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Seagrass communities of the Wellesley Island Group.
August 2007

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The Queensland Department of Primary Industries and Fisheries has taken all reasonable steps to ensure the information contained in this publication is accurate at the time of the surveys. Seagrass and benthic habitat distribution and abundance can change seasonally and between years, and readers should ensure they make appropriate enquiries to determine whether new information is available.

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EXECUTIVE SUMMARY

This report details the results of a seagrass survey in the Wellesley Islands region in August 2007. The survey was commissioned by the Carpentaria Land Council Aboriginal Corporation (CLCAC) and the North Australia Indigenous Land and Sea Management Alliance (NAILSMA) on behalf of the Traditional Owners of the Wellesley Island region who had raised concerns over unhealthy dugong and turtle reported from hunters. The concerns were raised that this may have been as a result of seagrass dieback causing a shortage of food to the animals.

Intertidal and shallow subtidal coastal benthic habitats were surveyed using helicopter and boat based underwater camera techniques to determine presence and location of seagrass meadows as well as species composition, community type and density (biomass).

Seagrass communities were the dominant benthic habitat of much of the intertidal and shallow subtidal areas surveyed. The diversity of seagrass species found was high (8) compared with surveys of other Gulf of Carpentaria locations. Despite the high diversity and large area of coastal seagrass, the majority of meadows were low biomass (density).

Evidence of heavy dugong feeding activity was observed on most intertidal seagrass meadows surveyed. The highest density of dugong feeding trails was observed in seagrass meadows dominated by *Halodule uninervis* (narrow leaf form) and/or *Halophila ovalis*. In addition, dugongs were regularly observed feeding in subtidal meadows from the helicopter during surveys.

This is the first time that seagrasses have been formally surveyed and mapped for 23 years in the Wellesley Islands, and the first time using modern survey techniques. Due to the difference in available mapping technologies it is difficult to make direct comparisons between the two surveys. In 2007 seagrass generally occurred in similar locations to the 1984 survey, although there appears to have been a shift in species composition of some meadows possibly driven by dugong grazing pressure. The 2007 survey information can be used as a baseline from which future changes could be measured.

INTRODUCTION

The Wellesley Islands are a group of 25 islands off the coast of north Queensland, in the Gulf of Carpentaria. The region is the traditional Sea Country of four different indigenous peoples who all share a strong relationship with their Sea Country. Mornington Island is the largest of the Wellesley Islands and is inhabited by approximately 1200 people (JCU, 2007). The majority of the islanders are from the Lardil people and are the Traditional Owners of the land and surrounding seas. Yangkal tribal lands consist of the islands south of Mornington Island to the Mainland. The Kaiadilt tribal group are the Traditional Owners of Bentinck and Sweers Islands. The coastal mainland region from Massacre Inlet to the Leichhardt River is Gangalidda people Sea Country (Carpentaria Land Council Aboriginal Corporation, 2006). Additionally, the Gangalidda people have shared responsibility with the Yangkaal people over Bayley and Robert Islands, and with the Kaiadilt people over Allen, Little Allen and Horseshoe Islands.

Seagrass meadows in Queensland are known to provide valuable nursery habitats for juvenile commercial and recreational fisheries species, as well as important food resources for endangered and threatened species such as dugong and turtles. Dugong are the most important marine mammal to the people of the Wellesley Islands as a major food source and as a key to their identity as saltwater people (Carpentaria Land Council Aboriginal Corporation, 2006).

In 2005, the Carpentaria Land Council Aboriginal Corporation (CLCAC) nominated the sea country of the Wellesley Islands and adjacent mainland as a trial site under the north Australia-wide Dugong and Marine Turtle Management Project (DMTP) coordinated by the North Australian Land and Sea Management Alliance (NAILSMA) and funded by the Australian Government's Natural Heritage Trust. Under the NAILSMA DMTP, Traditional Owners developed a Regional Activity Plan (RAP) that set out their concerns, aspirations and detailed activities regarding dugong and marine turtle management. A key issue identified was the need for more information on coastal habitats used by dugong and turtles including nesting beaches and feeding grounds and especially seagrass meadows. Implementation of the CLCAC RAP plus four other RAPs spanning the Kimberley coast to Cape York and Torres Strait commenced in early 2006.

In 2006, the Traditional Owners of the Wellesley Islands region prepared a Sea Country Plan to explain their cultural relationship with the Sea Country and ensure sustainable use and management. Building on discussions and work undertaken under the RAP, the Sea Country Plan highlighted a number of issues of concern, including alarm over unhealthy dugong and turtles that had been reported by hunters over several years. Traditional Owners felt that one possible cause of sick animals was a loss of seagrass causing a shortage of food to the animals. The Sea Country Plan identified that research was required to answer the uncertainties and to help with developing zoning plans for the management of their Sea Country.

To answer the concerns of the Traditional Owners, the Department of Primary Industries and Fisheries Marine Ecology Group was commissioned by NAILSMA and CLCAC to conduct a fine scale survey of the seagrass resources in the Wellesley Islands region. This survey was designed as a baseline to use as a benchmark from which future seagrass monitoring could be conducted and also to compare with results from a seagrass survey conducted by DPI&F in 1984.

This report details the findings of the seagrass survey conducted in August 2007. The objectives of the survey were to:

1. Survey and describe the seagrass communities in the Wellesley Islands;
2. Establish a baseline from which future monitoring can be conducted;
3. Provide training on seagrass mapping techniques to the local Wellesley Island Rangers;
4. Provide a GIS database and maps on seagrass communities within the Wellesley Islands; and
5. Identify a suitable site for Seagrass Watch to establish community based seagrass monitoring.

METHODOLOGY

Survey Approach

Seagrass communities within the Wellesley Island Group were surveyed from the 7th – 11th of August 2007. Due to the large area to be surveyed, sampling was prioritised to ensure that the largest area possible was surveyed within the available tide and weather windows.

Seagrass habitat observations included species composition, above ground biomass, percent algal cover, depth below mean sea level (MSL) (for subtidal sites), sediment type, time and position (Global Positioning System (GPS)). Two sampling methods were used to survey seagrass in coastal areas based on whether the meadows were intertidal or subtidal. These were:

1. *Helicopter intertidal seagrass survey*
   Exposed intertidal habitats were surveyed around the low spring tide to determine seagrass presence. Boundaries of intertidal seagrass meadows were mapped while hovering directly over the meadow edge and the position was fixed using a GPS. Where seagrass was present (and time permitted) seagrass habitat observations were conducted at sites scattered within the seagrass meadows while hovering less than 1 metre above the habitat.

Plate 1 Helicopter intertidal seagrass survey

2. *Boat based subtidal seagrass survey*
   Subtidal habitats were surveyed using a real-time underwater video camera mounted to a 0.25m^2 quadrat that provided live images viewed from a colour CRT monitor aboard the research vessel. The camera was used at sites scattered throughout the survey area and used to determine presence of seagrass. Position of sites was recorded using a GPS. Seagrass habitat observations were recorded at sites where seagrass was found. In addition to the camera a Van Veen sediment grab was used at each site to establish sediment type and confirm species seen on the video.

Plate 2 Boat based subtidal seagrass survey

Seagrass above ground biomass was determined using a modified “visual estimates of biomass” technique described by Mellors (1991). This technique involves an observer ranking seagrass biomass in the field in three random placements of a 0.25m^2 quadrat at each site. Ranks were made in reference to a series of quadrat photographs of similar seagrass habitat for which the above ground biomass had previously been measured. Two separate biomass ranges were used: low biomass; high biomass. The relative proportion of the above ground biomass (percentage) of each seagrass species within each survey quadrat was also recorded. Field biomass ranks were then converted into above ground biomass estimates in grams dry weight per square metre (g DW m^{-2}). At the completion of sampling each observer ranked a series of calibration quadrats that represented the range of seagrass biomass in the survey. After ranking, seagrass in these quadrats was harvested and the actual biomass determined in the laboratory. A separate regression of ranks and biomass from these calibration quadrats was generated for each observer and applied to the field survey data to determine above ground biomass estimates.

Habitat Mapping and Geographic Information System

Spatial data from the survey was incorporated into the DPI&F Geographic Information System (GIS) database. Three GIS layers were created:

Site information – site data containing above ground biomass (for each species), depth below mean sea level (MSL) (for subtidal sites), sediment type, time, Global Positioning System (GPS) fixes (±1.5m) and sampling technique.

