

# GREAT BARRIER REEF MARINE MONITORING PROGRAM

Summary Booklet 2024–25



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Aboriginal and Torres Strait Islander readers are advised this publication may contain names and images of deceased persons.

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The Great Barrier Reef Marine Monitoring Program (MMP) is a collaboration between the Great Barrier Reef Marine Park Authority, the Australian Institute of Marine Science (AIMS), James Cook University (JCU), the Cape York Water Partnership (CYWP), and the University of Queensland (UQ), with important contributions from the Commonwealth Scientific and Industrial Research Organisation’s (CSIRO) eReefs program, i-Sea, Traditional Owners, the Reef Joint Field Management Program, Seagrass-Watch, tourism operators, and community volunteers.

## Acknowledgement of Country

We Acknowledge the continuing Sea Country management and custodianship of the Great Barrier Reef by Aboriginal and Torres Strait Islander Traditional Owners, whose rich culture, heritage values, enduring connections and shared efforts protect the Reef for future generations.

Nautilus Shell Artwork © 2023 by Laurence Gibson, Yalanji Arts, Mossman Gorge



# The Marine Monitoring Program

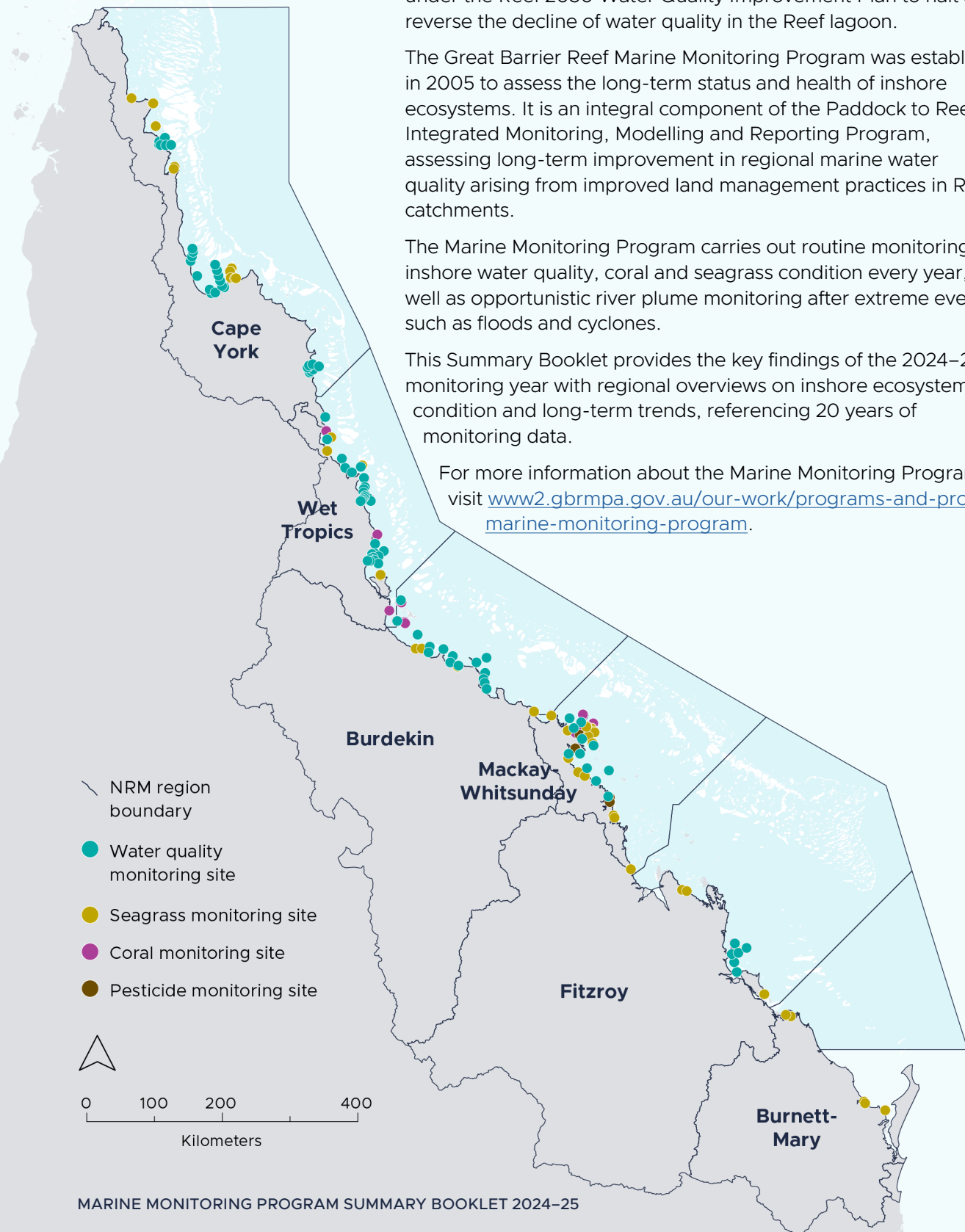
Water quality is a key issue for the health of the Great Barrier Reef (the Reef), its catchments and for the communities, industries and ecosystems that rely on good water quality. Substantial investment is being undertaken by the Australian and Queensland governments under the Reef 2050 Water Quality Improvement Plan to halt and reverse the decline of water quality in the Reef lagoon.

The Great Barrier Reef Marine Monitoring Program was established in 2005 to assess the long-term status and health of inshore ecosystems. It is an integral component of the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program, assessing long-term improvement in regional marine water quality arising from improved land management practices in Reef catchments.

The Marine Monitoring Program carries out routine monitoring of inshore water quality, coral and seagrass condition every year, as well as opportunistic river plume monitoring after extreme events such as floods and cyclones.

This Summary Booklet provides the key findings of the 2024–25 monitoring year with regional overviews on inshore ecosystem condition and long-term trends, referencing 20 years of monitoring data.

For more information about the Marine Monitoring Program, visit [www2.gbrmpa.gov.au/our-work/programs-and-projects/marine-monitoring-program](http://www2.gbrmpa.gov.au/our-work/programs-and-projects/marine-monitoring-program).



# Key environmental pressures

During the 2024–25 monitoring season the inshore Reef was affected by significant rainfall causing high river discharge and flooding, high monsoonal trough winds resulting in some localised storm damage, and periods of above average sea surface temperatures during the summer.



## Cyclones

No cyclones crossed the Reef during the 2024–25 monitoring season.



## Floods

Above average rainfall was mainly concentrated in the southern Wet Tropics and Burdekin regions, resulting in significant flood events.

Major floods occurred in the Tully, Murray and Herbert Rivers at the beginning of February 2025 and again to a lesser extent in mid-March 2025. During the largest event in February, the Herbert River exceeded flood levels for 10–14 days.

High flow events occurred in the Burdekin River during February and April 2025. The larger event in February was well above moderate flood levels and saw the highest peak daily flow volume since 2008–09 (1,600,000 ML/day). The Burdekin River remained above the moderate flood level for 7 consecutive days during this flow event.

Flooding also occurred in the Mackay-Whitsunday region but was not monitored by the Marine Monitoring Program due to resource constraints.



## River discharge

In the 2024-25 season, the total Reef-wide discharge was nearly double (1.9 times) the long-term median, the highest since the extreme 2010–11 season.

The Burdekin, Mackay-Whitsunday and Burnett-Mary regions had river discharge well above their long-term medians (6.8, 2.8, and 3.4 times), with the Burdekin recording its highest discharge since 2010–11. River discharge from the Cape York, Wet Tropics and Fitzroy regions, although not as high, was also above their long-term medians (1.4, 1.6 and 1.2 times).

