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JAMES COOK UNIVERSITY
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Extreme Weather Incident Response

Post Tropical Cyclone Ita assessment of intertidal seagrass status in dugong and green turtle feeding grounds - Jeannie River to Cape Bedford (Cape York)

Len McKenzie, Rob Coles, Louise Johns & Jessica Leech

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For further information contact:
Len McKenzie
Centre for Tropical Water & Aquatic Ecosystem Research (TropWATER)
James Cook University
len.mckenzie@jcu.edu.au
PO Box 6811
Cairns QLD 4870

This publication has been compiled by the Centre for Tropical Water & Aquatic Ecosystem Research (TropWATER), James Cook University. Email: TropWATER@jcu.edu.au Web: www.jcu.edu.au/tropwater/

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EXECUTIVE SUMMARY

Tropical Cyclone Ita TC (Category 4) impacted the north Queensland coast in early April 2014, making landfall at about 2200hrs on the evening of Friday April 11th near Cape Flattery.

Severe Tropical Cyclone Ita was the strongest tropical cyclone to impact Queensland, Australia since Cyclone Yasi three years prior.

Some of the most extensive coastal seagrass meadows in the Great Barrier Reef occur in the Starcke River region and it is an area recognised for its sizeable dugong populations.

An aerial reconnaissance flight was conducted from the Jeannie River to Cape Bedford on 30 April 2014 to assess any possible impacts from the destructive winds and associated wave activity from TC Ita on the inshore seagrass meadows (dugong and turtle feeding areas) of the region.

There were no substantial impacts to seagrass observed in the areas directly affected by the path of Tropical Cyclone Ita:

- wind appears to have come from the land providing some protection from wind and wave action and while there are some blowouts/washouts, seagrass is mostly intact *(NB: this close inshore, is an area not previously mapped in detail)*
- tide was high at the time of Tropical Cyclone Ita crossing the coast
- an almost continuous meadow occurs across the region, apart from the south facing beaches
- dugong grazing scars were abundant through all inshore seagrass meadows - irrespective of seagrass abundance
- it is most likely the dugong grazing scars were recent (within last 2-3 weeks), as recolonisation within the scars was minor, and wave action and associated sediment movement from TC Ita would have eliminated older scars
- no green turtles were observed basking or stranded on the intertidal banks
- meadows predominately *Halodule uninervis* and *Halophila ovalis* (dense at times), with a dense *Cymodocea* dominated meadow at Elim Beach (Bedford Bay)

This region is of critical importance for GBR seagrass and dugong. The "triangle" from Princess Charlotte Bay to Lizard island and Cooktown should be considered for special conservation/preservation in GBR.

We recommend a more comprehensive survey including the nearshore islands and sub-tidal waters be conducted within the next 6 to 9 months to assess fully the extent of any impacts.

OBJECTIVE:

Conduct an aerial reconnaissance of the region within the immediate path of TC Ita to assess possible impacts to intertidal dugong and turtle feeding areas.

INTRODUCTION & BACKGROUND

In early April 2014, the far northern section of the Great Barrier Reef World Heritage Area was impacted by severe Tropical Cyclone Ita. After forming southwest of the Solomon Islands on 5th April 2014, Tropical Cyclone Ita moved westward and intensified rapidly into a powerful Category 5 system on the 10th April 2014[1] (Figure 1). Turning southwest towards the far north Queensland coast, TC Ita weakened to a Category 4 system in the hours immediately preceding landfall at about 2200hrs on the evening of Friday April 11th near Cape Flattery[1] (Figure 1). Upon landfall, TC Ita quickly weakened (to a category 2) and continued to track southward along the inland north tropical coast for another two days while weakened further to a category 1 cyclone[1].