Seagrass meadow biomass and community types – area data for seagrass meadows with summary information on meadow characteristics. Seagrass community types were determined according to species composition. Abundance categories (light, moderate, dense) were assigned to community types according to above ground biomass of the dominant species (Table 1).

Seagrass cover category - area data showing the seagrass landscape category determined for each meadow:

Isolated seagrass patches
The majority of area within the meadows consisted of unvegetated sediment interspersed with isolated patches of seagrass

Aggregated seagrass patches
Meadows are comprised of numerous seagrass patches but still feature substantial gaps of unvegetated sediment within the meadow boundaries

Continuous seagrass cover
The majority of area within the meadows comprised of continuous seagrass cover interspersed with a few gaps of unvegetated sediment.

Table 1 Density categories and mean above ground biomass ranges for each species used in determining seagrass community density in the Wellesley Island Group, August 2007

Density	Mean above ground biomass (g DW m^{-2})				
	***H. uninervis* (narrow)**	***H. ovalis* *H. decipiens***	***H. uninervis* (wide)**	***H. spinulosa***	***Z. capricorni***
Light	< 1	< 1	< 5	< 15	< 20
Moderate	1 - 4	1 - 5	5 - 25	15 - 35	20 - 60
Dense	> 4	> 5	> 25	> 35	> 60

Meadows were also assigned a mapping precision estimate (in metres) based on mapping methodology utilised for that meadow (Table 2). Mapping precision for coastal seagrass meadows ranged from ±0m to ±20m for the seagrass meadows (Table 3). The mapping precision estimate was used to calculate a range of meadow area for each complete meadow and was expressed as a meadow reliability estimate (R) in hectares. Additional sources of mapping error associated with digitising and rectifying aerial photographs onto base maps and with GPS fixes for survey sites were embedded within the meadow reliability estimates.

Table 2 Mapping precision and methodology for seagrass meadows in the Wellesley Island Group, August 2007

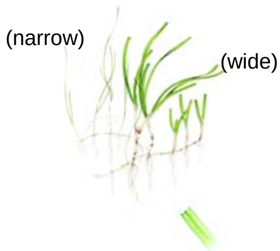
Mapping precision	Mapping methodology
0m	Meadow boundary not completed
5m	Meadow boundaries mapped in detail by GPS from helicopter Intertidal meadows completely exposed or visible at low tide Relatively high density of mapping and survey sites Recent aerial photography aided in mapping
10m	Meadow boundaries determined from helicopter and boat surveys Inshore boundaries mapped from helicopter Offshore boundaries interpreted from survey sites and aerial photography Relatively high density of mapping and survey sites
20m	Meadow boundaries determined from helicopter and boat surveys Some boundaries mapped from helicopter Offshore boundaries interpreted from camera survey sites Lower density of survey sites for some sections of boundary

RESULTS

In August 2007, seagrass was commonly found throughout the intertidal and shallow subtidal regions within the survey area (Map 1). Seagrass generally occurred in similar locations to that found in 1984 (Map 2), although individual meadows were often larger and covered a greater area.

Eight seagrass species (from three families) were identified in 43 seagrass meadows found on Mornington Island, Denham Island, Forsyth Island, Sydney Island, Lingnoonganee Island and Bentinck Island (Table 3).

Table 3 Seagrass species found in the Wellesley Island Group, August 2007

Family	Species			
CYMODOCEACEAE Taylor	*Syringodium isoetifolium* (Ashcers.) Dandy		*Cymodocea rotundata* Ehrenb. et Hempr. ex Aschers	
	Halodule uninervis (wide and narrow leaf morphology) (Forsk.) Aschers. in Boissier			
HYDROCHARITACEAE Jussieu	*Enhalus acoroides* (L.F.) Royle		*Thalassia hemprichii* (Ehrenb.) Aschers. in Petermann	
	Halophila decipiens Ostenfield		*Halophila ovalis* (R. Br.) Hook. F.	
	Halophila spinulosa (R. Br.) Aschers. in Neumayer			

A total of 21,674 ha (± 313.7 for meadows with complete boundaries) of seagrass habitat was mapped in 43 seagrass meadows identified in August 2007 (Table 4; Map 1). Meadow area ranged from 2.6 ha to 4,454 ha with the smallest meadow situated on the western side of Denham Island and largest meadow located on Bentinck Island (Table 4; Map 1). A total of 245 habitat observation sites (excluding meadow boundary mapping sites) were surveyed, 51% (124 sites) of which had seagrass present (Map 1). Of these monitoring sites 42 intertidal sites were surveyed from helicopter and 203 subtidal sites were surveyed using boat based methods.

The 43 seagrass meadows that were identified included ten different community types depending on species presence and dominance (Maps 3-13; Table 4). Communities that were dominated by *Halodule uninervis* were the most common followed by communities dominated by *Halophila ovalis*. A majority of the intertidal meadows found in the survey area were dominated by *Halodule uninervis* and *Halophila ovalis*, whilst the subtidal meadows were dominated by *Halophila spinulosa*.

Seagrass cover in the meadows was comprised primarily of aggregated patches, with meadows on all islands showing this pattern. Continuous cover meadows were those found in the rivers on Mornington Island (meadows 31, 43 & 24), a majority of the intertidal and subtidal habitats on Bentinck Island (meadows 1, 2, 3 & 7) plus a further three meadows on Mornington Island (meadows 35, 22 & 11). The remaining few meadows were comprised of isolated patches of seagrass.

Mean above ground biomass for meadows where this information was recorded ranged from 0.1 ± 0.05 g DW m^{-2} in the subtidal *Halophila decipiens* meadow on Denham Island (meadow 15) to 18.6 ± 2.0 g DW m^{-2} for the intertidal/subtidal *Halodule uninervis* dominated meadow in Sandlewood River (meadow 24)(Table 4).

The majority of the meadows found were intertidal (49%) followed by meadows that began on the intertidal flat and extended into the subtidal area (30%). Only 8 out of the 43 meadows found were completely subtidal.

Evidence of very heavy dugong feeding activity was observed on nearly every intertidal seagrass meadow surveyed. The highest density of dugong feeding trails was observed in seagrass meadows dominated by *Halodule uninervis* and or *Halophila ovalis*. In addition, dugongs were regularly observed feeding in subtidal meadows from the helicopter during surveys.

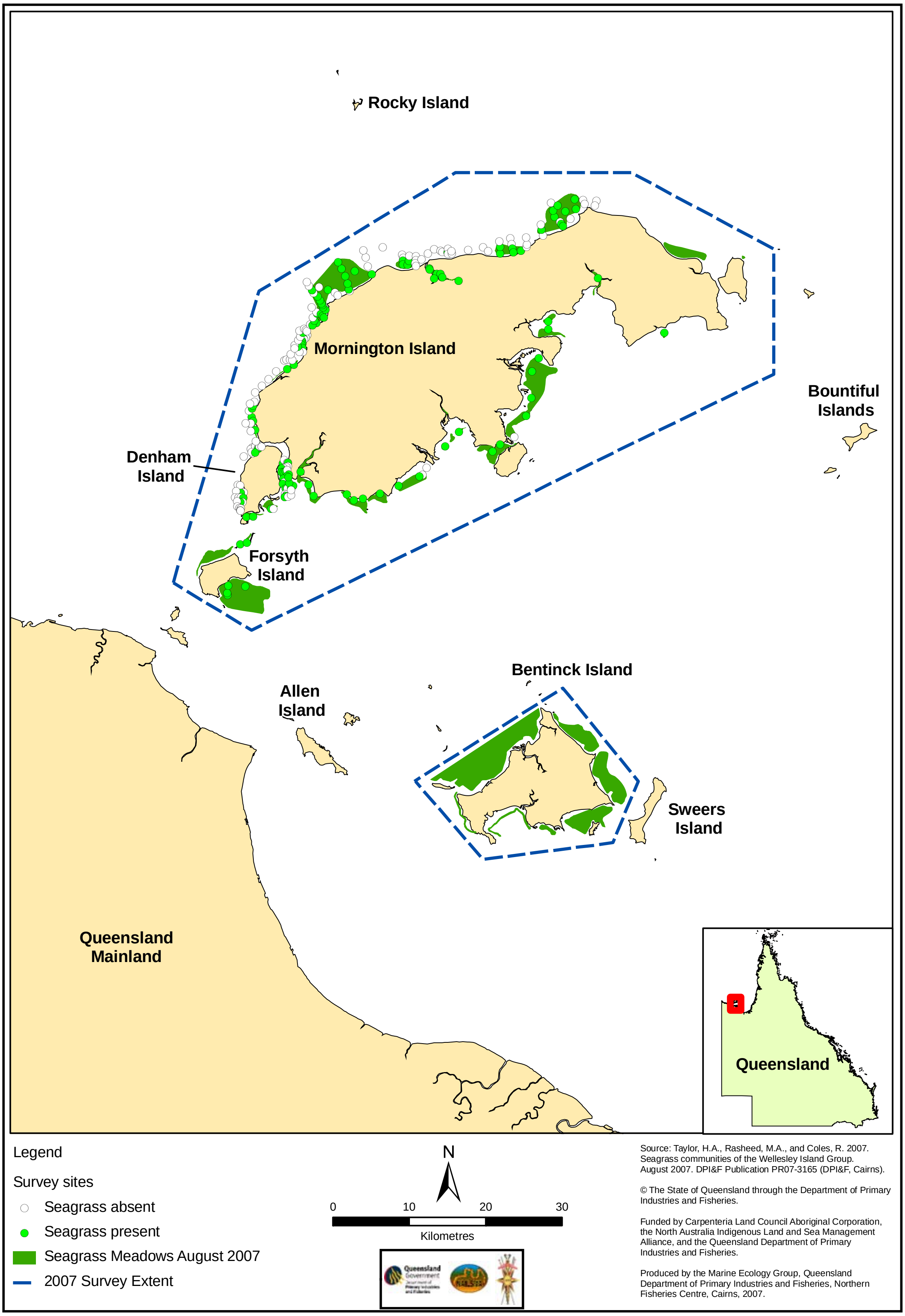
Table 4 Seagrass meadow information for the Wellesley Island Group, August 2007