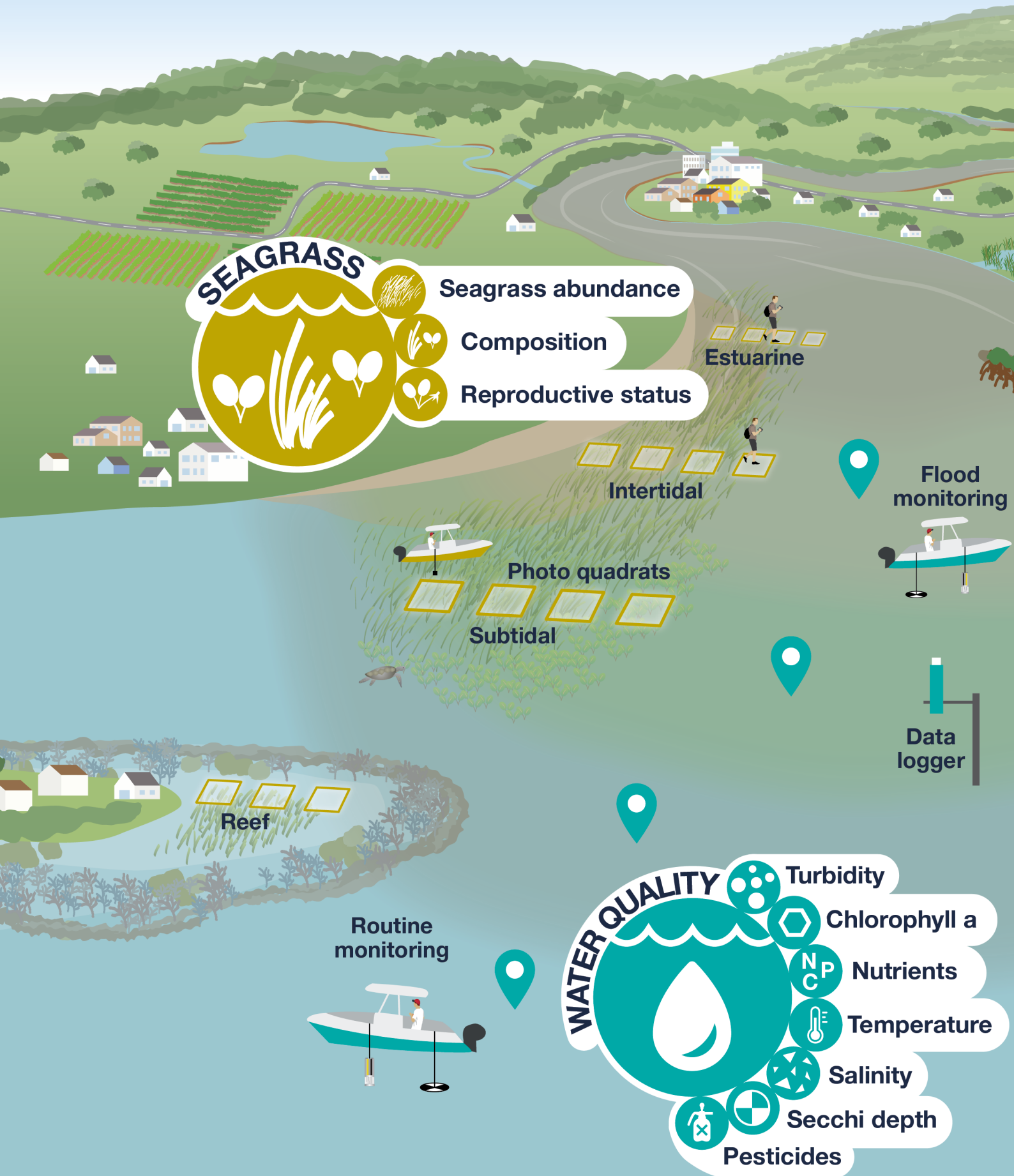



## Temperature

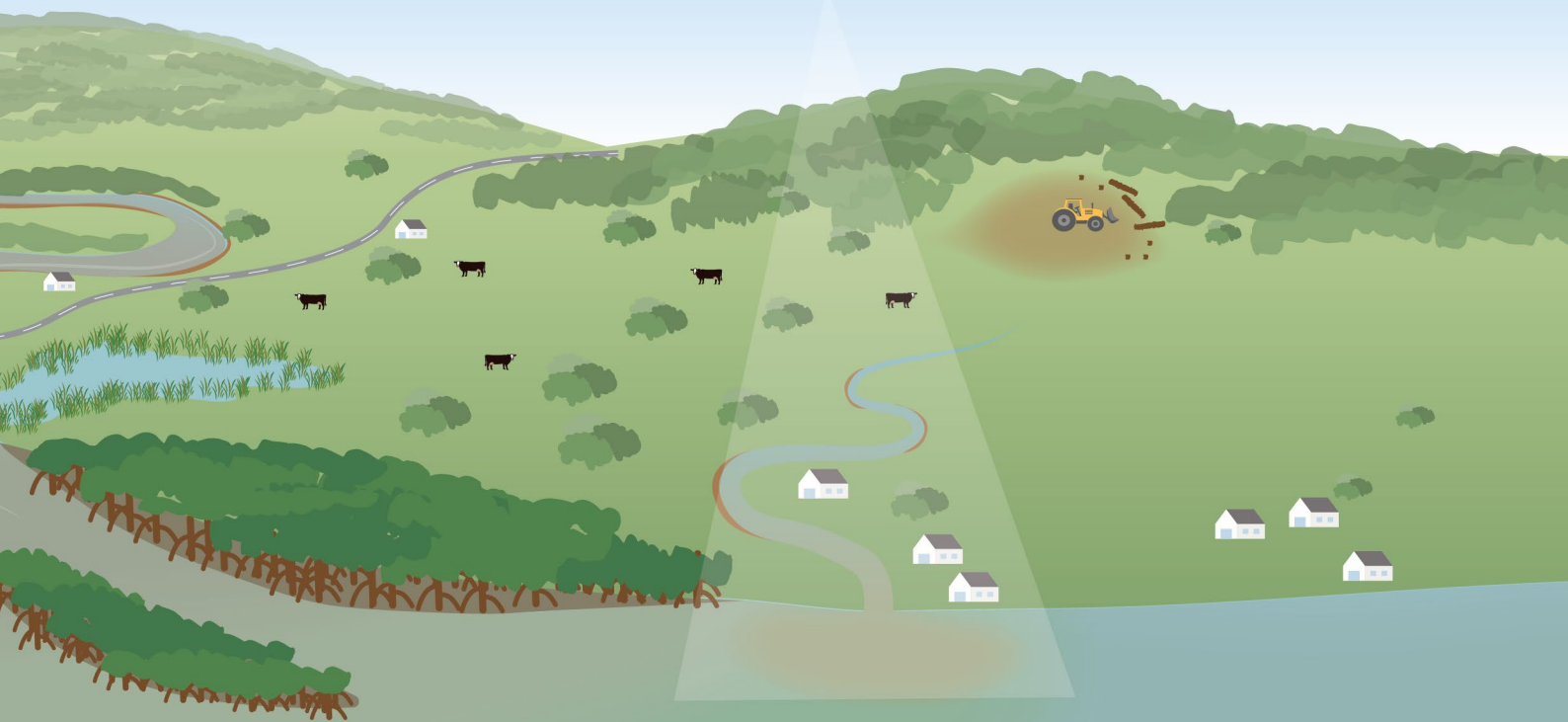
Sea surface temperatures over the 2024-25 summer were above long-term averages, particularly in the northern Wet Tropics, but no coral bleaching was reported from this.

The 2024–25 monitoring season was the fourth consecutive year of above-average within-canopy temperature in seagrass meadows and the sixth warmest on record. All regions, except for the Burdekin, recorded annual average temperatures exceeding the long-term average.

# Monitoring the inshore zone




Remote sensing 



# CORAL

-  Coral cover
-  Cover change
-  Macroalgae cover
-  Juvenile coral density
-  Coral community composition

