Norfolk Island Lagoonal Reef Ecosystem Health Assessment

March 2026

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Table of Contents

Executive Summary

This report provides a six-monthly assessment of coral reef health within the inshore reef systems of the Kingston and Arthur's Vale Historic Area (KAVHA catchment of Norfolk Marine Park (NMP) to February 2026. The findings draw on long-term ecological monitoring conducted since 2020 across the reef habitats of Emily Bay, Slaughter Bay, Cemetery Bay and Western Slaughter Bay, alongside reference observations from the offshore reef at Elephant Rock. The LTMP (long term monitoring program) as of February 2026 integrates benthic surveys, coral disease assessments, fish community surveys, oceanographic measurements and new high-resolution reef mapping technologies.

- Results from the 2025–2026 6-monthly reporting period indicate that the inshore coral reef ecosystems of the KAVHA catchment of Norfolk Marine Park are experiencing compounding environmental stressors and declining indicators of reef resilience**.** The 2025-26 period is a 10-month period of compounding local (land-based runoff) and global stressors (heat stress). The combination of these sequential stress events increases the risk of long-term ecological degradation and potential shifts from coral-dominated to algal-dominated reef states.
- The most significant trends as of December 2025, coinciding with the onset of summertime 25/26 heat stress include increasing turf algal cover, reduced availability of bare substrate for coral recruitment, and a prolonged coral disease outbreak affecting the dominant reef-building genera ***Acropora*** and ***Montipora***. Disease prevalence remains exceptionally high across all inshore bays of the KAVHA catchment with 30–75% of coral colonies affected across sites with sites at Cemetery Bay and Western Slaughter Bay now also experiencing some of the highest disease rates. This increase in disease rates may indicate that these bays have been exposed to a recent anthropogoenic impact.
- Comparisons with the offshore reference reef at Elephant Rock highlight the importance of land-based influences on reef condition on the inshore reefs of the KAVHA catchment. The offshore reef exhibited substantially higher coral cover (~47%), lower algal abundance and no evidence of coral disease, demonstrating ecosystem characteristics comparable to healthy reef systems elsewhere in the Coral Sea and Temperate East regions. This contrast strongly indicates that local water quality pressures influencing the condition of Norfolk Island's inshore reefs of the KAVHA catchment.

Despite these pressures, long-term monitoring continues to provide critical data supporting adaptive management. The integration of unmanned surface vessel (USV) surveys, automated image analysis and expanded oceanographic monitoring is improving the spatial resolution and efficiency of reef assessments across the marine park. Overall, the findings highlight the increasing vulnerability of Norfolk Island's KAVHA catchment inshore reef ecosystems to **combined local and climate-driven stressors**. While global climate impacts such as coral bleaching cannot be mitigated at the local scale, improvements in catchment management and water quality offer the most effective management pathway for supporting reef resilience in the Norfolk Marine Park.

Norfolk Inshore Reefs of the KAVHA catchment Report Card March 2026 (Issues are colour coded, positive ecosystem observation, observation of concern and observation of high concern)

Water Quality

- Major rainfall events during 2025 linked to prolonged sedimentation, freshwater inputs and nutrient enrichment across inshore bays of the KAVHA catchment.
- Elevated sea surface temperatures occurred during the 2025–2026 summer, following a prolonged period of catchment disturbance.

Benthic Condition

- Turf algae increasing across the inshore reefs of the KAVHA catchment, reducing available space for coral recruitment
- Declining substrate availability may limit coral recruitment and recovery.
- Coral cover remains stable however changes in Cemetery Bay need continued monitoring

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Coral Health

- A prolonged and widespread coral disease outbreak affecting primary habitat formers.
- Reduced settlement space and disease impacts may limit coral disturbance recovery.

Ecosystem Function

- Fish communities remain diverse indicating continued ecosystem function.
- Compounding stress increasing vulnerability of the KAVHA inshore reef ecosystems.

Overall, Reef Condition – 2026

- **High Concern** for the KAVHA catchment inshore reefs of Norfolk Marine Park experiencing compounding local and climate-driven stressors linked reducing reef resilience, increased risk of long-term ecological degradation.

Management Recommendations

The findings of the 2025–2026 monitoring period highlight ongoing and compounding environmental pressures on the inshore coral reef ecosystems of the KAVHA catchment. Improving catchment water quality while maintaining consistent long-term monitoring will be critical for understanding and managing future changes in the coral reef ecosystems of Norfolk Marine Park.

1. **Catchment and Water Quality Management.** Monitoring results indicate that land-based runoff, sedimentation and nutrient inputs are key pressures affecting the inshore reefs of the KAVHA catchment. Several major rainfall and flooding events during 2025 resulted in prolonged sedimentation, freshwater incursions and nutrification within the inshore bays of the KAVHA cachement, conditions that can promote algal growth and increase coral stress and disease susceptibility. Catchment management practices reducing sediment and nutrient inputs are considered a priority globally for land management adjacent to coral reef ecosystems and key management priority to support coral reef resilience.

2. **Maintain Long-Term Reef Health Monitoring.** The Norfolk Marine Park Long-Term Monitoring Program provides critical information on the status and trends of the KAVHA catchment inshore coral reef ecosystems. Maintaining continuity in this monitoring program will identify emerging risks and evaluate reef recovery over time. Priority actions include continuing benthic community surveys, coral disease assessments and fish community monitoring across the established KAVHA catchment inshore reef sites using the standardised methodologies established since 2020.

3. **Continue High-Resolution Reef Mapping and Imaging.** High-resolution imaging surveys using unmanned surface vessels (USVs) have expanded the spatial coverage of reef monitoring across the marine park. Continued deployment of these technologies will allow improved detection of spatial patterns in reef condition. Further development of automated image analysis tools will also improve the efficiency of processing large image datasets.

4. **Maintain Oceanographic Monitoring**. Given the occurrence of coral bleaching events in 2020, 2024, 2026 in the NMP continued oceanographic observations will support understanding of the environmental drivers influencing reef condition.

Report Introduction

This report provides a 6-monthly update through to February 2026 on the State of The Reef for the Norfolk Marine Park (NMP) under the Our Marine Parks Program 2025-2027.

Norfolk Marine Park (NMP) protects a network of inshore coral reef ecosystems that are of high ecological, cultural, and conservation value. These reefs provide habitat for diverse marine life, contribute to the health and resilience of surrounding ecosystems, and hold social and economic significance for local communities. To understand and respond effectively to these pressures, the **Norfolk Marine Park Long-Term Monitoring Program** was established to provide a consistent, scientifically robust assessment of coral reef condition. The program tracks ecological change since 2020, enabling managers to evaluate both short-term impacts and long-term trends in reef health. The monitoring program underpins evidence-based management by supplying the data necessary to identify risks, measure impacts and recovery, and assess the effectiveness of conservation actions. **The long-term monitoring program is designed to:**

- Document the status and trends of key ecological indicators of reef health.
- Detect and quantify responses of coral reefs to acute stress events,
- Assess recovery dynamics and resilience of coral communities.
- Provide early warning of ecological decline
- Support management decision-making within Norfolk Marine Park.

Monitoring is conducted across the inshore bays of the KAVHA catchment (Emily Bay, Slaughter Bay, Cemetery Bay) and Norfolk Island fringing reef systems (Elephant Rock, Crystal Pool) within the Marine Park. Standardised survey methods applied from 2020 ensure consistency and comparability across years. Previous NMP LTMP surveys (2020-25) of the inshore NMP coral reef lagoon of the KAVHA catchment have revealed increasing algal populations linked to reef decline and inshore pollution, including summertime blooms of red cyanobacteria and *Lyngbya*, increasing algal cover on the reefs. Surveys to-date have indicated trends of increasing algal cover, decreasing free space linked to reductions in the substrate available for coral larvae settlement, raising concerns for future recruitment and reef resilience across multiple coral reef ecosystems.

Methodologies

Benthic Community Surveys. Following the established ***LTMP program design*** benthic surveys were conducted in December 2024, April 2025 and December 2025. Benthic surveys consisted of 24 x 10 metre belt transects in Emily Bay and 27 x 10 metre belt transects Slaughter Bay (Figure 1), within each transect (10 m), 10 photos (TG-6 Olympus underwater camera) at 1m increments using a 0.5 m^2 photo quadrat to standardize the area (n = 10 photos transect-1). The resulting photos were analysed using the online platform CoralNet (https://coralnet.ucsd.edu) applying a grid of 100 points per photo for annotation. A standardised label set was used as per LTMP 2020-25 with data generated for benthic community cover and composition. Labelset includes; coral taxa (as per previous), algal categories, and invertebrate categories as listed below. Resulting cover was summed across each transect so that each category is described as the % cover $transect^{-1}$.