Meadow ID	Location	Meadow depth	No. of sites	Community type	Cover	Species present	Mean biomass (g dw m^{-2})	Area ± R (ha)
1	Bentinck Island	Intertidal / Subtidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Continuous cover	*Halodule uninervis, Halophila ovalis*	NA	4453.8
2	Bentinck Island	Intertidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Continuous cover	*Halodule uninervis, Halophila ovalis*	NA	907.7 ± 25.3
3	Bentinck Island	Intertidal / Subtidal	0	Dense *Halodule uninervis* and *Halophila ovalis*	Continuous cover	*Halodule uninervis, Halophila ovalis*	NA	1325.9
4	Bentinck Island	Intertidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis, Halophila ovalis*	NA	1067.4 ± 8.6
5	Bentinck Island	Intertidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis, Halophila ovalis*	NA	125.9 ± 2.8
6	Wilson Bay (Bentinck Island)	Intertidal / Subtidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis, Halophila ovalis*	NA	248.8
7	Bentinck Island	Intertidal / Subtidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Continuous cover	*Halodule uninervis, Halophila ovalis*	NA	158.8
8	Government Bay (Forsyth Island)	Intertidal	4	Light *Halodule uninervis* and *Halophila ovalis* with mixed species	Aggregated patches	*Halodule uninervis, Halophila ovalis, Cymodocea rotundata, Enhalus acoroides*	6.14 ± 0.96	2064.1 ± 18.5
9	Forsyth Island	Intertidal / Subtidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis, Halophila ovalis*	NA	436.1 ± 6.9
10	Forsyth Island	Intertidal	1	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis, Halophila ovalis*	6.45 ± 0.2	24.9 ± 1.1
11	Forsyth Island	Intertidal	1	Light *Halophila ovalis*	Continuous cover	*Halophila ovalis*	4.13 ± 0.5	46.6 ± 1.8
12	Denham Island	Intertidal	2	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis (wide), Halophila ovalis*	0.9 ± 0.7	101.7 ± 3.2
13	Denham Island	Intertidal	0	Light *Halophila ovalis*	Aggregated patches	*Halophila ovalis*	NA	2.6 ± 0.7
14	Denham Island	Intertidal / Subtidal	2	Light *Halodule uninervis*	Aggregated patches	*Halodule uninervis*	0.6 ± 0.3	171.8 ± 3.0
15	Denham Island	Subtidal	3	Light *Halophila decipiens*	Isolated patches	*Halophila decipiens, Halophila ovalis*	0.1 ± 0.05	36.5 ± 3.8

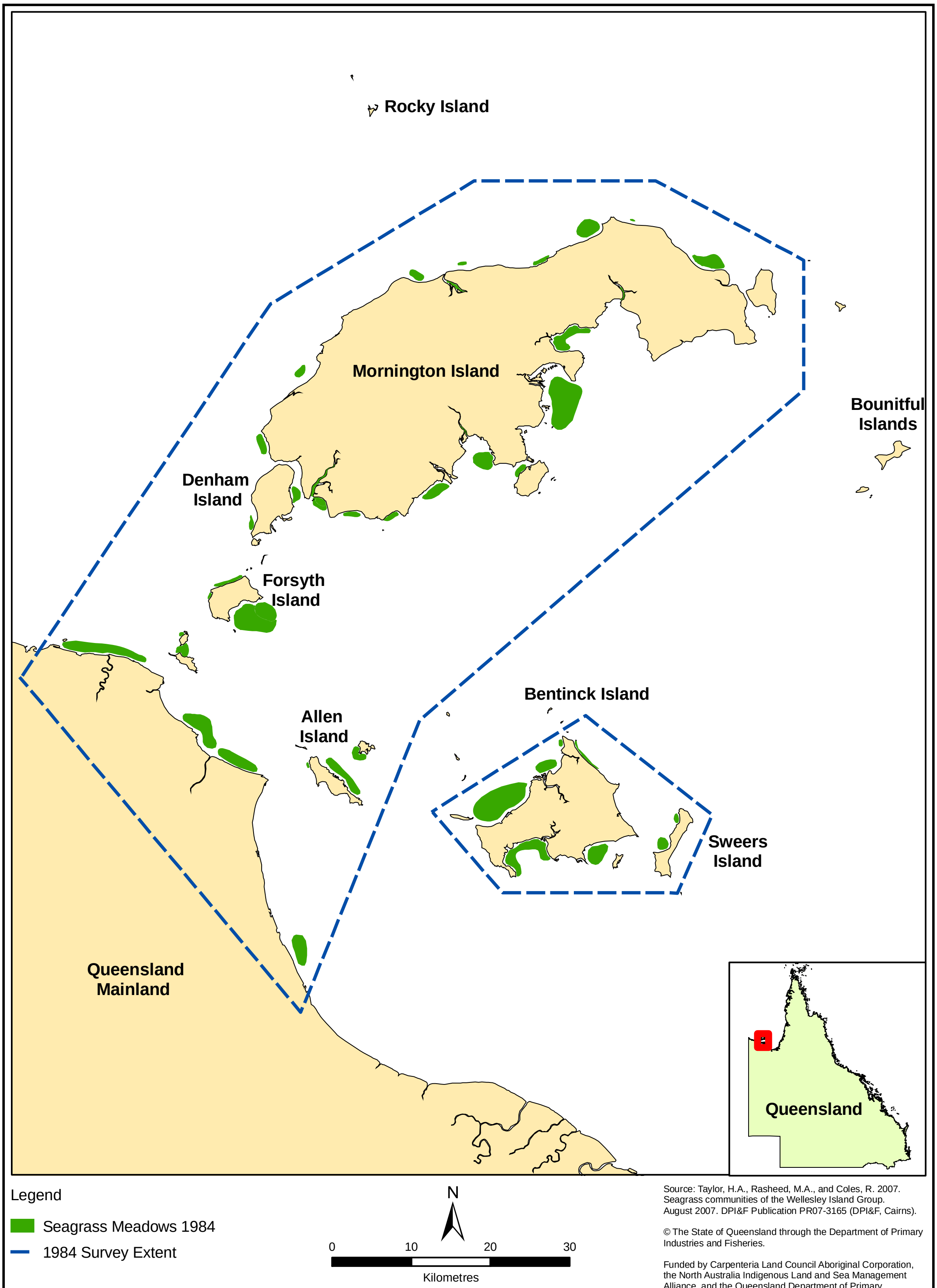
Meadow ID	Location	Meadow depth	No. of sites	Community type	Cover	Species present	Mean biomass (g dw m^{-2})	Area ± R (ha)
16	Denham Island	Intertidal / Subtidal	20	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis (wide & thin), Halophila ovalis, Halophila spinulosa*	1.4 ± 0.6	450.5 ± 11.1
17	Denham Island	Intertidal / Subtidal	9	Light *Halodule uninervis* and *Halophila ovalis* with mixed species	Aggregated patches	*Halodule uninervis (thin), Halophila ovalis, Syringodium isoetifolium*	1.6 ± 0.3	79.5 ± 4.6
18	Dubbar Point (Mornington Island)	Intertidal	3	Light *Halodule uninervis* and *Halophila ovalis* with mixed species	Isolated patches	*Halodule uninervis (wide & thin), Halophila ovalis, Thalassia hemprichii*	12.3 ± 0.8	54.6 ± 3.8
19	Gee Wee Point (MI)	Subtidal	2	Light *Halophila spinulosa*	Isolated patches	*Halophila ovalis, Halophila ovalis*	0.3 ± 0.2	11.0 ± 2.1
20	Mornington Island	Intertidal	2	Light *Halodule uninervis*	Aggregated patches	*Halodule uninervis (thin)*	6.6 ± 1.4	65.9 ± 4.6
21	Dwenty Point (MI)	Subtidal	10	Light *Halodule uninervis* and *Halophila spinulosa*	Aggregated patches	*Halodule uninervis, Halophila decipiens, Halophila ovalis, Halophila spinulosa*	6.9 ± 1.1	131.5 ± 9.3
22	Birri Beach (MI)	Subtidal	25	Light *Halophila spinulosa* with mixed species	Continuous cover	*Halodule uninervis, Halophila decipiens, Halophila ovalis, Halophila spinulosa*	8.2 ± 1.1	2709.7
23	Eengan Bay (MI)	Subtidal	4	Light *Halodule uninervis* and *Halophila spinulosa*	Aggregated patches	*Halodule uninervis (thin), Halophila ovalis, Halophila spinulosa*	7.3 ± 0.9	220.0 ± 11.3
24	Sandlewood River (MI)	Intertidal / Subtidal	7	Dense *Halodule uninervis* with mixed species	Continuous cover	*Halodule uninervis, Halophila ovalis, Cymodocea rotundata, Enhalus acoroides*	18.6 ± 2.0	148.4 ± 8.0
25	Eengan Bay (MI)	Subtidal	1	Light *Halodule uninervis*	Isolated patches	*Halodule uninervis (thin)*	8.8 ± 0.8	16.0 ± 3.1
26	Lowareah Point (MI)	Subtidal	7	Dense *Halodule uninervis* with mixed species	Aggregated patches	*Halodule uninervis, Halophila decipiens, Halophila ovalis, Halophila spinulosa*	2.6 ± 1.1	370.4 ± 17.3
27	White cliffs (MI)	Subtidal	10	Light *Halophila spinulosa* with mixed species	Aggregated patches	*Halophila decipiens, Halophila spinulosa, Syringodium isoetifolium*	9.7 ± 0.8	1448.0 ± 34.2
28	Thabugan Beach	Intertidal / Subtidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis, Halophila ovalis*	NA	570.6
29	Lingnoonganee Island	Intertidal	0	Light *Halophila ovalis*	Isolated patches	*Halophila ovalis*	NA	13.9 ± 0.7
30	Mornington Island	Intertidal	1	Light *Halophila ovalis*	Isolated patches	*Halophila ovalis*	5.1 ± 0.7	53.9 ± 1.5

