Department of **Employment, Economic Development and Innovation**
Fisheries Queensland

Queensland seagrasses

Status 2010 – Torres Strait and East Coast

Seagrasses are a key component of the marine ecosystem of Queensland and are essential for sustainable and productive fisheries.

There are 15 seagrass species common in Queensland waters, a region that is part of the Indo Pacific centre of seagrass biodiversity. Seagrasses are widespread and found from the upper intertidal region, on reef platforms, and down to 70 metres below sea level. They are one of the key habitat types along with algae and coral that underpin the biodiversity and productivity of tropical ecosystems and their fisheries. The Torres Strait and the east coast of Queensland have some of the most extensive seagrass meadows in the world with an estimated 17,206 sq km in the strait and at least 38,079 sq km down the east coast. As the status of the seagrass meadows and risks from human influences is not consistent over this large area, we have summarised our data by Natural Resource Management (NRM) areas. The threats to seagrass are almost all in the southern half of Queensland (south of Cooktown). Seagrass meadows in Queensland have declined in abundance down the east coast over the last 3-4 years, however the total area of seagrass in Queensland has changed little over the long-term (5-10 years). Seagrass declines where they have occurred are most likely the result of natural variations in climate, particularly tropical storms and flood run-off, against a background of reduced water quality.

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Biology of seagrass

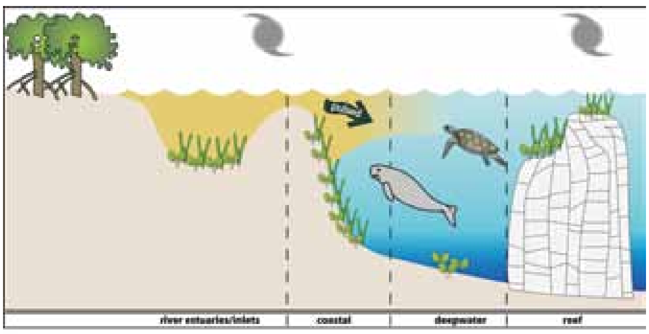
Seagrasses are flowering plants that have evolved to live in sea water. They are found in shallow inshore areas of bays, estuaries and coastal waters throughout the world. Fifteen of the approximately 70 seagrass species known, are common in Queensland waters.

Seagrass provides a nursery and shelter for fish, prawns and shellfish. Seagrass meadows have up to 27 times more habitable surface and support about 40 times more animals compared to bare seafloor. Seagrass is the primary food source for dugong, endangered green turtles, fish and numerous other animals that live in, on or around seagrasses. In some parts of the world, the carbon sink capacity of seagrass ecosystems is nearly equivalent to that of undisturbed rainforest.
It is estimated that the global value of ecosystem services that seagrass meadows provide is around US$1.9 trillion per year in nutrient cycling alone.

Seagrasses are also important because they reduce coastal erosion and filter toxic chemicals and nutrient run-off. The health of seagrass meadows is an excellent indicator of the health of inshore waters and early detection of change allows government agencies to adjust their management response.

Seagrass distribution

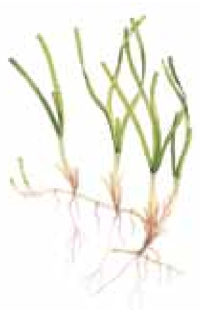
Approximately 18,374 square kilometres of seagrass has been mapped in the coastal waters around Queensland and Torres Strait since the mid 1980s. Surveys and statistical modelling of seagrass in offshore waters deeper than 15m shows 37,454 square kilometres of the sea floor within the Great Barrier Reef World Heritage Area and Torres Strait has some seagrass present making Queensland's seagrass resources globally significant.



General conceptual model of seagrass habitats in north east Australia (from Carruthers et al. 2002)

Seagrass habitats

The diversity of seagrass species in Queensland reflects the variety of habitats provided by coasts, bays, estuaries, and reefs as well as the complexity of the Torres Strait island systems and the length of the Great Barrier Reef and inshore lagoon. Seagrass habitats can be separated into four major categories: estuary/inlet, coastal, reef and deepwater. All but the outer reef habitats are influenced by seasonal pulses of sediment-laden, nutrient-rich river flows, resulting from high volume summer rainfall. Cyclones, severe storms, wind and waves as well as macro grazers (fish, dugongs and turtles) influence all habitats in this region. The result is dynamic, spatially and temporally variable seagrass meadows.