 Photo transects  
2m  
5m

# Reef-wide summary 2024-25

**Cape York**

WATER QUALITY: GOOD  
SEAGRASS: POOR

**Wet Tropics**

WATER QUALITY: MODERATE  
CORAL: MODERATE  
SEAGRASS: POOR

**Burdekin**

WATER QUALITY: GOOD  
CORAL: MODERATE  
SEAGRASS: POOR

**Mackay-Whitsunday**

WATER QUALITY: MODERATE  
CORAL: MODERATE  
SEAGRASS: MODERATE

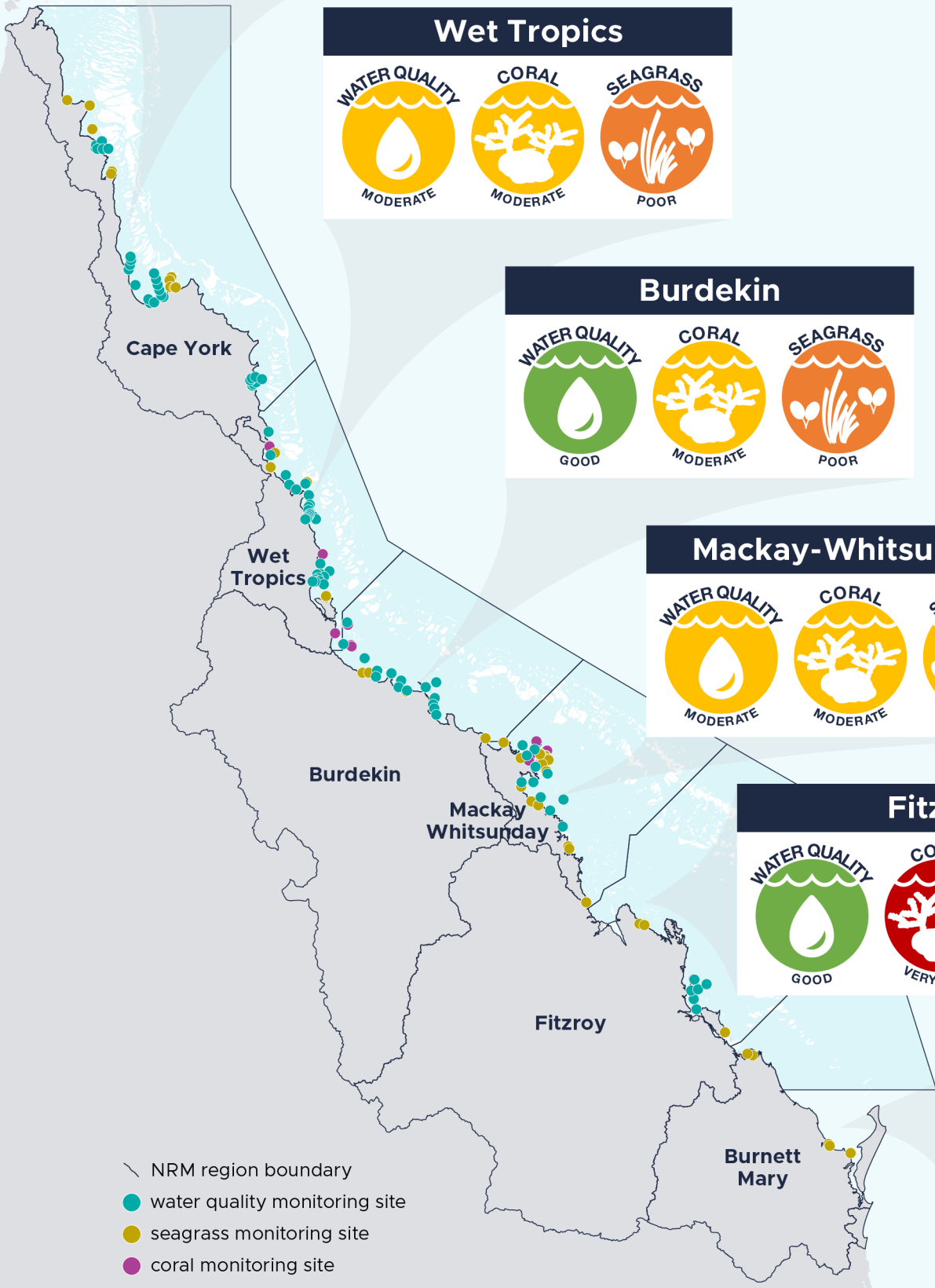
**Fitzroy**

WATER QUALITY: GOOD  
CORAL: VERY POOR  
SEAGRASS: MODERATE

**Burnett-Mary**

SEAGRASS: GOOD

- Very good
- Good
- Moderate
- Poor
- Very poor



- NRM region boundary
- water quality monitoring site
- seagrass monitoring site
- coral monitoring site



## Water quality

In 2024–25, the Annual Water Quality Index scored either 'good' or 'moderate' in all regions.

Water quality conditions improved in the northern and central parts of Cape York. However, declines were seen in the south of the region due to the ongoing impacts from Tropical Cyclone Jasper in December 2023.

Conditions deteriorated in the Wet Tropics and Mackay-Whitsundays following several consecutive years of above-median river flow in these regions, while water quality conditions in the Fitzroy region continued to remain stable.

Most water quality indicators have remained stable since 2015. Some indicators, such as Chlorophyll a (Chl-a) and phosphate (PO<sub>4</sub>), have shown deterioration, primarily related to high river discharge in recent years.

Despite the high flow events experienced in the Tully and Burdekin focus regions, nitrate/nitrite has continued to show a trend of improvement in these locations.



## Seagrass

Inshore seagrass meadows across the Reef declined in overall condition in 2024-25, with the Seagrass Index going from 'moderate' to 'poor'.

However, there were marked regional differences.

Seagrass condition in the northern regions (Cape York, Wet Tropics and Burdekin) was 'poor', with Cape York recording its lowest score to date.

Seagrass condition in the most southern regions (Burnett-Mary and Fitzroy) saw large improvements, with the Burnett-Mary scoring 'good', which is a significant increase from its previously 'poor' condition and its highest score since monitoring began.

This variability in condition across regions is a legacy of impacts and influences from previous extreme events.



## Coral

Inshore coral communities on the Reef overall have remained in 'poor' condition since 2018. Declines in the Coral Index were recorded across all monitoring regions except the Mackay-Whitsundays.

Inshore coral reefs in the Mackay-Whitsunday region improved to a 'moderate' condition, driven by continued improvement in the Juvenile coral, Coral cover and Macroalgae indicators since 2020. While strong coral recruitment was observed in this region, notably where macroalgae growth was low, juvenile scores continue to remain low overall.

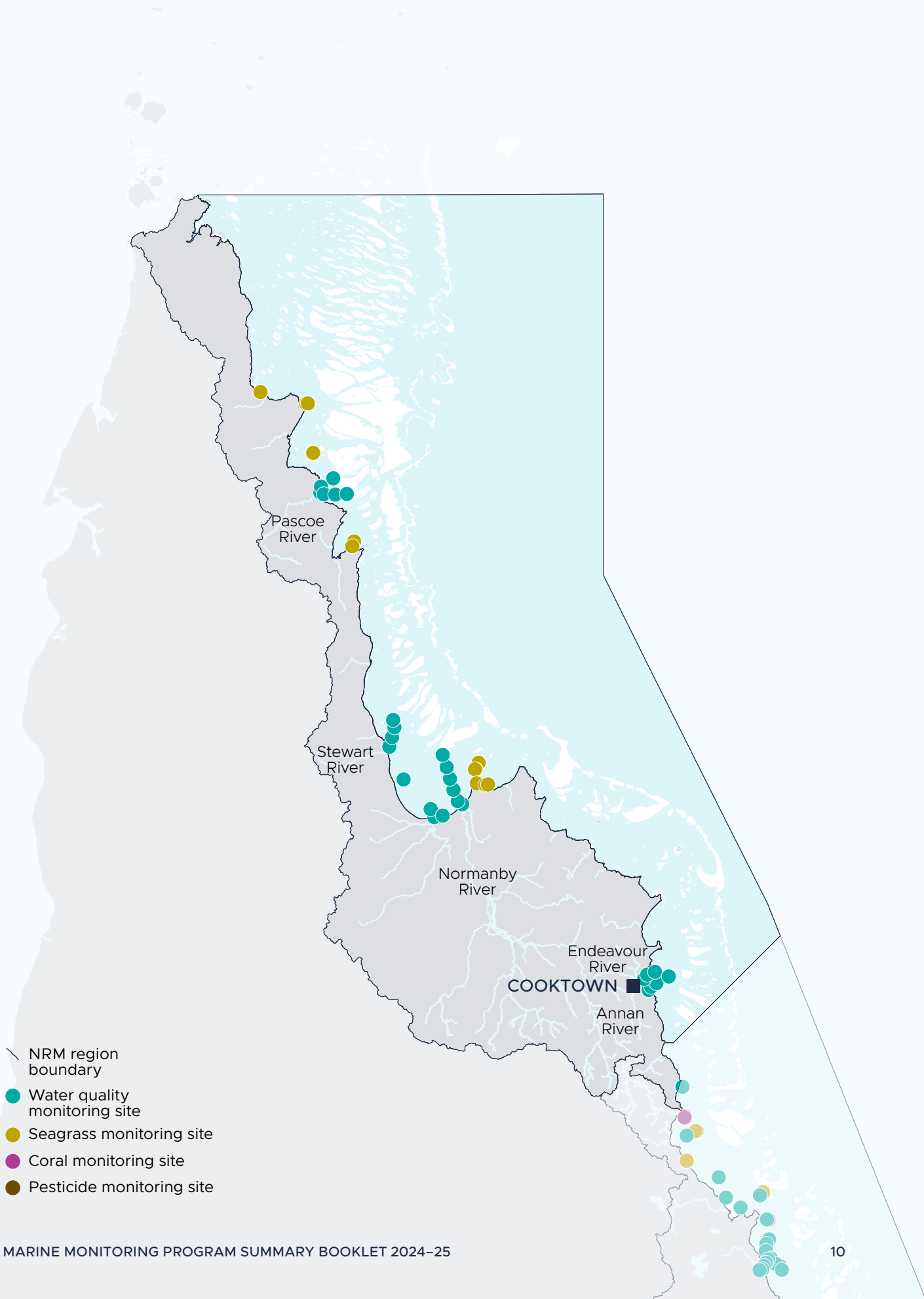
The impacts of recent flooding and bleaching events are being felt across most regions and will continue to become evident as macroalgae recolonises, suppressing coral growth and recruitment.

