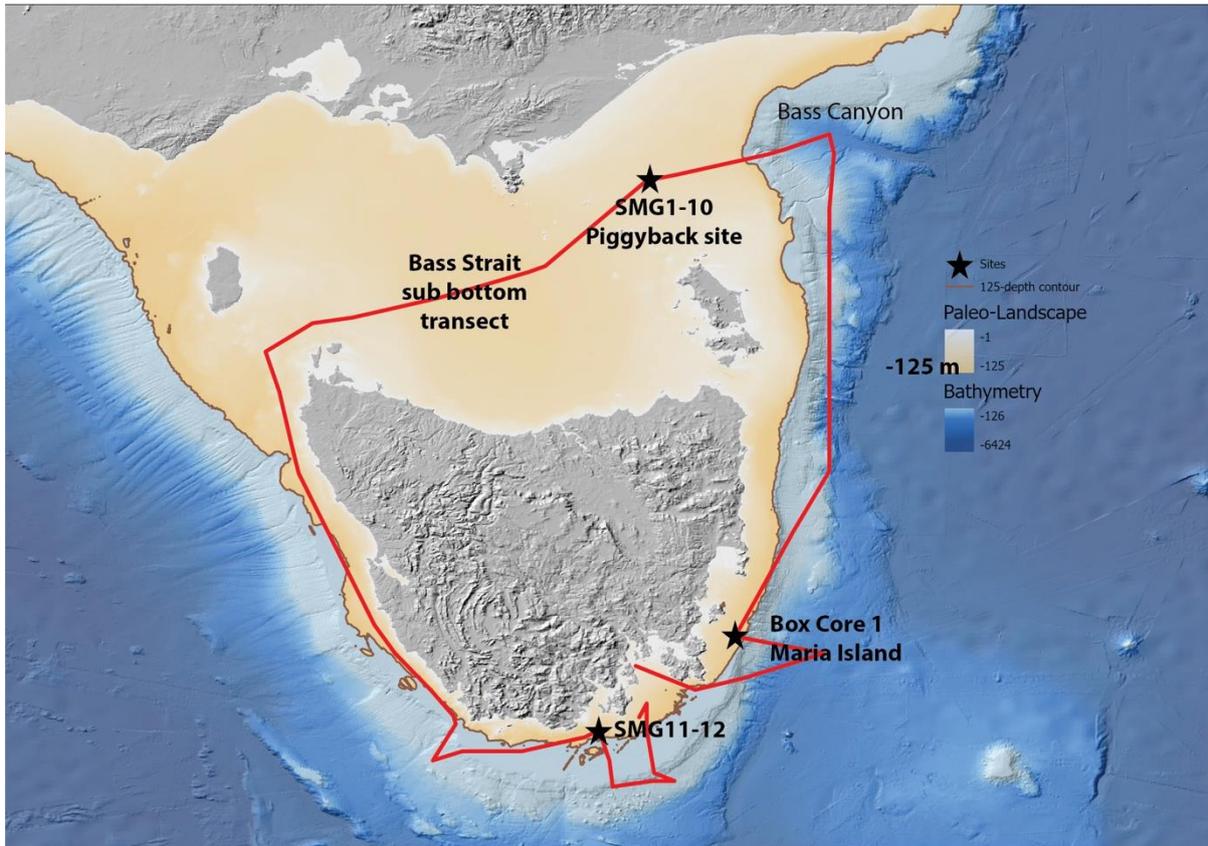


Figure 5: The Last Glacial Maximum shoreline around Tasmania (-125 m isobath).

## Voyage narrative

CAPSTAN 2025 brought together 21 students and 5 trainers for a week-long training voyage aboard *RV Investigator*, offering intensive, hands-on training in multidisciplinary marine science while contributing to ongoing studies of Tasmania’s dynamic marine environments. Following two days of shore-based workshops, participants joined the ship on March 7<sup>th</sup> 2025 and quickly immersed themselves in inductions, safety briefings, and lab orientations. For many, it was their first time aboard a research vessel – and a rare opportunity to engage directly in active, at-sea science.

The voyage’s scientific program centred on surveying key physical, chemical, and biological features associated with the eddies spinning off the East Australian Current extension (EACx) off eastern Tasmania, the deep Tasman Fracture Zone to the south, and the ecologically significant Bass Canyon in the north. These three core study areas, along with targeted investigations of shipwrecks and biodiversity hotspots, formed the research objectives. Continuous underway sampling for nutrients and environmental DNA (eDNA) was conducted throughout the circumnavigation of Tasmania, providing a broad-scale spatial dataset to complement targeted high-resolution surveys. In addition to the primary CAPSTAN objectives, the voyage incorporated two piggyback projects: a shipwreck mapping survey off the northwest coast of Tasmania and a shelf-focused study investigating the potential for offshore wind infrastructure in the middle of the Bass Strait.

