MAY 2022

PORT OF TOWNSVILLE

SEAGRASS MONITORING PROGRAM

BRIEF REPORT

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Report No. 22/34

TropWATER

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PORT OF TOWNSVILLE

INFORMATION SHOULD BE CITED AS

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KEY FINDINGS

This report summarises the results of the Townsville Channel Upgrade Seagrass Program (CUSP) 2022 post-wet season (May) survey and builds on the Long-term Seagrass Monitoring Program (LTSMP) established in 2007.

The May 2022 survey was expanded to include the LTSMP meadows and sections of meadows that are not common with the CUSP. This increase in survey extent was to identify if the March heatwave in Townsville had any impacts, and the scale (if any) of these impacts on seagrass in Townsville. Key findings include:

- 1,086 sites were assessed for seagrass in the 2022 post-wet season (May) survey.
- Seagrass in monitoring meadows maintained a footprint, species composition and density of seagrass at expected levels for this time of year:
    - CUSP meadows covered 4,445 ha
    - LTSMP meadows covered 6,899 ha
- There is no evidence at this stage that the March 2022 heatwave or periods of low light recorded in May 2022 have impacted seagrass condition.
- The large Magnetic Island, Cockle Bay reef top meadow (Meadow 5) had been declining in recent surveys but has stabilised in May 2022, remaining in a satisfactory condition measured against long-term baselines.
- Green sea turtles, dugongs and their feeding trails in seagrass meadows were observed during helicopter and boat-based field surveys indicating a high use of the area by megafauna.
- The next seagrass monitoring survey is scheduled for July 2022. This is an additional survey requested by Port of Townsville to capture any potential delayed response of seagrass loss from the March 2022 heatwave and periods of low light recorded in May 2022.

BACKGROUND & SCOPE OF WORKS

The Port of Townsville Limited (PoTL) is upgrading the approach channel as part of their Port Expansion Project. The Channel Upgrade Project (CU Project) is Stage 1 of the long-term plans and involves capital dredging-related activities of the Platypus and Sea channels, and the construction of a reclamation area and temporary offloading facility.

The port is situated in the Great Barrier Reef World Heritage Area, outside of the Great Barrier Reef Marine Park, and supports a diverse range of habitats including significant and productive reefs and seagrass meadows that begin in the intertidal zone and extend down to ~15m below mean sea level.

As part of their commitment to the environmental health of the port, and to address regulator conditions outlined for the CU Project, a fit-for-purpose seagrass habitat program was developed in 2019; the Channel Upgrade Seagrass Program (CUSP). This specified monitoring program builds on the established Long-term Monitoring Seagrass Program (LTSMP) and is designed to assess and monitor seagrass habitat surrounding Townsville, Cleveland Bay and Magnetic Island before, during and after the planned works.

The CUSP includes the monitoring meadows that form the LTSMP, and also includes expanded areas of seagrass in assessments to meet regulatory requirements and conditions associated with the CU Project. The CUSP involves:

- Establishing baseline conditions of seagrass communities before project works begin (post-wet season and dry season seagrass conditions);
- Monitoring the condition of seagrass communities before, during and after project works;
- Assessing seagrass condition at selected monitoring meadows bi-annually, and at the whole-of-port scale annually;
- Examining changes in seagrass communities due to project works, climate/weather or natural background changes.

This brief report presents the results of the 4th post-wet season CUSP survey and compares the results with previous surveys. A more detailed technical report from the 2021 whole-of-port survey (McKenna et al. 2022) is also available on the Port of Townsville or TropWATER websites.

SAMPLING APPROACH & METHODS

Methods for assessing seagrass in the Townsville region follow those of the established LTSMP and other Queensland ports (Bryant et al. 2016; Wells and Rasheed 2017). The application of standardised methods in Townsville and throughout Queensland allows for direct comparison of local seagrass dynamics with other seagrass monitoring programs in the broader Queensland region.

Seagrass assessments occur twice a year for the CUSP; once in the post-wet season (April/May) when natural environmental conditions are most likely to have impacted seagrass and they can be at their low point in resilience. Then again at the dry season when seagrass are going through a growth period and may peak in distribution and abundance (September – November).

The CUSP is structured using two levels of monitoring;

- whole-of-port assessments that occur annually in the dry season. It is at this whole-of-port scale that the deep-water highly variable seagrasses between Cleveland Bay and Magnetic Island are assessed.
- monitoring meadow assessments (sub-set of all meadows in the port) that occur bi-annually; post wet season and dry season.

Three indicators of seagrass condition are assessed at each survey: seagrass biomass, species composition and meadow area. These are fundamental indicators used to answer questions relating to seagrass condition, i.e: is seagrass present? What is the spatial footprint of the meadow? How dense is the seagrass? What species define the meadow?

INTERTIDAL SEAGRASS

Helicopter survey of exposed banks during low tide – sites are scattered throughout the seagrass meadow and sampled when the helicopter comes into a low hover; <1m from substrate.

SHALLOW SUBTIDAL SEAGRASS

Boat-based free diving or camera drop surveys – sites are sampled haphazardly throughout the meadow approximately every 50 - 500m or where major changes in bottom topography / seagrass community types occur. Sites extend to the offshore edge of seagrass meadows and measure continuity of seagrass communities.