Meadow ID	Location	Meadow depth	No. of sites	Community type	Cover	Species present	Mean biomass (g dw m^{-2})	Area ± R (ha)
31	Elizabeth River (MI)	Intertidal / Subtidal	1	Moderate *Halodule uninervis*	Continuous cover	*Halodule uninervis*	NA	77.1 ± 4.1
32	Charlie Bush Bay (MI)	Intertidal	1	Light *Halophila ovalis*	Isolated patches	*Halophila ovalis*	1.3 ± 0.7	98.6 ± 4.3
33	Charlie Bush Bay (MI)	Intertidal	1	Light *Halodule uninervis* and *Halophila ovalis*	Isolated patches	*Halodule uninervis (thin), Halophila ovalis*	2.4 ± 0.8	220.4 ± 8.4
34	Weediah Bay (MI)	Intertidal	5	Light *Halodule uninervis* and *Halophila ovalis* with mixed species	Aggregated patches	*Halodule uninervis (thin), Halophila ovalis, Thalassia hemprichii*	1.5 ± 0.4	1799.0 ± 61.2
35	Sydney Island	Intertidal	2	Light *Halodule uninervis* and *Halophila ovalis*	Continuous cover	*Halodule uninervis (thin), Halophila ovalis*	0.9 ± 0.1	513.0 ± 14.0
36	Mornington Island	Intertidal	1	Light *Halodule uninervis*	Aggregated patches	*Halodule uninervis (thin)*	2.0 ± 0.4	33.9 ± 1.8
37	Toongoowahgun River (MI)	Intertidal	0	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis, Halophila ovalis*	NA	16.7 ± 1.5
38	Mornington Island	Intertidal	0	Light *Halodule uninervis*	Aggregated patches	*Halodule uninervis*	NA	45.5 ± 1.5
39	Mornington Island	Intertidal	1	Light *Halodule uninervis*	Aggregated patches	*Halodule uninervis (thin)*	1.24 ± 0.2	26.5 ± 1.1
40	Gerrigroo Point (MI)	Intertidal / Subtidal	3	Light *Halodule uninervis* and *Halophila ovalis*	Aggregated patches	*Halodule uninervis (thin), Halophila ovalis*	1.2 ± 0.2	392.3
41	Gerrigroo Point (MI)	Intertidal	1	Light *Halophila ovalis*	Aggregated patches	*Halophila ovalis*	2.6 ± 0.4	220.8 ± 6.8
42	Tulburrerr Island (MI)	Intertidal	3	Light *Halophila ovalis*	Aggregated patches	*Halophila ovalis*	0.4 ± 0.1	309.4 ± 10.4
43	Dugong River (MI)	Intertidal / Subtidal	3	Light *Halodule uninervis* and *Halophila ovalis*	Continuous cover	*Halodule uninervis (thin), Halophila ovalis*	3.4 ± 0.6	404.5 ± 11.3

Map 1 Location of seagrass meadows and biomass assessment sites in the Wellesley Island Group, August 2007.



Map 2 Location of seagrass meadows in the Wellesley Island Group, 1984.



Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

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Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 3 Seagrass community types and seagrass cover on Bentinck Island, August 2007.

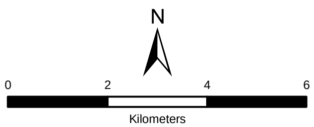
Legend

Community type

- Light *Halodule uninervis* and *Halophila ovalis*
- Dense *Halodule uninervis* and *Halophila ovalis*