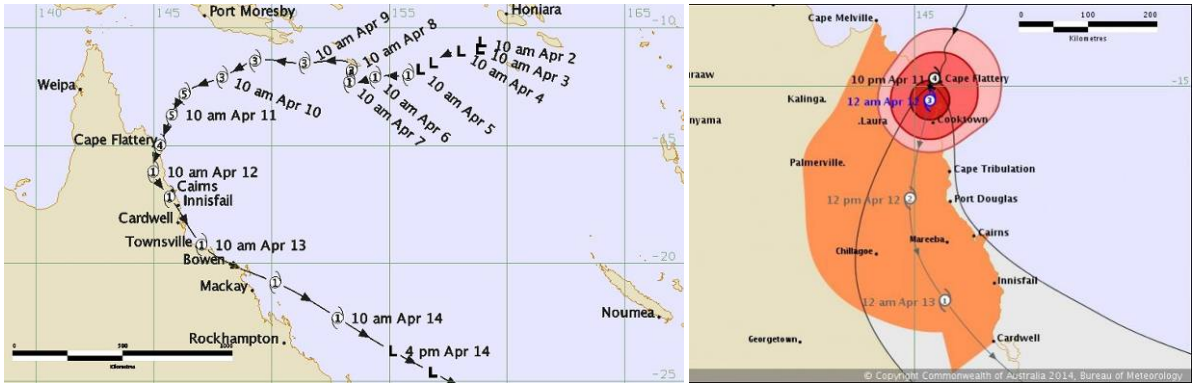


Figure 1. Track of Tropical Cyclone Ita. *Images copyright Commonwealth of Australia , Bureau of Meteorology.*

Severe Tropical Cyclone Ita was the strongest tropical cyclone to impact Queensland, Australia since Cyclone Yasi three years prior. With maximum wind gusts of 160 km/h recorded at the automatic weather station at Cape Flattery[1], and a 1.1 m tidal surge[1], a level of disturbance to coastal and nearshore environments was expected in the areas near where TC Ita made landfall.

In the days immediately following TC Ita, the Great Barrier Reef Marine Park Authority initiated an Extreme Weather Incident Response (EWIR). As impacts to seagrass resources from floods and cyclones are know to have significant flow-on effects to the dugong and green turtle populations which are highly dependent on seagrass as their primary food supply[2-5], a component of the EWIR program was to assess the status of seagrass in some well known dugong feeding grounds. The Starcke River region is one of the key dugong habitats in Australia[6], and the most impacted area from TC Ita in the region included Cape Bedford to the Jeannie River. As members of the TropWATER Seagrass Group (JCU) were scheduled to visit the Cape York region as part of the biannual MMP field sampling, this provided an excellent opportunity to assess the impacted areas.

The aim was to conduct an aerial reconnaissance of intertidal seagrass meadows from Cape Bedford to Jeannie River on 30th April 2014 to assess the impacts, if any, of TC Ita to critical dugong and turtle feeding areas.

Background on the seagrass resources from Cape Bedford to Jeannie River

Some of the most extensive seagrass meadows in the Great Barrier Reef occur in the Starcke River region. Broad-scale mapping of the seagrass meadows from Cape Bedford to the Jeannie River was first conducted in November 1984 and February 1985[7].

Cape Bedford to Cape Flattery

Between Cape Bedford and Cape Flattery, the only meadows observed in November 1984 were adjacent and slightly north of McIvor River[7]. The meadows were very low cover (<1%) and patchy *H. decipiens* (on sand substate) or *H. decipiens/H. ovalis* (mud/sand)[7, 8]. In July/August 2007 the bay was remapped and extensive seagrass meadows of *Halodule uninervis* and *Halophila ovalis* were found across much of the shallow/intertidal sand banks at Elim Beach[9]. These meadows were not reported in 1984 as the banks were not accessible due to the low tides. The meadows north of the McIvor River were also mapped in July 2007, however these were shallower than the 1984 surveys and dominated by *Halodule uninervis* and *Halophila ovalis*[9].

Cape Flattery to Lookout Point

From Cape Flattery to Lookout Point, 1111 ±200 ha of seagrass meadows were mapped in February 1996[10]. Eight species of seagrasses, and three types of seagrass meadow were identified, including: a predominantly *Halodule/Thalassia* meadow in the sandy intertidal area bordered by the shoreline and fringing coral reef; a small isolated high biomass *Cymodocea/Thalassia* meadow at the mouth of Crystal Creek in sand/mud sediment; and a large *Halodule/Halophila* meadow in muddy sediment offshore from the fringing reef in deeper water. *Halophila ovalis* was the most widely distributed species followed by *Halodule uninervis* (wide-leaf) and *Halodule uninervis* (narrow-leaf). *Syringodium isoetifolium* was found only in small isolated patches[10]. No seagrass was found deeper than 7.5 m below Mean Sea Level (MSL). *Cymodocea* spp and *Thalassia hemprichii* were only found in shallow areas (<1.6 m below MSL)[10]. Evidence from dugong feeding trails indicates these seagrass meadows are also important feeding habitat for dugong.