DEEP-WATER SEAGRASS

Boat-based ‘live’ camera sled tows – sites are sampled using an underwater camera system towed for approximately 100m while footage is observed on a monitor. Surface benthos is captured in a towed net and used to confirm seagrass, algal and benthic macro-invertebrate habitat characteristics observed on the monitor. The technique ensures that a large area of seafloor was surveyed and integrated at each site so that patchily distributed seagrass and benthic life, typically found in deep-water habitats is detected.

RESULTS & DISCUSSION

A total of 1,086 sites were assessed for seagrass in the CUSP May 2022 survey. Seagrass was present at 62% of sites (Figure 1).

Deep-water meadows were not surveyed in May 2022. Deep-water meadows (i.e., Meadow 19 in the middle of Cleveland Bay) are only sampled during the peak season whole-of-port surveys (Figure 1).

In May 2022 seagrass in monitoring meadows maintained a footprint, species composition and density of seagrass at expected levels for this time of year, measured against previous surveys and long term baselines.

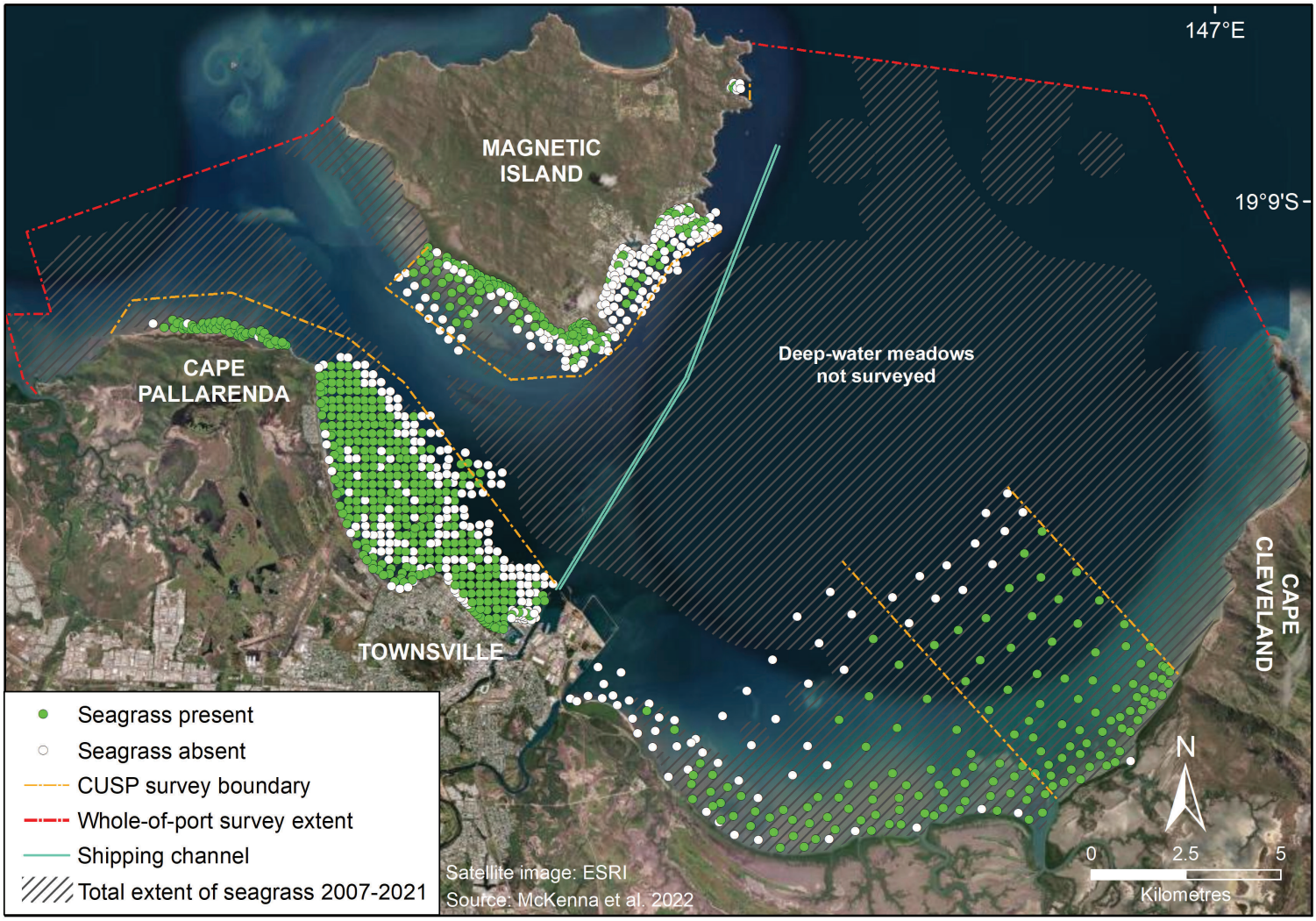

Figure 1: Seagrass presence / absence in the Townsville CUSP post-wet season monitoring survey survey May 2022.