Overall condition of inshore corals continues to decline as they face ongoing pressures, and the impacts of frequent extreme events outpace their ability to recover.

Monitoring a *Zostera* meadow at Midge Point, Mackay Whitsunday.



# Cape York region





The Annual Water Quality Index for the Cape York region was 'good'.

Discharge from rivers in the Cape York region was between 1 and 1.5 times the long-term median for all subregions. While there was high river discharge across this region, there were no above average magnitude flood events.

Water quality is improving in most of this region, following a deterioration in 2023-24 primarily associated with impacts from Tropical Cyclone Jasper. However, water quality in the Annan-Endeavour subregion is continuing to decline due to on-going impacts from Tropical Cyclone Jasper.

Water quality indicators Particulate Phosphorus (PP) and Total Suspended Solids (TSS) met guideline values in all subregions. Chl-a, nitrate/nitrite (NOx), PO4 and particulate nitrogen (PN) met guideline values in some subregions. Secchi depth did not meet guideline values in any subregion.



The Seagrass Index for the Cape York region was 'poor'.

Seagrass condition is only assessed in the late dry season in Cape York. Due to the timing of surveys, this is the first seagrass monitoring data to capture the effects of Tropical Cyclone Jasper in December 2023.



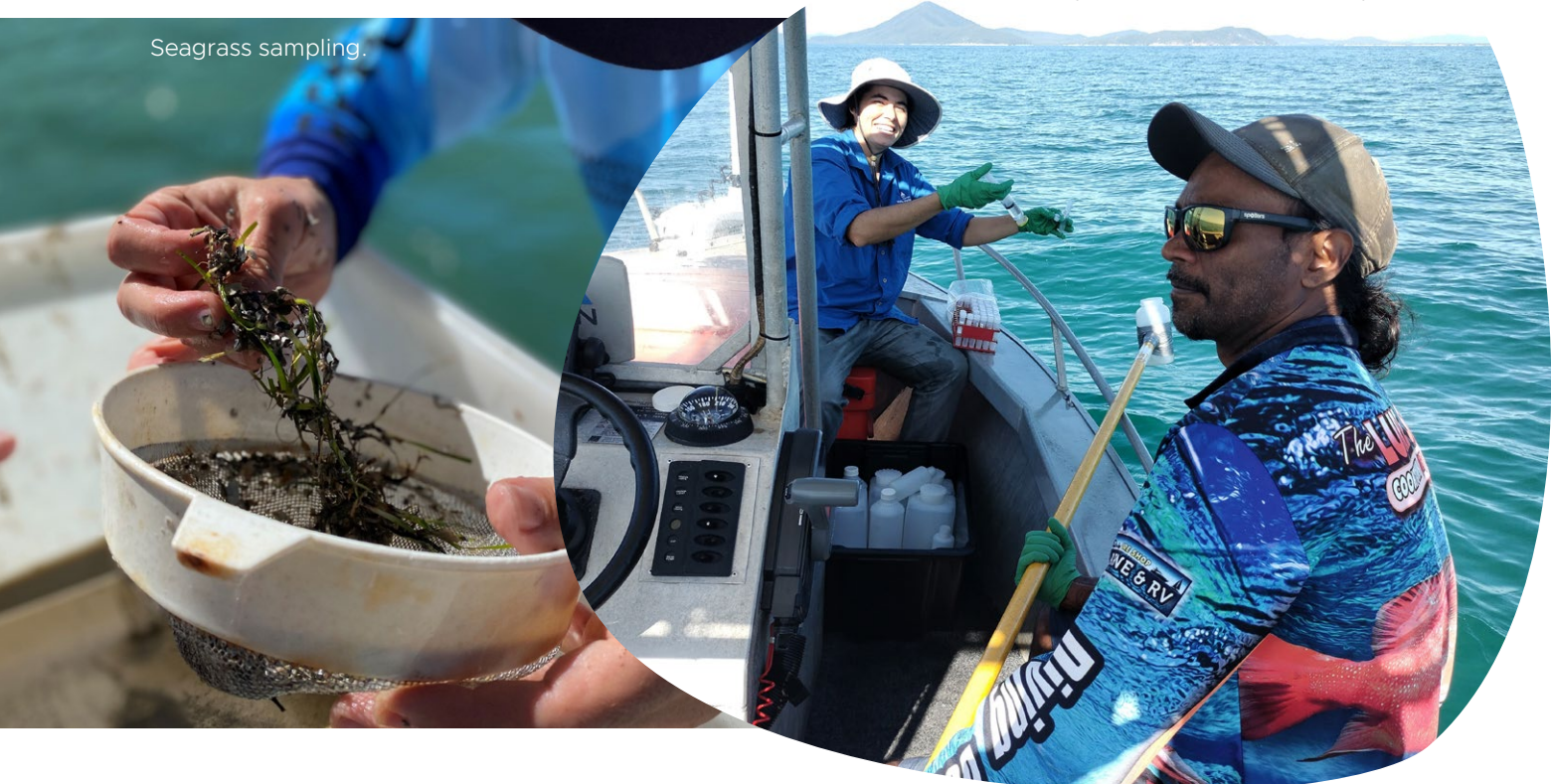
Seagrass condition greatly declined from 2023-24 to 2024-25 due to a deterioration in both abundance and resilience indicators. The Seagrass Index score in 2024-25 is the lowest since monitoring began. Reproductive effort declined to zero across coastal and reef habitats, consistent with historically low reproductive activity and limited seed production in reef intertidal meadows. The declining seed banks pose a considerable challenge for seagrass recovery across the region.



For safety reasons, the Marine Monitoring Program does not monitor inshore coral reefs in the Cape York region.

Water quality sampling, Cape York. Pictured: Orionne Albert-Mitchell and Robert Morris (Cape York Water Partnership).

Seagrass sampling.



# Wet Tropics region



The Annual Water Quality Index for the Wet Tropics region was 'moderate'.

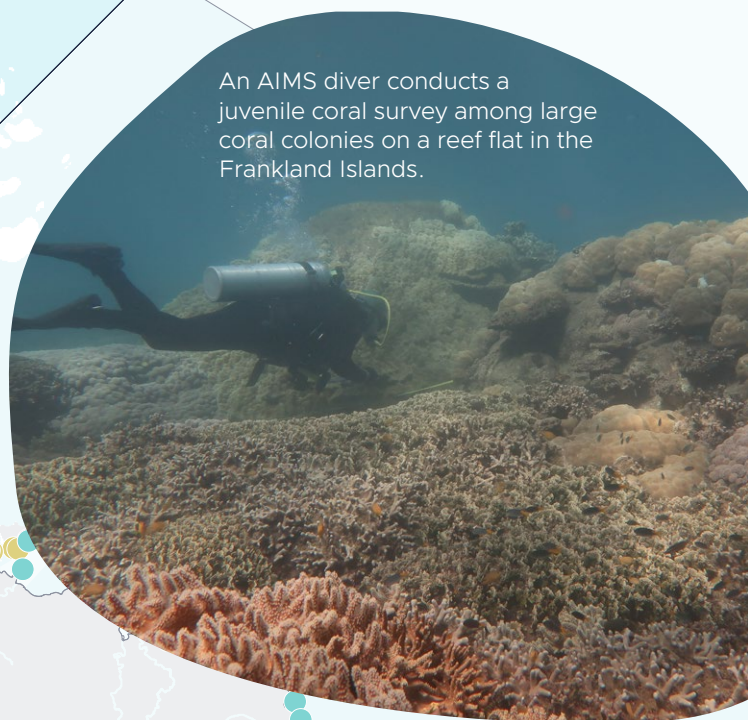
River discharge in the Wet Tropics region was above the long-term median in all catchments, with the southern areas of the region experiencing significant rainfall and high flow events. Discharge from the Tully, Murray, and Herbert basins was double the long-term median.