Cymodocea rotundata

Cymodocea serrulata

Enhalus acoroides

Halodule pinifolia

Halodule uninervis

Threats & risks

Over the last few decades the area of seagrass around the world has been declining at a rate of two football fields per hour. This places seagrass meadows among the most threatened ecosystems. Fortunately, threats and impacts in Queensland are low in most locations compared to other countries and the area of seagrass in Queensland has remained relatively stable.

Agricultural run-off poses the largest human-induced threat to seagrass health. Seagrass is also threatened, in decreasing order of magnitude, by the following impacts: urban and industrial runoff; urban and port infrastructure development; dredging; shipping accidents; trawling; recreational boat damage; commercial boat damage and netting.

As a result of successful, cooperative fisheries management in Queensland, fishing poses a relatively low threat to seagrass health.

Bottom trawling is restricted by spatial and temporal closures and trawl operators avoid areas of known seagrass meadows. A recent reduction in commercial boat numbers has also reduced pressure on bottom habitats.

Relatively small human populations along much of the coast and the successful management of key threats through legislation such as the *Fisheries Act 1994* provide some respite to implement strategies to ensure the long-term survival of seagrass resources. Fisheries Queensland has a responsibility to manage and safeguard these vital habitats. Seagrass resource status information is one tool to enable successful management.

Map of risks to seagrass

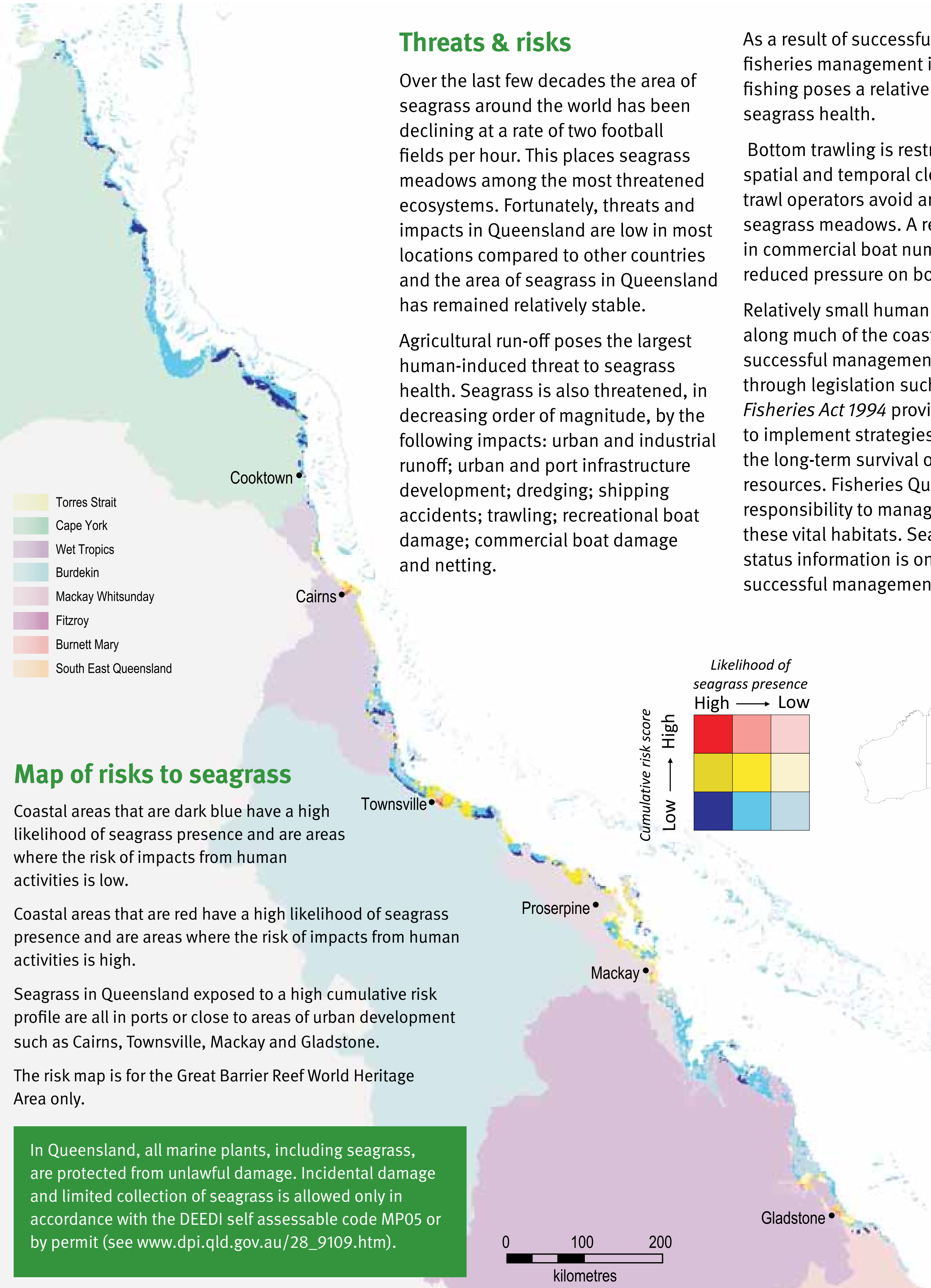
Coastal areas that are dark blue have a high likelihood of seagrass presence and are areas where the risk of impacts from human activities is low.