The inshore CUSP monitoring meadows covered 4,445 ha, with individual meadows/meadow sections ranging from ~1.52ha to ~2115 ha (Figures 2 & 3). The inshore LTSMP monitoring meadows covered ~6,899 ha, only 175 ha less than October 2021 the time when seagrasses normally are at their seasonal peak..

CUSP bi-annual monitoring indicates that the seasonal (low and peak season for seagrass abundance) signal in seagrass biomass and area may not be particularly strong or consistent compared with some other Queensland locations (Figure 3). There appears to be mixed results depending on meadow depth and seagrass community type, with the clearest seasonal signal occurring in deeper meadows and those dominated by the seasonal and ephemeral *Halophila* species (Figure 3: McKenna et al. 2022).

In the 2021 annual seagrass monitoring report we noted the decline in condition of the Magnetic Island Cockle Bay intertidal reef top meadow in recent surveys (Meadow 5; Figure 2; McKenna et al. 2022). This meadow has been declining in biomass since 2016 but has stabilised between October 2021 and May 2022, remaining in a satisfactory condition measured against its' long-term baseline (McKenna et al. 2022) (Figure 3 & 6). The decrease in biomass over the last few years occurred relatively evenly across the meadow and corresponds with a declining trend in the presence of *Cymodocea serrulata* in the meadow (Figure 3b inset). It is not clear as to why C. serrulata has decreased in biomass in the meadow. There are no obvious signs in available water quality data (light, temperature, turbidity etc.) for this period that would trigger a decline in a single species. It is not unusual for C. serrulata to undergo marked declines (and recovery) in Townsville with the loss of this species having occurred previously during the monitoring program and historically recorded (Birch & Birch 1984).

Heatwave conditions were reported for the Townsville region in March 2022. The results of the May 2022 survey indicate there is little evidence to suggest that this heatwave had an impact on Townsville seagrass. Field observations also did not identify any seagrass leaf 'burning' or 'blackening' (leaf necrosis); a sign of thermal stress (McKenna et al. 2021; Collier & Waycott 2014; McKenzie et al. 2010).

Temperatures during the March heatwave were not sustained at a level or duration that is likely to cause declines for Townsville seagrass species. Previous studies in Townsville have shown local species can withstand temperatures of 35°C, with no detrimental effects, but an impact is seen if 40°C is sustained (Collier & Waycott 2014). In fact, the optimum temperature for photosynthesis of *Halodule uninervis* and *C. serrulata* is 35°C (on average) and they must exceed 40°C for the plants to lose energy (Collier et al. 2017). Campbell et al. (2006) also found that the physiological functions of Townsville seagrass species are not impacted until temperature extremes of 40-45°C are reached for at least three days. Of the local species, *Halophila ovalis* is the least tolerant to thermal stress (Ralph 1998) and this species occurred in all intertidal meadows, even up to the intertidal/dry zone of the meadows in the May 2022 survey.

The temperatures recorded by the CU Water Quality Program during the March 2022 heatwave at seagrass meadows were within the range recorded in Townsville previously. Townsville seagrass meadows regularly experience temperatures greater than 35°C with no obvious signs of stress/loss of seagrass following these periods at sites monitored since 2005 as part of the GBR Marine Monitoring Program (McKenzie et al. 2022).

A July 2022 survey will be conducted to capture any potential delayed response of stress/loss from the March 2022 heatwave and additionally periods of low light that occurred in May 2022. The effects of light and temperature stresses can take some time to manifest particularly if multiple stresses accumulate. A delayed response was seen after the February 2019 floods where seagrass decline did not manifest by the May 2019 survey, but a delayed loss was captured in the October 2019 survey.