Following a period of stability and improvement in condition, water quality has deteriorated in the Wet Tropics region in 2024–25 due to high river discharge over the past two years.

Water quality indicators TSS and PN met guideline values for all subregions in the Wet Tropics and Chl-a met guideline values in two of the subregions. NOx, PO4, PP, Secchi depth and turbidity did not meet guideline values for any subregion. Deterioration in most indicators including Chl-a and PO4 across subregions are likely related to the recent wet years.



Despite recent high flow events, NOx continues to show a trend of improvement since 2015 in the Tully subregion.



An AIMS diver conducts a juvenile coral survey among large coral colonies on a reef flat in the Frankland Islands.

- NRM region boundary
- Water quality monitoring site
- Seagrass monitoring site
- Coral monitoring site
- Pesticide monitoring site



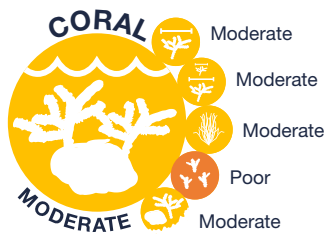
The Seagrass Index for the Wet Tropics region was 'poor'.

Seagrass condition in the northern and southern Wet Tropics region remained at 'moderate' and 'poor' respectively.

While improvements were seen in the seagrass abundance indicator across the region, its score in the southern area remains 'very poor'.

The seagrass resilience indicator declined across the Wet Tropics to 'poor', continuing a three-year downward trend driven by low abundance and the absence of reproductive structures at coastal sites.

Recovery of seagrass meadows post-2011 (Tropical Cyclone Yasi) has been challenging in the Wet Tropics region due to unstable substrates and chronic poor water quality at coastal sites driving high turbidity and light limitation.



The Coral Index scores for the Wet Tropics region remained at 'moderate'.

However, there were some declines in condition at the subregional level.

The Coral Index score in the Barron-Daintree subregion has declined to its lowest level on record and remains 'poor'. Inshore reef communities in this area have been severely affected by impacts from Tropical Cyclone Jasper.

The condition of inshore corals in the Johnstone Russell-Mulgrave subregion remained 'moderate' and stable after declining between 2021–2024 due to the cumulative impacts of Tropical Cyclone Jasper, coral bleaching and the corallivorous crown-of-thorns starfish. Outbreak densities of crown-of-thorns starfish continue to be observed in this subregion and remain a primary cause of coral cover loss.

In the Herbert-Tully subregion, the Coral Index score has continued to decline but remains 'moderate'. Low salinity floodwaters at shallow sites have decreased the coral cover, composition and juvenile density scores. The loss of macroalgae due to floodwaters has benefited the Coral Index in these locations, but it is likely to decline further next year as macroalgae recolonises.

## Flood monitoring

In February 2025, historic major flooding occurred in the Herbert River. Reactive flood monitoring by the Marine Monitoring Program team was carried out to characterise the flood plume, collecting crucial validation data for satellite imagery and the eReefs models.

Satellite imagery captured the extensive flood plume, illustrating the extent of turbid waters as well as the presence of 'island wakes' which show less turbid waters on the offshore side of several islands.

Pesticides were detected in all flood plume samples; the herbicides diuron, hexazinone and metolachlor were the most commonly detected. Metolachlor exceeded guideline values at Halifax Bay and the Palm Islands, and diuron remained slightly below guideline values.

The Pesticide Risk Metric (PRM), designed for Reef catchments, is used to estimate the additive ecological effect of pesticide mixtures on aquatic species. The PRM showed low risk to aquatic species at most sites, however there was moderate risk at Pandora Reef and Forrest Beach.



Copernicus Sentinel-2 data of the Tully plume (6 February 2025, True colour image).

# Burdekin region

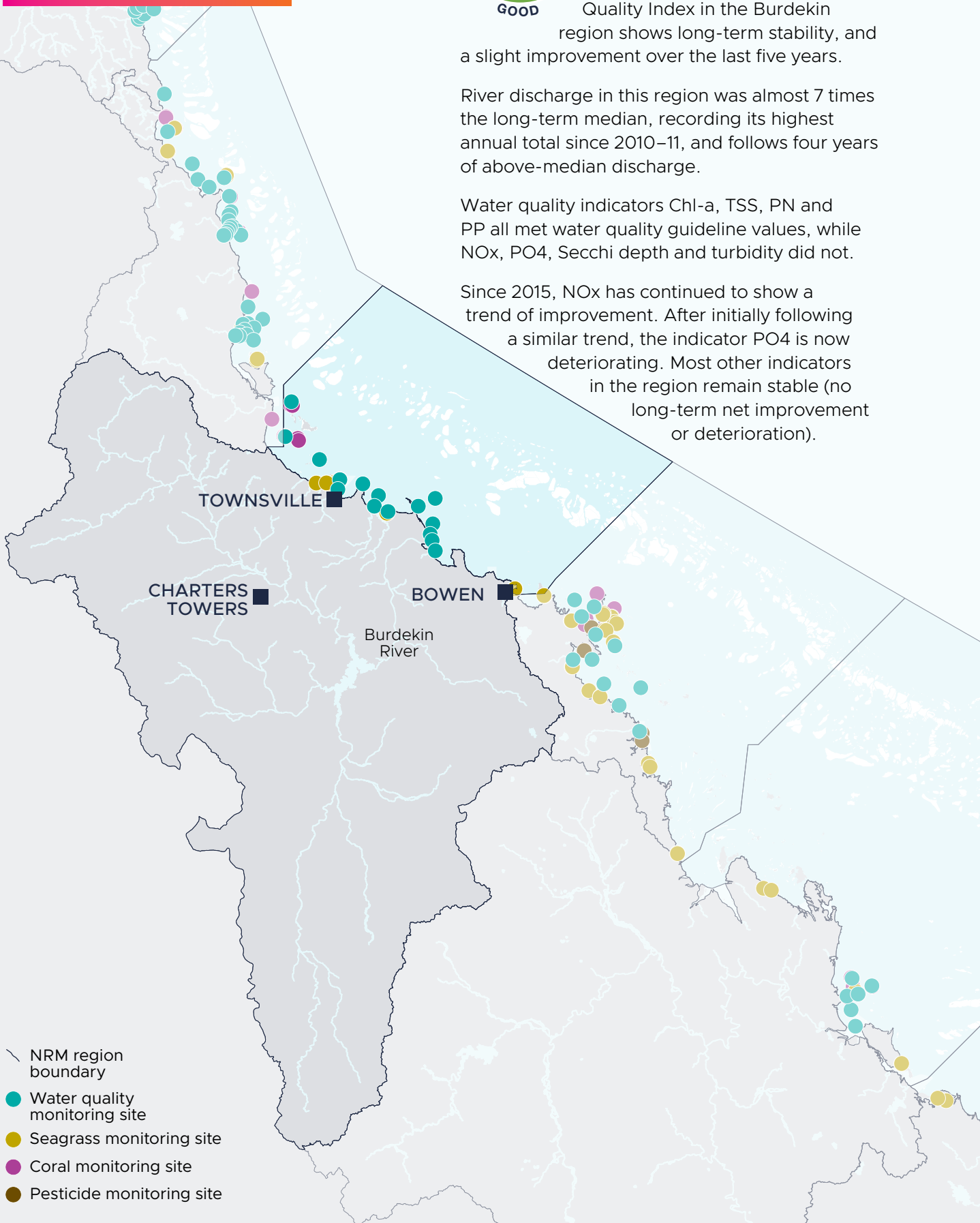


Despite the very high river discharge experienced in the Burdekin region in 2024–25, the Annual Water Quality Index remains 'good'. The Water Quality Index in the Burdekin region shows long-term stability, and a slight improvement over the last five years.

River discharge in this region was almost 7 times the long-term median, recording its highest annual total since 2010–11, and follows four years of above-median discharge.

Water quality indicators Chl-a, TSS, PN and PP all met water quality guideline values, while NO<sub>x</sub>, PO<sub>4</sub>, Secchi depth and turbidity did not.

Since 2015, NO<sub>x</sub> has continued to show a trend of improvement. After initially following a similar trend, the indicator PO<sub>4</sub> is now deteriorating. Most other indicators in the region remain stable (no long-term net improvement or deterioration).