Cover

- Continuous cover
- Aggregated patches
- Edge not determined



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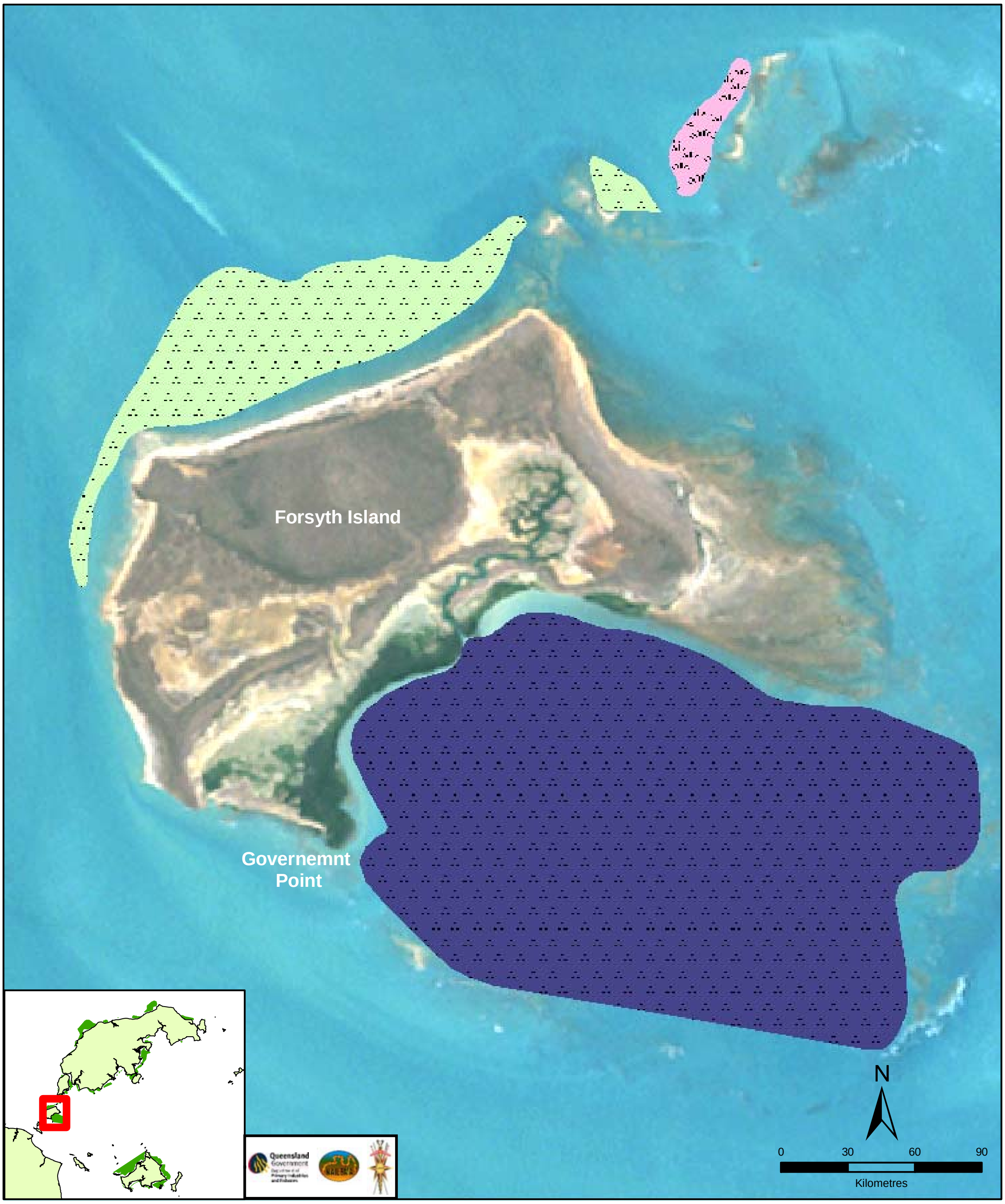
Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 4 Seagrass community type and seagrass cover around Forsyth Island, August 2007.



Legend

Community type

Light *Halodule uninervis* and *Halophila ovalis*

Light *Halodule uninervis* and *Halophila ovalis* with mixed species

Light *Halophila ovalis*

Cover

Continuous cover

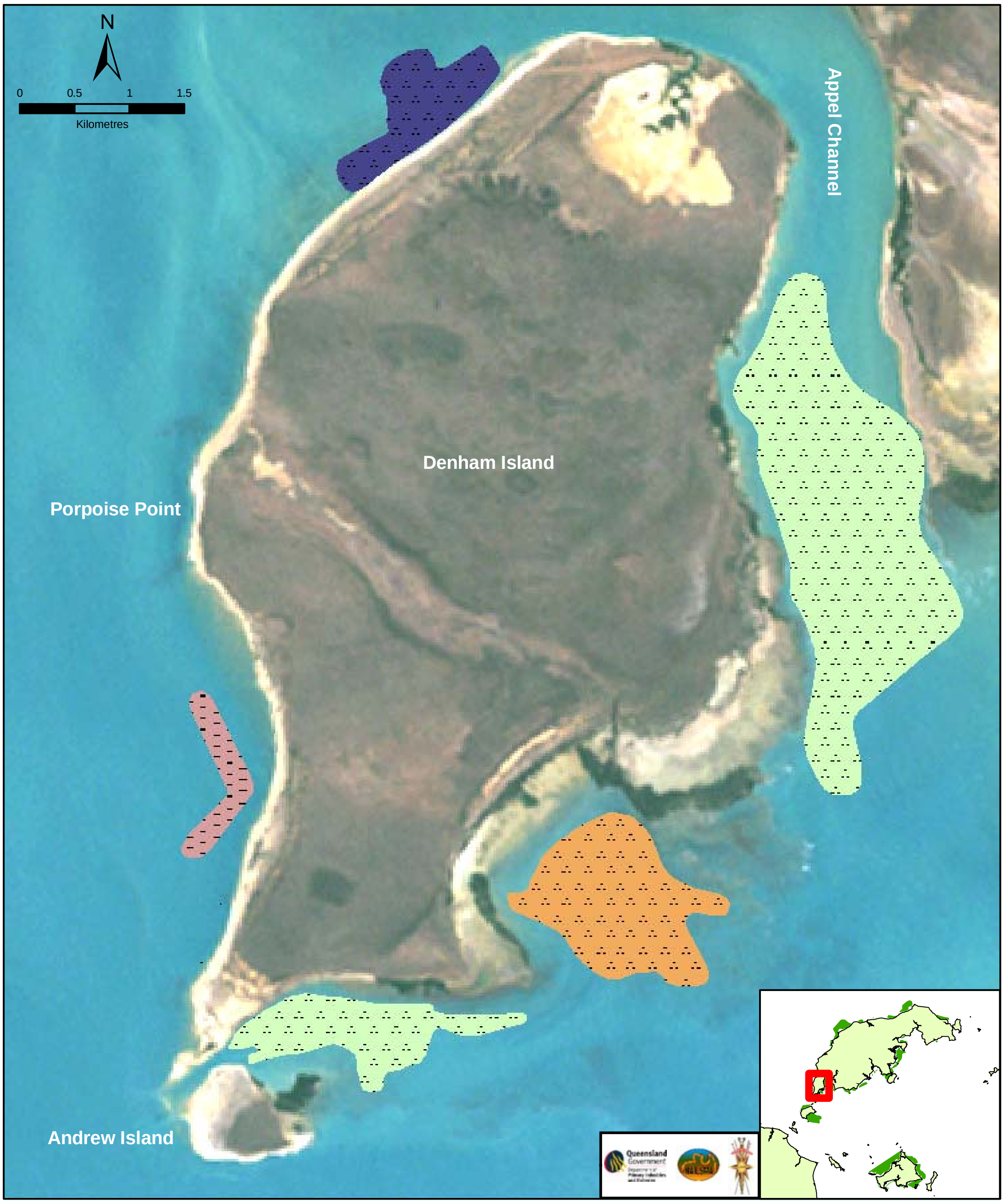
Aggregated patches

Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpenteria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 5 Seagrass community types and seagrass cover around Denham Island, August 2007.



Legend

Community type

- Light *Halodule uninervis*
- Light *Halodule uninervis* and *Halophila ovalis*
- Light *Halodule uninervis* and *Halophila ovalis* with mixed species
- Light *Halophila decipiens*

Cover

- Aggregated patches
- Isolated patches

Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpenteria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 6 Seagrass community types and seagrass cover from Dubbar Point to Brookes Reef, Mornington Island, August 2007.

Legend

Community type

- Light *Halodule uninervis*
- Light *Halodule uninervis* and *Halophila ovalis* with mixed species
- Light *Halophila spinulosa*

Cover

- Aggregated patches
- Isolated patches

Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpenteria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 7 Seagrass community types and seagrass cover for Brookes Ref to Lowareah Point, Mornington Island, August 2007.