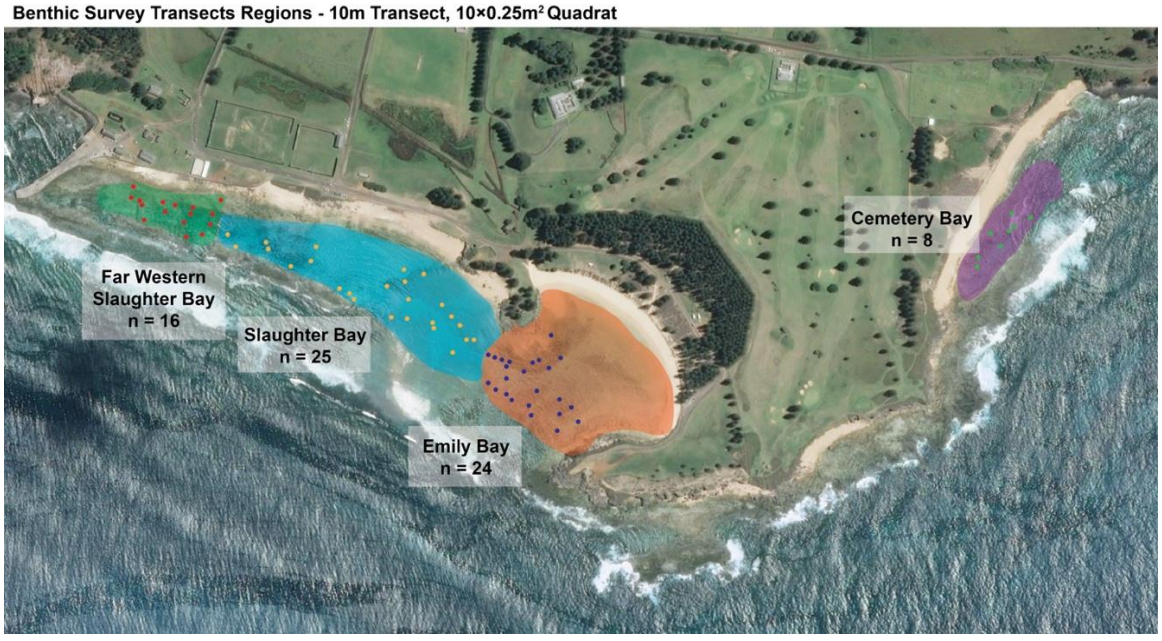

Figure 1. Benthic Health and Community Assessment Survey site locations for Emily Bay, Slaughter Bay, Far Western Slaughter Bay and Cemetery Bay. Dots indicate location of survey transects.

Other Benthic Indicator Organisms. Following the established **LTMP program design (as above)**, *b*enthic surveys consisted of 24 x 10 metre belt transects in Emily Bay and 27 x 10 metre belt transects in Slaughter Bay (Figure 1). Within each transect (10 m), 10 photos (TG-6 Olympus underwater camera) at 1m increments were captured using a 0.5 m^2 photo quadrat to standardize

the area (n = 10 photos transect^{-1}). The resulting photos were analysed for recorded other indicator organisms, including urchins, ascidians and crustose coralline algae, as reported here) using the online platform CoralNet (https://coralnet.ucsd.edu) applying a grid of 100 points per photo, for annotations of urchins. Individual urchins present were confirmed by counts within each photo quadrat allowing urchins to be reported as counts. Each are reported as a proportion of all cover.

Coral Disease Surveys. Disease prevalence surveys were conducted at four sites on Norfolk Island in December 2025. Emily Bay and Slaughter Bay were surveyed using 10 m × 2 m belt transects (n = 6 per site. Figure 2), with transects placed parallel to the reef edge, at least 10 m apart end-to-end and 5 m apart side-by-side. Within each transect, the total number of colonies and number of diseased colonies were recorded separately for plating *Acropora* and *Montipora*. Cemetery Bay and Western Slaughter were surveyed using random swim surveys, where the nearest colony after every two fin kicks was recorded, continuing until approximately 50 diseased colonies or 100 total colonies were observed (n = 50 per site). At all sites, one lesion was recorded per colony regardless of the number of lesions present. Each diseased colony ≥ 10 cm in diameter was photographed twice: once at distance showing the whole colony and once close-up showing the lesion with a calliper for scale.

Fish Survey Methodology. Field sampling was undertaken in December 2024, April 2025, June 2025 and December 2025. RUVS (remote underwater video) were used to determine fish community composition within Emily Bay and Slaughter Bay using two (2) different approaches:

1. Spatial comparison – reef and sand habitats throughout Emily Bay (eastern and western sites) and Slaughter Bay (eastern, central and western sites)
2. Species associations relating to habitat types around Salthouse

Three (3) replicate RUVs (GoPro Hero 10/11/12) were deployed at each site in each zone (Figure 3) for a minimum of thirty (30) minutes. Each video is watched in its entirety using EventMeasure™ software to record the abundance (measured as MaxN – maximum number of any species within a single frame) for each species, allowing for calculation of No. of Species (taxa richness) and Shannon Diversity Index, which measures ecological community diversity accouting for both the number of species and relavtive abundance.

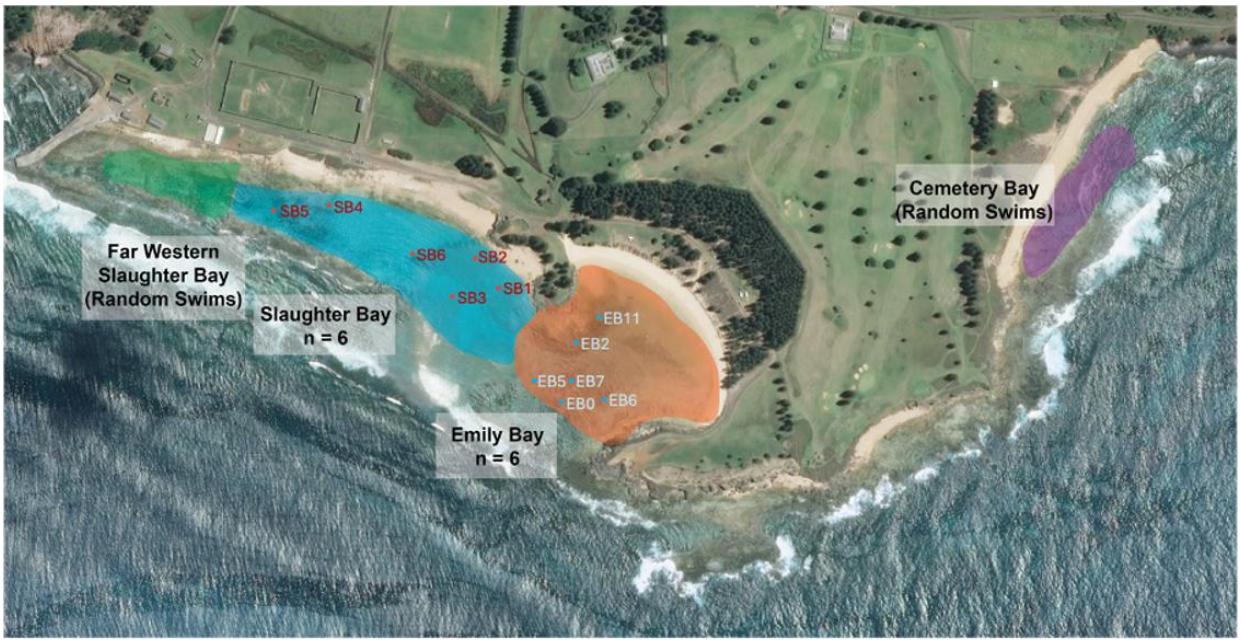

Figure 2. Map of inshore site showing coral disease survey sites.

Figure 3: Map of Emily Bay and Slaughter Bay showing sampling sites for fish surveys.

Notable trends in Benthic Community Structure and Reef Health

Long-term monitoring of benthic community structure within Norfolk Marine Park shows distinct trends across major functional groups between 2020 and 2026.

- **Hard coral cover** remains relatively stable across the monitoring period (~25 % of the benthic structure in the inshore reefs). No sustained declines in coral cover have been evident and cover in 2025 is comparable to earlier years for most inshore Bays of the KAVHA catchment.
- **Macroalgae** exhibited a sharp peak exceeding 30% cover in September 2022 and reduced to 9.5% shortly after, where it has remained relatively stable through to December 2025. It is unclear what was the driver of this large peak in macroalgae.
- **Turf algae** show a strong sustained increase from lows in March 2020 of 4.2% of the benthos to a peak of 22.6% in April 2025 and 19.5% (± 0.8%) in December 2025. Turf expansion represents a significant ecological shift, as it reduces free substrate available for coral larval settlement.
- **Lyngbya blooms** continue to occur across the inshore reefs of the KAVHA catchment evident in the early summer months.
- We also find continued upward trends in crustose coralline algae (CCA) (2.7% ± 0.2%) and urchin (0.2% ± 0.1%) populations across KAVHA catchment inshore lagoonal reef sites. CCA is critical for inducing coral larval settlement and recovery after disturbances and contribute to reef accretion, however they are vulnerable to ocran acidification and ocean warming. Ascidians remain a consistent low-level feature of the benthic community (0.2% ± 0.1%). Continued increases in urchin numbers may contribute to turf algae decline that is noted in inshore lagoonal sites during December 2025.
- We find all KAVHA catchment inshore bays of NMP impacted by an ongoing coral disease outbreak in the two primary habitat forming corals for the reef, *Acropora* and *Montipora*. Disease rates consistent with a severe disease outbreak are occurring in all inshore bays including Western Slaughter Bay and Cemetery Bay. We find no evidence for coral disease at the offshore Elephant Rock site.

Overall inshore community trends of the KAVHA catchment are shown in Figure 4, and assessment per inshore reef site for the benthic community composition is further provided below.