- NRM region boundary
- Water quality monitoring site
- Seagrass monitoring site
- Coral monitoring site
- Pesticide monitoring site



The Seagrass Index for the Burdekin region was 'poor'.

Seagrass meadows across the Burdekin region have continued to experience a marked decline in condition for the third year in a row. Both seagrass abundance and resilience indicators were 'poor' with abundance dropping from a 'moderate' score in 2023–24. The 'poor' resilience score was driven by a lack of sexual reproduction among foundational seagrass species, particularly in intertidal reef habitats.



The Coral Index score has declined in the Burdekin region in 2024–25 but remains at 'moderate'.

Freshwater inundation from floodwaters and wave damage associated with an active monsoon in early 2025 caused a reduction in coral cover, juvenile coral density, coral composition and abundance of macroalgae at shallow reef sites. While the reduction in macroalgae helped stabilise the Coral Index scores of these reefs, it is likely temporary as the macroalgae will recolonise quickly.

Regional-scale coral cover has remained reasonably stable despite impacts from a marine heatwave in 2022 and Tropical Cyclone Kiriilly in 2024. These acute events have slowed but not stopped local recovery. Recovery of coral reefs in this region is constrained by low juvenile coral density and high amounts of macroalgae.



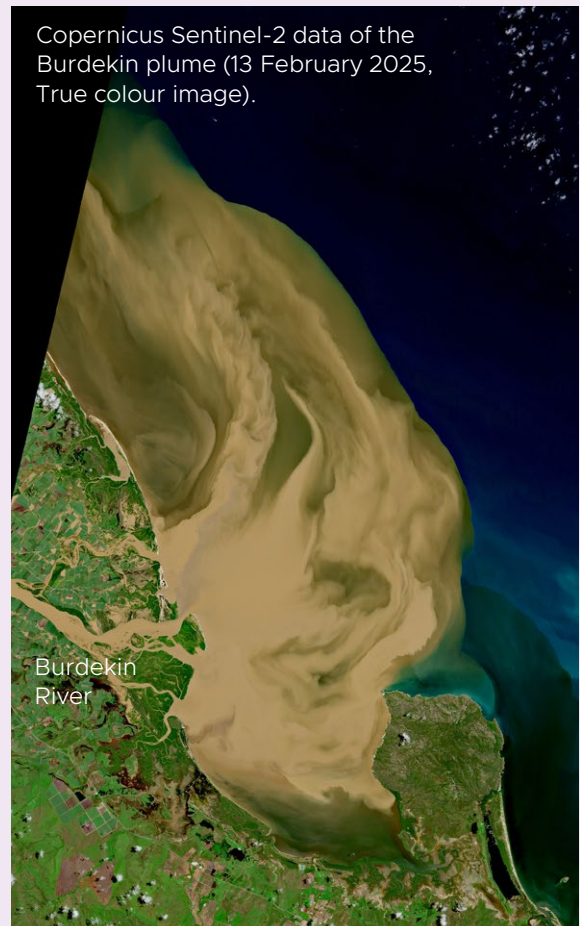
Sampling equipment on AIMS research vessel Solander being used to collect water quality samples at the mouth of the Burdekin River during flooding in February 2025.

## Flood monitoring

A significant flood event occurred in the Burdekin River in early February that peaked at 15.04 m and persisted above the moderate level for 7 consecutive days. The resulting flood plume lasted for several weeks, extending along the inshore Reef to as far north as the Palm Islands and reaching offshore to mid and outer shelf reefs.

Reactive flood monitoring by the Marine Monitoring Program team was carried out to characterise this flood plume, collecting crucial validation data for satellite imagery and the eReefs models. In situ sampling confirmed that water quality was impacted well beyond the inshore Reef.

Pesticides were detected in all samples across the flood plume. The herbicide tebuthiuron exceeded species protection guidelines and had the highest concentrations at the Burdekin River mouth. The Pesticide Risk Metric (PRM) threshold was exceeded at 6 event sampling sites and was mainly influenced by non-PSII herbicides such as 2,4-D and metolachlor.



Copernicus Sentinel-2 data of the Burdekin plume (13 February 2025, True colour image).

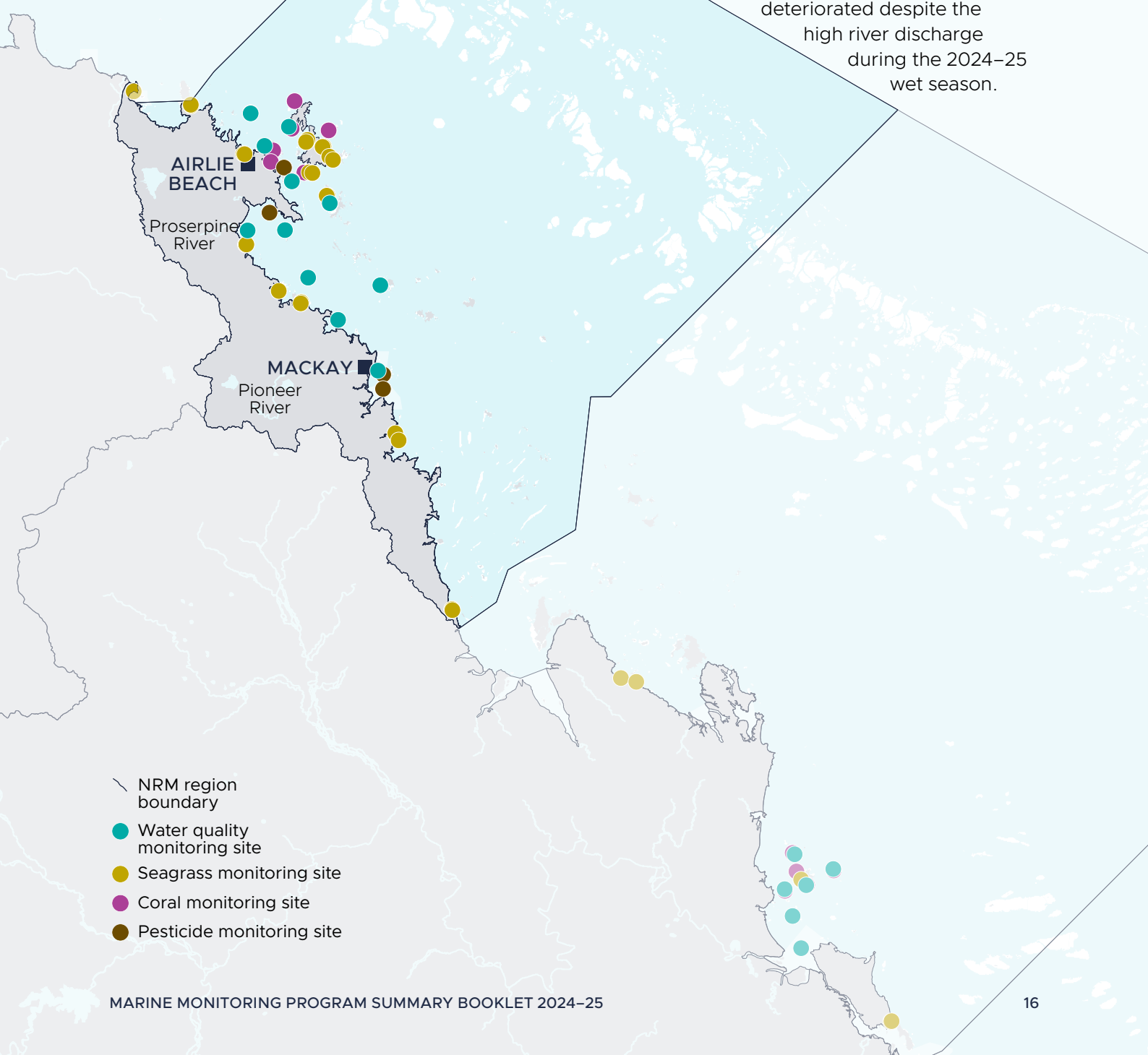
# Mackay–Whitsunday region



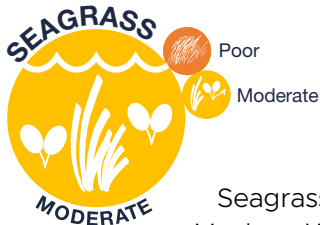
The Annual Water Quality Index for the Mackay-Whitsunday region was 'moderate'.

Rainfall was above the long-term average across all basins in the Mackay-Whitsunday region, with the combined river discharge 2.6 times the long-term median. This high river discharge has most likely resulted in the observed decline in the Water Quality Index to the low end of the 'moderate' range. This interrupts the gradual improvement in the region observed since Tropical Cyclone Debbie in March 2017.