Underway sampling – including hydrochemistry and eDNA sampling, as well as opportunistic seabird and marine mammal surveys – began as soon as *RV Investigator* departed Hobart. The ship headed east to target a cold-core EAC eddy southeast of Tasmania, our first point of oceanographic interest. Although an initial Triaxus deployment was postponed due to aileron issues, the eddy was successfully surveyed via a series of overnight yoyo CTD casts. On arrival at our first core site, we conducted sub-bottom profiler lines and deployed the box corer.

The voyage then headed north toward Bass Canyon, towing a Continuous Plankton Recorder (CPR) enroute to assess zoo- and phytoplankton biodiversity and deploying an Argo float along the way. Within the canyon, we deployed our deepest CTD (~3000 m), collecting oceanographic, hydrochemistry, and eDNA samples and data. A second Argo float was deployed here, along with our first multinet tow and the Deep Tow Camera (DTC). While a passive eDNA sampler failed to trigger due to a communication issue, students gained firsthand experience in deep-sea sampling systems and troubleshooting under pressure.

Crossing westward through Bass Strait, the team carried out a series of Smith-Mac grabs as part of the University of Melbourne's offshore wind research, and deployed another CPR to continue plankton monitoring. The second piggyback project, a shipwreck mapping survey in search of the Empress of China, followed, with students working alongside the Geophysical Survey and Mapping (GSM) team to learn the fundamentals of systematic seafloor survey design and execution. Although the wreck was not located, the experience provided valuable insights for the students into applied marine geophysics and spatial surveys.

The ship then transited towards the Tasman Fracture Marine Park, deploying our third CPR tow, using our second CPR cassette, along the way and mapping gaps in shallow-water bathymetry, including a single multibeam pass over the MV Blythe Star wreck site. Upon arrival, despite building sea states, we completed a CTD cast to 1500 m and a DTC deployment down a shelf escarpment, successfully collecting both video footage and comparative passive eDNA samples. With worsening conditions forecast, we cancelled the planned multinet tow but managed to complete a final Smith-Mac grab before heading offshore to conduct a Triaxus tow. Although the survey was cut slightly short by a power issue, a partial deployment was still completed, with the Seagoing Instrumentation Team (SIT) resolving the fault onboard.

By the final day of the voyage, students had sorted zooplankton and sediment samples, processed eDNA and hydrochemistry samples, analysed oceanographic data, assisted with equipment deployment, and participated in marine mammal and seabird surveys—rotating across deck and laboratory teams to gain broad experience. The voyage concluded with student presentations that covered topics from EAC eddy dynamics and past climate variability, to deep-sea biodiversity and molecular sampling approaches.

CAPSTAN 2025 successfully blended scientific research with intensive training, offering students an unparalleled opportunity to participate in live, multidisciplinary marine science and build the skills and confidence to contribute to Australia's future ocean research capacity.

## Outreach, education and communications activities

The CAPSTAN 2025 voyage was fundamentally structured around outreach and education, providing 21 students from across Australia with immersive, hands-on experience in multidisciplinary marine science. In the lead-up to the voyage, participants attended two days of shore-based workshops, where they were introduced to key scientific concepts, shipboard operations, and research techniques. Onboard, they received intensive training across disciplines including oceanography, hydrochemistry, genomics, and geophysics—working closely with research leaders, technicians, and the MNF crew to apply this knowledge in the field.

In addition to its core outreach and training mission, the voyage also featured a range of external communication and media activities. Student interviews, alongside commentary from Drs Ben Arthur and Pier van der Merwe, were broadcast on ABC Radio's Tasmanian Country Hour in a feature piece on the CAPSTAN program. Dr Georgia Nester also spoke with Gavin McGrath on ABC's Regional Victoria Saturday Breakfast, highlighting voyage activities and early insights from the Bass Canyon. This interview was subsequently adapted into an [article for ABC News](#), further broadening the program's visibility.