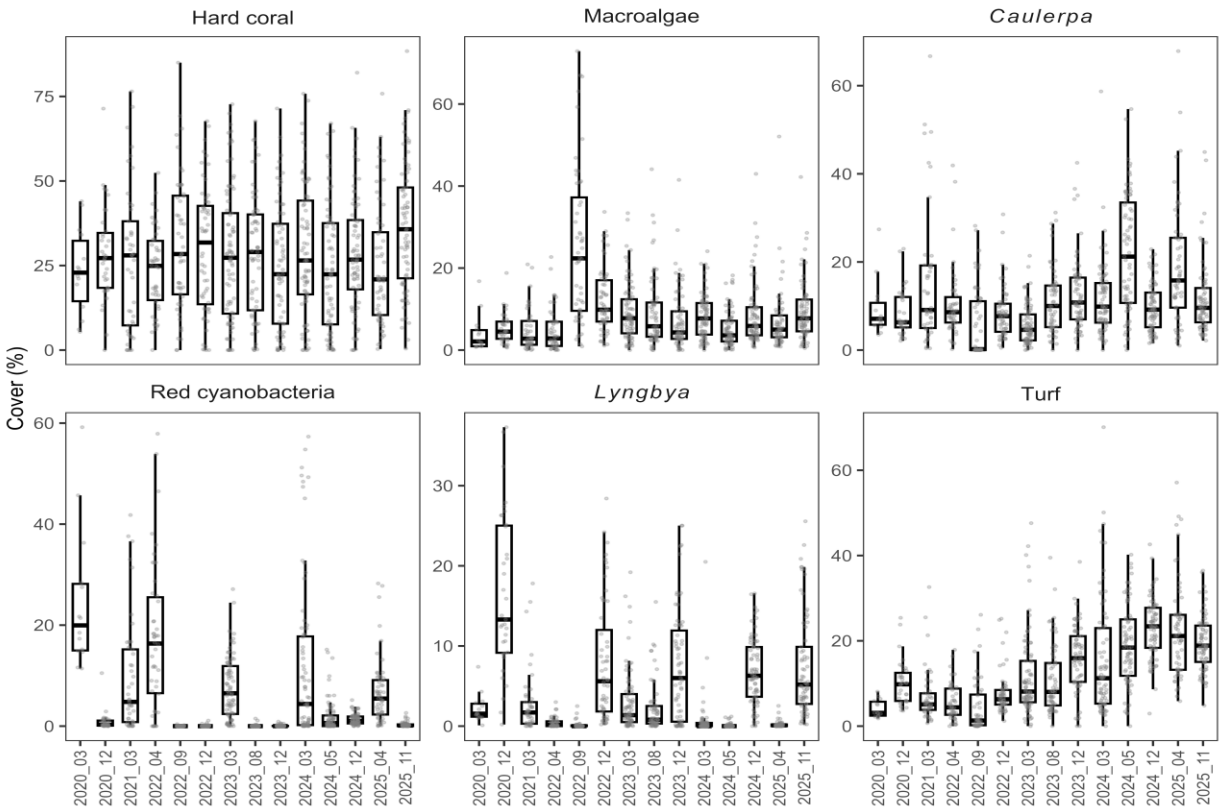

Figure 4. Benthic community cover patterns from 2020 – 2025 recorded pooled across all sites for important benthic categories. Dark line represents the medium value, boxes upper and lower values represent the interquartile range (25th and 75th percentile).

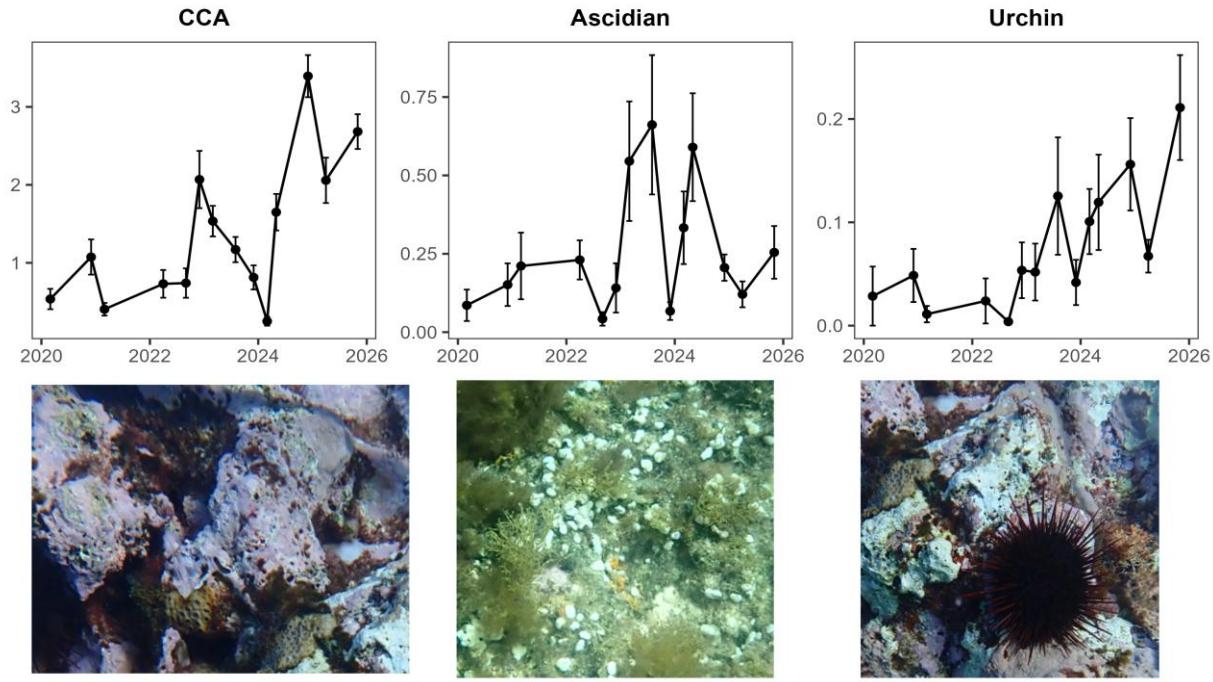

Figure 5. Top. Longterm trends in CCA, Ascidian and Urchin populations on the KAVHA catchment inshore lagoonal reefs of NMP. Bottom. Images showing, calcifying algae, Ascidian, urchin.

Benthic Community Trends - Emily Bay

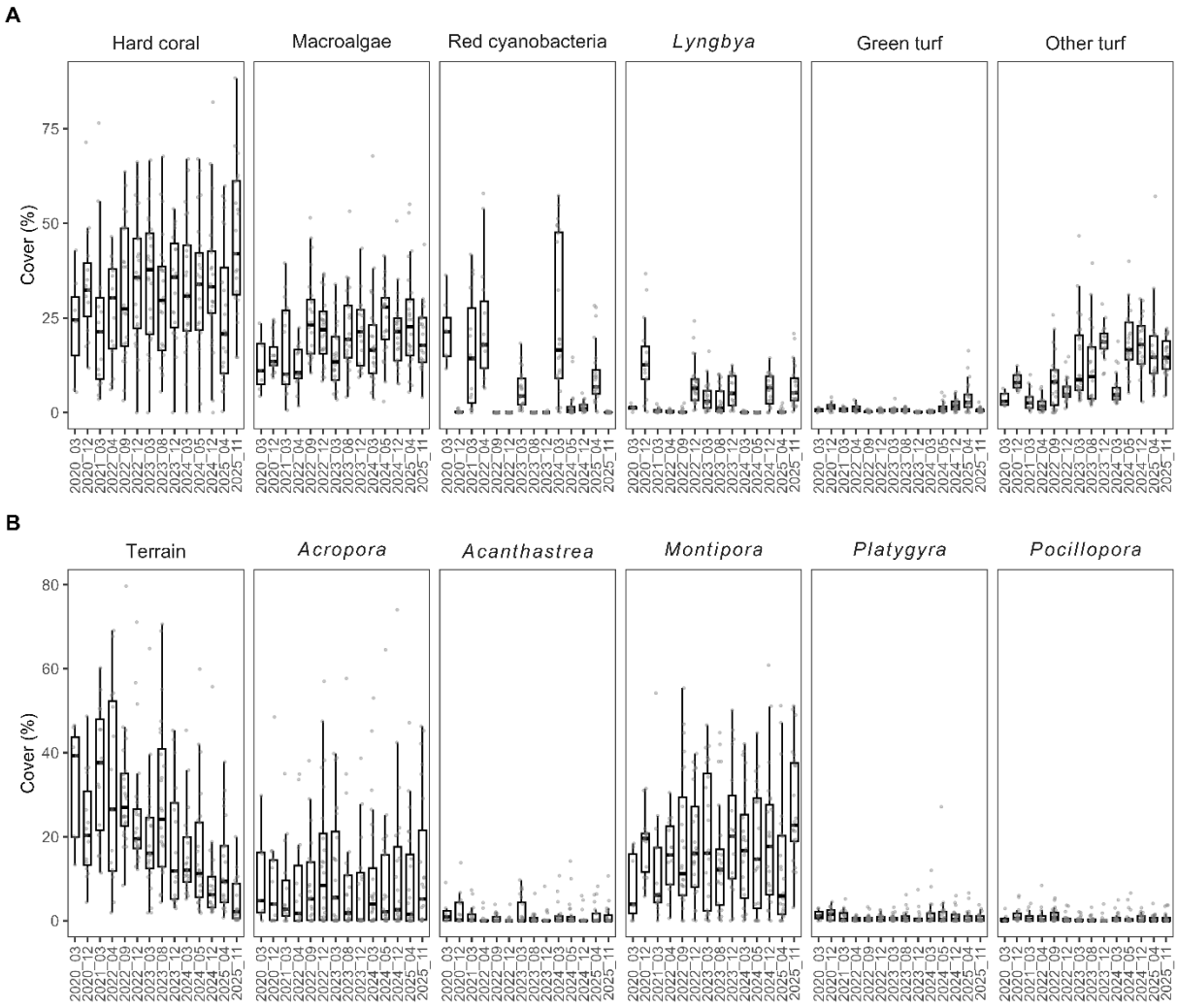

Figure 6. Community cover patterns from 2020 – 2025 recorded at Emily Bay for the main benthic groups (A) and main hard coral taxa and terrain (B). Dark line represents the medium value, boxes upper and lower values represent the interquartile range (25th and 75th percentile) and line represent the maximum and minimum values. Points represent outliers (i.e. transects placed on anomalously high areas of cover for the group being plotted).