Lookout Point to Murdoch Point

The Starcke River Region from Lookout Point to Murdoch Point is an area recognised for its sizeable dugong populations and associated seagrasses. Seagrasses have been reported along almost the entire coast of this region and from inter-reef waters in the vicinity of the Lizard Island group during a deep-water surveys of seagrasses[7, 8, 11, 12]. Coastal seagrass habitats between Lookout Point and Murdoch Point were first surveyed in October and November 1984[7, 8, 13]. Key seagrass areas along the same coastal region were re-surveyed in the following winter (July 1985). Between 17 - 22 September 1989, seagrass meadows in the area were once again surveyed along the coast and out to 28m deep as results of dugong aerial surveys suggested the dugong population of the region was large and required an area of seagrass for feeding much larger than that estimated in 1984[12, 14]. In 1989, seagrass formed a near continuous seagrass meadow covering approximately 1,500km^2 extending from the coast between Lookout Point to Murdoch Point to depths of 28m[12]. Seagrass cover ranged from dense in shallow water to a patchy and light cover of *Halophila* species in deeper water. Seagrass was also found on every reef platform examined. Deepwater surveys between Cape Weymouth and Cape Tribulation in 1995 confirmed that seagrass meadows were still relatively continuous across the region[11, 15, 16]. Eleven species of seagrass have been identified in the region. From the north west side of Lookout Point, a large *H. ovalis* and *H. spinulosa* meadow was reported extending along the sandy shore, becoming a wide, near-shore meadow of *H. spinulosa*, (80-100% cover) as the seabed becomes more muddy. This seagrass meadow continued three to four nautical miles south-east of the Starcke River[12]. Between the Starcke River and Murdoch Point seagrass was

sparse. In the deeper waters (10 to 20 m) seagrasses were dominated by *H. ovalis* and *H. spinulosa.* At depths between 15 and 28 m, *H. ovalis* was more common than *H. spinulosa* and bottom cover generally less than 20%[12].

METHODOLOGY

Survey strategy and Data Collection

The survey focused on the areas of the coast from the mouth of the Jeannie River to Cape Bedford where seagrass had been previously reported or were likely to support seagrass (e.g. sheltered from the prevailing SE trades) (Figure 2). An aerial reconnaissance was conducted by helicopter on the 30 April 2014 and was aimed at obtaining the broad-scale picture of where seagrasses remain in the region. The helicopter survey commenced at 1355 hrs working 1-2 hours either side of low spring tide; 0.5m at 1534 hrs (Cape Flattery, port 58900).