Coastal areas that are red have a high likelihood of seagrass presence and are areas where the risk of impacts from human activities is high.

Seagrass in Queensland exposed to a high cumulative risk profile are all in ports or close to areas of urban development such as Cairns, Townsville, Mackay and Gladstone.

The risk map is for the Great Barrier Reef World Heritage Area only.

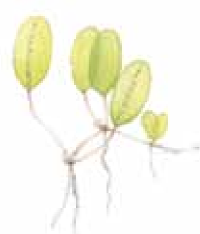
In Queensland, all marine plants, including seagrass, are protected from unlawful damage. Incidental damage and limited collection of seagrass is allowed only in accordance with the DEEDI self assessable code MP05 or by permit (see www.dpi.qld.gov.au/28_9109.htm).



Halophila capricorni

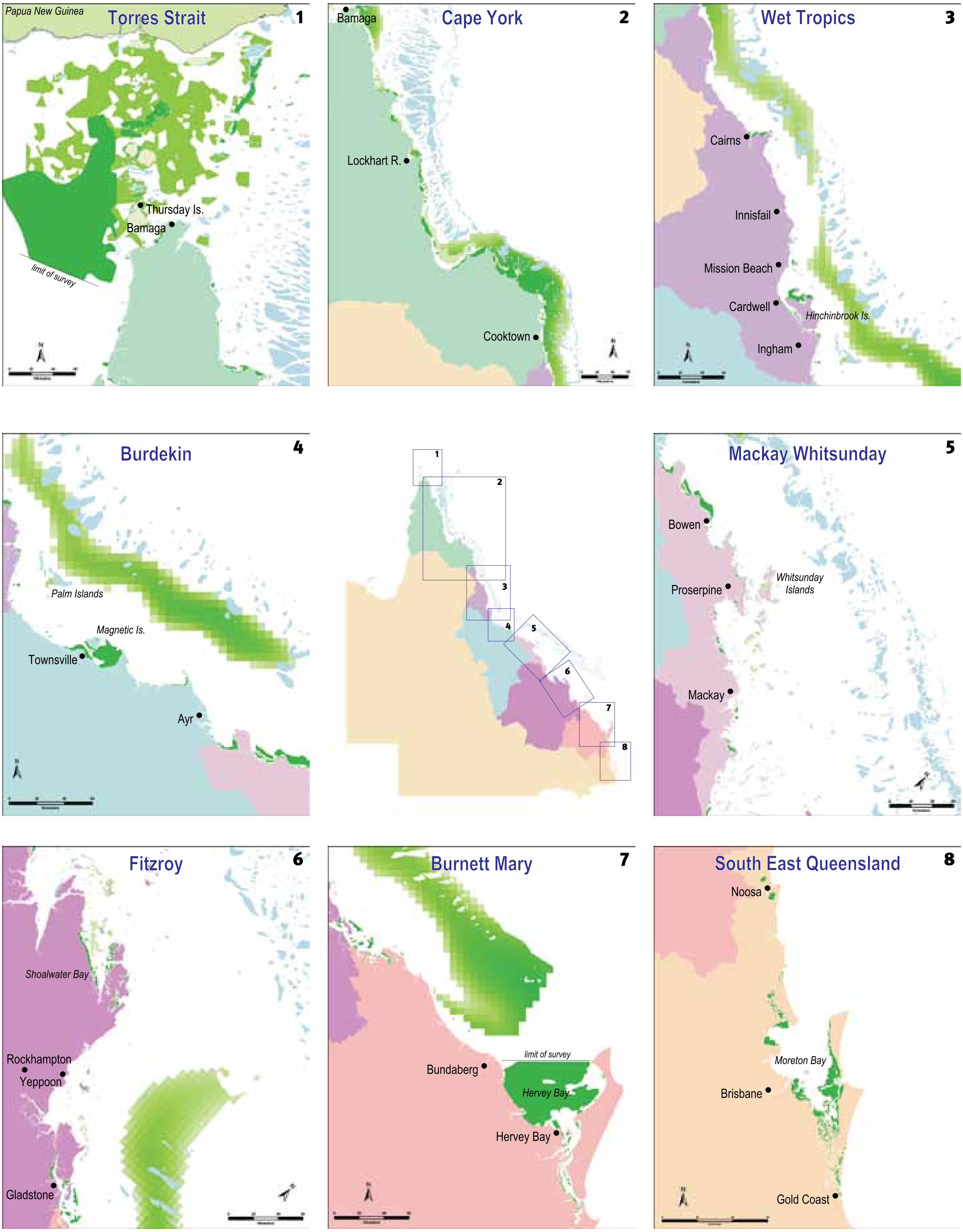
Halophila decipiens

Halophila minor



Halophila ovalis

Halophila spinulosa

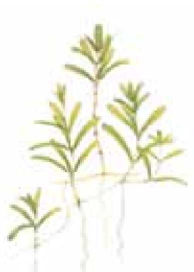


Legend: Seagrass maps are composite *(all mapping surveys pooled).*

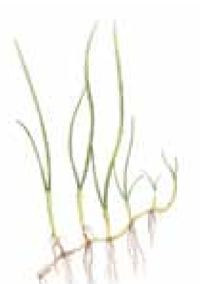
Actual meadow boundary

50% - 100% Modelled meadow probabilities (pixel size of 2km^2) from all deepwater (>15m) survey points pooled.