Benthic Community Trends - Slaughter Bay

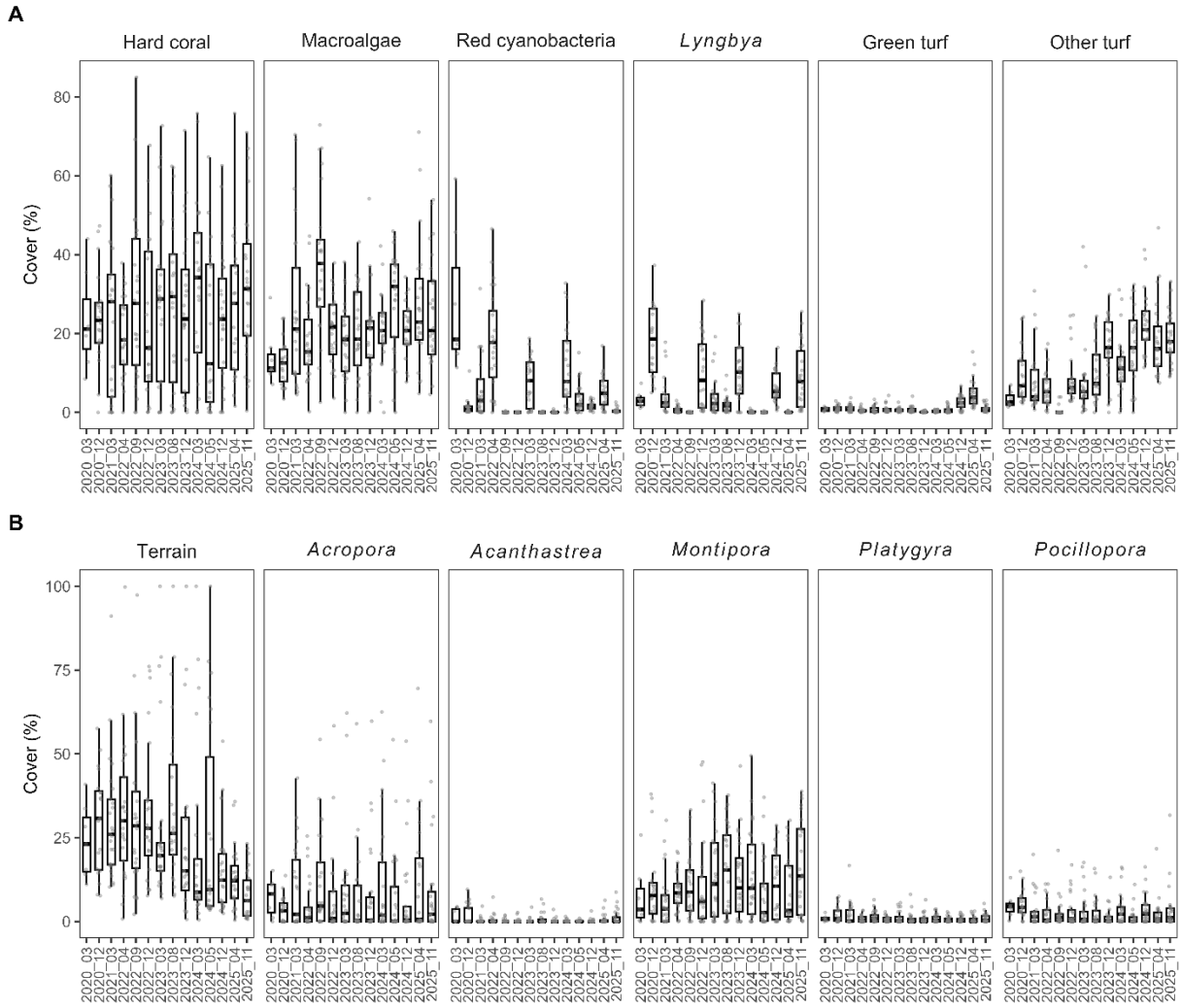

Figure 7. Plots showing community cover patterns from 2020 – 2025 recorded at Slaughter Bay for the main benthic groups (A) and main hard coral taxa and terrain (B). Dark line represents the medium value, boxes upper and lower values represent the interquartile range (25th and 75th percentile) and line represent the maximum and minimum values. Points represent outliers (i.e. transects placed on anomalously high areas of cover for the group being plotted).

Benthic Community Trends - Western Slaughter Bay

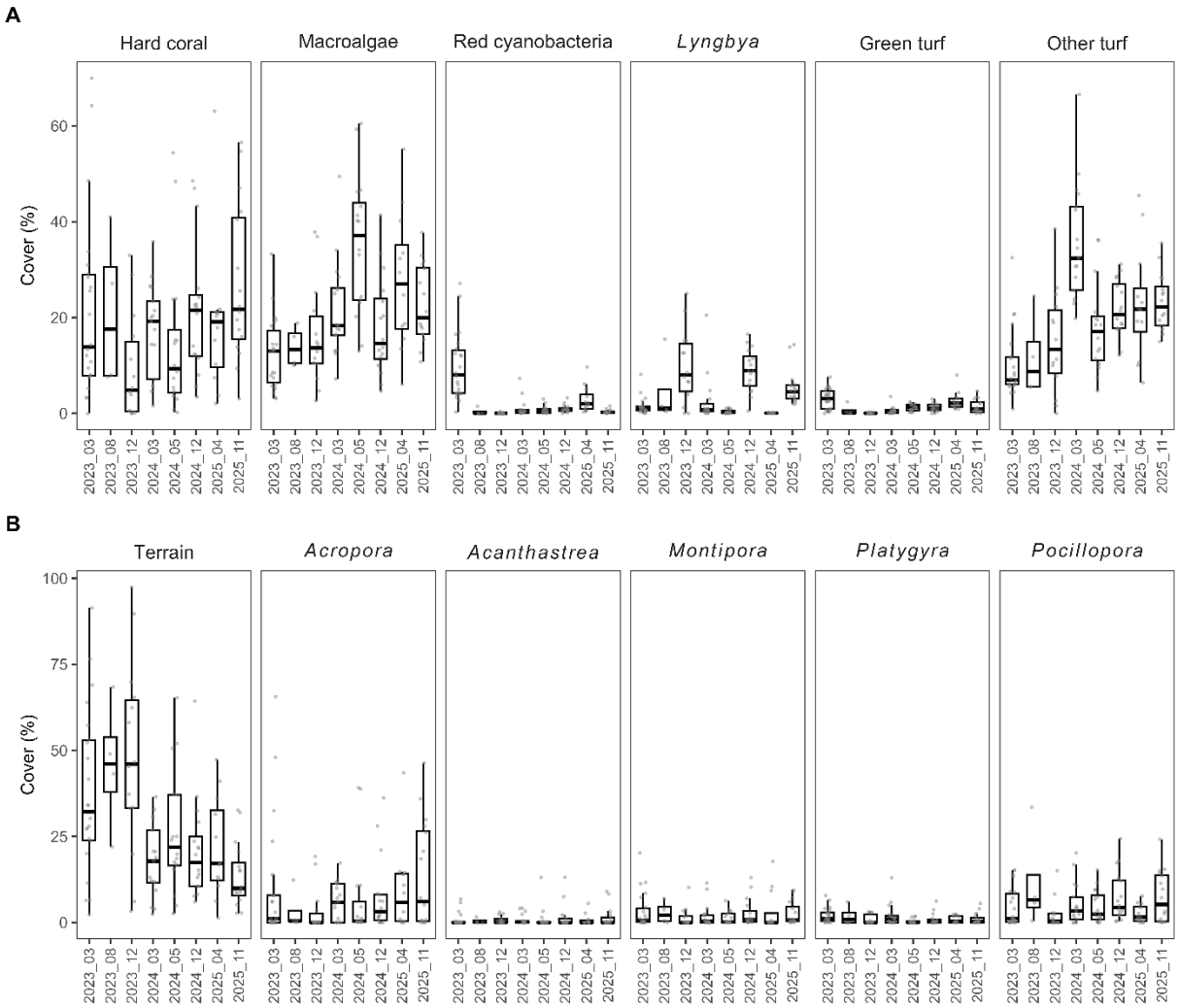

Figure 8. Plots showing community cover patterns from 2020 – 2025 recorded at Far Western Slaughter Bay for the main benthic groups (A) and main hard coral taxa and terrain (B). Dark line represents the medium value, boxes upper and lower values represent the interquartile range (25th and 75th percentile) and line represent the maximum and minimum values. Points represent outliers (i.e. transects placed on anomalously high areas of cover for the group being plotted).