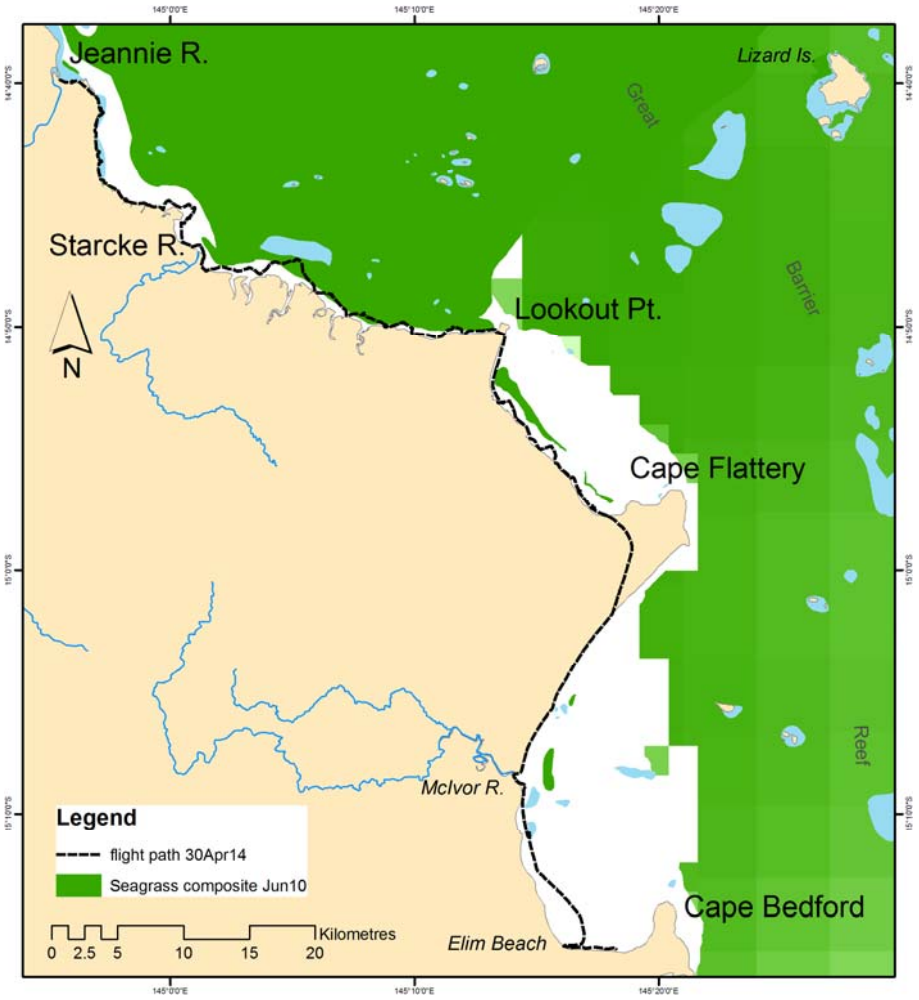


Figure 2. Helicopter flight path from Jeannie River to Cape Bedford, 30th April 2014. Seagrass composite represents the maximal habitable area that seagrass has been mapped November 1984 to June 2010[17].

Benthos was examined at haphazardly selected points across shallow banks exposed during the low spring tide. Seagrass presence/absence was assessed visually (including photography) and a Global Positioning System (GPS) was used to accurately determine geographic location of sampling points (±5 m). Seagrass species were identified where possible[18].

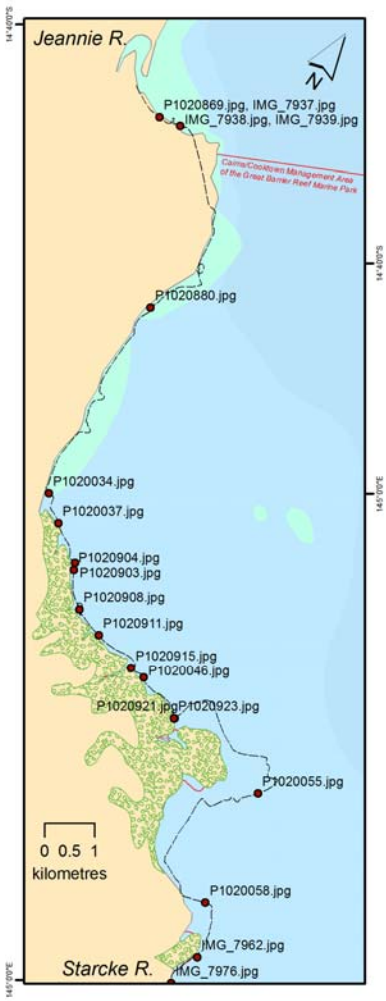
RESULTS & DISCUSSION

Aerial reconnaissance of the inshore intertidal area between the Jeannie River and Cape Bedford was conducted on the 30 April 2014 (Figure 2).

Jeannie River to Starcke River

The helicopter survey commenced on the southern mouth of the Jeannie River within the Barrow Point to Lookout Point Marine National Park (MNP-14-1025). The intertidal banks examined from the Jeannie River to the Starcke River showed little evidence of physical disturbance which could be attributed to TC Ita. *Halodule uninervis* and *Halophila ovalis* meadows of low abundance covered the intertidal banks from the Jeannie River to the northern border of the Cairns/Cooktown Management Area of the Great Barrier Reef Marine Park and the Starcke River (Ngulun) declared Fish Habitat Area (Figure 3, Figure 4).

Continuing south to the Starcke River, a large amount of detrital material (e.g. mangrove leaf wrack) and flotsam (e.g. small branches) was observed along the beaches and on banks adjacent to creek mouths (Figure 5). Whether this detrital material was a consequence of TC Ita or seasonal is unknown. No larger items of flotsam (e.g. logs and pieces of timber), which would have caused physical damage to seagrass and mangrove seedlings were observed.