Detailed maps & sources are available at www.dpi.qld.gov.au/28_142.htm



Halophila tricostata

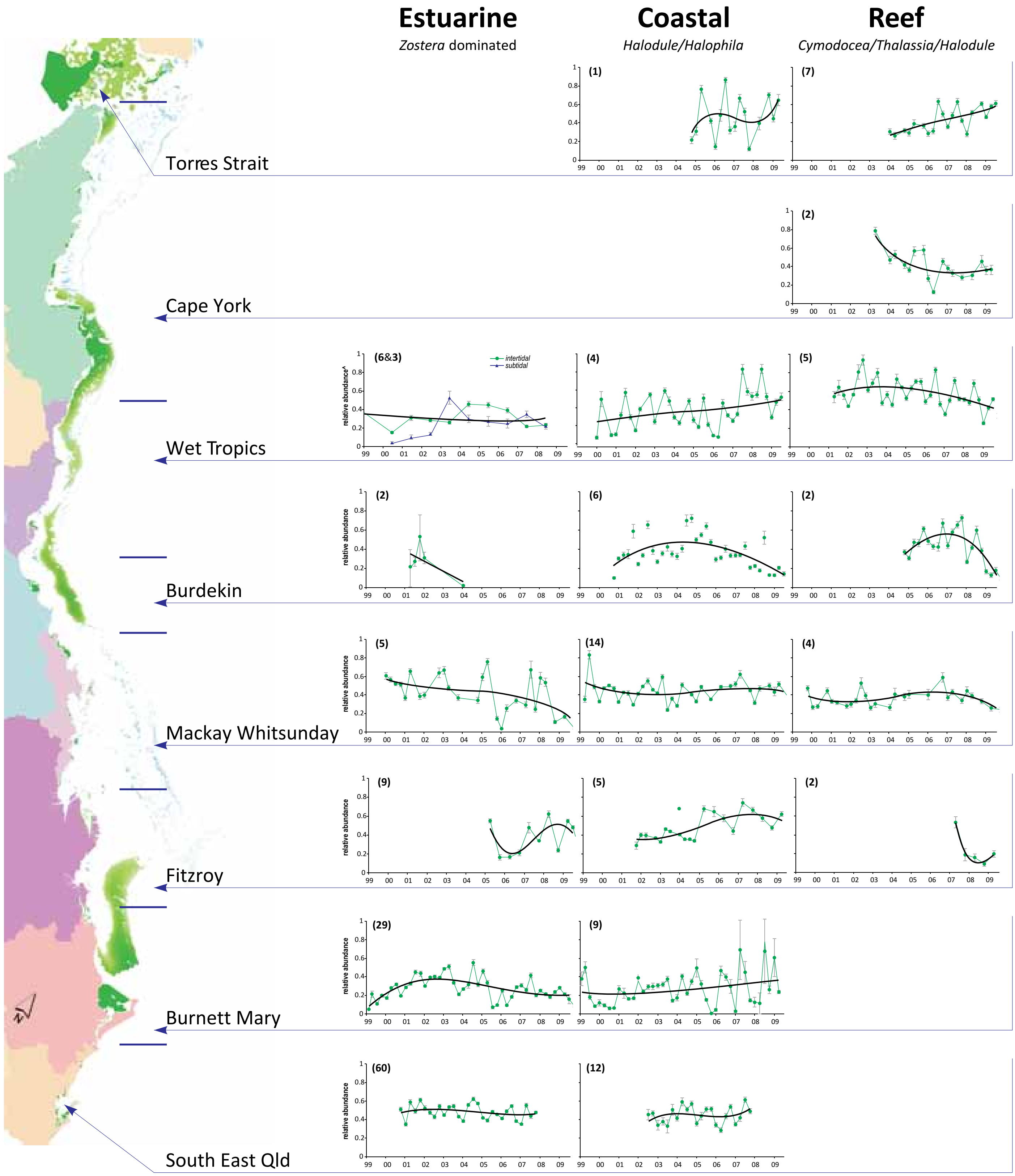


Syringodium isoetifolium

Thalassia hemprichii

Thalassodendron ciliatum

Zostera muelleri subsp. *capricorni*



Relative seagrass abundance (all sites pooled) for intertidal estuarine, coastal and reef habitats within each NRM region along the east coast of Queensland (pooled by season for each year). Long-term trend line is calculated as polynomial. Values in parenthesis are the number of monitoring units (sites or meadows). Seagrass abundance (seagrass percentage cover or biomass as g DW m^{-2}) relative to the 95th percentile at each monitoring site enables standarised comparisons.

The data underpinning this assessment of seagrass status along the east-coast of Queensland and Torres Strait has been collected from the Seagrass-Watch program, with additional input from the Habitats at Risk and the Risk Modelling programs. The Seagrass-Watch program is a participatory monitoring program involving community groups and agencies. Seagrass-Watch plays a key role in tracking changes to coastal seagrass meadows in Queensland, nationally and globally, providing early warning of coastal ecological decline.

The Habitats at Risk program is a partnership with industry to provide expert advice on coastal, fishing and port management to ensure Queensland develops its industries with the least impact to seagrass habitats. The Risk Modelling program using available data sets to provide advice on management options and to assess the ecosystem values of seagrass meadows.