Benthic Community Trends - Cemetery Bay

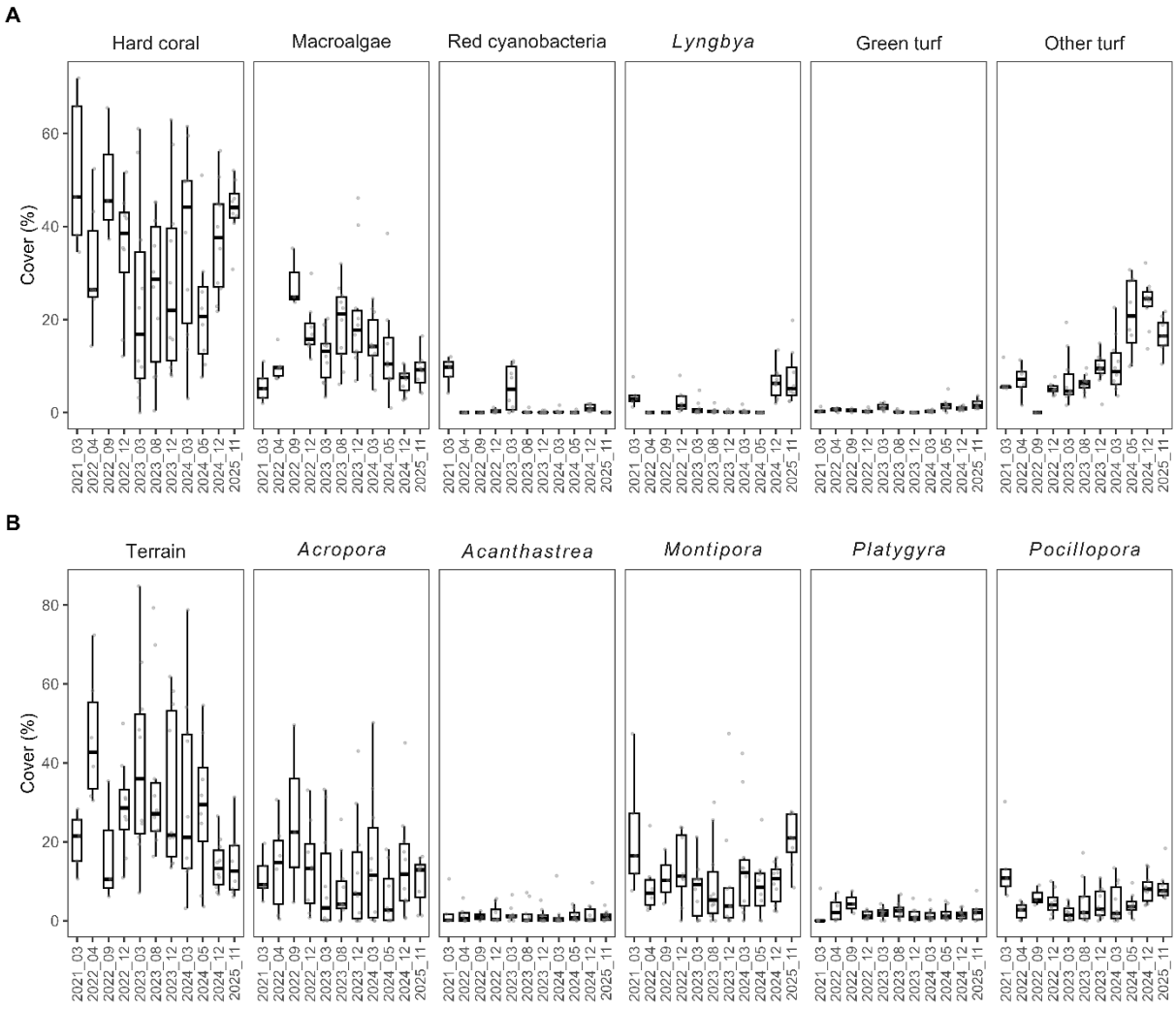

Figure 9. Plots showing community cover patterns from 2020 – 2025 recorded at Cemetery Bay for the main benthic groups (A) and main hard coral taxa and terrain (B). Dark line represents the medium value, boxes upper and lower values represent the interquartile range (25th and 75th percentile) and line represent the maximum and minimum values. Points represent outliers (i.e. transects placed on anomalously high areas of cover for the group being plotted).

Fringing reefs of Norfolk Marine Park, Elephant Rock

Benthic cover at the offshore reef of Elephant Rock (Figure 10, 11), a site removed from the impacts of land-based pollution into the KAVHA catchment, at a depth of ~3 m, is similar to that recorded in Coral Sea and Great Barrier Reef coral reef ecosystems.

Hard coral cover at the offshore site between 2024 and 2025 varied from 44.3% (SE ± 9.0%) to 50.2% (SE ± 1.9%; Figure 11), reflective of benthic variability and survey methodology. Average offshore (Elephant Rock) coral cover of ~ 47% is consistent with reports of coral cover in offshore reef sites of the Norfolk, Middleton and Coral Sea sites.

CCA cover increased from 12.2% (SE ± 2.2%) to 17.5% (SE ± 2.0%) which is the highest CCA cover recorded in the Norfolk Marine Park (Figure 11). Urchin cover also increased from 1.2% to 2.3% (Figure 11), remaining considerably higher than at inshore lagoonal sites of KAVHA which also saw urchin increases.

Turf algae decreased from 13.2% (SE ± 2.6%) to 7.1% (SE ± 1.2%) and macroalgae from 16.6% (SE ± 2.7%) to 12.7% (SE ± 1.1%) (Figure 11). Red cyanobacteria also declined markedly from 2.5% to 0.5%, while *Lyngbya* remained stable at low levels (0.6 – 0.7%). Ascidians were effectively absent from both surveys. Given that surveys have only been undertaken for two periods, as yet it can not be determined if these are normal seasonal changes.

Benthic community patterns at the offshore Elephant Rock reef contrast with those observed at inshore lagoonal sites of the KAVHA catchment, where algal cover has been consistently higher. The low algal cover and high hard coral and CCA cover at Elephant Rock are consistent with a reef system removed from the influence of land-based nutrient inputs and catchment run-off that characterise the KAVHA catchment inshore bays.

Figure 10. location and image of Elephant Rock Reef.

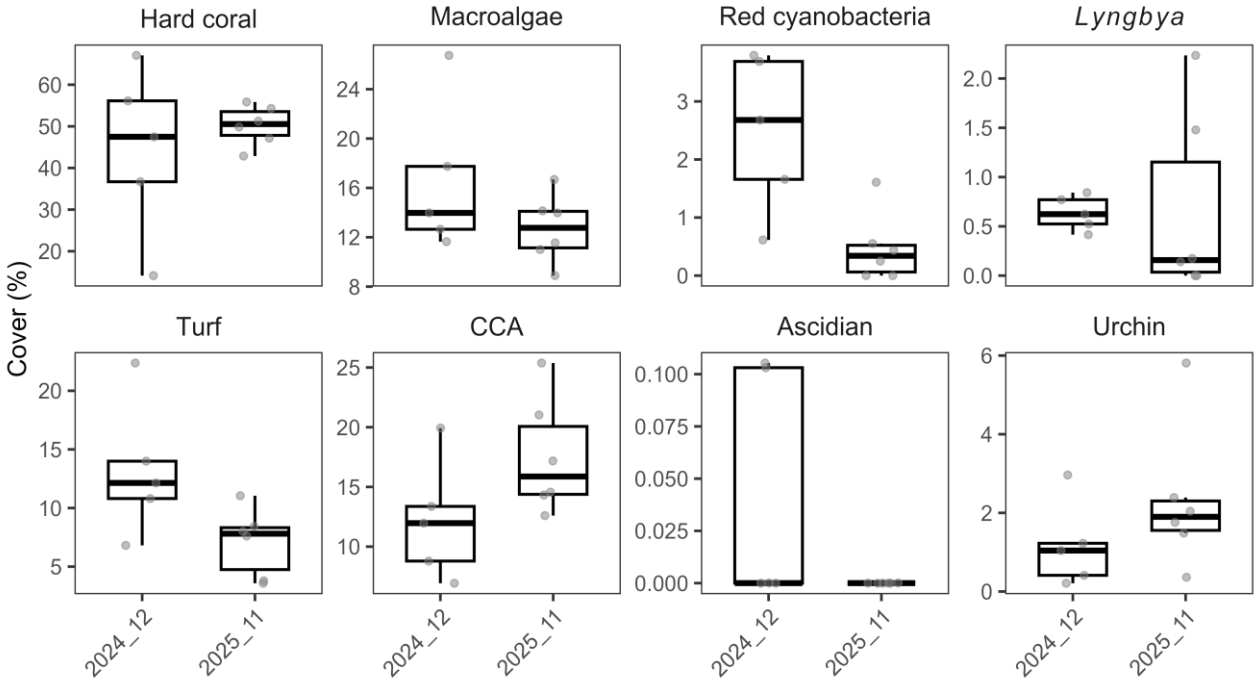

Figure 11. Community structure of fringing coral reef at Elephant Rock, NMP, December 2024 and December 2025.

Coral disease prevalence across inshore lagoonal reefs of the KAVHA catchment

Coral disease, *Montipora* White Syndrome (MWS) and *Acropora* White Syndrome (AWS) were recorded across all four inshore survey sites (Figure 12, 13). Both diseases remain consistently high and at levels consistent with an ongoing disease outbreak with approximately 30% of the population of the two genera impacted by disease. At Emily Bay and Slaughter Bay, mean *Montipora* disease prevalence was found to be 38.3% and 43.1% respectively. Plating *Acropora* disease prevalence was found to be impacting 23.5% of the population at Emily Bay and 14.4% in the Slaughter Bay populations. At Cemetery Bay and Western Slaughter *Montipora* disease prevalence was markedly elevated at 75.4% (52 of 69 colonies) and 50.0% (42 of 84 colonies) respectively. Disease rates at both WSB and CB are consistent with the highest rates of disease recorded in EB and SB earlier in the outbreak from 2022-2024. Plating *Acropora* disease prevalence was 45.2% at Cemetery Bay and 31.2% at Western Slaughter. Notably, Cemetery Bay recorded the highest disease prevalence of any site for both species. The reson for this large increase in areas that previously had low disease prevalence is unkown but is of concern and may indicated these areas are being further affected by anthropogenic impacts. Coral disease prevalence rates across the NMP inshore KAVHA catchment reefs remain both the highest on record and the longest running disease outbreak. *The number of colonies surveyed at all sites can be found in Table 1.*