In the vicinity of the Starcke River, the large intertidal banks fringed by mangroves supported extensive *Halodule uninervis* and *Halophila ovalis* meadows of low to moderate abundance (Figures 6-7). Dugong grazing scars were observed throughout all meadows examined - irrespective of seagrass abundance (Figures 8-10). It is most likely the scars were recent (within last 2-3 weeks), as the vegetative growth within scars was minor and wave action and associated sediment movement from TC Ita would have eliminated older scars. The number of grazing scars indicates a sizable population of dugongs continues to persist throughout the survey area.

Patches of *Halophila ovalis* were also observed in the exposed coastal reefs dominated by coral rubble (Figure 11).

Figure 3. Intertidal banks immediately south of the Jeannie River with *Halodule univervis (clockwise from left: P1020869.jpg, IMG_7937.jpg, IMG_7938.jpg).*

Figure 4. *Halodule uninervis* and *Halophila ovalis* meadow on southern banks of Jeannie River mouth (IMG_7939.jpg).

Figure 5. Mangrove leaves in wrack along shoreline (little or no seagrass present in wrack) and on the northern bank of the Starcke River mouth (left to right: P1020880.jpg, P1020058.jpg).

Figure 6. Intertidal sand banks with *Halodule uninervis* and intact mangrove fringe (left to right: P1020034.jpg, P1020037.jpg).

Figure 7. Intertidal banks with *Halodule uninervis* and intact mangrove fringe (left to right: P1020904.jpg, P1020903.jpg).

Figure 8. Large intertidal banks with extensive dugong grazing scars throughout the *Halodule uninervis/Halophila ovalis* meadows (left to right: P1020911.jpg, P1020908.jpg).

Figure 9. Abundant dugong grazing trails throughout *Halodule uninervis/Halophila ovalis* meadows (left to right: P1020915.jpg, P1020046.jpg).

Figure 10. Abundant dugong grazing trails in *Halodule uninervis* meadows across intertidal sand banks and adjacent to mangrove fringe (left to right: P1020921.jpg, P1020923.jpg).

Figure 11. Low cover of *Halophila ovalis* within coral rubble (P1020055.jpg).

Starcke River to Lookout Point

South from Starcke River to Lookout Point, the intertidal banks were wide and supported extensive meadows of *Halodule uninervis* and *Halophila ovalis*. The majority of banks were sand dominated (Figures 14, 19), with the exception of the southern bank of the Starcke River mouth which was dominated by gravel substrates (Figure 13.).

Dugong grazing scars were abundant throughout meadows in the entire area (Figures 12, 14) and for the most part, the landward edge of the sand banks was lined with intact mangroves (Figure 15). The only evidence of TC Ita impacts was immediately north of Lookout Point on the landward fringe of the *Melaleuca* (adjacent to dunes), where defoliation was extensive (Figure 17). *Rhizophora* along the shoreline also showed evidence of defoliation from damaging winds. Coastal mangroves were still intact so it would indicate that the damaging winds were from the west, behind the mangroves.

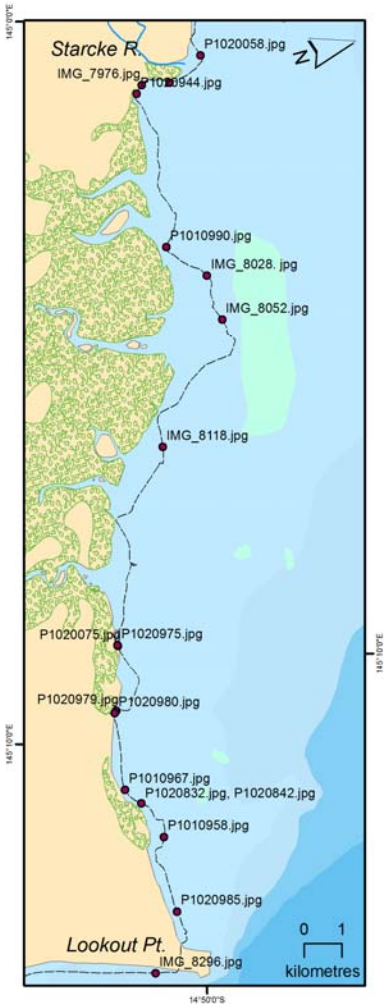


Figure 12. Extensive dugong grazing scars in seagrass meadows, between Starcke River and Lookout Point (P1020980.jpg).

Figure 13. *Halophila ovalis* in gravel/coarse sand substrate (IMG_7962.jpg).