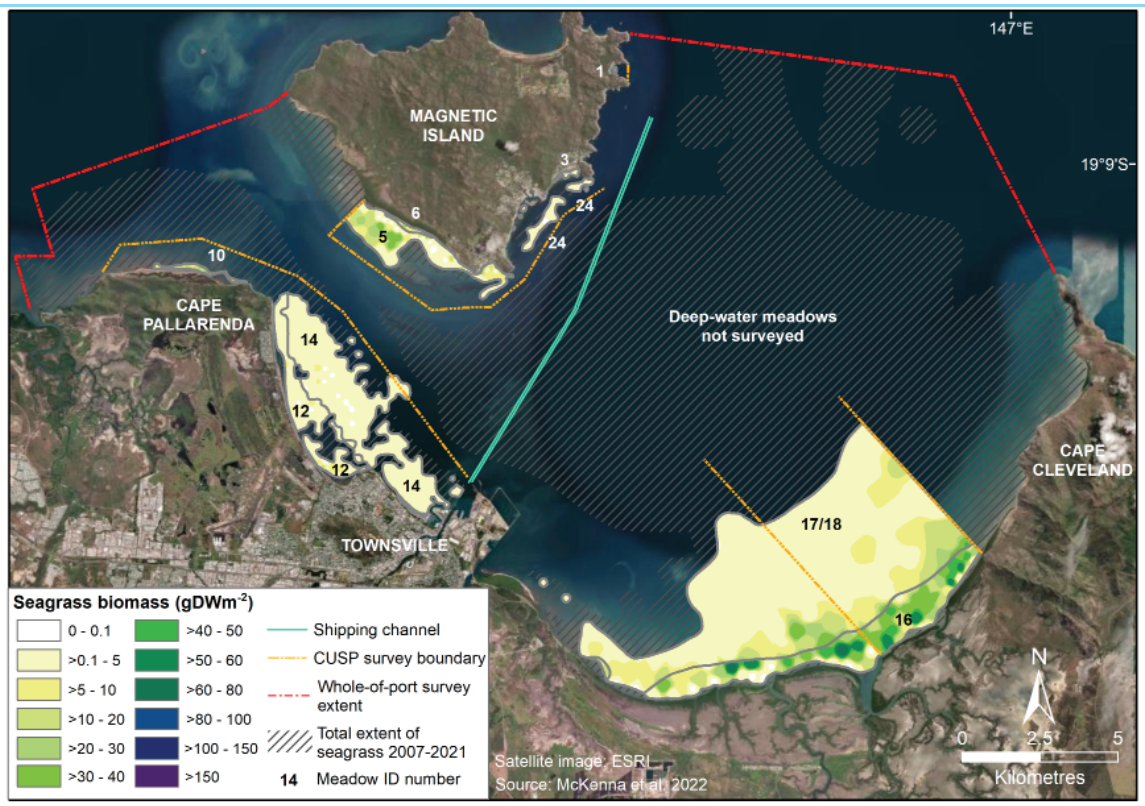

Figure 2: Seagrass meadow biomass (gDWm^{-2}) and spatial extent during the Townsville CUSP monitoring survey May 2022.

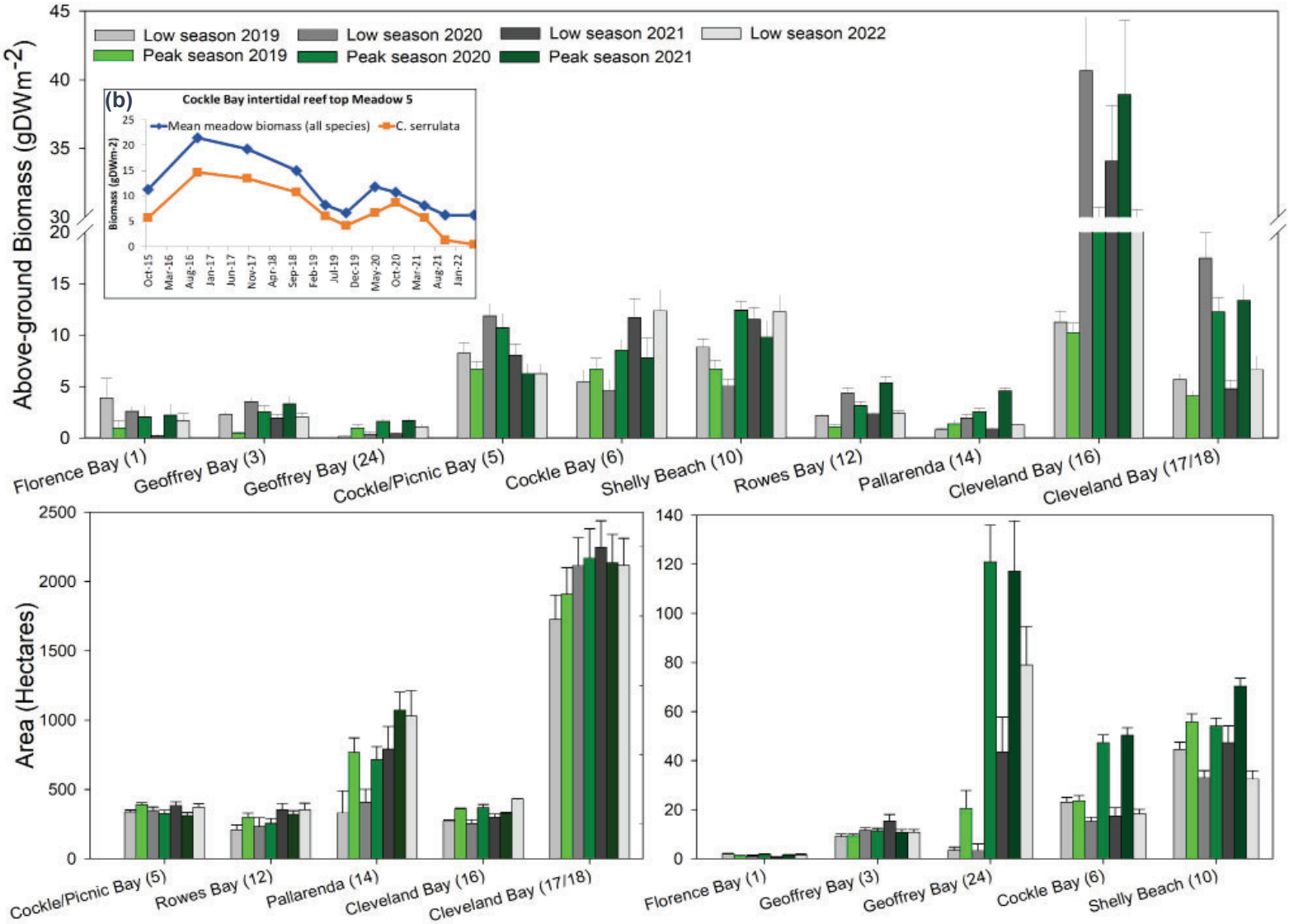

Figure 3: (a) Seasonal CUSP meadow biomass and area from 2019 - 2022 & **(b inset)** Meadow 5: mean meadow biomass (blue line) and *C. serrulata* biomass (orange line) showing decline of meadow biomass and corresponding decline in *C. serrulata*.