Legend

Community type

- Light *Halodule uninervis*
- Light *Halodule uninervis* and *Halophila spinulosa*
- Dense *Halodule uninervis* with mixed species
- Light *Halophila spinulosa* with mixed species

Cover

- Continuous cover
- Aggregated patches
- Isolated patches
- Edge not determined

N

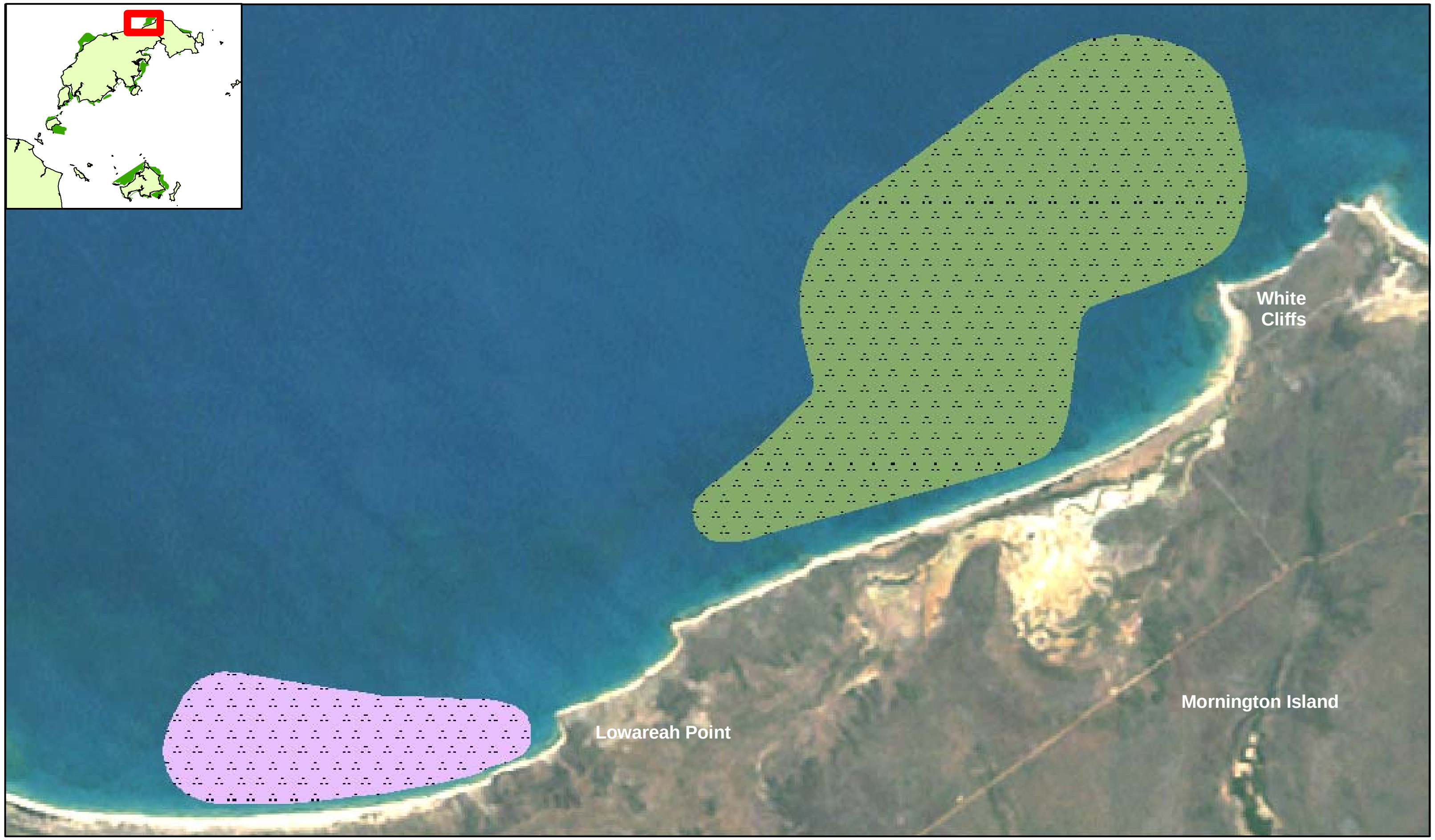
0 1 2 3
Kilometers

Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpenteria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 8 Seagrass communities from Lowareah Point to White Cliffs, Mornington Island, August 2007.



Legend

Community type

- Light *Halodule uninervis* with mixed species
- Light *Halophila spinulosa* with mixed species

Cover

- Aggregated patches

N

0 1 2 3

Kilometers

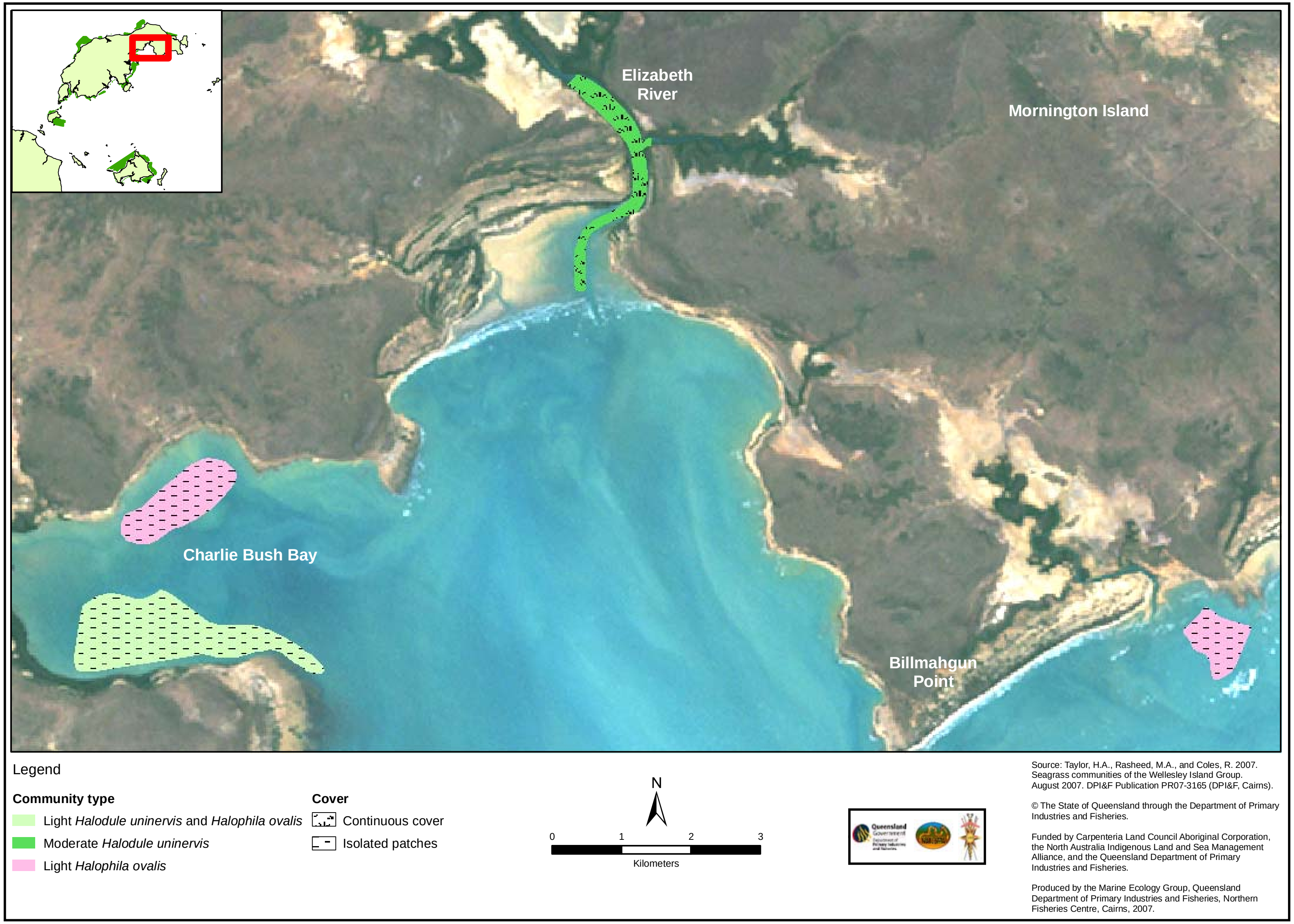
Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpentaria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