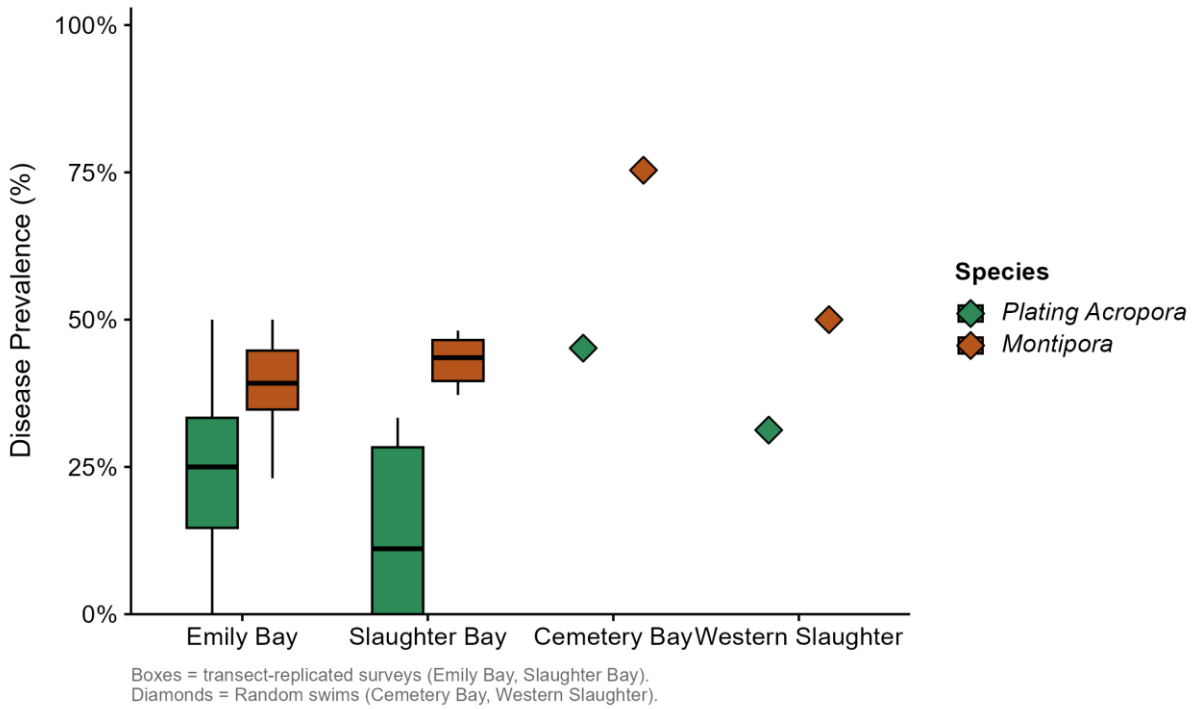

Figure 12. Coral Disease prevalence across survey sites in December 2025.

Table 1. The total number of coral colonies surveyed at each site (December 2025).

Site	*Acropora* colony count	*Montipora* colony count
Emily Bay	88	217
Slaughter Bay	44	411
Cemetery Bay	31	69
Western Slaughter	16	84

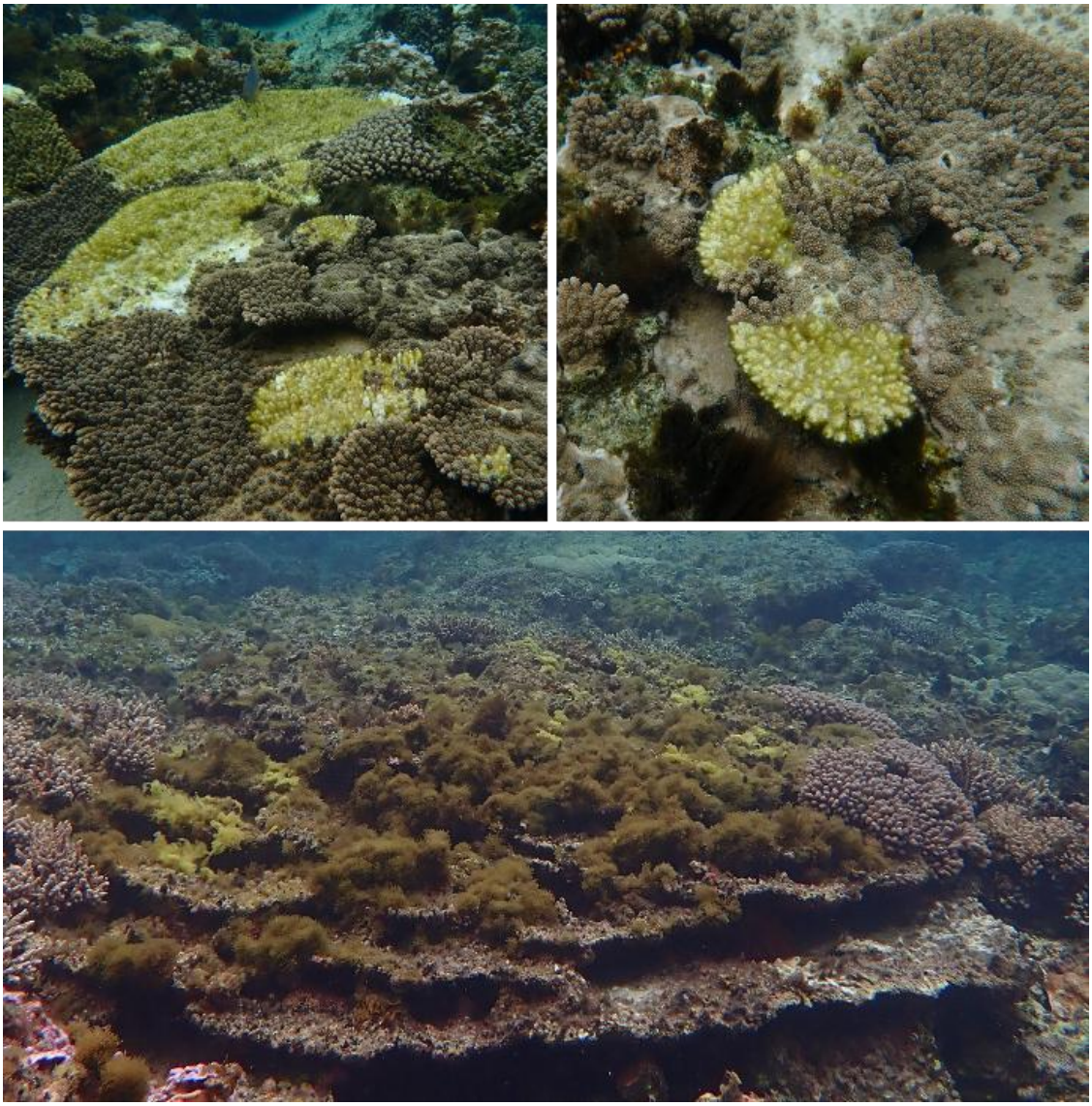

Figure 13. Coral disease (AWS) affecting live coral colonies in Cemetery Bay (top), dead coral colony with patchy algal overgrowth consistent with disease driven mortality in Cemetery Bay (bottom).

NMP Fish diversity and Habitat Usage

Taxa richness was found to increase from Eastern Emily Bay to Western Slaughter Bay over the reef however there is no difference in taxa richness of sand habitats (Figure 14). Taxa richness was found to be significantly greater than sand within all other zones. Results to-date (August 2024) indicate there is no significant difference in species diversity between coral reef; coral reef with macroalgae matrix; and coral reef with rocky reef and macroalgae. Further analysis of fish communities following the disturbance events of 2025 are underway to assess ongoing habitat usage patterns.

Labridae (wrasses) are the most dominant fish family in all zones over reef throughout Emily Bay and Slaughter Bay. Many of the Labridae species are well known reef-associated species (*Thalassoma spp., Gomphosus varius, Pseudolabrus luculentus*). Over sand, *Mugilidae* (mullets) and Labridae (wrasses) are the dominant families. *Apogonidae* (cardinal fishes) are only found over sand in western Slaughter Bay, representing many juvenile endemic Norfolk Island species. *Mugilidae* (mullets) and *Mullidae* (goat fishes) are known sand-associated species given their feeding ecology.

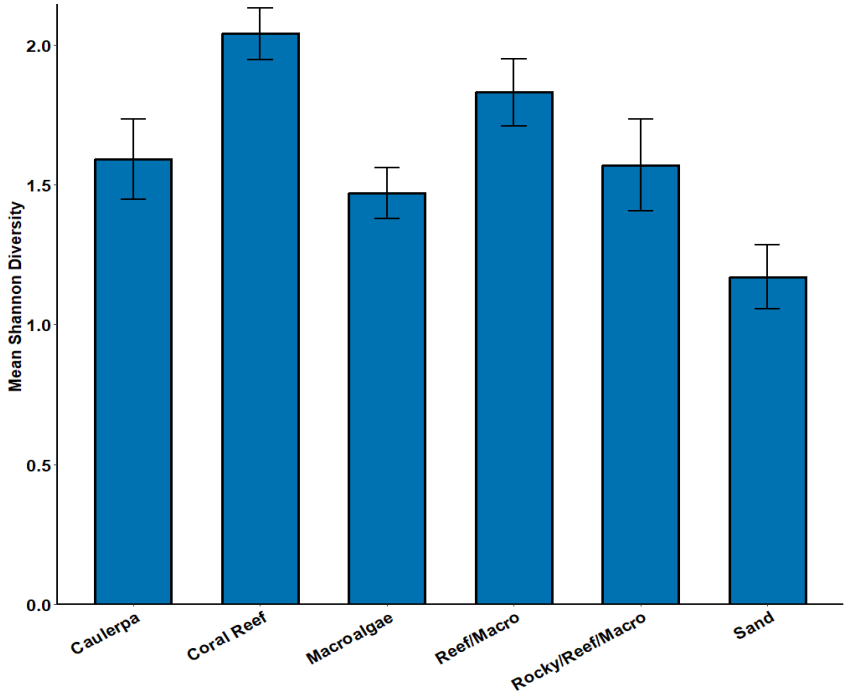

Figure 14. Mean diversity (Shannon) over different habitats at Salthouse. Values are mean ± se.