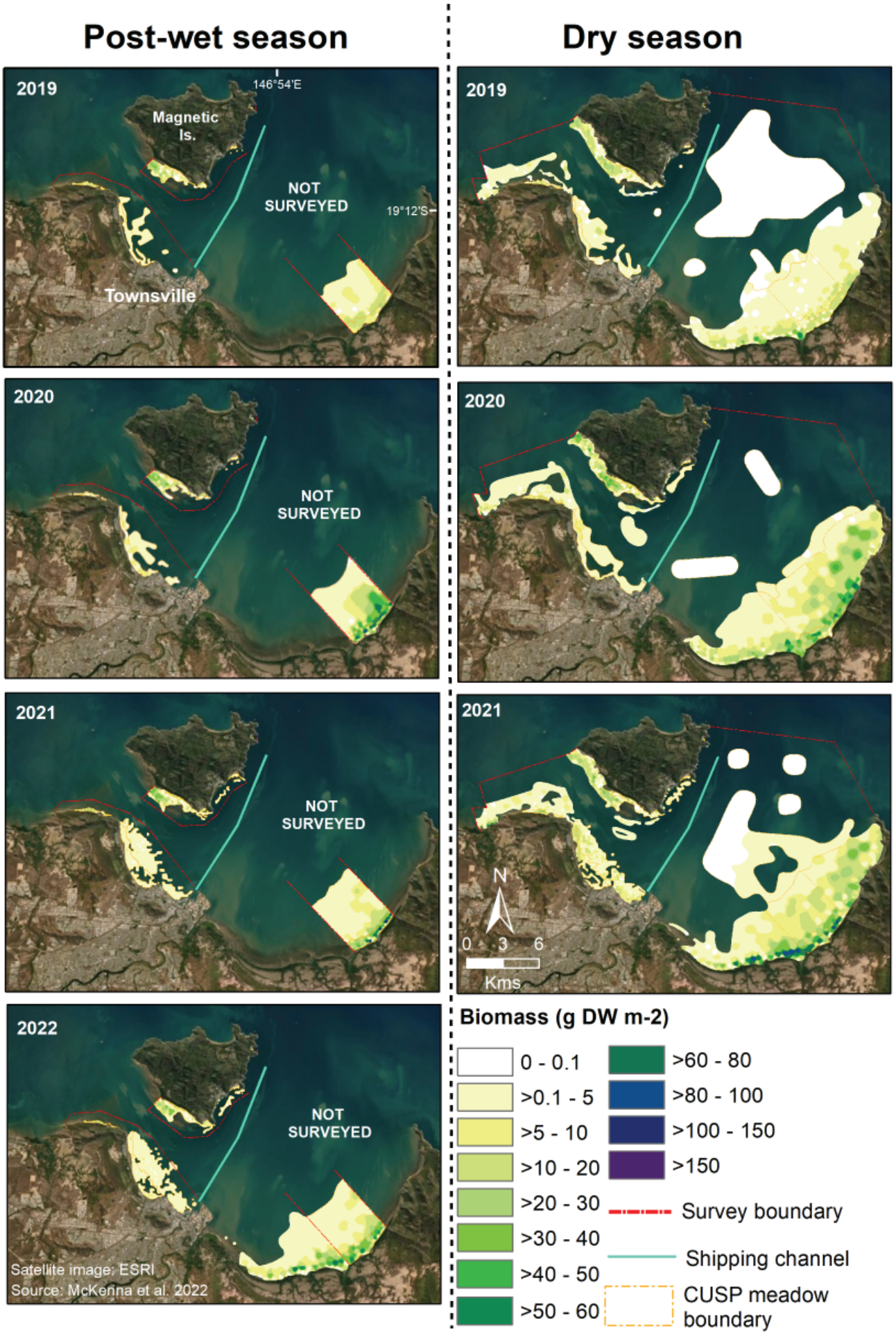

Figure 4: Comparison of seagrass biomass (g DWm^{-2}) and meadow extent from 2019 - 2022 post-wet and dry season surveys.

Note: deep-water seagrasses are not surveyed during the post-wet season survey due to the growth strategy of these communities.