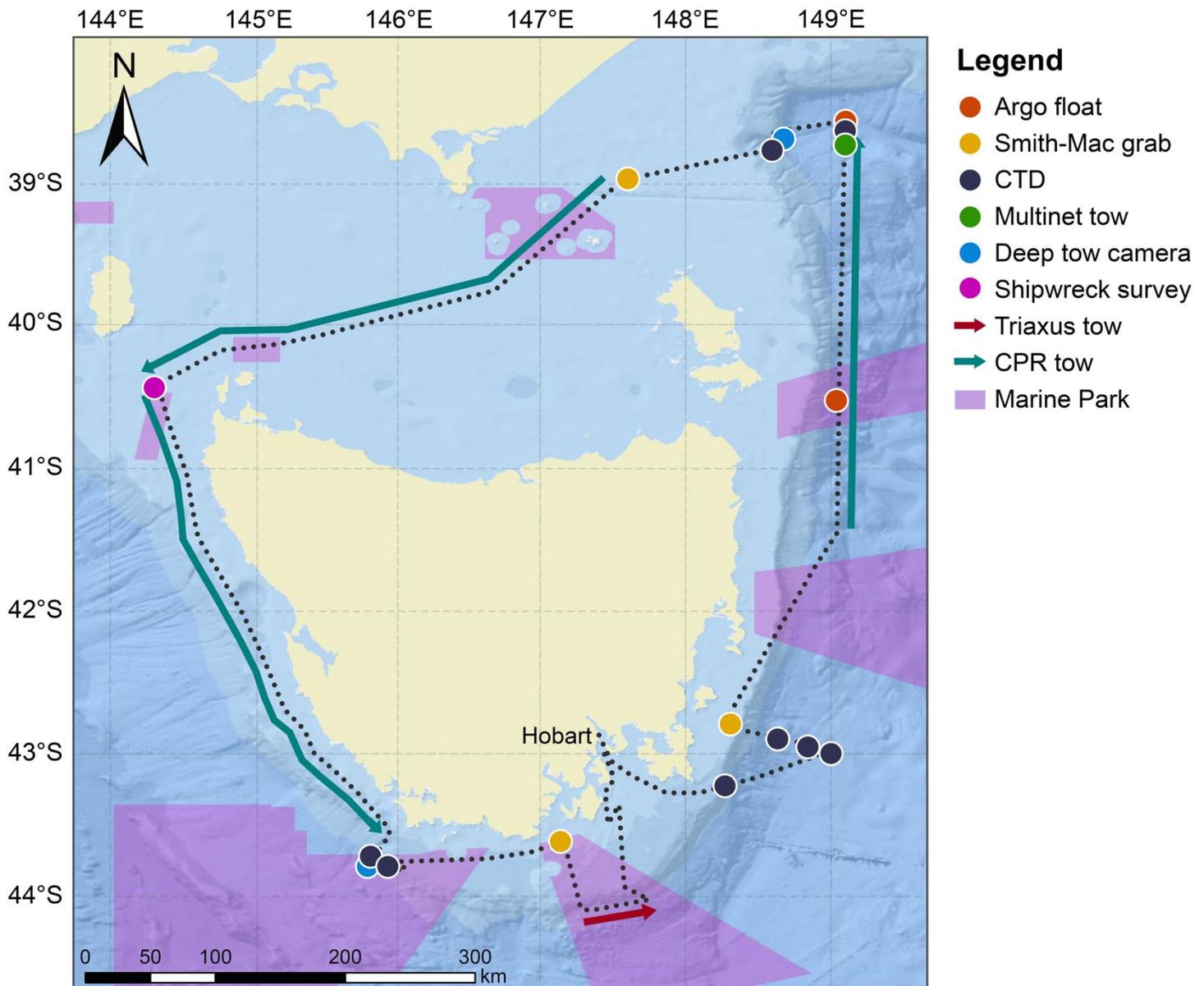
CSIRO coordinated additional communications, including online content and social media posts throughout the voyage. Collectively, these efforts contributed to building public awareness around the scientific value of the voyage, the importance of early-career training at sea, and the unique marine environments surrounding Tasmania.

Students have assisted in communications post-voyage also with 3 students assisting in writing a piece for the AusCPR newsletter alongside Dr Nicole Hellessey. The piece was written for a broad scientific audience and shared the students' experiences of learning about the CPR program through CAPSTAN. One student has also developed a comic strip based on their experiences through CAPSTAN that was published alongside the AusCPR piece.

## Curation Report

<b>Item #</b>	<b>Description</b>	<b>Storage</b>	<b>Access</b>	<b>Custodian</b>
	eDNA samples	Minderoo OceanOmics, University of Western Australia (Perth)	For analysis and processing – results will be a .fastq or ZOTU table. Email request or OceanOmics dashboard.	Minderoo-UWA OceanOmics (Georgia Nester)
	Grab samples	University of Melbourne	Contact Associate Professor Stephen Gallagher or Associate Professor Shiao Huey	Associate Professor Stephen Gallagher

# Track Chart



## Links to Further Data and Information

[NCMI Information and Data Centre \(csiro.au\)](https://ncmi.csiro.au)

[Data Trawler \(csiro.au\)](https://data.csiro.au) – Data Extraction tools for Voyage Data

[MNF Reporting \(csiro.au\)](https://mnmf.csiro.au) – Publications and reports from research on vessels run by the Marine National Facility

[Marlin3 - Marlin - CSIRO Oceans and Atmosphere Metadata Catalogue](https://marlin3.csiro.au)

[Open Access to Ocean Data \(aodn.org.au\)](https://aodn.org.au)

[AusSeabed \(ausseabed.gov.au\)](https://ausseabed.gov.au)

[CAAB - Codes for Australian Aquatic Biota \(csiro.au\)](https://caab.csiro.au)

[Ocean Biodiversity Information System - Australia \(obis.org.au\)](https://obis.org.au)

[Atlas of Living Australia \(ala.org.au\)](https://ala.org.au)

[CSIRO Data Access Portal \(data.csiro.au\)](https://data.csiro.au)

[Global Biodiversity Information Facility \(GBIF\) \(gbif.org\)](https://gbif.org)

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## Signature

Your name:	Georgia Nester
Title:	Chief Scientist
Signature:	
Date:	28/04/2025

## Appendix A – Photographs



**Figure 4:** University students and trainers from the CAPSTAN 2025 voyage. Image: CSIRO- Matt Marrison