Figure 14. Dugong grazing scars in the *Halodule uninervis/Halophila ovalis* meadows located on the large intertidal sand banks (clockwise from top left: P1020944.jpg, IMG_7976.jpg, IMG_8052.jpg, IMG_8028. jpg).

Figure 15. Intact mangroves along seaward fringe (left to right: P1010990.jpg, IMG_8118.jpg).

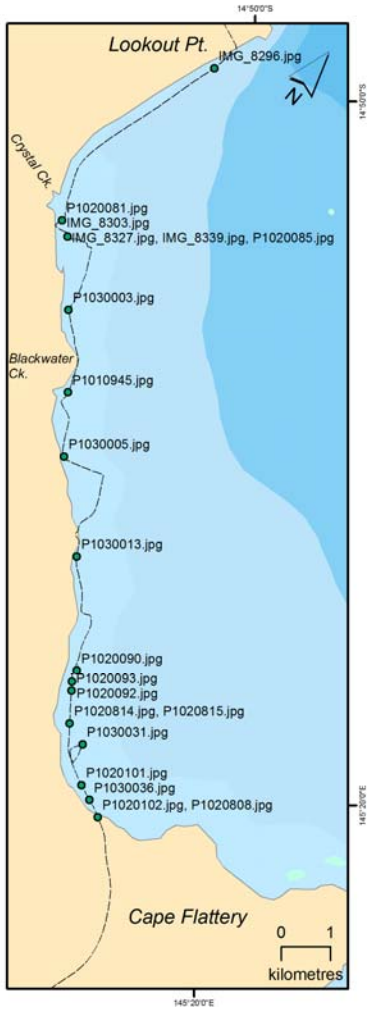
Figure 16. Extensive dugong grazing scars throughout *Halodule uninervis/Halophila ovalis* meadows (clockwise from top left: P1020975.jpg, P1020075.jpg, IMG_8188.jpg).

Figure 17. *Melaleuca* adjacent to dunes showing extensive defoliation (top) and *Rhizophora* behind the shoreline with defoliation from damaging winds (bottom), 3km north of Lookout Point (clockwise from top left: P1010967.jpg, P1010958.jpg, P1020842.jpg, P1020832.jpg).

Figure 18. Large intertidal sand banks with sparse covering of *Halodule uninervis*, immediately north of Lookout Point (P1020985.jpg).

Lookout Point to Cape Flattery

In the north parts of Flattery Harbour (Lookout Point to Cape Flattery), the intertidal banks were relatively narrow and exposed to the SE trades winds (Figure 19). No seagrass was present along the coast from Lookout Point until Crystal Creek. Around Crystal Creek, the intertidal banks widened and although the rippled sands indicated a degree of sediment movement, the disturbance from wave activity was not sufficient enough to inhibit seagrass establishment (Figure 20). Less than a kilometre south, a seaward sand-ridge had created a sheltered shallow lagoon adjacent to the mangroves, within which seagrass abundance was high and the juvenile sandfish (*Holothuria scabra*) were common (Figure 21). There was no evidence of any TC Ita damage in the area.



The wide intertidal sand banks from Blackwater Creek to Cape Flattery supported extensive meadows of *Halodule uninervis* and *Halophila ovalis*, and dugong grazing scars were abundant throughout (Figure 22, Figure 23). The only evidence of possible TC Ita impacts was an area of blowouts (excavation of the seagrass and underlying substrate) within the meadows 2-3km north of Cape Flattery township (Figure 24). However, as *Rhizophora* seedlings still persist along the seaward mangrove fringe, the level of impact from destructive winds was possibly quite low (Figure 25, Figure 26).

Figure 19. South east facing beaches with no seagrass (IMG_8296.jpg).

Figure 20. Meadows of *Halodule uninervis* and *Halophila ovalis* on the intertidal bank adjacent to Crystal Creek (left to right: IMG_8303.jpg, P1020081.jpg).

Figure 21. Dense *Halodule uninervis* meadow with sheltered coastal lagoon, with dugong grazing scars and sandfish (clockwise from top left:IMG_8327.jpg, IMG_8339.jpg, P1020085.jpg).

Figure 22. Meadows of *Halodule uninervis* and *Halophila ovalis* on the large intertidal banks, with dugong grazing scars, near Blackwater Creek (left to right: P1030003.jpg, P1030005.jpg).

Figure 23. Meadows of *Halodule uninervis* and *Halophila ovalis* with dugong grazing scars on the large intertidal banks, 4-6km north of Cape Flattery (left to right: P1030013.jpg, P1020090.jpg).