PN was the only indicator that met water quality guideline values in this region. However, no indicators deteriorated despite the high river discharge during the 2024–25 wet season.



- NRM region boundary
- Water quality monitoring site
- Seagrass monitoring site
- Coral monitoring site
- Pesticide monitoring site



The Seagrass Index for the Mackay-Whitsunday region was 'moderate'.

Seagrass condition in the Mackay-Whitsunday has fluctuated between 'poor' and 'moderate' since 2011-12 due to a range of environmental pressures at both regional and local scales. The seagrass abundance score decreased to 'poor', driven by declines in reef intertidal and subtidal habitats. The overall resilience score for the region remained 'moderate', however, the absence of reproductive structures and seedbank indicates there is limited recovery potential for seagrass at reef intertidal and subtidal sites.



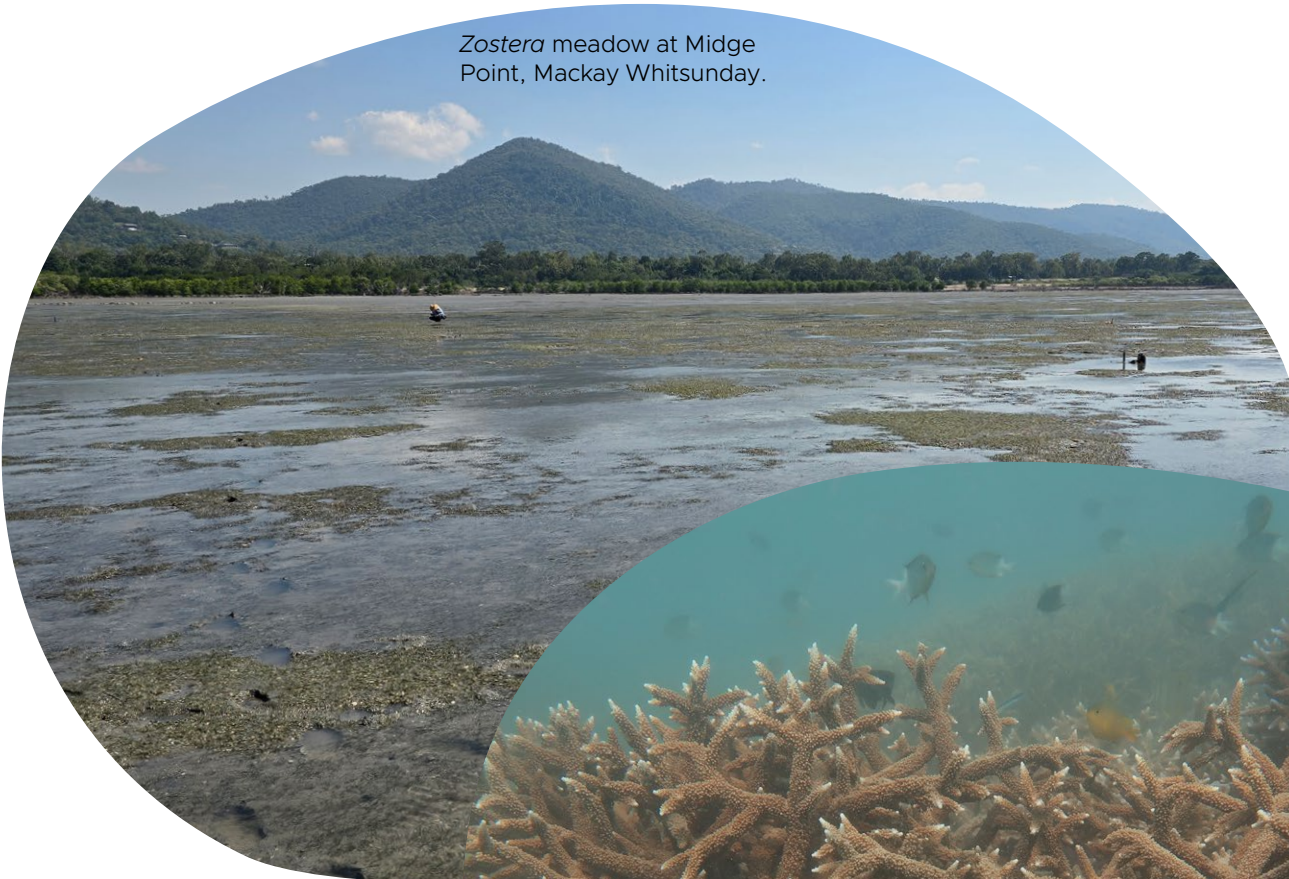
The Coral Index for the Mackay-Whitsunday region was 'moderate', an increase in grade from 'poor' for the first time since 2018-19.

All coral indicators have improved in 2024-25. Notably the juvenile density indicator continues to increase and has been in the 'moderate' score range for the last 4 years. The coral cover and macroalgae indicators remain 'poor' but their improvement has reached the upper limits of this range.



Coral communities continue to show signs of recovery in the region following the severe impacts of Tropical Cyclone Debbie in 2017.

*Zostera* meadow at Midge Point, Mackay Whitsunday.



Sheltered from recent disturbances, branching *Acropora* is widespread and healthy in the shallows at Tancred Island.

# Fitzroy region

- NRM region boundary
- Water quality monitoring site
- Seagrass monitoring site
- Coral monitoring site
- Pesticide monitoring site

BLACKWATER

ROCKHAMPTON

Fitzroy River YEPPOON

GLADSTONE

Dawson River



The Annual Water Quality Index for the Fitzroy region was 'good'.

River discharge in the Fitzroy region was slightly above the long-term median. Concentrations of Chl-a, PO4, PN, PP, and TSS met guideline values in the region. Indicators NOx and Secchi depth did not meet water quality guideline values but are showing signs of improvement.

Over the long-term, water quality condition in the Fitzroy region improved from 2007–2015 and has remained stable over the last 5 years. All water quality indicators have been stable since 2020. The deterioration seen in Chl-a and TSS indicators in other regions was not evident in the Fitzroy due to river discharge similar to the long-term median in this region in recent years.



The Seagrass Index for the Fitzroy region was 'moderate'.

The seagrass abundance indicator increased significantly due to improved conditions in estuarine and coastal habitats. The resilience indicator achieved a 'moderate' score with improvements observed across all seagrass habitat types. Recovery potential varied across habitats, with reproductive structures and persisting seedbanks present at estuarine and coastal sites, but notably absent at reef sites.



Seagrass condition improved in 2024–25, increasing from its previous 'poor' score, and achieving its highest level since 2007–08.



The Coral Index has declined to 'very poor' in the Fitzroy region.

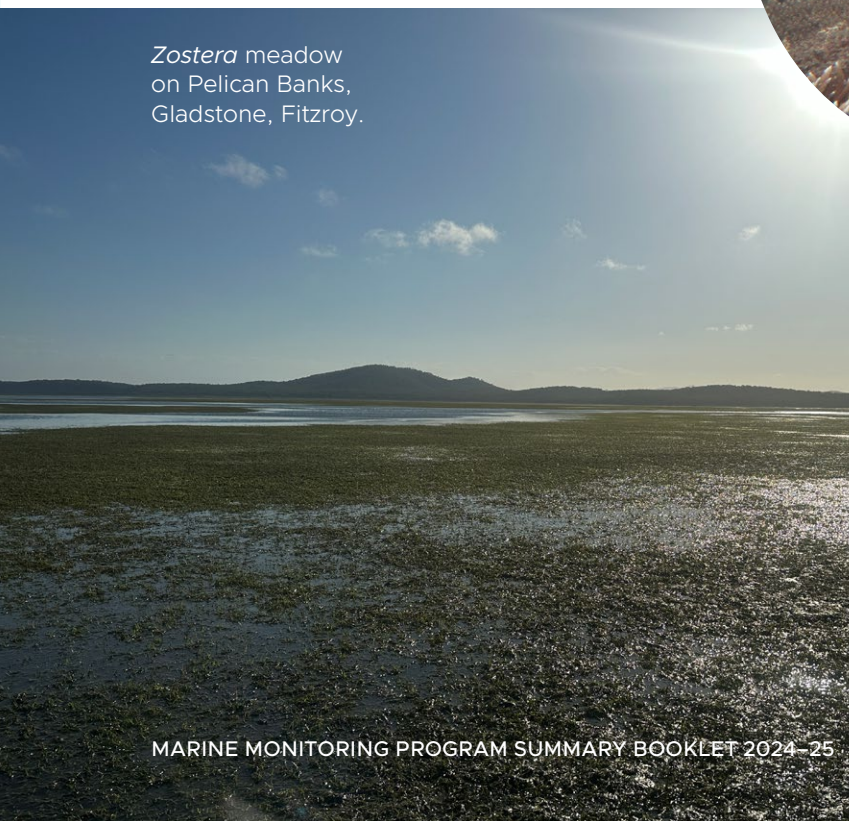
The marine heatwave of 2024 had a severe impact on coral communities in this region. Surveys in 2025

showed a 57% loss in in hard coral cover compared to 2023 levels. This region has a history of high macroalgae cover and low densities of juvenile corals, both of which continue to limit coral recovery.