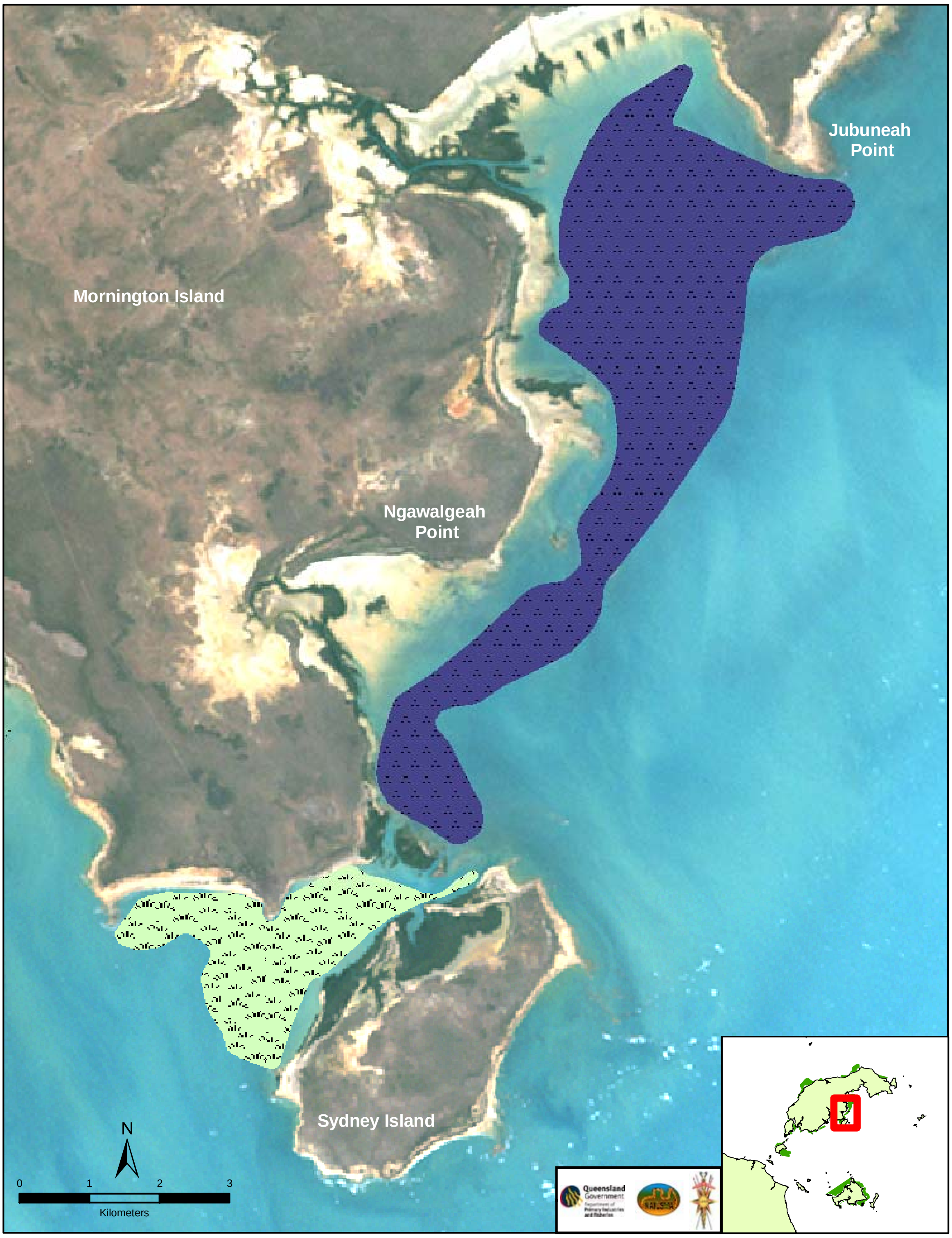
Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 9 Seagrass community type and seagrass cover from Thabugan Point to Mudgun Point, Mornington Island, August 2007.

Map 10 Seagrass community type and seagrass cover from near Billmahgun Point to Charlie Bush Bay, Mornington Island, August 2007.



Map 11 Seagrass community type and seagrass cover from Jubuneah Point to Sydney Island, Mornington Island, August 2007.



Legend

Community type

- Light *Halodule uninervis* and *Halophila ovalis*
- Light *Halodule uninervis* and *Halophila ovalis* with mixed species

Cover

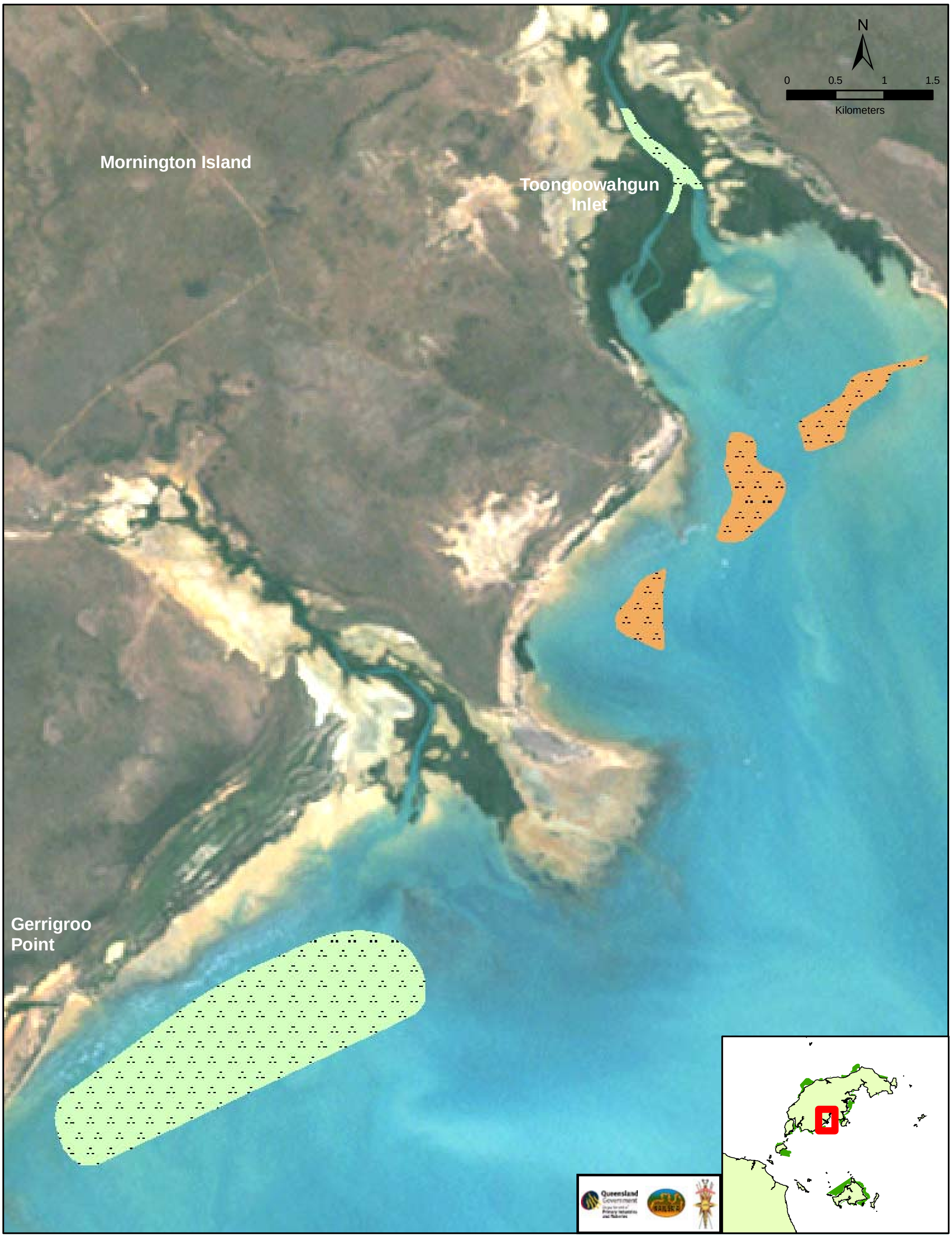
- Continuous cover
- Aggregated patches

Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpenteria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 12 Seagrass community type and seagrass cover from Toongoowahgun Inlet to Gerrigroo Point, Mornington Island, August 2007.