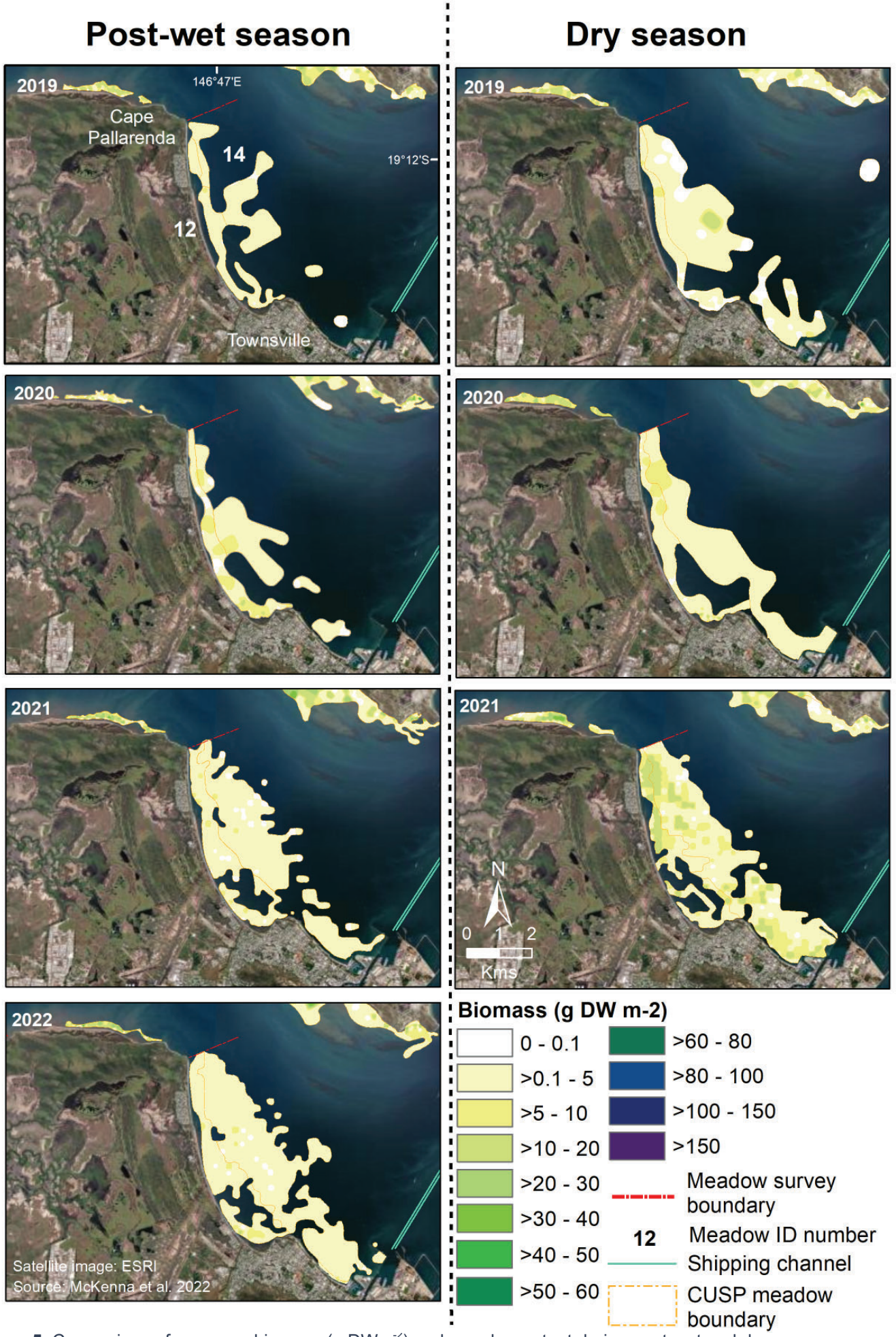

Figure 5: Comparison of seagrass biomass (g DWm^{-2}) and meadow extent during post-wet and dry season surveys from Shelly Beach to The Strand 2019-2022.