2025 to February 2026 Environmental Conditions

The Norfolk Marine Park has been exposed to anomalously high sea surface temperatures since late November 2025. Early bleaching watch conditions were identified through the NOAA regional Bleach Watch site for Norfolk Island from November. Conditions eased in December with bleaching conditions returning through January 2026 (Alert level 1) and February 2026 (Alert level 2; Figure 15). Initial citizen observations and reports suggest paling of thermally susceptible genera Pocilloporid and Montiporid was evident in late February. Throughout 2025 the NMP inshore reefs of the KAVHA catchment experienced several severe rain events and flooding resulting in land-based pollution and run-off into the marine park. In each event the inshore coral reefs were exposed to prolonged periods of sedimentation, freshwater incursion and nutrification. Together consecutive sedimentation and freshwater events, followed by prolonged period of heat stress leading to coral bleaching result in an 11-month long period of severe compounding pressures which are linked to increased risk of coral reef degradation.

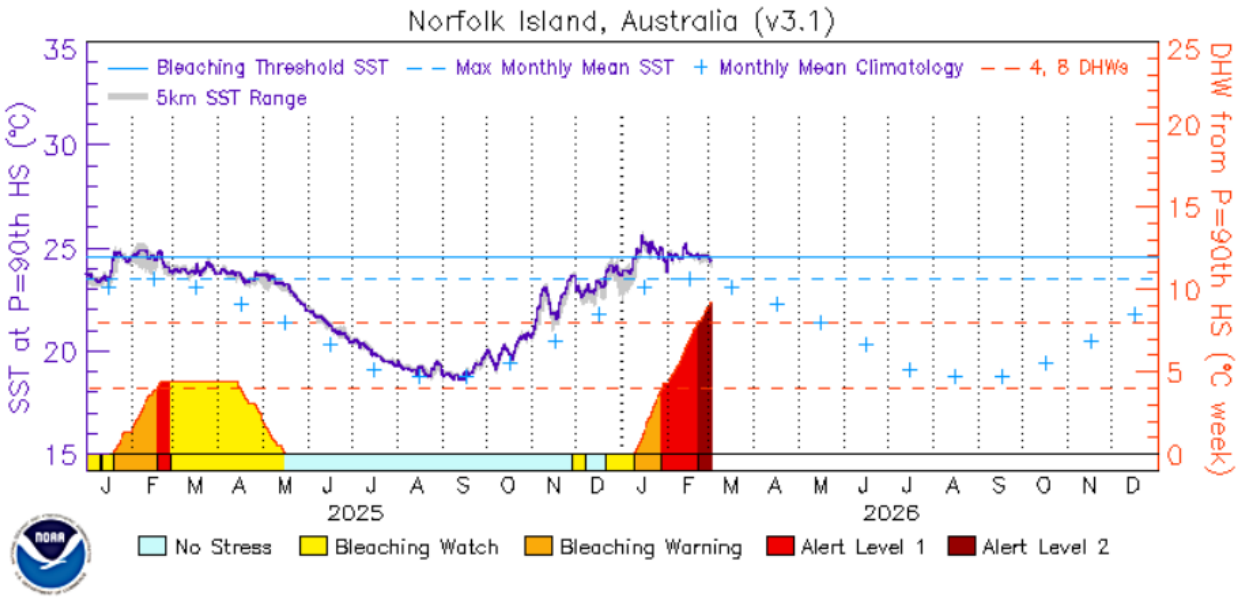

Figure 15. Sea surface temperature, alert level and thermal stress (Degree Heating Weeks) for the Norfolk Island reef NOAA virtual station (https://coralreefwatch.noaa.gov/product/vs/gauges/norfolk_island.php), accessed 10 March 2026.

High Resolution Benthic Imaging

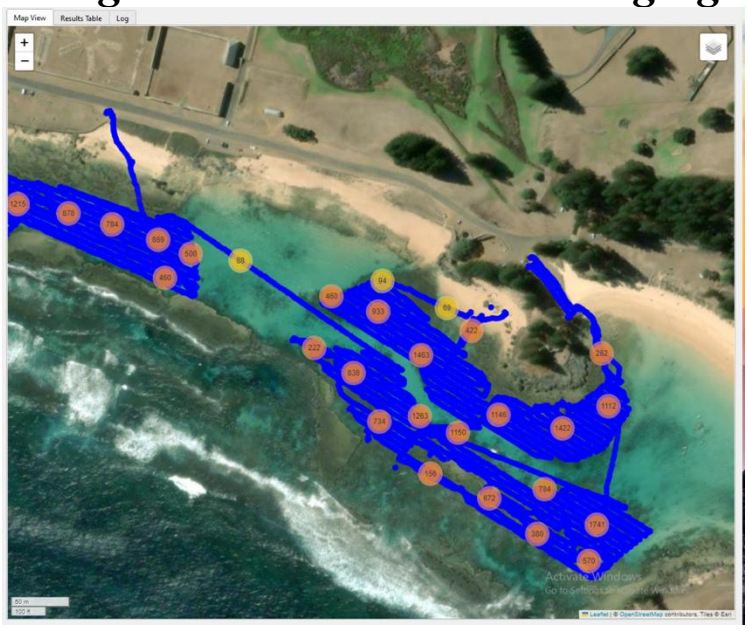

Figure 16. Image records of Emily and Slaughter Bay.

Between 2024 and 2026, unmanned surface vessel (USV) technology (Blue Boat) was deployed across the inshore reefs of the KAVHA catchment of the Norfolk Marine Park to provide high-resolution monitoring of reef condition and benthic community structure. USVs are surface-based drones capable of conducting automated or manually guided surveys enabling efficient data collection across all shallow reef environments including areas otherwise inaccessible to diver-based surveys. The USV platform were used to conduct high resolution imaging of the entire Emily, Slaughter and Cemetery Bay reefs, collecting extensive geo-referenced imagery, in each of December 2024, April 2025, June 2025, September 2025 and December 2025. Each survey coinciding with LTMP survey periods (04/25, 12/25) and degradation events (04/25, 06/25, 09/25). Individual survey missions typically covered approximately 10.5 km of reef habitat and captured as many as 30,000 high-resolution images of the reef. Each image was spatially referenced, allowing precise mapping of benthic features and enabling repeat surveys at identical locations through time. This repeatability provides a robust framework for detecting temporal changes in reef condition and supports long-term monitoring of the NMP coral reef ecosystems. The high-resolution datasets also supported mapping of reef structure and shallow bathymetry, contributing to improved understanding of habitat heterogeneity across the NMP reef system.

A key component of the program was the application of newly developed automated image-analysis software currently being produced by Dr Tom Moir, UNSW and University of Newcastle. This system enables the rapid processing of the large image datasets and to conduct high resolution surveys of coral disease prevalence and severity. By automating disease detection and classification, software can substantially increase the efficiency of analysing large spatial datasets generated by the USV surveys.

Bathymetric Inshore Seabed Mapping Trial bathymetric surveys (Figure 15) were conducted in November/December 2025 at Salthouse (Figure 15 panel B) and Cemetery Bay (Figure 15 panel C) using a Blue Robotics BlueBoat equipped with a Cerulean Sonar Surveyor multibeam echosounder.

The sounder utilises 240 kHz sound waves in an 80-degree swath to achieves a ping rate of up to 20 pings per second allowing for efficient, accurate, and high-resolution depth data. The BlueBoat was operated autonomously along pre-programmed survey lines using its integrated GPS. The trials demonstrated that using this methodology we can acquire high resolution bathymetry data from the inshore lagoons, coastal habitats and shallow reef locations. It is planned that in subsequent bathymetric mapping will include the extent of Slaughter-Emily Bay inshore lagoon and outer reef lagoon areas not currently accessible by diver surveys. The aim of inshore bathymetric surveys over time is to allow for the detection of morphological change driven by coral loss or storm surges and mapping of inaccessible reef areas coupled with high resolution benthic imaging.

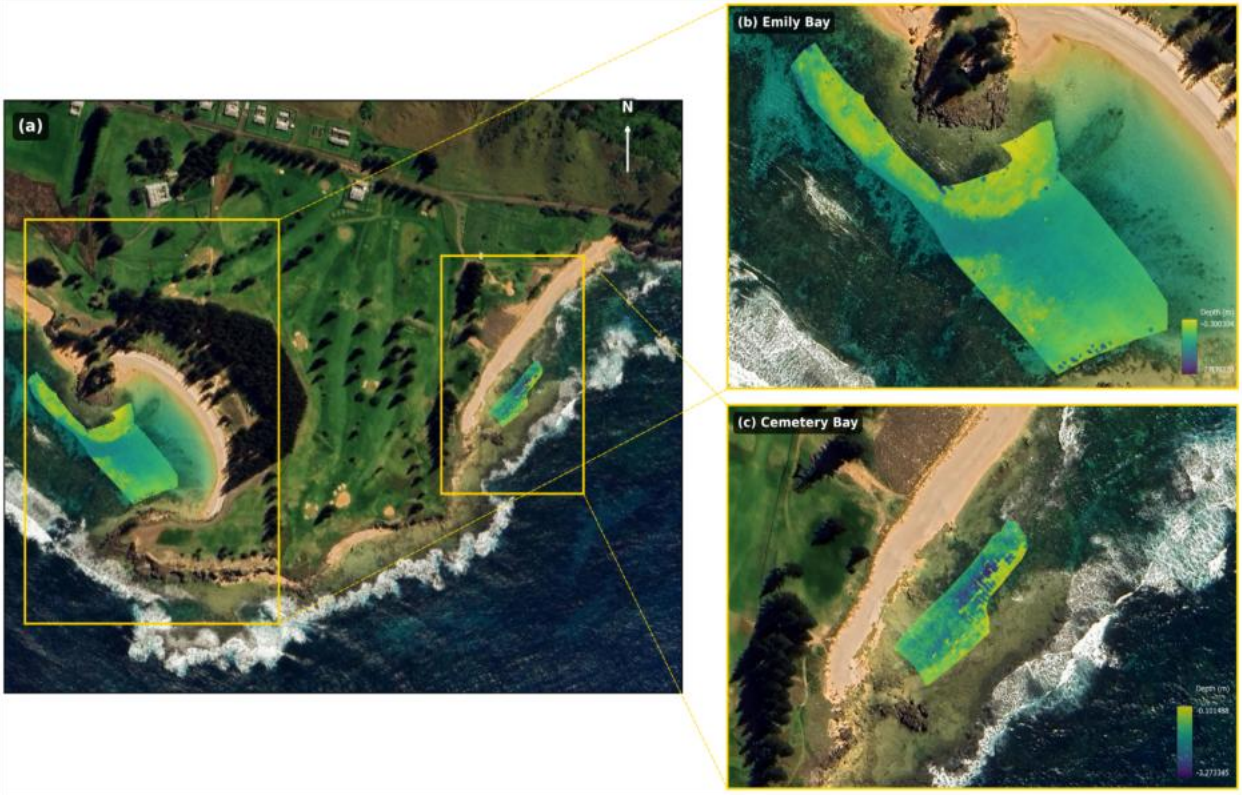

Figure 17. Representative images of the BlueBoat trial bathymetric surveys.