An AIMS diver records juvenile corals along the transect at 5 m depth at Barren Island.

*Zostera* meadow on Pelican Banks, Gladstone, Fitzroy.



Filtering water quality samples on AIMS research vessel Aquarius at Pandora Reef. Pictured: Kathy Lisa Connellan.

# Burnett–Mary region

- NRM region boundary
- Water quality monitoring site
- Seagrass monitoring site
- Coral monitoring site
- Pesticide monitoring site

BUNDABERG ■

Burnett River

HERVEY BAY ■

MARYBOROUGH ■

Mary River



The Seagrass Index increased to 'good' in the Burnett-Mary region.

The seagrass abundance indicator improved in all locations, with scores surpassing long-term averages for both estuarine and coastal habitats. The resilience indicator has had an impressive increase from 'poor' in 2023–24 to 'good' in 2024–25, driven by strong recovery in estuarine habitats with high amounts of reproductive structures and the persistence of seedbanks.

The past two years of improvement to seagrass condition follow multiple years of decline since 2018–19, which reached a concerning 'very poor' grade in 2022–23. Fortunately, seagrass meadows throughout this region have a high capacity to recover, largely due to the persistence of their seedbanks.



Inshore seagrass meadows across the Burnett-Mary region improved in overall condition in 2024–25, achieving their highest score since the monitoring program commenced in 2005.



There is no formal water quality monitoring program in the Burnett-Mary region that is reported as part of the Paddock to Reef program. As a result, Water Quality index values are not available.



There are few coral reefs in inshore waters of the Burnett-Mary region and no established Marine Monitoring Program monitoring sites.



Monitoring *Zostera* meadow at Urangan, Burnett-Mary.

# Inshore marine pesticide monitoring

The presence of pesticides was also monitored at routine sites across 3 regions using passive sampler and grab sampling techniques. Pesticides were detected across all inshore sites, with peak concentrations occurring during high river discharge periods. The most commonly detected group of pesticides were PSII-inhibiting herbicides. Overall, the most frequently occurring pesticides were diuron, hexazinone, and atrazine.

The Pesticide Risk Metric (PRM), designed for Reef catchments, is used to estimate the additive ecological effect of pesticide mixtures on aquatic species. The PRM exceeded 1% species affected at least once at 6 of the 8 routine monitoring sites.

## Wet Tropics region

The herbicides diuron, hexazinone and atrazine were the most frequently detected pesticides in this region.

The highest pesticide concentrations were recorded at Dunk Island in January and February 2025 (81 nanograms per litre in passive samplers and 173 nanograms per litre in grab samples) coinciding with high river discharge in the region. This was the highest pesticide concentration recorded in grab samples across all monitoring sites for the 2024-25 season.

## Burdekin region

The herbicides atrazine, diuron, hexazinone, metolachlor and tebuthiuron were detected in every passive sampler deployed in this region.

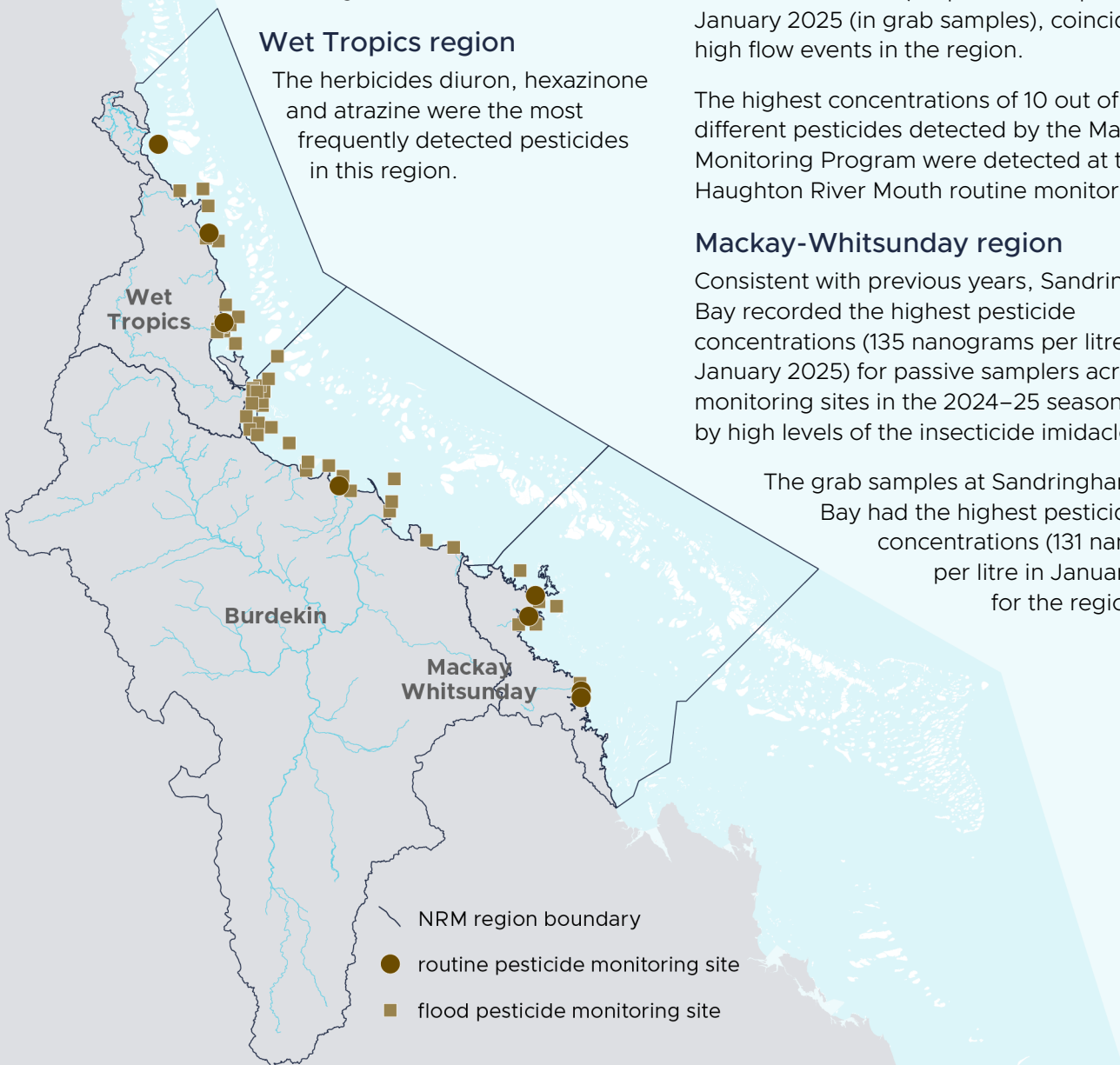
At the routine pesticide monitoring site in the Burdekin region (Haughton River Mouth), the highest pesticide concentrations were recorded in December 2024 (for passive samplers) and January 2025 (in grab samples), coinciding with high flow events in the region.

The highest concentrations of 10 out of the 17 different pesticides detected by the Marine Monitoring Program were detected at the Haughton River Mouth routine monitoring site.

## Mackay-Whitsunday region

Consistent with previous years, Sandringham Bay recorded the highest pesticide concentrations (135 nanograms per litre in January 2025) for passive samplers across all monitoring sites in the 2024–25 season, driven by high levels of the insecticide imidacloprid.

The grab samples at Sandringham Bay had the highest pesticide concentrations (131 nanograms per litre in January 2025) for the region.



Collecting water quality samples on AIMS research vessel Aquarius at Pelorus Island.



A mix of healthy *Acropora* and *Montipora* corals dominate the reef flat at 2 m depth at Frankland Group East.



*Zostera* meadow at Urangan, Burnett-Mary.



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