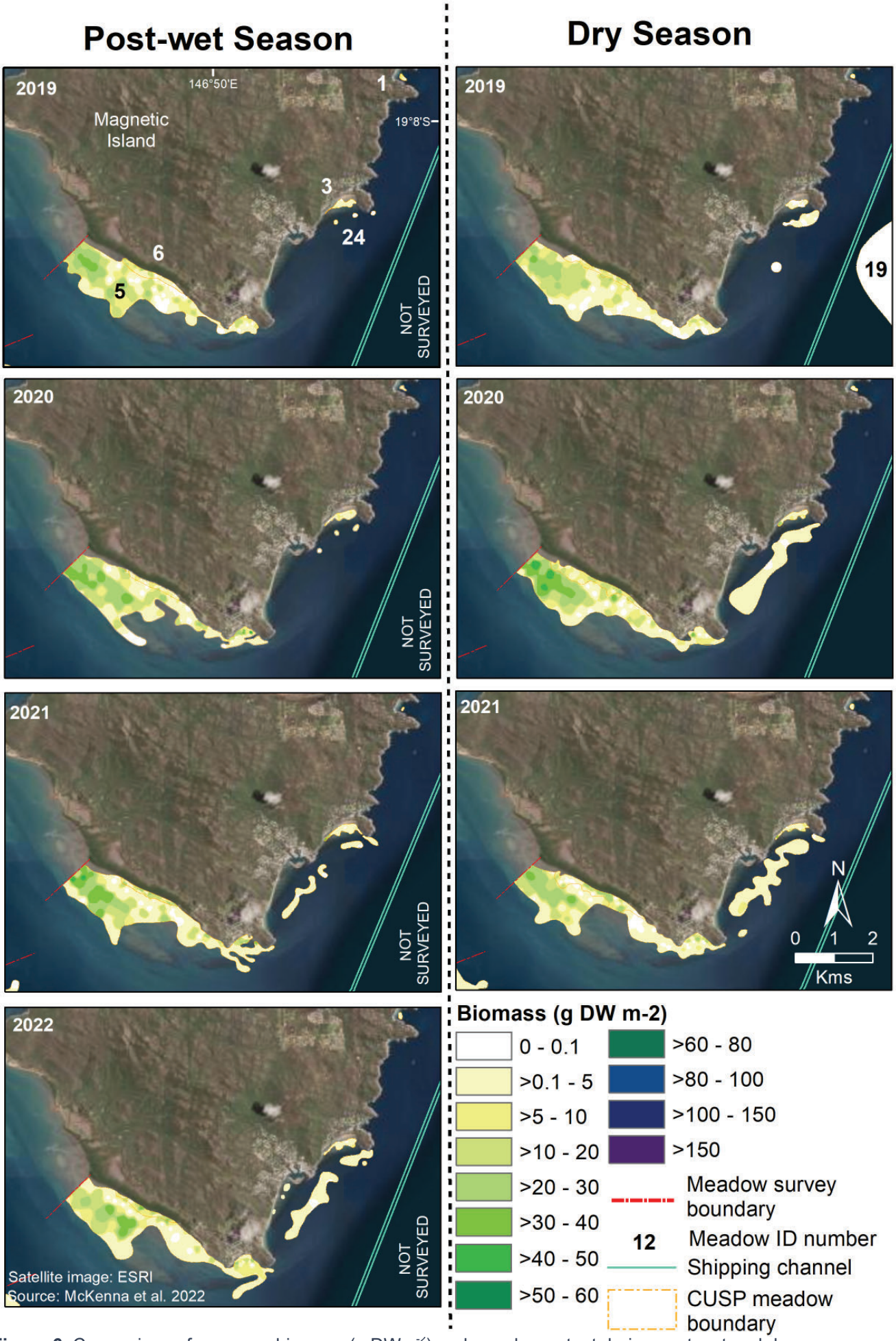

Figure 6: Comparison of seagrass biomass (g DWm^{-2}) and meadow extent during post-wet and dry season surveys at Magnetic Island 2019 - 2022.