Figure 24. Blowouts and dugong grazing scars within *Halodule uninervis/Halophila ovalis* meadow 2-3km north of Cape Flattery township (clockwise from top left: P1020092.jpg, P1020093.jpg, P1020101.jpg, P1030031.jpg, P1020815.jpg, P1020814.jpg).

Figure 25. Undamaged seedlings at seaward edge of *Rhizophora* forest, Cape Flattery (P1010945.jpg).

Figure 26. Intact mangrove forests immediately north of Cape Flattery (P1020102.jpg, P1020808.jpg).

Cape Flattery to Cape Bedford

The northern shoreline between Cape Flattery and McIvor River is exposed to the SE trade winds and as a consequence, the intertidal banks are narrow and the substrates highly mobile, which create an environment unsuitable for seagrass to establish. South of McIvor River, the shore is more sheltered and the intertidal banks widen. Although substrates are highly rippled from mobile sands, extensive and abundant (>20% cover) meadows of *Halodule univervis* meadows are present across much of the intertidal banks (Figure 29). At Elim Beach (the rainbow sands area), the intertidal banks are wide and dense meadows of *Cymodocea* with *Halodule* and *Halophila* were present in the shallow sheltered lagoon created by a seaward sand-ridge (Figures 28, 29, 31)

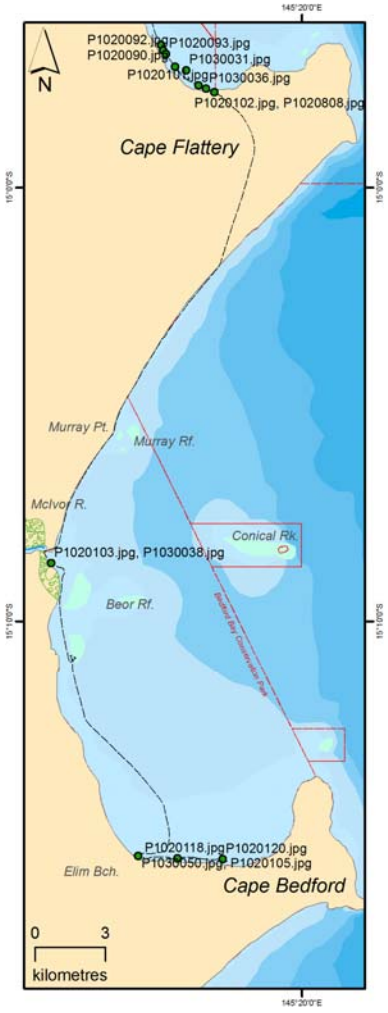


Figure 27. Intact seagrass meadow, Elim Beach (P1030050.jpg).

Figure 28. Seagrass meadow in shallow coastal lagoon, Elim Beach. NB: defoliation in trees on top of ridge but no damage to foreshore mangroves - indicating damaging winds from the west (from the land)

(P1020105.jpg).

Figure 29. Dense *Halodule uninervis* meadow on rippled sand banks adjacent to McIvor River mouth (left to right: P1020103.jpg, P1030038.jpg).

Figure 30. Seagrass meadow in shallow coastal lagoon, Elim Beach, and wide intertidal banks, looking east toward Cape Bedford (P1020118.jpg, P1020120.jpg).

CONCLUSIONS & RECOMMENDATIONS

Extensive seagrass meadows persist on the wide intertidal banks between the Jeannie River and Cape Bedford. These meadows support large populations of dugong, evident from the very high number of dugong grazing scars. No green turtles were observed basking or stranded on the intertidal banks.

Impacts from the destructive winds of TC Ita were limited to the occasional blowout within meadows immediately north of Cape Flattery and defoliation of *Melaleuca* trees on the landward edge of the wetlands and defoliation of *Rhizophora* behind the coastal mangrove fringe. This suggests the inshore meadows were buffered from the destructive winds which came predominately from the west and north west.

The present survey was confined to the intertidal sand banks and seagrass meadows which were visible during the low spring tide and did not include subtidal seagrass as they were not observable from aerial surveys. Near shore islands were also not included in the present aerial survey.

It is recommended that a more comprehensive survey including the nearshore islands and sub-tidal waters be conducted within the next 6 to 9 months to assess fully the extent of any impacts particularly those from environmental stresses that may not be apparent in short time scales.

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