NRM	Area of seagrass (km^2)	# species	mean % cover	abundance data quality	status (since Jan2007)
Torres Strait	<15m = 13,413	total = 13			
	>15m = 3,793	estuary = 2		deficient	□
		coastal = 11	58.4 ±1.2 (Feb 2007-Mar 2010)	inadequate	■
		reef = 11	36.6 ±0.5 (Jun 2004-Mar 2010)	sufficient	■
Cape York	<15m = 1,843	total = 15			
	>15m = 10,641	estuary = 4		deficient	▲
		coastal = 6		deficient	▲
		reef = 9	17.5 ±0.5 (Oct 2003-Apr 2010)	inadequate	■
Wet Tropics	<15m = 201	total = 14			
	>15m = 6,638	estuary = 5	22.6 ±0.7 ^ (Dec 1993-Nov 2009)	inadequate	■
		coastal = 5	12.4 ±0.2 (Aug 2000-Apr 2010)	sufficient	■
		reef = 9	30.3 ±0.4 (Nov 2001-Apr 2010)	sufficient	■
Burdekin	<15m = 55	total = 11			
	>15m = 2,372	estuary = 3	11.3 ±1.4 (Sep 2001-Jun 2004)	deficient	●
		coastal = 8	19.6 ±0.3 (Apr 2001-Jun 2010)	sufficient	●
		reef = 8	30.3 ±0.6 (May 2005-Jun 2010)	adequate	●
Mackay Whitsunday	<15m = 154	total = 12			
	>15m = 293	estuary = 4	20.7 ±0.4 (Jun 2000-Mar 2010)	inadequate	●
		coastal = 5	20.1 ±0.2 (Sep 1999-Mar 2010)	sufficient	■
		reef = 8	12.0 ±0.2 (Apr 2000-Mar 2010)	adequate	■
Fitzroy	<15m = 240	total = 6			
	>15m = 6,725	estuary = 4	18.0 ±0.5 (Oct 2005-Apr 2010)	sufficient	▲
		coastal = 3	19.8 ±0.2 (Apr 2003-Apr 2010)	adequate	■
		reef = 4	2.3 ±0.2 (Sep 2007-Apr 2010)	inadequate	▲
Burnett Mary	<15m = 1,026	total = 8			
	>15m = 6,992	estuary = 8	9.9 ±0.1 (Aug 1999-May 2010)	sufficient	■
		coastal = 5	3.8 ±0.1 (Aug 1999-Feb 2010)	adequate	▲
SEQ	<15m = 401	total = 9			
	>15m = unknown	estuary = 8	35.0 ±0.2 (May 2001-Dec 2008)	sufficient	■
		coastal = 7	33.7 ±0.5 (Feb 2003-Jul 2008)	sufficient	■

Area calculated from composite (all mapping surveys pooled) maps. Area measures for seagrass ›15m depth determined by actual mapping and modelled probabilities 50% (pixel size of $5km^2$) from all survey points pooled. NB: actual and modelled information is at different levels of precision.

^Abundance in blue = grams Dry Weight m^{-2} above-ground. Abundance data quality (column 5) indicates level of precision: deficient = no or very few monitoring sites; inadequate = several sites but not enough to be representative; adequate = enough sites to be representative; sufficient = many sites available.

Status: ■ increasing or stable ● decreasing ▲ variable/uncertain □ unknown

Future