Oceanographic Monitoring Activities

In December 2025 and January 2026 routine maintenance and redeployment of oceanographic monitoring equipment were undertaken as part of the ongoing coastal observing program at Norfolk Island. The primary offshore temperature and salinity mooring located in 45 m depth was successfully recovered, serviced, and redeployed to ensure continuity of long-term environmental observations. In addition, two lagoon-based temperature and pressure loggers were recovered, serviced, and redeployed at established monitoring sites within the lagoon system. One logger is positioned at the reef pass leading into Emily Bay Lagoon, while the second is located adjacent to Kingston Pier. Field operations included the recovery and inspection of the temperature mooring at Kingston Pier and deployment of the Conductivity–Temperature–Depth (CTD) within the Emily Bay/Slaughter Bay lagoon. These activities ensure the continued operation of the observing network and support long-term environmental monitoring at Norfolk Island.

To expand monitoring of lagoon water properties, a CTD instrument was also deployed within the Emily Bay/Slaughter Bay lagoon system. This CTD provides higher-resolution measurements of salinity and temperature variability within the lagoon and complements the existing long-term logger network. The CTD was inspected after one month of deployment in January 2026 to confirm successful operation. Additional temperature loggers attached to shark receiver moorings remain deployed and are scheduled for servicing in April 2026. The offshore mooring and lagoon logger network will undergo their next routine servicing in June 2026.

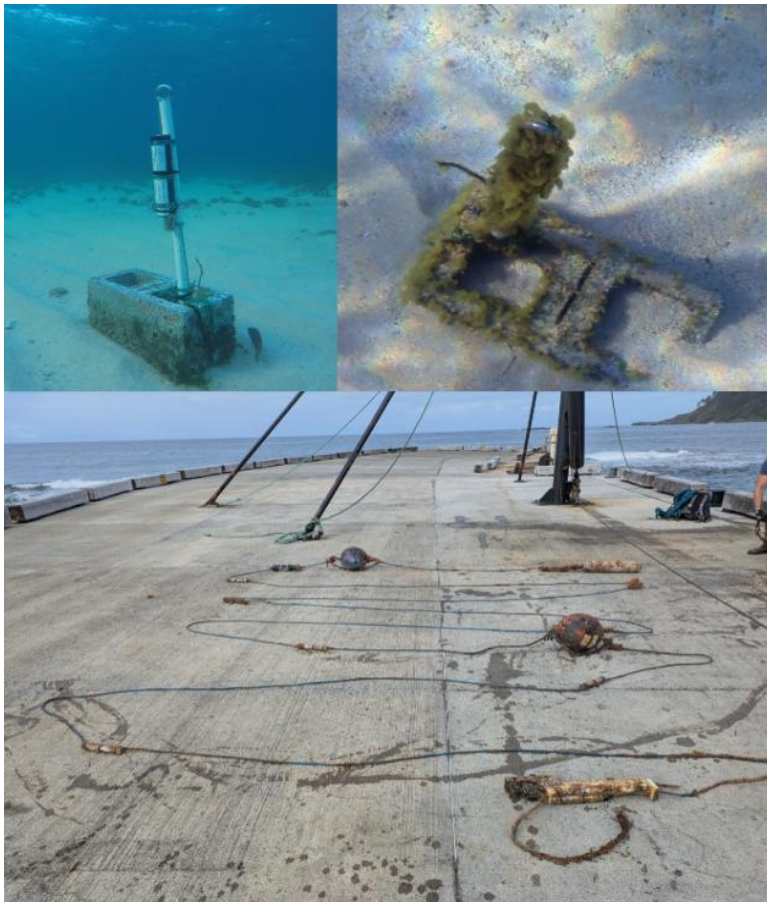

Figure 18. Inshore and offshore oceanographic monitoring equipment deploy in NMP.

Data collected (Figure 19) over the monitoring period demonstrate continuous environmental records across multiple sites. A one-year time series from the offshore mooring documents temperature variability throughout 2024–2025. Lagoon monitoring data from the reef pass and Kingston Pier sites provide a comparable one-year temperature record within the lagoon environment. In addition, six months of subsurface salinity measurements were obtained from the offshore mooring.

Data is openly available via Austin, T., do Valle Chagas Azaneu, M., & Roughan, M. (2026). UNSW temperature records for Norfolk Island [Data set].
Zenodo. https://doi.org/10.5281/zenodo.18453398

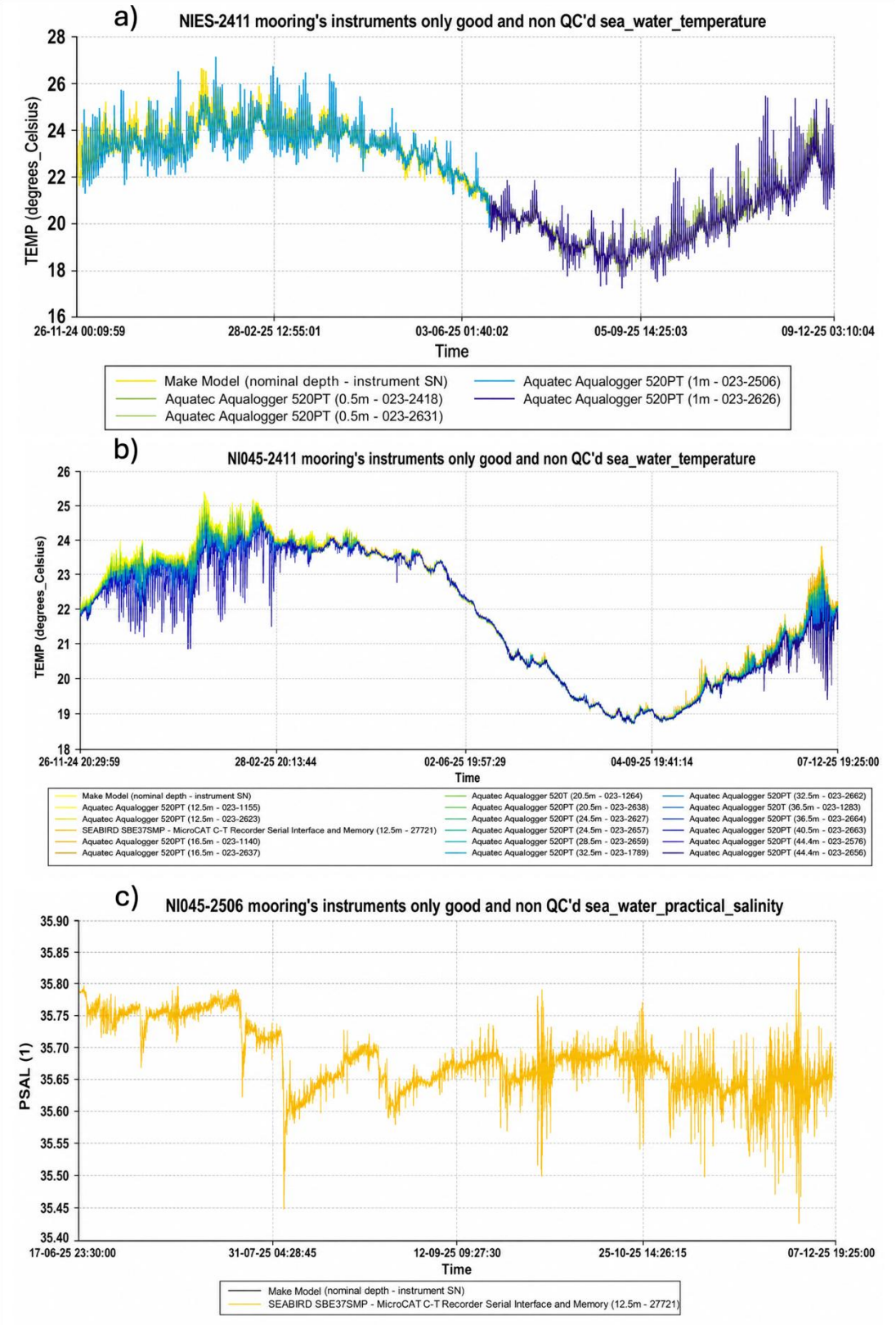

Figure 19. Time series oceanographic data NMP deployments to January 2026. (A) Temperature data from Emily Bay temperature loggers at 0.5 (yellow, green) and 1 m (blue, purple). (B) Temperature data from oceanic mooring from 12.5 m to 44 m. (C) Emily Bay salinity data.

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