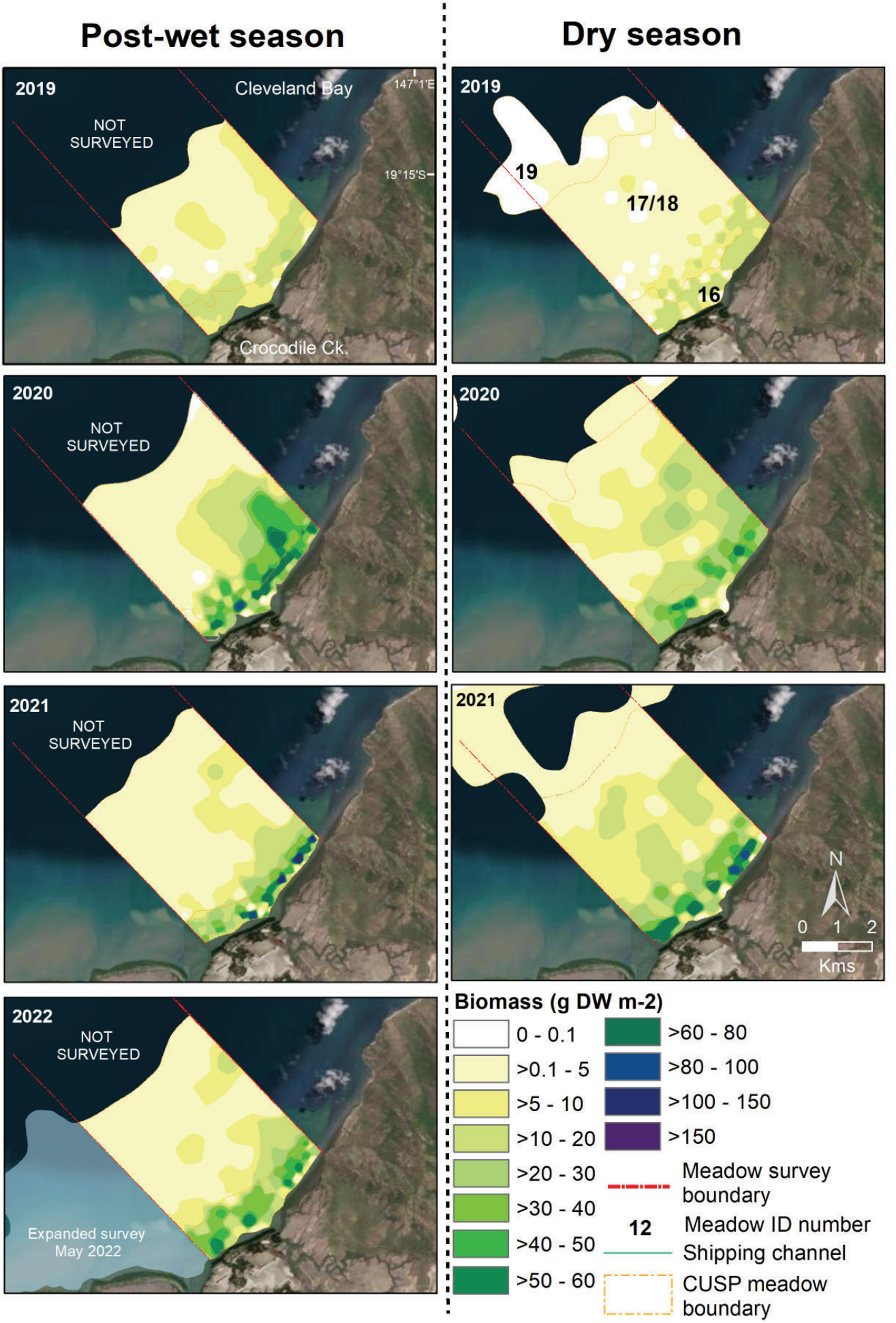

Figure 7: Comparison of seagrass biomass (g DWm^{-2}) and meadow extent during post-wet and dry season surveys in the Cleveland Bay meadows 2019 - 2022.

Note: deep-water seagrasses are not surveyed during the post-wet season survey due to the growth strategy of these communities.

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HELPFUL INFO

2019 APRIL SURVEY **2020 APRIL SURVEY** **2021 MAY SURVEY**

2019 OCT SURVEY **2020 OCT SURVEY** **2021 OCT SURVEY**

SEAGRASS IN THE REGION

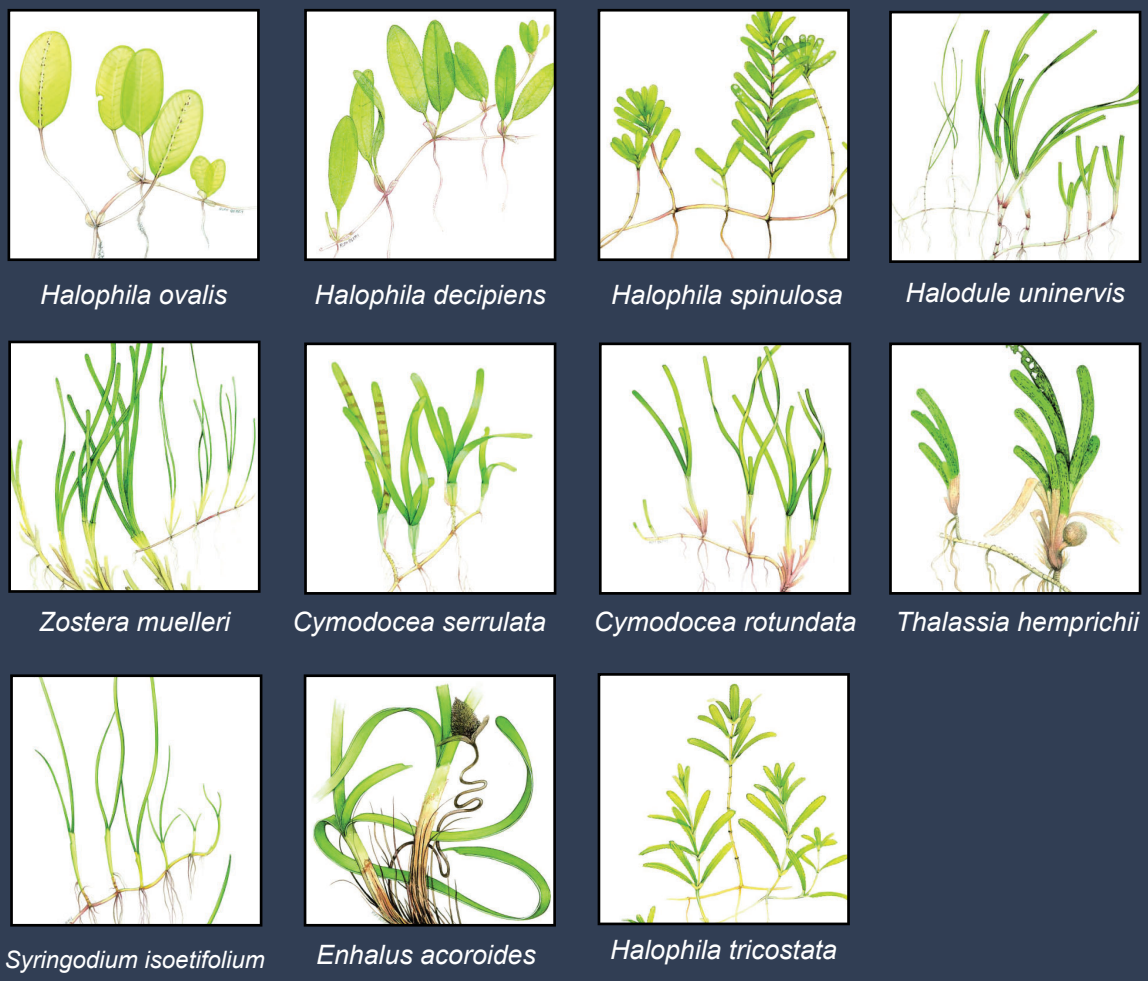

Figure 8: Seagrass species identified in the Townsville region

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