In the next 10-20 years it is expected that changes in climate (i.e. increasing temperature, sea-level rise and tropical storm frequency) will increase stress to coastal habitats. This will add to existing threats to seagrass meadows. The best defence against unnecessary habitat loss will be to use high quality, long-term information in decision making regarding coastal development and management. Monitoring change in seagrass performance and understanding the factors underpinning trends in change, resilience and recovery processes will be critical. There are significant gaps in our knowledge of seagrass ecology, namely: species level response to change, subtidal meadow dynamics, responses to light quality and turbidity, and in understanding responses to natural cycles such as La Niña and El Niño fluctuations.

The Marine Ecology Group is working in partnership with James Cook University and other research institutions to improve knowledge in these areas.

We thank all Queensland Seagrass-Watch participants whose dedication and data collection over the past decade have made this brochure possible. We thank M. Rasheed, H. Taylor, M. Waycott (JCU) and the Marine Ecology Group for their contributions and also the many organisations who assisted with monitoring in partnership with Fisheries Queensland.

Fisheries Queensland has a team of scientists in the Marine Ecology Group that conduct state, national and global seagrass assessment, monitoring and research. The group provides the scientific papers, reports and advice that in partnership with managers, industry and other research organisations underpins the successful management, conservation and protection of fisheries habitat.

Further reading

Carruthers et al. (2001). Seagrass habitats of north east Australia: models of key processes and controls. *Bulletin of Marine Science* 71(3): 1153-1169.

Coles et al. (2007). *Status and trends of seagrass habitats in the Great Barrier Reef World Heritage Area*. RRRC Ltd, Cairns (122 pp). www.rrrc.org.au

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Larkum et al. (2006). *Seagrasses: Biology Ecology and Conservation*. Springer, The Netherlands. 691 pp.

Waycott et al. (2007). Vulnerability of seagrasses in the Great Barrier Reef to climate change. *Climate Change and the Great Barrier Reef*, eds. Johnson & Marshall. GBRMPA and Australian Greenhouse Office, Australia. pp.193-235.

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