Legend

Community type

- Light *Halodule uninervis*
- Light *Halodule uninervis* and *Halophila ovalis*

Cover

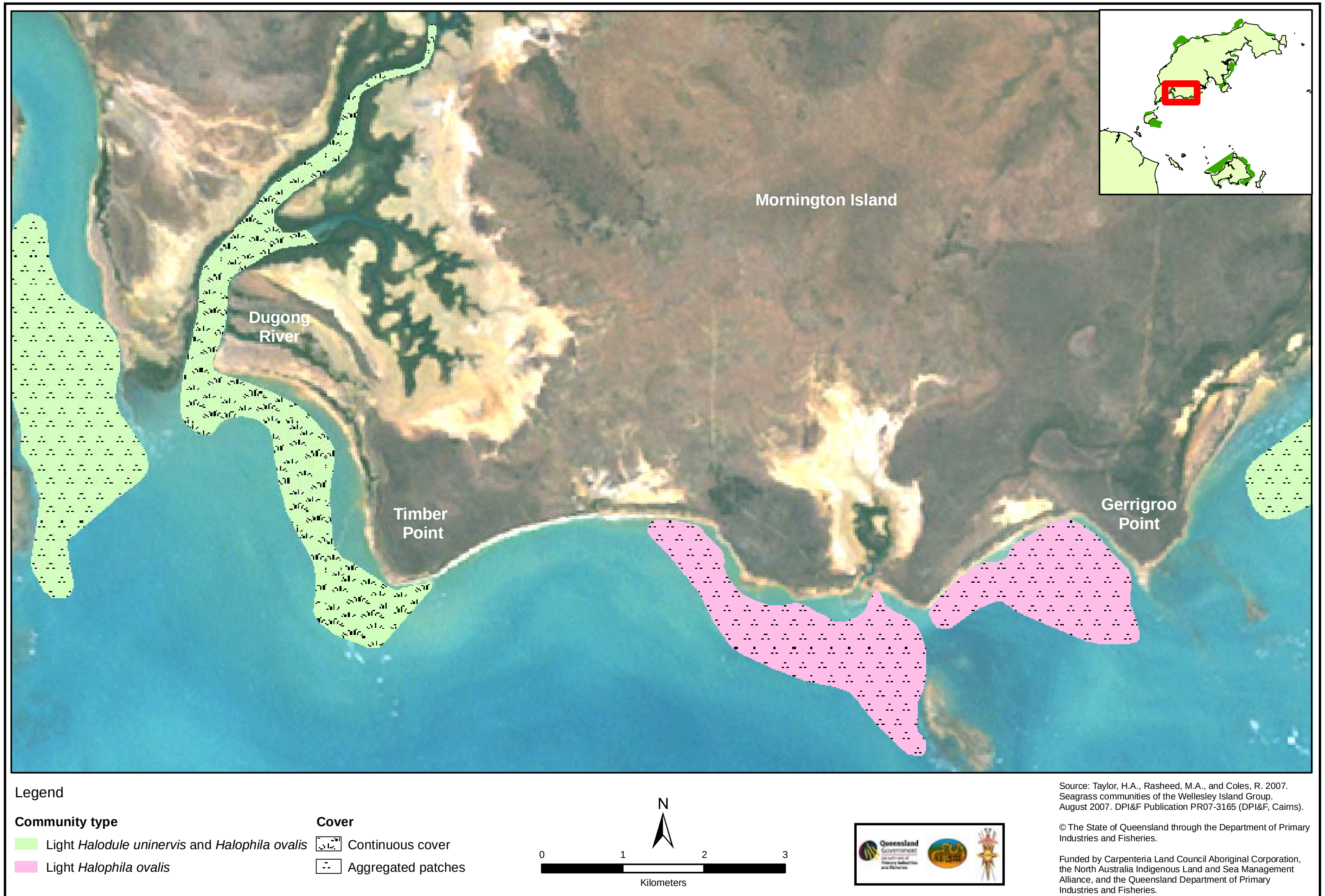
- Continuous cover
- Aggregated patches

Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpentaria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

Map 13 Seagrass community type and seagrass cover from Timber Point to Dugong River, Mornington Island, August 2007.



Source: Taylor, H.A., Rasheed, M.A., and Coles, R. 2007. Seagrass communities of the Wellesley Island Group. August 2007. DPI&F Publication PR07-3165 (DPI&F, Cairns).

Funded by Carpenteria Land Council Aboriginal Corporation, the North Australia Indigenous Land and Sea Management Alliance, and the Queensland Department of Primary Industries and Fisheries.

Produced by the Marine Ecology Group, Queensland Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, 2007.

DISCUSSION

The survey examined the coastal intertidal and subtidal benthic habitats throughout a large area of the Wellesley Islands. All intertidal areas on Mornington, Sydney, Lingnoonganee, Denham, Forsyth and Bentinck Islands were surveyed with seagrass meadows mapped and community information recorded where possible. Subtidal coastal areas were only surveyed around the northern coastline of Mornington Island, and around Denham Island.

Seagrass communities were a dominant benthic habitat of the intertidal and shallow subtidal areas surveyed. The diversity of seagrass species found was high (8) compared with surveys of other Gulf of Carpentaria locations at Karumba (2 species; Rasheed *et al.* 2001) and Weipa (6 species; Roelofs *et al*. 2006). Despite the high diversity and large area of coastal seagrass present, the majority of meadows were low biomass (density).

The low biomass *Halophila* and *Halodule* meadows that dominated the survey area are seagrasses known to be preferred as food by dugong as they are more palatable and easily digested (Lanyon 1991; Preen 1995). Dugong feeding trails were recorded in almost every seagrass meadow in very high densities and dugongs were often sighted during the survey, suggesting that the coastal waters surrounding the Wellesley Islands supports a large population of dugongs. Survey's of dugong populations in the region in the 1970's and 1990's suggested that the Wellesley Islands supported the third largest population of dugongs in Queensland (Marsh *et al.* 1981; Marsh & Lawler, 1993).

This is the first time that seagrasses have been mapped for 23 years in the Wellesley Islands, and the first time using modern GPS and helicopter techniques, so it is difficult to make a direct assessment of change in the seagrass communities. In 1984, seagrass communities covered 11,214 ha of area (within the 2007 survey limit; Coles & Lee Long, 1985), which is almost half that of the seagrass area found in 2007 (21,674 ha; Map 2). Much of this difference could be attributable to the availability of modern seagrass mapping techniques in 2007 allowing for more detailed mapping. Our use of helicopters in intertidal regions allowed access to shallow areas that could not easily be assessed using the boat based techniques in 1984.

While differences in methodology may account for some of the change observed, seagrass meadow area and biomass are likely to vary naturally both seasonally and between years in the Wellesley Island region. Studies of tropical and subtropical seagrass communities have found distinct seasonal patterns with maximum abundance and area usually occurring in spring/summer and minima in winter (McKenzie, 1994; Lanyon & Marsh, 1995). This seasonal pattern is likely to be driven by a combination of climatic and environmental parameters, particularly rainfall, water and air temperature, and solar irradiance. Seagrass meadows in tropical Queensland that have shown marked seasonal changes include Weipa (Roelofs *et al.* 2003; Taylor *et al*. 2007), Karumba (Rasheed *et al.* 2001; Dew *et al.* 2007), Mourilyan (McKenzie *et al.* 1998; McKenna *et al.* 2007) and Cairns (Campbell *et al.* 2003; Rasheed *et al*, 2007). The large difference in seagrass area and density between 1984 and 2007 in the Wellesley Islands may be partially attributable to this pattern, as a portion of the 1984 survey was conducted during the known winter minima period (Coles & Lee Long, 1985).

There were also some substantial shifts in species composition of seagrass meadows between 1984 and 2007. The seagrass communities in 1984 consisted mainly of dense *Cymodocea* and *Enhalus* dominated meadows, with *Halophila* and *Halodule* dominated meadows comprising a smaller component. This is in direct contrast to the dominance of low biomass *Halophila* and *Halodule* meadows in 2007. Heavy dugong grazing has been shown to reduce the standing crop of seagrass and allow pioneering species (*Halophila* and *Halodule*) the chance to establish and be cultivated (Preen 1995). The high incidence of dugong feeding observed in 2007 may indicate that this process played a part in facilitating the species shift over time.

Historically, the Wellesley Islands have been a major prawn fishing ground with seagrass meadows providing valuable nursery habitats for juveniles. Coles & Lee Long (1985) reported that two of the most important prawn species to the southeastern Gulf of Carpentaria fishery were common on the inshore seagrass meadows. Economically, the Queensland prawn fishery contributed over $27 million Gross Value of Production of the state in 2005 (DPI&F, 2007).

The 2007 survey was restricted by time and resources and as such some subtidal areas and Bentinck Island were not completely surveyed. It is recommended that the subtidal surveys are completed, as well as more detailed surveys of Bentinck Island should resources and funding become available. This information could then be used as a baseline from which future changes can be measured. Seagrass meadows in the Wellesley Islands appear to be extremely important environmentally as food for dugong and nursery grounds for prawns. Future monitoring of these meadows will provide fisheries management with information to ensure the continued health of these vital habitats.

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